PARKDALE
PRELIMINARY UTILITY REPORT

PREPARED FOR

OEO, LLC
7353 S Alton Way, Suite A100
Centennial, CO 80112

PREPARED BY



KT Engineering, LLC
12500 W 58TH Ave, Suite 230
Arvada, CO 80002

DATE

May, 2017
Revised, October 2017
Revised, January 20167

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1. GENERAL LOCATION AND DESCRIPTION

The Parkdale Subdivision is a proposed 633 lot residential housing development. The Parkdale Subdivision is bounded to the north by large residential lots, to the east by E. County Line Road, to the south by Baseline Road and to the west by N. 119th Street. Please refer to the Appendix A of this report for a vicinity map.

2. DESIGN CRITERIA

The preliminary water and sewer systems for the Parkdale Development have been designed using the Town of Erie's Design Criteria along with recommendations from the Technical memorandum, "Water/Sewer Service to Proposed Development Southwest of E. County Line and Arapahoe", prepared by Merrick and Company, February 5, 2016. Please refer to the Appendix C of this report for the memorandum.

3. SANITARY SEWER DESIGN

Sanitary sewer service to the site will be provided by a large trunk line along Coal Creek. Currently the most southern sewer line is the Compass Filing No. 1 sewer outfall near Vista Parkway and Coal Creek. An extension from this point south along Coal Creek has already been designed with the "South Coal Creek Sanitary Sewer and Airport Road to Baron Court Waterline" project. The Parkdale development will tie into manhole SC-12 of the South Coal Creek Line and construct from that point north. The pipe diameters of the proposed and existing trunk lines may need to be increased as outlined in the Merrick memo. Please refer to Appendix B of this report for an overall utility map. Also please refer to Appendix C for preliminary pipe sizing.

An analysis of the entire area tributary to the South Coal Creek tie-in point has also been included with this report. Proposed pipes have been shown with the required minimum diameters and slopes needed to carry the projected flows at 80% capacity. The existing compass and South Coal Creek trunk lines have also been evaluated. Utilizing the Town of Erie's peaking factors the analysis shows that a capacity issue may exist in the Compass trunk line, as indicated in the Merrick Memo. However, if the more conservative Denver Wastewater peaking factor is used the existing line should have just enough capacity at full buildout. Please refer to Appendix C of this report for a sewer basing map and capacity calculations.

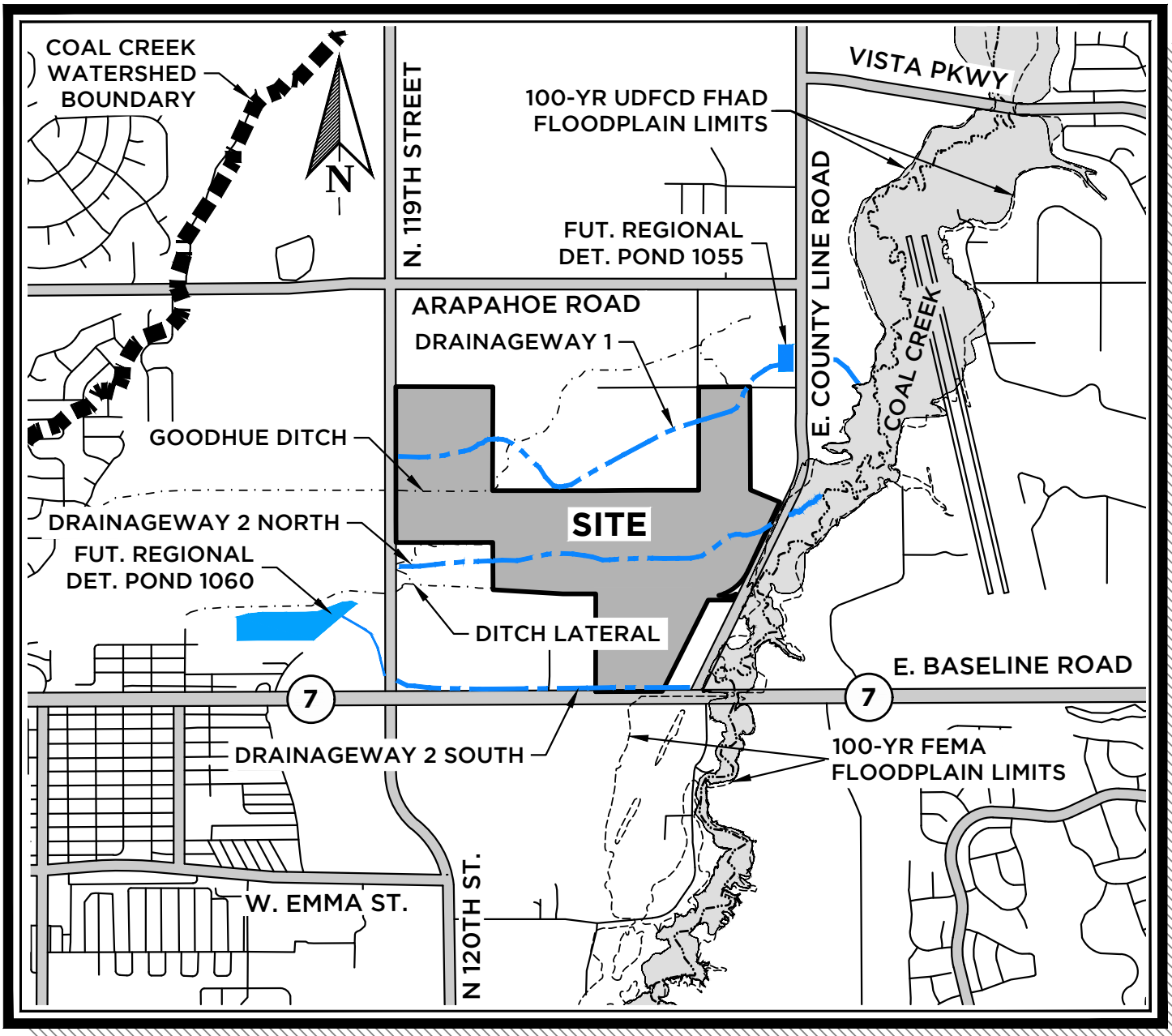
4. POTABLE WATER DESIGN

The proposed Parkdale Development will draw its potable water from pressure Zone 3 of the Town's system. According the Merrick's Technical memorandum Zone 3 is one of the Town's strongest zones and could reasonably serve this area. Connections to the existing potable water system will be made via two 12-inch water lines, one connecting to the existing 14-inch line in Grenville Circle and one connection to a 14-inch line at County Line Road and Main Street. Please refer to Appendix B of this report for an overall utility map.

Estimated Potable design flows (633 lots): 230,412 Avg. gpd, 37,465 Peak gal / hour

Parkdale as currently depicted contains 519 single family lots and 114 duplex lots. Per Town of Erie design flow requirements these lots require 1,000 GPM for a 2 hour duration. The Penner and Thero properties south of Parkdale are currently submitted to the Town of Erie for annexation consideration and will be developed in conjunction with the Parkdale development. The Penner / Thero properties will also be served from the proposed facilities and are currently planned as small single family and duplex lots, totaling approximately 220 units. A minimum fire flow 1,000 GPM for a 2 hour duration is assumed for the Penner / Thero properties as well.

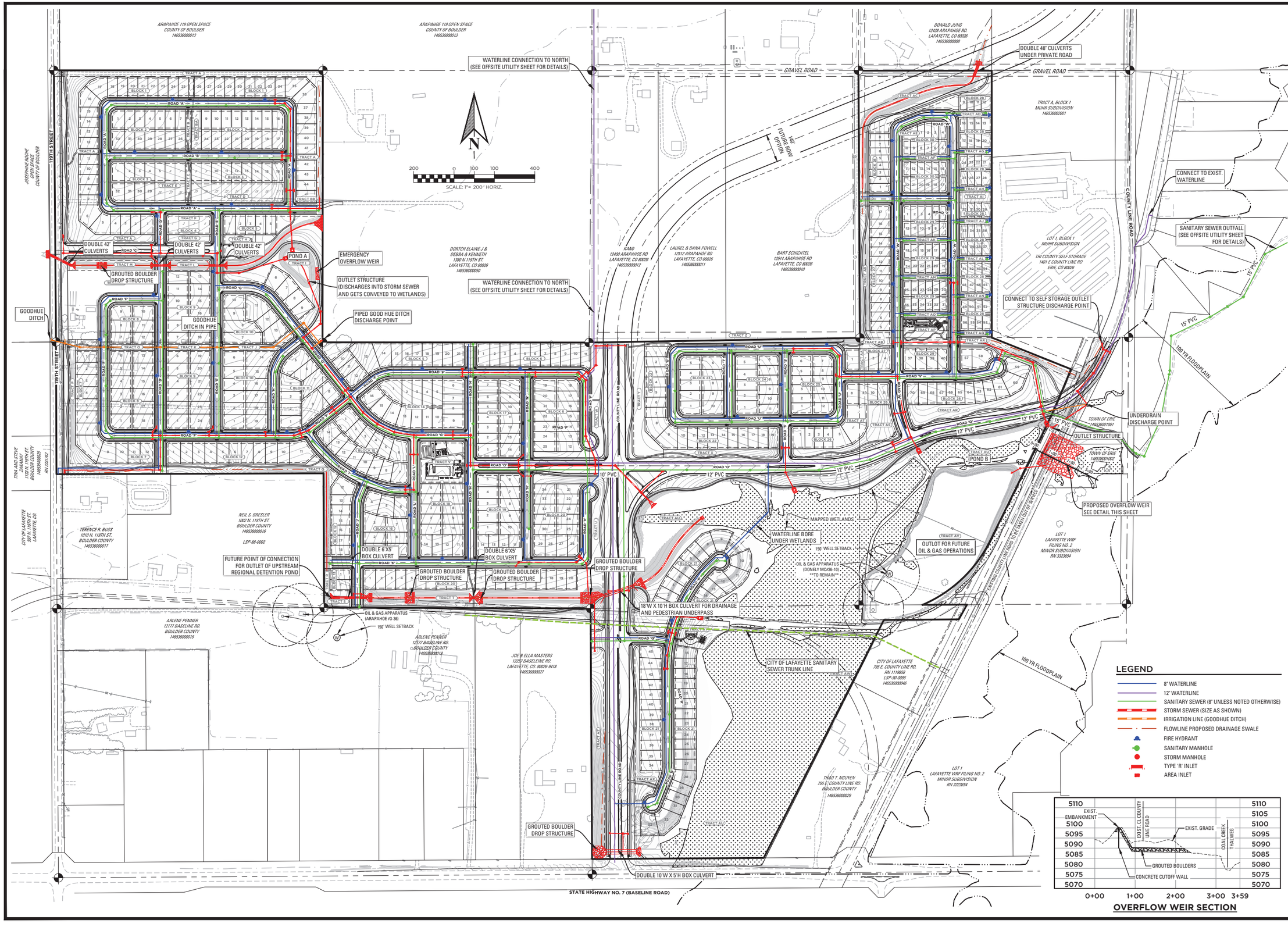
APPENDIX A



GENERAL LOCATION MAP

1" = 2000'

APPENDIX B



J:\DWG\3DEVELOP\PLANNING\PDP\SHEETS\1532-PDP-UTILITY OVERALL.dwg

ENGINEERING:

KT ENGINEERING
12500 W. 58TH AVE. #230
ARVADA, CO 80002
P: 720.638.5190

LAND PLANNING:

people creating spaces
pcs group inc. www.pcsgroupco.com
#3 & 180 Independence plaza
1007 16th street . denver co 80265
t 303.531.4905 . f 303.531.4908

PREPARED FOR:

OEO, LLC
7353 SOUTH ALTON WAY
CENTENNIAL, CO 80112
303.770.9111

REVISIONS:

NO.	REVISION DESCRIPTION	DATE	BY
1.	REVISIONS PER TOWN COMMENT	10.09.2017	BSS
2.			
3.			
4.			
5.			
6.			
7.			
8.			

SHEET INFO:

PARKDALE
PRELIMINARY DEVELOPMENT PLAN
OVERALL UTILITY PLAN

PROJECT NO: 0043-1532
DRAWN BY: BSS
DESIGNED BY: BSS
SCALE: 1" = 200'
SUBMITTED ON: 05.22.17

06
OF 44

APPENDIX C

Estimated Wastewater Design Flowrates

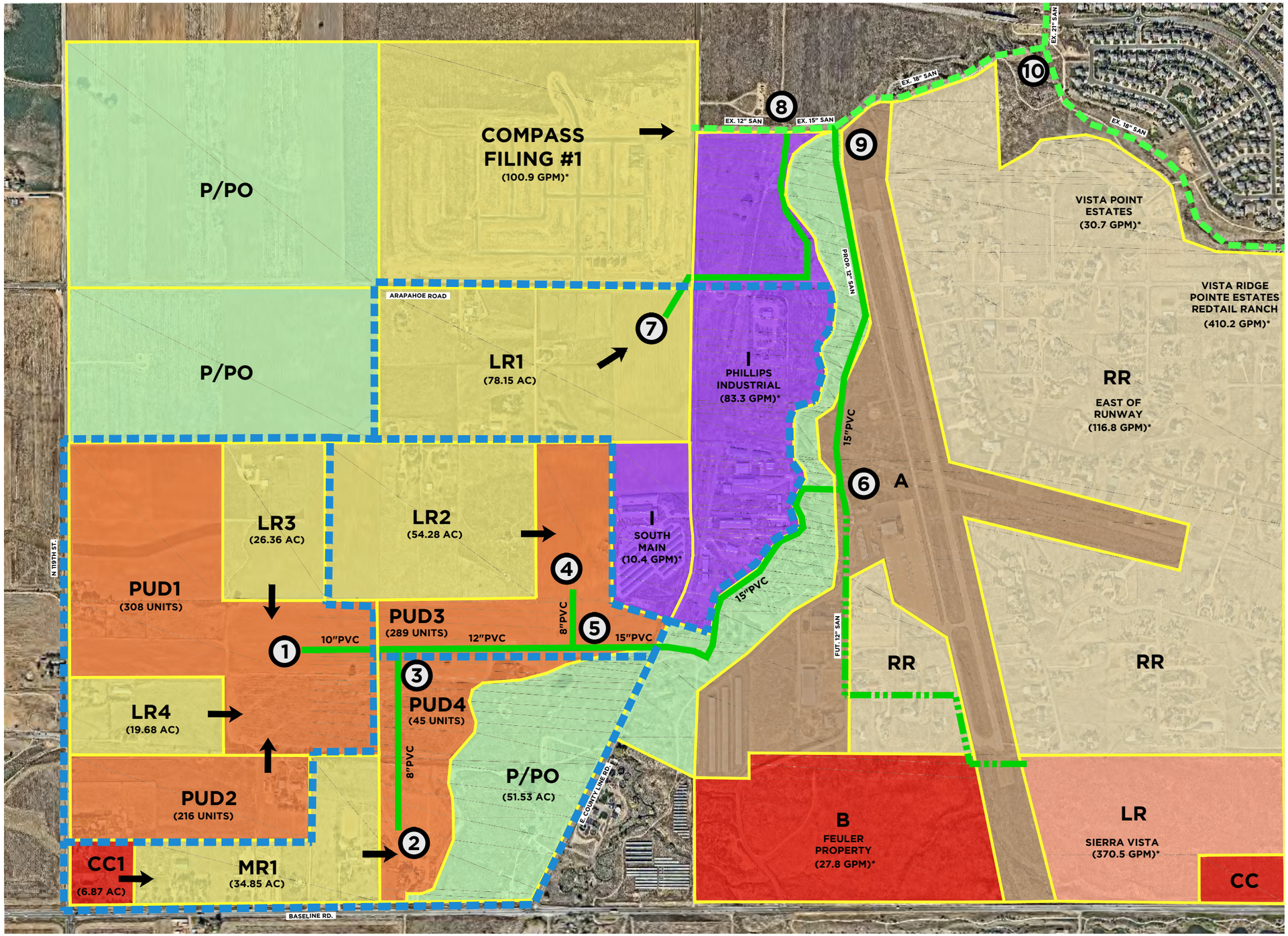
Land Use Area	Area (acres)	DU/AC	Number of Units	Population Density (persons/unit)	Flow (GPD/capita)	Average Daily Flow (GPM)
PUD1	Parkview		308	2.79	90	53.7
PUD2	Parkview Phase II		216	2.79	90	37.7
PUD3	Parkview		289	2.79	90	50.4
PUD4	Parkview		45	2.79	90	7.8
LR1	78.15	5	391	2.79	90	68.1
LR2	54.28	5	271	2.79	90	47.3
LR3	26.36	5	132	2.79	90	23.0
LR4	19.68	5	98	2.79	90	17.2
MR1	34.85	8	279	2.79	90	48.6
CC1	6.87	8	55	2.79	90	9.6
South Main	Flows take from Merrick Sewer Service Memo, 12/31/2015					10.4
Feuler. Sierra Vista, Tract E	Flows take from Merrick Sewer Service Memo, 12/31/2015					137.0
Phillips Industrial	Flows take from Merrick Sewer Service Memo, 12/31/2015					83.3
Compass Filing #1	Flows take from Merrick Sewer Service Memo, 12/31/2015					100.9
Visa Ridge, Pointe Estates, Redtail Ranch	Flows take from Merrick Sewer Service Memo, 12/31/2015					410.2

SEWER FLOW AND PIPE CAPACITY SUMMARY

Design Point	Reach U/S	Reach D/S	Slope %	Pipe Diameter (inches)	Mannings n	Q (Full) (cfs)	Q-Ave (gpm)	Q-Ave (gpd)	Q-(full) (gpd)	Peak Factor	Peak Flow (gpd)	% Capacity
						PUD1	53.7	77,339				
						PUD2	37.7	54,238				
						LR3	23.0	33,095				
						LR4	17.2	24,708				
DP1	**DP1**	**DP3**	**0.6**	**10**	**0.012**	**1.81**	**131.5**	**189,380**	**1,169,752**	**4.68**	**886,627**	**76%**
						PUD4	7.8	11,300				
						MR1		-				
						CC1	9.6	13,800				
DP2	**DP2**	**DP3**	**0.5**	**8**	**0.012**	**0.93**	**17.4**	**25,100**	**601,033**	**5.00**	**125,500**	**21%**
						DP1	131.5	189,380				
						DP2	17.4	25,100				
DP3	**DP3**	**DP5**	**0.5**	**12**	**0.012**	**2.72**	**176.0**	**214,480**	**1,757,860**	**4.58**	**983,115**	**56%**
						LR2	47.3	68,149				
						PUD3	50.4	72,568				
DP4	**DP4**	**DP5**	**1.0**	**8**	**0.012**	**1.33**	**97.7**	**140,716**	**859,542**	**4.92**	**692,916**	**81%**
						DP3	176.0	253,380				
						DP4	97.7	140,716				
DP5	**DP5**	**DP6**	**0.3**	**15**	**0.012**	**4.08**	**273.7**	**394,096**	**2,636,790**	**4.13**	**1,628,937**	**62%**
					Feuler, Sierra Vista, Tract E		137	197,280				
						DP5	273.7	394,096				
DP6	**DP6**	**DP9**	**0.2**	**18**	**0.012**	**5.42**	**410.7**	**591,376**	**3,502,794**	**3.86**	**2,281,399**	**65%**
					Phillips Industrial		83.3	119,952				
						LR1	68.1	98,117				
DP7	**DP7**	**DP8**	**0.5**	**12**	**0.012**	**2.72**	**151.4**	**218,069**	**1,757,860**	**4.57**	**996,753**	**57%**
					Compass Filing #1		100.9	145,296				
						DP7	151.4	218,069				
DP8	**DP7**	**DP9**	**0.14**	**15**	**0.012**	**2.79**	**252.3**	**363,365**	**1,803,099**	**4.19**	**1,522,787**	**84%**
						DP8	252.3	363,365				
						DP6	410.7	591,376				
DP9	**DP7**	**DP9**	**0.11**	**18**	**0.012**	**4.02**	**663.0**	**954,742**	**2,598,013**	**3.56**	**3,395,154**	**131%**
				Visa Ridge, Pointe Estates, Redtail Ranch			410.2	590,616		**2.44**	**2,332,083**	**90%**
						DP9	663.0	954,742				
DP10	**CC28**	**CC27**	**0.20**	**21**	**0.012**	**7.7**	**1,073.2**	**1,545,358**	**4,976,294**	**3.28**	**5,063,471**	**102%**
										2.26	**3,494,815**	**70%**

Peak flow using Denver Wastewater Peaking factor.

SOUTHWEST ERIE
SANITARY SEWER STUDY MAP



LEGEND

- EXISTING SANITARY SEWER
- FUTURE SANITARY SEWER
- PROPOSED SANITARY SEWER
- BASIN BOUNDARY
- LAND USE BOUNDARY
- (1) DESIGN POINT
- (00.00 AC) APPROXIMATE AREA IN ACRES
- (00 UNITS) ESTIMATED SINGLE FAMILY UNITS FROM PROPOSED DEVELOPMENTS.
- (00.0 GPM) ESTIMATED AVERAGE FLOW RATES FROM "WATER/SEWER SERVICE TO PROPOSED DEVELOPMENT SOUTHWEST OF E. COUNTY LINE AND ARAPAHOE" MEMORANDUM PREPARE BY MERRICK & COMPANY, 12/31/15.

N

400 0 200 400 800

SCALE: 1"= 400' HORIZ.

KT ENGINEERING
ENGINEERS • SURVEYORS
12500 W. 58th AVE. #230
ARVADA, CO 80002
PH: 720.638.5190

J:\JOBS\15XXX\15XXXX\15XXXXX\EXHIBITS\UTILITY MAPS\SEWER STUDY MAP.DWG

APPENDIX D

MERRICK & COMPANY
McLaughlin Water Engineers
A Division of Merrick & Company

MEMORANDUM
December 31, 2015
Revised February 5, 2016

TO: Wendi Palmer, Civil Engineer
Russell Pennington, Deputy Director of Public Works

FROM: Melanie Asquith, Terry Kenyon

RE: WATER/SEWER SERVICE TO PROPOSED DEVELOPMENT SOUTHWEST OF E. COUNTY LINE AND ARAPAHOE

As requested, we have evaluated the feasibility of providing water and sewer service to a "Proposed Development" southwest of the E. County Line Road and Arapahoe Road intersection. The property consists of approximately190 acres, with the majority currently outside of the Town of Erie's Planning Area Boundary. We understand the development will be primarily residential, with a proposed density of approximately 2.8 single family equivalents (SFE) per acre - a total of 686 SFEs. The extent of the proposed development is shaded on the attached drawings. In a subsequent meeting, Staff requested that we extend the analyses to include other possible "Future Development Areas" adjacent to the proposed development and south to Baseline Road, an additional 180 acres. Since land use planning has not been completed for these areas, we assumed a medium density, per the Town's criteria, of 8 SFE/acre. This results in an additional 1,440 SFE, for a total of 2,126 SFE. The Future Development Area is shown on the attached drawings.

WATER SERVICE

The entire proposed development is located within Pressure Zone 3. There is an existing 14-inch main in E. County Line Road which continues east toward the airport runway. This line is master planned to be increased to 16-inch as the aging AC pipe is replaced. A portion of this water system "back bone" is currently being upgraded to 16-inch as part of the "South Coal Creek Sanitary Sewer and Airport Road to Baron Court Waterline" project.

Proposed mains for serving the ultimate development (including the Future Development Areas) are shown schematically on the attached drawing. Actual routing of mains would be based on final development plans and should be reviewed during final plat/design submittals.

The layout and sizing of mains throughout the subject property should be equivalent to 12-inch pipe with a minimum of two connections to the Town's system; one to the existing 14-inch main in E. County Line Road and one to the proposed Compass development. Looping and fire flow availability should be reviewed during final plat/design submittal.

SANITARY SEWER SERVICE

Sanitary sewer service to the site is not as straightforward as the water. Until recently there were no sewer lines in the vicinity. The Compass "Filing No. 1 Offsite" project provided gravity service from the existing sewer at S. Parkdale Circle to E. County Line Road. The "South Coal Creek Sanitary Sewer and Airport Road to Baron Court Waterline" project (construction postponed) will provide service to the west side of the airport runway from the new Compass Trunk to just north of Baseline Road.

In order to analyze the capacity of the existing/planned sewers, an Excel spreadsheet model was created using as-constructed information and design drawings provided by the Town. The existing and projected loads used were established and specified in the Technical Memorandum "Relocation of West Grandview Basin Extension to 21-inch Section of Coal Creek Interceptor" by Indigo Water Group, dated February 22, 2013. An update to the Vista Ridge trunk loading was made in accordance with the information provided in the "Montex South Preliminary Plat" memo by Hurst & Associates, dated April 6, 2015. The spreadsheets are presented in this memo.

The Memorandum by Indigo Group used the Town Design Criteria and Peaking Factors to establish the proposed ultimate flows at build out. They also evaluated the same flows using the State of Colorado and the North Front Range Water Quality Planning Association (NFRWQPA) peaking factor, resulting in slightly lower ultimate flow rates. Note that the Town's criteria allows a maximum peaking factor of 5 for a contributing population of this size. Many jurisdictions and engineering texts use a maximum peaking factor of 4 (typical for new development with gasketed sewers and little to no infiltration). Applying the City and County of Denver's Sanitary Sewer Design Criteria formula (as we have for previous capacity analyses) results in lower peak flow rates. We have presented the Town's and Denver's design criteria for comparison.

Entity	Town of Erie	State of Colorado/ NFRWQPA	City and County of Denver Wastewater
Per Capita Flow (gpd)	90		120
Persons per Household	2.79		2.1
Household or SFE Flow (gpd)	251		252
Peaking Factor Formula	$PF = \frac{3.8}{Q_{average\ total}{}^{0.17}}$ *(max 5)*	$PF = \frac{3.65}{Q_{average\ total}{}^{0.167}}$	$PF = 2.6Q_{avg}{}^{-0.16}$ *(max 4)*

The following Table 1 is a summary of the sewer capacities from the Compass Filing No. 1 Offsite Trunk (Compass Trunk) and the Coal Creek Trunk to Manhole CC-17 (Coal Creek Trunk) at the southern point of Erie Commons. The results reflect only those proposed

developments within the Town's Planning Area Boundary that were evaluated in the Indigo Group Memorandum. Additional flows from the proposed development are not added. The two peaking factors are shown for comparison.

Table 1 – Trunk Sewer Capacities with Planning Area Boundary Buildout Projections

												Town of Erie Peaking Factor			Denver Wastewater Peaking Factor		
Region/ Trunk	Manhole U/S	Manhole D/S	Length (ft.)	Pipe Slope	Pipe (in.)	Mannings n	Q(full) (cfs)	Q(full) (gpd)	Q-Ave (gpm)	Q-Ave (gpd)	Q-Cumm. (gpd)	PEAK FACTOR	PEAK FLOW (gpd)	% Capacity	PEAK FACTOR	PEAK FLOW (gpd)	% Capacity
								From Compass	***100.9***								
Compass	SSMH-9	SSMH-8	401	0.0230	12	0.012	5.866	3,791,234	100.9	145,299	145,299	5.00	726,494	19%	3.30	479,667	13%
								From South Main	***10.4***								
							From SW of County Line and Arapahoe		***31.3***								
								From Phillips Industrial	***83.3***								
							From New County Line Development		***0.0***								
Compass	SSMH-8	SSMH-7	198	0.0218	12	0.012	5.711	3,691,008	125	180,000	325,299	4.27	1,389,149	38%	2.90	943,968	26%
Compass	SSMH-7	SSMH-6	221	0.0026	15	0.012	3.581	2,314,450	0	0	325,299	4.27	1,389,149	60%	2.90	943,968	41%
Compass	SSMH-6	SSMH-5	380	0.0014	15	0.012	2.665	1,722,433	0	0	325,299	4.27	1,389,149	81%	2.90	943,968	55%
Compass	SSMH-5	SSMH-4	247	0.0018	15	0.012	2.980	1,925,739	0	0	325,299	4.27	1,389,149	72%	2.90	943,968	49%
Compass	SSMH-4	SSMH-3	228	0.0016	15	0.012	2.809	1,815,604	0	0	325,299	4.27	1,389,149	77%	2.90	943,968	52%
								From Feurer Property	***27.8***								
								From East of Runway	***116.8***								
Compass	SSMH-3	SSMH-2	343	0.0011	18	0.012	3.784	2,445,536	145	208,251	533,550	3.93	2,094,639	86%	2.68	1,430,430	58%
Compass	SSMH-2	SSMH-1	301	0.0015	18	0.012	4.419	2,855,771	0	0	533,550	3.93	2,094,639	73%	2.68	1,430,430	50%
Compass	SSMH-1	CC-28	433	0.0019	18	0.012	4.973	3,214,064	0	0	533,550	3.93	2,094,639	65%	2.68	1,430,430	45%
					From Vista Ridge/Pointe Estates/Redtail Ranch				***410.15***								
Coal Creek	CC-29	CC-28	278	0.0010	21	0.012	5.446	3,519,802	410	590,610	590,610	3.86	2,278,946	65%	2.64	1,557,875	44%
							Total From West Side of Airpark		***370.5***								
								From Vista Pointe	***30.69***								
Coal Creek	CC-28	CC-27	477	0.0020	21	0.012	7.702	4,977,751	401	577,743	1,168,353	3.44	4,014,586	81%	2.36	2,763,135	56%
Coal Creek	CC-27	CC-26A	271	0.0050	21	0.012	12.178	7,870,516		0	1,168,353	3.44	4,014,586	51%	2.36	2,763,135	35%
Coal Creek	CC-26A	CC-26	278	0.0040	24	0.012	15.544	10,045,461		0	1,168,353	3.44	4,014,586	40%	2.36	2,763,135	28%
Coal Creek	CC-26	CC-21	520	0.0220	24	0.012	36.453	23,558,694		0	1,168,353	3.44	4,014,586	17%	2.36	2,763,135	12%
							From NW of County Line and Vista Parkway		***59.0***								
							From W of Vista Pointe and Coal Creek		***145.8***								
Coal Creek	CC-21	CC-20	516	0.0020	24	0.012	10.991	7,103,214	205	295,000	1,463,353	3.31	4,839,428	68%	2.28	3,338,359	47%
Coal Creek	CC-20	CC-19	343	0.0020	24	0.012	10.991	7,103,214		0	1,463,353	3.31	4,839,428	68%	2.28	3,338,359	47%
Coal Creek	CC-19	CC-18	472	0.0020	24	0.012	10.991	7,103,214		0	1,463,353	3.31	4,839,428	68%	2.28	3,338,359	47%
Coal Creek	CC-18	CC-17	401	0.0020	24	0.012	10.991	7,103,214		0	1,463,353	3.31	4,839,428	68%	2.28	3,338,359	47%

The segments that calculated at or above 80% capacity have been highlighted in red. The segments calculated between 71% - 80% capacity have been highlighted in yellow, and is typical for the Tables that follow. According to Town Standards, a sewer main 12-inches in diameter and larger may be designed to flow full at the peak design flow rate. However, industry practice is, and we recommend, to not design sewers above approximately 80% capacity flowing full.

The results for the initial development density of 686 SFE are presented in the following Table 2. Note that the majority of segments are highlighted red and yellow, with some reaches well above 100% capacity using the Town's peaking factor. Using the Denver Peaking Factor, the segments between SSMH-6 and SSMH-2 are over 70% capacity, and are highlighted yellow to indicate that flow monitoring is recommended as development occurs.

Table 2 – Proposed County Line Development of 686 SFE

												Town of Erie Peaking Factor			Denver Wastewater Peaking Factor		
Region/ Trunk	Manhole U/S	Manhole D/S	Length (ft.)	Pipe Slope	Pipe (in.)	Mannings n	Q(full) (cfs)	Q(full) (gpd)	Q-Ave (gpm)	Q-Ave (gpd)	Q-Cumm. (gpd)	PEAK FACTOR	PEAK FLOW (gpd)	% Capacity	PEAK FACTOR	PEAK FLOW (gpd)	% Capacity
								From Compass	***100.9***								
Compass	SSMH-9	SSMH-8	401	0.0230	12	0.012	5.866	3,791,234	100.9	145,299	145,299	5.00	726,494	19%	3.30	479,667	13%
								From South Main	***10.4***								
								From SW of County Line and Arapahoe	***31.3***								
								From Phillips Industrial	***83.3***								
								From New County Line Development	***119.6***								
Compass	SSMH-8	SSMH-7	198	0.0218	12	0.012	5.711	3,691,008	0	0	145,299	4.90	711,593	19%	3.30	479,667	13%
Compass	SSMH-7	SSMH-6	221	0.0026	15	0.012	3.581	2,314,450	245	352,255	497,553	3.97	1,976,657	85%	2.71	1,348,917	58%
Compass	SSMH-6	SSMH-5	380	0.0014	15	0.012	2.665	1,722,433	0	0	497,553	3.97	1,976,657	115%	2.71	1,348,917	78%
Compass	SSMH-5	SSMH-4	247	0.0018	15	0.012	2.980	1,925,739	0	0	497,553	3.97	1,976,657	103%	2.71	1,348,917	70%
Compass	SSMH-4	SSMH-3	228	0.0016	15	0.012	2.809	1,815,604	0	0	497,553	3.97	1,976,657	109%	2.71	1,348,917	74%
								From Feurer Property	***27.8***								
								From East of Runway	***116.8***								
Compass	SSMH-3	SSMH-2	343	0.0011	18	0.012	3.784	2,445,536	145	208,251	705,804	3.74	2,642,178	108%	2.56	1,809,400	74%
Compass	SSMH-2	SSMH-1	301	0.0015	18	0.012	4.419	2,855,771	0	0	705,804	3.74	2,642,178	93%	2.56	1,809,400	63%
Compass	SSMH-1	CC-28	433	0.0019	18	0.012	4.973	3,214,064	0	0	705,804	3.74	2,642,178	82%	2.56	1,809,400	56%
					From Vista Ridge/Pointe Estates/Redtail Ranch				***410.15***								
Coal Creek	CC-29	CC-28	278	0.0010	21	0.012	5.446	3,519,802	410	590,610	590,610	3.86	2,278,946	65%	2.64	1,557,875	44%
							Total From West Side of Airpark		***245.5***								
								From Vista Pointe	***30.69***								
Coal Creek	CC-28	CC-27	477	0.0020	21	0.012	7.702	4,977,751	276	397,743	988,353	3.54	3,494,068	70%	2.43	2,400,856	48%
Coal Creek	CC-27	CC-26A	271	0.0050	21	0.012	12.178	7,870,516		0	988,353	3.54	3,494,068	44%	2.43	2,400,856	31%
Coal Creek	CC-26A	CC-26	278	0.0040	24	0.012	15.544	10,045,461		0	988,353	3.54	3,494,068	35%	2.43	2,400,856	24%
Coal Creek	CC-26	CC-21	520	0.0220	24	0.012	36.453	23,558,694		0	988,353	3.54	3,494,068	15%	2.43	2,400,856	10%
					From NW of County Line and Vista Parkway				***59.0***								
					From W of Vista Pointe and Coal Creek				***145.8***								
Coal Creek	CC-21	CC-20	516	0.0020	24	0.012	10.991	7,103,214	205	295,000	1,283,353	3.38	4,339,918	61%	2.33	2,989,858	42%
Coal Creek	CC-20	CC-19	343	0.0020	24	0.012	10.991	7,103,214		0	1,283,353	3.38	4,339,918	61%	2.33	2,989,858	42%
Coal Creek	CC-19	CC-18	472	0.0020	24	0.012	10.991	7,103,214		0	1,283,353	3.38	4,339,918	61%	2.33	2,989,858	42%
Coal Creek	CC-18	CC-17	401	0.0020	24	0.012	10.991	7,103,214		0	1,283,353	3.38	4,339,918	61%	2.33	2,989,858	42%

As shown in Table 3, The Compass Trunk does not have capacity to support the Future Development Area of 2,126 SFE. Paralleling the Compass Trunk with an approximate 12-inch sewer would be needed to provide the required capacity. (Actual size would be confirmed in final design.)

Table 3 – Proposed County Line Development of 2,126 SFE

												Town of Erie Peaking Factor			Denver Wastewater Peaking Factor		
Region/ Trunk	Manhole U/S	Manhole D/S	Length (ft.)	Pipe Slope	Pipe (in.)	Mannings n	Q(full) (cfs)	Q(full) (gpd)	Q-Ave (gpm)	Q-Ave (gpd)	Q-Cumm. (gpd)	PEAK FACTOR	PEAK FLOW (gpd)	% Capacity	PEAK FACTOR	PEAK FLOW (gpd)	% Capacity
								From Compass	***100.9***								
Compass	SSMH-9	SSMH-8	401	0.0230	12	0.012	5.866	3,791,234	100.9	145,299	145,299	5.00	726,494	19%	3.30	479,667	13%
								From South Main	***10.4***								
								From SW of County Line and Arapahoe	***31.3***								
								From Phillips Industrial	***83.3***								
								From New County Line Development	***370.7***								
Compass	SSMH-8	SSMH-7	198	0.0218	12	0.012	5.711	3,691,008	0	0	145,299	4.90	711,593	19%	3.30	479,667	13%
Compass	SSMH-7	SSMH-6	221	0.0026	15	0.012	3.581	2,314,450	496	713,839	859,137	3.62	3,110,471	134%	2.48	2,134,285	92%
Compass	SSMH-6	SSMH-5	380	0.0014	15	0.012	2.665	1,722,433	0	0	859,137	3.62	3,110,471	181%	2.48	2,134,285	124%
Compass	SSMH-5	SSMH-4	247	0.0018	15	0.012	2.980	1,925,739	0	0	859,137	3.62	3,110,471	162%	2.48	2,134,285	111%
Compass	SSMH-4	SSMH-3	228	0.0016	15	0.012	2.809	1,815,604	0	0	859,137	3.62	3,110,471	171%	2.48	2,134,285	118%
								From Feurer Property	***27.8***								
								From East of Runway	***116.8***								
Compass	SSMH-3	SSMH-2	343	0.0011	18	0.012	3.784	2,445,536	145	208,251	1,067,388	3.49	3,724,447	152%	2.40	2,561,124	105%
Compass	SSMH-2	SSMH-1	301	0.0015	18	0.012	4.419	2,855,771	0	0	1,067,388	3.49	3,724,447	130%	2.40	2,561,124	90%
Compass	SSMH-1	CC-28	433	0.0019	18	0.012	4.973	3,214,064	0	0	1,067,388	3.49	3,724,447	116%	2.40	2,561,124	80%
					From Vista Ridge/Pointe Estates/Redtail Ranch				***410.15***								
Coal Creek	CC-29	CC-28	278	0.0010	21	0.012	5.446	3,519,802	410	590,610	590,610	3.86	2,278,946	65%	2.64	1,557,875	44%
						Total From West Side of Airpark			***245.5***								
								From Vista Pointe	***30.69***								
Coal Creek	CC-28	CC-27	477	0.0020	21	0.012	7.702	4,977,751	276	397,743	988,353	3.54	3,494,068	70%	2.43	2,400,856	48%
Coal Creek	CC-27	CC-26A	271	0.0050	21	0.012	12.178	7,870,516		0	988,353	3.54	3,494,068	44%	2.43	2,400,856	31%
Coal Creek	CC-26A	CC-26	278	0.0040	24	0.012	15.544	10,045,461		0	988,353	3.54	3,494,068	35%	2.43	2,400,856	24%
Coal Creek	CC-26	CC-21	520	0.0220	24	0.012	36.453	23,558,694		0	988,353	3.54	3,494,068	15%	2.43	2,400,856	10%
					From NW of County Line and Vista Parkway				***59.0***								
						From W of Vista Pointe and Coal Creek			***145.8***								
Coal Creek	CC-21	CC-20	516	0.0020	24	0.012	10.991	7,103,214	205	295,000	1,283,353	3.38	4,339,918	61%	2.33	2,989,858	42%
Coal Creek	CC-20	CC-19	343	0.0020	24	0.012	10.991	7,103,214		0	1,283,353	3.38	4,339,918	61%	2.33	2,989,858	42%
Coal Creek	CC-19	CC-18	472	0.0020	24	0.012	10.991	7,103,214		0	1,283,353	3.38	4,339,918	61%	2.33	2,989,858	42%
Coal Creek	CC-18	CC-17	401	0.0020	24	0.012	10.991	7,103,214		0	1,283,353	3.38	4,339,918	61%	2.33	2,989,858	42%

Surcharge Analysis

At the Town's request, we evaluated the impacts of surcharging the Compass Trunk using SewerCAD. Flows from the proposed developments, including the Future Development Area, were estimated based on 2,126 SFE (shown using both peaking factors) and loaded at MH-7. The results of the analysis resulted in 1,918 feet of surcharged sewers, between manholes SSMH-7 and SSMH-2. To provide the required capacity, a surcharge of approximately 0.5 ft. (Denver peaking factor) or 3.5 ft. (Erie peaking factor) over the top of pipe would be needed. The results are shown on the attached profiles.

ALTERNATIVE SEWER ALIGNMENT

Following discussions with the Town, a review of an alternative alignment was requested. This alignment directed the flows from the proposed development to the planned South Coal Creek Sanitary Sewer as shown on the Proposed Sewer Alignment – 2,126 SFE, Alternate Alignments drawing. The spreadsheet in Table 4 shown below highlights the results.

The South Coal Creek Sewer is currently designed at 12-inch diameter until increasing to 18-inch at the most downstream section prior to connecting to the Compass Trunk. The proposed

trunk sewer does not have capacity as currently designed; however, if it is upsized to 15-inch diameter below the tie-in, it can accommodate the 686 SFE development scenario. To serve development above approximately 1,800 SFE (as is the case for the evaluated 2,126 SFE), the trunk must be increased to 18-inch. The connection could be made at either of the locations shown on the drawing, with the upsizing being made at the connection and downstream.

When evaluating an expanded future development area of 2,126 SFE, (as shown in Table 4) the segments between SSMH-3 and CC-28 are highlighted red at over 80% and the next segment yellow at 76%. Slight surcharging occurs at manhole SSMH-3.

Table 4 – Alternative Alignment with 2,126 SFE

												Town of Erie Peaking Factor			Denver Wastewater Peaking Factor		
Region/ Trunk	Manhole U/S	Manhole D/S	Length (ft.)	Pipe Slope	Pipe (in.)	Mannings n	Q(full) (cfs)	Q(full) (gpd)	Q-Ave (gpm)	Q-Ave (gpd)	Q-Cumm. (gpd)	PEAK FACTOR	PEAK FLOW (gpd)	% Capacity	PEAK FACTOR	PEAK FLOW (gpd)	% Capacity
								From Sierra Vista, Feurer, and Airpark Track E	**137**								
S Coal Crk	SC-9	SC-10	100	0.0094	12.00	0.012	3.750	2,423,710	137	197,704	197,704	4.65	918,855	38%	3.14	621,288	26%
S Coal Crk	SC-10	SC-11	490	0.0038	12.00	0.012	2.384	1,541,021		197,704	197,704	4.65	918,855	60%	3.14	621,288	40%
S Coal Crk	SC-11	SC-12	485	0.0038	12.00	0.012	2.384	1,541,021		197,704	197,704	4.65	918,855	60%	3.14	621,288	40%
S Coal Crk	SC-12	SC-13	375	0.0033	12.00	0.012	2.222	1,436,064		197,704	197,704	4.65	918,855	64%	3.14	621,288	43%
							From New Development		**371**								
							From South Main, Phillips		**132**								
S Coal Crk	SC-13	SC-14	500	0.0039	18.00	0.012	7.125	4,604,792	503	724,385	922,089	3.58	3,298,494	72%	2.46	2,264,900	49%
S Coal Crk	SC-14	SC-15	500	0.0037	18.00	0.012	6.940	4,485,167		0	922,089	3.58	3,298,494	74%	2.46	2,264,900	50%
S Coal Crk	SC-15	SC-16	512	0.0036	18.00	0.012	6.846	4,424,141		0	922,089	3.58	3,298,494	75%	2.46	2,264,900	51%
S Coal Crk	SC-16	SC-17	513	0.0035	18.00	0.012	6.750	4,362,262		0	922,089	3.58	3,298,494	76%	2.46	2,264,900	52%
S Coal Crk	SC-17	SC-18	275	0.0032	18.00	0.012	6.454	4,171,121		0	922,089	3.58	3,298,494	79%	2.46	2,264,900	54%
S Coal Crk	SC-18	SC-19	485	0.0035	18.00	0.012	6.750	4,362,262		0	922,089	3.58	3,298,494	76%	2.46	2,264,900	52%
S Coal Crk	SC-19	SC-20	415	0.0048	18.00	0.012	7.905	5,108,559		0	922,089	3.58	3,298,494	65%	2.46	2,264,900	44%
S Coal Crk	SC-20	SC-21	225	0.0047	18.00	0.012	7.822	5,055,064		0	922,089	3.58	3,298,494	65%	2.46	2,264,900	45%
S Coal Crk	SC-21	SC-22	100	0.0052	18.00	0.012	8.227	5,317,156		0	922,089	3.58	3,298,494	62%	2.46	2,264,900	43%
S Coal Crk	SC-22	SC-23	340	0.0014	21.00	0.012	6.444	4,164,685		0	922,089	3.58	3,298,494	79%	2.46	2,264,900	54%

												Town of Erie Peaking Factor			Denver Wastewater Peaking Factor		
Region/ Trunk	Manhole U/S	Manhole D/S	Length (ft.)	Pipe Slope	Pipe (in.)	Mannings n	Q(full) (cfs)	Q(full) (gpd)	Q-Ave (gpm)	Q-Ave (gpd)	Q-Cumm. (gpd)	PEAK FACTOR	PEAK FLOW (gpd)	% Capacity	PEAK FACTOR	PEAK FLOW (gpd)	% Capacity
								From Compass	***100.9***								
Compass	SSMH-9	SSMH-8	401	0.0230	12	0.012	5.866	3,791,234	100.9	145,299	145,299	5.00	726,494	19%	3.30	479,667	13%
Compass	SSMH-8	SSMH-7	198	0.0218	12	0.012	5.711	3,691,008	0	0	145,299	4.90	711,593	19%	3.30	479,667	13%
Compass	SSMH-7	SSMH-6	221	0.0026	15	0.012	3.581	2,314,450	0	0	145,299	4.90	711,593	31%	3.30	479,667	21%
Compass	SSMH-6	SSMH-5	380	0.0014	15	0.012	2.665	1,722,433	0	0	145,299	4.90	711,593	41%	3.30	479,667	28%
Compass	SSMH-5	SSMH-4	247	0.0018	15	0.012	2.980	1,925,739	0	0	145,299	4.90	711,593	37%	3.30	479,667	25%
Compass	SSMH-4	SSMH-3	228	0.0016	15	0.012	2.809	1,815,604	0	0	145,299	4.90	711,593	39%	3.30	479,667	26%
								From South Coal Creek Sanitary Sewer Extension	***640.3***								
Compass	SSMH-3	SSMH-2	343	0.0011	18	0.012	3.784	2,445,536	640	922,089	1,067,388	3.49	3,724,447	152%	2.40	2,561,124	105%
Compass	SSMH-2	SSMH-1	301	0.0015	18	0.012	4.419	2,855,771	0	0	1,067,388	3.49	3,724,447	130%	2.40	2,561,124	90%
Compass	SSMH-1	CC-28	433	0.0019	18	0.012	4.973	3,214,064	0	0	1,067,388	3.49	3,724,447	116%	2.40	2,561,124	80%
								From Vista Ridge/Pointe Estates/Redtail Ranch	***410.15***								
Coal Creek	CC-29	CC-28	278	0.0010	21	0.012	5.446	3,519,802	410	590,610	590,610	3.86	2,278,946	65%	2.64	1,557,875	44%
								Total From West Side of Airpark	***741.2***								
								From Vista Pointe	***30.69***								
Coal Creek	CC-28	CC-27	477	0.0020	21	0.012	7.702	4,977,751	772	1,111,582	1,702,192	3.22	5,486,448	110%	2.23	3,790,417	76%
Coal Creek	CC-27	CC-26A	271	0.0050	21	0.012	12.178	7,870,516		0	1,702,192	3.22	5,486,448	70%	2.23	3,790,417	48%
Coal Creek	CC-26A	CC-26	278	0.0040	24	0.012	15.544	10,045,461		0	1,702,192	3.22	5,486,448	55%	2.23	3,790,417	38%
Coal Creek	CC-26	CC-21	520	0.0220	24	0.012	36.453	23,558,694		0	1,702,192	3.22	5,486,448	23%	2.23	3,790,417	16%
								From NW of County Line and Vista Parkway	***59.0***								
								From W of Vista Pointe and Coal Creek	***145.8***								
Coal Creek	CC-21	CC-20	516	0.0020	24	0.012	10.991	7,103,214	205	295,000	1,997,192	3.14	6,264,734	88%	2.17	4,335,033	61%
Coal Creek	CC-20	CC-19	343	0.0020	24	0.012	10.991	7,103,214		0	1,997,192	3.14	6,264,734	88%	2.17	4,335,033	61%
Coal Creek	CC-19	CC-18	472	0.0020	24	0.012	10.991	7,103,214		0	1,997,192	3.14	6,264,734	88%	2.17	4,335,033	61%
Coal Creek	CC-18	CC-17	401	0.0020	24	0.012	10.991	7,103,214		0	1,997,192	3.14	6,264,734	88%	2.17	4,335,033	61%

CONCLUSIONS

In determining the feasibility of providing the proposed County Line development water and sanitary sewer service, existing, build-out of the proposed 190 acre development and the addition of possible Future Development Areas (approximately 180 acres) were evaluated.

Water

Zone 3 is the strongest pressure zone of the Town's system with a network of mains that can reasonably serve the new area. It is recommended that a minimum of two connections be made, one to the 14-inch line in E. County Line Road and one to the north within the Compass development. This will prevent a "bubble loop" connection. A schematic layout of the proposed mains for ultimate development of the site, including adjacent land parcels, is shown on the attached drawing. The development should be designed with minimum 8-inch internal looping to provide fire flows. Confirmation of available flows within the developer designed system can be checked during Final Plat/Design review.

Sewer

For these larger trunk sewers, it is reasonable to use the lower Denver peaking factors and plan for an ultimate sewer capacity based on approximately 80 percent capacity, as long as periodic flow monitoring for critical reaches is implemented and continued as future development occurs.

Using these lower peaking factors, excess capacity should be available to provide service to the currently planned (190 acre) development. Including the Future Development Area (180 acres) and/or increasing the density would require:

- A parallel trunk sewer from SSMH-7 to Manhole SSMH-2,
- surcharging approximately 0.5 feet of the Compass Trunk, between manholes SSMH-7 and SSMH-2, or
- constructing an alternative alignment; i.e., diverting flows across Coal Creek to the planned Coal Creek Trunk. This would require upsizing the sewer to at least 18-inch diameter downstream of the tie in.

There is always a risk associated with surcharging sewers. The Town would have to take measures to ensure that no sewer connections are made between the surcharged manholes and that any connections directly above these reaches are higher than the 0.5 ft. of surcharge.

Key recommendations follow:

- Planning, and sizing, for both the water and sewer facilities should consider the possible future development of adjacent private parcels. It should consider the potential for possible higher development densities.
- Final water main layout (and possibly sizing to achieve the equivalent hydraulic capacity) will, of course, be based upon final platting/street layout for the development.
- The need for a parallel sewer versus the acceptability of surcharging should be based on final development plans and flows.

- A sewer monitoring program should be established to better estimate peak wet weather flows/available capacity, continuing periodically as development occurs to verify peaking assumptions.

In conclusion, the existing Compass Trunk can accommodate the planned development of 686 SFE. The original alignment of a sewer paralleling the creek and connecting at SSMH-7 would be the most economical routing since it does not require a creek crossing. However, if additional development is considered, the need to parallel the Compass Trunk may outweigh the cost of the creek crossing.

Alternatively, diverting flows from the proposed development to the planned South Coal Creek Sanitary Sewer is a feasible option. This routing would require a creek crossing and an increase in the currently designed size (12-inch) downstream of the connection. However, it would eliminate the need for paralleling an extended length (±1,920 ft.) of the Compass Trunk since only one segment would be surcharged. Note that construction of the South Coal Creek Sanitary Sewer has been postponed with no time table established.

Since the total acreage and densities of the Future Development Areas are unknown, it may be reasonable to proceed with connecting the Proposed Development to the Compass Trunk and taking a “wait-and-see” approach to additional development. If no additional development occurs, no surcharge or parallel sewers are required. If development does occur, an economic/capacity analysis can be completed to determine if minimal surcharge or a parallel sewer are the most beneficial option.

LEFT HAND WATER INTERCONNECT

LYNN R. MORGAN WTF ZONE 3 AND ZONE 4A PUMP STATION

PROPOSED DEVELOPMENT

FUTURE DEVELOPMENT AREA

ARAPAHOE ROAD

COLORADO HIGHWAY 7 / BASELINE ROAD

E COUNTY LINE ROAD

N 119TH ST

VISTA PARKWAY

ERIE COMMONS

VISTA POINTE

VISTA POINTE ESTATES

REDTAIL RANCH PRATT 2

EAST OF RUNWAY

VISTA RIDGE

PHILLIPS INDUSTRIAL

SOUTH MAIN

AIRPORT

AIRPARK TRACT E

AIRPARK VISTA

FEURER PROPERTY

SIERRA VISTA

COMPASS

SW OF CNTY LINE AND ARAPAHOE

CC-17

CC-21

LEGEND

- TOWN BOUNDARY
- PLANNING AREA BOUNDARY
- EXISTING WATER
- PROPOSED WATER IN ACCORDANCE WITH 2013 MASTER PLAN
- PROPOSED PIPELINES

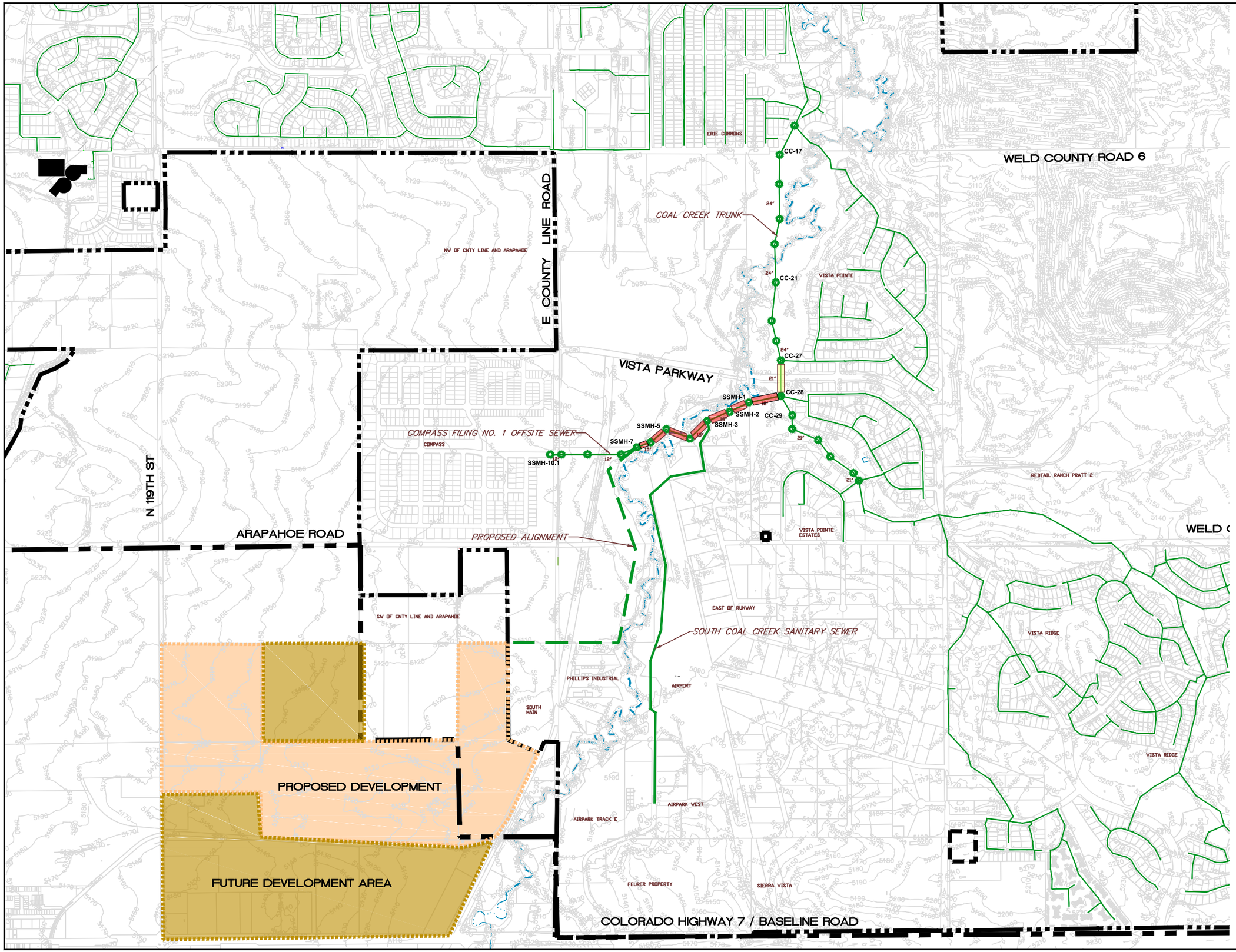
1,200 0 1,200

1 inch = 1,200 feet

SCHEMATIC PROPOSED WATER LAYOUT - REVISED

MERRICK & COMPANY
McLaughlin Water Engineers
A DIVISION OF MERRICK & COMPANY

FEBRUARY 2016



LEGEND

- TOWN BOUNDARY
- PLANNING AREA BOUNDARY
- EXISTING SEWER
- PROPOSED SEWER
- MANHOLE

CAPACITY WITHOUT PROPOSED

- EXCEEDING 80% CAPACITY AT BUILD-OUT
- TO BE MONITORED, APPROACHING 80% CAPACITY AT BUILD-OUT

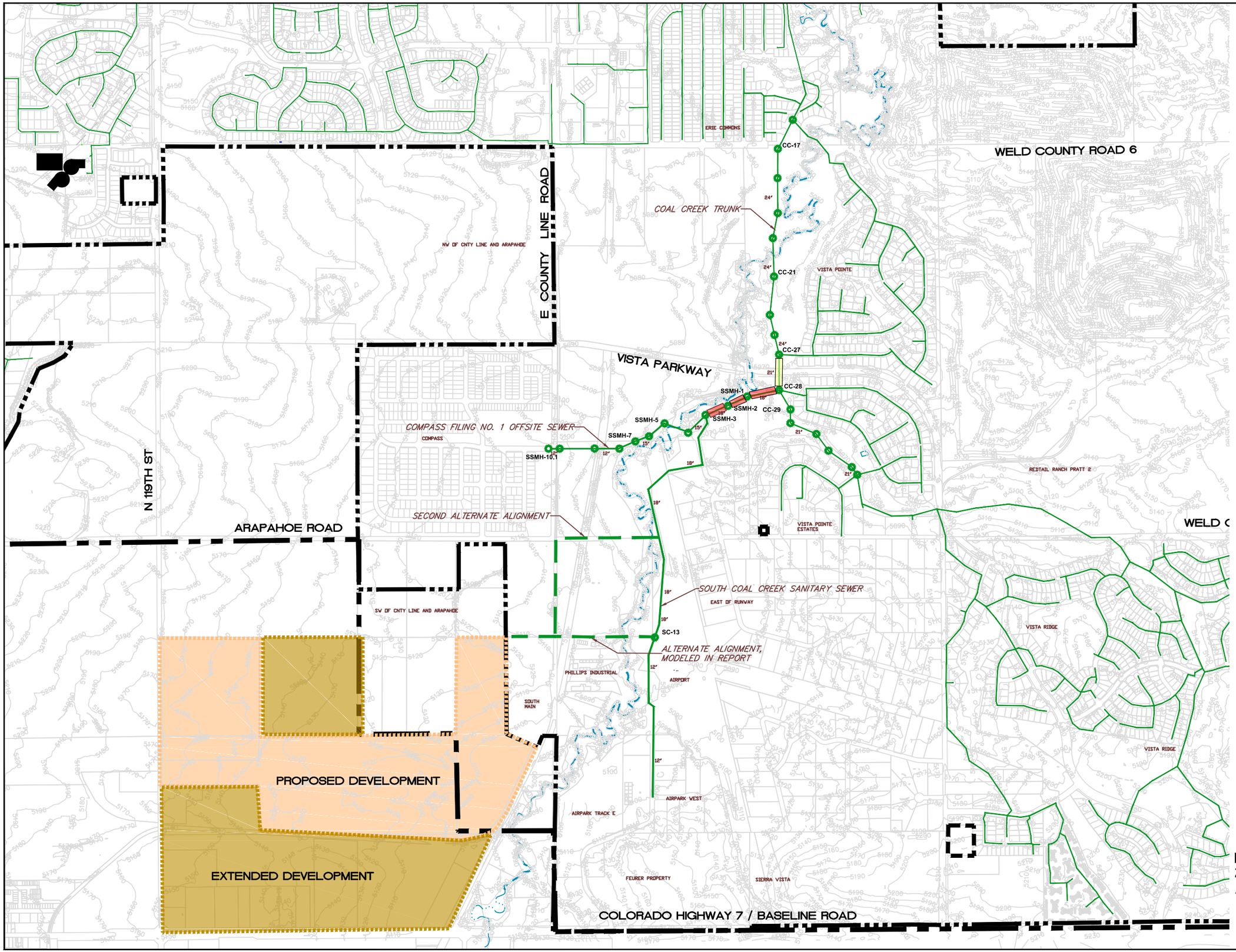
1,200 0 1,200

1 inch = 1,200 feet

PROPOSED SEWER ALIGNMENT- 2,216 SFE REVISED

MERRICK & COMPANY
McLaughlin Water Engineers
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FEBRUARY 2016



LEGEND

- TOWN BOUNDARY
- PLANNING AREA BOUNDARY
- EXISTING SEWER
- PROPOSED SEWER
- MANHOLE

CAPACITY WITHOUT PROPOSED

- EXCEEDING 80% CAPACITY AT BUILD-OUT
- TO BE MONITORED, APPROACHING 80% CAPACITY AT BUILD-OUT

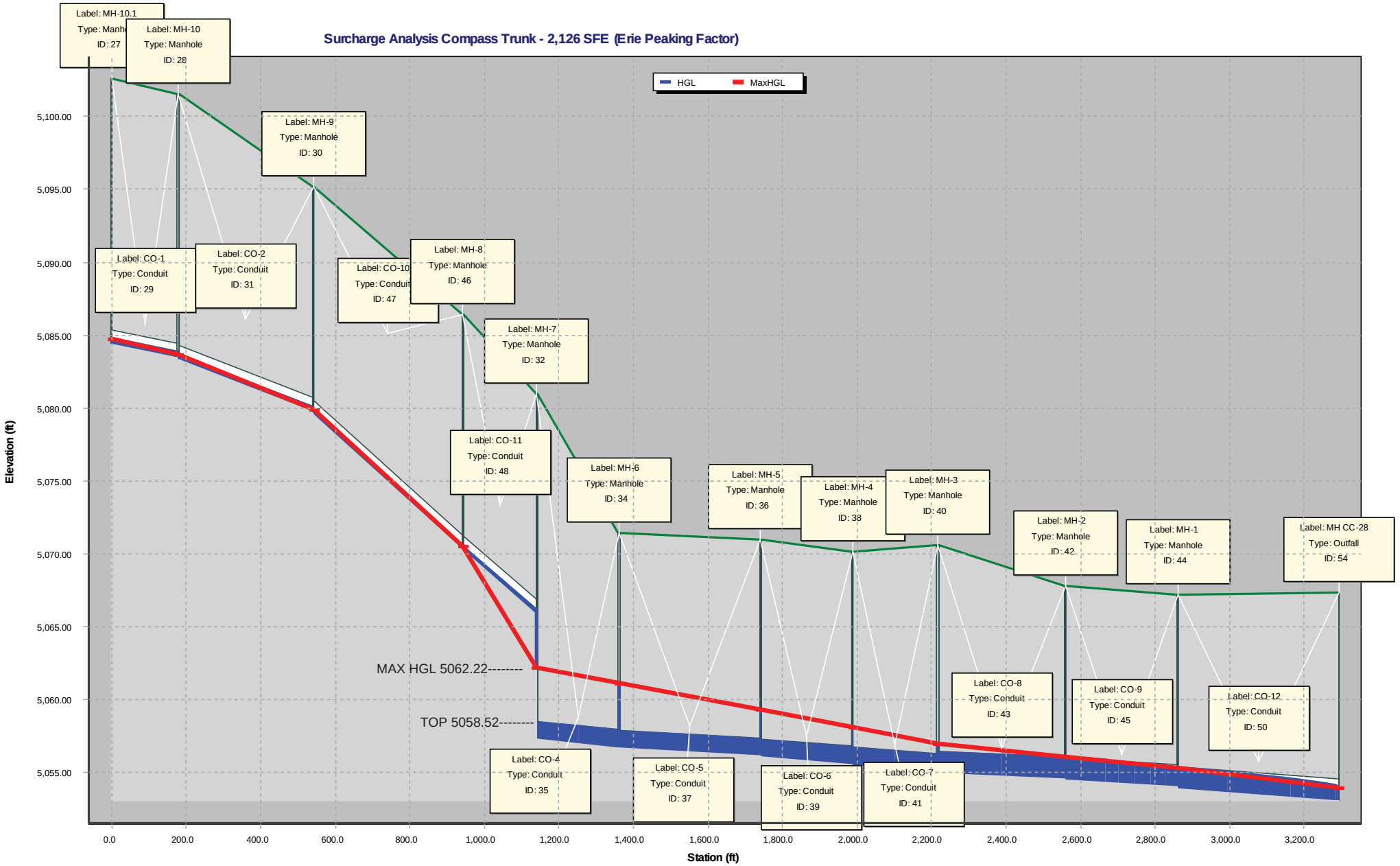
1,200 0 1,200

1 inch = 1,200 feet

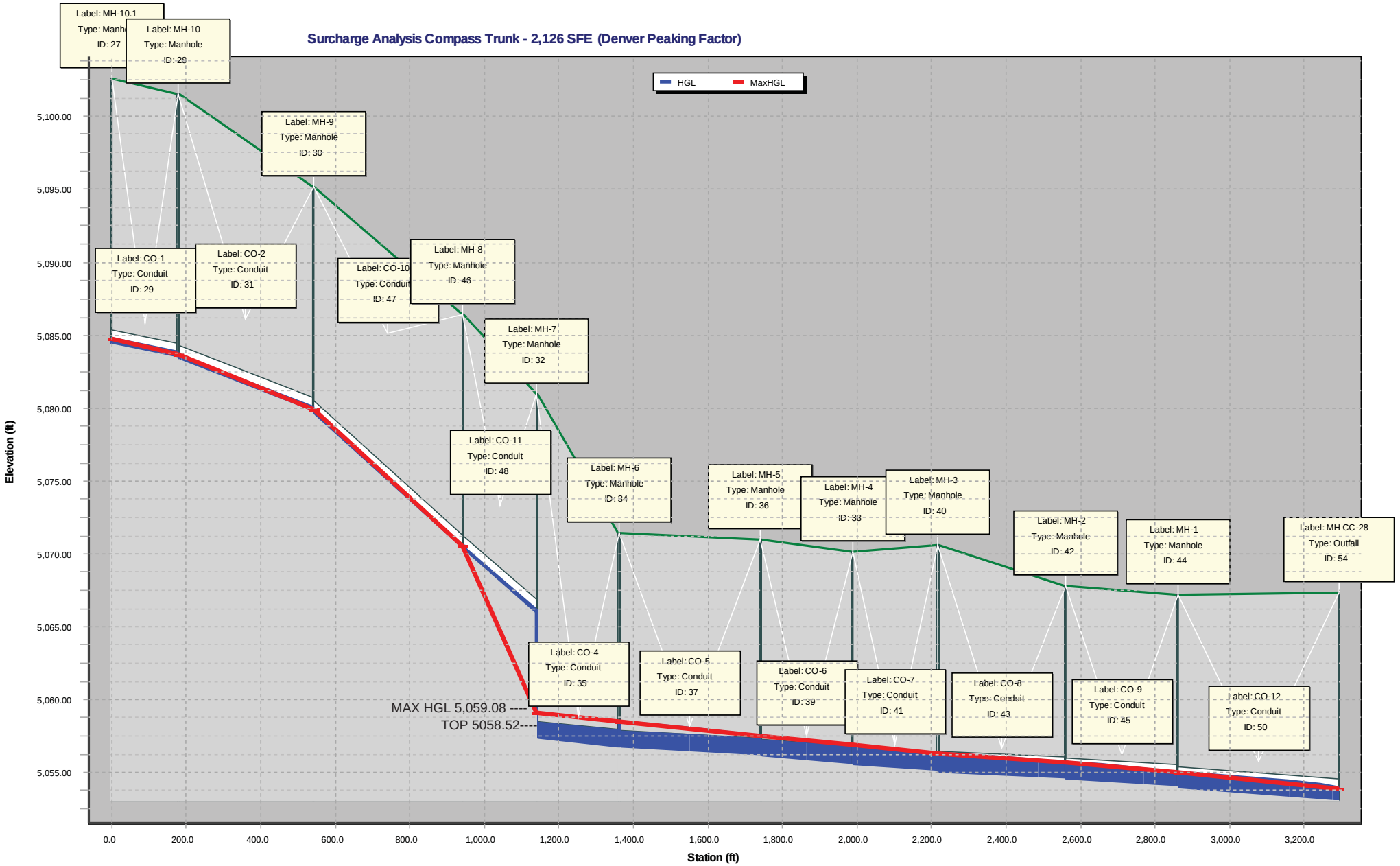
PROPOSED SEWER ALIGNMENT- 2,126 SFE, ALTERNATE ALIGNMENTS

MERRICK & COMPANY
McLaughlin Water Engineers
A DIVISION OF MERRICK & COMPANY

FEBRUARY 2016



Note: Development flows added to MH-7.



Note: Development flows added to MH-7.


KT
KT ENGINEERING
ENGINEERS • SURVEYORS
PDR
PROJECT:
PARKDALE
REPORT:
PHASE II DRAINAGE REPORT
ISSUE DATE:
MAY 21, 2017
REVISIONS:
10.10.2017 | 01.23.2018 | 04.16.2018

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A complete Appendices listing is located on the following page.

APPENDIX A

a) General Location Map
b) Design Charts & Tables

APPENDIX B

a) Hydrologic Calculations

APPENDIX C

a) Hydraulic Calculations
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APPENDIX D

a) Erie OSP Maps w/ Parkdale Development and SWMM Schematic
b) CUHP/SWMM Model – Ultimate Conditions – Pond B, Drainageway 2S, 2N (2-yr, 100-yr, 500-yr)
c) CUHP/SWMM Model – Interim Condition – Pond B, Drainageway 2S, 2N (2-yr, 100-yr)
d) CUHP/SWMM Model – Drainageway 1 – Existing Conditions (2-yr, 100-yr)
e) CUHP/SWMM Model – Drainageway 1 – Proposed Conditions (2-yr, 100-yr)
f) CUHP/SWMM Model – Low Area Analysis – Existing Conditions (100-yr, 500-yr)
g) CUHP/SWMM Model – Low Area Analysis – Proposed Conditions (100-yr, 500-yr)

APPENDIX E

a) FIRM Maps
b) NRCS Soils Report
c) 404 Permit Documentation

APPENDIX F

a) Appendix G (Conceptual Design Plan) of the Town of Erie OSP and Text Narrative

i. ENGINEER'S CERTIFICATION

"I hereby certify that this Phase II Drainage Report for the design of the Parkdale Subdivision was prepared by me (or under my direct supervision) in accordance with the provisions of the *Town of Erie Standards and Specifications for Design and Construction* for the owners thereof. I understand that the Town of Erie does not and will not assume liability for drainage facilities designed by others, including the designs presented in this report."

Owen Keith Keenan
Registered Professional Engineer
State of Colorado No. 47677

ii. TOWN ACCEPTANCE

This report has been reviewed and found to be in general compliance with the *Town of Erie Standards and Specifications for Design and Construction* and other Town requirements. **THE ACCURACY AND VALIDITY OF THE ENGINEERING DESIGN, DETAILS, DIMENSIONS, QUANTITIES, AND CONCEPTS IN THIS REPORT REMAINS THE SOLE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE APPEAR HEREON.**

Accepted by: _____ _____
Town Engineer Date

I. GENERAL LOCATION AND DESCRIPTION

A. Location

The Parkdale Subdivision is a proposed 642 lot residential single family housing development that is composed of 5 separate parcels. The Parkdale Subdivision is bounded to the north by adjacent parcels, to the east by E. County Line Road, to the south by Baseline Road and to the west by N. 119th Street. At this time, it is anticipated that E. County Line Road will be realigned through the Parkdale site to a new intersection with Baseline Road.

The Parkdale Project is located in the Section 36, Township 1 North, Range 69 West of the Sixth Principal Meridian.

Coal Creek is the closest major drainageway and is located on the east side of E. County Line Road. All runoff generated from the proposed site is ultimately conveyed to Coal Creek.

The majority of surrounding properties abutting the proposed site are rural residences primarily used for agriculture. There is a Tri-County Self Storage complex abutting the site to the east. Compass Subdivision, a large single family development in Erie by Standard Pacific Homes is located approximately 1,500 feet to the north at the northwest corner of the intersection of County Line Road and Arapahoe Road.

A General Location Map has been provided in Appendix A.

B. Description of the Property

The Parkdale Subdivision is composed of 5 separate parcels encompassing an area of approximately 217 acres.

Existing ground cover varies from parcel to parcel. A majority of ground cover that exists today consist of farmed winter wheat. Native grasses and weeds also exist in certain areas. Trees are sparsely located on the site, mainly around existing structures. A significant amount of wetland vegetation exists along the eastern boundary near E. County Line Road.

There are no named major drainageways that are within the property. Several smaller drainages traverse the site have been identified in the Town of Erie Outfall Systems Plan (West of Coal Creek) prepared by RESPEC Consulting & Services dated January 2014 (Erie OSP). From south of the site to north, these drainages are known as Drainageway 2 South, Drainageway 2 North, and Drainageway 1.

There is one existing irrigation ditch lateral that traverses the Parkdale Site and another abuts the Parkdale site at or near the project boundary. Both laterals are associated with the Goodhue Ditch. The northernmost lateral traverses the site in a straight line from west to east from N. 119th Street to the east. This lateral is situated on the existing property line between the 1160 N. 119th Street and 1130 N. 119th Street addresses. This ditch then proceeds to the northeast at the site boundary and does not return within the site. The southernmost lateral meanders through the adjacent property address at 1002 N. 119th Street before it is conveyed west and ends.

A significant amount of wetlands exist along the eastern portion of the site. The Parkdale site contains approximately 30 acres of wetlands. The wetlands exist primarily along the east side of site and abut the E. County Line Road Right-of-Way. An abandoned railroad line embankment exists on the west side of E. County Line Road. The abandoned railroad embankment pins drainage along the west side of E. County Line Road. There is an existing culvert that conveys water through the railroad embankment to a roadside ditch along E. County Line Road. Approximately 16 acres of wetlands in the southernmost parcels of 12329 Baseline Road and 795 E. County Line Road addresses compose a wetlands area known as Powers Marsh. Powers Marsh has been designated as a Critical Wildlife Habitat in the Boulder County Comprehensive Plan. Boulder County acknowledges that this large wetland is a known habitat for the Northern Harrier and Least Bittern bird species.

II. DRAINAGE BASINS

A. Major Basin Description

The Parkdale site lies within the Coal Creek Drainage Basin. Coal Creek at its closest point to the site is approximately 220 feet to the east of the boundary on the east side of E. County Line Road. The site is located approximately 1 mile downstream of the Rock Creeks confluence with Coal Creek. The entire Coal Creek and Rock Creek watershed is approximately 80 square miles and lies within Weld County, City and County of Broomfield, Boulder County, Jefferson County and Gilpin County.

Applicable Major Drainageway Studies

Coal Creek has been the subject of numerous Urban Drainage and Flood Control District (UDFCD) studies and master plans. Below is a list of the most recent UDFCD Drainage Studies and Master Plans associated with Coal Creek.

- Flood Hazard Area Delineation, Coal Creek and Rock Creek, Prepared by RESPEC Consulting Services, Dated November 2014.
- Coal Creek and Rock Creek, Major Drainageway Plan, Prepared by RESPEC Consulting Services, Dated October 2014.
- Town of Erie, Outfall Systems Plan (West of Coal Creek), Prepared by RESPEC Consulting Services, Dated January 2014.

Appendix G, Conceptual Design Plan, from the Eire OSP has been included with this report in Appendix F, along with the written narrative of the Conceptual Design Plan as contained in the Erie OSP.

It is important to note that CUHP 2005 Version 1.3.3 was utilized in the Erie OSP, and therefore calculations in this report were prepared utilizing the same version.

The Parkdale site is located in Zone X according to FEMA Flood Insurance Rate Maps (FIRM). Zone X is defined as areas determined to be outside the 0.2% annual chance floodplain. The Parkdale site is located on map number 08013C0443J, Revised December 18, 2012, and map number 08013C0439J, Revised December 18 2012. The 100-year FEMA floodplain shown within the Drainage Plan also incorporates a Revision to Reflect LOMR within Map Number 08013C0443 J, Effective December 28, 2012.

The 2014 Flood Hazard Area Delineation (FHAD) for Coal Creek is currently in the Physical Map Revision (PMR) process with FEMA and is not yet effective. The 100-year 2014 FHAD Floodplain limits are also shown within the Drainage Plan.

Existing Major Basin Characteristics

Existing Coal Creek major basin characteristics include a mix of open space, parks, rural residential, low, medium and high density residential and commercial land uses. Table 1 below was obtained from the Coal Creek and Rock Creek Flood Hazard Area Delineation (Coal Creek FHAD) and summarizes percent impervious, land use, and percent of area composition of the Coal Creek Drainage basin.

Table 1: Existing Land Use Table

Percent Impervious	Land Use Type	Percent of Area
2%	Open Space	55%
3-10%	Parks	6%
11-20%	Rural Residential	5%
21-30%	Rural Residential	5%
31-40%	Rural Residential	6%
41-50%	Public Facilities/Schools	7%
51-60%	Low Density Residential	6%
61-70%	Med. Density Residential/Business Office	4%
71-80%	High Density Residential/Commercial	2%
81-90%	Retail/Roadways	2%
91-100%	Industrial	2%

The Coal Creek FHAD also developed a Future Land Use table which was developed by assigning imperviousness values to various land use categories provided from each municipalities' comprehensive plans. The Table 2 below summarizes these calculations.

Table 2: Future Land Use Table

Percent Impervious	Land Use Type	Percent of Area
2%	Open Space	33%
3-10%	Parks	11%
11-20%	Rural Residential	5%
21-30%	Rural Residential	4%
31-40%	Rural Residential	9%
41-50%	Public Facilities/Schools	7%
51-60%	Low Density Residential	9%
61-70%	Med. Density Residential/Business Office	4%
71-80%	High Density Residential/Commercial	8%
81-90%	Retail/Roadways	6%
91-100%	Industrial	4%

The Coal Creek FHAD states that the overall land use imperviousness for existing and future land use is 19.8% and 32.7%, respectively. In review of the land use map contained within the Coal Creek FHAD, the Parkdale site was assumed open space in both existing and future analysis.

Existing Major Basin Drainage Patterns

In general, Coal Creek drains to the northeast. Coal Creek is a tributary to Boulder Creek. The Boulder Creek confluence is approximately 5 miles north of the Parkdale site. The Parkdale site drains from west to east, to Coal Creek. The Major drainage basins to Coal Creek within the Parkdale site extend approximately 1.5 Miles to the west. The existing major drainages that traverse through the Parkdale site combine for a total drainage area of 1,341 acres. These drainageways as shown in the Erie OSP are Drainageway 2 South (719 Acres), Drainageway 2 North (318 Acres) and Drainageway 1 (304 acres).

Existing Irrigation Facilities

The Goodhue Ditch and a lateral of the Goodhue ditch are located surrounding and within the Parkdale site. The southernmost lateral crosses N. 119th Street and Meanders through 1010 N. 119th Street and 1002 N. 119th Street properties before branching off to the east along the north side of the abandoned BNSF railroad right-of-way. At this point, the lateral enters the Parkdale site. The lateral travels east and then turns north along the west side of E. County Line Road. The ditch ultimately ties into the natural drainage of the site near the 36" RCP outfall under E. County Line Road to Coal Creek. The northernmost lateral crosses N 119th Street and enters the Parkdale Site along the existing property lines of 1130 N. 119th Street and 1160 N. 119th Street. The lateral travels east and exits the Parkdale site and enters 1380 N. 119th Street. In this property, the lateral travels to the northeast and remains outside the Parkdale site.

Existing Ponds within the Parkdale Site

There are two existing ponds that exist within the Parkdale site. Both ponds are associated with the site wetlands located along the eastern side of the proposed site. The southernmost pond is associated with the Powers Marsh wetland. Both ponds appear to be owned by the respective owner of the properties in which they reside. The existing ponds are not under jurisdiction of the State Engineer's office.

B. Sub-basin Description

Proposed Master Plan Improvements

Improvements associated with the Erie OSP are proposed within the Parkdale site. Channel improvements and associated Boulder Drop structures will be constructed within the Parkdale site along the north side of the abandoned BNSF railroad line (Channel A). The Erie OSP outlines that this channel is to convey future outflows from the future Regional Detention Pond 1060 located upstream of the Parkdale site. The purpose of this conveyance is to re-direct flows exceeding the historical 100-year peak flows from Drainageway 2 South to proposed Channel A.

As part of development of the Parkdale site, Channel A will serve as a dual purpose channel that will convey offsite flows as well as the future Regional Pond 1060 release of 222 cfs. Offsite flows and future pond release will be directed to the east through a culvert crossing under the realigned E. County Line Road and will ultimately discharge into the wetland area and regional Water Quality Capture Volume (WQCV) Pond B associated with the Parkdale site. The adjacent parcels along Baseline Road that contribute flows to Channel A could potentially be commercial/mixed use in the future as they are specified as "Opportunity Parcels" in the City of Lafayette Comprehensive Plan. For this drainage study, these parcels have been analyzed as mixed use as outlined in the Erie OSP (80% impervious). Due to the mixed use land use of the surrounding offsite properties and the future Regional Pond 1060 release rate, peak flows are calculated to be approximately 534 cfs based upon the updated CUHP/SWMM Model included

with this report (Design Point P50). Interim condition (without Regional Pond 1060) peak flows at P50 are calculated as 360 cfs. Due to the large wetland area within the Parkdale Site, no channel improvements are proposed within the existing wetland area due to the large disturbances associated with construction of Channel A. Channel A construction will require the installation of a series of box culverts (Culverts # 5, 6 and 7). Culvert #7 will consists of a box culvert with a low-flow channel as well as a pedestrian trail underpass beneath the re-aligned County Line Road. Culvert #7 is proposed to be an 18'W x 10'H box culvert that will provide 8 feet of clearance along the pedestrian underpass. A cross section of this proposed box culvert has been included within the Drainage Maps in this report. The pedestrian underpass portion will become inundated between the 2-year and 5-year storm events in the ultimate condition and the 10-year storm event in the interim condition. Flooding Hazard Warning signage will be provided at each end of the culvert for pedestrian safety. Culvert #7 is required to convey 641 cfs (534 x 1.2 for 20% clogging factor under an Arterial Street). Due to the clearance required for the pedestrian underpass, this culvert is oversized for the proposed design flows. Calculations show that this culvert carries 3.5 times the required flowrate (2,243 cfs). In the very unlikely event of a complete culvert failure, flows would be conveyed through County Line Road within the 2.4 ft deep sump (low point) centered above the box culvert and water would be discharged to Pond B.

In addition to the channel and culvert improvements mentioned above, a proposed box culvert (Culvert #8) will be constructed along Drainageway 2 South along the north side of Baseline Road. This culvert will be sized to accommodate existing condition (with a future imperviousness rates) flows without the future Regional Detention Pond 1060 upstream. This is considered a worst case scenario in terms of peak flowrates. Based upon the updated CUHP/SWMM Model included with this report, the 100-year existing condition peak flow is calculated as 1,536 cfs (Design Point 900). Culvert #8 has been designed to convey 1,843 cfs (1,536 cfs x 1.2 for 20% clogging factor under an Arterial Street). When the future Regional Detention Pond 1060 is constructed, flowrates would be reduced to 684 cfs at the same design point.

As defined in the Erie OSP, future Regional Pond 1060 is proposed. The drainage design of the Parkdale site consists of analyzing both interim (without Regional Pond 1060) and ultimate (with Regional Pond 1060) conditions. The purpose of Regional Pond 1060 is to divert flows from an area that currently has flooding problems along Baseline Road. The drainage infrastructure within the Parkdale site was designed to accommodate the worst case scenario for each individual drainage feature (i.e. Culvert #8 designed for the interim condition, Channel A and Culvert #7 designed for the ultimate condition). There is currently no known timeline for the construction of future Regional Pond 1060.

Existing Drainage Patterns

The existing Parkdale site is composed of three primary drainages that traverse the site. From south to north, the drainages are known as the following: Drainageway 2 South, Drainageway 2 North, and Drainageway 1. Each basin is discussed in further detail below.

Drainageway 2 South is composed of approximately 717 acres of tributary area upstream of the Parkdale site outfall. This basin flows from west to east and is along Baseline Road through the southernmost portion of the site. Existing flooding problems occur along the properties north of Baseline Road as this portion of the channel receives peak 100-year flows in excess of 1,190 cfs (Downstream of Design Point 503). Improvements are proposed in the Erie OSP which includes a

future Regional Detention Pond 1060 upstream of the Parkdale Project. The regional pond will reduce peak outflows flowing to Drainageway 2 South to historical flowrates as well as diverting flows to the north to Drainageway 2 North.

Drainageway 2 North is composed of approximately 313 acres of tributary area including portions of the proposed Parkdale site. This basin flows from west to east. Runoff from this basin is generated in the open space parcel located on the west side of N. 119th Street. Runoff is conveyed under N. 119th Street via a 24-inch RCP culvert. Flows continue east through the adjacent 1010 N. 119th Street and 1002 N. 119th Street addresses before entering the Parkdale Site. Flows proceed east to and ultimately northeast along the abandoned railroad embankment to an existing 24-inch diameter steel pipe through the railroad embankment and to a 36-inch RCP under County Line Road to Coal Creek. Drainageway 2 North is prone to flooding due to the existing railroad embankment adjacent to County Line Road and limited capacity of the 24-inch pipe that currently conveys flows to the 36-in RCP under County Line Road. In larger storm events, flows from this basin become pinned against the existing railroad berm and begin to pool up eventually inundating the detention pond area of the adjacent Tri-County Storage facility. The existing railroad berm becomes less apparent in the Tri-County Storage facility property and ultimately if flooding was severe enough, storm runoff would overtop County Line Road adjacent to the Tri-County Storage Facility to Coal Creek. The breaching point is at an approximate elevation of 5095.1.

Drainageway 1 is composed of approximately 203 acres of tributary area including portions of the proposed Parkdale site. This basin flows from west to east. Runoff from this basin is generated in the upper reaches from the Hawks Ridge single family residential subdivision. Runoff from the subdivision is treated in a local detention pond before it's released to the east to open space. Runoff is conveyed under N. 119th Street via a 24-inch RCP culvert and enters the Parkdale Site. Flows continue to the east and exit the Parkdale Site before entering the site again approximately ½ mile to the east. There is an existing low point at this location that does not currently drain. The low point is approximately 5 feet in depth and would ultimately encompass an area of approximately 24 acres before overflowing to the south. Based upon analysis of the existing condition of this low area provided in this report, the low area does not drain out in both 100-year and 500-year storm events. Based on topography, the overflow is to the south and would enter the Drainageway 2 North outfall.

Downstream Flow Patterns and Impacts of Proposed Development

Downstream flow patterns for Drainageway 2 South, Drainageway 2 North, and Drainageway 1 are all to Coal Creek.

The Coal Creek Outfall for Drainageway 2 South is approximately 750 feet to the east of the Parkdale Site. The existing Drainageway 2 South outfall downstream of the Parkdale site is undersized and flooding occurs along the north side of Baseline Road. The existing E. County Line Road storm crossing is also undersized. Upon development of the Parkdale Site, a road crossing improvement will be constructed within the proposed site along the property frontage to Baseline Road; however, flooding will still be an issue with the remaining properties along this drainage until the future Regional Detention Pond 1060 is constructed as outlined in the Erie OSP.

The Coal Creek Outfall for Drainageway 2 North is approximately 625 feet east of the Parkdale site. There are a series of culverts that convey runoff from the Parkdale site, under the abandoned railroad embankment and then under E. County Line Road to a natural drainage channel that outfalls to Coal Creek. The culvert under the abandoned BNSF railroad embankment is a 24-inch diameter steel pipe and the culvert under E. County Line Road is a 36-inch diameter RCP. As mentioned in previously, this area is subject to flooding due to the undersized culvert under the existing railroad embankment. Existing flooding from the Parkdale property encroaches into and ultimately would breach County Line Road adjacent to the Tri County Storage site if flooding was severe. Upon the development of the Parkdale site, and the re-alignment and construction of E. County Line Road, pond embankment improvements will be constructed for proposed Pond B. These improvements will remove drainage impacts from the Parkdale site to the Tri County Storage facility. Due to Pond B improvements including pond embankment construction, outlet structure to Coal Creek, and an overflow weir to Coal Creek, all flows to Pond B will be conveyed directly to Coal Creek and therefore should have no impact on the Tri-County Storage facility. It is anticipated that the existing BNSF railroad berm will remain and will serve as a pond embankment for proposed Pond B along existing County Line Road. A professional geotechnical engineer has been retained to analyze the existing BNSF railroad berm to determine the suitability of the existing berm as a pond embankment. If the existing berm is not suitable, re-construction of the existing berm will be done per the professional geotechnical engineer's recommendations. The existing embankment top elevation is above the 100-year FEMA and UDFCD floodplain elevations. The proposed Pond B spillway that will be cut into the berm will also be above the existing 100-year FEMA and UDFCD floodplain elevations.

Upon the development of the Parkdale site, it is anticipated that work within the 100-year FEMA and FHAD floodplains will be required for approximately 1,000 LF along the Coal Creek drainageway. Improvements will consist of areas of cuts and minor fills for the construction of the Pond B embankment, Pond B Spillway, Spine Trail connection, and re-alignment of E. County Line Road. KT Engineering has modeled the proposed improvement within the 2014 FHAD 100-year floodplain and floodway and have determined that the proposed improvements do not adversely affect the 100-year floodplain and 100-year floodway (0.5' rise) elevations. Based upon our analysis, KT Engineering will be pursuing a "no-rise" certification in regards to the E. County Line Road re-alignment.

The Coal Creek outfall for Drainageway 1 is approximately ½ mile to the northeast as depicted in the Erie OSP. There is an existing 5-ft low area that does not currently drain at approximately Design Point 507B. The existing low area has the possibility to inundate portions of the Parkdale site and adjoining farming properties (Schichtel, Powell, and Kano Properties) between the northernmost portions of the Parkdale site. A Channel providing drainage relief to the low point was originally proposed; however, after a meeting with Town Engineering Staff and UDFCD, it was determined that a better approach in the interim would be to allow pooling to the extent possible and provide overflow relief in order to protect existing structures. The concern was the introduction of channelized flows to areas that historically have not experienced flows due to the low area.

Further analysis of the existing low area was preformed and has been included in the Appendix of this report. A SWMM model (The Low Area SWMM Model) was prepared for both the 500-yr and 100-yr storm events in the existing condition which indicate that both 100-yr and 500-yr storm events are contained within the low area and do not release. The 100-yr and 500-yr maximum water surface elevations were calculated as 5117.73 and 5118.73, respectively. Within the low area there are two structures, a house and pole barn. The house (Schichtel Property) has a lowest opening elevation of 5118.97; the barn (Powell Property) has a lowest opening elevation of 5118.60.

Once Parkdale is constructed, storage capacity within the low point will be removed and an additional SWMM model was prepared for 500-year and 100-year storm events to analyze the impact of the Parkdale development. A temporary outfall weir will be constructed at an elevation of 5117.00 and Temporary Spillover Channel B will be constructed to provide 1-foot of freeboard above the proposed 100-year water surface within the low point to the lowest opening of the existing barn on the Powell property. Temporary Spillover Channel B been designed for capacity of the 100-year storm event and conveys water in the manner as depicted in the Erie OSP to the northeast (to the Jung Property). Flows will be conveyed across the existing gravel access road to the Jung Property. The SWMM model analysis indicates that overtopping of the weir occurs between the 10 and 25-year storm events. Proposed peak 100-yr and 500-yr water surface elevations are calculated as 5117.59 and 5118.03, which are both lower than in the existing conditions. The proposed 100-year peak water surface elevation (5117.59) in the low point provides 1 foot of freeboard to the lowest opening of the existing barn structure located on the Powell Property. Proposed peak flowrates for the 100-year and 500-year storm events along Temporary Outfall Channel B are 110.80 cfs and 259.91 cfs, respectively.

It is anticipated at this time that the Kano, Powell and Schichtel properties will be included in future phases of the Parkdale development. It is anticipated that County Line Road will be extended to the north as depicted on the maps as part of the future development. Ultimately, the low area would be removed and Drainageway 1 would be conveyed along the proposed County Line Road alignment and ultimately to a regional EURV pond to be constructed to the north and east adjacent to Coal Creek as depicted in the Erie OSP. The proposed solution reduces the amount of runoff that will be conveyed to the northeast to the extent possible while also providing necessary freeboard in order to protect existing structures. Also, as the area develops further, this will likely represent a temporary condition that will be remedied upon future development of the area utilizing the implementation of the Erie OSP.

III. DRAINAGE DESIGN CRITERIA

A. Development Criteria Reference and Constraints

Previous Drainage Studies

The Parkdale stormwater facilities have been designed in conformance with the Erie OSP and the approved Erie Gateway South Phase 1 Drainage Report. During the Phase I and Phase II processes, meetings have been held with UDFCD and Town staff, their recommendations have also been incorporated.

Adjacent Property Drainage Studies

Adjacent properties are undeveloped and are without drainage studies that could influence the property.

Existing Site Constraints

The existing low point on west side of North 119th Street controls the location and elevation of Drainageway 1 as it enters the site. County Line Road controls the eastern limits of Pond B while the adjacent railroad berm controls the maximum allowable pond elevation.

Wetlands Issues

Wetlands disturbance for the Parkdale subdivision shall be under ½ acre. A nationwide 404 permit will be processed through the CORP. Lost wetlands will be mitigated through the purchase of wetlands credits. A summary letter of the status of wetland permitting from Ecological Resources Consultants, Inc. has been included in Appendix E.

B. Hydrological Criteria

Rainfall and recurrence intervals

The rainfall intensities used in the rational method computations of runoff were obtained from the Rainfall Intensity Duration Curves for the Town of Erie included in their Standards and Specifications. Storm frequencies are the 2-year and 100-year storms.

One-Hour Design Rainfall Depths for CUHP Models were obtained from the Erie OSP (Table 3-1). One-Hour Design Rainfall Depth for the 500-yr analysis was taken from NOAA Atlas 14 in a portion of the Parkdale site.

Runoff Calculation Method

The Rational method was use for all basins less than 160 acres.

CUHP 2005 v. 1.3.3 and SWMM v. 5.1.012 were used for conveyances associated with the Erie OSP (Drainageway 2 South, Drainageway 2 North, and Drainageway 1) as well as Pond B.

C. Hydraulic Criteria

Downstream Capacity:

Release to downstream drainage facilities will be less than historic except for the release from Pond B into Coal Creek that is in compliance with the Erie OSP.

Preliminary Strom sewer layout

Storm sewer layout is designed by placing inlets at locations where the 2-year street capacity would be exceeded or where there is a sump or low point. Storm pipes are designed to convey the 2-year storm to one of the two detention facilities.

Detention Volume and Allowable Release Rates

Allowable release rates from detention ponds were taken from Table 800-4 for SCS Soil Groups B. Detention volumes were calculated using UDFCD's UD-Detention, Version 3.07.

D. Adaptation from Criteria

Adaptation

The Parkdale project is requesting a variation to Section 814.00 of the Town of Erie's standards and specifications that required detention and restricted release rates for all new development. Pond B will provide EURV storage only in the interim condition (Pre-construction of Regional Detention Pond 1060 as outlined in the Erie OSP). In the ultimate condition (Post construction of Regional Detention Pond 1060 as outlined in the Erie OSP), the pond will serve as a regional WQCV pond.

Adaptation Justification

Given the close proximity of the project to Coal Creek, Pond B has been designed to provide EURV storage only. The EURV volume has been designed for all upstream tributary area in the interim condition. In the ultimate condition, the pond is designed to provide WQCV storage only. Storm water runoff in excess of the water quality volume will be passed directly to Coal Creek via and overflow weir and conveyed downstream prior the peak of Coal Creek. This configuration agrees with the Town of Erie, Outfall Systems Plan and the approved Erie Gateway South Phase 1 Drainage Report.

IV. DRAINAGE FACILITY DESIGN

A. General Concept

Existing Drainage Patterns

The three primary existing drainage patterns through the site, Drainageway 2 South, Drainageway 2 North and Drainageway 1 will be modified to accommodate development of the Parkdale site. Below is a discussion of each of the drainages and how development of the Parkdale site may impact each basin.

Drainageway 2 South will not be impacted by the development of the Parkdale site. This basin will remain unchanged as it is today. Proposed Box Culvert #8 is proposed at the County Line Road relocation and is a triple 5-ft H x 12-ft W reinforced concrete box culvert (RCBC). Culvert #8 is capable of conveying existing flowrates (assuming future development) as calculated in the revised CUHP/SWMM Model at Design Point 900 (1,536 cfs). This flowrate is based on the existing condition without future Regional Pond 1060 in place. In the future, when/if Regional Pond 1060 is constructed, flowrates will peak at 684 cfs. Once flows are downstream of the box culvert, flows will be conveyed as they are historically through the existing wetland area. Existing flows (assuming future development) at this location present a "worst case" scenario. The proposed box culvert as designed would pass the existing 100-yr event assuming 20% clogging per the Town of Erie Standards (Culvert #8 capacity = 1.2 x 1,536 = 1,843 cfs). In the event of culvert failure, runoff would be conveyed east across County Line Road to the existing wetland area to the east.

Drainageway 2 North will be modified to accommodate the development of the Parkdale site. Upstream portions of Drainageway 2 North outside of the Parkdale site will be captured and conveyed by proposed Channel A and will ultimately convey storm flows to Pond B. Offsite flows include Erie OSP sub-basin 424 and offsite basins G6 and G7 as identified in the drainage map. Offsite Basin G6 has been assumed as agricultural/open space as designated in the Erie OSP. Offsite Basin G7 has been assumed as Mixed Use (80% impervious) as designated in the Erie OSP. Basin G7 has been assumed as Mixed Use based upon the City of Lafayette Comprehensive Plan. These parcels have been identified as "Opportunity Parcels" due to their proximity to Baseline Road and would provide good access for commercial development. Erie OSP Sub-Basin 424 is primarily composed of a parcel of land owned by the City of Lafayette and is designated as Open Space in the City of Lafayette comprehensive plan. Sub-basin 424 was assumed to remain open space in the future for the purposes of this drainage analysis. Drainage associated with Drainageway 2 North within the Parkdale site will be conveyed via Channel A to Pond B. In addition to the offsite flows discussed above, Channel A is also sized to convey the future Regional Pond 1060 primary outflow (not to exceed 222 cfs) as outlined in the Erie OSP Conceptual Plan narrative. Channel A also consists of 3 culvert crossings (Culvert #5, #6, and #7) which all convey 100-yr ultimate flows without overtopping. The peak future Erie OSP flow for the culverts has been calculated as 534 cfs in the revised CUHP/SWMM Model at Design Point P50. Culvert #7 under re-aligned County Line Road will also function as a pedestrian crossing. A low flow channel with 5.17'Wx5'H dimensions will convey the existing condition 10-yr flows and in the ultimate condition somewhere between the 2-yr and 5-yr event with Regional Pond 1060 in place. Storm events exceeding those noted will inundate the pedestrian portion of the proposed culvert. Safety signage regarding potential flooding hazards will be provided at each entrance to the box. A cross section of the proposed box culvert has been included within the

Drainage Maps in this report. Culvert #7 is required to convey 641 cfs (534 x 1.2 for 20% clogging factor under an Arterial Street). Due to the clearance required for the pedestrian underpass, this culvert is oversized for the proposed design flows. Calculations show that this culvert carries 3.5 times the required flowrate (2,243 cfs). In the very unlikely event of a complete culvert failure, flows would be conveyed through County Line Road within the 2.4 ft deep sump (low point) centered above the box culvert and water would be discharged to Pond B.

Pond B ultimately receives all flows from Channel A and will function in two phases, the interim phase (prior to construction of Regional Pond 1060) and the ultimate phase (after the construction of Regional Pond 1060). Pond B will provide EURV treatment for all tributary area in the interim phase. Once Regional Pond 1060 is constructed and Channel A serves as the primary regional pond release (up to but not exceeding 222 cfs from the regional pond), Pond B will need to change out the orifice plate and trash rack and will serve as a regional WQCV Pond for all upstream properties. In the interim condition, an EURV outlet structure will treat water and release it to Coal Creek. Larger storms will be conveyed by an overflow weir to Coal Creek. In the ultimate condition, the EURV orifice plate will need to be replaced by a new WQCV orifice plate for a larger tributary area. Larger storms exceeding the WQCV will be conveyed by an overflow weir to Coal Creek. The proposed overflow weir to the pond will consist of a 190'W grouted boulder weir sized for ultimate condition peak 500-year inflows as calculated in the revised CUHP/SWMM Model for Pond B (1,020 cfs).

Pond C is also proposed mainly for portions of the re-alignment of County Line Road that cannot be piped into the Pond B. Pond C is proposed to be constructed within the Town of Erie Parcel, on the east side of the existing County Line Road, just Southeast of the Tri-County Storage facility. The Pond C basin is small (5.73 acres) and is sized to detain the WQCV, 10-year and 100-year runoff volumes. Pond C was designed not to include treated water from the Tri-County Storage facility. Treated water from the Tri-County Storage facility will be piped in a separate storm sewer system directly to Coal Creek without entering Pond C. Treated water from Pond C will be piped to the proposed Tri-County Storage extension and will discharge along with treated water from the Tri-County Storage facility to Coal Creek.

Drainageway 1 will be modified to accommodate the development of the Parkdale site. Major and minor storm flows from offsite Erie OSP sub-basin 430 will be collected and conveyed under N. 119th Avenue via Culvert #1 at Design Point 506 and discharge into Channel C. Channel C will be routed through the Parkdale Development and released without detention to the historical flow path of Drainageway 1 at Design Point 507A. Erie OSP sub-basin 430 is owned by Boulder County and is listed as Boulder County Open Space that is a closed area. The offsite portion is assumed to remain undeveloped in the future for these calculations (and as recommended in the Erie OSP). The proposed developed drainage within the Parkdale site will be will be captured and collected in storm sewer and conveyed to the east to Pond A. Pond A is sized to detain the WQCV, 10-year and 100-year runoff volumes. Pond A will discharge to the south into the proposed storm sewer system and then will be conveyed to Pond B and ultimately Coal Creek. The reasoning for discharging Pond A to storm sewer is to eliminate constant neighborhood nuisance flows that occur in residential ponds from leaving the site at Design Point 144 and causing erosion or standing water downstream. The storm water release from Pond A should not affect the overall capacity for the proposed storm system as it ties into to the Pond B storm sewer at DP 72. The Release from Pond A should be delayed enough to allow peak flow from the Pond B storm sewer to be conveyed away prior to storm flows from Pond A entering the system.

Drainageway 1 enters the Parkdale site again east of Pond A at Design Point 146. There is an existing 5-ft low area centered near Design Points 507B and 146 that does not currently drain. The existing low area has the possibility to inundate portions of the Parkdale site and adjoining Schichtel, Powell, and Kano properties. A channel providing drainage relief to the low point was originally proposed; however, after a meeting with Town Engineering Staff and UDFCD, it was determined that a better approach in the interim would be to allow pooling to the extent possible and provide overflow relief in order to protect existing structures.

A solution has been proposed by constructing a weir that will allow storage of storm events exceeding the 10-year storm event. The overflow weir begins to overtop at some event between the 10-year and 25-year storm event. Flows from the 100-year event are reduced and peak at 110.80 cfs. A house (Schichtel Property) and a barn (Powell Property) exist within the low area. Once the Parkdale site is developed, and storage volume within the low point is removed, a proposed overflow weir will provide 1 foot of freeboard from the 100-year water surface elevation within the low area to the lowest opening of the existing barn (Powell Property). A Low Area CUHP/SWMM Model has been included in the Appendix of this report with results. The surrounding properties within the low area (Kano, Powell, Schichtel) are expected to be included in future development associated with Parkdale. This will be a temporary condition and when County Line Road is extended north, a formal channel for Drainageway 1 will be constructed and conveyed ultimately to a regional EURV pond near Coal Creek as depicted in the Erie OSP.

Basins L1, L2, L3 and L4 all contain portions of developed Parkdale area that is released un-detained to Drainageway 1. An existing and proposed condition CUHP/SWMM model (Existing Vs Proposed SWMM Model) has been completed which shows an overall matching or reduction in peak developed flows at Design Points 507A and 508A. This is a direct result the routing the Pond A outfall to site storm sewer and ultimately Pond B when compared to the small basins that are left un-detained.

Proposed Goodhue Ditch Improvements and Ditch Overflow Paths

The Goodhue Ditch currently crosses N. 119th Street in a 19-inch x30-inch elliptical pipe and headwall structure. It currently discharges on the east side of 119th Street within the Right-of-Way. The Goodhue ditch is proposed to be piped through the Parkdale site in a 24-inch RCP. At the proposed outfall at the western boundary line, the outfall will be equipped with a flow regulator. The flow regulator will allow adjustment of the flowrate at the outfall. Flows not discharging out the flared end section will be connected into the site storm sewer and ultimately outfall to Pond B.

In the event that the proposed conveyance has insufficient capacity, topography indicates that the Goodhue Ditch flows will be conveyed to the north along west side of N. 119th Street in a roadside ditch. Ultimately, these flows will enter the Channel C drainage culvert and will be conveyed through the Parkdale site via Channel C along Drainageway 1 to an existing low area.

The Waneka Bishop Lateral located just south and west of the Parkdale site within the 1002 N. 119th Street property will overflow to Channel A. Channel A will convey the ditch flows to Pond B.

Existing and Ultimate Condition CUHP/SWMM Modeling

Revised CUHP/SWMM Models for the existing condition and ultimate condition of conveyances along Drainageway 2 North, Drainageway 2 South, and Pond B have been included in the Appendix of this report. The CUHP Basins needed to be additionally broken up and configured to reflect the development of the Parkdale site. In doing so, other adjustments were made when compared with the Conceptual Design modeling previously done in the Erie OSP. The purpose a revised CUHP/SWMM model was to route flows through Pond B as well as to accurately size proposed channels and culverts as reflected in the Parkdale plan under worst case scenario conditions. This meant sizing infrastructure associated with Drainageway 2 North with Regional Pond 1060 in place, and sizing infrastructure associated with Drainageway 2 South without Regional Pond 1060 in place.

In reviewing the CUHP/SWMM Model contained in the Erie OSP it became evident that the text of the Conceptual Design document and the actual Conceptual Design modeling were different. The Erie OSP Conceptual CUHP/SWMM Model appears to route 100% of Pond 1060's outflows to Design Point 504 and the text indicates that this outflow to Design Point 504 would be limited to 222 cfs. The revised model included with this report conveys the initial 222 cfs to Design Point P50 and the remainder of flows south along Drainageway 2 South to Design Point 503.
The second thing that was manipulated was the areas for Erie OSP Sub-Basins 416 and 417. These basins were modified to Sub-Basins 416U and 417U. The purpose for this was to encompass the area downstream of the Regional Pond 1060 into Sub-Basin 416 (The portion of land south of the railroad right-of-way.
The third difference is the text narrative discusses an improved detention pond located in the City of Lafayette (Wild Ridge) had been added to the conceptual design SWMM model, which reduced flows along Drainageway 2 South. I could not locate any revisions in the model except for the flowrates, and therefore this was ignored in the revised model.

A revised SWMM Routing Map highlighting modifications in the ultimate condition has also been included in the Appendix.

A CUHP/SWMM Model for the existing condition of Pond B and Drainageway 2 South has been included in the Appendix of this report as well. This model also was used for the sizing of infrastructure along Drainageway 2 South as well as analyzes Pond B. This Model ignores impacts of future Regional Pond 1060.

Another item worth noting is the modeling of Pond A in revised CUHP/SWMM Models. Due to the recent changes hydrologic criteria for UDFCD which consisted of a major re-calibration of CUHP; the current version of CUHP/UD-Detention and the older versions of CUHP generate different hydrographs for flow routing. Newer versions of CUHP and UD-Detention tend to have lower peak flowrates and runoff volumes. The CUHP/SWMM Models included with this report were made with older versions of the software and indicate that Pond A is overtopping the spillway in the 100-year event. These flows over the spillway have been ignored because flows in Pond A have been sized accordingly with the most recent version of UD-Detention software.

Compliance with off-site runoff

In general, off-site runoff will be collected and/or conveyed through the site. With the exception of Channel A and Pond B, Parkdale site runoff will remain separate from off-site conveyances to an extent practical. Pond B will serve as a regional pond and offsite developed flows as well as

Parkdale developed flows will be comingled in Pond B before discharging to Coal Creek. All off-site conveyances are designed to safely convey the 100-year storm event.

Design Tables & Charts

Tables and charts utilized for the calculations enclosed in this report are attached in Appendix A of this report. Design tables and criteria were obtained from the 2017 Edition of the Design and Construction of Public Improvements, Town of Erie, Colorado, Section 800 Storm Drainage Facilities, and/or the Urban Storm Drainage Criteria Manual updated in March 2017.

Discussion of Referenced Reports

The Town of Erie, Outfall Systems Plan (West of Coal Creek), Prepared by RESPEC Consulting Services, Dated January 2014 was a primary document utilized in this Report. Basin delineations, routing, and calculations were reviewed as part of this drainage report and appear to be complete with the exception of the EPA SWMM routing of the conceptual design plan. Based on the text of the document, proposed pipe sizes and channel sizes, the proposed regional pond outlet adjacent to Drainageway 2 North – Reach 1 is only supposed receive a maximum of 222 cfs. The Peak Flow Summary for Conceptual Design Plan included in Appendix F of the Erie OSP documents appears to be inaccurate downstream of the proposed regional detention pond as it relates to the proposed OSP channel and ultimate outfall of Drainageway 2 North. It appears that the routing has routed all outflows from the proposed regional detention facility to the OSP channel and ultimately inflating flowrates along the Channel and Drainageway 2 North, when flows exceeding 222 cfs should be diverted south to Drainageway 2 South as indicated in the text of the OSP. A revised CUHP/SWMM Model as discussed above in the Existing and Ultimate Condition CUHP/SWMM Modeling section.

B. Specific Details

Potential Drainage Problems and Solutions

An existing low area exists at Design Point 507B in Basin 431B. The low area is approximately 5-ft deep and if full, would encompass an area of 24 acres. The low area is large enough to contain both 100-year and 500-year storm events. After discussion with Town and UDFCD staff, the best solution would be to utilize the storage capacity of the existing low area, and attenuate flows to the extent possible to keep impacts downstream of Drainageway 1 minimal until such time that County Line Road is extended. A proposed weir will allow larger storm events (>10yr, <25-yr) to flow out into the Temporary Overflow Path Channel B while providing 1 foot of freeboard to protect existing structures within the low area during the 100-yr event. Upon the extension of County Line Road, a formal Drainageway 1 channel will be constructed to alleviate flooding in the area.

Another potential drainage problem is the lack of channel improvements downstream of Culverts #7 and #8. Channel A improvements downstream of Culvert #7 continue to the northeast for approximately 480 feet where they end within the existing site wetlands and Culvert 8 has no channel improvements downstream. This is due to the potential wetland disturbances in order to construct the channel. Immediately downstream of Culvert #7, a Grouted Boulder Stilling Basin will be provided on the downstream end of the culvert. Energy will be dissipated downstream of Culvert #8 by 30 LF of Type M Riprap. The proposed outlet protection at downstream ends of Culverts #7 and #8 exceed minimum criteria set forth by UDFCD and should dissipate energy from storm flows prior to the storm flows entering the wetland areas.

All Parkdale site Storm Drain outfalls to Pond A and B will include concrete forebays at each outfall with maintenance access provided to each. The forebays are designed to capture 3% of the WQCV and release it in a 5 minute drain time. The purpose of the forebay is to provide energy dissipation and pre-treatment of small storm flows before entering the existing wetland area.

Detention Pond Storage and Outlet Design

There are three proposed detention facilities located within the Parkdale site. Pond A is located in Basin A9 and will provide WQCV, 10-year and 100-year detention. Pond A was sized utilizing the UD-Detention v. 3.07, which utilizes Modified Puls Routing as provided by Urban Drainage and Flood Control District. Pond A will provide WQCV, 10-year and 100-year storage volumes totaling 3.09 acre-ft. Peak flowrates out of the Pond A for the 10-year and 100-year storm events will be approximately 4.2 cfs and 29.9 cfs, respectively. The pond outlet structure will consist of a two stage outlet structure with a restrictor plate on the inside of the outlet structure. The WQCV release rate will be controlled by the orifice plate located on the inside wall of the outlet structure (the outside wall will be a trash grate). The 10-year event will be controlled by an 8-inch x 8-inch orifice notched out of the steel orifice plate with an invert just above the WQCV. The trash grate will be extended above the 10-year orifice as required by the Town of Erie. The 100-year release rate is controlled by a restrictor plate on the outgoing pipe of the outlet structure. The pond will include a trickle channel, initial surcharge volume area, and a micro-pool. Access to the bottom of the outlet structure will be provided. Grading along the bottom of the pond will be graded at 2% to the trickle channel. The trickle channel will have a longitudinal slope of 0.6% draining toward the outlet structure.

Pond B is proposed to be located in a significant area of existing wetlands. In order to protect the wetlands, no trickle channel or interior pond grading is proposed within the wetland area. The large wetland area will effectively treat storm flows prior to water leaving the pond. Pond B is designed in two conditions, in the interim (without Regional Pond 1060 as depicted in the Erie OSP) and ultimate (with Regional Pond 1060 as depicted in the Erie OSP) conditions. In the interim, Pond B will be a regional EURV pond based on its proximity to Coal Creek. No 100-year detention will be provided. Pond B is located in Basin G9 and will provide EURV detention for 344.08 Acres. The pond bottom (top of micropool) elevation is 5091.50; the top of pond embankment is a minimum elevation of 5101.00. The calculated EURV storage volume is 12.20 acre-ft. The peak EURV flowrates out of the pond outlet structure will be 3.3 cfs. The corresponding water surface elevation is 5099.00 for the EURV. A spillway will be constructed at elevation 5099.40 to bypass flows exceeding the EURV event. The SWMM Models indicate this happens between the 2-year and 5-year storm events. The UD-Detention Model indicates this happens between the 5-year and 10-year storm event. The discrepancy in models is due to recent changes in hydrologic criteria for UDFCD which consisted of a major re-calibration of CUHP. The latest version of CUHP and UD-Detention tend to have lower peak flowrates and runoff volumes compared to older versions. Due to the Erie OSP utilizing older versions of the software, the CUHP calculations in this drainage report are reflective of the older software. The proposed overflow spillway is proposed to be 190-ft long and 1.6-ft in depth and will be grouted boulder rip rap from the crest to the conveyance channel to Coal Creek. The proposed spillway provides capacity for 1,020 cfs, which is slightly greater than the 500-year peak inflow into Pond B in the ultimate condition based upon the revised CUHP/SWMM modeling. The spillway overflow and associated drop will be grouted boulders to 15-ft past to weir toe and riprap to

Coal Creek. The spillway downstream of the toe will be designed by a professional geotechnical engineer to minimize erosion of the existing E. County Line Road embankment and downstream banks of Coal Creek. It is important to note that a future oil and gas extraction pad is being proposed adjacent to proposed Pond A. At this time KT Engineering recommends elevating the proposed pad above the top of embankment (5101.00). For the purpose of this drainage study, the elevated pad has been assumed to be constructed; therefore not taking into account any additional storage capacity that would be removed upon the construction of the oil and gas extraction pad.

In the ultimate condition, Pond B will be a regional WQCV pond. This is due to treating diverted flows from future Regional Pond 1060 as depicted in the Erie OSP. Pond B will provide WQCV detention for 947 acres. The calculated storage volume is 14.70 acre feet. At the time that Pond 1060 becomes operational, the orifice plate within Pond B will need to be changed out to accommodate more drainage area. The peak WQCV flowrates out of the pond outlet structure will be 7.3 cfs. The corresponding water surface elevation is 5099.39. The total storage capacity of the pond will be 14.70 acre feet to the crest of the spillway. Storm events exceeding the WQCV will overtop the spillway and enter Coal Creek. This will happen at some storm event less than the 2-year event.

There is an existing abandoned railroad embankment that exists on the west side of County Line Road. This will serve as the pond embankment for Pond B. A professional geotechnical engineer has been retained to certify the existing embankment as suitable for detention or re-construct the embankment per the geotechnical engineer's recommendations. The existing embankment top elevation is above the 100-year FEMA and UDFCD floodplain elevations as is the proposed spillway elevation of 5099.40.

Prior to the construction of Pond B, E. County Line Road will need to be re-aligned. Once traffic is routed along the new alignment, the existing portion of E. County Line Road will be abandoned. The asphalt will be removed and the area will be re-vegetated and armored in riprap along the spillway area. A professional geotechnical engineer will review the design the overflow weir outfall to Coal Creek in order to minimize erosion from frequent flows. Temporary ponds/sediment basins may be used in areas upstream of the wetlands in order to facilitate earthmoving operations and utility installation prior to the completion the E. County Line Road re-alignment.

The Coal Creek Outfall for Drainageway 2 North is approximately 625 feet east of the Parkdale site. There are a series of culverts that convey runoff from the Parkdale site, under the abandoned railroad embankment and then under E. County Line Road to a natural drainage channel that outfalls to Coal Creek. The culvert under the abandoned BNSF railroad embankment is a 24-inch diameter steel pipe and the culvert under E. County Line Road is a 36-inch diameter RCP. Upon the development of the Parkdale site, and the re-alignment and construction of E. County Line Road, the existing BNSF railroad berm will remain and will serve as a pond embankment for proposed Pond B. A professional geotechnical engineer has been retained to certify the existing embankment as suitable for a pond or re-construct the embankment per a professional geotechnical engineer's recommendations. The existing embankment top elevation is above the 100-year FEMA and UDFCD floodplain elevations. The proposed Pond B spillway that will be cut into the berm will also be above the existing 100-year FEMA and UDFCD floodplain elevations.

Pond C is located in Basin K4 and will provide WQCV, 10-year and 100-year detention. Pond A was sized utilizing the UD-Detention v. 3.07, which utilizes Modified Puls Routing as provided by Urban Drainage and Flood Control District. Pond C will provide WQCV, 10-year and 100-year storage volumes totaling 0.42 acre-ft. Peak flowrates out of the Pond C for the 10-year and 100-year storm events will be approximately 0.6 cfs and 4.4 cfs, respectively. The pond outlet structure will consist of a two stage outlet structure with a restrictor plate on the inside of the outlet structure. The WQCV release rate will be controlled by the orifice plate located on the inside wall of the outlet structure (the outside wall will be a trash grate). The 10-year event will be controlled by an 8-inch x 3-inch orifice notched out of the steel orifice plate with an invert just above the WQCV. The trash grate will be extended above the 10-year orifice as required by the Town of Erie. The 100-year release rate is controlled by a restrictor plate on the outgoing pipe of the outlet structure. The pond will include a trickle channel and riprap at the outlet pipe to dissipate erosive velocities. Access to the bottom of the outlet structure will be provided. Grading along the bottom of the pond will be graded at 2% to the trickle channel. The trickle channel will have a longitudinal slope of 0.8% draining toward the outlet structure.

Maintenance and Access of Drainage Facilities

Proposed channels will have access roads located above the 100-year water surface for maintenance purposes. Access to the bottom of Ponds A and C outlet structures will be provided for maintenance purposes. Access to the outlet structure and spillway of Pond B will be provided for maintenance purposes. Access will be provided to each storm sewer outfall forebay located in Ponds A and B.

Drainage easements and Tracts

All storm drainage facilities will be contained within street rights-of-ways or within Tracts with dedicated blanket drainage easements.

Drainage Impacts to Downstream Properties

The only potential downstream impact is the spillway outlet for Pond B. The outlet would spill approximately 636 cfs to the east across an abandoned portion of E. County Line Road to Coal Creek during the ultimate condition 100-year storm event. Currently there are two parcels on the east side of Coal Creek owned by the Town of Erie. These parcels are located entirely within the 100-year FEMA and FHAD floodplains and therefore do not serve any significant purpose for future development.

The Tri-County Storage facility owners have voiced concerns regarding the proposed Parkdale development and how it relates to their flooding problems (as seen in the 2013 flood); and especially the design of Pond B. As previously stated in this report, currently Drainageway 2 North is conveyed through the Parkdale site being directed by an existing abandoned railroad embankment to an existing 24-inch diameter steel pipe through the railroad embankment and to a 36-inch RCP under County Line Road. Drainageway 2 North is prone to flooding due to the existing railroad embankment adjacent to County Line Road and limited capacity of the 24-inch pipe that currently conveys flows through the railroad embankment. In larger storm events, flows from this basin become pinned against the existing railroad berm and begin to pool up eventually inundating the detention pond area of the adjacent Tri-County Storage facility. The existing railroad berm becomes less apparent in the Tri-County Storage facility property and

ultimately if flooding was severe enough, storm runoff would overtop County Line Road adjacent to the Tri-County Storage Facility to Coal Creek. The breaching point is at an approximate elevation of 5095.1. Pond B will provide a means of separation between the Parkdale site drainage system and the Tri-County Storage site. The elevations of the existing lowest storage units within the Tri-County Storage Facility appear to be approximately 5101.00. The top of the Pond B embankment is proposed at an elevation of 5101.00. The ultimate condition 100-year water surface elevation for Pond B is calculated as 5100.45. This correlates to 1.05 feet flowing over the overflow spillway (spillway crest elevation = 5099.40). The overflow spillway will provide a means of conveyance directly to Coal Creek and is sized to convey 1,020 cfs, which is greater than the 500-year ultimate condition peak flow in to Pond B. Flows that are conveyed via the spillway are conveyed directly to Coal Creek. Coal Creek provides adequate capacity to convey local Parkdale flows without impacting the Tri-County Storage area.

All remaining drainages through the site will remain close to historical flows and are therefore not impacted.

Floodplain Impacts

There are no floodplains within the site. However, the 100-year floodplain for Coal Creek does expand onto County Line Road to the former BNSF Railroad Berm for a reach of approximately 1,000 LF. It is anticipated that work within the 100-year FEMA and FHAD floodplains will be required in this area along the Coal Creek drainageway. Improvements will consist of areas of cuts and minor fills associated with the construction of the Pond B embankment, Pond B Spillway, Spine Trail connection and re-alignment of E. County Line Road. KT Engineering has modeled the proposed improvements within the 2014 FHAD 100-year floodplain and floodway and has determined that the proposed improvements do not adversely affect the 100-year floodplain and floodway (0.5' rise) elevations. A no-rise certification will be requested at the time of Final Plat. Based upon floodplain modeling performed, proposed minor fill areas within the 100-year FEMA and FHAD floodplains appear to be mitigated by areas of cut upstream associated with the Pond B Spillway.

V. SUMMARY

A. Conclusion

This site is designed to conform to the criteria set forth in the Town of Erie Standards and Specifications for Design and Construction of Public Improvements (2017 Edition) and the Urban Storm Drainage Criteria Manual (Updated March 2017). The facilities to be built with this subdivision will effectively prevent damage to property due to stormwater runoff and will not create any adverse effects to the downstream properties.

VI. REFERENCES

1. **Urban Storm Drainage Criteria Manual**
   Urban Drainage and Flood Control District, Revised March 2017

2. **Town of Erie Standards and Specifications for Design and Construction of Public Improvements**
   Town of Erie, 2016 Edition

3. **FIRM Map Number 08013C0443J & Map Number 0813C0439J**
   Federal Emergency Management Agency, Maps Revised December 18, 2012

4. **FIRM Map Number 08013C0443J Revision (Revised to Reflect LOMR)**
   Federal Emergency Management Agency, Effective Date: December 28, 2012

5. **Town of Erie, Outfall Systems Plan (West of Coal Creek)**
   RESPEC Consulting Services, Dated January 2014

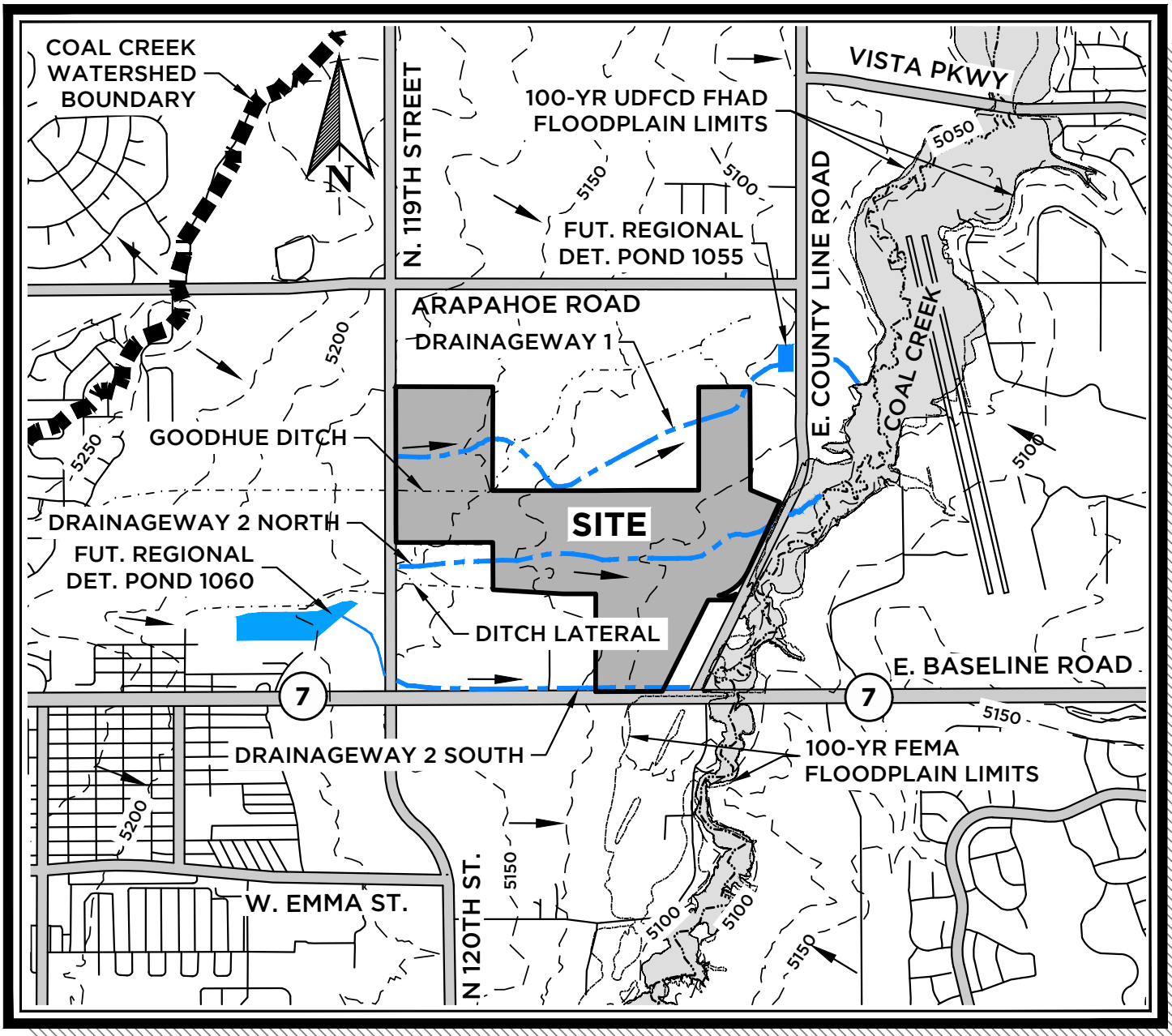
6. **Flood Hazard Area Delineation, Coal Creek and Rock Creek**
   RESPEC Consulting Services, Dated November 2014

7. **Erie Gateway South Phase I Drainage Report,**
   KT Engineering, LLC, Dated May 2016

8. **Parkdale Phase II Drainage Report,**
   KT Engineering, LLC, Issued May 21, 2017, Last Revised January 23, 2018.

Appendix A

General Location Map, Design Charts & Tables



GENERAL LOCATION MAP

1" = 2000'

SURFACE FLOW DIRECTION ARROW

DESIGN STORM RETURN PERIODS

Land Use or Zoning	Design Storm Return Period	
	Initial Storm	Major Storm
Residential	2-year	100-year
Business	5-year	100-year
Public Building Areas	5-year	100-year
Parks, Greenbelts, etc.	2-year	100-year
Open Channels and Drainage ways	10 year	100-year
Detention Facilities	Water Quality and 10 year	100-year

813.03 Runoff Computations, Colorado Urban Hydrograph Procedure (CUHP)

The CUHP method is generally applicable to basins greater than 90 acres. However, the CUHP is required for watershed areas larger than 160-acres. The procedures for the CUHP, as explained in the Urban Storm Drainage Criteria Manual, shall be followed in the preparation of drainage reports and storm drainage facility designs in the Town. The CUHP program requires the input of a design storm, either as a detailed hyetograph or as a 1-hour rainfall depth. The program for the latter using the 2-hour storm distribution recommended in the Urban Storm Drainage Criteria Manual generates a detailed hyetograph distribution. The 1-hour rainfall depths for the Town of Erie are presented in Table 800-2.

Table 800-2
TOWN OF ERIE
ONE-HOUR RAINFALL DEPTH

Design Storm	Rainfall Depth (in.)
2-Year	1.01
5-Year	1.43
10-Year	1.73
50-Year	2.40
100-Year	2.70

The hydrograph from the CUHP program must be routed through any proposed conveyance facility using UDSWM or a similar method.

813.04 Runoff Computations, Rational Method

The Rational Method will be utilized for sizing storm sewers and for determining runoff magnitude from un-sewered areas. The limit of application of the Rational Method is approximately 160 acres. When the drainage basin exceeds 160 acres, the CUHP method shall be used.
The procedures for the Rational Method, as explained in the Urban Storm Drainage Criteria Manual, shall be followed in the preparation of drainage reports in the Town.

813.05 Runoff Coefficients

Rational method runoff coefficients: The runoff coefficient (C) to be used in conjunction with the Rational Method will be calculated using the percent imperviousness shown in Table 800-3 as explained in the Urban Storm Drainage Criteria Manual.

TABLE 800-3

PERCENT IMPERVIOUS FOR RATIONAL METHOD

LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS
Business	
Commercial Areas	95
Neighborhood Areas	85
Residential	
Single-Family	*
Multi-Unit (detached)	60
Multi-Unit (attached)	75
1/2 Acre Lot or Larger	*
Apartments	80
Industrial	
Light Areas	80
Heavy Areas	90
Parks, Cemeteries	5
Playgrounds	10
Schools	50
Railroad Yard Areas	15
Undeveloped Areas	
Historic Flow Analysis	2
Greenbelts, Agricultural	2
Offsite Flow Analysis	
(when land use not defined)	45
Streets	
Paved	100
Gravel	40
Drives and Walks	90
Roofs	90
Lawns, Sandy Soil	0
Lawns, Clay Soil	0

USED 45% PER UDFCD

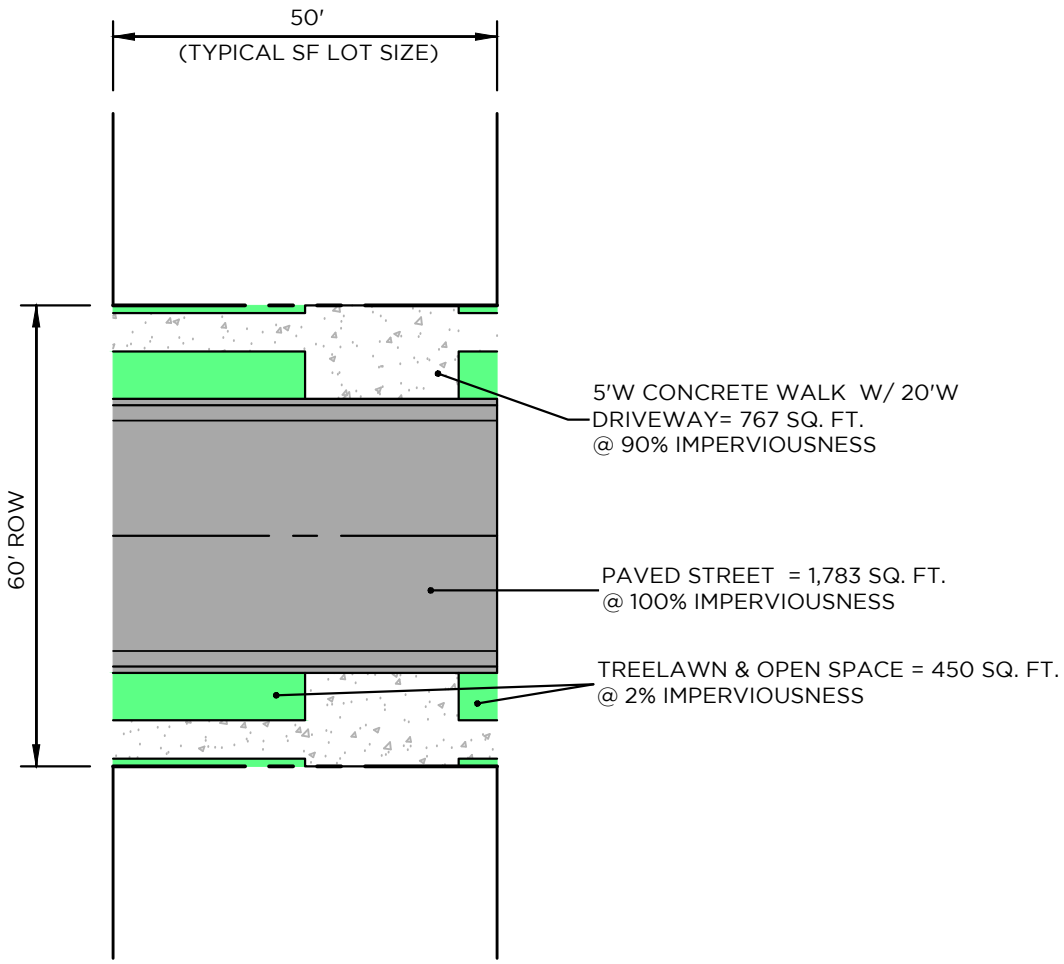
USED 10% PER UDFCD

Note: These Rational Formula coefficients may not be valid for large basins.
* Refer to Urban Storm Drainage Criteria Manual for percent impervious values.

813.06 Rainfall Intensities

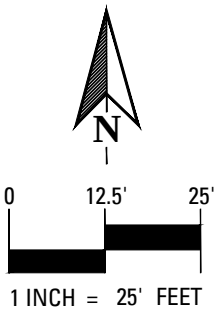
Table 6-5. Runoff coefficients, *c*

Total or Effective % Impervious	NRCS Hydrologic Soil Group A						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
2%	0.01	0.01	0.01	0.01	0.04	0.13	0.27
5%	0.02	0.02	0.02	0.03	0.07	0.15	0.29
10%	0.04	0.05	0.05	0.07	0.11	0.19	0.32
15%	0.07	0.08	0.08	0.1	0.15	0.23	0.35
20%	0.1	0.11	0.12	0.14	0.2	0.27	0.38
25%	0.14	0.15	0.16	0.19	0.24	0.3	0.42
30%	0.18	0.19	0.2	0.23	0.28	0.34	0.45
35%	0.21	0.23	0.24	0.27	0.32	0.38	0.48
40%	0.25	0.27	0.28	0.32	0.37	0.42	0.51
45%	0.3	0.31	0.33	0.36	0.41	0.46	0.54
50%	0.34	0.36	0.37	0.41	0.45	0.5	0.58
55%	0.39	0.4	0.42	0.45	0.49	0.54	0.61
60%	0.43	0.45	0.47	0.5	0.54	0.58	0.64
65%	0.48	0.5	0.51	0.54	0.58	0.62	0.67
70%	0.53	0.55	0.56	0.59	0.62	0.65	0.71
75%	0.58	0.6	0.61	0.64	0.66	0.69	0.74
80%	0.63	0.65	0.66	0.69	0.71	0.73	0.77
85%	0.68	0.7	0.71	0.74	0.75	0.77	0.8
90%	0.73	0.75	0.77	0.79	0.79	0.81	0.84
95%	0.79	0.81	0.82	0.83	0.84	0.85	0.87
100%	0.84	0.86	0.87	0.88	0.88	0.89	0.9
Total or Effective % Impervious	**NRCS Hydrologic Soil Group B**						
	2-Year	**5-Year**	**10-Year**	**25-Year**	**50-Year**	**100-Year**	**500-Year**
2%	0.01	0.01	0.07	0.26	0.34	0.44	0.54
5%	0.03	0.03	0.1	0.28	0.36	0.45	0.55
10%	0.06	0.07	0.14	0.31	0.38	0.47	0.57
15%	0.09	0.11	0.18	0.34	0.41	0.5	0.59
20%	0.13	0.15	0.22	0.38	0.44	0.52	0.61
25%	0.17	0.19	0.26	0.41	0.47	0.54	0.63
30%	0.2	0.23	0.3	0.44	0.49	0.57	0.65
35%	0.24	0.27	0.34	0.47	0.52	0.59	0.66
40%	0.29	0.32	0.38	0.5	0.55	0.61	0.68
45%	0.33	0.36	0.42	0.53	0.58	0.64	0.7
50%	0.37	0.4	0.46	0.56	0.61	0.66	0.72
55%	0.42	0.45	0.5	0.6	0.63	0.68	0.74
60%	0.46	0.49	0.54	0.63	0.66	0.71	0.76
65%	0.5	0.54	0.58	0.66	0.69	0.73	0.77
70%	0.55	0.58	0.62	0.69	0.72	0.75	0.79
75%	0.6	0.63	0.66	0.72	0.75	0.78	0.81
80%	0.64	0.67	0.7	0.75	0.77	0.8	0.83
85%	0.69	0.72	0.74	0.78	0.8	0.82	0.85
90%	0.74	0.76	0.78	0.81	0.83	0.84	0.87
95%	0.79	0.81	0.82	0.85	0.86	0.87	0.88
100%	0.84	0.86	0.86	0.88	0.89	0.89	0.9



AREA DESCRIPTION	TOTAL AREA	IMPERVIOUSNESS	IMPERVIOUS AREA
PAVED STREETS	1,783 SQ. FT.	100%	1,783 SQ. FT.
CONCRETE DRIVE/WALK	787 SQ. FT.	90%	708 SQ. FT.
TREELAWN/OPEN SPACE	430 SQ. FT.	2%	9 SQ. FT.
TOTAL:	3,000 SQ. FT.	83%	2,500 SQ. FT.

85% USED IN CALCULATIONS



KT ENGINEERING
12500 W. 58th AVE. #230
ARVADA, CO 80002
PH: 720.638.5190

TITLE:

COMPOSITE RUNOFF COEFFECIENT C-VALUE CALCULATION FOR LOCAL STREETS

2.4.1 Initial or Overland Flow Time

The initial or overland flow time, t_i, may be calculated using Equation 6-3:

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}} \qquad \text{Equation 6-3}$$

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Equation 6-3 is adequate for distances up to 300 feet in urban areas and 500 feet in rural areas. Note that in a highly urbanized catchment, the overland flow length is typically shorter than 300 feet due to effective man-made drainage systems that collect and convey runoff.

2.4.2 Channelized Flow Time

The channelized flow time (travel time) is calculated using the hydraulic properties of the conveyance element. The channelized flow time, t_t, is estimated by dividing the length of conveyance by the velocity. The following equation, Equation 6-4 (Guo 2013), can be used to determine the flow velocity in conjunction with Table 6-2 for the conveyance factor.

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t} \qquad \text{Equation 6-4}$$

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

The time of concentration, t_c, is the sum of the initial (overland) flow time, t_i, and the channelized flow time, t_t, as per Equation 6-2.

2.4.3 First Design Point Time of Concentration in Urban Catchments

Equation 6-4 was solely determined by the waterway characteristics and using a set of empirical formulas. A calibration study between the Rational Method and the Colorado Urban Hydrograph Procedure (CUHP) suggests that the time of concentration shall be the lesser of the values calculated by Equation 6-2 and Equation 6-5 (Guo and Urbonas 2013).

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}} \qquad \text{Equation 6-5}$$

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Equation 6-5 is the regional time of concentration that warrants the best agreement on peak flow predictions between the Rational Method and CUHP when the imperviousness of the tributary area is greater than 20 percent. It was developed using the UDFCD database that includes 295 sample urban catchments under 2-, 5-, 10-, 50, and 100-yr storm events (MacKenzie 2010). It suggests that both initial flow time and channelized flow velocity are directly related to the catchment's imperviousness (Guo and MacKenzie 2013).

The first design point is defined as a node where surface runoff enters the storm drain system. For example, all inlets are "first design points" because inlets are designed to accept flow into the storm drain.

Typically, but not always, Equation 6-5 will result in a lesser time of concentration at the first design point and will govern in an urbanized watershed. For subsequent design points, add the travel time for each relevant segment downstream.

2.4.4 Minimum Time of Concentration

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

2.4.5 Common Errors in Calculating Time of Concentration

A common mistake in urbanized areas is to assume travel velocities that are too slow. Another common error is to not check the runoff peak resulting from only part of the catchment. Sometimes a lower portion of the catchment or a highly impervious area produces a larger peak than that computed for the whole catchment. This error is most often encountered when the catchment is long or the upper portion contains grassy open land and the lower portion is more developed.

Appendix B

Hydrologic Calculations

PROJECT: PARKDALE – PH. II DRAINAGE
SHEET TITLE: COMPOSITE RUNOFF FACTORS

Basin Name	Total Area (Acres)	Total Area (SF)	Park Areas (SF)	SF Lots (SF)	Multi-Unit Detached (SF)	Asphalt Streets (SF)	Drives and Walks (SF)	Local Street ROW (SF)	Agriculture/Open Space (SF)	Mixed Use Space (SF)	Soil Type "B" Composite Runoff Factors			
											C_2	C_5	C_{100}	I %
A1	3.58	155783	3742	118710			758	32573			0.40	0.43	0.67	52.74
A2	2.44	106310	2495	77348			505	25962			0.41	0.44	0.68	54.16
A3	3.22	140478	26580	88079				25819			0.33	0.36	0.64	45.73
A4	1.40	60902	2622	36365				21915			0.44	0.47	0.70	57.89
A5	2.32	101189	1391	56343			110	43345			0.47	0.51	0.72	61.70
A6	1.35	58796	25915	32881							0.20	0.23	0.57	29.57
A7	2.56	111554	2493	77881			505	30675			0.42	0.45	0.68	55.42
A8	0.73	31914	6864	10737				14313			0.42	0.45	0.68	55.41
A9	1.22	53007	38731	14276							0.12	0.14	0.52	19.43
B1	4.28	186473	14870		113340		21569	36694			0.49	0.53	0.73	64.40
B2	4.61	200896	4391		133910		19890	42705			0.52	0.56	0.74	67.19
B3	1.17	51015	1450		28574		7552	13439			0.55	0.58	0.75	69.61
B4	2.55	111256	35079	24205	25862		5083	21027			0.35	0.38	0.65	47.07
B5	1.05	45609			7150			38459			0.65	0.68	0.80	81.08
B6	9.27	403961	65503	113506	12739			87089	125124		0.24	0.27	0.59	35.10
B7	3.87	168549		110329				58220			0.45	0.48	0.70	58.82
B8	2.78	120919		78612				42307			0.45	0.48	0.70	59.00
B9	2.26	98409		73105				25304			0.42	0.45	0.68	55.29
B10	1.48	64266	42678			16533	5055				0.28	0.31	0.61	39.45
B11	0.39	17001				17001					0.84	0.86	0.89	100.00
C1	2.40	104737	22183	47247		12199	1852	21256			0.40	0.43	0.67	52.91
C2	0.44	19139	6747	5146		5980	1266				0.40	0.43	0.67	52.82
C3	1.51	65880	24892	21151		17224	2613				0.35	0.38	0.65	47.94
C4	0.40	17457				17457					0.84	0.86	0.89	100.00
D1	4.38	190936	51251	90426		18880	4154	26225			0.35	0.38	0.65	47.52
D2	0.25	10751	634	4696				5421			0.48	0.52	0.72	63.11
D3	0.98	42837				42837					0.84	0.86	0.89	100.00
E1	1.12	48825	11376			30857	6592				0.62	0.65	0.79	77.68
E2	1.47	63990	29194	16373		15979	2444				0.32	0.35	0.63	44.48
E3	1.00	43432	9843			28052	5537				0.62	0.65	0.79	78.33
E4	3.27	142292	46944	71062				24286			0.29	0.32	0.61	40.28
E5	1.45	63176	6259	37446				19471			0.41	0.44	0.67	53.86
E6	1.65	71725	12593	26293		10435	1448	20956			0.45	0.48	0.70	59.45
E7	0.86	37562	2590	13766		10436	1448	9322			0.55	0.58	0.75	69.53
E8	0.25	10934						10934			0.69	0.72	0.82	85.00
F1	3.27	142402	5251	106584				30567			0.39	0.42	0.67	52.30
F2	1.00	43723	1362	21759				20602			0.48	0.52	0.72	62.76
F3	3.38	147192	31964	92065				23163			0.32	0.35	0.63	43.69
F4	0.89	38608	9729			23665	5214				0.60	0.63	0.78	75.97
F4A	0.48	21039	21039								0.06	0.07	0.47	10.00
F5	3.10	134997	5249	108914				20834			0.37	0.40	0.66	49.81
F6	1.51	65763	1349	36252				28162			0.47	0.50	0.71	61.41
F7	1.83	79611	1414	48764				29433			0.45	0.48	0.70	59.17
F8	2.89	126056	9023	84946				32087			0.40	0.43	0.67	52.68
F9	2.13	92732	8265	54158				30309			0.42	0.45	0.68	54.95
F10	1.50	65524		55993				9531			0.38	0.41	0.66	50.82
F11	0.27	11711		5181				6530			0.52	0.56	0.74	67.30
F12	1.70	74044	1730	44827				27487			0.45	0.48	0.70	59.03
F13	1.32	57500	13598	17893				26009			0.42	0.45	0.68	54.82
F14	1.48	64319		47338				16981			0.42	0.45	0.68	55.56
F15	2.02	87812		51130				36682			0.47	0.51	0.72	61.71
F16	1.98	86095		59354				26741			0.44	0.47	0.69	57.42
F17	1.32	57534	7342	26250			9741	14201			0.44	0.47	0.70	58.03
F18	0.98	42753		22875				19878			0.49	0.53	0.72	63.60
F19	0.45	19600	4335				7711	7554			0.55	0.58	0.75	70.38
F20	1.30	56481	9183	25569			7843	13886			0.42	0.45	0.68	55.39
F21	0.69	30167	1879	15547		6722	1196	4823			0.48	0.52	0.72	63.25
F22	0.90	39148	1878	20910		6725	1194	8441			0.48	0.52	0.72	62.77
F23	0.66	28736		23609				5127			0.39	0.42	0.67	52.14
F24	1.21	52497		44123				8374			0.38	0.41	0.66	51.38

Basin Name	Total Area (Acres)	Total Area (SF)	Park Areas (SF)	SF Lots (SF)	Multi-Unit Detached (SF)	Asphalt Streets (SF)	Drives and Walks (SF)	Local Street ROW (SF)	Agriculture/Open Space (SF)	Mixed Use Space (SF)	Soil Type "B" Composite Runoff Factors				
											C_2	C_5	C_{100}	I %	
F25	0.86	37537	0	29176				8361			0.41	0.44	0.67	53.91	
F26	1.02	44637	21192			16164	2352	4929			0.42	0.45	0.68	55.09	
F27	1.28	55780	27387			24657	3736				0.42	0.45	0.68	55.14	
F28	2.46	107203	11130	77460				18613			0.35	0.38	0.65	48.31	
F29	2.21	96401		79300				17101			0.39	0.42	0.67	52.10	
F30	2.33	101706		64808				36898			0.46	0.49	0.71	59.51	
F31	2.70	117752	8809	69818				39125			0.42	0.45	0.68	55.67	
F32	1.96	85499		66941				18558			0.41	0.44	0.67	53.68	
F33	1.43	62171	38615			18998	4558				0.31	0.34	0.63	43.37	
F34	1.51	65720	30324			30888	4508				0.44	0.47	0.70	57.79	
F35	0.50	21990				21990					0.84	0.86	0.89	100.00	
G1	2.41	105178		65385				39793			0.46	0.49	0.71	60.13	
G2	1.32	57311		33651				23660			0.47	0.51	0.72	61.51	
G3	2.00	86972		58429				28543			0.44	0.47	0.70	58.13	
G4	0.85	36834		13162				23672			0.56	0.59	0.75	70.71	
G5	3.06	133305	62962	59136				11207			0.21	0.24	0.58	31.83	
G5A	5.38	234445	172857	61588							0.12	0.14	0.52	19.19	
G6	20.14	877146							877146		0.01	0.01	0.44	2.00	
G7	45.18	1968002							21739	1946263	0.63	0.66	0.80	79.14	
G8	7.10	309265							293819	15446	0.03	0.03	0.45	5.90	
G9	34.31	1494399	42000				31000		1421399		0.02	0.02	0.45	4.05	
G10	24.07	1048300							1048300		0.01	0.01	0.44	2.00	
G11	0.25	11074		4677				6397			0.53	0.56	0.74	68.11	
G12	0.15	6420						6420			0.69	0.72	0.82	85.00	
I1	2.04	88825	38365			42970	7490				0.46	0.49	0.71	60.28	
I2	1.34	58379	9050			44168	5161				0.69	0.72	0.82	85.16	
J1	1.71	74664	21449			46744	6471				0.58	0.61	0.77	73.28	
J2	1.18	51442	12690			32301	6451				0.61	0.64	0.79	76.54	
J3	5.51	239852					10000		229852		0.03	0.03	0.45	5.67	
J4	8.09	352322				35380			316942		0.07	0.08	0.48	11.84	
K1	5.03	219158	171870	8984	4949	15789	17566				0.17	0.19	0.54	25.46	
K2	0.28	12244	1577			10450	217				0.72	0.74	0.83	88.23	
K3	0.25	10918				10918					0.84	0.86	0.89	100.00	
K4	0.17	7486							7486		0.01	0.01	0.44	2.00	
L1	1.36	59246	32569	26677							0.17	0.19	0.54	25.76	
L2	0.47	20334	13734	6600							0.14	0.16	0.52	21.36	
L3	2.86	124538	109303	15235							0.08	0.10	0.49	14.28	
L4	4.16	181074			27426		5120		148528		0.08	0.09	0.49	13.27	
OS1	12.50	544562					18834		525728		0.03	0.03	0.45	5.04	
OSP BASIN 424	64.00	2787840							2787840		0.01	0.01	0.44	2.00	
PARTIAL OSP BASIN 431	67.00	2918520							2918520		0.01	0.01	0.44	2.00	
TO POND A	29.89	1301869	229632	677560		95759	19347	279571			0.39	0.42	0.67	52.13	
TO POND B	344.08	14988095	1096591	2943555	321575	480817	180085	1428396	6575367	1961709	0.24	0.27	0.59	34.59	
TO POND C	5.73	249806	173447	8984	4949	37157	17783		7486		0.21	0.24	0.57	31.09	**CUHP/SWMM BASIN NOTES**
431A (CUHP/SWMM)	4.69	204118	155606	48512							0.11	0.13	0.51	18.32	L1+L2+L3
431B (CUHP/SWMM)	67.00	2918520							2918520		0.01	0.01	0.44	2.00	PARTIAL OSP BASIN 431
432A (CUHP/SWMM)	16.66	725636			27426		23954		674256		0.04	0.05	0.46	7.10	OS1+L4
P200 (CUHP/SWMM)	29.89	1301869	229632	677560		95759	19347	279571			0.39	0.42	0.67	52.13	BASINS A+E
P600 (CUHP/SWMM)	27.06	1178886	163971	210816	321575	33534	59149	264717	125124		0.39	0.42	0.67	52.46	B1 THRU B6, B9 THRU B11
P500 (CUHP/SWMM)	11.40	496681	53822	262485		52860	5731	121783			0.44	0.47	0.69	57.39	BASINS C, B7, B8
P400 (CUHP/SWMM)	5.61	244524	51885	95122		61717	4154	31646			0.44	0.47	0.69	57.40	BASINS D
P300 (CUHP/SWMM)	56.53	2462440	272047	1401544		149809	48053	590987			0.42	0.45	0.68	54.96	BASINS F + D
P100 (CUHP/SWMM)	91.21	3973156	283234	296028		87138	12651	139692	1192704	1961709	0.37	0.40	0.66	49.63	G1 THRU G8, G11, G12, I1,I2
P700 (CUHP/SWMM)	58.37	2542699	42000	0			31000		2469699		0.02	0.02	0.44	3.21	G9, G10

GREEN CELLS SHOW BASINS NOT INCLUDED IN POND B VOLUME CALCULATION

Land Use	Imp., I %
Park Areas	10
Single Family <0.25 Acre	45
Multi-Unit Detached	60
Asphalt Streets	100
Concrete Drives and Walks / Roofs	90
Local Street ROW	85
Agriculture/Open Space (OSP)	2
Mixed Use (OSP)	80

PROJECT: PARKDALE – PH. II DRAINAGE
SHEET TITLE: TIME OF CONCENTRATION

			TIME (Ti) *[Max. 300']*					TRAVEL TIME (Tt)								Tc CHECK (Urbanized Basins)					FINAL Tc	Time to Peak** Flow	Remarks
Basin No.	Area (acres)	5Yr. co-eff.	Elevations Upstream	Elevations Downstream	Dist. (ft)	Slope (ft/ft)	Ti (min)	Elevations Upstream	Elevations Downstream	Dist. (ft)	Slope (ft/ft)	*	Vel. (fps)	Tt (min)	Tc	Length (ft)	Avg Slope (ft/ft)	Imperv.	Tc (min)	(min)		
A1	3.58	0.43	5169.0	5160.3	194	0.045	10.5	5160.3	5149.2	694	0.016	6.0	2.5	4.6	15.0	694	0.02	0.01	35.9	15.0	**15.0**	Developed
A2	2.44	0.44	5164.5	5160.8	140	0.026	10.4	5160.8	5149.2	726	0.016	6.0	2.5	4.8	15.1	726	0.02	0.01	36.4	15.1	**15.1**	Developed
A3	3.22	0.36	5178.1	5168.5	187	0.051	10.7	5168.5	5152.2	843	0.019	6.0	2.8	5.1	15.7	843	0.02	0.01	37.0	15.7	**15.7**	Developed
A4	1.40	0.47	5156.4	5151.8	134	0.034	8.9	5151.8	5147.1	486	0.010	6.0	2.0	4.1	13.0	486	0.01	0.01	34.9	13.0	**13.0**	Developed
A5	2.32	0.51	5169.1	5167.2	63	0.030	6.0	5167.2	5147.1	1,217	0.017	6.0	2.6	7.9	13.9	1217	0.02	0.01	43.2	13.9	**13.9**	Developed
A6	1.35	0.23	5153.5	5148.5	124	0.040	11.2	5148.5	5144.5	544	0.007	6.0	1.7	5.3	16.5	544	0.01	0.01	37.5	16.5	**16.5**	Developed
A7	2.56	0.45	5164.7	5160.8	122	0.032	8.9	5160.8	5149.5	689	0.016	6.0	2.6	4.5	13.4	689	0.02	0.01	35.7	13.4	**13.4**	Developed
A8	0.73	0.45	5155.8	5154.0	58	0.031	6.2	5154.0	5148.1	261	0.023	6.0	3.0	1.4	7.7	261	0.02	0.01	29.1	7.7	**7.7**	Developed
A9	1.22	0.14	5152.0	5142.0	117	0.085	9.3	5142.0	5141.0	168	0.006	6.0	1.5	1.8	11.1	168	0.01	0.01	29.9	11.1	**11.1**	Developed
B1	4.28	0.53	5125.3	5121.7	125	0.029	8.2	5121.7	5108.8	731	0.018	6.0	2.7	4.6	12.8	731	0.02	0.01	36.0	12.8	**12.8**	Developed
B2	4.61	0.56	5122.4	5118.4	127	0.031	7.7	5118.4	5108.8	438	0.022	6.0	3.0	2.5	10.1	438	0.02	0.01	31.3	10.1	**10.1**	Developed
B3	1.17	0.58	5111.9	5105.0	167	0.041	7.7	5105.0	5101.8	211	0.015	6.0	2.5	1.4	9.2	211	0.02	0.01	29.0	9.2	**9.2**	Developed
B4	2.55	0.38	5111.1	5106.1	183	0.027	12.8	5106.1	5101.8	239	0.018	6.0	2.7	1.5	14.3	239	0.02	0.01	29.2	14.3	**14.3**	Developed
B5	1.05	0.68	5122.6	5118.2	136	0.032	6.1	5118.2	5105.7	710	0.018	6.0	2.7	4.5	10.5	710	0.02	0.01	35.7	10.5	**10.5**	Developed
B6	9.27	0.27	5128.4	5123.3	300	0.017	22.1	5123.3	5105.7	719	0.024	6.0	3.1	3.8	25.9	719	0.02	0.01	34.3	25.9	**25.9**	Developed
B7	3.87	0.48	5123.3	5118.5	190	0.025	11.5	5118.5	5110.4	845	0.010	6.0	2.0	7.2	18.7	845	0.01	0.01	41.7	18.7	**18.7**	Developed
B8	2.78	0.48	5123.3	5118.4	192	0.026	11.6	5118.4	5114.8	515	0.007	6.0	1.7	5.1	16.7	515	0.01	0.01	37.2	16.7	**16.7**	Developed
B9	2.26	0.45	5110.2	5105.9	130	0.033	9.1	5105.9	5101.6	443	0.010	6.0	2.0	3.7	12.9	443	0.01	0.01	34.1	12.9	**12.9**	Developed
B10	1.48	0.31	5110.1	5105.4	114	0.041	9.6	5105.4	5100.8	557	0.008	6.0	1.8	5.1	14.8	557	0.01	0.01	37.1	14.8	**14.8**	Developed
B11	0.39	0.86	5107.9	5107.1	33	0.024	1.9	5107.1	5100.8	739	0.009	6.0	1.8	6.7	8.6	739	0.01	0.01	40.5	8.6	**8.6**	Developed
C1	2.40	0.43	5115.4	5114.2	58	0.021	7.4	5114.2	5105.3	813	0.011	6.0	2.1	6.5	13.9	813	0.01	0.01	40.1	13.9	**13.9**	Developed
C2	0.44	0.43	5109.9	5105.8	92	0.045	7.2	5105.8	5105.3	81	0.006	6.0	1.6	0.9	8.1	81	0.01	0.01	27.8	8.1	**8.1**	Developed
C3	1.51	0.38	5115.4	5110.8	129	0.036	9.8	5110.8	5107.5	400	0.008	6.0	1.8	3.7	13.5	400	0.01	0.01	34.0	13.5	**13.5**	Developed
C4	0.40	0.86	5112.7	5111.9	34	0.024	1.9	5111.9	5107.2	539	0.009	6.0	1.9	4.8	6.7	539	0.01	0.01	36.4	6.7	**6.7**	Developed

			TIME (Ti) *[Max. 300']*					TRAVEL TIME (Tt)							Tc CHECK (Urbanized Basins)					FINAL Tc	Time to Peak** Flow	Remarks
Basin No.	Area (acres)	5Yr. co-eff.	Elevations		Dist. (ft)	Slope (ft/ft)	Ti (min)	Elevations		Dist. (ft)	Slope (ft/ft)	*	Vel. (fps)	Tt (min)	Tc	Length (ft)	Avg Slope (ft/ft)	Imperv.	Tc (min)	(min)		
			Upstream	Downstream				Upstream	Downstream													
D1	4.38	0.38	5125.5	5121.5	125	0.032	10.0	5121.5	5111.9	817	0.012	6.0	2.2	6.3	16.3	817	0.01	0.01	39.7	16.3	**16.3**	Developed
D2	0.25	0.52	5115.5	5112.3	78	0.041	5.9	5112.3	5111.9	30	0.013	6.0	2.3	0.2	6.1	30	0.01	0.01	26.4	6.1	**6.1**	Developed
D3	0.98	0.86	5127.1	5125.7	70	0.020	2.9	5125.7	5112.1	845	0.016	6.0	2.5	5.5	8.5	845	0.02	0.01	38.0	8.5	**8.5**	Developed
E1	1.12	0.65	5181.3	5180.2	40	0.028	3.7	5180.2	5167.9	799	0.015	6.0	2.5	5.4	9.1	799	0.02	0.01	37.6	9.1	**9.1**	Developed
E2	1.47	0.35	5168.8	5160.6	166	0.049	10.4	5160.6	5155.9	267	0.018	6.0	2.7	1.7	12.1	267	0.02	0.01	29.6	12.1	**12.1**	Developed
E3	1.00	0.65	5173.0	5172.2	40	0.020	4.1	5172.2	5155.9	830	0.020	6.0	2.8	4.9	9.0	830	0.02	0.01	36.7	9.0	**9.0**	Developed
E4	3.27	0.32	5180.5	5168.5	222	0.054	12.1	5168.5	5159.6	765	0.012	6.0	2.2	5.9	18.1	765	0.01	0.01	38.9	18.1	**18.1**	Developed
E5	1.45	0.44	5172.0	5164.6	166	0.045	9.5	5164.6	5155.6	590	0.015	6.0	2.5	4.0	13.5	590	0.02	0.01	34.6	13.5	**13.5**	Developed
E6	1.65	0.48	5158.1	5154.3	118	0.032	8.3	5154.3	5152.9	128	0.011	6.0	2.1	1.0	9.4	128	0.01	0.01	28.1	9.4	**9.4**	Developed
E7	0.86	0.58	5158.5	5155.1	190	0.018	10.9	5155.1	5152.8	165	0.014	6.0	2.4	1.2	12.1	165	0.01	0.01	28.4	12.1	**12.1**	Developed
E8	0.25	0.72																			**5.0**	Developed
E7	0.86	0.58	5158.5	5155.1	190	0.018	10.9	5155.1	5152.8	165	0.014	6.0	2.4	1.2	12.1	165	0.01	0.01	28.4	12.1	**12.1**	Developed
F1	3.27	0.42	5165.4	5156.4	204	0.044	10.9	5156.4	5150.1	165	0.038	6.0	3.9	0.7	11.6	165	0.04	0.01	27.4	11.6	**11.6**	Developed
F2	1.00	0.52	5166.1	5164.6	58	0.026	6.0	5164.6	5150.9	668	0.021	6.0	2.9	3.9	9.8	668	0.02	0.01	34.4	9.8	**9.8**	Developed
F3	3.38	0.35	5169.9	5161.7	187	0.044	11.5	5161.7	5150.9	578	0.019	6.0	2.7	3.5	15.0	578	0.02	0.01	33.6	15.0	**15.0**	Developed
F4	0.89	0.63	5173.2	5171.6	41	0.039	3.5	5171.6	5166.5	631	0.008	6.0	1.8	5.8	9.3	631	0.01	0.01	38.7	9.3	**9.3**	Developed
F4A	0.48	0.07																			**5.0**	Developed
F5	3.10	0.40	5160.0	5154.1	203	0.029	12.9	5154.1	5144.6	600	0.016	6.0	2.5	4.0	16.9	600	0.02	0.01	34.6	16.9	**16.9**	Developed
F6	1.51	0.50	5160.1	5158.6	58	0.026	6.1	5158.6	5145.3	631	0.021	6.0	2.9	3.6	9.7	631	0.02	0.01	33.8	9.7	**9.7**	Developed
F7	1.83	0.48	5157.3	5153.1	135	0.031	9.0	5153.1	5140.3	773	0.017	6.0	2.6	5.0	14.0	773	0.02	0.01	36.9	14.0	**14.0**	Developed
F8	2.89	0.43	5152.0	5144.1	231	0.034	12.5	5144.1	5138.6	410	0.013	6.0	2.3	2.9	15.4	410	0.01	0.01	32.4	15.4	**15.4**	Developed
F9	2.13	0.45	5156.1	5146.3	200	0.049	10.0	5146.3	5138.6	510	0.015	6.0	2.5	3.5	13.5	510	0.02	0.01	33.5	13.5	**13.5**	Developed
F10	1.50	0.41	5141.9	5135.3	142	0.046	9.1	5135.3	5135.0	23	0.013	6.0	2.3	0.2	9.3	23	0.01	0.01	26.3	9.3	**9.3**	Developed
F11	0.27	0.56	5140.1	5135.1	95	0.053	5.6	5135.1	5135.0	10	0.010	6.0	2.0	0.1	5.7	10	0.01	0.01	26.1	5.7	**5.7**	Developed
F12	1.70	0.48	5157.0	5150.2	169	0.040	9.3	5150.2	5136.9	504	0.026	6.0	3.2	2.6	11.8	504	0.03	0.01	31.6	11.8	**11.8**	Developed
F13	1.32	0.45	5153.6	5152.0	58	0.028	6.5	5152.0	5136.9	641	0.024	6.0	3.1	3.5	10.0	641	0.02	0.01	33.5	10.0	**10.0**	Developed
F14	1.48	0.45	5140.2	5136.3	170	0.023	11.7	5136.3	5132.4	390	0.010	6.0	2.0	3.2	15.0	390	0.01	0.01	33.0	15.0	**15.0**	Developed
F15	2.02	0.51	5140.4	5136.7	154	0.024	10.1	5136.7	5132.4	418	0.010	6.0	2.0	3.4	13.5	418	0.01	0.01	33.4	13.5	**13.5**	Developed

			TIME (Ti) *[Max. 300']*					TRAVEL TIME (Tt)								Tc CHECK (Urbanized Basins)					FINAL Tc	Time to Peak** Flow	Remarks
Basin No.	Area (acres)	5Yr. co-eff.	Elevations Upstream	Elevations Downstream	Dist. (ft)	Slope (ft/ft)	Ti (min)	Elevations Upstream	Elevations Downstream	Dist. (ft)	Slope (ft/ft)	*	Vel. (fps)	Tt (min)	Tc	Length (ft)	Avg Slope (ft/ft)	Imperv.	Tc (min)	(min)		
F16	1.98	0.47	5140.2	5134.3	126	0.047	7.8	5134.3	5130.7	327	0.011	6.0	2.1	2.6	10.4	327	0.01	0.01	31.6	10.4	**10.4**	Developed
F17	1.32	0.47	5137.6	5133.7	135	0.029	9.4	5133.7	5130.7	282	0.011	6.0	2.1	2.3	11.6	282	0.01	0.01	30.9	11.6	**11.6**	Developed
F18	0.98	0.53	5136.2	5134.7	58	0.026	5.8	5134.7	5130.1	476	0.010	6.0	2.0	4.0	9.9	476	0.01	0.01	34.7	9.9	**9.9**	Developed
F19	0.45	0.58	5132.6	5130.9	66	0.026	5.7	5130.9	5130.1	98	0.008	6.0	1.8	0.9	6.6	98	0.01	0.01	27.9	6.6	**6.6**	Developed
F20	1.30	0.45	5137.6	5132.0	126	0.044	8.1	5132.0	5129.9	258	0.008	6.0	1.8	2.4	10.5	258	0.01	0.01	31.1	10.5	**10.5**	Developed
F21	0.69	0.52	5132.9	5131.3	58	0.028	5.8	5131.3	5127.2	365	0.011	6.0	2.1	2.9	8.6	365	0.01	0.01	32.2	8.6	**8.6**	Developed
F22	0.90	0.52	5134.3	5132.2	88	0.024	7.5	5132.2	5127.2	469	0.011	6.0	2.1	3.8	11.3	469	0.01	0.01	34.2	11.3	**11.3**	Developed
F23	0.66	0.42	5132.9	5128.0	199	0.025	13.0	5128.0	5126.8	105	0.011	6.0	2.1	0.8	13.8	105	0.01	0.01	27.7	13.8	**13.8**	Developed
F24	1.21	0.41	5134.3	5128.9	198	0.027	12.7	5128.9	5126.7	189	0.012	6.0	2.2	1.5	14.2	189	0.01	0.01	29.1	14.2	**14.2**	Developed
F25	0.86	0.44	5133.0	5129.4	134	0.027	10.2	5129.4	5126.7	229	0.012	6.0	2.2	1.8	11.9	229	0.01	0.01	29.8	11.9	**11.9**	Developed
F26	1.02	0.45	5128.6	5125.9	89	0.030	7.8	5125.9	5123.5	252	0.010	6.0	2.0	2.2	9.9	252	0.01	0.01	30.6	9.9	**9.9**	Developed
F27	1.28	0.45	5128.9	5126.3	95	0.027	8.3	5126.3	5123.5	243	0.012	6.0	2.1	1.9	10.2	243	0.01	0.01	30.0	10.2	**10.2**	Developed
F28	2.46	0.38	5144.1	5130.5	264	0.052	12.4	5130.5	5125.6	375	0.013	6.0	2.3	2.7	15.1	375	0.01	0.01	31.9	15.1	**15.1**	Developed
F29	2.21	0.42	5136.1	5128.5	190	0.040	10.8	5128.5	5125.6	292	0.010	6.0	2.0	2.4	13.3	292	0.01	0.01	31.3	13.3	**13.3**	Developed
F30	2.33	0.49	5132.8	5127.8	200	0.025	11.7	5127.8	5122.6	212	0.025	6.0	3.1	1.1	12.9	212	0.02	0.01	28.4	12.9	**12.9**	Developed
F31	2.70	0.45	5129.2	5124.4	137	0.035	9.1	5124.4	5121.1	505	0.007	6.0	1.6	5.2	14.3	505	0.01	0.01	37.3	14.3	**14.3**	Developed
F32	1.96	0.44	5129.1	5122.0	189	0.038	10.8	5122.0	5120.5	178	0.008	6.0	1.8	1.6	12.4	178	0.01	0.01	29.4	12.4	**12.4**	Developed
F33	1.43	0.34	5125.4	5123.5	99	0.019	11.1	5123.5	5119.6	451	0.009	6.0	1.9	4.0	15.1	451	0.01	0.01	34.8	15.1	**15.1**	Developed
F34	1.51	0.47	5125.0	5122.7	129	0.018	10.8	5122.7	5119.6	362	0.009	6.0	1.9	3.3	14.1	362	0.01	0.01	33.0	14.1	**14.1**	Developed
F35	0.50	0.86																			**5.0**	Developed
G1	2.41	0.49	5140.1	5134.7	123	0.044	7.6	5134.7	5129.2	644	0.009	6.0	1.8	5.8	13.4	644	0.01	0.01	38.6	13.4	**13.4**	Developed
G2	1.32	0.51	5137.6	5137.2	58	0.007	9.4	5137.2	5129.2	717	0.011	6.0	2.1	5.7	15.1	717	0.01	0.01	38.3	15.1	**15.1**	Developed
G3	2.00	0.47	5133.1	5129.3	137	0.028	9.6	5129.3	5126.5	308	0.009	6.0	1.9	2.7	12.3	308	0.01	0.01	31.8	12.3	**12.3**	Developed
G4	0.85	0.59	5131.3	5129.5	58	0.031	4.9	5129.5	5126.5	387	0.008	6.0	1.8	3.7	8.6	387	0.01	0.01	33.9	8.6	**8.6**	Developed
G5	3.06	0.24	5142.0	5138.4	96	0.038	9.9	5138.4	5128.0	989	0.011	5.0	1.5	10.7	20.6	989	0.01	0.01	43.6	20.6	**20.6**	Developed
G5A	5.38	0.14	5135.3	5127.4	99	0.079	8.8	5127.4	5110.7	1,142	0.015	5.0	1.8	10.5	19.3	1142	0.01	0.01	43.3	19.3	**19.3**	Developed

			TIME (Ti) *[Max. 300']*					TRAVEL TIME (Tt)							Tc CHECK (Urbanized Basins)					FINAL Tc	Time to Peak** Flow	Remarks
Basin No.	Area (acres)	5Yr. co-eff.	Elevations		Dist. (ft)	Slope (ft/ft)	Ti (min)	Elevations		Dist. (ft)	Slope (ft/ft)	*	Vel. (fps)	Tt (min)	Tc	Length (ft)	Avg Slope (ft/ft)	Imperv.	Tc (min)	(min)		
			Upstream	Downstream				Upstream	Downstream													
G6	20.14	0.01	5156.9	5149.7	300	0.024	25.9	5149.7	5133.1	826	0.020	5.0	2.1	6.5	32.3	826	0.02	0.00	36.6	32.3	**32.3**	Developed
G7	45.18	0.66	5157.8	5152.3	300	0.018	11.4	5152.3	5133.6	1,859	0.010	6.0	2.0	15.4	26.8	1859	0.01	0.01	59.8	26.8	**26.8**	Developed
G8	7.10	0.03	5143.6	5128.8	300	0.049	19.9	5128.8	5123.5	465	0.011	5.0	1.6	4.8	24.7	465	0.01	0.00	33.9	24.7	**24.7**	Developed
G9	34.31	0.02	5123.2	5100.6	300	0.075	17.4	5100.6	5091.6	1,492	0.006	5.0	1.2	21.3	38.8	1492	0.01	0.00	61.3	38.8	**38.8**	Developed
G10	24.07	0.01	5123.1	5105.4	244	0.073	16.1	5105.4	5102.2	1,308	0.002	5.0	0.7	29.4	45.5	1308	0.00	0.00	74.6	45.5	**45.5**	Developed
G11	0.25	0.56																			**5.0**	Developed
G12	0.15	0.72																			**5.0**	Developed
I1	2.04	0.49	5136.0	5127.0	101	0.089	5.4	5127.0	5123.4	494	0.007	6.0	1.7	4.8	10.2	494	0.01	0.01	36.5	10.2	**10.2**	Developed
I2	1.34	0.72	5127.1	5125.8	61	0.021	4.2	5125.8	5123.4	323	0.007	6.0	1.7	3.1	7.4	323	0.01	0.01	32.7	7.4	**7.4**	Developed
J1	1.71	0.61	5137.6	5126.8	121	0.089	4.8	5126.8	5118.3	611	0.014	6.0	2.4	4.3	9.1	611	0.01	0.01	35.3	9.1	**9.1**	Developed
J2	1.18	0.64	5127.3	5123.4	104	0.038	5.5	5123.4	5118.6	368	0.013	6.0	2.3	2.7	8.2	368	0.01	0.01	31.8	8.2	**8.2**	Developed
J3	5.51	0.03	5140.0	5127.5	300	0.042	21.0	5127.5	5113.3	172	0.083	5.0	4.3	0.7	21.7	172	0.08	0.00	27.0	21.7	**21.7**	Developed
J4	8.09	0.08	5126.4	5106.4	300	0.067	17.2	5106.4	5106.0	227	0.002	5.0	0.6	6.0	23.2	227	0.00	0.00	35.9	23.2	**23.2**	Developed
K1	5.03	0.19	5105.8	5092.8	242	0.054	14.8	5092.8	5092.0	274	0.003	5.0	0.8	5.6	20.5	274	0.00	0.01	35.2	20.5	**20.5**	Developed
K2	0.28	0.74																			**5.0**	Developed
K3	0.25	0.86																			**5.0**	Developed
K4	0.17	0.01																			**5.0**	Developed
L1	1.36	0.19	5167.2	5157.6	226	0.042	15.4	5157.6	5153.0	278	0.017	6.0	2.6	1.8	17.2	278	0.02	0.01	29.9	17.2	**17.2**	Developed
L2	0.47	0.16	5158.5	5148.8	93.5	0.104	7.7	5148.8	5148.4	78	0.005	6.0	1.4	0.9	8.6	78	0.01	0.01	27.9	8.6	**8.6**	Developed
L3	2.86	0.10	5156.0	5146.9	226	0.040	17.3	5146.9	5144.6	376	0.006	5.0	1.2	5.3	22.6	376	0.01	0.00	34.8	22.6	**22.6**	Developed
L4	4.16	0.09	5121.8	5113.4	96	0.088	8.8	5113.4	5110.7	881	0.003	5.0	0.8	17.7	26.5	881	0.00	0.00	55.2	26.5	**26.5**	Developed
OS1	12.50	0.03	5128.3	5123.0	300	0.018	28.1	5123.0	5114.7	636	0.013	5.0	1.7	6.2	34.3	636	0.01	0.00	36.1	34.3	**34.3**	Developed

* Type of Land Surface for Overland Travel Time	VELOCITY COEFFICIENTS	
1 = Heavy Meadow	1	2.5
2 = Tillage / Field	2	5
3 = Short pasture & lawns	3	7
4 = Nearly bare ground	4	10
5 = Grassed waterway	5	15
6 = Paved areas and shallow paved swales	6	20

PROJECT: PARKDALE – PH. II DRAINAGE
SHEET TITLE: SF-3 FORM (2-YR)

			DIRECT RUNOFF						TOTAL RUNOFF				STREET/CHANNEL			PIPE			TRAVEL TIME			
BASIN	DESIGN POINT	AREA DESIGN.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	CARRYOVER (cfs)	PIPE FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	Tt (min)	REMARKS
A1	1	A1	3.58	0.40	15.0	1.41	2.29	**3.2**								3.2	1.0	18	18	5.4	0.1	10' TYPE R - PIPED TO DP 3
A2	2	A2	2.44	0.41	15.1	1.00	2.29	**2.3**								2.3	1.0	18	18	5.0	0.1	10' TYPE R - PIPED TO DP 3
A1+A2	3	A1+A2							15.2	2.41	2.29	5.5				5.5	0.7	24	41	5.4	0.1	COMBINED FLOW IN MH AT DP 3
A3	4	A3	3.22	0.33	15.7	1.08	2.26	**2.4**								2.4		18	337	4.8	1.2	10' TYPE R - PIPED TO DP 5
A1+A2+A3	5	A1+A2+A3							16.9	3.49	2.19	7.6				7.6	0.7	30	180	6.4	0.5	COMBINED FLOW IN MH AT DP 5
A4	6	A4	1.40	0.44	13.0	0.62	2.49	**1.5**								1.5	0.7	24	18	3.6	0.1	10' TYPE R - PIPED TO DP 8
A5	7	A5	2.32	0.47	13.9	1.10	2.40	**2.6**								2.6	0.7	30	18	4.2	0.1	15' TYPE R - PIPED TO DP 8
A1+A2+A3+A4+A5	8	A1+A2+A3+A4+A5							17.4	5.20	2.16	11.2				11.2	0.7	36	80	6.3	0.2	COMBINED FLOW IN MH AT DP 8
A6	9	A6	1.35	0.20	16.5	0.27	2.22	**0.6**								0.6	1.0	18	195	3.5	0.9	TYPE C INLET - PIPED TO DP 11
A7	10	A7	2.56	0.42	13.4	1.08	2.45	**2.6**								2.6	1.1	18	108	5.2	0.3	10' TYPE R - PIPED TO DP 11
A1+A2+A3+A4+A5+A6+A7	11	A1+A2+A3+A4+A5+A6+A7							17.6	6.54	2.14	14.0				14.0	0.7	36	18	7.7	0.0	COMBINED FLOW IN MH AT DP 11
A8	12	A8	0.73	0.42	7.7	0.31	3.12	**1.0**	17.6	6.85	2.14	14.7				14.7	1.0	42	189	7.7	0.4	5' TYPE R - COMBINED FLOW IN INLET AT DP 12
E1	13	E1	1.12	0.62	9.1	0.69	2.89	**2.0**								2.0	2.5	18	469	6.5	1.2	10' TYPE R - PIPED TO DP 17
E2	14	E2	1.47	0.32	12.1	0.47	2.56	**1.2**								0.0	1.0	18	27	7.4	0.1	10' TYPE R - PIPED TO DP 17
E5	15	E5	1.45	0.41	13.5	0.59	2.42	**1.4**								1.4	1.0	18	35	4.3	0.1	5' TYPE R - PIPED TO DP 16
E3	16	E3	1.00	0.62	9.0	0.62	2.89	**1.8**	13.7	1.21	2.42	2.9				2.9	1.0	18	27	5.2	0.1	10' TYPE R - PIPED TO DP 17
E1+E2+E3+E5	17	E1+E2+E3+E5							13.7	2.38	2.42	5.8				5.8	1.2	24	46	6.7	0.1	COMBINED FLOW IN MH AT DP 17
E4	18	E4	3.27	0.29	18.1	0.95	2.11	**2.0**								2.0	1.7	18	227	5.6	0.7	10' TYPE R - PIPED TO DP 19
E1+E2+E3+E4+E5	19	E1+E2+E3+E4+E5							18.7	3.32	2.08	6.9				6.9	1.1	30	210	6.6	0.5	COMBINED FLOW IN MH AT DP 19
E6	20	E6	1.65	0.45	9.4	0.74	2.85	**2.1**								2.1	1.0	18	27	4.8	0.1	10' TYPE R - PIPED TO DP 22
E7	21	E7	0.86	0.55	12.1	0.47	2.56	**1.2**								1.2	1.0	18	27	4.1	0.1	5' TYPE R - PIPED TO DP 22
E1+E2+E3+E4+E5+E6+E7	22	E1+E2+E3+E4+E5+E6+E7							19.3	4.54	2.03	9.2				9.2	1.1	30	70	7.3	0.2	COMBINED FLOW IN MH AT DP 22
E8	23	E8	0.25	0.69	5.0	0.17	3.50	**0.6**								0.6	1.0	18	27	3.3	0.1	5' TYPE R - PIPED TO DP 24
E1+E2+E3+E4+E5+E6+E7+E8	24	E1+E2+E3+E4+E5+E6+E7+E8							19.4	4.71	2.03	9.6				9.6	1.1	30	464	7.3	1.1	COMBINED FLOW IN MH AT DP 24
A9	25	A9	1.22	0.12	11.1	0.15	2.64	**0.4**														DIRECT BASIN TO POND A
ALL A AND E BASINS	25	ALL A AND E BASINS							20.5	11.71	1.98	23.1				23.1	1.1	30	464	7.3	1.1	COMBINED STORM INFLOWS TO POND A

			DIRECT RUNOFF						TOTAL RUNOFF				STREET/CHANNEL			PIPE			TRAVEL TIME			
BASIN	DESIGN POINT	AREA DESIGN.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	CARRYOVER (cfs)	PIPE FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	Tt (min)	REMARKS
B1	26	B1	4.28	0.49	12.8	2.11	2.49	**5.2**								5.2	1.0	24	18	5.7	0.1	15' TYPE R - PIPED TO DP 28
B2	27	B2	4.61	0.52	10.1	2.40	2.73	**6.6**								6.6	1.0	18	18	5.6	0.1	10' TYPE R - PIPED TO DP 28
B1+B2	28	B1+B2							12.9	4.50	2.49	11.2				11.2	2.4	24	293	9.3	0.5	COMBINED FLOW IN MH AT DP 28
B6	29	B6	9.27	0.24	25.9	2.23	1.73	**3.9**								3.9	1.0	24	36	5.6	0.1	15' TYPE R - PIPED TO DP 30
B5	30	B5	1.05	0.65	10.5	0.68	2.69	**1.8**	26.0	2.91	1.72	5.0				5.0	1.6	30	239	7.4	0.5	15' TYPE R - COMBINED FLOW IN INLET AT DP 30 PIPED TO DP 31
B4	31	B4	2.55	0.35	14.3	0.88	2.36	**2.1**	26.6	3.79	1.71	6.5				6.5	1.0	30	18	6.7	0.0	10' TYPE R - COMBINED FLOW IN INLET AT DP 31 PIPED TO DP 32
B1+B2+B4+B5+B6	32	B1+B2+B4+B5+B6							26.6	8.29	1.71	14.2				14.2	1.0	36	18	7.8	0.0	COMBINED FLOW IN MH AT DP 32
B3	33	B3	1.17	0.55	9.2	0.64	2.89	**1.8**	26.6	8.93	1.71	15.3				15.3	1.4	36	223	8.8	0.4	10' TYPE R - COMBINED FLOW IN INLET AT DP 33 PIPED TO DP 35
B9	34	B9	2.26	0.42	12.9	0.95	2.49	**2.4**								2.4	3.0	18	50	7.3	0.1	10' TYPE R - PIPED TO DP 35
B1+B2+B3+B4+B5+B6+B9	35	B1+B2+B3+B4+B5+B6+B9							27.0	9.88	1.69	16.7				16.7	0.5	42	381	6.2	1.0	COMBINED FLOW IN MH AT DP 35
B10	36	B10	1.48	0.28	14.8	0.41	2.31	**1.0**	28.0	10.29	1.65	17.0				17.0	0.7	42	37	7.1	0.1	15' TYPE R - COMBINED FLOW IN INLET AT DP 36 PIPED TO DP 37
B11	37	B11	0.39	0.84	8.6	0.33	2.96	**1.0**	28.1	10.62	1.65	17.6				17.6	0.7	42	40	7.1	0.1	10' TYPE R - COMBINED FLOW IN INLET AT DP 37 PIPED TO POND B
B8	38	B8	2.78	0.45	16.7	1.24	2.20	**2.7**								2.7	0.9	18	373	4.5	1.4	10' TYPE R - PIPED TO DP 40
B7	39	B7	3.87	0.45	18.7	1.73	2.08	**3.6**								3.6	1.0	18	17	4.8	0.1	10' TYPE R - PIPED TO DP 40
B7+B8	40	B7+B8							18.8	2.98	2.06	6.1				6.1	1.1	24	473	6.5	1.2	COMBINED FLOW IN MH AT DP 40
C1	41	C1	2.40	0.40	13.9	0.95	2.40	**2.3**								2.3	1.0	18	40	4.9	0.1	10' TYPE R - PIPED TO DP 43
C2	42	C2	0.44	0.40	8.1	0.17	3.04	**0.5**								0.5	1.0	18	13	3.2	0.1	5' TYPE R - PIPED TO DP 43
B7+B8+C1+C2	43	B7+B8+C1+C2							20.0	4.10	1.99	8.1				8.1	0.7	30	128	5.9	0.4	COMBINED FLOW IN MH AT DP 43
C4	44	C4	0.40	0.84	6.7	0.34	3.27	**1.1**								1.1	1.0	18	37	3.8	0.2	10' TYPE R - PIPED TO MH AT DP 46
C3	45	C3	1.51	0.35	13.5	0.53	2.45	**1.3**								1.3	1.0	18	12	4.2	0.0	10' TYPE R - PIPED TO MH AT DP 46
C3+C4	46	C3+C4							13.5	0.87	2.42	2.1				2.1	0.7	18	95	4.6	0.3	COMBINED FLOW IN MH AT DP 46
B7+B8+C1+C2+C3+C4	47	B7+B8+C1+C2+C3+C4							20.4	4.97	1.98	9.8				9.8	0.7	30	72	7.1	0.2	COMBINED FLOW IN MH AT DP 47 - PIPED TO POND B
D1	48	D1	4.38	0.35	16.3	1.53	2.22	**3.4**								3.4	1.0	24	18	5.5	0.1	10' TYPE R - PIPED TO DP 50
D2	49	D2	0.25	0.48	6.1	0.12	3.35	**0.4**								0.4	1.0	18	18	2.9	0.1	5' TYPE R - PIPED TO DP 50
D1+D2	50	D1+D2							16.4	1.65	2.22	3.7				3.7	0.7	24	121	4.9	0.4	COMBINED FLOW IN MH AT DP 50 PIPED TO MH AT DP 107

			DIRECT RUNOFF						TOTAL RUNOFF				STREET/CHANNEL			PIPE			TRAVEL TIME			
BASIN	DESIGN POINT	AREA DESIGN.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	CARRYOVER (cfs)	PIPE FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	Tt (min)	REMARKS
F1	52	F1	3.27	0.39	11.6	1.27	2.60	**3.3**								3.3	1.0	18	25	5.5	0.1	10' TYPE R - PIPED TO DP 53
F2	53	F2	1.00	0.48	9.8	0.48	2.77	**1.3**	11.6	1.76	2.60	4.6				4.6	1.0	24	18	5.9	0.1	5' TYPE R - COMBINED FLOW IN INLET - PIPED TO DP 55
F3	54	F3	3.38	0.32	15.0	1.07	2.29	**2.5**								2.5	1.0	18	18	5.0	0.1	10' TYPE R - PIPED TO DP 55
F1+F2+F3	55	F1+F2+F3							15.1	2.83	2.29	6.5				6.5	2.0	24	38	8.3	0.1	COMBINED FLOW IN MH AT DP 55
F4	56	F4	0.89	0.60	9.3	0.54	2.85	**1.5**								1.5	3.0	18	472	6.3	1.2	15' TYPE R - PIPED TO DP 57
F4A	57	F4A	0.48	0.06	5.0	0.03	3.50	**0.1**	10.6	0.56	2.69	1.5				1.5	2.5	18	176	5.9	0.5	MH W/ GRATED LID - COMBINED FLOW IN MH PIPED TO DP 58
F1+F2+F3+F4+F4A	58	F1+F2+F3+F4+F4A							15.2	3.40	2.29	7.8				7.8	2.0	24	241	8.6	0.5	COMBINED FLOW IN MH AT DP 58
F5	59	F5	3.10	0.37	16.9	1.13	2.19	**2.5**								2.5	1.0	18	25	5.0	0.1	10' TYPE R - PIPED TO DP 60
F6	60	F6	1.51	0.47	9.7	0.71	2.81	**2.0**	16.9	1.84	2.19	4.0				4.0	1.0	24	17	5.6	0.1	10' TYPE R - COMBINED FLOW IN INLET - PIPED TO DP 61
F1+F2+F3+F4+F4A+F5+F6	61	F1+F2+F3+F4+F4A+F5+F6							17.0	5.24	2.19	11.4				11.4	1.8	30	280	9.2	0.5	COMBINED FLOW IN MH AT DP 61
F7	62	F7	1.83	0.45	14.0	0.83	2.38	**2.0**								2.0	1.0	18	17	4.6	0.1	10' TYPE R - PIPED TO DP 63
F1 THRU F7	63	F1 THRU F7							17.5	6.06	2.14	13.0				13.0	1.0	30	175	7.7	0.4	COMBINED FLOW IN MH AT DP 63
F8	64	F8	2.89	0.40	15.4	1.14	2.28	**2.6**								2.6	1.7	18	15	5.1	0.0	10' TYPE R - PIPED TO DP 66
F9	65	F9	2.13	0.42	13.5	0.88	2.45	**2.2**								2.2	1.0	18	20	4.8	0.1	10' TYPE R - PIPED TO DP 66
F1 THRU F9	66	F1 THRU F9							17.9	8.09	2.12	17.2				17.2	1.0	36	204	7.9	0.4	COMBINED FLOW IN MH AT DP 66
F10	67	F10	1.50	0.38	9.3	0.56	2.85	**1.6**								1.6	2.0	18	18	4.5	0.1	10' TYPE R - PIPED TO DP 69
F11	68	F11	0.27	0.52	5.7	0.14	3.42	**0.5**								0.5	1.0	18	18	3.1	0.1	5' TYPE R - PIPED TO DP 69
F1 THRU F11	69	F1 THRU F11							18.3	8.79	2.09	18.4				18.4	0.6	36	105	6.9	0.3	COMBINED FLOW IN MH AT DP 69
F12	70	F12	1.70	0.45	11.8	0.77	2.58	**2.0**								2.0	1.0	18	18	4.6	0.1	10' TYPE R - PIPED TO DP 72
F13	71	F13	1.32	0.42	10.0	0.55	2.73	**1.5**								1.5	1.0	18	18	4.2	0.1	5' TYPE R - PIPED TO DP 72
F12+F13	72	F12+F13							11.9	1.32	2.58	3.4				3.4	3.0	18	41	5.3	0.1	COMBINED FLOW IN MH AT DP 72
F1 THRU F13	73	F1 THRU F13							18.6	10.11	2.08	21.0				21.0	0.9	42	382	8.4	0.8	COMBINED FLOW IN MH AT 73
F14	74	F14	1.48	0.42	15.0	0.63	2.31	**1.4**								1.4	1.0	18	18	4.2	0.1	5' TYPE R - PIPED TO DP 76
F15	75	F15	2.02	0.47	13.5	0.95	2.42	**2.3**								2.3	1.0	18	18	4.8	0.1	10' TYPE R - PIPED TO DP 76
F14+F15	76	F14+F15							15.0	1.58	2.29	3.6				3.6	0.8	24	218	4.7	0.8	COMBINED FLOW IN MH AT DP 76
F16	77	F16	1.98	0.44	10.4	0.86	2.71	**2.3**								2.3	1.0	18	18	4.8	0.1	5' TYPE R - PIPED TO DP 79
F17	78	F17	1.32	0.44	11.6	0.59	2.60	**1.5**								1.5	1.0	18	18	4.3	0.1	5' TYPE R - PIPED TO DP 79
F14+F15+F16+F17	79	F14+F15+F16+F17							15.8	3.03	2.25	6.8				6.8	0.8	30	96	5.8	0.3	COMBINED FLOW IN MH AT DP 79
F1 THRU F17	80	F1 THRU F17							19.3	13.13	2.03	26.7				26.7	1.0	42	192	7.1	0.5	COMBINED FLOW IN MH AT DP 80
F18	81	F18	0.98	0.49	9.9	0.48	2.77	**1.3**								1.3	1.0	18	18	4.1	0.1	5' TYPE R - PIPED TO DP 83

			DIRECT RUNOFF						TOTAL RUNOFF				STREET/CHANNEL			PIPE			TRAVEL TIME			
BASIN	DESIGN POINT	AREA DESIGN.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	CARRYOVER (cfs)	PIPE FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	Tt (min)	REMARKS
F19	82	F19	0.45	0.55	6.6	0.25	3.27	**0.8**								0.8	1.0	18	18	3.6	0.1	5' TYPE R - PIPED TO DP 82
F1 THRU F19	83	F1 THRU F19							19.8	13.86	2.00	27.8				27.8	1.0	42	238	7.2	0.6	COMBINED FLOW IN MH AT 83
F20	84	F20	1.30	0.42	10.5	0.54	2.69	**1.5**								1.5	1.0	18	18	4.3	0.1	10' TYPE R - PIPED TO DP 85
F1 THRU F20	85	F1 THRU F20							20.3	14.41	1.98	28.5				28.5	1.1	42	237	9.5	0.4	COMBINED FLOW IN MH AT DP 85
F23	86	F23	0.66	0.39	13.8	0.26	2.40	**0.6**								0.6	1.0	18	32	3.2	0.2	5' TYPE R - PIPED TO DP 87
F21	87	F21	0.69	0.48	8.6	0.34	2.96	**1.0**	14.0	0.59	2.38	1.4				1.4	1.0	18	27	4.3	0.1	5' TYPE R - COMBINED FLOW IN INLET - PIPED TO DP 91
F25	88	F25	0.86	0.41	11.9	0.35	2.58	**0.9**								0.9	1.0	18	35	3.8	0.2	5' TYPE R - PIPED TO DP 89
F24	89	F24	1.21	0.38	14.2	0.46	2.38	**1.1**	14.2	0.81	2.38	1.9				1.9	1.0	18	32	4.8	0.1	5' TYPE R - COMBINED FLOW IN INLET - PIPED TO DP 90
F22	90	F22	0.90	0.48	11.3	0.43	2.62	**1.1**	14.3	1.24	2.36	2.9				2.9	1.0	18	27	5.3	0.1	5' YPE R - COMBINED FLOW IN INLET - PIPED TO DP 91
F1 THRU F25	91	F1 THRU F25							20.7	16.24	1.96	31.9				31.9	1.0	42	381	9.5	0.7	COMBINED FLOW IN MH AT DP 91
F28	92	F28	2.46	0.35	15.1	0.87	2.29	**2.0**								2.0	1.0	18	18	4.8	0.1	10' TYPE R - PIPED TO DP 94
F29	93	F29	2.21	0.39	13.3	0.86	2.45	**2.1**								2.1	1.0	18	18	4.8	0.1	10' TYPE R - PIPED TO DP 94
F28+F29	94	F28+F29							15.1	1.73	2.29	4.0				4.0	0.8	24	361	5.2	1.2	COMBINED FLOW IN MH AT DP 94
F30	95	F30	2.33	0.46	12.9	1.06	2.49	**2.7**								2.7	1.0	18	18	5.0	0.1	10' TYPE R - PIPED TO DP 96
F28+F29+F30	96	F28+F29+F30							16.3	2.80	2.22	6.2				6.2	0.8	24	267	5.8	0.8	COMBINED FLOW IN MH AT DP 96
F33	97	F33	1.43	0.31	15.1	0.45	2.29	**1.0**								1.0	1.0	18	101	4.3	0.4	5' TYPE R - PIPED TO DP 98
F34	98	F34	1.51	0.44	14.1	0.66	2.38	**1.6**	15.5	1.11	2.26	2.5				2.5	0.6	18	194	4.4	0.7	5' TYPE R - COMBINED FLOW IN INLET - PIPED TO DP 99
F31	99	F31	2.70	0.42	14.3	1.15	2.36	**2.7**	16.3	2.26	2.22	5.0				5.0	0.6	24	32	5.2	0.1	15' TYPE R - COMBINED FLOW IN INLET - PIPED TO DP 101
F32	100	F32	1.96	0.41	12.4	0.79	2.53	**2.0**								2.0	1.0	18	18	4.6	0.1	10' TYPE R - PIPED TO DP 101
F28 THRU F34	101	F28 THRU F34							17.1	5.85	2.17	12.7				12.7	0.5	36	421	5.9	1.2	COMBINED FLOW IN MH AT DP 101
F26	102	F26	1.02	0.42	9.9	0.43	2.77	**1.2**	18.3	6.28	2.09	13.2				15.9	0.5	36	27	6.0	0.1	10' TYPE R - COMBINED FLOW IN INLET - PIPED TO DP 104
F27	103	F27	1.28	0.42	10.2	0.54	2.73	**1.5**								1.5	1.0	18	27	4.5	0.1	10' TYPE R - PIPED TO DP 104
F1 THRU F34	104	F1 THRU F34							21.4	23.06	1.93	44.5				44.5	0.5	60	283	8.0	0.6	COMBINED FLOW IN MH AT DP 104
F35	105	F35	0.50	0.84	5.0	0.42	3.50	**1.5**								1.5	1.0	18	146	4.2	0.6	10' TYPE R - PIPED TO DP 106
F1 THRU F35	106	F1 THRU F35							22.0	23.48	1.90	44.5				44.5	1.0	60	608	11.4	0.9	COMBINED FLOW IN MH AT DP 106 PIPED TO MH AT DP 107
F1 THRU F35+D1+D2	107	F1 THRU F35+D1+D2							22.9	25.13	1.86	46.8				46.8	1.0	60	32	10.0	0.1	COMBINED FLOW IN MH AT DP 107 PIPED TO INLET AT DP 108
D3	108	D3	0.98	0.84	8.5	0.83	3.00	**2.5**	22.9	25.96	1.86	48.3				48.3	1.0	24	66	10.1	0.1	10' TYPE R - COMBINED FLOW IN INLET AT DP 108 PIPED TO POND B

			DIRECT RUNOFF						TOTAL RUNOFF				STREET/CHANNEL			PIPE			TRAVEL TIME			
BASIN	DESIGN POINT	AREA DESIGN.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	CARRYOVER (cfs)	PIPE FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	Tt (min)	REMARKS
G1	109	G1	2.41	0.46	13.4	1.11	2.45	**2.7**								2.7	1.0	18	18	3.9	0.1	10' TYPE R - PIPED TO DP 109
G2	110	G2	1.32	0.47	15.1	0.62	2.29	**1.4**								1.4	1.0	18	18	3.3	0.1	5' TYPE R - PIPED TO DP 109
G1+G2	111	G1+G2							15.2	1.73	2.29	4.0				4.0	1.0	24	316	5.5	1.0	COMBINED FLOW IN MH AT DP 109
G3	112	G3	2.00	0.44	12.3	0.89	2.53	**2.2**								2.2	1.0	18	11	4.5	0.0	10' TYPE R - PIPED TO DP 111
G1+G2+G3	113	G1+G2+G3							16.1	2.62	2.23	5.8				5.8	1.0	24	38	6.1	0.1	COMBINED FLOW IN MH AT DP 111
G4	114	G4	0.85	0.56	8.6	0.47	2.96	**1.4**	16.2	3.09	2.23	6.9				6.9	3.0	24	150	6.3	0.4	5' TYPE R - COMBINED FLOW IN INLET - PIPED TO DP 119
OSP BASIN 424	504	OSP BASIN 424						**1.0**														OSP - FUTURE DEVELOPMENT FLOWS AT SWMM DP 504
G5	115	G5	3.06	0.21	20.6	0.65	1.96	**1.3**														DEVELOPED FLOWS TO DP 119
G6	116	G6	20.14	0.01	32.3	0.20	1.52	**0.3**	32.3	0.85	1.52	1.3										ROUTED G5+G6 FLOWS
G5+G6+OSP 424	116	G5+G6+OSP 424										2.3										TOTAL COMBINED FLOWS IN CHANNEL AT DP 115
FUT. DUAL 48" RCPS	117	FUT. DUAL 48" RCPS						**121.0**														FUTURE OSP POND 1060 FLOWS IN DUAL 48" RCPS TO ON-SITE (SWMM MODEL)
G11	118	G11	0.25	0.53	5.0	0.13	3.50	**0.5**								0.5	1.0	24	35	3.5	0.2	10' TYPE R - PIPED TO DP 118
G12	119	G12	0.15	0.69	5.0	0.10	3.50	**0.4**	5.2	0.24	3.50	0.8										TOTAL COMBINED FLOW IN INLET AT DP 118
G7	120	G7	45.18	0.63	26.8	28.55	1.70	**48.5**														DIRECT FLOWS TO DP 119
CHANNEL A SIZE	P50	CHANNEL A SIZE						**135.0**														CHANNEL A SIZED BY SWMM ANALYSIS OSP - FUTURE DEVELOPMENT FLOWS AT SWMM DP 504 (INCL. G, I, OSP BASINS)
G8	121	G8	7.10	0.03	24.7	0.23	1.78	**0.4**								0.4	3.0	24	243	4.3	0.9	
G5A	122	G5A	5.38	0.12	19.3	0.66	2.03	**1.3**								1.3	3.0	24	243	4.3	0.9	
G1 THRU G8 + G11 + G12	P50	G1 THRU G8 + G11 + G12						**135.0**														OSP - FUTURE DEVELOPMENT FLOWS AT SWMM DP 504 (INCL. G, I, OSP BASINS)
G9	123	G9	34.31	0.02	38.8	0.80	1.36	**1.1**														DIRECT FLOWS TO POND B
G10	124	G10	24.07	0.01	45.5	0.24	1.23	**0.3**														FLOWS TO POND B
I2	125	I2	1.34	0.69	7.4	0.92	3.15	**2.9**								2.9	1.0	18	101	4.5	0.4	5' TYPE R - PIPED TO DP 125
I1	126	I1	2.04	0.46	10.2	0.94	2.73	**2.6**	10.2	1.86	2.73	5.1				5.1	1.0	18	4	5.8	0.0	5' TYPE R - COMBINED FLOWS IN INLET - PIPED TO DP 126
TOTAL FLOWS IN BOX CULVERT	P50	TOTAL FLOWS IN BOX CULVERT						**135.0**														OSP - FUTURE DEVELOPMENT FLOWS AT SWMM DP 504 (INCL. G, I, OSP BASINS)
OSP BASIN 416+417+UPSTREAM FLOWS	503	OSP BASIN 416+417+UPSTREAM FLOWS						**311.0**														OSP EXISTING CONDITION (W/ FUT. IMP) FLOWS AT SWMM DP 503 - WORST CASE SCENARIO
OSP BASIN 416+417+418+ UPSTREAM FLOWS	900	OSP BASIN 416+417+418+ UPSTREAM FLOWS						**275.0**														OSP EXISTING CONDITION (W/ FUT. IMP) FLOWS AT SWMM DP 900 - WORST CASE SCENARIO
J3	133	J3	5.51	0.03	21.7	0.18	1.92	**0.3**														BASIN J3 INCLUDED IN OSP BASIN 418, DIRECT FLOWS NOT INCLUDED IN CULVERT CALCS
J1	134	J1	1.71	0.58	9.1	0.99	2.89	**2.9**								2.9	1.0	18	64	5.2	0.2	5' TYPE R - PIPED TO MH AT DP 136
J2	135	J2	1.18	0.61	8.2	0.72	3.04	**2.2**								2.2	1.0	18	25	5.2	0.1	5' TYPE R - PIPED TO MH AT DP 136
J1+J2	136	J1+J2							8.3	1.72	3.00	5.2				5.2	1.0	24	80	5.9	0.2	COMBINED FLOW IN MH AT DP 136
K1	137	K1	5.03	0.17	20.5	0.86	1.98	**1.7**				1.7				1.7	0.5	24	14	3.3	0.1	TYPE D INLET - PIPED TO DP 138
K2	138	K2	0.28	0.72	5.0	0.20	3.50	**0.7**	20.5	1.06	1.96	2.1				2.1	0.5	24	40	3.5	0.2	ROUTED K1 + K2 FLOWS 10' TYPE R - PIPED TO DP 139
K3	139	K3	0.25	0.84	5.0	0.21	3.50	**0.7**	20.7	1.27	1.96	2.5				2.5	0.5	24	100	3.6	0.5	ROUTED K1 + K2 + K3 FLOWS 10' TYPE R - PIPED TO POND C AT DP 140
K4	140	K4	0.17	0.01	5.0	0.00	3.50	**0.0**	21.2	1.27	1.94	2.5				2.5	0.5	24	100	3.6	0.5	DIRECT INFLOWS TO POND C PEAK INFLOW POND C

			DIRECT RUNOFF						TOTAL RUNOFF				STREET/CHANNEL			PIPE			TRAVEL TIME			
BASIN	DESIGN POINT	AREA DESIGN.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	CARRYOVER (cfs)	PIPE FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	Tt (min)	REMARKS
OSP BASIN 430 (DP 506)	506	OSP BASIN 430 (DP 506)						**7.0**														OSP - FUTURE DEVELOPMENT FLOWS AT SWMM DP 506
L1	142	L1	1.36	0.17	17.2	0.24	2.17	**0.5**														DIRECT FLOW AT DP 142 CHANNEL C SIZED BY SWMM ANALYSIS
L2	143	L2	0.47	0.14	8.6	0.06	2.96	**0.2**														DIRECT FLOW AT DP 143 CHANNEL C SIZED BY SWMM ANALYSIS
L3	144	L3	2.86	0.08	22.6	0.24	1.87	**0.4**														DIRECT FLOW AT DP 144 CHANNEL C SIZED BY SWMM ANALYSIS
OSP BASIN 430+431A	507A	OSP BASIN 430+431A						**7.0**														TOTAL FLOW AT SWMM DP 507A
OSP BASIN 430+431A+431B	507B	OSP BASIN 430+431A+431B						**6.0**														TOTAL FLOW AT SWMM DP 507B
OS1	146	OS1	12.50	0.03	34.3	0.38	1.47	**0.5**														DIRECT FLOW AT DP 146 CHANNEL B SIZED BY SWMM ANALYSIS
L4	147	L4	4.16	0.08	26.5	0.32	1.72	**0.6**														DIRECT FLOW AT DP 147 CHANNEL B SIZED BY SWMM ANALYSIS
OSP BASINS 430+431A+431B+432A	508A	OSP BASINS 430+431A+431B+432A						**6.0**														OSP FUTURE DEVELOPMENT FLOWS AT SWMM DP 508A
J4	148	J4	8.09	0.07	23.2	0.56	1.85	**1.0**														OFF-SITE FLOWS

RED TEXT INDICATES OSP/SWMM MODEL FLOWRATES

PROJECT: PARKDALE – PH. II DRAINAGE
SHEET TITLE: SF-3 FORM (100-YR)

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE			TRAVEL TIME			
BASIN	DESIGN POINT	AREA DESIGN.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	CARRYOVER (cfs)	PIPE FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	Tt (min)	REMARKS
										0.90		5.5	1.0	5.5					205	3.2	1.1	CARRY-OVER TO DP 7
A1	1	A1	3.58	0.67	15.0	2.40	6.13	**14.7**		1.50		9.2				9.2	1.0	18	18	6.7	0.0	FLOWS CAPTURED - PIPED TO DP 3
										0.39		2.4	1.0	2.4					164	2.7	1.0	CARRY-OVER TO DP 7
A2	2	A2	2.44	0.68	15.1	1.65	6.13	**10.1**		1.26		7.7				7.7	1.0	18	18	6.5	0.0	FLOWS CAPTURED - PIPED TO DP 3
A1+A2	3	A1+A2							15.2	2.76	6.13	16.9				16.9	0.7	24	41	6.8	0.1	COMBINED FLOWS IN MH AT DP 3
										0.65		3.9	1.0	3.9					511	2.9	2.9	CARRY-OVER TO DP 6
A3	4	A3	3.22	0.64	15.7	2.07	6.05	**12.5**		1.42		8.6				8.6	1.0	18	337	6.7	0.8	FLOWS CAPTURED - PIPED TO DP 5
A1+A2+A3	5	A1+A2+A3							16.6	4.18	5.88	24.6				24.6	0.7	24	180	7.6	0.4	COMBINED FLOWS IN MH AT DP 5
A4	6	A4	1.40	0.70	13.0	0.97	6.66	**6.5**	18.7	1.62	5.56	9.0				9.0	0.7	18	18	6.7	0.0	TOTAL FLOWS CAPTURED AT DP 6 - PIPED TO DP 8
A5	7	A5	2.32	0.72	13.9	1.66	6.42	**10.7**	16.2	3.42	5.97	20.4				10.7	0.7	24	18	8.2	0.0	TOTAL FLOWS CAPTURED AT DP 7 - PIPED TO DP 8
A1+A2+A3+A4+A5	8	A1+A2+A3+A4+A5							17.0	9.22	5.84	53.9				53.9	0.7	36	80	9.0	0.1	TOTAL FLOWS IN MH AT DP 8
A6	9	A6	1.35	0.57	16.5	0.77	5.92	**4.5**								4.5	1.0	18	195	5.8	0.6	TYPE C - PIPED TO DP 11
										0.47		3.1	0.8	3.1					130	2.6	0.8	CARRY-OVER TO DP 7
A7	10	A7	2.56	0.68	13.4	1.74	6.54	**11.4**		1.27		8.3				8.3	1.1	18	108	6.9	0.3	FLOWS CAPTURED - PIPED TO DP 11
A1+A2+A3+A4+A5+A6+A7	11	A1+A2+A3+A4+A5+A6+A7							17.1	11.26	5.80	65.3				65.3	0.7	42	18	11.7	0.0	COMBINED FLOWS IN MH AT DP 11
A8	12	A8	0.73	0.68	7.7	0.50	8.35	**4.2**	17.2	11.76	5.80	68.2				68.2	1.0	42	189	11.4	0.3	TOTAL FLOWS CAPTURED, COMBINED FLOWS IN INLET PIPED TO POND A
										0.15		1.1	2.5	1.1					461	3.7	2.1	CARRY-OVER TO DP 14
E1	13	E1	1.12	0.79	9.1	0.89	7.72	**6.8**		0.74		5.7				5.7	2.5	18	469	8.5	0.9	FLOWS CAPTURED - PIPED TO DP 17
																						TOTAL FLOW TO INLET
E2	14	E2	1.47	0.63	12.1	0.93	6.83	**6.4**	12.1	1.08	6.83	7.4										
										0.20		1.4	1.3	1.4					246	2.8	1.5	CARRY-OVER TO DP 20
										0.88		6.0				6.0	1.0	18	27	6.2	0.1	FLOWS CAPTURED - PIPED TO DP 17
										0.44		2.8	1.3	2.8					245	3.1	1.3	CARRY-OVER TO DP 21
E5	15	E5	1.45	0.67	13.5	0.98	6.48	**6.3**		0.54		3.5				3.5	1.0	18	35	5.3	0.1	FLOWS CAPTURED - PIPED TO DP 16
										0.10		0.8	1.3	0.8					244	2.6	1.6	CARRY-OVER TO DP 21
E3	16	E3	1.00	0.79	9.0	0.79	7.72	**6.1**		0.69		5.3										FLOWS CAPTURED
									13.6	1.23	6.48	7.9				7.9	1.0	18	27	6.6	0.1	COMBINED FLOW IN INLET - PIPED TO DP 17
E1+E2+E3+E5	17	E1+E2+E3+E5							13.7	2.84	6.48	18.4				18.4	1.2	24	46	6.7	0.1	COMBINED FLOWS IN MH AT DP 17
										0.57		3.2	1.7	3.2					402	3.5	1.9	CARRY-OVER TO DP 20
E4	18	E4	3.27	0.61	18.1	1.99	5.64	**11.2**		1.42		8.0				8.0	1.7	18	227	8.1	0.5	FLOWS CAPTURED - PIPED TO DP 19
E1+E2+E3+E4+E5	19	E1+E2+E3+E4+E5							18.5	4.26	5.56	23.7				23.7	1.1	24	210	8.5	0.4	COMBINED FLOWS IN MH AT DP 19
E6	20	E6	1.65	0.70	9.4	1.16	7.62	**8.8**	20.0	1.93	5.35	10.4				10.4	1.0	18	27	7.0	0.1	TOTAL FLOWS CAPTURED AT DP 20 - PIPED TO DP 22
E7	21	E7	0.86	0.75	12.1	0.65	6.83	**4.4**	14.9	1.19	6.19	7.3				7.3	1.0	18	27	6.5	0.1	TOTAL FLOWS CAPTURED AT DP 21 - PIPED TO DP 22
E1+E2+E3+E4+E5+E6+E7	22	E1+E2+E3+E4+E5+E6+E7							20.0	7.38	5.31	39.2				39.2	1.1	30	70	10.0	0.1	COMBINED FLOW IN MH AT DP 22
E8	23	E8	0.25	0.82	5.0	0.21	9.40	**1.9**								1.9	1.0	18	27	4.4	0.1	TOTAL FLOWS CAPTURED AT DP 23 - PIPED TO DP 24
E1+E2+E3+E4+E5+E6+E7+E8	24	E1+E2+E3+E4+E5+E6+E7+E8							20.1	7.59	5.31	40.3				40.3	1.1	30	464	10.0	0.8	COMBINED FLOWS IN MH AT DP 24 - PIPED TO POND A
A9	25	A9	1.22	0.52	11.1	0.63	7.07	**4.4**														DIRECT POND FLOWS
ALL A AND E BASINS	25	ALL A AND E BASINS							20.9	19.97	5.22	104.3										COMBINED STORM INFLOWS TO POND A

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE			TRAVEL TIME			
BASIN	DESIGN POINT	AREA DESIGN.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	CARRYOVER (cfs)	PIPE FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	Tt (min)	REMARKS
B1	26	B1	4.28	0.73	12.8	3.11	6.66	**20.7**		0.87 2.24		5.8 14.9	2.7	5.8		14.9	1.0	24	286 18	4.5 7.6	1.1 0.0	CARRY-OVER TO DP 33 FLOWS CAPTURED - PIPED TO DP 28
B2	27	B2	4.61	0.74	10.1	3.40	7.30	**24.9**		1.17 2.23		8.6 16.3	2.7	8.6		16.3	1.0	18	286 18	4.5 6.8	1.1 0.0	CARRY-OVER TO DP 31 FLOWS CAPTURED - PIPED TO DP 28
B1+B2	28	B1+B2							12.8	4.47	6.66	29.8				29.8	2.4	24	293	11.9	0.4	COMBINED FLOWS IN MH AT DP 28
B6	29	B6	9.27	0.59	25.9	5.47	4.63	**25.4**	25.9 INTERCEPTION CAPACITY @ 8"D	6.62	4.63	30.7 20.2	(10.5 CFS TO DP 30)			20.2	2.0	24	36	11.3	0.1	TOTAL FLOW TO INLET TOTAL FLOW CAPTURED - PIPED TO DP 30
B5	30	B5	1.05	0.80	10.5	0.84	7.19	**6.1**	MAX FLOW (6.1+10.5) 26.0	6.31	4.63	16.6 29.3	(INTERCEPTION CAP = 20.3 CFS AT 8"D)			29.3	1.6	30.0	239	11.5	0.3	TOTAL FLOW CAPTURED COMBINED FLOW IN INLET - PIPED TO DP 31
B4	31	B4	2.55	0.65	14.3	1.66	6.31	**10.4**	14.3 26.3	2.83 9.14	6.31 4.59	17.8 41.9				41.9	1.0	30	18	11.6	0.0	TOTAL FLOW CAPTURED COMBINED FLOW IN INLET - PIPED TO DP 32
B1+B2+B4+B5+B6	32	B1+B2+B4+B5+B6							26.3	13.61	4.59	62.4				62.4	1.0	36	18	10.7	0.0	COMBINED FLOW IN MH AT DP 32
B3	33	B3	1.17	0.75	9.2	0.88	7.72	**6.8**	11.2 26.4	2.05 15.66	7.07 4.59	14.5 71.8				71.8	1.4	36	223	12.7	0.3	TOTAL FLOW CAPTURED COMBINED FLOW IN INLET - PIPED TO DP 35
B9	34	B9	2.26	0.68	12.9	1.54	6.66	**10.2**								10.2	3.0	18	50	10.6	0.1	TOTAL FLOW CAPTURED - PIPED TO DP 35
B1+B2+B3+B4+B5+B6+B9	35	B1+B2+B3+B4+B5+B6+B9							26.7	17.19	4.56	78.5				78.5	0.5	42	381	9.0	0.7	COMBINED FLOW IN MH AT DP 35
B10	36	B10	1.48	0.61	14.8	0.89	6.19	**5.5**	27.4	18.09	4.49	81.3				81.3	1.0	42	37	11.7	0.1	TOTAL FLOW CAPTURED - COMBINED FLOW IN INLET PIPED TO DP 37
B11	37	B11	0.39	0.89	8.6	0.35	7.93	**2.8**	27.4	18.44	4.49	82.9				82.9	1.0	42	40	11.7	0.1	TOTAL FLOW CAPTURED - COMBINED FLOW IN INLET PIPED TO POND B
B8	38	B8	2.78	0.70	16.7	1.95	5.88	**11.4**		0.59 1.36		3.4 8.0	0.9	3.4		8.0	0.9	18	318 373	2.8 6.3	1.9 1.0	CARRY-OVER TO DP 39 FLOWS CAPTURED - PIPED TO DP 40
B7	39	B7	3.87	0.70	18.7	2.71	5.56	**15.1**	18.7	3.30 1.24 1.15 1.15	5.56	**18.3** 6.9 6.4 6.4	1.3 1.3	6.4 6.4		6.9	1.0	18	17 424 415	6.3 3.5 3.5	0.0 2.0 2.0	TOTAL FLOW TO INLET TOTAL FLOW CAPTURED - PIPED TO DP 40 CARRY-OVER TO DP 29 CARRY-OVER TO DP 41
B7+B8	40	B7+B8							18.8	2.60	5.52	14.3				14.3	1.1	24	473	7.9	1.0	COMBINED FLOW IN MH AT DP 40
C1	41	C1	2.40	0.67	13.9	1.61	6.42	**10.3**	20.7	2.90	5.25	**15.3**				15.3	1.0	24	40	7.8	0.1	TOTAL FLOW CAPTURED - PIPED TO DP 43
C2	42	C2	0.44	0.67	8.1	0.29	8.14	**2.4**								2.4	1.0	18	13	3.2	0.1	TOTAL FLOW CAPTURED - PIPED TO DP 43
B7+B8+C1+C2	43	B7+B8+C1+C2							20.8	4.51	5.22	23.5				23.5	0.7	30	128	7.6	0.3	COMBINED FLOW IN MH AT DP 43
C4	44	C4	0.40	0.89	6.7	0.36	8.77	**3.1**	12.4	0.51	6.78	3.5				3.1	1.0	18	37	5.2	0.1	TOTAL FLOW CAPTURED - PIPED TO MH AT DP 46
C3	45	C3	1.51	0.65	13.5	0.98	6.54	**6.4**		0.14 0.84		0.9 5.5				6.4	1.0	18	12	6.0	0.0	CARRY-OVER TO DP 41 FLOWS CAPTURED - PIPED OT DP 46
C3+C4	46	C3+C4							13.5	1.20	6.48	7.8				7.8	0.7	18	95	4.6	0.3	COMBINED FLOWS IN MH AT DP 46
B7+B8+C1+C2+C3+C4	47	B7+B8+C1+C2+C3+C4							21.1	5.70	5.19	29.6				29.6	0.7	30	72	9.2	0.1	COMBINED FLOWS IN MH AT DP 47 - PIPED TO POND B
D1	48	D1	4.38	0.65	16.3	2.85	5.92	**16.9**								16.9	1.0	24	18	5.5	0.1	TOTAL FLOWS CAPTURED - PIPED TO DP 50
D2	49	D2	0.25	0.72	6.1	0.18	8.98	**1.6**								1.6	1.0	18	18	2.9	0.1	TOTAL FLOWS CAPTURED - PIPED TO DP 50
D1+D2	50	D1+D2							16.4	3.03	5.92	17.9				17.9	0.7	24	121	4.9	0.4	COMBINED FLOWS IN MH AT DP 50 PIPED TO MH AT DP 107

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE			TRAVEL TIME			
BASIN	DESIGN POINT	AREA DESIGN.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	CARRYOVER (cfs)	PIPE FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	Tt (min)	REMARKS
F1	52	F1	3.27	0.67	11.6	2.18	6.95	**15.2**		0.85 1.34		5.9 9.3	1.7	5.9		9.3	1.0	18	272 25	4.0 6.7	1.1 0.1	CARRY-OVER TO DP 60 FLOWS CAPTURED - PIPED TO DP 53
F2	53	F2	1.00	0.72	9.8	0.72	7.41	**5.4**	11.6	0.30 0.42 1.76	6.95	2.3 3.1 12.2	2.0	2.3		12.2	1.5	18	272 18	3.5 8.2	1.3 0.0	CARRY-OVER TO DP 60 FLOWS CAPTURED COMBINED FLOW IN INLET - PIPED TO DP 55
F3	54	F3	3.38	0.63	15.0	2.13	6.13	**13.1**		0.70 1.44		4.3 8.8	1.7	4.3		8.8	1.0	18	735 18	3.7 6.7	3.3 0.0	CARRY-OVER TO DP 65 FLOWS CAPTURED - PIPED TO DP 55
F1+F2+F3	55	F1+F2+F3							15.1	3.89	6.13	23.8				23.8	2.0	24	38	8.3	0.1	COMBINED FLOW IN MH AT DP 55
F4	56	F4	0.89	0.78	9.3	0.69	7.62	**5.3**								5.3	3.0	18	472	9.0	0.9	TOTAL FLOWS CAPTURED - PIPED TO DP 57
F4A	57	F4A	0.48	0.47	5.0	0.23	9.40	**2.1**	10.2	0.92	7.30	6.7				6.7	2.5	18	176	9.0	0.3	TOTAL FLOWS CAPTURED - PIPED TO 58
F1+F2+F3+F4+F4A	58	F1+F2+F3+F4+F4A							15.2	4.81	6.13	29.5				29.5	2.0	24	241	11.6	0.3	COMBINED FLOWS IN MH AT DP 58
F5	59	F5	3.10	0.66	16.9	2.04	5.84	**11.9**		0.60 1.44		3.5 8.4	1.5	3.5		8.4	1.0	18	275 25	3.4 6.6	1.3 0.1	CARRY-OVER TO DP 62 FLOWS CAPTURED - PIPED TO DP 60
F6	60	F6	1.51	0.71	9.7	1.08	7.51	**8.1**	12.7 16.9	2.23 0.83 1.40 2.84	6.72 5.84	15.0 5.6 9.4 16.6				16.6	1.0	24	17	7.9	0.0	TOTAL FLOW TO INLET CARRY-OVER TO DP 62 FLOWS CAPTURED COMBINED FLOW IN INLET - PIPED TO DP 61
F1+F2+F3+F4+F4A+F5+F6	61	F1+F2+F3+F4+F4A+F5+F6							17.0	7.65	5.84	44.7				44.7	1.8	30	280	12.6	0.4	COMBINED FLOW IN MH AT DP 61
F7	62	F7	1.83	0.70	14.0	1.29	6.36	**8.2**	18.2	2.72 1.09 1.63	5.64	15.3 6.1 9.2	1.0	6.1		9.2	1.0	18	164 17	3.3 6.7	0.8 0.0	TOTAL FLOW TO INLET CARRY-OVER TO DP 64 FLOWS CAPTURED - PIPED TO DP 63
F1 THRU F7	63	F1 THRU F7							18.2	9.28	5.64	52.3				52.3	1.0	36	175	10.5	0.3	COMBINED FLOWS IN MH AT DP 63
F8	64	F8	2.89	0.67	15.4	1.94	6.09	**11.8**	19.0	3.02 1.29 1.74	5.47	16.6 7.1 9.5	1.7	7.1		9.5	1.0	18	190 15	4.2 8.0	0.8 0.0	TOTAL FLOW TO INLET CARRY-OVER TO DP 67 FLOWS CAPTURED - PIPED TO DP 66
F9	65	F9	2.13	0.68	13.5	1.44	6.54	**9.4**	18.4	2.14 0.67 1.46	5.60	12.0 3.8 8.2	1.0	3.8		8.2	1.0	18	605 20	2.9 6.6	3.4 0.1	TOTAL FLOW TO INLET CARRY-OVER TO DP 75 FLOWS CAPTURED - PIPED TO DP 66
F1 THRU F9	66	F1 THRU F9							19.1	12.48	5.47	68.3				68.3	1.0	36	204	11.8	0.3	COMBINED FLOWS IN MH AT DP 66
F10	67	F10	1.50	0.66	9.3	1.00	7.62	**7.6**	19.8	2.47	5.35	13.2				13.2	2.0	18	18	9.5	0.0	TOTAL FLOWS CAPUTURED - PIPED TO DP 69
F11	68	F11	0.27	0.74	5.7	0.20	9.19	**1.8**								1.8	1.0	18	18	4.6	0.1	TOTAL FLOWS CAPTURED - PIPED TO DP 69
F1 THRU F11	69	F1 THRU F11							19.8	15.14	5.35	81.0				81.0	0.6	42	105	10.0	0.2	COMBINED FLOWS IN MH AT DP 69
F12	70	F12	1.70	0.70	11.8	1.20	6.89	**8.2**		0.18 1.02		1.2 7.0	1.0	1.2		7.0	1.0	18	100 18	2.4 5.5	0.7 0.1	CARRY-OVER TO DP 67 FLOWS CAPTURED - PIPED TO DP 72
F13	71	F13	1.32	0.68	10.0	0.89	7.30	**6.5**		0.40 0.49		2.9 3.6	1.9	2.9		3.6	1.0	18	595 18	3.5 4.7	2.8 0.1	CARRY-OVER TO DP 92 FLOWS CAPTURED - PIPED TO DP 72
F12+F13	72	F12+F13							11.9	1.51	6.89	10.4				10.4	3.0	30	41	5.3	0.1	COMBINED FLOWS IN MH AT DP 72
F1 THRU F13	73	F1 THRU F13							20.0	16.65	5.35	89.1				89.1	0.9	42	382	8.4	0.8	COMBINED FLOWS IN MH AT DP 73
F14	74	F14	1.48	0.68	15.0	1.01	6.19	**6.2**		0.44 0.57		2.7 3.5	0.9	2.7		3.5	1.0	18	169 18	2.6 5.1	1.1 0.1	CARRY-OVER TO DP 77 FLOWS CAPTURED - PIPED TO DP 76
F15	75	F15	2.02	0.72	13.5	1.44	6.48	**9.4**	16.9	2.12 0.70 1.42	5.84	12.4 4.1 8.3	0.8	4.1		9.4 8.3	1.0 1.0	18 18	18 207 18	4.8 2.7 6.6	0.1 1.3 0.0	TOTAL FLOW TO INLET CARRY-OVER TO DP 77 FLOWS CAPTURED - PIPED TO DP 76
F14+F15	76	F14+F15							16.9	1.99	5.84	11.6				11.6	0.8	24	218	6.7	0.5	COMBINED FLOWS IN MH AT DP 76
F16	77	F16	1.98	0.69	10.4	1.37	7.25	**9.9**	18.2	2.51	5.64	14.1				14.1	1.0	24	18	7.7	0.0	TOTAL FLOWS CAPTURED -PIPED TO DP 79
F17	78	F17	1.32	0.70	11.6	0.92	6.95	**6.4**								6.4	1.0	18	18	4.3	0.1	TOTAL FLOWS CAPTURED - PIPED TO DP 79
F14+F15+F16+F17	79	F14+F15+F16+F17							18.2	5.42	5.64	30.5				30.5	0.8	30	96	8.2	0.2	COMBINED FLOWS IN MH AT DP 79
F1 THRU F17	80	F1 THRU F17							20.8	22.07	5.22	115.2				115.2	1.0	48	192	12.8	0.2	COMBINED FLOWS IN MH AT DP 80
F18	81	F18	0.98	0.72	9.9	0.71	7.41	**5.3**								5.3	1.0	18	18	6.0	0.1	TOTAL FLOWS CAPTURED - PIPED TO DP 83
F19	82	F19	0.45	0.75	6.6	0.34	8.77	**3.0**								3.0	1.0	18	18	5.2	0.1	TOTAL FLOWS CAPTURED - PIPED TO DP 83
F1 THRU F19	83	F1 THRU F19							21.0	23.11	5.19	120.0				120.0	1.0	48	238	12.9	0.3	COMBINED FLOWS IN MH AT DP 83

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE			TRAVEL TIME			
BASIN	DESIGN POINT	AREA DESIGN.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	CARRYOVER (cfs)	PIPE FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	Tt (min)	REMARKS
F20	84	F20	1.30	0.68	10.5	0.88	7.19	**6.3**								6.3	1.0	18	18	6.3	0.0	TOTAL FLOWS CAPTURED - PIPED TO DP 85
F1 THRU F20	85	F1 THRU F20							21.3	24.00	5.16	123.8				123.8	1.1	48	237	13.5	0.3	COMBINED FLOWS IN MH AT DP 85
										0.08		0.5	0.9	0.5					372	2.1	2.9	CARRY-OVER TO DP 102
F23	86	F23	0.66	0.67	13.8	0.44	6.42	**2.8**		0.36		2.3				2.3	1.0	18	32	4.8	0.1	FLOWS CAPTURED - PIPED TO DP 87
										0.18		1.5	0.9	1.5					372	2.4	2.6	CARRY-OVER TO DP 102
F21	87	F21	0.69	0.72	8.6	0.50	7.93	**4.0**		0.32		2.5										FLOWS CAPTURED
									14.0	0.67	6.42	4.3				4.3	1.0	18	27	5.7	0.1	COMBINED FLOW IN INLET - PIPED TO DP 91
										0.17		1.2	0.9	1.2					332	2.4	2.3	CARRY-OVER TO DP 103
F25	88	F25	0.86	0.67	11.9	0.58	6.89	**4.0**		0.41		2.8				2.8	1.0	18	35	5.2	0.1	FLOWS CAPTURED - PIPED TO DP 89
										0.30		1.9	0.9	1.9					372	2.5	2.5	CARRY-OVER TO DP 103
F24	89	F24	1.21	0.66	14.2	0.80	6.36	**5.1**		0.50		3.2										FLOWS CAPTURED
									14.2	0.91	6.36	5.8				5.8	1.0	18	32	6.1	0.1	COMBINED FLOW IN INLET - PIPED TO DP 90
										0.26		1.8	0.9	1.8					372	2.5	2.5	CARRY-OVER TO DP 103
F22	90	F22	0.90	0.72	11.3	0.65	7.01	**4.5**		0.39		2.7										FLOWS CAPTURED
									14.3	1.29	6.31	8.2				8.2	1.0	18	27	6.6	0.1	COMBINED FLOW IN INLET - PIPED TO DP 91
F1 THRU F25	91	F1 THRU F25							21.6	25.96	5.13	133.2				133.2	1.0	48	381	13.0	0.5	COMBINED FLOW IN MH AT DP 91
F28	92	F28	2.46	0.65	15.1	1.60	6.13	**9.8**	15.1	2.01	6.13	12.3										TOTAL FLOW TO INLET
										0.67		4.1	0.8	4.1					657	2.7	4.1	CARRY-OVER TO DP 99
										1.34		8.2				8.2	1.0	18	18	6.6	0.0	FLOWS CAPTURED - PIPED TO DP 94
										0.25		2.4	0.8	2.4					352	2.5	2.4	CARRY-OVER TO DP 95
F29	93	F29	2.21	0.67	13.3	1.48	6.54	**9.7**		0.75		7.3				7.3	1.0	18	18	6.4	0.0	FLOWS CAPTURED - PIPED TO DP 94
F28+F29	94	F28+F29							15.1	2.09	6.13	12.8				12.8	0.8	24	361	6.8	0.9	COMBINED FLOW IN MH AT DP 94
F30	95	F30	2.33	0.71	12.9	1.65	6.66	**11.0**	15.6	1.90	6.05	11.5										TOTAL FLOW TO INLET
										0.57		3.5	0.8	3.5					241	2.6	1.6	CARRY-OVER TO DP 100
										1.32		8.0				8.0	1.0	18	18	5.9	0.1	FLOWS CAPTURED - PIPED TO MH AT DP 96
F28+F29+F30	96	F28+F29+F30							15.7	3.42	6.05	20.7				20.7	0.8	24	267	7.3	0.6	COMBINED FLOWS IN MH AT DP 96
F33	97	F33	1.43	0.63	15.1	0.90	6.13	**5.5**								5.5	1.0	18	101	6.2	0.3	TOTAL FLOWS CAPTURED - PIPED TO DP 98
F34	98	F34	1.51	0.70	14.1	1.05	6.36	**6.7**	15.4	1.94	6.09	11.8				11.8	0.6	24	194	7.5	0.4	TOTAL FLOWS CAPTURED - PIPED TO DP 99
F31	99	F31	2.70	0.68	14.3	1.85	6.31	**11.6**	19.2	2.52	5.47	13.8										TOTAL FLOW CAPTURED
									19.2	4.46	5.47	24.4				24.4	0.6	30	32	7.3	0.1	COMBINED FLOWS IN INLET - PIPED TO DP 101
F32	100	F32	1.96	0.67	12.4	1.32	6.78	**9.0**	14.4	1.90	6.31	12.0				12.0	1.0	24	18	7.2	0.0	TOTAL FLOWS CAPTURED - PIPED TO DP 101
F28 THRU F34	101	F28 THRU F34							19.3	9.77	5.43	53.1				53.1	0.5	36	421	9.0	0.8	COMBINED FLOWS IN MH AT DP 101
F26	102	F26	1.02	0.68	9.9	0.70	7.41	**5.2**	16.7	0.96	5.88	5.7										TOTAL FLOWS CAPTURED
									20.1	10.74	5.31	57.0				57.0	0.5	42	27	8.3	0.1	COMBINED FLOW IN INLET - PIPED TO DP 104
F27	103	F27	1.28	0.68	10.2	0.87	7.30	**6.4**	16.7	1.60	5.88	9.4				6.4	1.0	18	27	8.3	0.1	TOTAL FLOWS CAPTURED - PIPED TO DP 104
F1 THRU F34	104	F1 THRU F34							22.1	38.30	5.07	194.2				194.2	1.0	54	283	13.9	0.3	COMBINED FLOW IN MH AT DP 104
F35	105	F35	0.50	0.89	5.0	0.45	9.40	**4.2**								4.2	1.0	18	146	4.2	0.6	TOTAL FLOWS CAPTURED - PIPED TO DP 106
F1 THRU F35	106	F1 THRU F35							22.4	38.75	5.04	195.3				195.3	1.0	60	608	14.5	0.7	COMBINED FLOWS IN MH AT DP 106 - PIPED TO POND B
F1 THRU F35 + D1+D2	107	F1 THRU F35 + D1+D2							23.1	41.78	4.95	206.7				206.7	1.0	60	32	14.7	0.0	COMBINED FLOWS IN MH AT DP 106 - PIPED TO POND B
										0.15		1.2	0.9	1.2					551	2.3	3.9	CARRY-OVER TO DP 44
D3	108	D3	0.98	0.89	8.5	0.88	8.04	**7.0**		0.72		5.8										FLOWS CAPTURED
									23.2	42.50	4.95	210.3				210.3	0.6	60	66	11.7	0.1	COMBINED FLOW IN INLET - PIPED TO POND B

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE			TRAVEL TIME			
BASIN	DESIGN POINT	AREA DESIGN.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	CARRYOVER (cfs)	PIPE FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	Tt (min)	REMARKS
G1	109	G1	2.41	0.71	13.4	1.71	6.54	**11.2**		0.51 1.21		3.3 7.9	0.9	3.3		7.9	1.0	18	293 18	2.7 6.5	1.8 0.0	CARRY-OVER TO DP 110 FLOWS CAPTURED - PIPED TO DP 109
G2	110	G2	1.32	0.72	15.1	0.94	6.13	**5.8**		0.40 0.54		2.5 3.3	0.9	2.5		3.3	1.0	18	327 18	2.5 5.2	2.1 0.1	CARRY-OVER TO DP 112 FLOWS CAPTURED - PIPED TO DP 109
G1+G2	111	G1+G2							15.1	1.75	6.13	10.7				10.7	1.0	18	316	6.7	0.8	COMBINED FLOW IN MH AT DP 109
G3	112	G3	2.00	0.70	12.3	1.39	6.78	**9.4**	15.2	1.90	6.13	11.6				11.6	1.0	18	11	6.8	0.0	TOTAL FLOWS CAPTURED - PIPED TO DP 111
G1+G2+G3	113	G1+G2+G3							15.2	3.65	6.13	22.4				22.4	1.0	24	38	8.2	0.1	COMBINED FLOW IN MH AT DP 111
G4	114	G4	0.85	0.75	8.6	0.64	7.93	**5.1**	17.2 17.2	1.04 4.69	5.80 5.80	6.0 27.2				27.2	3.0	24	150	13.3	0.2	TOTAL FLOWS CAPTURED COMBINED FLOW IN INLET - PIPED TO DP 119
OSP BASIN 424	504	OSP BASIN 424						**86.0**														OSP - FUTURE DEVELOPMENT FLOWS
G5	115	G5	3.06	0.58	20.6	1.76	5.25	**9.3**														DEVELOPED FLOWS TO DP 119
G6	116	G6	20.14	0.44	32.3	8.86	4.07	**36.0**	32.3	10.62	4.07	43.2										ROUTED G5+G6 FLOWS
G5+G6+OSP 424	116	G5+G6+OSP 424										129.2	0.6	129.2					200	4.4	0.8	TOTAL COMBINED FLOWS IN CHANNEL AT DP 115
FUT DUAL 48" RCPS	117	FUT DUAL 48" RCPS						**222.0**														FUTURE OSP POND 1060 FLOWS IN DUAL 48" RCPS TO ON SITE (SWMM MODEL)
G11	118	G11	0.25	0.74	5.0	0.19	9.40	**1.8**								1.8	1.0	24	35	5.2	0.1	TOTAL FLOWS CAPTURED IN INLET - PIPED TO DP 118
G12	119	G12	0.15	0.82	5.0	0.12	9.40	**1.1**	5.1	0.31	9.40	2.9										TOTAL COMBINED FLOWS IN CHANNEL AT DP 118
G7	120	G7	45.18	0.80	26.8	35.96	4.54	**163.3**														DIRECT FLOWS TO DP 119 CHANNEL A SIZED BY SWMM ANALYSIS
CHANNEL A SIZE	P50	CHANNEL A SIZE						**534.0**														OSP - FUTURE DEVELOPMENT FLOWS AT SWMM DP 504 (INCL. G, I, OSP BASINS)
G8	121	G8	7.10	0.45	24.7	3.21	4.77	**15.3**								0.6	3.0	24	243	8.2	0.5	TOTAL FLOW TO INLET - PIPED TO DP 121
G5A	122	G5A	5.38	0.52	19.3	2.78	5.43	**15.1**														DIRECT BASIN FLOW
G1 THRU G8 + G11 + G12	P50	G1 THRU G8 + G11 + G12						**534.0**														OSP - FUTURE DEVELOPMENT FLOWS AT SWMM DP 504 (INCL. G, I, OSP BASINS)
G9	123	G9	34.31	0.45	38.8	15.32	3.63	**55.6**														DIRECT FLOWS TO POND B
G10	124	G10	24.07	0.44	45.5	10.59	3.28	**34.7**														FLOWS TO POND B
I2	125	I2	1.34	0.82	7.4	1.10	8.46	**9.3**								9.3	1.0	18	101	6.2	0.3	TOTAL FLOW CAPTURED - PIPED TO DP 125
I1	126	I1	2.04	0.71	10.2	1.45	7.30	**10.6**	10.2	2.55	7.30	18.6				18.6	1.0	24	4	7.9	0.0	TOTAL FLOW CAPTURED - COMBINED FLOW IN INLET PIPED TO DP 126
TOTAL FLOWS IN BOX CULVERT	P50	TOTAL FLOWS IN BOX CULVERT						**534.0**														OSP - FUTURE DEVELOPMENT FLOWS AT SWMM DP 504 (INCL. G, I, OSP BASINS)
OSP BASIN 416+417+UPSTREAM FLOWS	503	OSP BASIN 416+417+UPSTREAM FLOWS						**1514.0**														OSP EXISTING CONDITION (W/ FUT. IMP) FLOWS AT SWMM DP 503 - WORST CASE SCENARIO
OSP BASIN 416+417+418+ UPSTREAM FLOWS	900	OSP BASIN 416+417+418+ UPSTREAM FLOWS						**1536.0**														OSP EXISTING CONDITION (W/ FUT. IMP) FLOWS AT SWMM DP 900 - WORST CASE SCENARIO
J3	133	J3	5.51	0.45	21.7	2.49	5.13	**12.8**														BASIN J3 INCLUDED IN OSP BASIN 418, DIRECT FLOWS NOT INCLUDED IN CULVERT CALCS
J1	134	J1	1.71	0.77	9.1	1.32	7.72	**10.2**								10.2	1.0	18	64	6.6	0.2	5' TYPE R - PIPED TO MH AT DP 136
J2	135	J2	1.18	0.79	8.2	0.93	8.14	**7.6**								7.6	1.0	18	25	6.7	0.1	5' TYPE R - PIPED TO MH AT DP 136
J1+J2	136	J1+J2							8.3	2.24	8.04	18.0				18.0	1.0	24	80	8.1	0.2	COMBINED FLOW IN MH AT DP 136

			DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE			TRAVEL TIME			
BASIN	DESIGN POINT	AREA DESIGN.	AREA (Acres)	RUNOFF COEFF	Tc (min)	C A (Acres)	I (in/hour)	Q (cfs)	Tc (min)	(C A) (Acres)	I (in/hour)	Q (cfs)	SLOPE (%)	STREET FLOW (cfs)	CARRYOVER (cfs)	PIPE FLOW (cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	Tt (min)	REMARKS
K1	137	K1	5.03	0.54	20.5	2.72	5.28	**14.3**				14.3				14.3	0.5	24	14	9.1	0.0	TYPE D INLET - PIPED TO DP 138
K2	138	K2	0.28	0.83	5.0	0.23	9.40	**2.2**	20.5	2.95	5.28	15.6				15.6	0.5	24	40	9.1	0.1	ROUTED K1 + K2 FLOWS 10' TYPE R - PIPED TO DP 139
K3	139	K3	0.25	0.89	5.0	0.22	9.40	**2.1**	20.6	3.17	5.25	16.7				16.7	0.5	24	100	9.2	0.2	ROUTED K1 + K2 + K3 FLOWS 10' TYPE R - PIPED TO POND C AT DP 140
K4	140	K4	0.17	0.44	5.0	0.08	9.40	**0.7**	20.7	3.25	5.25	17.1				17.1	0.5	24	100	9.2	0.2	DIRECT INFLOWS TO POND C PEAK INFLOW POND C
OSP BASIN 430 (DP 506)	506	OSP BASIN 430 (DP 506)						**158.0**														OSP - FUTURE DEVELOPMENT FLOWS AT SWMM DP 506
L1	142	L1	1.36	0.54	17.2	0.74	5.80	**4.3**														DIRECT FLOW AT DP 142 CHANNEL C SIZED BY SWMM ANALYSIS
L2	143	L2	0.47	0.52	8.6	0.24	7.93	**1.9**														DIRECT FLOW AT DP 143 CHANNEL C SIZED BY SWMM ANALYSIS
L3	144	L3	2.86	0.49	22.6	1.41	5.01	**7.1**														DIRECT FLOW AT DP 144 CHANNEL C SIZED BY SWMM ANALYSIS
OSP BASIN 430+431A	507A	OSP BASIN 430+431A						**161.0**														TOTAL FLOW AT SWMM DP 507A
OSP BASIN 430+431A+431B	507B	OSP BASIN 430+431A+431B						**242.0**														TOTAL FLOW AT SWMM DP 507B
OS1	146	OS1	12.50	0.45	34.3	5.63	3.92	**22.0**														DIRECT FLOW AT DP 146 CHANNEL B SIZED BY SWMM ANALYSIS
L4	147	L4	4.16	0.49	26.5	2.03	4.59	**9.3**														DIRECT FLOW AT DP 147 CHANNEL B SIZED BY SWMM ANALYSIS
OSP BASINS 430+431A+431B+432A	508A	OSP BASINS 430+431A+431B+432A						**256.0**														OSP FUTURE DEVELOPMENT FLOWS AT SWMM DP 508A
J4	148	J4	8.09	0.48	23.2	3.87	4.95	**19.2**														OFF-SITE FLOWS

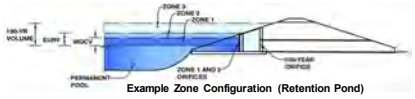
RED TEXT INDICATES OSP/SWMM MODEL FLOWRATES

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: PARKDALE

Basin ID: POND A



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	29.89	acres
Watershed Length =	2,137	ft
Watershed Slope =	0.018	ft/ft
Watershed Imperviousness =	52.13%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Erie	
Water Quality Capture Volume (WQCV) =	0.528	acre-feet
Excess Urban Runoff Volume (EURV) =	1.671	acre-feet
2-yr Runoff Volume (P1 = 1.01 in.) =	1.148	acre-feet
5-yr Runoff Volume (P1 = 1.43 in.) =	1.756	acre-feet
10-yr Runoff Volume (P1 = 1.73 in.) =	2.442	acre-feet
25-yr Runoff Volume (P1 = 1.84 in.) =	3.126	acre-feet
50-yr Runoff Volume (P1 = 2.4 in.) =	4.315	acre-feet
100-yr Runoff Volume (P1 = 2.7 in.) =	5.244	acre-feet
500-yr Runoff Volume (P1 = 3.89 in.) =	8.228	acre-feet
Approximate 2-yr Detention Volume =	1.075	acre-feet
Approximate 5-yr Detention Volume =	1.649	acre-feet
Approximate 10-yr Detention Volume =	2.251	acre-feet
Approximate 25-yr Detention Volume =	2.285	acre-feet
Approximate 50-yr Detention Volume =	2.768	acre-feet
Approximate 100-yr Detention Volume =	3.088	acre-feet

Optional User Override 1-hr Precipitation	
1.01	inches
1.43	inches
1.73	inches
	inches
2.40	inches
2.70	inches
	inches

Stage-Storage Calculation

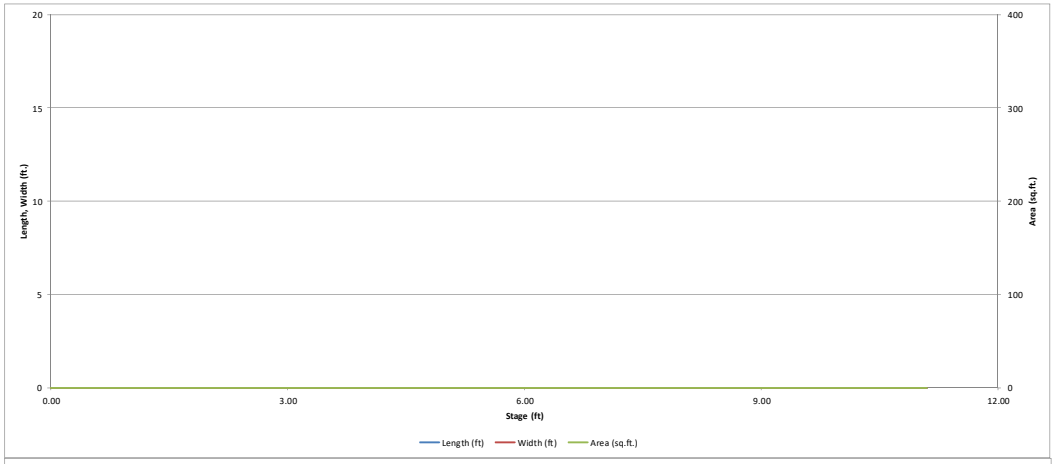
Zone 1 Volume (WQCV) =	0.528	acre-feet
Zone 2 Volume (10-year - Zone 1) =	1.722	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.837	acre-feet
Total Detention Basin Volume =	3.088	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

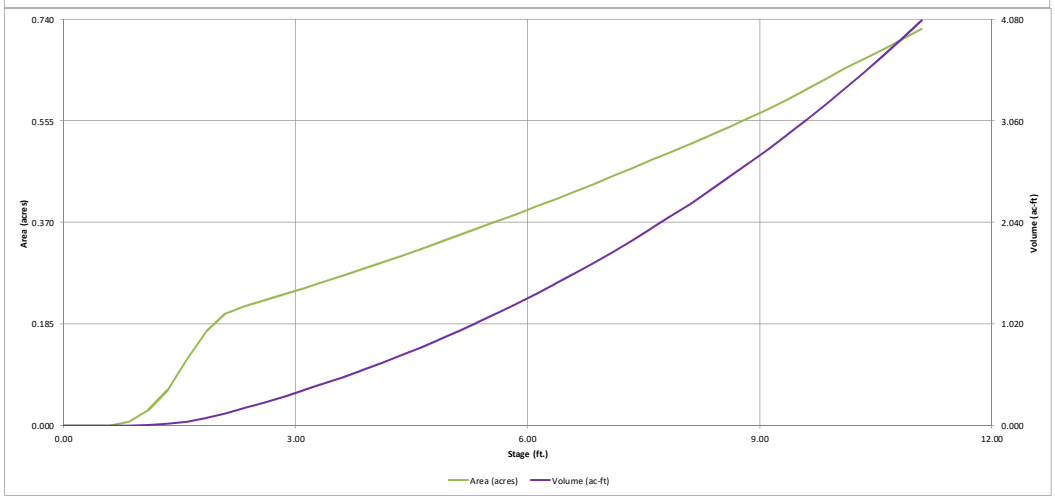
Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
5139.5	--	0.60	--	--	--	21	0.000	6	0.000
5139.75	--	0.85	--	--	--	289	0.007	42	0.001
5140	--	1.10	--	--	--	1,221	0.028	222	0.005
5140.25	--	1.35	--	--	--	2,817	0.065	710	0.016
5140.5	--	1.60	--	--	--	5,285	0.121	1,699	0.039
5140.75	--	1.85	--	--	--	7,456	0.171	3,270	0.075
5141	--	2.10	--	--	--	8,899	0.204	5,388	0.124
5141.25	--	2.35	--	--	--	9,496	0.218	7,687	0.176
5141.5	--	2.60	--	--	--	9,947	0.228	10,118	0.232
5141.75	--	2.85	--	--	--	10,404	0.239	12,662	0.291
5142	--	3.10	--	--	--	10,868	0.249	15,321	0.352
5142.25	--	3.35	--	--	--	11,357	0.261	18,099	0.415
5142.5	--	3.60	--	--	--	11,856	0.272	21,000	0.482
5142.75	--	3.85	--	--	--	12,364	0.284	24,028	0.552
5143	--	4.10	--	--	--	12,884	0.296	27,184	0.624
5143.25	--	4.35	--	--	--	13,415	0.308	30,471	0.700
5143.5	--	4.60	--	--	--	13,954	0.320	33,892	0.778
5143.75	--	4.85	--	--	--	14,503	0.333	37,449	0.860
5144	--	5.10	--	--	--	15,063	0.346	41,145	0.945
5144.25	--	5.35	--	--	--	15,616	0.358	44,980	1.033
5144.5	--	5.60	--	--	--	16,178	0.371	48,954	1.124
5144.75	--	5.85	--	--	--	16,748	0.384	53,070	1.218
5145	--	6.10	--	--	--	17,326	0.398	57,329	1.316
5145.25	--	6.35	--	--	--	17,922	0.411	61,735	1.417
5145.5	--	6.60	--	--	--	18,527	0.425	66,291	1.522
5145.75	--	6.85	--	--	--	19,140	0.439	71,000	1.630
5146	--	7.10	--	--	--	19,762	0.454	75,863	1.742
5146.25	--	7.35	--	--	--	20,390	0.468	80,882	1.857
5146.5	--	7.60	--	--	--	21,028	0.483	86,059	1.976
5146.75	--	7.85	--	--	--	21,675	0.498	91,397	2.098
5147	--	8.10	--	--	--	22,333	0.513	96,898	2.224
5147.25	--	8.35	--	--	--	22,993	0.528	102,564	2.355
5147.5	--	8.60	--	--	--	23,662	0.543	108,395	2.488
5147.75	--	8.85	--	--	--	24,342	0.559	114,396	2.626
5148	--	9.10	--	--	--	25,033	0.575	120,568	2.768
5148.25	--	9.35	--	--	--	25,830	0.593	126,926	2.914
5148.5	--	9.60	--	--	--	26,641	0.612	133,485	3.064
5148.75	--	9.85	--	--	--	27,463	0.630	140,248	3.220
5149	--	10.10	--	--	--	28,296	0.650	147,217	3.380
5149.25	--	10.35	--	--	--	29,066	0.667	154,388	3.544
5149.5	--	10.60	--	--	--	29,850	0.685	161,752	3.713
5149.75	--	10.85	--	--	--	30,648	0.704	169,314	3.887
5150	--	11.10	--	--	--	31,458	0.722	177,078	4.065

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



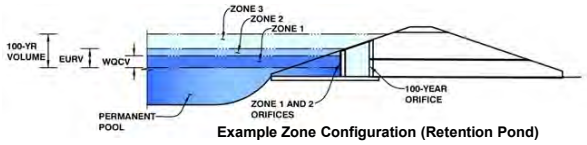


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: PARKDALE

Basin ID: POND A



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.77	0.528	Orifice Plate
Zone 2 (10-year)	8.16	1.722	Rectangular Orifice
Zone 3 (100-year)	9.64	0.837	Weir&Pipe (Restrict)
		3.088	Total

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.056E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.77	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	13.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	1.52	sq. inches (diameter = 1-3/8 inches)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.10	2.20					
Orifice Area (sq. inches)	1.52	1.52	1.52					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	4.00	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	8.16	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	8.00	N/A	inches
Vertical Orifice Width =	8.00		inches

Calculated Parameters for Vertical Orifice

	Zone 2 Rectangular	Not Selected	
Vertical Orifice Area =	0.44	N/A	ft^2
Vertical Orifice Centroid =	0.33	N/A	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	8.20	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	5.67	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	2.92	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	8.20	N/A	feet
Over Flow Weir Slope Length =	2.92	N/A	feet
Grate Open Area / 100-yr Orifice Area =	6.33	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	11.60	N/A	ft^2
Overflow Grate Open Area w/ Debris =	5.80	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.60	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	30.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	12.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	1.83	N/A	ft^2
Outlet Orifice Centroid =	0.58	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.37	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal) D

Spillway Invert Stage=	9.81	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	60.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	0.00	feet

Calculated Parameters for Spillway

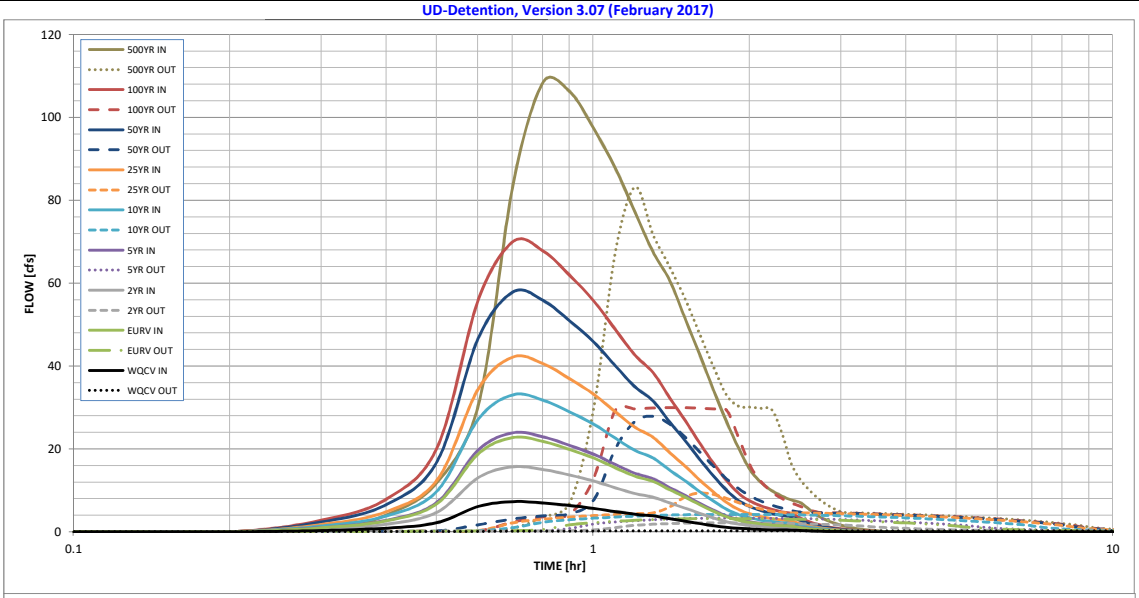
Spillway Design Flow Depth=	0.52	feet
Stage at Top of Freeboard =	10.33	feet
Basin Area at Top of Freeboard =	0.67	acres

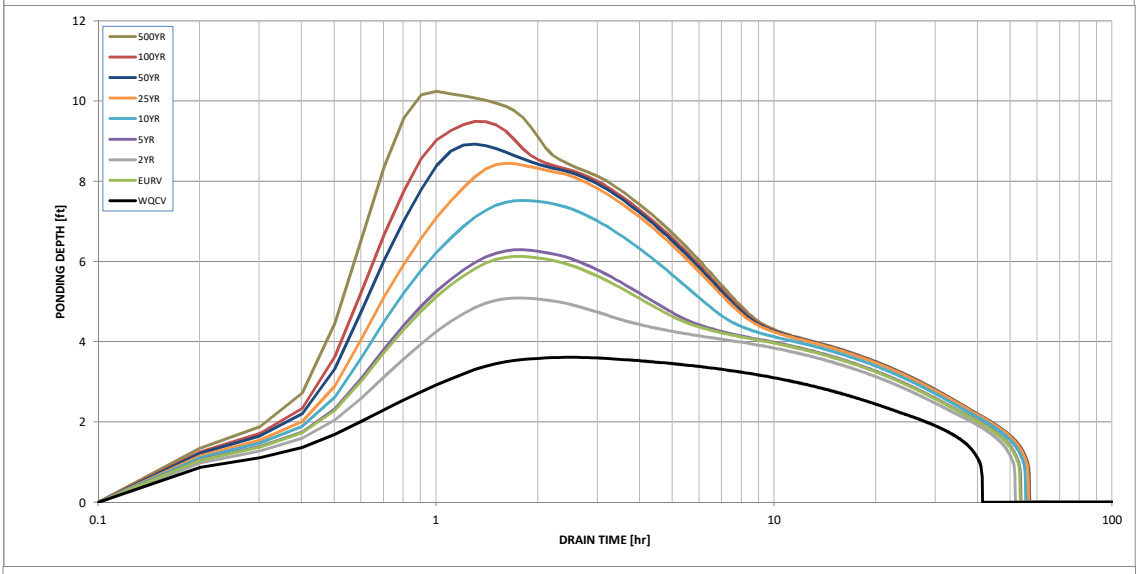
Routed Hydrograph Results

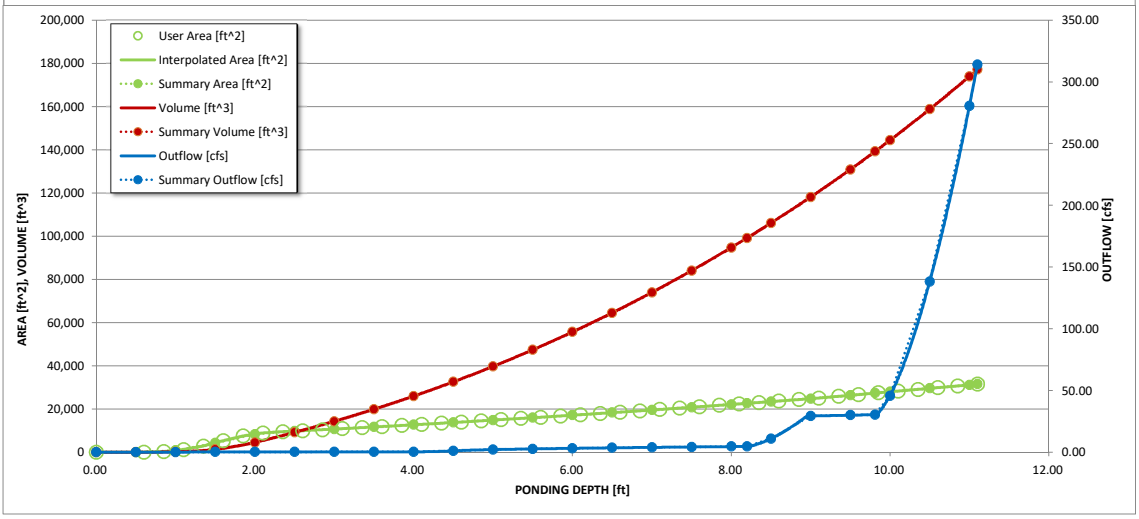
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.01	1.43	1.73	1.84	2.40	2.70	3.89
Calculated Runoff Volume (acre-ft) =	0.528	1.671	1.148	1.756	2.442	3.126	4.315	5.244	8.228
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.528	1.671	1.148	1.756	2.441	3.126	4.315	5.242	8.220
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.15	0.49	0.79	1.07	1.84
Predevelopment Peak Q (cfs) =	0.0	0.0	0.2	0.5	4.5	14.6	23.5	32.0	54.9
Peak Inflow Q (cfs) =	7.3	22.8	15.7	23.9	33.1	42.2	57.9	70.1	108.6
Peak Outflow Q (cfs) =	0.2	3.2	2.2	3.3	4.2	9.4	27.9	29.9	83.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	7.1	0.9	0.6	1.2	0.9	1.5
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.4	2.0	2.1	2.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	46	46	46	46	45	41	39	32
Time to Drain 99% of Inflow Volume (hours) =	**40**	50	49	51	51	52	50	49	46
Maximum Ponding Depth (ft) =	3.61	6.13	5.09	6.29	7.53	8.45	8.92	9.49	10.24
Area at Maximum Ponding Depth (acres) =	0.27	0.40	0.35	0.41	0.48	0.53	0.56	0.60	0.66
Maximum Volume Stored (acre-ft) =	0.485	1.324	0.941	1.393	1.937	2.402	2.665	2.992	3.471

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename:

Storm Inflow Hydrographs **UD-Detention, Version 3.07 (February 2017)**

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
6.03 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:06:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:12:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:18:05	0.32	0.98	0.69	1.03	1.41	1.78	2.40	2.84	4.14
0.829	0:24:07	0.87	2.68	1.86	2.81	3.87	4.91	6.67	7.99	11.98
	0:30:09	2.24	6.88	4.78	7.22	9.94	12.62	17.12	20.51	30.77
	0:36:11	6.16	18.89	13.12	19.83	27.27	34.62	46.94	56.19	84.18
	0:42:13	7.29	22.75	15.71	23.90	33.07	42.21	57.92	70.08	108.62
	0:48:14	6.95	21.78	15.01	22.88	31.70	40.49	55.76	67.69	106.11
	0:54:16	6.33	19.82	13.67	20.82	28.85	36.85	50.80	61.77	97.24
	1:00:18	5.64	17.78	12.24	18.68	25.93	33.16	45.77	55.67	87.71
	1:06:20	4.87	15.44	10.61	16.23	22.58	28.94	40.05	48.78	77.12
	1:12:22	4.24	13.41	9.23	14.10	19.65	25.22	34.97	42.63	67.50
	1:18:23	3.84	12.17	8.36	12.79	17.80	22.81	31.56	38.41	60.59
	1:24:25	3.16	10.13	6.94	10.65	14.86	19.07	26.46	32.28	51.26
	1:30:27	2.58	8.34	5.70	8.77	12.27	15.78	21.93	26.78	42.61
	1:36:29	1.98	6.52	4.43	6.87	9.65	12.45	17.39	21.30	34.13
	1:42:31	1.47	4.95	3.34	5.22	7.38	9.57	13.44	16.50	26.59
	1:48:32	1.07	3.63	2.42	3.83	5.45	7.11	10.04	12.38	20.09
	1:54:34	0.83	2.76	1.86	2.91	4.13	5.36	7.53	9.25	14.90
	2:00:36	0.68	2.25	1.52	2.37	3.35	4.33	6.05	7.41	11.85
	2:06:38	0.58	1.90	1.29	2.01	2.82	3.65	5.09	6.23	9.94
	2:12:40	0.51	1.67	1.13	1.75	2.46	3.18	4.43	5.41	8.61
	2:18:41	0.46	1.50	1.02	1.57	2.21	2.84	3.96	4.83	7.67
	2:24:43	0.42	1.37	0.93	1.45	2.03	2.61	3.62	4.42	7.00
	2:30:45	0.31	1.01	0.69	1.07	1.50	1.93	2.70	3.32	5.34
	2:36:47	0.23	0.74	0.50	0.78	1.09	1.40	1.96	2.40	3.85
	2:42:49	0.17	0.54	0.37	0.57	0.80	1.04	1.45	1.78	2.86
	2:48:50	0.12	0.40	0.27	0.42	0.60	0.77	1.08	1.32	2.12
	2:54:52	0.09	0.29	0.20	0.31	0.43	0.56	0.79	0.97	1.57
	3:00:54	0.06	0.21	0.14	0.22	0.31	0.40	0.57	0.70	1.13
	3:06:56	0.04	0.15	0.10	0.16	0.22	0.29	0.41	0.51	0.82
	3:12:58	0.03	0.10	0.07	0.11	0.15	0.20	0.29	0.36	0.58
	3:18:59	0.02	0.06	0.04	0.07	0.10	0.13	0.19	0.23	0.38
	3:25:01	0.01	0.03	0.02	0.04	0.05	0.07	0.11	0.13	0.23
	3:31:03	0.00	0.01	0.01	0.01	0.02	0.03	0.05	0.06	0.11
	3:37:05	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.03
	3:43:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:49:08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:01:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:07:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:13:16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:19:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:31:21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:37:23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:43:25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:49:26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:01:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:07:32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:13:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:19:35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:31:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:37:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:43:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:49:44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:01:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:07:50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:13:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:19:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:25:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:31:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:37:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:44:01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:50:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:56:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:02:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:08:08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:14:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
	0.00	0	0.000	0	0.000	0.00
	0.50	17	0.000	4	0.000	0.04
	1.00	811	0.019	122	0.003	0.05
	1.50	4,199	0.096	1,230	0.028	0.09
	2.00	8,264	0.190	4,444	0.102	0.12
	2.50	9,766	0.224	9,132	0.210	0.17
	3.00	10,682	0.245	14,243	0.327	0.20
	3.50	11,657	0.268	19,825	0.455	0.23
	4.00	12,676	0.291	25,906	0.595	0.26
	4.50	13,738	0.315	32,508	0.746	1.01
	5.00	14,839	0.341	39,650	0.910	2.05
	5.50	15,953	0.366	47,348	1.087	2.63
	6.00	17,095	0.392	55,608	1.277	3.10
	6.50	18,285	0.420	64,451	1.480	3.50
	7.00	19,513	0.448	73,899	1.696	3.86
	7.50	20,773	0.477	83,969	1.928	4.19
	8.00	22,070	0.507	94,678	2.173	4.50
	8.20	22,597	0.519	99,144	2.276	4.61
	8.50	23,394	0.537	106,043	2.434	10.87
	9.00	24,757	0.568	118,078	2.711	29.30
	9.50	26,317	0.604	130,837	3.004	29.96
	9.81	27,331	0.627	139,152	3.194	30.36
	10.00	27,962	0.642	144,404	3.315	45.66
	10.50	29,537	0.678	158,783	3.645	138.20
	11.00	31,134	0.715	173,948	3.993	280.35
	11.10	31,458	0.722	177,078	4.065	313.85

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Weir Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Apr 17 2018

POND A SPILLWAY SIZING (2 x 100-YR)

Trapezoidal Weir

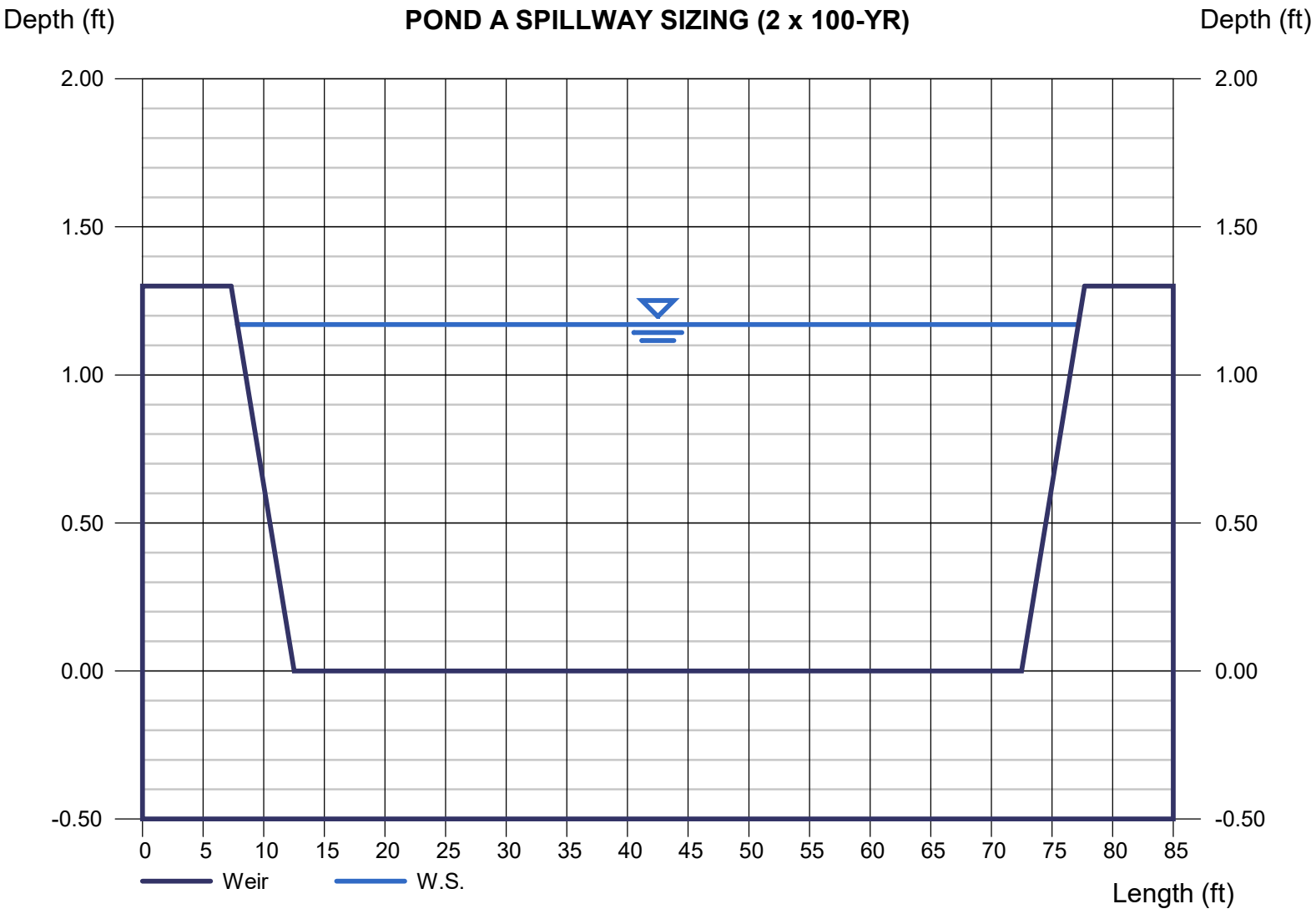
Crest	= Sharp
Bottom Length (ft)	= 60.00
Total Depth (ft)	= 1.30
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 2.60
Compute by:	Known Q
Known Q (cfs)	= 209.00

Highlighted

Depth (ft)	= 1.17
Q (cfs)	= 209.00
Area (sqft)	= 75.68
Velocity (ft/s)	= 2.76
Top Width (ft)	= 69.36

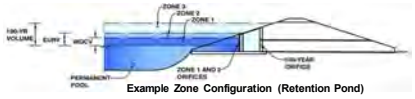


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: PARKDALE

Basin ID: POND B - INTERIM CONDITION (WITHOUT REGIONAL DETENTION POND 1060)



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	344.08	acres
Watershed Length =	8,436	ft
Watershed Slope =	0.014	ft/ft
Watershed Imperviousness =	34.59%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	88.9%	percent
Percentage Hydrologic Soil Groups C/D =	11.1%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Erie	
Water Quality Capture Volume (WQCV) =	4.733	acre-feet
Excess Urban Runoff Volume (EURV) =	12.197	acre-feet
2-yr Runoff Volume (P1 = 0.98 in.) =	7.954	acre-feet
5-yr Runoff Volume (P1 = 1.48 in.) =	13.626	acre-feet
10-yr Runoff Volume (P1 = 1.71 in.) =	19.702	acre-feet
25-yr Runoff Volume (P1 = 2.06 in.) =	32.738	acre-feet
50-yr Runoff Volume (P1 = 2.4 in.) =	42.208	acre-feet
100-yr Runoff Volume (P1 = 2.68 in.) =	52.880	acre-feet
500-yr Runoff Volume (P1 = 3.39 in.) =	75.601	acre-feet
Approximate 2-yr Detention Volume =	7.432	acre-feet
Approximate 5-yr Detention Volume =	12.797	acre-feet
Approximate 10-yr Detention Volume =	17.499	acre-feet
Approximate 25-yr Detention Volume =	20.932	acre-feet
Approximate 50-yr Detention Volume =	22.779	acre-feet
Approximate 100-yr Detention Volume =	26.534	acre-feet

Optional User Override 1-hr Precipitation

0.98	inches
1.48	inches
1.71	inches
2.06	inches
2.40	inches
2.68	inches
3.39	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	4.733	acre-feet
Zone 2 Volume (EURV - Zone 1) =	7.463	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	12.197	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

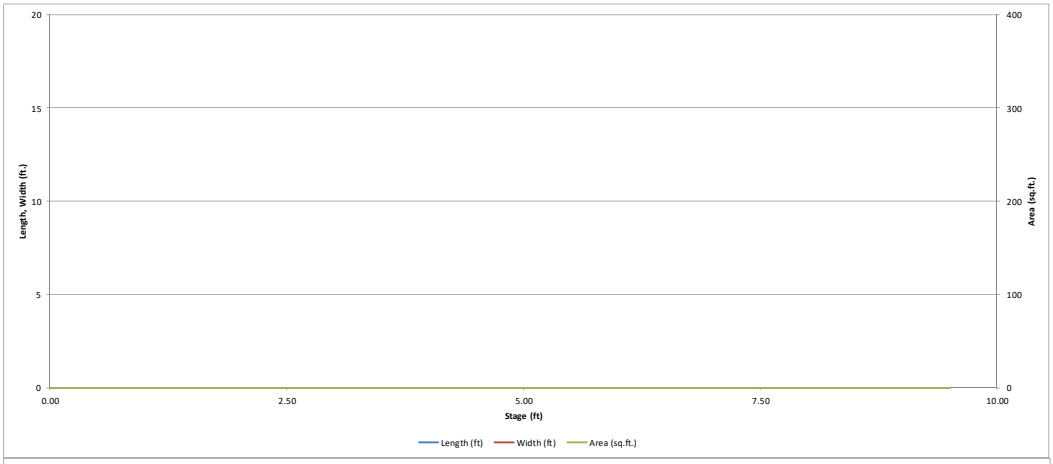
Total detention volume is less than 100-year volume.

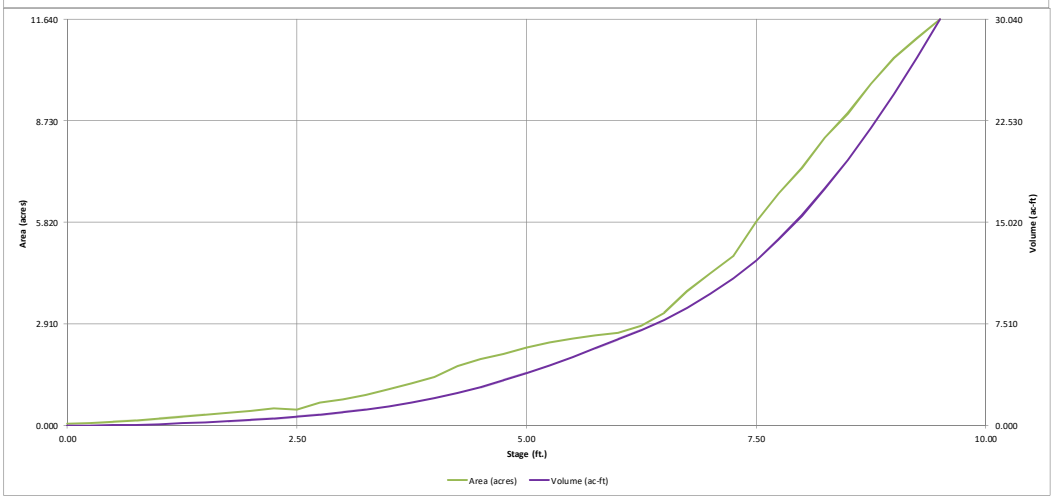
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	2,346	0.054		
5091.75	--	0.25	--	--	--	2,888	0.066	625	0.014
5092	--	0.50	--	--	--	4,776	0.110	1,565	0.036
5092.25	--	0.75	--	--	--	6,541	0.150	2,962	0.068
5092.5	--	1.00	--	--	--	8,509	0.195	4,823	0.111
5092.75	--	1.25	--	--	--	11,003	0.253	7,238	0.166
5093	--	1.50	--	--	--	13,608	0.312	10,288	0.236
5093.25	--	1.75	--	--	--	15,991	0.367	13,964	0.321
5093.5	--	2.00	--	--	--	18,439	0.423	18,243	0.419
5093.75	--	2.25	--	--	--	21,195	0.487	23,381	0.537
5094	--	2.50	--	--	--	20,101	0.461	28,543	0.655
5094.25	--	2.75	--	--	--	28,514	0.655	34,620	0.795
5094.5	--	3.00	--	--	--	32,692	0.751	42,271	0.970
5094.75	--	3.25	--	--	--	38,453	0.883	51,164	1.175
5095	--	3.50	--	--	--	45,484	1.044	61,656	1.415
5095.25	--	3.75	--	--	--	52,958	1.216	73,961	1.698
5095.5	--	4.00	--	--	--	60,254	1.383	88,113	2.023
5095.75	--	4.25	--	--	--	74,049	1.700	104,901	2.408
5096	--	4.50	--	--	--	82,590	1.896	124,480	2.858
5096.25	--	4.75	--	--	--	89,709	2.059	146,018	3.352
5096.5	--	5.00	--	--	--	97,028	2.227	169,360	3.888
5096.75	--	5.25	--	--	--	103,932	2.386	194,480	4.465
5097	--	5.50	--	--	--	108,508	2.491	221,035	5.074
5097.25	--	5.75	--	--	--	112,372	2.580	248,645	5.708
5097.5	--	6.00	--	--	--	115,602	2.654	277,142	6.362
5097.75	--	6.25	--	--	--	124,548	2.859	307,160	7.051
5098	--	6.50	--	--	--	140,231	3.219	340,258	7.811
5098.25	--	6.75	--	--	--	167,682	3.849	378,747	8.695
5098.5	--	7.00	--	--	--	189,540	4.351	423,400	9.720
5098.75	--	7.25	--	--	--	211,512	4.856	473,531	10.871
5099	--	7.50	--	--	--	254,854	5.851	531,827	12.209
5099.25	--	7.75	--	--	--	289,829	6.654	599,912	13.772
5099.5	--	8.00	--	--	--	320,925	7.367	676,256	15.525
5099.75	--	8.25	--	--	--	358,664	8.234	761,205	17.475
5100	--	8.50	--	--	--	389,439	8.940	854,717	19.622
5100.25	--	8.75	--	--	--	426,194	9.784	956,672	21.962
5100.5	--	9.00	--	--	--	457,925	10.513	1,067,186	24.499
5100.75	--	9.25	--	--	--	482,692	11.081	1,184,764	27.198
5101	--	9.50	--	--	--	506,269	11.622	1,308,384	30.036

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



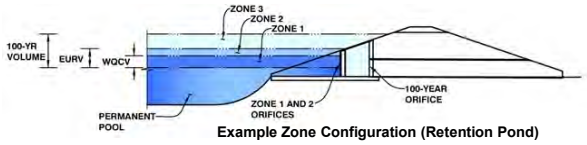


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: PARKDALE

Basin ID: POND B - INTERIM CONDITION (WITHOUT REGIONAL DETENTION POND 1060)



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	5.37	4.733	Orifice Plate
Zone 2 (EURV)	7.50	7.463	Orifice Plate
Zone 3			Not Utilized
		12.197	Total

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	7.59	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	15.50	sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row =	1.076E-01	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.50	5.00					
Orifice Area (sq. inches)	15.50	15.50	15.50					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	N/A	N/A	feet
Overflow Weir Slope =	N/A	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	N/A	N/A	feet
Overflow Grate Open Area % =	N/A	N/A	%, grate open area/total area
Debris Clogging % =	N/A	N/A	%

Calculated Parameters for Overflow Weir

	Not Selected	Not Selected	
Height of Grate Upper Edge, H_t =	N/A	N/A	feet
Over Flow Weir Slope Length =	N/A	N/A	feet
Grate Open Area / 100-yr Orifice Area =	N/A	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	N/A	N/A	ft^2
Overflow Grate Open Area w/ Debris =	N/A	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	N/A	N/A	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected	
Outlet Orifice Area =	N/A	N/A	ft^2
Outlet Orifice Centroid =	N/A	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	7.90	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	190.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

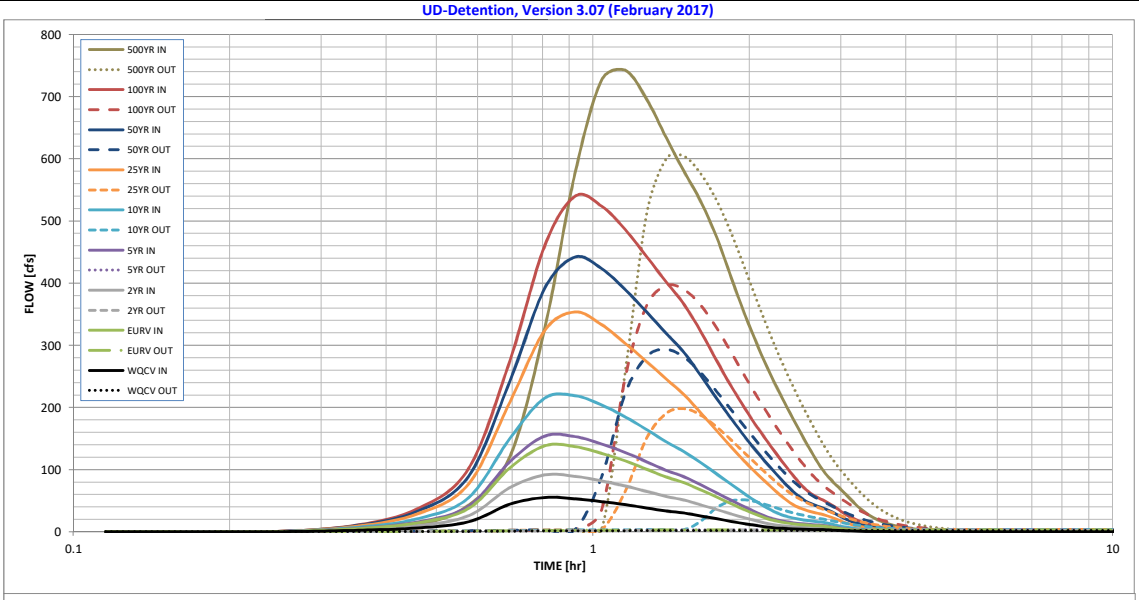
Spillway Design Flow Depth=	0.95	feet
Stage at Top of Freeboard =	9.85	feet
Basin Area at Top of Freeboard =	11.62	acres

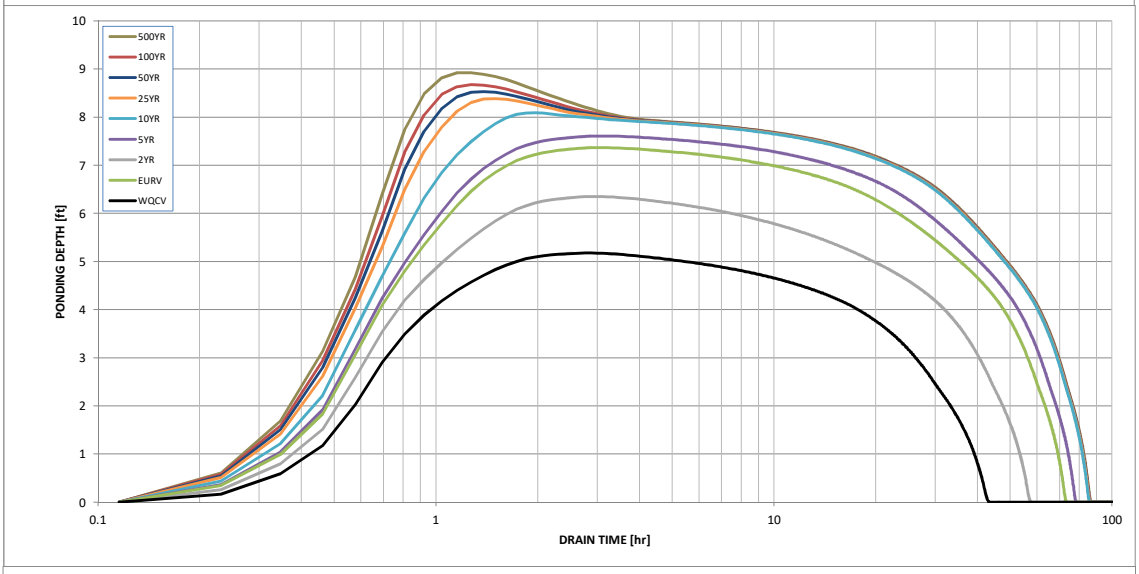
Routed Hydrograph Results

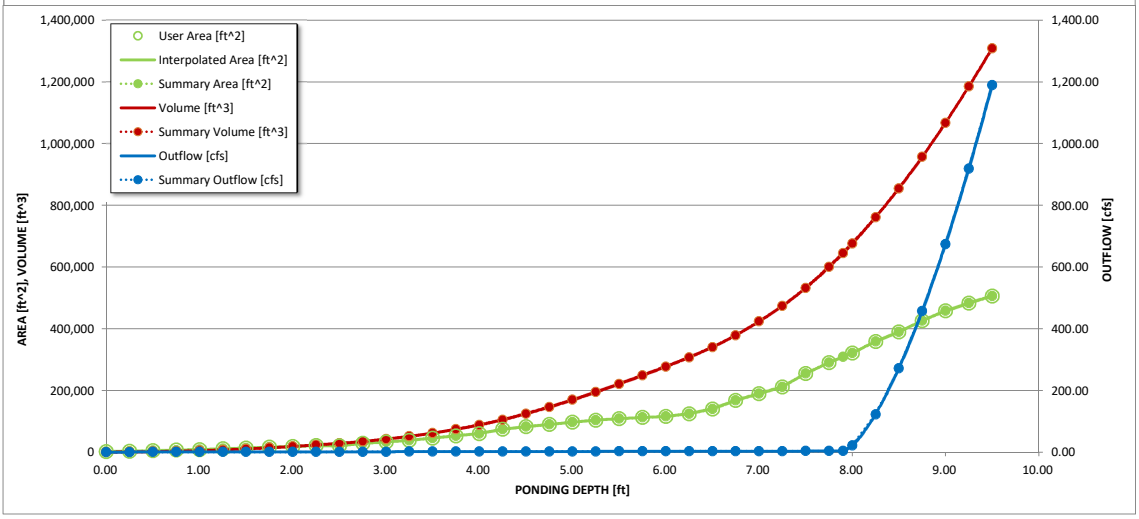
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	0.98	1.48	1.71	2.06	2.40	2.68	3.39
Calculated Runoff Volume (acre-ft) =	4.733	12.197	7.954	13.626	19.702	32.738	42.208	52.880	75.601
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	4.730	12.186	7.944	13.615	19.680	32.708	42.178	52.843	75.469
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.13	0.48	0.68	0.92	1.39
Predevelopment Peak Q (cfs) =	0.0	0.0	2.3	7.2	46.2	163.6	233.8	317.3	478.3
Peak Inflow Q (cfs) =	55.1	138.4	91.4	153.9	218.9	353.6	441.9	539.6	742.4
Peak Outflow Q (cfs) =	2.2	3.3	2.9	3.4	51.3	197.9	293.3	396.2	603.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	1.1	1.2	1.3	1.2	1.3
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	64	51	69	73	69	67	64	60
Time to Drain 99% of Inflow Volume (hours) =	**41**	69	54	74	80	78	77	75	72
Maximum Ponding Depth (ft) =	5.18	7.37	6.35	7.61	8.09	8.39	8.53	8.67	8.92
Area at Maximum Ponding Depth (acres) =	2.34	5.29	3.00	6.17	7.68	8.60	9.04	9.51	10.28
Maximum Volume Stored (acre-ft) =	4.276	11.429	7.345	12.810	16.202	18.569	19.891	21.190	23.668

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename:

Storm Inflow Hydrographs **UD-Detention, Version 3.07 (February 2017)**

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
6.93 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:06:56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:13:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:20:47	2.26	4.87	3.50	5.28	6.68	8.41	9.26	9.98	10.77
0.721	0:27:43	6.32	14.67	10.11	16.12	21.41	29.28	33.70	37.74	43.16
	0:34:39	16.23	37.72	25.98	41.44	55.25	77.31	90.03	102.51	121.25
	0:41:35	44.47	102.96	71.07	113.05	150.34	208.97	242.88	275.92	327.43
	0:48:31	55.14	138.37	91.44	153.93	215.08	323.92	391.67	460.47	576.09
	0:55:26	53.16	137.03	89.23	153.15	218.92	353.57	441.88	539.59	726.35
	1:02:22	48.47	126.17	81.74	141.22	203.98	333.39	423.46	523.85	742.38
	1:09:18	43.67	113.91	73.73	127.52	184.73	302.94	389.45	485.99	695.49
	1:16:14	38.24	100.46	64.81	112.57	164.23	273.52	353.14	442.21	633.25
	1:23:10	33.40	88.02	56.72	98.65	144.61	245.22	318.85	401.53	578.57
	1:30:05	30.12	78.70	50.93	88.09	128.39	219.74	287.65	364.74	529.85
	1:37:01	25.28	67.04	43.06	75.20	110.66	190.42	250.11	320.89	473.43
	1:43:57	20.97	55.82	35.79	62.65	92.91	162.41	214.34	274.85	408.38
	1:50:53	16.65	44.98	28.65	50.58	76.11	136.20	181.70	233.74	348.80
	1:57:49	12.88	35.20	22.32	39.63	60.55	112.51	152.47	198.16	298.03
	2:04:44	9.64	26.74	16.85	30.18	47.16	91.79	126.74	166.59	254.15
	2:11:40	7.22	19.72	12.50	22.30	35.57	73.36	104.01	139.14	216.65
	2:18:36	5.79	15.58	9.95	17.56	27.26	57.06	83.41	114.08	182.81
	2:25:32	4.87	13.03	8.34	14.65	22.39	43.98	65.36	91.43	151.75
	2:32:28	4.23	11.25	7.23	12.64	19.14	36.33	51.93	72.11	123.42
	2:39:23	3.78	10.01	6.44	11.23	16.89	31.38	43.74	59.10	99.14
	2:46:19	3.46	9.12	5.89	10.23	15.28	27.90	38.42	51.00	81.81
	2:53:15	2.59	7.08	4.48	7.98	12.19	22.95	31.89	42.57	68.03
	3:00:11	1.87	5.09	3.23	5.75	8.85	17.24	24.38	33.05	54.08
	3:07:07	1.39	3.78	2.40	4.26	6.52	12.53	17.97	24.58	41.00
	3:14:02	1.03	2.81	1.78	3.16	4.85	9.24	13.28	18.30	30.70
	3:20:58	0.76	2.08	1.31	2.34	3.61	7.03	9.93	13.60	22.93
	3:27:54	0.54	1.51	0.95	1.70	2.65	5.27	7.54	10.32	17.21
	3:34:50	0.39	1.09	0.69	1.23	1.93	3.95	5.67	7.82	13.03
	3:41:46	0.28	0.78	0.49	0.88	1.42	2.95	4.28	5.94	9.93
	3:48:41	0.18	0.52	0.32	0.59	0.98	2.20	3.28	4.55	7.61
	3:55:37	0.10	0.31	0.19	0.36	0.63	1.56	2.42	3.46	5.94
	4:02:33	0.05	0.16	0.09	0.18	0.35	1.03	1.70	2.51	4.54
	4:09:29	0.01	0.05	0.03	0.06	0.16	0.61	1.10	1.72	3.32
	4:16:25	0.00	0.00	0.00	0.00	0.04	0.30	0.63	1.08	2.29
	4:23:20	0.00	0.00	0.00	0.00	0.00	0.09	0.29	0.59	1.45
	4:30:16	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.24	0.80
	4:37:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.35
	4:44:08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
	4:51:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:57:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:04:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:11:51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:18:47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:32:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:39:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:46:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:53:26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:07:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:14:13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:21:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:28:05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:35:01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:41:56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:48:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:55:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:02:44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:09:40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:16:35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:23:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:30:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:37:23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:44:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:51:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:58:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:05:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:12:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:18:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
5091.5	0.00	2,346	0.054	0	0.000	0.00
5091.75	0.25	2,866	0.066	625	0.014	0.25
5092	0.50	4,700	0.108	1,565	0.036	0.36
5092.25	0.75	6,470	0.149	2,962	0.068	0.45
5092.5	1.00	8,430	0.194	4,823	0.111	0.52
5092.75	1.25	10,903	0.250	7,238	0.166	0.58
5093	1.50	13,504	0.310	10,288	0.236	0.63
5093.25	1.75	15,896	0.365	13,964	0.321	0.68
5093.5	2.00	18,341	0.421	18,243	0.419	0.73
5093.75	2.25	21,195	0.487	23,381	0.537	0.78
5094	2.50	20,101	0.461	28,543	0.655	0.82
5094.25	2.75	28,514	0.655	34,620	0.795	1.12
5094.50	3.00	32,692	0.751	42,271	0.970	1.26
5094.75	3.25	38,453	0.883	51,164	1.175	1.38
5095	3.50	45,484	1.044	61,656	1.415	1.49
5095.25	3.75	52,958	1.216	73,961	1.698	1.58
5095.50	4.00	60,254	1.383	88,113	2.023	1.67
5095.75	4.25	74,049	1.700	104,901	2.408	1.75
5096	4.50	82,590	1.896	124,480	2.858	1.83
5096.25	4.75	89,709	2.059	146,018	3.352	1.91
5096.50	5.00	97,028	2.227	169,360	3.888	1.98
5096.75	5.25	103,932	2.386	194,480	4.465	2.31
5097	5.50	108,508	2.491	221,035	5.074	2.48
5097.25	5.75	112,372	2.580	248,645	5.708	2.63
5097.5	6.00	115,602	2.654	277,142	6.362	2.76
5097.75	6.25	124,548	2.859	307,160	7.051	2.88
5098	6.50	140,231	3.219	340,258	7.811	2.99
5098.25	6.75	167,682	3.849	378,747	8.695	3.10
5098.50	7.00	189,540	4.351	423,400	9.720	3.20
5098.75	7.25	211,512	4.856	473,531	10.871	3.30
5099	7.50	254,854	5.851	531,827	12.209	3.40
5099.25	7.75	289,829	6.654	599,912	13.772	3.49
5099.40	7.90	308,487	7.082	644,786	14.802	3.54
5099.50	8.00	320,925	7.367	676,256	15.525	21.63
5099.75	8.25	358,664	8.234	761,205	17.475	122.39
5100	8.50	389,439	8.940	854,717	19.622	271.34
5100.25	8.75	426,194	9.784	956,672	21.962	456.91
5100.50	9.00	457,925	10.513	1,067,186	24.499	673.70
5100.75	9.25	482,692	11.081	1,184,764	27.198	918.40
5101	9.50	506,269	11.622	1,308,384	30.036	1,188.75

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

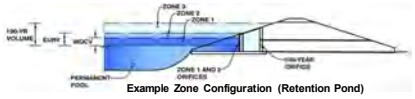
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: PARKDALE

Basin ID: POND B - ULTIMATE CONDITION (W/ REGIONAL DETENTION POND 1060 IN PLACE)



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB		
Watershed Area =	947.00	acres	
Watershed Length =	16,000	ft	
Watershed Slope =	0.014	ft/ft	
Watershed Imperviousness =	42.46%	percent	
Percentage Hydrologic Soil Group A =	0.0%	percent	
Percentage Hydrologic Soil Group B =	66.8%	percent	
Percentage Hydrologic Soil Groups C/D =	33.2%	percent	
Desired WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	Erie		
Water Quality Capture Volume (WQCV) =	14.703	acre-feet	Optional User Override 1-hr Precipitation
Excess Urban Runoff Volume (EURV) =	40.805	acre-feet	
2-yr Runoff Volume (P1 = 0.98 in.) =	28.097	acre-feet	0.98 inches
5-yr Runoff Volume (P1 = 1.48 in.) =	48.303	acre-feet	1.48 inches
10-yr Runoff Volume (P1 = 1.71 in.) =	65.730	acre-feet	1.71 inches
25-yr Runoff Volume (P1 = 2.06 in.) =	100.967	acre-feet	2.06 inches
50-yr Runoff Volume (P1 = 2.4 in.) =	127.449	acre-feet	2.40 inches
100-yr Runoff Volume (P1 = 2.68 in.) =	156.538	acre-feet	2.68 inches
500-yr Runoff Volume (P1 = 3.39 in.) =	219.078	acre-feet	3.39 inches
Approximate 2-yr Detention Volume =	26.295	acre-feet	
Approximate 5-yr Detention Volume =	45.424	acre-feet	
Approximate 10-yr Detention Volume =	57.642	acre-feet	
Approximate 25-yr Detention Volume =	67.172	acre-feet	
Approximate 50-yr Detention Volume =	72.730	acre-feet	
Approximate 100-yr Detention Volume =	83.163	acre-feet	

Stage-Storage Calculation

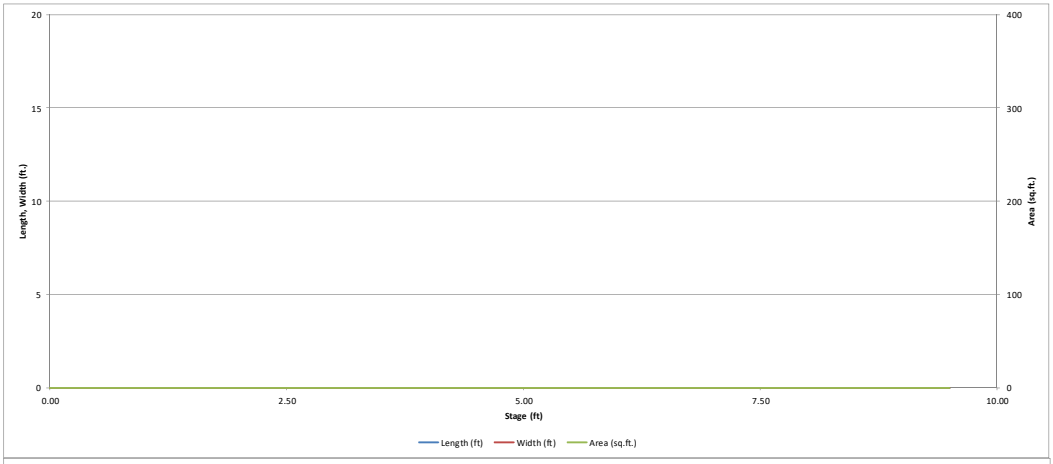
Zone 1 Volume (WQCV) =	14.703	acre-feet	
Select Zone 2 Storage Volume (Optional) =		acre-feet	Total detention volume is less than 100-year volume.
Select Zone 3 Storage Volume (Optional) =		acre-feet	
Total Detention Basin Volume =	14.703	acre-feet	
Initial Surcharge Volume (ISV) =	user	ft^3	
Initial Surcharge Depth (ISD) =	user	ft	
Total Available Detention Depth (H_{total}) =	user	ft	
Depth of Trickle Channel (H_{TC}) =	user	ft	
Slope of Trickle Channel (S_{TC}) =	user	ft/ft	
Slopes of Main Basin Sides (S_{main}) =	user	H:V	
Basin Length-to-Width Ratio ($R_{L/W}$) =	user		
Initial Surcharge Area (A_{ISV}) =	user	ft^2	
Surcharge Volume Length (L_{ISV}) =	user	ft	
Surcharge Volume Width (W_{ISV}) =	user	ft	
Depth of Basin Floor (H_{FLOOR}) =	user	ft	
Length of Basin Floor (L_{FLOOR}) =	user	ft	
Width of Basin Floor (W_{FLOOR}) =	user	ft	
Area of Basin Floor (A_{FLOOR}) =	user	ft^2	
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3	
Depth of Main Basin (H_{MAIN}) =	user	ft	
Length of Main Basin (L_{MAIN}) =	user	ft	
Width of Main Basin (W_{MAIN}) =	user	ft	
Area of Main Basin (A_{MAIN}) =	user	ft^2	
Volume of Main Basin (V_{MAIN}) =	user	ft^3	
Calculated Total Basin Volume (V_{total}) =	user	acre-feet	

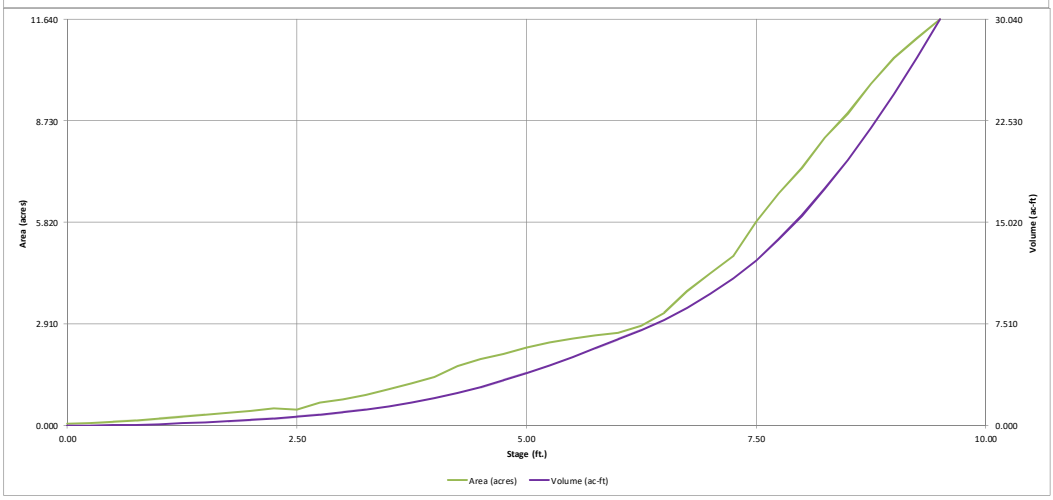
Depth Increment = 0.1 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	2,346	0.054		
5091.75	--	0.25	--	--	--	2,888	0.066	625	0.014
5092	--	0.50	--	--	--	4,776	0.110	1,565	0.036
5092.25	--	0.75	--	--	--	6,541	0.150	2,962	0.068
5092.5	--	1.00	--	--	--	8,509	0.195	4,823	0.111
5092.75	--	1.25	--	--	--	11,003	0.253	7,238	0.166
5093	--	1.50	--	--	--	13,608	0.312	10,288	0.236
5093.25	--	1.75	--	--	--	15,991	0.367	13,964	0.321
5093.5	--	2.00	--	--	--	18,439	0.423	18,243	0.419
5093.75	--	2.25	--	--	--	21,195	0.487	23,381	0.537
5094	--	2.50	--	--	--	20,101	0.461	28,543	0.655
5094.25	--	2.75	--	--	--	28,514	0.655	34,620	0.795
5094.5	--	3.00	--	--	--	32,692	0.751	42,271	0.970
5094.75	--	3.25	--	--	--	38,453	0.883	51,164	1.175
5095	--	3.50	--	--	--	45,484	1.044	61,656	1.415
5095.25	--	3.75	--	--	--	52,958	1.216	73,961	1.698
5095.5	--	4.00	--	--	--	60,254	1.383	88,113	2.023
5095.75	--	4.25	--	--	--	74,049	1.700	104,901	2.408
5096	--	4.50	--	--	--	82,590	1.896	124,480	2.858
5096.25	--	4.75	--	--	--	89,709	2.059	146,018	3.352
5096.5	--	5.00	--	--	--	97,028	2.227	169,360	3.888
5096.75	--	5.25	--	--	--	103,932	2.386	194,480	4.465
5097	--	5.50	--	--	--	108,508	2.491	221,035	5.074
5097.25	--	5.75	--	--	--	112,372	2.580	248,645	5.708
5097.5	--	6.00	--	--	--	115,602	2.654	277,142	6.362
5097.75	--	6.25	--	--	--	124,548	2.859	307,160	7.051
5098	--	6.50	--	--	--	140,231	3.219	340,258	7.811
5098.25	--	6.75	--	--	--	167,682	3.849	378,747	8.695
5098.5	--	7.00	--	--	--	189,540	4.351	423,400	9.720
5098.75	--	7.25	--	--	--	211,512	4.856	473,531	10.871
5099	--	7.50	--	--	--	254,854	5.851	531,827	12.209
5099.25	--	7.75	--	--	--	289,829	6.654	599,912	13.772
5099.5	--	8.00	--	--	--	320,925	7.367	676,256	15.525
5099.75	--	8.25	--	--	--	358,664	8.234	761,205	17.475
5100	--	8.50	--	--	--	389,439	8.940	854,717	19.622
5100.25	--	8.75	--	--	--	426,194	9.784	956,672	21.962
5100.5	--	9.00	--	--	--	457,925	10.513	1,067,186	24.499
5100.75	--	9.25	--	--	--	482,692	11.081	1,184,764	27.198
5101	--	9.50	--	--	--	506,269	11.622	1,308,384	30.036

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



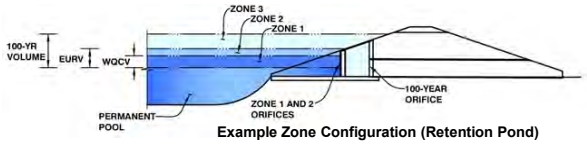


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: PARKDALE

Basin ID: POND B - ULTIMATE CONDITION (W/ POND 1060)



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	7.89	14.703	Orifice Plate
Zone 2			Not Utilized
Zone 3			Not Utilized
		14.703	Total

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	7.89	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	14.00	sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row =	9.722E-02	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.00	2.00	3.00	4.00	5.00	6.00	
Orifice Area (sq. inches)	14.00	14.00	14.00	14.00	14.00	14.00	14.00	

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	N/A	N/A	feet
Overflow Weir Slope =	N/A	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	N/A	N/A	feet
Overflow Grate Open Area % =	N/A	N/A	%, grate open area/total area
Debris Clogging % =	N/A	N/A	%

Calculated Parameters for Overflow Weir

	Not Selected	Not Selected	
Height of Grate Upper Edge, H_t =	N/A	N/A	feet
Over Flow Weir Slope Length =	N/A	N/A	feet
Grate Open Area / 100-yr Orifice Area =	N/A	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	N/A	N/A	ft^2
Overflow Grate Open Area w/ Debris =	N/A	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	N/A	N/A	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected	
Outlet Orifice Area =	N/A	N/A	ft^2
Outlet Orifice Centroid =	N/A	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	7.90	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	190.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

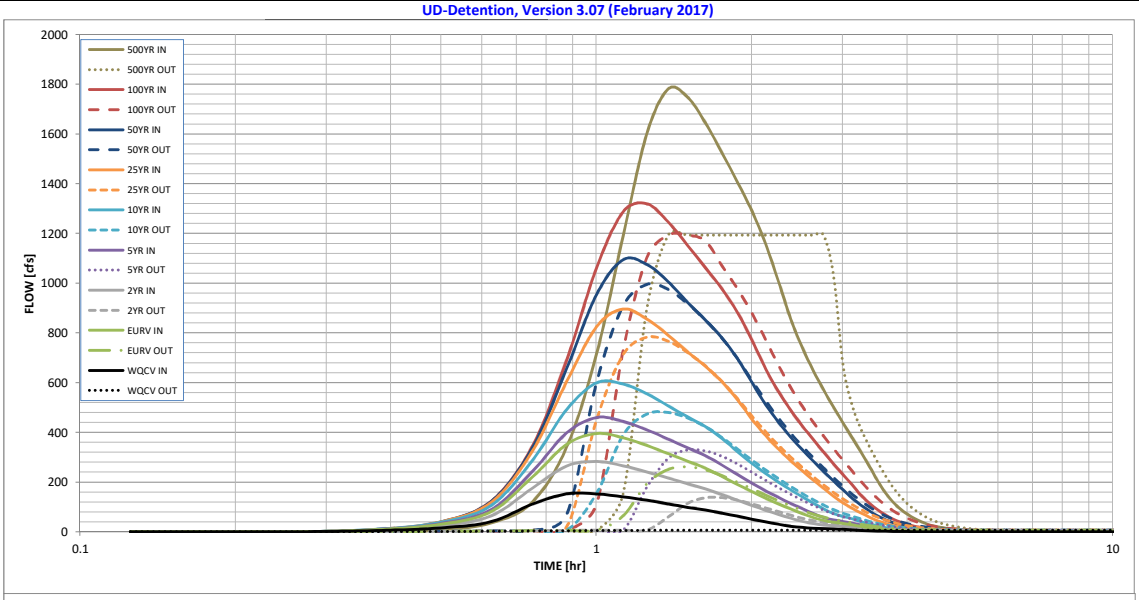
Spillway Design Flow Depth=	1.71	feet
Stage at Top of Freeboard =	10.61	feet
Basin Area at Top of Freeboard =	11.62	acres

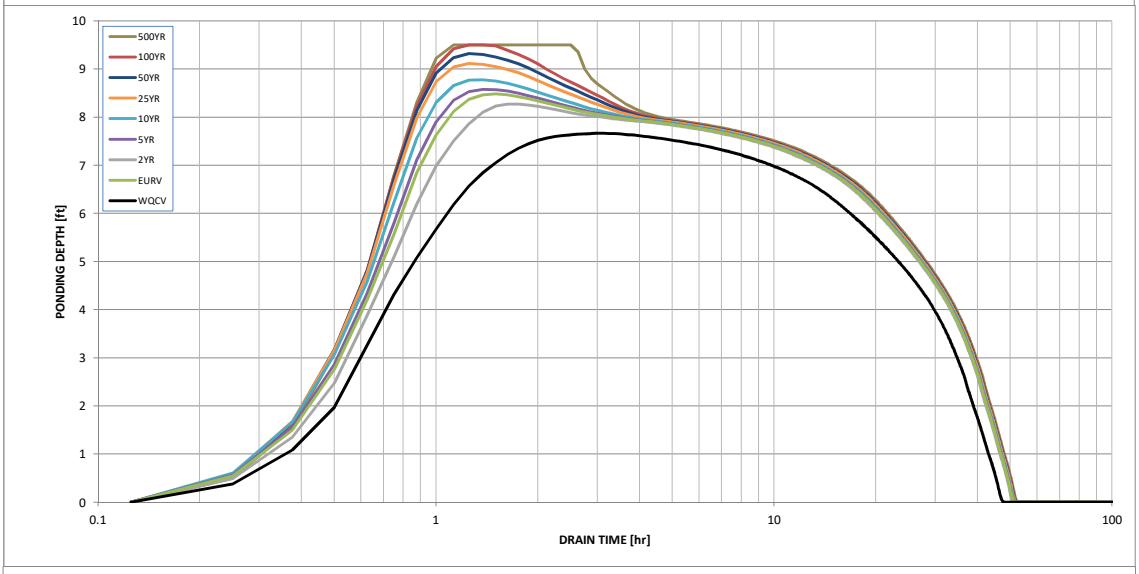
Routed Hydrograph Results

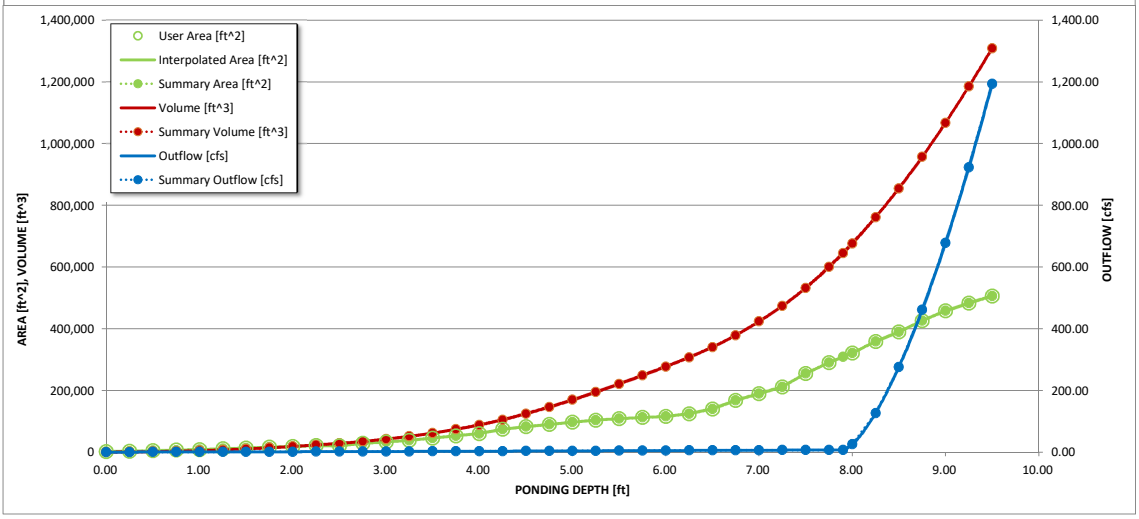
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	0.98	1.48	1.71	2.06	2.40	2.68	3.39
Calculated Runoff Volume (acre-ft) =	14.703	40.805	28.097	48.303	65.730	100.967	127.449	156.538	219.078
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	14.689	40.776	28.083	48.275	65.697	100.831	127.300	156.429	218.938
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.03	0.14	0.46	0.64	0.87	1.31
Predevelopment Peak Q (cfs) =	0.0	0.0	6.1	30.2	133.2	431.5	609.5	823.8	1237.4
Peak Inflow Q (cfs) =	152.6	395.0	282.8	459.5	599.4	895.6	1094.0	1319.4	1780.5
Peak Outflow Q (cfs) =	6.9	261.2	137.4	329.3	479.9	782.7	994.7	1192.9	1192.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	10.9	3.6	1.8	1.6	1.4	1.0
Structure Controlling Flow =	Plate	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway	N/A	N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	37	39	36	34	31	28	26	21
Time to Drain 99% of Inflow Volume (hours) =	**43**	43	44	42	41	39	38	37	34
Maximum Ponding Depth (ft) =	7.66	8.48	8.27	8.58	8.77	9.11	9.32	9.50	9.50
Area at Maximum Ponding Depth (acres) =	6.36	8.86	8.29	9.18	9.84	10.76	11.21	11.62	11.62
Maximum Volume Stored (acre-ft) =	13.186	19.355	17.640	20.256	22.158	25.669	27.867	30.036	30.036

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename:

Storm Inflow Hydrographs **UD-Detention, Version 3.07 (February 2017)**

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
7.52 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:07:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:15:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:22:34	5.14	8.43	7.28	8.94	9.82	9.31	8.74	8.24	7.47
0.665	0:30:05	15.83	30.51	24.66	33.28	38.45	40.56	40.21	38.99	35.93
	0:37:36	40.71	81.32	64.62	89.77	106.32	118.85	122.61	123.45	118.93
	0:45:07	111.00	219.49	175.02	241.82	286.11	323.15	336.61	343.33	342.12
	0:52:38	152.57	352.08	264.67	398.17	492.37	605.30	657.60	691.93	717.57
	1:00:10	152.29	395.00	282.78	459.48	599.44	825.32	955.58	1063.56	1190.18
	1:07:41	140.59	377.92	265.30	443.54	594.14	895.57	1093.98	1286.95	1599.51
	1:15:12	126.97	347.15	240.53	409.99	555.37	855.47	1075.33	1319.45	1780.47
	1:22:43	112.15	314.62	216.26	372.54	506.41	790.63	1005.62	1245.81	1747.57
	1:30:14	98.29	283.82	192.88	337.51	462.17	723.24	921.99	1151.54	1642.89
	1:37:46	87.70	255.77	172.18	305.76	422.30	664.88	850.65	1060.85	1522.06
	1:45:17	74.98	221.97	149.11	267.80	375.05	602.76	778.64	975.02	1405.05
	1:52:48	62.48	190.24	126.67	229.40	321.34	529.60	695.07	880.76	1288.79
	2:00:19	50.51	161.20	105.55	194.83	274.31	451.25	599.37	769.65	1156.47
	2:07:50	39.61	135.05	86.29	164.53	234.36	386.24	511.19	654.68	1005.71
	2:15:22	30.21	112.04	69.55	137.72	198.93	332.51	440.65	563.44	856.29
	2:22:53	22.35	91.70	54.66	114.21	168.61	285.95	380.99	489.44	741.88
	2:30:24	17.56	73.27	41.89	92.80	140.81	245.73	330.63	426.34	648.93
	2:37:55	14.63	57.24	32.97	73.55	115.37	208.75	285.06	371.42	570.67
	2:45:26	12.61	45.71	27.57	57.54	92.43	174.50	242.91	321.03	501.39
	2:52:58	11.20	38.62	23.97	47.89	73.49	143.28	203.70	273.66	437.81
	3:00:29	10.19	33.97	21.43	41.76	62.08	116.39	168.19	229.87	377.86
	3:08:00	7.99	28.16	17.49	34.81	51.96	94.41	134.84	188.15	319.83
	3:15:31	5.75	21.48	12.99	26.86	40.88	75.82	107.25	147.07	262.85
	3:23:02	4.27	15.81	9.44	19.90	30.70	58.58	83.68	114.88	205.11
	3:30:34	3.17	11.67	7.01	14.75	23.03	44.20	63.74	88.39	156.22
	3:38:05	2.35	8.75	5.30	10.96	17.12	33.44	48.51	67.34	119.20
	3:45:36	1.70	6.63	3.96	8.36	12.83	25.13	36.74	51.35	91.53
	3:53:07	1.23	4.99	2.94	6.31	9.81	18.86	27.76	38.99	70.13
	4:00:38	0.88	3.76	2.19	4.79	7.44	14.30	20.83	29.33	53.59
	4:08:10	0.59	2.88	1.60	3.67	5.72	10.95	15.90	21.98	40.54
	4:15:41	0.36	2.12	1.11	2.75	4.45	8.48	12.25	16.96	30.43
	4:23:12	0.19	1.48	0.70	1.97	3.33	6.68	9.62	13.14	23.26
	4:30:43	0.07	0.95	0.39	1.32	2.38	5.10	7.55	10.51	18.14
	4:38:14	0.00	0.54	0.17	0.80	1.58	3.73	5.72	8.18	14.52
	4:45:46	0.00	0.24	0.04	0.40	0.95	2.57	4.15	6.14	11.43
	4:53:17	0.00	0.06	0.00	0.14	0.47	1.63	2.83	4.39	8.71
	5:00:48	0.00	0.00	0.00	0.00	0.16	0.90	1.76	2.93	6.36
	5:08:19	0.00	0.00	0.00	0.00	0.00	0.39	0.94	1.76	4.38
	5:15:50	0.00	0.00	0.00	0.00	0.00	0.09	0.38	0.89	2.77
	5:23:22	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.30	1.52
	5:30:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65
	5:38:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
	5:45:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:53:26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:08:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:16:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:23:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:31:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:38:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:46:05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:53:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:01:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:08:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:16:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:23:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:31:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:38:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:46:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:53:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:01:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:08:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:16:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:23:50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:31:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:38:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:46:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:53:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9:01:26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
5091.5	0.00	2,346	0.054	0	0.000	0.00
5091.75	0.25	2,866	0.066	625	0.014	0.23
5092	0.50	4,700	0.108	1,565	0.036	0.33
5092.25	0.75	6,470	0.149	2,962	0.068	0.40
5092.5	1.00	8,430	0.194	4,823	0.111	0.47
5092.75	1.25	10,903	0.250	7,238	0.166	0.75
5093	1.50	13,504	0.310	10,288	0.236	0.90
5093.25	1.75	15,896	0.365	13,964	0.321	1.02
5093.5	2.00	18,341	0.421	18,243	0.419	1.13
5093.75	2.25	21,195	0.487	23,381	0.537	1.46
5094	2.50	20,101	0.461	28,543	0.655	1.64
5094.25	2.75	28,514	0.655	34,620	0.795	1.80
5094.50	3.00	32,692	0.751	42,271	0.970	1.94
5094.75	3.25	38,453	0.883	51,164	1.175	2.30
5095	3.50	45,484	1.044	61,656	1.415	2.52
5095.25	3.75	52,958	1.216	73,961	1.698	2.71
5095.50	4.00	60,254	1.383	88,113	2.023	2.88
5095.75	4.25	74,049	1.700	104,901	2.408	3.27
5096	4.50	82,590	1.896	124,480	2.858	3.51
5096.25	4.75	89,709	2.059	146,018	3.352	3.73
5096.50	5.00	97,028	2.227	169,360	3.888	3.92
5096.75	5.25	103,932	2.386	194,480	4.465	4.34
5097	5.50	108,508	2.491	221,035	5.074	4.61
5097.25	5.75	112,372	2.580	248,645	5.708	4.85
5097.5	6.00	115,602	2.654	277,142	6.362	5.07
5097.75	6.25	124,548	2.859	307,160	7.051	5.51
5098	6.50	140,231	3.219	340,258	7.811	5.80
5098.25	6.75	167,682	3.849	378,747	8.695	6.07
5098.50	7.00	189,540	4.351	423,400	9.720	6.31
5098.75	7.25	211,512	4.856	473,531	10.871	6.54
5099	7.50	254,854	5.851	531,827	12.209	6.76
5099.25	7.75	289,829	6.654	599,912	13.772	6.96
5099.40	7.90	308,487	7.082	644,786	14.802	7.09
5099.50	8.00	320,925	7.367	676,256	15.525	25.22
5099.75	8.25	358,664	8.234	761,205	17.475	126.08
5100	8.50	389,439	8.940	854,717	19.622	275.14
5100.25	8.75	426,194	9.784	956,672	21.962	460.81
5100.50	9.00	457,925	10.513	1,067,186	24.499	677.69
5100.75	9.25	482,692	11.081	1,184,764	27.198	922.49
5101	9.50	506,269	11.622	1,308,384	30.036	1,192.94

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Weir Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Apr 17 2018

POND B - SPILLWAY - CAPACITY (DESIGNED FOR ULT SWMM 500-YR PEAK IN = 1020

Trapezoidal Weir

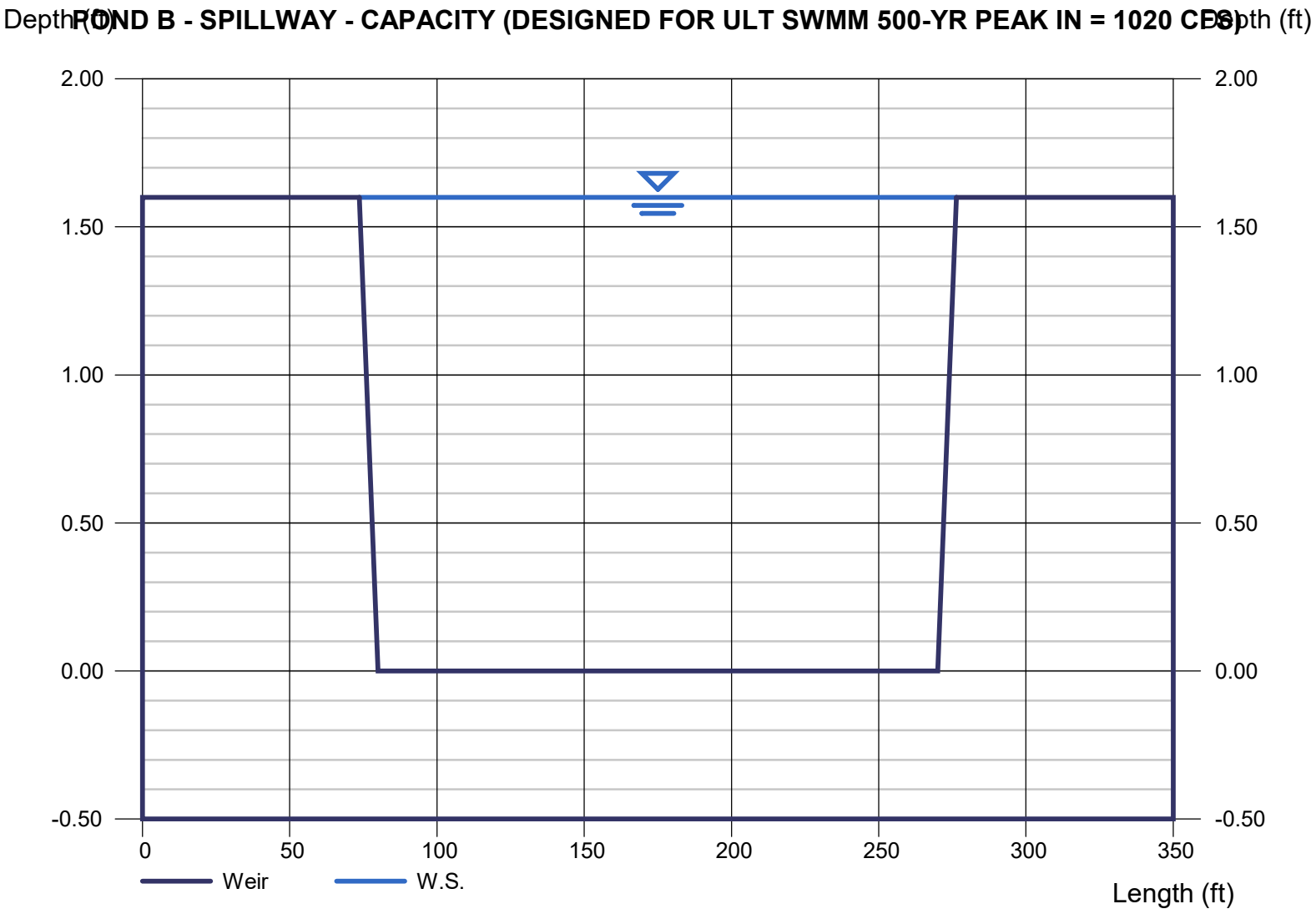
Crest	= Sharp
Bottom Length (ft)	= 190.00
Total Depth (ft)	= 1.60
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 2.60
Compute by:	Known Q
Known Q (cfs)	= 1020.00

Highlighted

Depth (ft)	= 1.60
Q (cfs)	= 1020.00
Area (sqft)	= 314.24
Velocity (ft/s)	= 3.25
Top Width (ft)	= 202.80

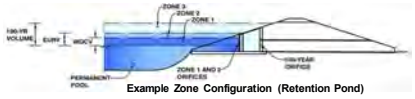


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: PARKDALE

Basin ID: POND C



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	5.73	acres
Watershed Length =	1,265	ft
Watershed Slope =	0.021	ft/ft
Watershed Imperviousness =	31.09%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Erie	
Water Quality Capture Volume (WQCV) =	0.074	acre-feet
Excess Urban Runoff Volume (EURV) =	0.183	acre-feet
2-yr Runoff Volume (P1 = 1.01 in.) =	0.120	acre-feet
5-yr Runoff Volume (P1 = 1.43 in.) =	0.191	acre-feet
10-yr Runoff Volume (P1 = 1.73 in.) =	0.299	acre-feet
25-yr Runoff Volume (P1 = 1.84 in.) =	0.460	acre-feet
50-yr Runoff Volume (P1 = 2.4 in.) =	0.671	acre-feet
100-yr Runoff Volume (P1 = 2.7 in.) =	0.856	acre-feet
500-yr Runoff Volume (P1 = 3.89 in.) =	1.409	acre-feet
Approximate 2-yr Detention Volume =	0.112	acre-feet
Approximate 5-yr Detention Volume =	0.179	acre-feet
Approximate 10-yr Detention Volume =	0.269	acre-feet
Approximate 25-yr Detention Volume =	0.289	acre-feet
Approximate 50-yr Detention Volume =	0.352	acre-feet
Approximate 100-yr Detention Volume =	0.417	acre-feet

Optional User Override 1-hr Precipitation

1.01	inches
1.43	inches
1.73	inches
	inches
2.40	inches
2.70	inches
	inches

Stage-Storage Calculation

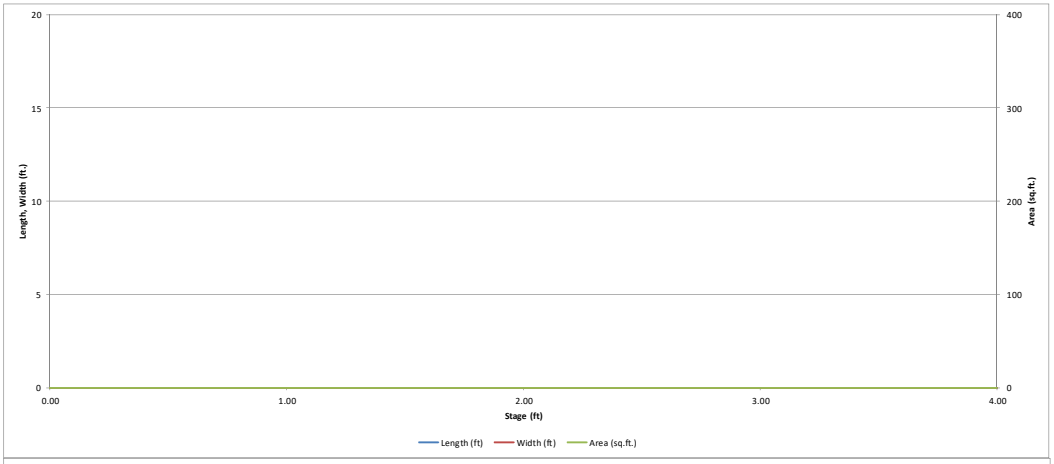
Zone 1 Volume (WQCV) =	0.074	acre-feet
Zone 2 Volume (10-year - Zone 1) =	0.195	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.148	acre-feet
Total Detention Basin Volume =	0.417	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

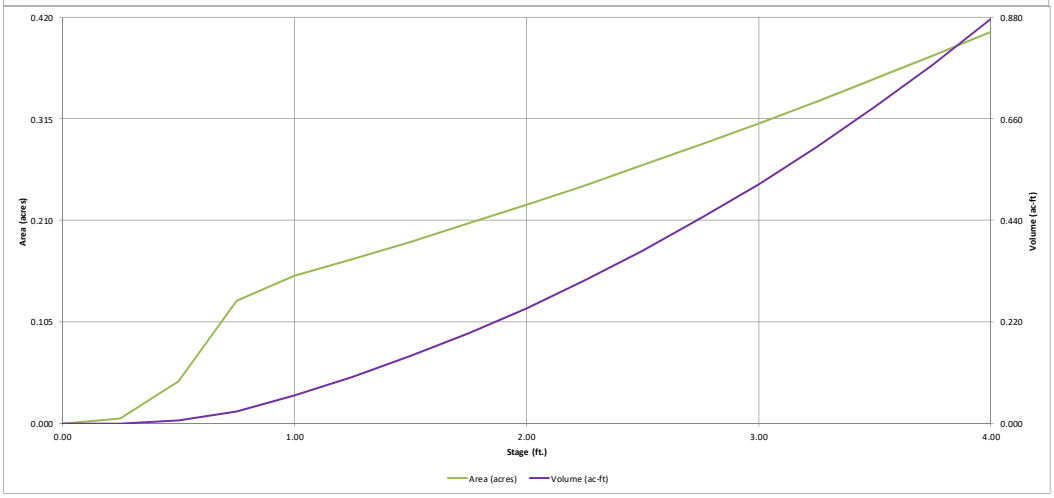
Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
5090.25	--	0.25	--	--	--	216	0.005	25	0.001
5090.5	--	0.50	--	--	--	1,902	0.044	273	0.006
5090.75	--	0.75	--	--	--	5,535	0.127	1,167	0.027
5091	--	1.00	--	--	--	6,638	0.152	2,677	0.061
5091.25	--	1.25	--	--	--	7,398	0.170	4,423	0.102
5091.5	--	1.50	--	--	--	8,186	0.188	6,364	0.146
5091.75	--	1.75	--	--	--	9,000	0.207	8,504	0.195
5092	--	2.00	--	--	--	9,845	0.226	10,851	0.249
5092.25	--	2.25	--	--	--	10,718	0.246	13,519	0.310
5092.5	--	2.50	--	--	--	11,618	0.267	16,311	0.374
5092.75	--	2.75	--	--	--	12,545	0.288	19,332	0.444
5093	--	3.00	--	--	--	13,500	0.310	22,587	0.519
5093.25	--	3.25	--	--	--	14,495	0.333	26,087	0.599
5093.5	--	3.50	--	--	--	15,507	0.356	29,837	0.685
5093.75	--	3.75	--	--	--	16,548	0.380	33,844	0.777
5094	--	4.00	--	--	--	17,622	0.405	38,115	0.875

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



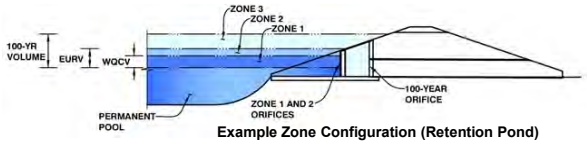


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: PARKDALE

Basin ID: POND C



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.08	0.074	Orifice Plate
Zone 2 (10-year)	2.08	0.195	Rectangular Orifice
Zone 3 (100-year)	2.66	0.148	Weir&Pipe (Restrict)
		0.417	Total

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.708E-03	ft^2
Depth at top of Zone using Orifice Plate =	1.07	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.39	sq. inches (diameter = 11/16 inch)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.33	0.67					
Orifice Area (sq. inches)	0.39	0.39	0.39					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	1.25	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	2.08	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	3.00	N/A	inches
Vertical Orifice Width =	8.00		inches

Calculated Parameters for Vertical Orifice

	Zone 2 Rectangular	Not Selected	
Vertical Orifice Area =	0.17	N/A	ft^2
Vertical Orifice Centroid =	0.13	N/A	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.14	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	2.92	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	2.92	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	2.14	N/A	feet
Over Flow Weir Slope Length =	2.92	N/A	feet
Grate Open Area / 100-yr Orifice Area =	14.90	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	5.97	N/A	ft^2
Overflow Grate Open Area w/ Debris =	2.98	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.60	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	5.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.40	N/A	ft^2
Outlet Orifice Centroid =	0.25	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.11	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =		feet
Spillway End Slopes =		H:V
Freeboard above Max Water Surface =		feet

Calculated Parameters for Spillway

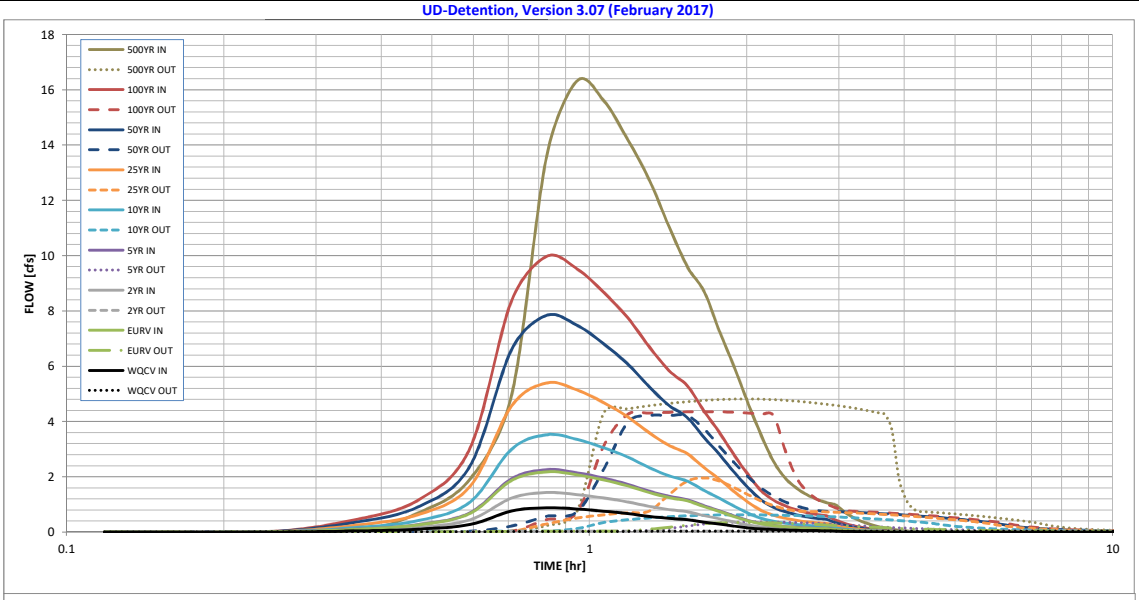
Spillway Design Flow Depth=		feet
Stage at Top of Freeboard =		feet
Basin Area at Top of Freeboard =		acres

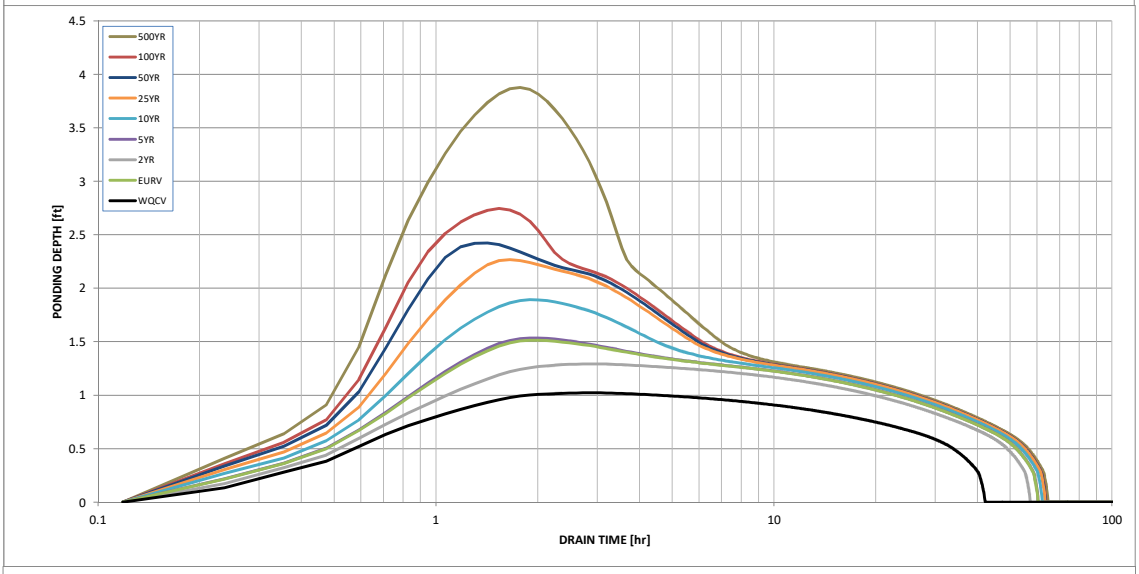
Routed Hydrograph Results

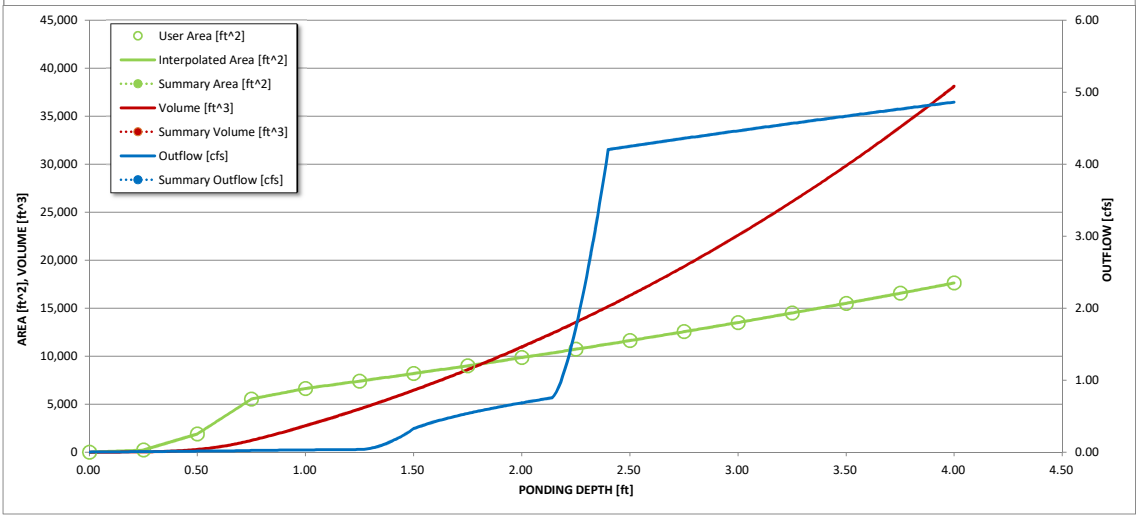
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.01	1.43	1.73	1.84	2.40	2.70	3.89
Calculated Runoff Volume (acre-ft) =	0.074	0.183	0.120	0.191	0.299	0.460	0.671	0.856	1.409
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.073	0.183	0.119	0.190	0.298	0.459	0.671	0.855	1.408
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.01	0.12	0.41	0.66	0.91	1.56
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.1	0.7	2.3	3.8	5.2	8.9
Peak Inflow Q (cfs) =	0.9	2.2	1.4	2.3	3.5	5.4	7.8	10.0	16.3
Peak Outflow Q (cfs) =	0.0	0.3	0.0	0.4	0.6	2.0	4.2	4.4	4.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	4.9	0.9	0.8	1.1	0.8	0.5
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.2	0.6	0.6	0.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	53	52	53	52	50	46	43	36
Time to Drain 99% of Inflow Volume (hours) =	**41**	57	55	57	57	57	56	54	51
Maximum Ponding Depth (ft) =	1.02	1.51	1.29	1.54	1.89	2.27	2.42	2.74	3.88
Area at Maximum Ponding Depth (acres) =	0.15	0.19	0.17	0.19	0.22	0.25	0.26	0.29	0.39
Maximum Volume Stored (acre-ft) =	0.066	0.150	0.110	0.154	0.227	0.313	0.353	0.441	0.823

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename:

Storm Inflow Hydrographs **UD-Detention, Version 3.07 (February 2017)**

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
7.10 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:07:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:14:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:21:18	0.04	0.10	0.07	0.10	0.16	0.24	0.35	0.44	0.71
0.704	0:28:24	0.11	0.26	0.17	0.27	0.42	0.65	0.93	1.19	1.93
	0:35:30	0.28	0.68	0.45	0.70	1.09	1.66	2.40	3.05	4.95
	0:42:36	0.76	1.86	1.23	1.93	3.00	4.56	6.60	8.37	13.59
	0:49:42	0.88	2.18	1.43	2.26	3.52	5.39	7.84	9.97	16.32
	0:56:48	0.83	2.07	1.36	2.15	3.35	5.14	7.48	9.52	15.61
	1:03:54	0.76	1.88	1.23	1.95	3.05	4.68	6.81	8.67	14.21
	1:11:00	0.67	1.67	1.09	1.73	2.71	4.17	6.08	7.76	12.74
	1:18:06	0.57	1.43	0.93	1.48	2.33	3.59	5.25	6.71	11.05
	1:25:12	0.50	1.25	0.81	1.30	2.04	3.13	4.58	5.84	9.60
	1:32:18	0.45	1.13	0.74	1.17	1.84	2.84	4.15	5.29	8.71
	1:39:24	0.36	0.92	0.60	0.95	1.51	2.33	3.42	4.38	7.24
	1:46:30	0.29	0.74	0.48	0.77	1.22	1.90	2.80	3.59	5.95
	1:53:36	0.21	0.56	0.36	0.58	0.93	1.46	2.16	2.77	4.64
	2:00:42	0.15	0.41	0.26	0.42	0.68	1.08	1.61	2.07	3.51
	2:07:48	0.11	0.30	0.19	0.31	0.50	0.78	1.16	1.50	2.56
	2:14:54	0.09	0.24	0.15	0.24	0.39	0.61	0.90	1.16	1.96
	2:22:00	0.07	0.19	0.12	0.20	0.32	0.50	0.74	0.95	1.60
	2:29:06	0.06	0.17	0.11	0.17	0.27	0.43	0.63	0.81	1.35
	2:36:12	0.06	0.15	0.09	0.15	0.24	0.37	0.55	0.71	1.19
	2:43:18	0.05	0.13	0.08	0.14	0.22	0.34	0.50	0.64	1.06
	2:50:24	0.05	0.12	0.08	0.13	0.20	0.31	0.46	0.59	0.98
	2:57:30	0.04	0.09	0.06	0.09	0.15	0.23	0.34	0.43	0.72
	3:04:36	0.03	0.07	0.04	0.07	0.11	0.17	0.25	0.32	0.53
	3:11:42	0.02	0.05	0.03	0.05	0.08	0.12	0.18	0.23	0.39
	3:18:48	0.01	0.03	0.02	0.04	0.06	0.09	0.13	0.17	0.29
	3:25:54	0.01	0.02	0.02	0.03	0.04	0.06	0.10	0.12	0.21
	3:33:00	0.01	0.02	0.01	0.02	0.03	0.05	0.07	0.09	0.15
	3:40:06	0.00	0.01	0.01	0.01	0.02	0.03	0.05	0.06	0.11
	3:47:12	0.00	0.01	0.00	0.01	0.01	0.02	0.03	0.04	0.07
	3:54:18	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.04
	4:01:24	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02
	4:08:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	4:15:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:22:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:29:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:36:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:44:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:51:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:58:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:12:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:19:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:26:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:33:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:47:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:02:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:09:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:16:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:23:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:30:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:37:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:44:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:51:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:58:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:06:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:13:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:20:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:27:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:34:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:41:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:48:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7:55:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:02:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:09:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:17:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:24:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:31:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Weir Report

POND C - SPILLWAY DESIGN (2 x 100-YR)

Trapezoidal Weir

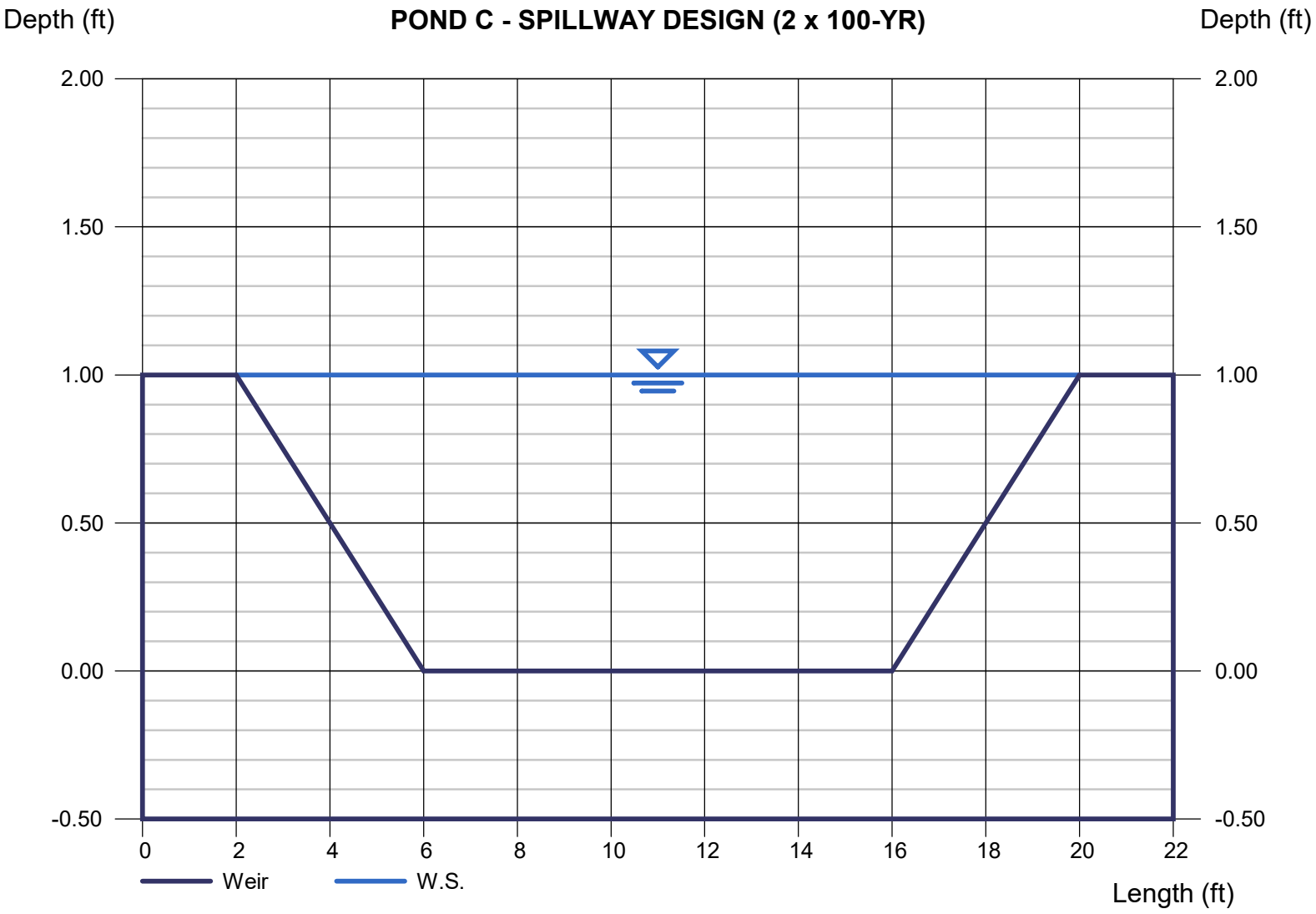
Crest	= Sharp
Bottom Length (ft)	= 10.00
Total Depth (ft)	= 1.00
Side Slope (z:1)	= 4.00

Calculations

Weir Coeff. Cw	= 2.60
Compute by:	Known Q
Known Q (cfs)	= 34.20

Highlighted

Depth (ft)	= 1.00
Q (cfs)	= 34.20
Area (sqft)	= 14.00
Velocity (ft/s)	= 2.44
Top Width (ft)	= 18.00



Appendix C

Hydraulic Calculations

Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Apr 16 2018

CULVERT # 1 - DP 506 - 100 YR

Invert Elev Dn (ft)	=	5158.26
Pipe Length (ft)	=	119.15
Slope (%)	=	2.89
Invert Elev Up (ft)	=	5161.70
Rise (in)	=	42.0
Shape	=	Circular
Span (in)	=	42.0
No. Barrels	=	2
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

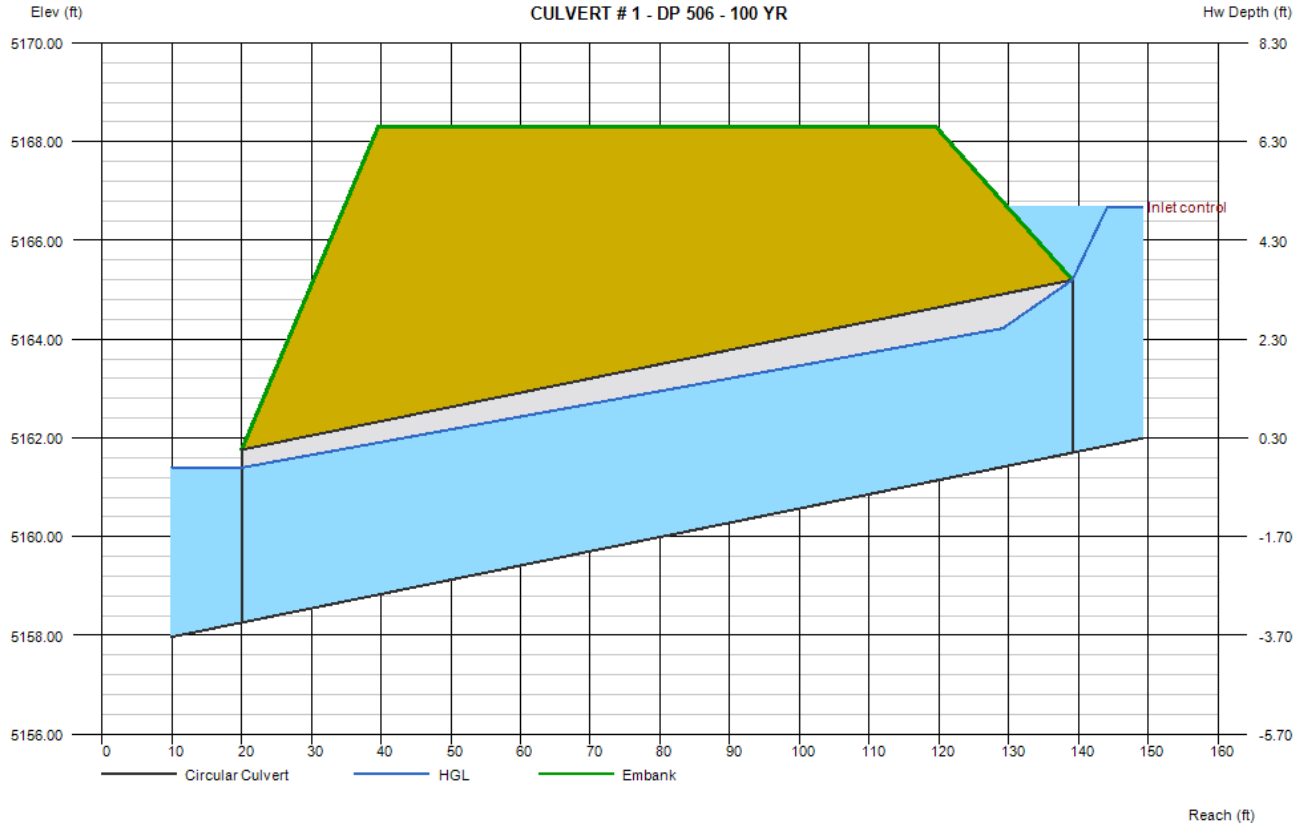
Top Elevation (ft)	=	5168.30
Top Width (ft)	=	80.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	158.00
Qmax (cfs)	=	158.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	158.00
Qpipe (cfs)	=	158.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	8.69
Veloc Up (ft/s)	=	9.65
HGL Dn (ft)	=	5161.40
HGL Up (ft)	=	5164.48
Hw Elev (ft)	=	5166.68
Hw/D (ft)	=	1.42
Flow Regime	=	Inlet Control



Culvert Report

CULVERT #2 - DP 142 - 100 YR

Invert Elev Dn (ft)	=	5149.57
Pipe Length (ft)	=	76.00
Slope (%)	=	0.61
Invert Elev Up (ft)	=	5150.03
Rise (in)	=	42.0
Shape	=	Circular
Span (in)	=	42.0
No. Barrels	=	2
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

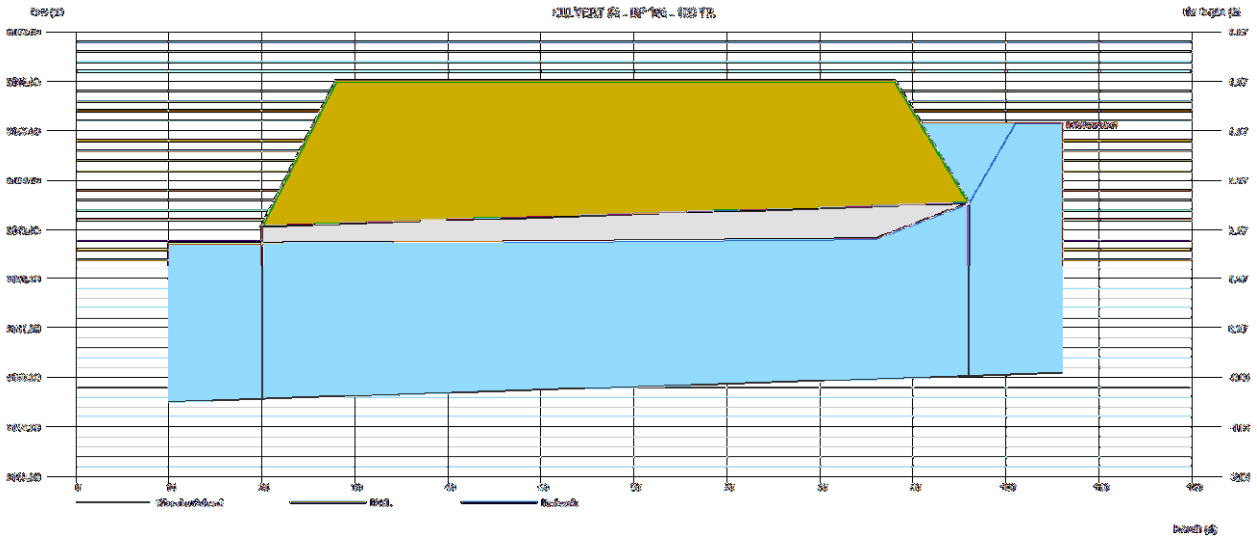
Top Elevation (ft)	=	5156.00
Top Width (ft)	=	60.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	161.00
Qmax (cfs)	=	161.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	161.00
Qpipe (cfs)	=	161.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	8.83
Veloc Up (ft/s)	=	9.76
HGL Dn (ft)	=	5152.72
HGL Up (ft)	=	5152.83
Hw Elev (ft)	=	5155.15
Hw/D (ft)	=	1.46
Flow Regime	=	Inlet Control



Culvert Report

CULVERT #3 - DP 143 - 100 YR

Invert Elev Dn (ft)	=	5147.90
Pipe Length (ft)	=	76.00
Slope (%)	=	0.61
Invert Elev Up (ft)	=	5148.36
Rise (in)	=	42.0
Shape	=	Circular
Span (in)	=	42.0
No. Barrels	=	2
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

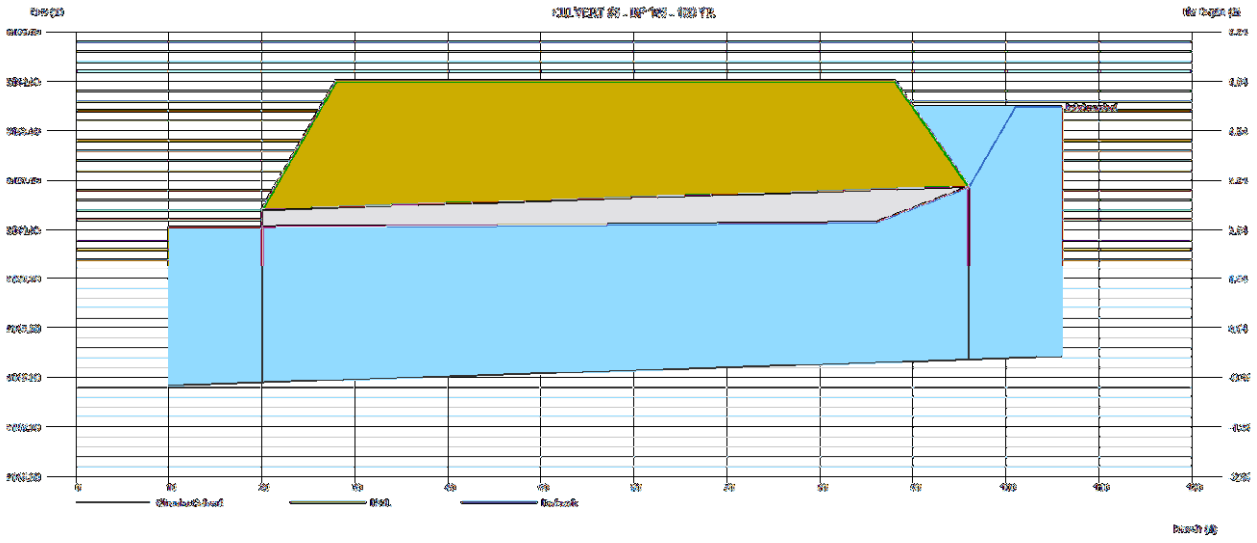
Top Elevation (ft)	=	5154.00
Top Width (ft)	=	60.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	161.00
Qmax (cfs)	=	161.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	161.00
Qpipe (cfs)	=	161.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	8.83
Veloc Up (ft/s)	=	9.76
HGL Dn (ft)	=	5151.05
HGL Up (ft)	=	5151.16
Hw Elev (ft)	=	5153.48
Hw/D (ft)	=	1.46
Flow Regime	=	Inlet Control



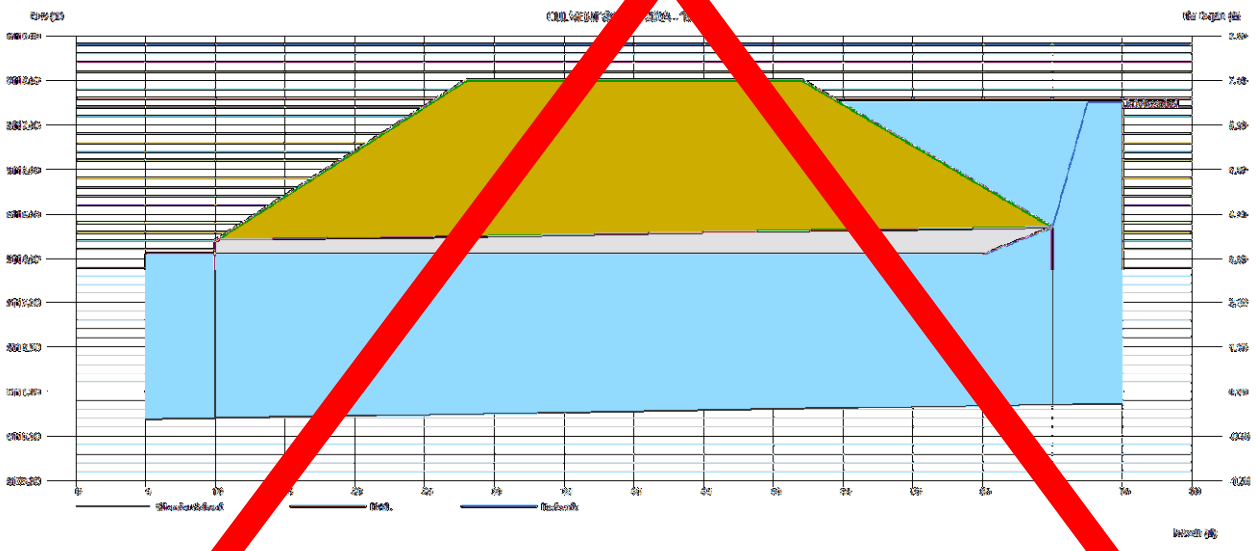
Culvert Report

Hyd low Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Saturday, Oct 7 17

CULV RT #4 - DP 508A - 100 YR

CULVERT #4 REMOVED FROM PLAN DUE TO REVISED LOW AREA DESIGN ALONG DRAINAGEWAY 1

Invert Elev			
Pipe Leng			00
Slope (%)			00
Invert Elev			D)/2
Rise (in)			
Shape	= Circular	**Highlighted**	
Span (in)	= 48.0	Qtotal (cfs)	= 256.00
No. Barrels	= 2	Qpipe (cfs)	= 256.00
n-Value	= .013	Qovertop (cfs	= 0.00
Culvert Type	= rcular Concrete	Veloc Dn (ft	= 10.56
Culvert Entrance	= Sq are edge w/headwall (C)	Veloc Up /s)	= 11.28
Coeff. K,M,c,Y,k	= 0.00 , 2, 0.0398, 0.67, 0.5	HGL Dn ft)	= 5114.09
		HGL (ft)	= 5114.09
Embankment		Hw ev (ft)	= 5117.50
Top Elevation (ft)	= 5118.00	H D (ft)	= 1.70
Top Width (ft)	= 24.00	ow Regime	= Inlet Control
Crest Width (ft)	= 50.00		



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Apr 16 2018

CULVERT #5 - P50 - 100 YR

Invert Elev Dn (ft)	=	5127.51
Pipe Length (ft)	=	92.00
Slope (%)	=	0.30
Invert Elev Up (ft)	=	5127.79
Rise (in)	=	60.0
Shape	=	Box
Span (in)	=	72.0
No. Barrels	=	2
n-Value	=	0.013
Culvert Type	=	Flared Wingwalls
Culvert Entrance	=	30D to 75D wingwall flares
Coeff. K,M,c,Y,k	=	0.026, 1, 0.0347, 0.81, 0.4

Embankment

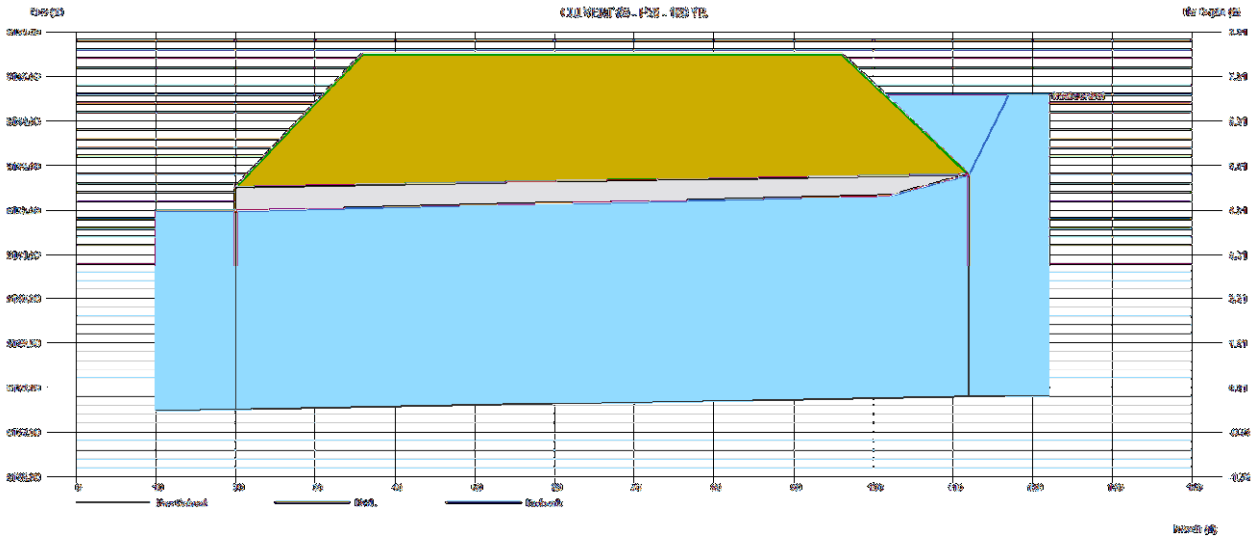
Top Elevation (ft)	=	5135.50
Top Width (ft)	=	60.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	534.00
Qmax (cfs)	=	534.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	534.00
Qpipe (cfs)	=	534.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	9.95
Veloc Up (ft/s)	=	9.75
HGL Dn (ft)	=	5131.98
HGL Up (ft)	=	5132.35
Hw Elev (ft)	=	5134.58
Hw/D (ft)	=	1.36
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Apr 16 2018

CULVERT #6 - P50 - 100 YR

Invert Elev Dn (ft)	=	5122.92
Pipe Length (ft)	=	15.00
Slope (%)	=	0.34
Invert Elev Up (ft)	=	5122.97
Rise (in)	=	60.0
Shape	=	Box
Span (in)	=	72.0
No. Barrels	=	2
n-Value	=	0.013
Culvert Type	=	Flared Wingwalls
Culvert Entrance	=	30D to 75D wingwall flares
Coeff. K,M,c,Y,k	=	0.026, 1, 0.0347, 0.81, 0.4

Embankment

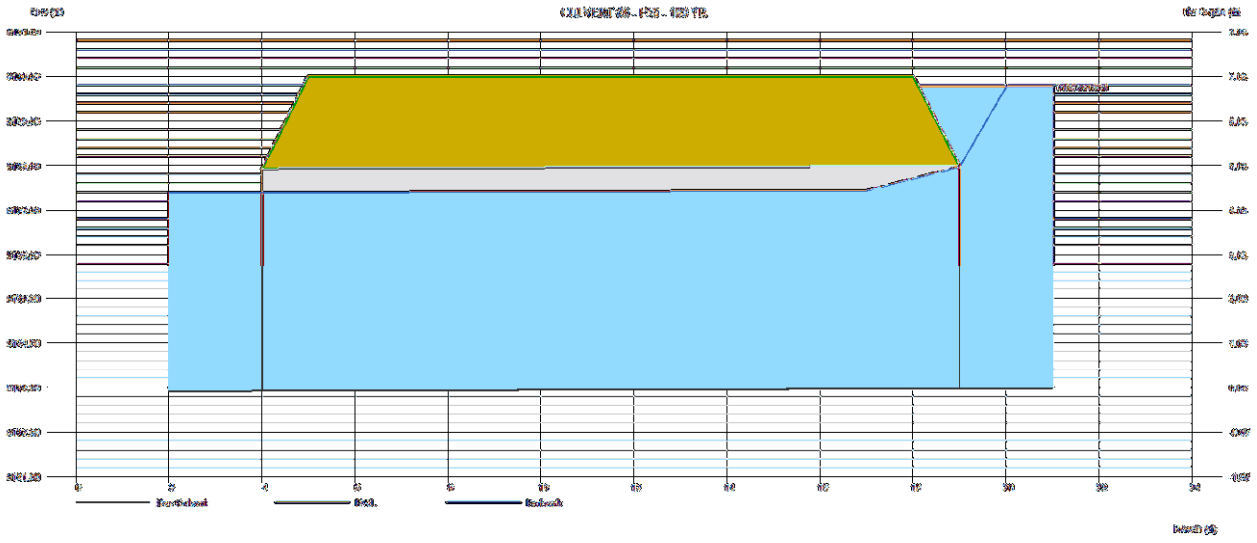
Top Elevation (ft)	=	5130.00
Top Width (ft)	=	13.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	534.00
Qmax (cfs)	=	534.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	534.00
Qpipe (cfs)	=	534.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	9.95
Veloc Up (ft/s)	=	9.95
HGL Dn (ft)	=	5127.39
HGL Up (ft)	=	5127.44
Hw Elev (ft)	=	5129.76
Hw/D (ft)	=	1.36
Flow Regime	=	Inlet Control



Culvert Report

CULVERT #7 - DP 122 - LOW FLOW CAPACITY

Invert Elev Dn (ft)	=	5110.25
Pipe Length (ft)	=	155.00
Slope (%)	=	0.30
Invert Elev Up (ft)	=	5110.71
Rise (in)	=	60.0
Shape	=	Box
Span (in)	=	62.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Flared Wingwalls
Culvert Entrance	=	30D to 75D wingwall flares
Coeff. K,M,c,Y,k	=	0.026, 1, 0.0347, 0.81, 0.4

Embankment

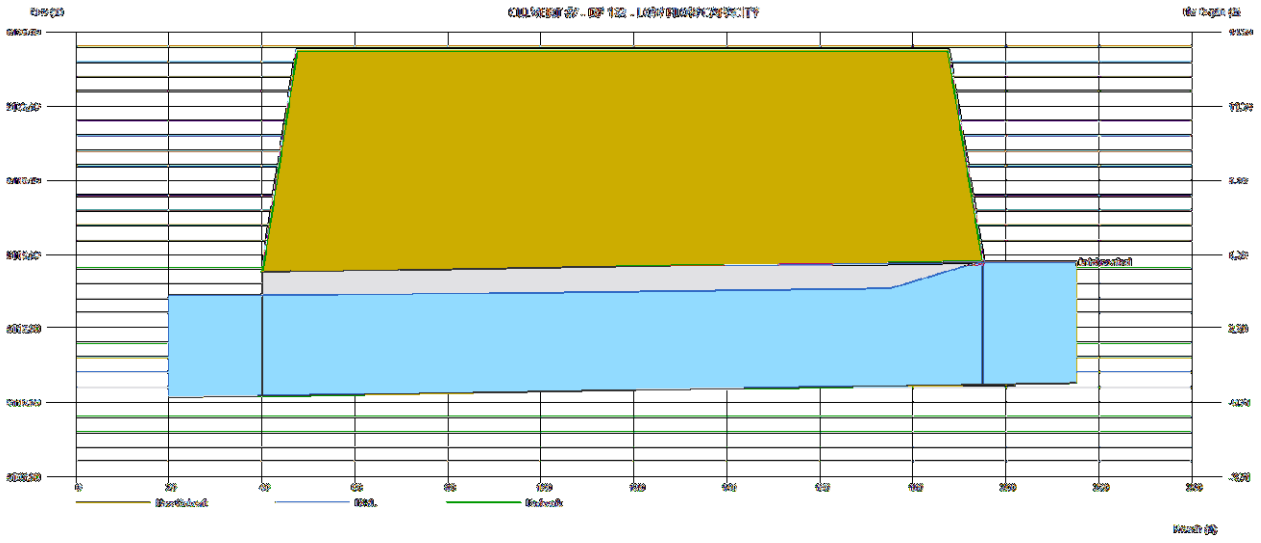
Top Elevation (ft)	=	5124.24
Top Width (ft)	=	140.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	160.00
Qmax (cfs)	=	160.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	160.00
Qpipe (cfs)	=	160.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	7.65
Veloc Up (ft/s)	=	7.90
HGL Dn (ft)	=	5114.30
HGL Up (ft)	=	5114.63
Hw Elev (ft)	=	5115.71
Hw/D (ft)	=	1.00
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Apr 16 2018

CULVERT #7 - DP 122 - 100 YR - 20% CLOGGED

Invert Elev Dn (ft)	=	5110.25
Pipe Length (ft)	=	155.00
Slope (%)	=	0.30
Invert Elev Up (ft)	=	5110.71
Rise (in)	=	118.8 (9.9 FT)
Shape	=	Box CROSS SECTIONAL AREA = 178.34 SF
Span (in)	=	216.0 (18 FT)
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Flared Wingwalls
Culvert Entrance	=	30D to 75D wingwall flares
Coeff. K,M,c,Y,k	=	0.026, 1, 0.0347, 0.81, 0.4

Embankment

Top Elevation (ft)	=	5124.24
Top Width (ft)	=	140.00
Crest Width (ft)	=	50.00

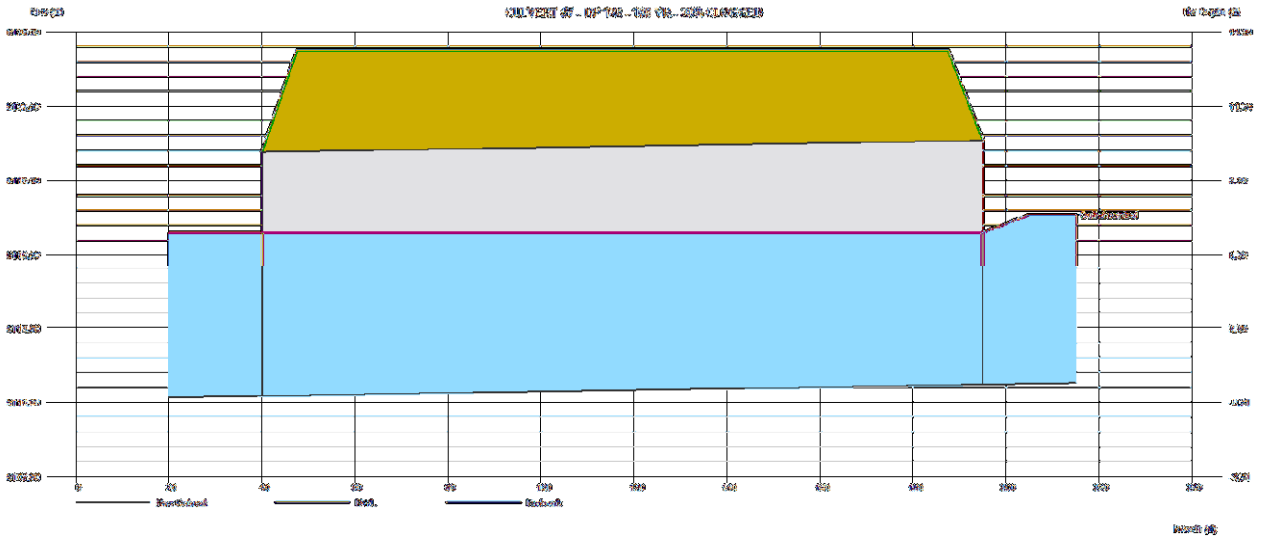
Calculations

Qmin (cfs)	=	641.00
Qmax (cfs)	=	641.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	641.00
Qpipe (cfs)	=	641.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.36
Veloc Up (ft/s)	=	5.75
HGL Dn (ft)	=	5116.90
HGL Up (ft)	=	5116.90
Hw Elev (ft)	=	5117.62
Hw/D (ft)	=	0.70
Flow Regime	=	Outlet Control

SEE DRAINAGE REPORT MAPS FOR ACTUAL BOX CULVERT CROSS SECTION.



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Apr 16 2018

CULVERT #8 - DP 133 - 100 YR - 20% CLOGGED

Invert Elev Dn (ft)	=	5111.30
Pipe Length (ft)	=	150.00
Slope (%)	=	0.30
Invert Elev Up (ft)	=	5111.75
Rise (in)	=	60.0
Shape	=	Box
Span (in)	=	144.0
No. Barrels	=	3
n-Value	=	0.013
Culvert Type	=	Flared Wingwalls
Culvert Entrance	=	30D to 75D wingwall flares
Coeff. K,M,c,Y,k	=	0.026, 1, 0.0347, 0.81, 0.4

Embankment

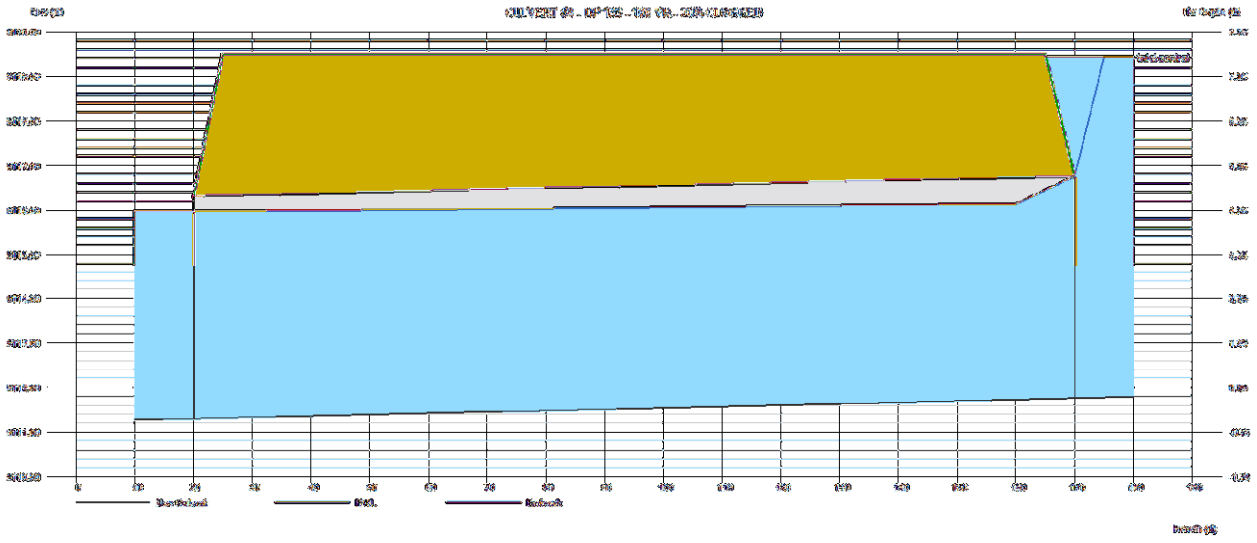
Top Elevation (ft)	=	5119.50
Top Width (ft)	=	140.00
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	1843.00
Qmax (cfs)	=	1843.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	1843.00
Qpipe (cfs)	=	1843.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	10.98
Veloc Up (ft/s)	=	11.66
HGL Dn (ft)	=	5115.96
HGL Up (ft)	=	5116.14
Hw Elev (ft)	=	5119.43
Hw/D (ft)	=	1.54
Flow Regime	=	Inlet Control



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Apr 16 2018

CHANNEL A T DP 116 - Q100

Triangular

Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.70
Invert Elev (ft)	= 100.00
Slope (%)	= 0.55
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 129.20

Highlighted

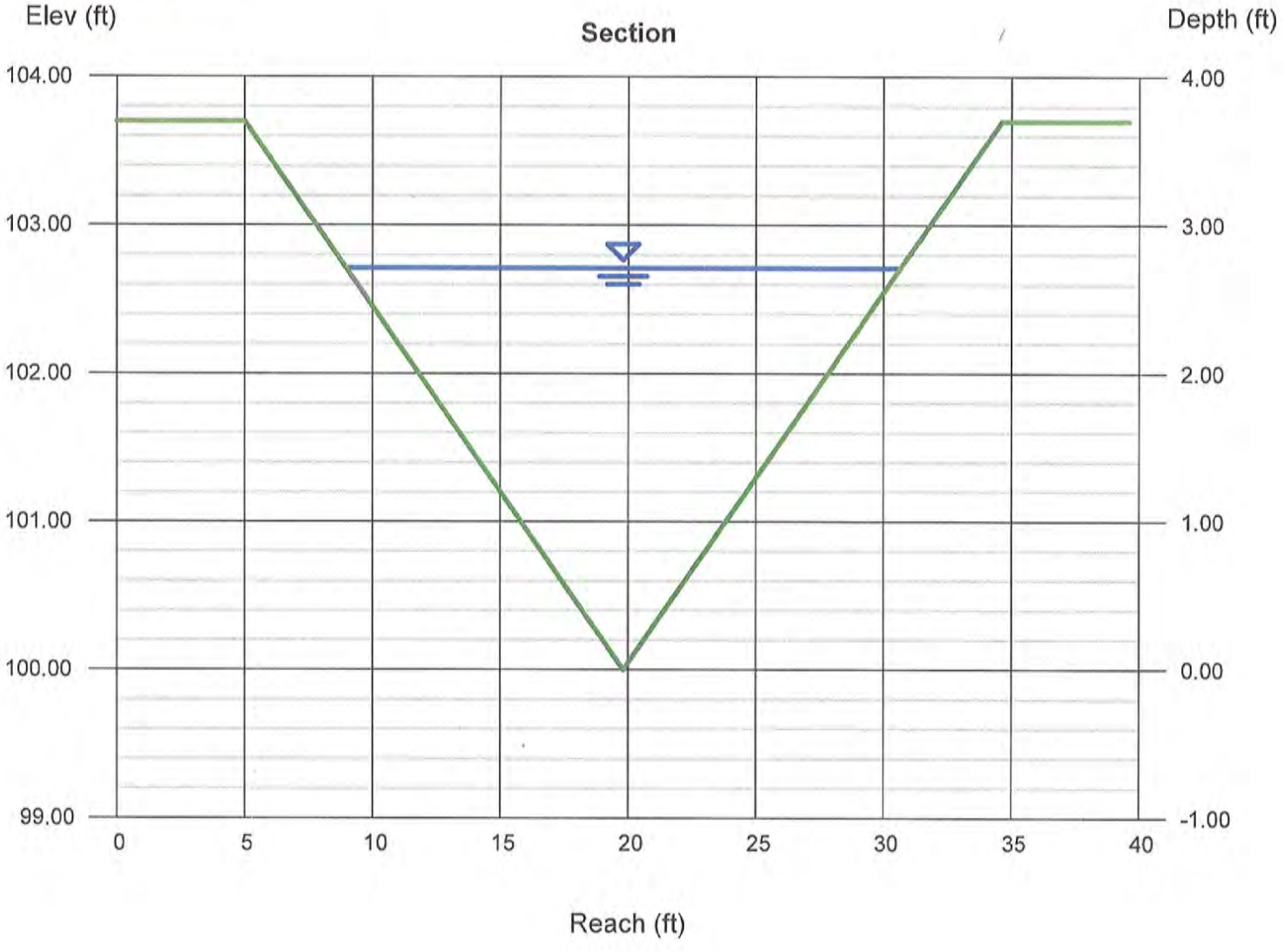
Depth (ft)	= 2.71
Q (cfs)	= 129.20
Area (sqft)	= 29.38
Velocity (ft/s)	= 4.40
Wetted Perim (ft)	= 22.35
Crit Depth, Yc (ft)	= 2.31
Top Width (ft)	= 21.68
EGL (ft)	= 3.01

$F_R = \frac{V}{\sqrt{gL}}$

$L = \frac{\text{FLOW AREA}}{\text{TOP WIDTH}} = \frac{29.38}{21.68} = 1.355$

$F_R = \frac{4.40}{\sqrt{(32.2)(1.355)}} = 0.67$

WHERE V = VELOCITY
g = GRAV. ACCELERATION (32.2)
L = HYDRAULIC DEPTH



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Apr 16 2018

CHANNEL A AT DP P50 - Q100

Trapezoidal

Bottom Width (ft)	= 16.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 4.75
Invert Elev (ft)	= 100.00
Slope (%)	= 0.30
N-Value	= 0.030

Highlighted

Depth (ft)	= 3.61
Q (cfs)	= 534.00
Area (sqft)	= 109.89
Velocity (ft/s)	= 4.86
Wetted Perim (ft)	= 45.77
Crit Depth, Yc (ft)	= 2.61
Top Width (ft)	= 44.88
EGL (ft)	= 3.98

Calculations

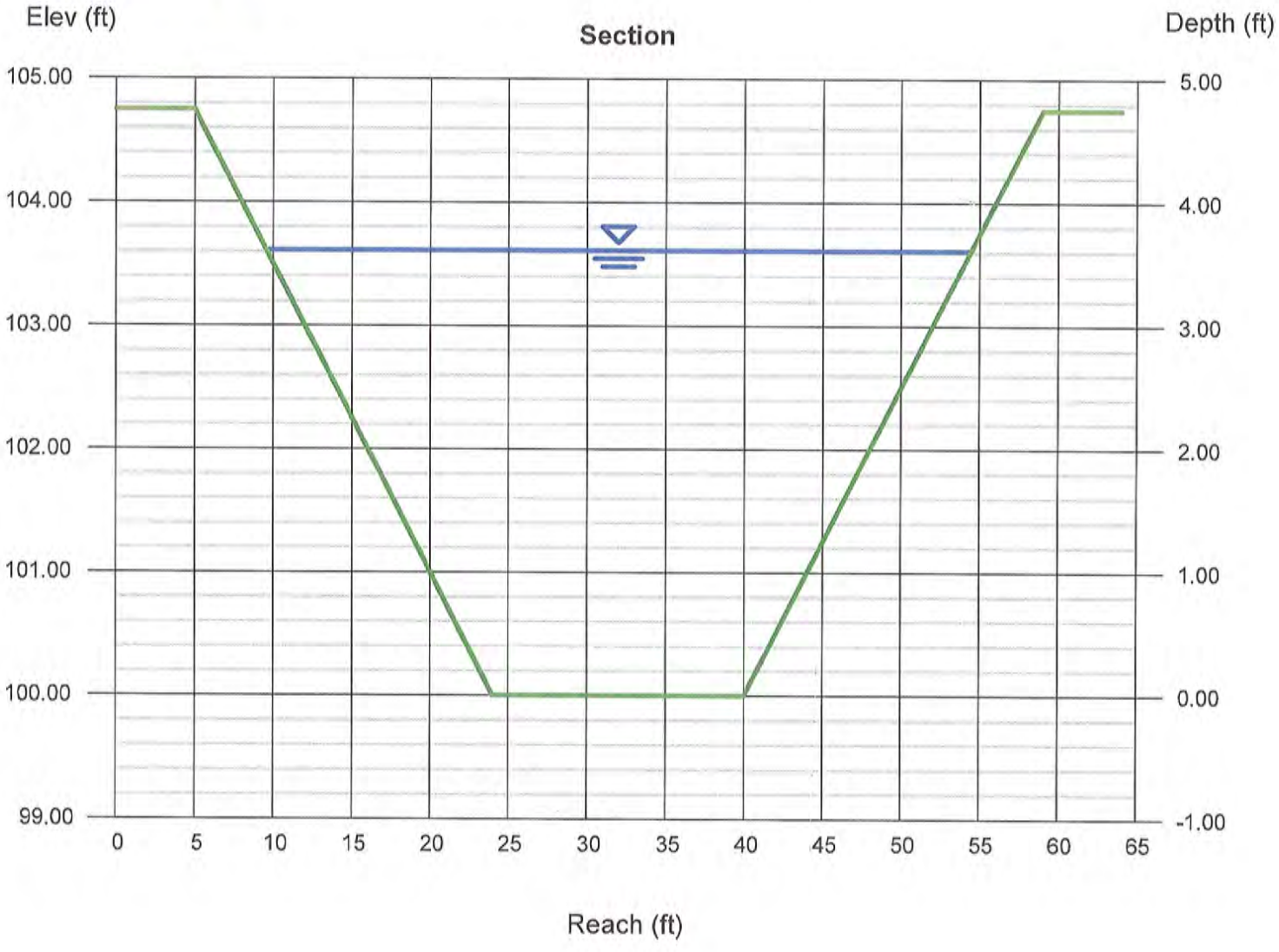
Compute by:	Known Q
Known Q (cfs)	= 534.00

$F_R = \frac{V}{\sqrt{gL}}$

WHERE V = VELOCITY
g = GRAV. ACCEL. (32.2)
L = HYDRAULIC DEPTH

$L = \frac{\text{FLOW AREA}}{\text{TOP WIDTH}} = \frac{109.89}{44.88} = 2.45$

$F_R = \frac{4.86}{\sqrt{(32.2)(2.45)}} = 0.55$



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Apr 17 2018

TEMPORARY SPILLOVER CHANNEL B - Q100

Trapezoidal

Bottom Width (ft)	= 30.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.60
Invert Elev (ft)	= 100.00
Slope (%)	= 0.10
N-Value	= 0.030

Highlighted

Depth (ft)	= 1.60
Q (cfs)	= 110.80
Area (sqft)	= 58.24
Velocity (ft/s)	= 1.90
Wetted Perim (ft)	= 43.19
Crit Depth, Yc (ft)	= 0.73
Top Width (ft)	= 42.80
EGL (ft)	= 1.66

Calculations

Compute by: Known Q

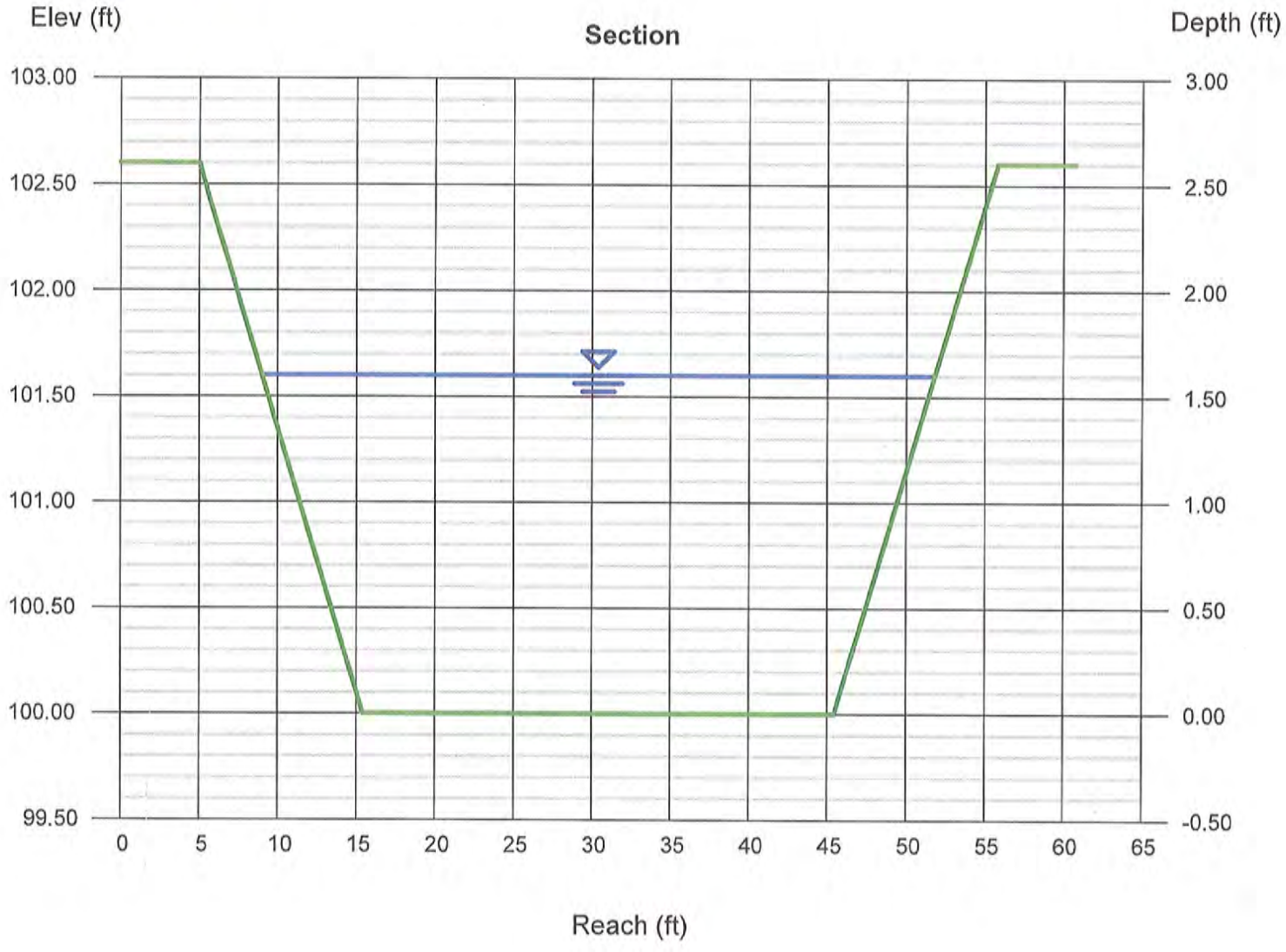
Known Q (cfs) = 110.80

$F_R = \frac{V}{\sqrt{gL}}$

$L = \frac{\text{FLOW AREA}}{\text{TOP WIDTH}} = \frac{58.24}{42.80} = 1.361$

$F_R = \frac{1.90}{\sqrt{(32.2)(1.361)}} = 0.29$

WHERE V = VELOCITY
g = GRAV. ACCEL (32.2)
L = HYDRAULIC DEPTH



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Oct 9 2017

CHANNEL C AT DP 507A - Q100

Trapezoidal

Bottom Width (ft)	= 10.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.60
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 161.00

Highlighted

Depth (ft)	= 2.11
Q (cfs)	= 161.00
Area (sqft)	= 38.91
Velocity (ft/s)	= 4.14
Wetted Perim (ft)	= 27.40
Crit Depth, Yc (ft)	= 1.61
Top Width (ft)	= 26.88
EGL (ft)	= 2.38

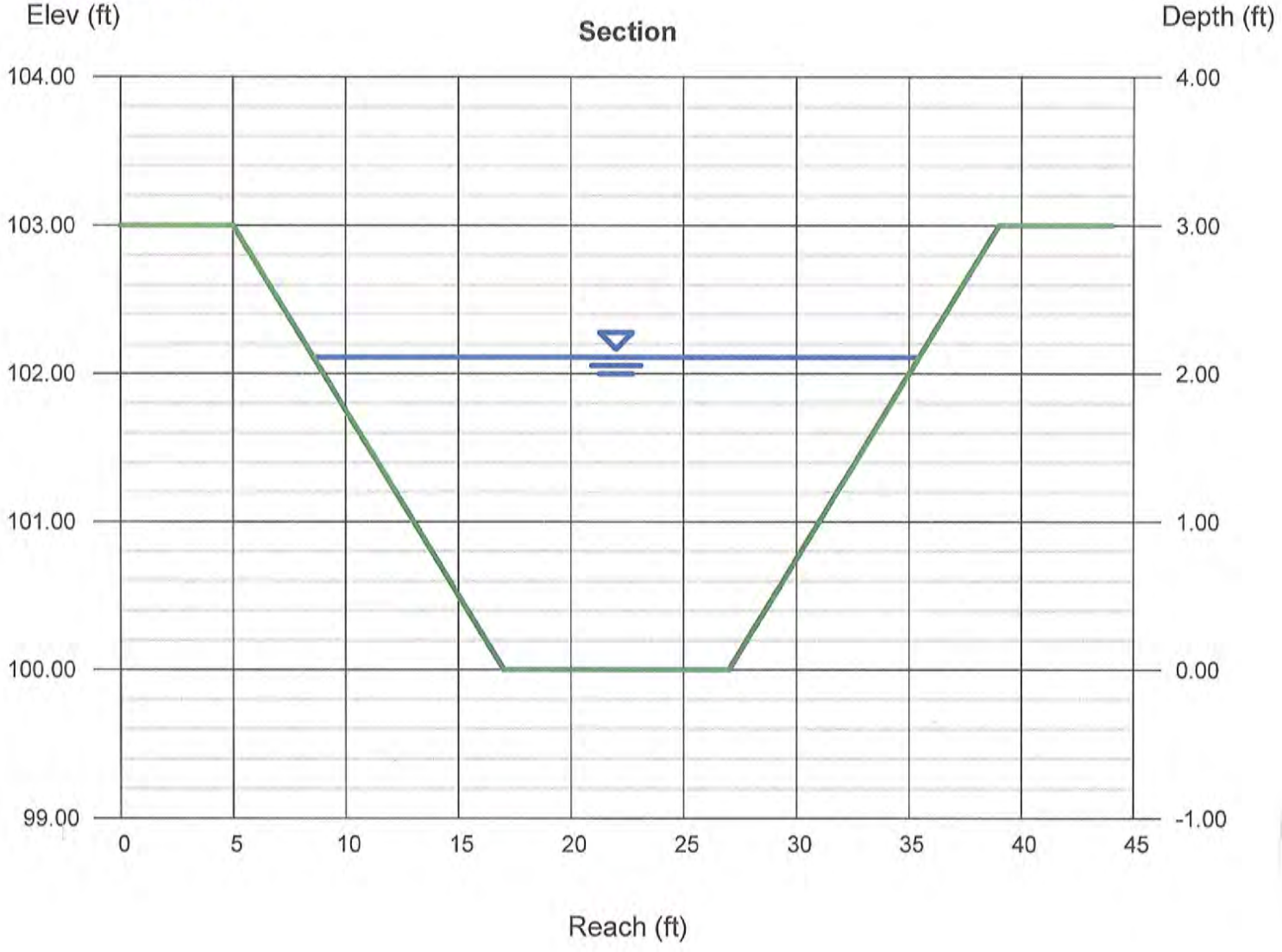
$F_R = \frac{V}{\sqrt{gL}}$

$L = \frac{\text{FLOW AREA}}{\text{TOP WIDTH}} = \frac{38.91}{26.88} = 1.448$

FROUDE NUMBER

$F_R = \frac{4.14}{\sqrt{(32.2)(1.448)}} = 0.61$

WHERE V = VELOCITY
g = GRAV. ACCELERATION (32.2)
L = HYDRAULIC DEPTH



Appendix D

Erie OSP Maps w/ Parkdale Development

CUHP/SWMM Models For:
Existing Conditions (Pond B, Drainageway 2 North/South)
Ultimate Conditions (Pond B, Drainageway 2 North/South)
Drainageway 1 - Existing Conditions
Drainageway 1 - Proposed Conditions
Low Area Analysis - Existing Conditions
Low Area Analysis - Proposed Conditions

LEGEND

- Study Area Boundary
- Town of Erie
- City of Lafayette
- Subbasin Boundary
- Major Watershed Boundary
- Regional Detention Ponds

XXX — Subbain ID
XX | X X — % Impervious (Existing Land Use) / % Impervious (Future Land Use)
Area (Acres)

- BASIN POND A
- BASIN POND B
- BASIN OSP POND 1060
- DRAINAGE CHANNEL
- PARKDALE BOUNDARY

DENOTES MODIFIED BASINS IN POND B ULTIMATE SWMM ANALYSIS

ULTIMATE POND B TRIBUTARY AREA UPON CONSTRUCTION OF REGIONAL POND 1060

PROPERTY BOUNDARY

CHANNEL A

CHANNEL C

SPILLOVER CHANNEL B

KEY MAP

N W E S

0 750 1,500 3,000 Feet

1 " = 1,500 FT

M:\2234\GIS\2234.MXD - 12/12/12 - NRT

WRC ENGINEERING, INC.
950 SOUTH CHERRY STREET, SUITE 404
DENVER, COLORADO 80246
PHONE: 303-757-8513
FAX: 303-758-3208

TOWN OF ERIE
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

TOWN OF ERIE OUTFALL SYSTEMS PLAN
(WEST OF COAL CREEK)

SUBBASIN MAP

FIGURE B-2

LEGEND

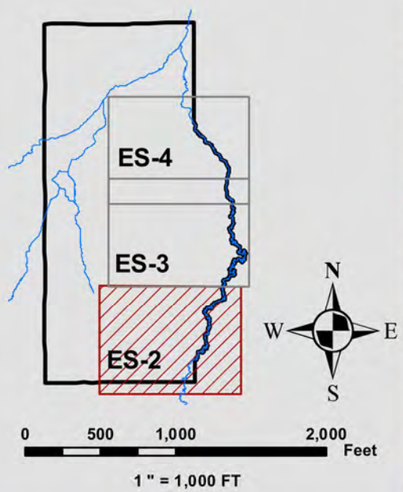
- Study Area Boundary
- Erie Planning Area Boundary
- Town of Erie
- City of Lafayette
- 100-Year Floodplain (FIS)
- Existing Detention Ponds
- Outfall Alignment
  (Outfall Name)

Note: 100-Year floodplain information from Boulder County Flood Insurance Study (FIS), FEMA, December 18, 2012

CONCEPTUAL DESIGN

- Storm Sewer
- Channel
- Regional Detention
- Culvert/Bridge Improvements
- Bank Stabilization
- Property Acquisition

KEY MAP



BASIN POND A

BASIN POND B

BASIN OSP POND 1060

DRAINAGE CHANNEL

PROPERTY BOUNDARY

N 119TH STREET

COUNTY LINE ROAD

UNINCORPORATED BOULDER COUNTY

CITY OF LAFAYETTE

ERIE FARMS

ARAPAHOE ROAD

BASELINE ROAD

Erie Farms 1

Erie Farms 2

Arapahoe Road

Drainageway 1

Drainageway 2 North

Drainageway 2 South

Coal Creek

Existing Sanitary Sewer

RR ROW

Extend Irrigation Ditch Pipe

2 - 72" RCP

2 - 48" RCP

4' x 6' RCBC

1053

1054

1055

1061

1060

REACH 1

REACH 2

CHANNEL A

CHANNEL C

SPILLOVER CHANNEL B

A
30 | 52%

B
344 | 35%

Conceptual Design Plan
Erie Farms 1 - Reach 1
Regional detention with
100-year storm conveyance
V=14 ac-ft
Qin=575 cfs, Qout=480 cfs

Conceptual Design Plan
Erie Farms 1 - Reach 2
No proposed improvements

Conceptual Design Plan
Erie Farms 2
Erie Farms 2 outfall will be combined with Erie Farms 1 outfall as proposed in the Erie Farms phase III drainage report

Conceptual Design Plan
Arapahoe Road - Reach 1
Regional detention with
100-year storm conveyance
V=4 ac-ft
Qin=191 cfs, Qout=163 cfs

Conceptual Design Plan
Arapahoe Road - Reach 2
No proposed improvements

Conceptual Design Plan
Drainageway 1 - Reach 1
Water Quality (EURV only)
V=3 ac-ft
Qin=377 cfs
Qout=375 cfs

Conceptual Design Plan
Drainageway 1 - Reach 2
No proposed improvements

Conceptual Design Plan
Drainageway 2 South - Reach 2
Regional detention with
100-year storm conveyance
V=31 ac-ft
Qin=1,253 cfs, Qout=866 cfs

Conceptual Design Plan
Drainageway 2 North - Reach 1
The recommended plan for this outfall is to divert 222 cfs of the Drainageway 2 South outfall along the railroad right-of-way

Conceptual Design Plan
Drainageway 2 South - Reach 1
Optimization of stormwater facilities, convey minor storm event

M:\2234\GIS\2234 CONCEPTUAL DESIGN SCHEMATIC.MXD - 3/1/13 - NRT

RESPEC
720 SOUTH COLORADO BLVD, SUITE 410S
DENVER, COLORADO 80246
PHONE: 303-757-3655
FAX: 303-300-1635

TOWN OF ERIE - CITY OF LAFAYETTE - BOULDER COUNTY
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

TOWN OF ERIE OUTFALL SYSTEMS PLAN
(WEST OF COAL CREEK)

CONCEPTUAL DESIGN PLAN
COAL CREEK TRIBUTARIES

FIGURE
ES-2

LEGEND

- Study Area Boundary
- Town of Erie
- City of Lafayette
- Subbasin Boundary
- Major Watershed Boundary
- Regional Detention Ponds

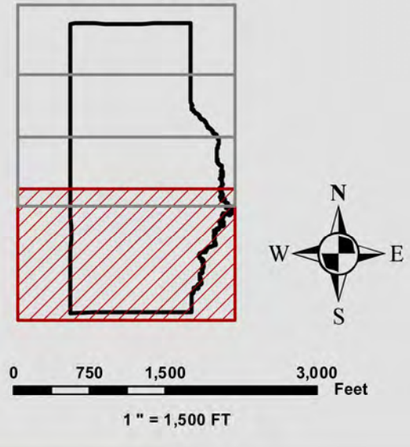
SWMM Elements

- Subbasin (xxx)
- Design Point (xxx)
- Conveyance Element (xxx)
- Detention Facility (xxx)
- Outfall (xxx)
- Revised SWMM Routing (xxx)

ULTIMATE CONDITION SWMM ROUTING
POND B, DRAINAGEWAY 2 SOUTH/NORTH

DRAINAGEWAY 1 SWMM ROUTING

KEY MAP



0 750 1,500 3,000 Feet

1 " = 1,500 FT

M:\2234\GIS\2234.MXD - 12/12/12 - NRT

PARKDALE SWMM MODEL

RESPEC
720 SOUTH COLORADO BLVD, SUITE 410S
DENVER, COLORADO 80246
PHONE: 303-757-3655
FAX: 303-300-1635

TOWN OF ERIE - CITY OF LAFAYETTE - BOULDER COUNTY
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

TOWN OF ERIE OUTFALL SYSTEMS PLAN
(WEST OF COAL CREEK)

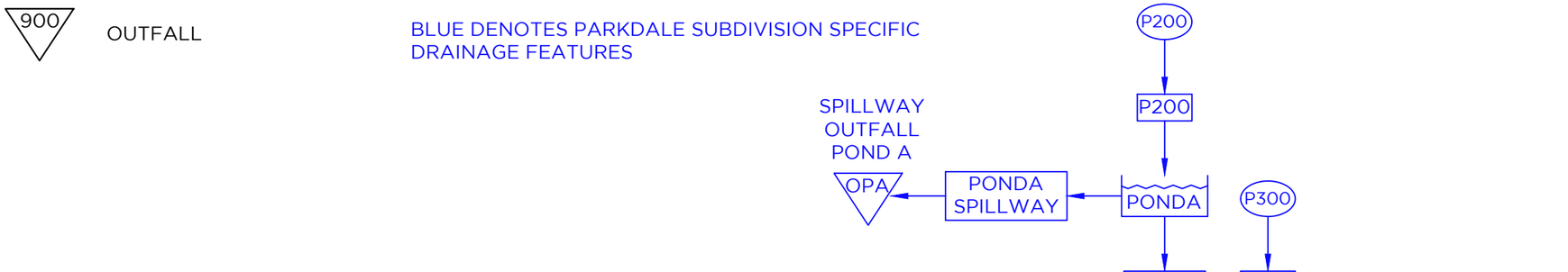
SWMM ROUTING MAP
CONCEPTUAL DESIGN PLAN

FIGURE
G-1

PARKDALE - POND B - ULTIMATE CONDITION
SWMM SCHEMATIC

LEGEND

501	DESIGN POINT	414	CONVEYANCE ELEMENT
424	SUBBASIN	500	OVERFLOW CONVEYANCE ELEMENT
1060	DETENTION FACILITY	→	SURFACE OVERFLOW
900	OUTFALL	BLUE DENOTES PARKDALE SUBDIVISION SPECIFIC DRAINAGE FEATURES	



KT ENGINEERING
12500 W. 58th AVE. #230
ARVADA, CO 80002
PH: 720.638.5190

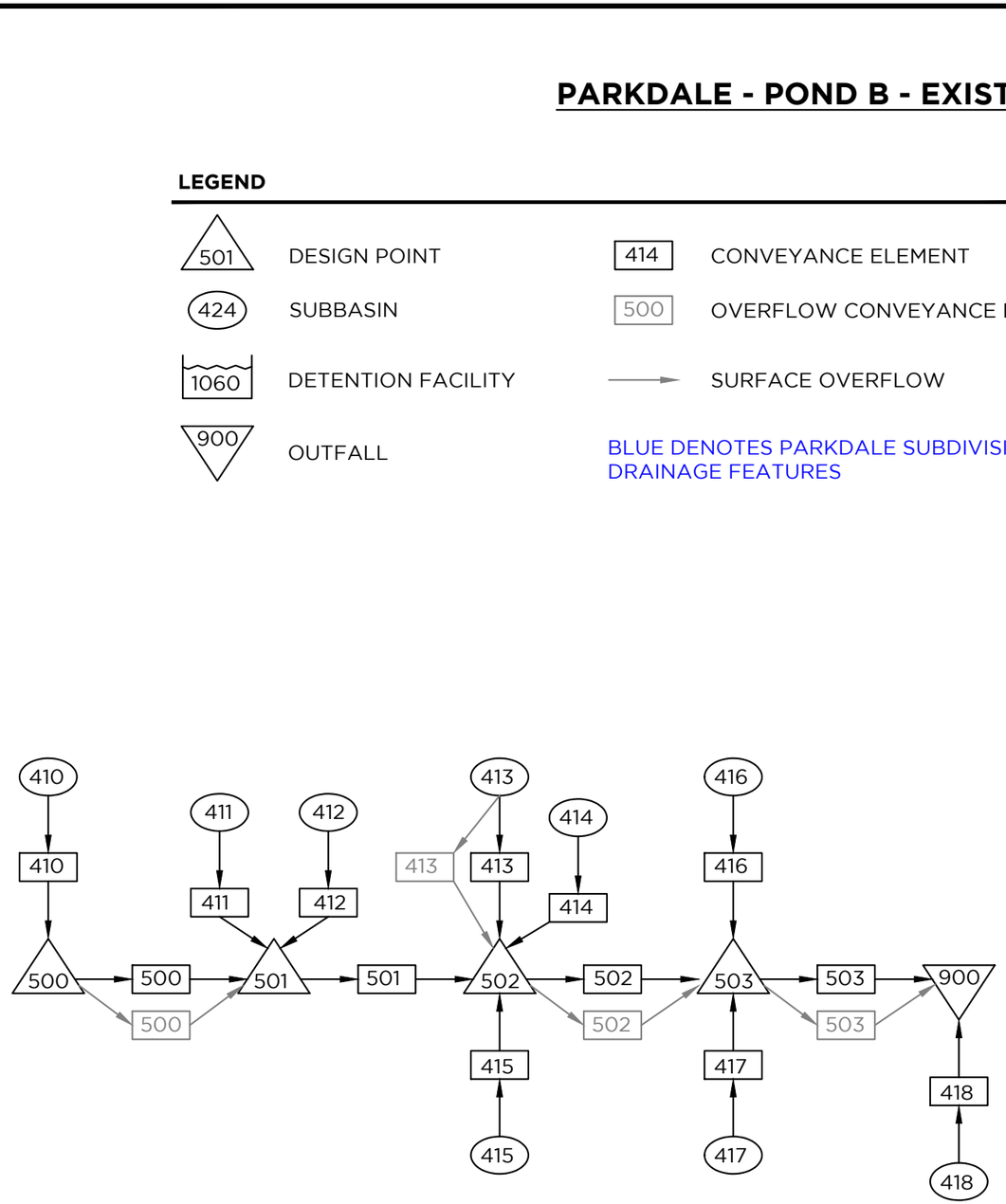
04.16.2018

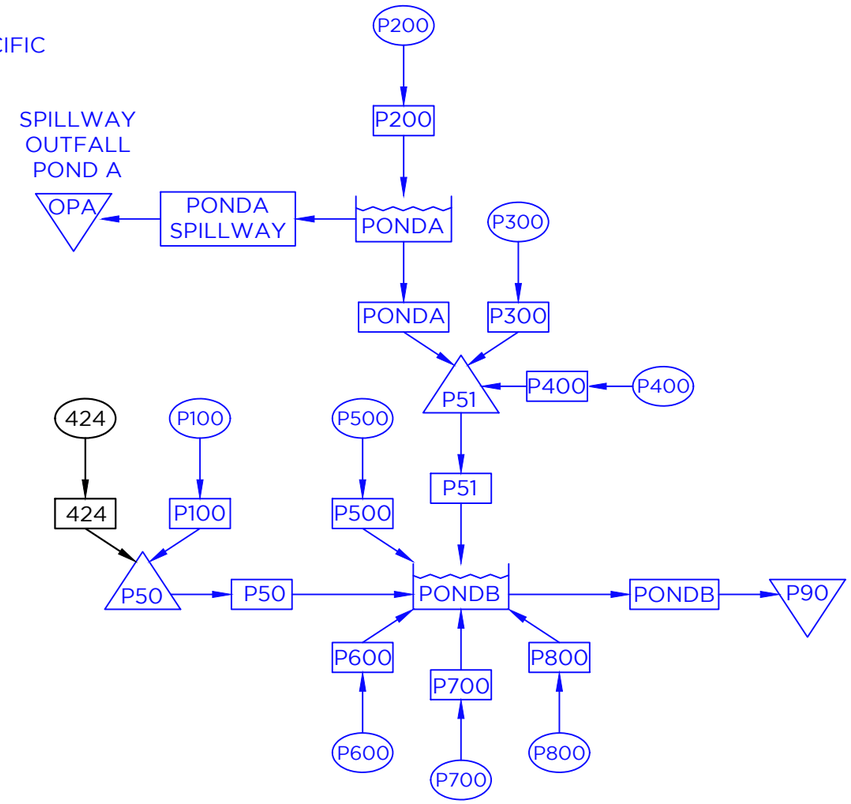
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PARKDALE - POND B - EXISTING CONDITION (W/ FUTURE IMPERVIOUSNESS)
SWMM SCHEMATIC

LEGEND

501	DESIGN POINT	414	CONVEYANCE ELEMENT
424	SUBBASIN	500	OVERFLOW CONVEYANCE ELEMENT
1060	DETENTION FACILITY	→	SURFACE OVERFLOW
900	OUTFALL	BLUE DENOTES PARKDALE SUBDIVISION SPECIFIC DRAINAGE FEATURES	





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PH: 720.638.5190

04.16.2018

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PROJECT: PARKDALE – PH. II DRAINAGE

SHEET TITLE: POND B – SWMM SUMMARY TABLE

ULTIMATE CONDITION (POND B, DRAINAGEWAY 2 NORTH/SOUTH		
SWMM DESIGN POINT	PROPOSED 2YR (CFS)	PROPOSED 100YR (CFS)
500	115	507
501	240	1052
502	282	1341
503	71	646
900	67	684
P50	135	534
P51	41	193
P90	98	636

EXISTING CONDITION (POND B, DRAINAGEWAY 2 NORTH/SOUTH		
SWMM DESIGN POINT	PROPOSED 2YR (CFS)	PROPOSED 100YR (CFS)
500	115	507
501	240	1052
502	283	1342
503	311	1514
900	275	1536
P50	60	360
P51	40	193
P90	3	454

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

PARKDALE SUBDIVISION
EXISTING CONDITION (FUT. IMPERVIOUSNESS)
POND B, DRAINAGEWAY 2 SOUTH AND NORTH
(2-YR)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 10/03/2017 01:00:00
Ending Date 10/03/2017 13:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 60.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	33.635	10.960
External Outflow	28.936	9.429
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000

```
Exfiltration Loss ........          0.000          0.000
Initial Stored Volume ....          0.000          0.000
Final Stored Volume ......          7.012          2.285
Continuity Error (%) .....         -6.875
```

```
*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.
```

```
*************************
Routing Time Step Summary
*************************
Minimum Time Step           :    60.00 sec
Average Time Step           :    60.00 sec
Maximum Time Step           :    60.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.02
Percent Not Converging      :     0.00
```

```
******************
Node Depth Summary
******************
```

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
JUNCT_410	JUNCTION	0.00	0.00	5303.69	0 00:00	0.00
JUNCT_411	JUNCTION	0.00	0.00	5231.98	0 00:00	0.00
JUNCT_412	JUNCTION	0.00	0.00	5231.98	0 00:00	0.00
JUNCT_414	JUNCTION	0.00	0.00	5187.29	0 00:00	0.00
JUNCT_415	JUNCTION	0.00	0.00	5187.29	0 00:00	0.00
JUNCT_416	JUNCTION	0.00	0.00	5149.83	0 00:00	0.00
JUNCT_417	JUNCTION	0.00	0.00	5149.83	0 00:00	0.00
JUNCT_418	JUNCTION	0.00	0.00	5086.35	0 00:00	0.00
JUNCT_P50	JUNCTION	0.10	1.09	5128.69	0 00:36	1.08
JUNCT_424	JUNCTION	0.02	0.13	5160.13	0 00:46	0.13
JUNCT_P100	JUNCTION	0.00	0.00	5127.70	0 00:00	0.00
JUNCT_P200	JUNCTION	0.00	0.00	5139.00	0 00:00	0.00
JUNCT_P300	JUNCTION	0.13	1.19	5117.19	0 00:36	1.17

JUNCT_PONDA	JUNCTION	0.21	0.40	5136.69	0	02:03	0.40
JUNCT_P400	JUNCTION	0.00	0.00	5108.35	0	00:00	0.00
JUNCT_P500	JUNCTION	0.04	0.44	5098.44	0	00:36	0.44
JUNCT_P600	JUNCTION	0.00	0.00	5092.00	0	00:00	0.00
JUNCT_P700	JUNCTION	0.02	0.11	5114.11	0	00:51	0.11
JUNCT_P800	JUNCTION	0.00	0.00	5091.60	0	00:00	0.00
JUNCT_P51	JUNCTION	0.28	1.19	5109.44	0	00:37	1.17
OUTFALL_900	OUTFALL	0.21	1.35	5087.69	0	01:04	1.34
OUTFALL_P90	OUTFALL	0.00	0.00	5081.00	0	00:00	0.00
SPILLWAY-OFL-PONDA	OUTFALL	0.00	0.00	5138.80	0	00:00	0.00
JUNCT_500	DIVIDER	0.19	1.89	5305.57	0	00:36	1.88
JUNCT_501	DIVIDER	0.25	2.17	5234.14	0	00:38	2.15
JUNCT_502	DIVIDER	0.30	2.55	5189.83	0	00:41	2.54
JUNCT_413	DIVIDER	0.04	0.21	5202.12	0	00:46	0.21
JUNCT_503	DIVIDER	0.32	2.51	5152.33	0	00:49	2.51
STORAGE_PONDB	STORAGE	5.90	6.54	5098.04	0	03:51	6.54
STORAGE_PONDA	STORAGE	4.06	5.13	5144.03	0	02:03	5.13

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
JUNCT_410	JUNCTION	115.31	115.31	0	00:36	2.4	2.4	0.000
JUNCT_411	JUNCTION	98.30	98.30	0	00:31	1.45	1.45	0.000
JUNCT_412	JUNCTION	89.86	89.86	0	00:31	1.39	1.39	0.000
JUNCT_414	JUNCTION	33.78	33.78	0	00:36	0.78	0.78	0.000
JUNCT_415	JUNCTION	17.82	17.82	0	00:36	0.452	0.452	0.000
JUNCT_416	JUNCTION	16.67	16.67	0	00:41	0.452	0.452	0.000
JUNCT_417	JUNCTION	28.83	28.83	0	00:36	0.653	0.653	0.000
JUNCT_418	JUNCTION	9.23	9.23	0	00:46	0.362	0.362	0.000
JUNCT_P50	JUNCTION	0.00	59.59	0	00:36	0	1.15	0.000
JUNCT_424	JUNCTION	1.32	1.32	0	00:46	0.037	0.037	0.000
JUNCT_P100	JUNCTION	59.51	59.51	0	00:36	1.11	1.11	0.000
JUNCT_P200	JUNCTION	22.85	22.85	0	00:31	0.387	0.387	0.000
JUNCT_P300	JUNCTION	36.72	36.72	0	00:36	0.771	0.771	0.000
JUNCT_PONDA	JUNCTION	0.00	2.20	0	02:03	0	0.226	0.000
JUNCT_P400	JUNCTION	4.02	4.02	0	00:31	0.0824	0.0824	0.000
JUNCT_P500	JUNCTION	7.57	7.57	0	00:36	0.166	0.166	-0.000

JUNCT_P600	JUNCTION	16.97	16.97	0	00:36	0.349	0.349	0.000	
JUNCT_P700	JUNCTION	0.87	0.87	0	00:51	0.0322	0.0322	0.000	
JUNCT_P800	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	gal
JUNCT_P51	JUNCTION	0.00	40.25	0	00:37	0	1.07	0.000	
OUTFALL_900	OUTFALL	0.00	275.19	0	01:04	0	8.56	0.000	
OUTFALL_P90	OUTFALL	0.00	3.01	0	03:51	0	0.872	0.000	
SPILLWAY-OFL-PONDA	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	gal
JUNCT_500	DIVIDER	0.00	115.31	0	00:36	0	2.4	0.000	
JUNCT_501	DIVIDER	0.00	239.91	0	00:38	0	5.27	0.000	
JUNCT_502	DIVIDER	0.00	282.54	0	00:41	0	6.62	-0.000	
JUNCT_413	DIVIDER	1.91	1.91	0	00:46	0.0808	0.0808	0.000	
JUNCT_503	DIVIDER	0.00	311.10	0	00:48	0	7.77	0.000	
STORAGE_PONDB	STORAGE	0.00	85.52	0	00:49	0	2.98	-0.001	
STORAGE_PONDA	STORAGE	0.00	22.85	0	00:31	0	0.387	0.059	

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STORAGE_PONDB	289.054	22	0	0	346.353	26	0 03:51	3.01
STORAGE_PONDA	27.562	16	0	0	41.703	24	0 02:02	2.20

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal

OUTFALL_900	98.47	26.89	275.19	8.556
OUTFALL_P90	98.33	2.75	3.01	0.872
SPILLWAY-OFL-PONDA	0.00	0.00	0.00	0.000
System	65.60	29.64	277.11	9.428

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
410	DUMMY	115.31	0	00:36			
500	CONDUIT	108.45	0	00:46	5.92	0.35	0.61
500_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
411	DUMMY	98.30	0	00:31			
412	DUMMY	89.86	0	00:31			
501	CONDUIT	233.29	0	00:43	6.86	0.51	0.71
501_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
413_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
413	CONDUIT	1.89	0	00:53	1.60	0.01	0.07
414	DUMMY	33.78	0	00:36			
415	DUMMY	17.82	0	00:36			
417	DUMMY	28.83	0	00:36			
503	CONDUIT	24.01	0	00:34	5.43	1.00	1.00
503_OVERFLOW	CONDUIT	243.34	0	01:04	5.03	0.01	0.13
418	DUMMY	9.23	0	00:46			
424	CONDUIT	1.15	0	00:59	1.23	0.00	0.04
P100	DUMMY	59.51	0	00:36			
P50	CONDUIT	37.82	0	00:58	2.80	0.04	0.17
P200	DUMMY	22.85	0	00:31			
P400	DUMMY	4.02	0	00:31			
P500	CONDUIT	7.27	0	00:40	1.52	0.01	0.09
P600	DUMMY	16.97	0	00:36			
P800	DUMMY	0.00	0	00:00			
P700	CONDUIT	0.64	0	01:31	0.62	0.00	0.02
PONDA	CONDUIT	2.20	0	02:10	4.32	0.06	0.16
P51	CONDUIT	37.87	0	00:44	2.77	0.05	0.21
P300	CONDUIT	36.35	0	00:37	10.20	0.12	0.24
416	DUMMY	16.67	0	00:41			
502	CONDUIT	273.42	0	00:49	6.45	0.70	0.83

502_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OUTLET_PONDA	DUMMY	2.20	0	02:03			
OUTLET_PONDB	DUMMY	3.01	0	03:51			
SPILLWAY-PONDA	DUMMY	0.00	0	00:00			

****
Conduit Surcharge Summary
****

Conduit	Hours Full			Hours Above Full Normal Flow	Hours Capacity Limited
	Both Ends	Upstream	Dnstream		
503	2.15	2.15	2.15	2.12	2.15

Analysis begun on: Mon Apr 16 11:58:44 2018
Analysis ended on: Mon Apr 16 11:58:44 2018
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

PARKDALE SUBDIVISION
ULTIMATE CONDITION
POND B, DRAINAGEWAY 2 SOUTH AND NORTH
(2-YR)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 10/03/2017 01:00:00
Ending Date 10/03/2017 13:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 60.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	33.908	11.049
External Outflow	22.939	7.475
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	12.518	4.079
Continuity Error (%)	-4.568	

```
*******************************
Highest Flow Instability Indexes
*******************************
Link P50 (2)
Link 503 (1)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :    60.00 sec
Average Time Step           :    60.00 sec
Maximum Time Step           :    60.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.03
Percent Not Converging      :     0.00


******************
Node Depth Summary
******************
```

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
JUNCT_410	JUNCTION	0.00	0.00	5303.69	0 00:00	0.00
JUNCT_411	JUNCTION	0.00	0.00	5231.98	0 00:00	0.00
JUNCT_412	JUNCTION	0.00	0.00	5231.98	0 00:00	0.00
JUNCT_414	JUNCTION	0.00	0.00	5188.81	0 00:00	0.00
JUNCT_415	JUNCTION	0.00	0.00	5188.80	0 00:00	0.00
JUNCT_1060B	JUNCTION	0.00	0.10	5169.60	0 01:21	0.10
JUNCT_1060A	JUNCTION	0.35	1.29	5170.79	0 01:21	1.29
JUNCT_416U	JUNCTION	0.00	0.00	5170.01	0 00:00	0.00
JUNCT_417U	JUNCTION	0.00	0.00	5149.83	0 00:00	0.00
JUNCT_418	JUNCTION	0.00	0.00	5086.35	0 00:00	0.00
JUNCT_P50	JUNCTION	0.45	1.71	5129.31	0 01:12	1.70
JUNCT_424	JUNCTION	0.02	0.13	5160.13	0 00:46	0.13
JUNCT_P100	JUNCTION	0.00	0.00	5127.70	0 00:00	0.00
JUNCT_P200	JUNCTION	0.00	0.00	5139.00	0 00:00	0.00
JUNCT_P300	JUNCTION	0.13	1.19	5117.19	0 00:36	1.17
JUNCT_PONDA	JUNCTION	0.21	0.40	5136.69	0 02:03	0.40
JUNCT_P400	JUNCTION	0.00	0.00	5108.35	0 00:00	0.00
JUNCT_P500	JUNCTION	0.04	0.44	5098.44	0 00:36	0.44
JUNCT_P600	JUNCTION	0.00	0.00	5092.00	0 00:00	0.00
JUNCT_P700	JUNCTION	0.02	0.11	5114.11	0 00:51	0.11

JUNCT_P800	JUNCTION	0.00	0.00	5091.60	0	00:00	0.00
JUNCT_P51	JUNCTION	0.28	1.19	5109.44	0	00:37	1.17
OUTFALL_900	OUTFALL	0.07	0.50	5086.84	0	00:29	0.50
OUTFALL_P90	OUTFALL	0.00	0.00	5081.00	0	00:00	0.00
SPILLWAY-OFL-PONDA	OUTFALL	0.00	0.00	5138.80	0	00:00	0.00
JUNCT_500	DIVIDER	0.19	1.89	5305.57	0	00:36	1.88
JUNCT_501	DIVIDER	0.25	2.19	5234.16	0	00:38	2.17
JUNCT_502	DIVIDER	0.33	2.80	5191.59	0	00:42	2.79
JUNCT_413	DIVIDER	0.04	0.22	5202.13	0	00:46	0.22
JUNCT_503	DIVIDER	0.06	0.59	5150.41	0	00:31	0.57
STOR_1060	STORAGE	0.18	1.04	5171.04	0	01:21	1.04
STORAGE_PONDB	STORAGE	7.21	8.14	5099.64	0	02:36	8.14
STORAGE_PONDA	STORAGE	4.06	5.13	5144.03	0	02:03	5.13

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent	
JUNCT_410	JUNCTION	115.31	115.31	0	00:36	2.4	2.4	0.000	
JUNCT_411	JUNCTION	98.30	98.30	0	00:31	1.45	1.45	0.000	
JUNCT_412	JUNCTION	89.86	89.86	0	00:31	1.39	1.39	0.000	
JUNCT_414	JUNCTION	33.78	33.78	0	00:36	0.78	0.78	0.000	
JUNCT_415	JUNCTION	17.82	17.82	0	00:36	0.452	0.452	0.000	
JUNCT_1060B	JUNCTION	0.00	4.36	0	01:21	0	0.0332	0.000	
JUNCT_1060A	JUNCTION	0.00	120.82	0	01:21	0	6.83	0.000	
JUNCT_416U	JUNCTION	8.86	8.86	0	00:41	0.233	0.233	0.000	
JUNCT_417U	JUNCTION	71.01	71.01	0	00:31	0.961	0.961	0.000	
JUNCT_418	JUNCTION	9.23	9.23	0	00:46	0.362	0.362	0.000	
JUNCT_P50	JUNCTION	0.00	134.64	0	01:12	0	7.96	0.000	
JUNCT_424	JUNCTION	1.32	1.32	0	00:46	0.037	0.037	0.000	
JUNCT_P100	JUNCTION	59.51	59.51	0	00:36	1.11	1.11	0.000	
JUNCT_P200	JUNCTION	22.85	22.85	0	00:31	0.387	0.387	0.000	
JUNCT_P300	JUNCTION	36.72	36.72	0	00:36	0.771	0.771	0.000	
JUNCT_PONDA	JUNCTION	0.00	2.20	0	02:03	0	0.226	0.000	
JUNCT_P400	JUNCTION	4.02	4.02	0	00:31	0.0824	0.0824	0.000	
JUNCT_P500	JUNCTION	7.57	7.57	0	00:36	0.166	0.166	-0.000	
JUNCT_P600	JUNCTION	16.97	16.97	0	00:36	0.349	0.349	0.000	
JUNCT_P700	JUNCTION	0.87	0.87	0	00:51	0.0322	0.0322	0.000	
JUNCT_P800	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	gal
JUNCT_P51	JUNCTION	0.00	40.25	0	00:37	0	1.07	0.000	
OUTFALL_900	OUTFALL	0.00	66.74	0	00:48	0	1.59	0.000	
OUTFALL_P90	OUTFALL	0.00	97.93	0	02:36	0	5.88	0.000	

SPILLWAY-OFL-PONDA	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	gal
JUNCT_500	DIVIDER	0.00	115.31	0	00:36	0	2.4	0.000	
JUNCT_501	DIVIDER	0.00	239.91	0	00:38	0	5.27	0.000	
JUNCT_502	DIVIDER	0.00	282.20	0	00:42	0	6.62	0.000	
JUNCT_413	DIVIDER	1.91	1.91	0	00:46	0.0808	0.0808	0.000	
JUNCT_503	DIVIDER	0.00	71.01	0	00:31	0	1.01	0.000	
STOR_1060	STORAGE	0.00	284.23	0	00:48	0	6.88	0.189	
STORAGE_PONDB	STORAGE	0.00	144.84	0	01:39	0	9.78	0.123	
STORAGE_PONDA	STORAGE	0.00	22.85	0	00:31	0	0.387	0.059	

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STOR_1060	63.991	3	0	0	369.746	20	0 01:20	125.18
STORAGE_PONDB	554.177	42	0	0	724.316	55	0 02:35	97.93
STORAGE_PONDA	27.562	16	0	0	41.703	24	0 02:02	2.20

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OUTFALL_900	98.47	5.01	66.74	1.594
OUTFALL_P90	98.33	18.51	97.93	5.881
SPILLWAY-OFL-PONDA	0.00	0.00	0.00	0.000
System	65.60	23.52	102.45	7.475

****

Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
410	DUMMY	115.31	0	00:36			
500	CONDUIT	108.45	0	00:46	5.92	0.35	0.61
500_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
411	DUMMY	98.30	0	00:31			
412	DUMMY	89.86	0	00:31			
501	CONDUIT	233.14	0	00:43	6.78	0.52	0.72
501_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
502	CONDUIT	276.35	0	00:48	5.60	0.85	0.92
502_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
413_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
413	CONDUIT	1.89	0	00:53	1.54	0.01	0.07
414	DUMMY	33.78	0	00:36			
415	DUMMY	17.82	0	00:36			
1060B	CONDUIT	4.30	0	01:36	1.50	0.00	0.01
417U	DUMMY	71.01	0	00:31			
503	CONDUIT	24.01	0	00:29	5.60	1.00	1.00
503_OVERFLOW	CONDUIT	33.58	0	00:48	5.03	0.00	0.04
418	DUMMY	9.23	0	00:46			
1060A	CONDUIT	120.80	0	01:22	17.27	0.22	0.32
424	CONDUIT	1.15	0	00:59	1.23	0.00	0.04
P100	DUMMY	59.51	0	00:36			
P50	CONDUIT	128.95	0	01:42	3.54	0.13	0.35
P200	DUMMY	22.85	0	00:31			
P400	DUMMY	4.02	0	00:31			
P500	CONDUIT	7.27	0	00:40	1.52	0.01	0.09
P600	DUMMY	16.97	0	00:36			
P800	DUMMY	0.00	0	00:00			
P700	CONDUIT	0.64	0	01:31	0.62	0.00	0.02
PONDA	CONDUIT	2.20	0	02:10	4.32	0.06	0.16
P51	CONDUIT	37.87	0	00:44	2.77	0.05	0.21
416U	DUMMY	8.86	0	00:41			
P300	CONDUIT	36.35	0	00:37	10.20	0.12	0.24
OUTLET_1060B	DUMMY	4.36	0	01:21			
OUTLET_1060A	DUMMY	120.82	0	01:21			
OUTLET_PONDA	DUMMY	2.20	0	02:03			
OUTLET_PONDB	DUMMY	97.93	0	02:36			
SPILLWAY-PONDA	DUMMY	0.00	0	00:00			

****
Conduit Surcharge Summary

****

Conduit	Hours Full (Both Ends)	Hours Full (Upstream)	Hours Full (Dnstream)	Hours Above Full Normal Flow	Hours Capacity Limited
503	0.43	0.43	0.43	0.38	0.43

Analysis begun on: Mon Apr 16 10:40:06 2018
Analysis ended on: Mon Apr 16 10:40:06 2018
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

PARKDALE SUBDIVISION
EXISTING CONDITION (FUT. IMPERVIOUSNESS)
POND B, DRAINAGEWAY 2 SOUTH AND NORTH
(100-YR)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 10/03/2017 01:00:00
Ending Date 10/03/2017 13:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 60.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	181.277	59.072
External Outflow	177.010	57.681
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000

```
Exfiltration Loss ........          0.000          0.000
Initial Stored Volume ....          0.000          0.000
Final Stored Volume ......         14.454          4.710
Continuity Error (%) .....         -5.620
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*******************************
Highest Flow Instability Indexes
*******************************
Link PONDA (1)
Link 503 (1)
Link P500 (1)
Link 501 (1)
```

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*************************
Routing Time Step Summary
*************************
Minimum Time Step           :    60.00 sec
Average Time Step           :    60.00 sec
Maximum Time Step           :    60.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.07
Percent Not Converging      :     0.00
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Node Depth Summary
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Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
JUNCT_410	JUNCTION	0.00	0.00	5303.69	0 00:00	0.00
JUNCT_411	JUNCTION	0.00	0.00	5231.98	0 00:00	0.00
JUNCT_412	JUNCTION	0.00	0.00	5231.98	0 00:00	0.00
JUNCT_414	JUNCTION	0.00	0.00	5187.29	0 00:00	0.00
JUNCT_415	JUNCTION	0.00	0.00	5187.29	0 00:00	0.00
JUNCT_416	JUNCTION	0.00	0.00	5149.83	0 00:00	0.00
JUNCT_417	JUNCTION	0.00	0.00	5149.83	0 00:00	0.00
JUNCT_418	JUNCTION	0.00	0.00	5086.35	0 00:00	0.00
JUNCT_P50	JUNCTION	0.31	2.86	5130.46	0 00:41	2.82
JUNCT_424	JUNCTION	0.18	1.38	5161.38	0 00:51	1.37

JUNCT_P100	JUNCTION	0.00	0.00	5127.70	0	00:00	0.00
JUNCT_P200	JUNCTION	0.00	0.00	5139.00	0	00:00	0.00
JUNCT_P300	JUNCTION	0.25	2.77	5118.77	0	00:41	2.71
JUNCT_PONDA	JUNCTION	0.48	1.67	5137.96	0	01:04	1.67
JUNCT_P400	JUNCTION	0.00	0.00	5108.35	0	00:00	0.00
JUNCT_P500	JUNCTION	0.10	1.05	5099.05	0	00:41	1.05
JUNCT_P600	JUNCTION	0.00	0.00	5092.00	0	00:00	0.00
JUNCT_P700	JUNCTION	0.18	1.01	5115.01	0	00:56	1.00
JUNCT_P800	JUNCTION	0.00	0.00	5091.60	0	00:00	0.00
JUNCT_P51	JUNCTION	0.58	2.76	5111.01	0	00:42	2.71
OUTFALL_900	OUTFALL	0.43	3.00	5089.34	0	01:09	2.99
OUTFALL_P90	OUTFALL	0.00	0.00	5081.00	0	00:00	0.00
SPILLWAY-OFL-PONDA	OUTFALL	0.00	0.00	5138.80	0	00:00	0.00
JUNCT_500	DIVIDER	0.35	3.00	5306.68	0	00:35	3.00
JUNCT_501	DIVIDER	0.41	3.00	5234.97	0	00:30	3.00
JUNCT_502	DIVIDER	0.50	3.00	5190.28	0	00:31	3.00
JUNCT_413	DIVIDER	0.18	1.04	5202.95	0	00:56	1.03
JUNCT_503	DIVIDER	0.53	3.04	5152.86	0	00:59	3.04
STORAGE_PONDB	STORAGE	7.56	8.73	5100.23	0	01:20	8.73
STORAGE_PONDA	STORAGE	5.76	9.99	5148.89	0	01:04	9.99

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
JUNCT_410	JUNCTION	507.39	507.39	0	00:41	9.86	9.86	0.000
JUNCT_411	JUNCTION	405.96	405.96	0	00:36	5.73	5.73	0.000
JUNCT_412	JUNCTION	375.71	375.71	0	00:36	5.52	5.52	0.000
JUNCT_414	JUNCTION	221.86	221.86	0	00:41	4.54	4.54	0.000
JUNCT_415	JUNCTION	171.16	171.16	0	00:41	4.01	4.01	0.000
JUNCT_416	JUNCTION	172.29	172.29	0	00:46	4.35	4.35	0.000
JUNCT_417	JUNCTION	120.34	120.34	0	00:41	2.56	2.56	0.000
JUNCT_418	JUNCTION	85.45	85.45	0	00:51	2.97	2.97	0.000
JUNCT_P50	JUNCTION	0.00	359.73	0	00:41	0	7.92	0.000
JUNCT_424	JUNCTION	85.25	85.25	0	00:51	2.64	2.64	0.000
JUNCT_P100	JUNCTION	305.20	305.20	0	00:41	5.27	5.27	0.000
JUNCT_P200	JUNCTION	113.17	113.17	0	00:36	1.77	1.77	0.000
JUNCT_P300	JUNCTION	174.26	174.26	0	00:41	3.39	3.39	0.000

JUNCT_PONDA	JUNCTION	0.00	30.60	0	01:04	0	1.49	0.000	
JUNCT_P400	JUNCTION	18.34	18.34	0	00:36	0.349	0.349	0.000	
JUNCT_P500	JUNCTION	34.57	34.57	0	00:41	0.702	0.702	0.000	
JUNCT_P600	JUNCTION	83.44	83.44	0	00:41	1.58	1.58	0.000	
JUNCT_P700	JUNCTION	63.64	63.64	0	00:56	2.51	2.51	0.000	
JUNCT_P800	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	gal
JUNCT_P51	JUNCTION	0.00	193.13	0	00:42	0	5.22	-0.000	
OUTFALL_900	OUTFALL	0.00	1535.73	0	01:09	0	43.8	0.000	
OUTFALL_P90	OUTFALL	0.00	453.64	0	01:20	0	13.8	0.000	
SPILLWAY-OFL-PONDA	OUTFALL	0.00	14.25	0	01:04	0	0.0853	0.000	
JUNCT_500	DIVIDER	0.00	507.39	0	00:41	0	9.86	0.000	
JUNCT_501	DIVIDER	0.00	1051.79	0	00:39	0	21.4	0.000	
JUNCT_502	DIVIDER	0.00	1342.43	0	00:50	0	31.9	0.000	
JUNCT_413	DIVIDER	32.89	32.89	0	00:56	1.33	1.33	0.000	
JUNCT_503	DIVIDER	0.00	1513.97	0	00:59	0	39.9	0.000	
STORAGE_PONDB	STORAGE	0.00	597.65	0	00:57	0	18.4	0.211	
STORAGE_PONDA	STORAGE	0.00	113.17	0	00:36	0	1.77	0.081	

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Node Flooding Summary
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No nodes were flooded.

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Storage Volume Summary
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Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STORAGE_PONDB	627.639	48	0	0	947.254	72	0 01:19	453.64
STORAGE_PONDA	56.332	32	0	0	144.275	81	0 01:04	44.85

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Outfall Loading Summary
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	Flow	Avg	Max	Total

Outfall Node	Freq Pcnt	Flow CFS	Flow CFS	Volume 10^6 gal
OUTFALL_900	99.17	136.55	1535.73	43.758
OUTFALL_P90	98.89	43.29	453.64	13.834
SPILLWAY-OFL-PONDA	2.78	9.50	14.25	0.085
System	66.94	189.35	1948.59	57.677

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Link Flow Summary
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Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
410	DUMMY	507.39	0	00:41			
500	CONDUIT	310.57	0	00:40	7.64	1.00	1.00
500_OVERFLOW	CONDUIT	158.18	0	00:54	9.11	0.00	0.10
411	DUMMY	405.96	0	00:36			
412	DUMMY	375.71	0	00:36			
501	CONDUIT	456.66	0	00:34	8.31	1.00	1.00
501_OVERFLOW	CONDUIT	506.94	0	00:51	6.94	0.02	0.15
413_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
413	CONDUIT	32.79	0	00:58	3.91	0.11	0.35
414	DUMMY	221.86	0	00:41			
415	DUMMY	171.16	0	00:41			
417	DUMMY	120.34	0	00:41			
503	CONDUIT	24.01	0	00:29	5.34	1.00	1.00
503_OVERFLOW	CONDUIT	1435.65	0	01:09	6.13	0.05	0.30
418	DUMMY	85.45	0	00:51			
424	CONDUIT	84.41	0	00:54	5.11	0.21	0.46
P100	DUMMY	305.20	0	00:41			
P50	CONDUIT	292.56	0	01:01	4.91	0.29	0.53
P200	DUMMY	113.17	0	00:36			
P400	DUMMY	18.34	0	00:36			
P500	CONDUIT	33.91	0	00:43	2.50	0.05	0.21
P600	DUMMY	83.44	0	00:41			
P800	DUMMY	0.00	0	00:00			
P700	CONDUIT	61.26	0	01:13	2.16	0.02	0.20
PONDA	CONDUIT	30.56	0	01:10	9.44	0.78	0.67
P51	CONDUIT	186.26	0	00:46	4.29	0.24	0.50

P300	CONDUIT	173.53	0	00:42	15.62	0.59	0.55
416	DUMMY	172.29	0	00:46			
502	CONDUIT	389.46	0	00:35	7.22	1.00	1.00
502_OVERFLOW	CONDUIT	891.78	0	01:00	6.92	0.04	0.22
OUTLET_PONDA	DUMMY	30.60	0	01:04			
OUTLET_PONDB	DUMMY	453.64	0	01:20			
SPILLWAY-PONDA	DUMMY	14.25	0	01:04			

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Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
500	0.48	0.48	0.48	0.01	0.48
501	0.73	0.73	0.73	0.01	0.73
503	2.63	2.63	2.63	2.60	2.63
502	1.03	1.03	1.03	0.01	1.03

Analysis begun on: Mon Apr 16 11:57:46 2018
Analysis ended on: Mon Apr 16 11:57:46 2018
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

PARKDALE SUBDIVISION
ULTIMATE CONDITION
POND B, DRAINAGEWAY 2 SOUTH AND NORTH
(100-YR)

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NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
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Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 10/03/2017 01:00:00
Ending Date 10/03/2017 13:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 60.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	181.221	59.053
External Outflow	175.586	57.217
Flooding Loss	0.000	0.000

Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	13.446	4.382
Continuity Error (%)	-4.310	

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Highest Flow Instability Indexes
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Link 503 (1)
Link PONDA (1)
Link P500 (1)
Link 501 (1)

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Routing Time Step Summary
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Minimum Time Step	:	60.00 sec
Average Time Step	:	60.00 sec
Maximum Time Step	:	60.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.03
Percent Not Converging	:	0.00

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Node Depth Summary
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Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
JUNCT_410	JUNCTION	0.00	0.00	5303.69	0 00:00	0.00
JUNCT_411	JUNCTION	0.00	0.00	5231.98	0 00:00	0.00
JUNCT_412	JUNCTION	0.00	0.00	5231.98	0 00:00	0.00
JUNCT_414	JUNCTION	0.00	0.00	5188.81	0 00:00	0.00
JUNCT_415	JUNCTION	0.00	0.00	5188.80	0 00:00	0.00
JUNCT_1060B	JUNCTION	0.21	1.73	5171.23	0 01:27	1.73
JUNCT_1060A	JUNCTION	0.54	1.79	5171.29	0 00:51	1.79
JUNCT_416U	JUNCTION	0.00	0.00	5170.01	0 00:00	0.00
JUNCT_417U	JUNCTION	0.00	0.00	5149.83	0 00:00	0.00

JUNCT_418	JUNCTION	0.00	0.00	5086.35	0	00:00	0.00
JUNCT_P50	JUNCTION	0.79	3.49	5131.09	0	00:51	3.46
JUNCT_424	JUNCTION	0.18	1.38	5161.38	0	00:51	1.37
JUNCT_P100	JUNCTION	0.00	0.00	5127.70	0	00:00	0.00
JUNCT_P200	JUNCTION	0.00	0.00	5139.00	0	00:00	0.00
JUNCT_P300	JUNCTION	0.25	2.77	5118.77	0	00:41	2.71
JUNCT_PONDA	JUNCTION	0.48	1.67	5137.96	0	01:04	1.67
JUNCT_P400	JUNCTION	0.00	0.00	5108.35	0	00:00	0.00
JUNCT_P500	JUNCTION	0.10	1.05	5099.05	0	00:41	1.05
JUNCT_P600	JUNCTION	0.00	0.00	5092.00	0	00:00	0.00
JUNCT_P700	JUNCTION	0.18	1.01	5115.01	0	00:56	1.00
JUNCT_P800	JUNCTION	0.00	0.00	5091.60	0	00:00	0.00
JUNCT_P51	JUNCTION	0.58	2.76	5111.01	0	00:42	2.71
OUTFALL_900	OUTFALL	0.34	2.06	5088.40	0	01:41	2.06
OUTFALL_P90	OUTFALL	0.00	0.00	5081.00	0	00:00	0.00
SPILLWAY-OFL-PONDA	OUTFALL	0.00	0.00	5138.80	0	00:00	0.00
JUNCT_500	DIVIDER	0.35	3.00	5306.68	0	00:35	3.00
JUNCT_501	DIVIDER	0.41	3.00	5234.97	0	00:30	3.00
JUNCT_502	DIVIDER	0.53	3.00	5191.79	0	00:30	3.00
JUNCT_413	DIVIDER	0.19	1.07	5202.98	0	00:56	1.06
JUNCT_503	DIVIDER	0.32	2.07	5151.89	0	01:28	2.07
STOR_1060	STORAGE	0.65	4.83	5174.83	0	01:27	4.83
STORAGE_PONDB	STORAGE	7.63	8.95	5100.45	0	01:21	8.95
STORAGE_PONDA	STORAGE	5.76	9.99	5148.89	0	01:04	9.99

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Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
JUNCT_410	JUNCTION	507.39	507.39	0	00:41	9.86	9.86	0.000
JUNCT_411	JUNCTION	405.96	405.96	0	00:36	5.73	5.73	0.000
JUNCT_412	JUNCTION	375.71	375.71	0	00:36	5.52	5.52	0.000
JUNCT_414	JUNCTION	221.86	221.86	0	00:41	4.54	4.54	0.000
JUNCT_415	JUNCTION	171.16	171.16	0	00:41	4.01	4.01	0.000
JUNCT_1060B	JUNCTION	0.00	630.02	0	01:27	0	20.2	0.000
JUNCT_1060A	JUNCTION	0.00	222.00	0	00:51	0	15.8	0.000
JUNCT_416U	JUNCTION	128.26	128.26	0	00:46	3.31	3.31	0.000
JUNCT_417U	JUNCTION	270.44	270.44	0	00:36	3.58	3.58	0.000

JUNCT_418	JUNCTION	85.45	85.45	0	00:51	2.97	2.97	0.000	
JUNCT_P50	JUNCTION	0.00	534.46	0	00:51	0	23.7	0.000	
JUNCT_424	JUNCTION	85.25	85.25	0	00:51	2.64	2.64	0.000	
JUNCT_P100	JUNCTION	305.20	305.20	0	00:41	5.27	5.27	0.000	
JUNCT_P200	JUNCTION	113.17	113.17	0	00:36	1.77	1.77	0.000	
JUNCT_P300	JUNCTION	174.26	174.26	0	00:41	3.39	3.39	0.000	
JUNCT_PONDA	JUNCTION	0.00	30.60	0	01:04	0	1.49	0.000	
JUNCT_P400	JUNCTION	18.34	18.34	0	00:36	0.349	0.349	0.000	
JUNCT_P500	JUNCTION	34.57	34.57	0	00:41	0.702	0.702	0.000	
JUNCT_P600	JUNCTION	83.44	83.44	0	00:41	1.58	1.58	0.000	
JUNCT_P700	JUNCTION	63.64	63.64	0	00:56	2.51	2.51	0.000	
JUNCT_P800	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	gal
JUNCT_P51	JUNCTION	0.00	193.13	0	00:42	0	5.22	-0.000	
OUTFALL_900	OUTFALL	0.00	684.25	0	01:38	0	27.2	0.000	
OUTFALL_P90	OUTFALL	0.00	636.21	0	01:21	0	29.9	0.000	
SPILLWAY-OFL-PONDA	OUTFALL	0.00	14.25	0	01:04	0	0.0853	0.000	
JUNCT_500	DIVIDER	0.00	507.39	0	00:41	0	9.86	0.000	
JUNCT_501	DIVIDER	0.00	1051.79	0	00:39	0	21.4	0.000	
JUNCT_502	DIVIDER	0.00	1340.81	0	00:50	0	31.9	0.000	
JUNCT_413	DIVIDER	32.89	32.89	0	00:56	1.33	1.33	0.000	
JUNCT_503	DIVIDER	0.00	645.59	0	01:28	0	23.9	0.000	
STOR_1060	STORAGE	0.00	1410.66	0	00:58	0	36.1	0.058	
STORAGE_PONDB	STORAGE	0.00	747.46	0	01:02	0	34.2	0.244	
STORAGE_PONDA	STORAGE	0.00	113.17	0	00:36	0	1.77	0.081	

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Node Flooding Summary
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No nodes were flooded.

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Storage Volume Summary
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Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STOR_1060	237.190	13	0	0	1809.023	96	0 01:26	852.02
STORAGE_PONDB	652.540	50	0	0	1043.959	80	0 01:21	636.21
STORAGE_PONDA	56.332	32	0	0	144.275	81	0 01:04	44.85

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Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OUTFALL_900	99.17	84.88	684.25	27.199
OUTFALL_P90	98.89	93.66	636.21	29.929
SPILLWAY-OFL-PONDA	2.78	9.50	14.25	0.085
System	66.94	188.05	1279.69	57.213

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Link Flow Summary
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Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
410	DUMMY	507.39	0	00:41			
500	CONDUIT	310.57	0	00:40	7.64	1.00	1.00
500_OVERFLOW	CONDUIT	158.18	0	00:54	9.11	0.00	0.10
411	DUMMY	405.96	0	00:36			
412	DUMMY	375.71	0	00:36			
501	CONDUIT	448.88	0	00:34	8.17	1.00	1.00
501_OVERFLOW	CONDUIT	513.50	0	00:51	6.64	0.02	0.15
502	CONDUIT	323.43	0	00:33	5.95	1.00	1.00
502_OVERFLOW	CONDUIT	975.45	0	00:59	5.54	0.05	0.26
413_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
413	CONDUIT	32.79	0	00:58	3.76	0.12	0.35
414	DUMMY	221.86	0	00:41			
415	DUMMY	171.16	0	00:41			
1060B	CONDUIT	629.58	0	01:30	4.04	0.02	0.17
417U	DUMMY	270.44	0	00:36			
503	CONDUIT	24.01	0	00:25	6.34	1.00	1.00
503_OVERFLOW	CONDUIT	614.46	0	01:41	6.36	0.02	0.21
418	DUMMY	85.45	0	00:51			

1060A	CONDUIT	222.00	0	01:14	20.44	0.41	0.45
424	CONDUIT	84.41	0	00:54	5.11	0.21	0.46
P100	DUMMY	305.20	0	00:41			
P50	CONDUIT	464.57	0	01:08	5.21	0.46	0.68
P200	DUMMY	113.17	0	00:36			
P400	DUMMY	18.34	0	00:36			
P500	CONDUIT	33.91	0	00:43	2.50	0.05	0.21
P600	DUMMY	83.44	0	00:41			
P800	DUMMY	0.00	0	00:00			
P700	CONDUIT	61.26	0	01:13	2.16	0.02	0.20
PONDA	CONDUIT	30.56	0	01:10	9.44	0.78	0.67
P51	CONDUIT	186.26	0	00:46	4.29	0.24	0.50
416U	DUMMY	128.26	0	00:46			
P300	CONDUIT	173.53	0	00:42	15.62	0.59	0.55
OUTLET_1060B	DUMMY	630.02	0	01:27			
OUTLET_1060A	DUMMY	222.00	0	00:51			
OUTLET_PONDA	DUMMY	30.60	0	01:04			
OUTLET_PONDB	DUMMY	636.21	0	01:21			
SPILLWAY-PONDA	DUMMY	14.25	0	01:04			

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Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
500	0.48	0.48	0.48	0.01	0.48
501	0.75	0.75	0.75	0.72	0.75
502	1.12	1.12	1.12	0.01	1.12
503	2.67	2.67	2.67	2.63	2.67

Analysis begun on: Mon Apr 16 10:37:40 2018
Analysis ended on: Mon Apr 16 10:37:40 2018
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

PARKDALE SUBDIVISION
ULTIMATE CONDITION
POND B, DRAINAGEWAY 2 SOUTH AND NORTH
(500-YR; FOR POND B SPILLWAY SIZING ONLY)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 10/03/2017 01:00:00
Ending Date 10/03/2017 13:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 60.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	246.709	80.394
External Outflow	221.305	72.115
Flooding Loss	20.464	6.669
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	13.513	4.403
Continuity Error (%)	-3.475	

```
*******************************
Highest Flow Instability Indexes
*******************************
Link PONDA (1)
Link 503 (1)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :    60.00 sec
Average Time Step           :    60.00 sec
Maximum Time Step           :    60.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.03
Percent Not Converging      :     0.00


******************
Node Depth Summary
******************
```

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
JUNCT_410	JUNCTION	0.00	0.00	5303.69	0 00:00	0.00
JUNCT_411	JUNCTION	0.00	0.00	5231.98	0 00:00	0.00
JUNCT_412	JUNCTION	0.00	0.00	5231.98	0 00:00	0.00
JUNCT_414	JUNCTION	0.00	0.00	5188.81	0 00:00	0.00
JUNCT_415	JUNCTION	0.00	0.00	5188.80	0 00:00	0.00
JUNCT_1060B	JUNCTION	0.24	1.75	5171.25	0 01:33	1.75
JUNCT_1060A	JUNCTION	0.57	1.79	5171.29	0 00:47	1.79
JUNCT_416U	JUNCTION	0.00	0.00	5170.01	0 00:00	0.00
JUNCT_417U	JUNCTION	0.00	0.00	5149.83	0 00:00	0.00
JUNCT_418	JUNCTION	0.00	0.00	5086.35	0 00:00	0.00
JUNCT_P50	JUNCTION	0.85	3.91	5131.51	0 00:48	3.87
JUNCT_424	JUNCTION	0.23	1.66	5161.66	0 00:51	1.65
JUNCT_P100	JUNCTION	0.00	0.00	5127.70	0 00:00	0.00
JUNCT_P200	JUNCTION	0.00	0.00	5139.00	0 00:00	0.00
JUNCT_P300	JUNCTION	0.30	3.34	5119.34	0 00:41	3.27
JUNCT_PONDA	JUNCTION	0.50	1.68	5137.97	0 00:51	1.68
JUNCT_P400	JUNCTION	0.00	0.00	5108.35	0 00:00	0.00
JUNCT_P500	JUNCTION	0.11	1.23	5099.23	0 00:41	1.22
JUNCT_P600	JUNCTION	0.00	0.00	5092.00	0 00:00	0.00
JUNCT_P700	JUNCTION	0.22	1.18	5115.18	0 00:56	1.17

JUNCT_P800	JUNCTION	0.00	0.00	5091.60	0	00:00	0.00
JUNCT_P51	JUNCTION	0.62	3.34	5111.59	0	00:42	3.24
OUTFALL_900	OUTFALL	0.39	2.12	5088.46	0	01:26	2.12
OUTFALL_P90	OUTFALL	0.00	0.00	5081.00	0	00:00	0.00
SPILLWAY-OFL-PONDA	OUTFALL	0.00	0.00	5138.80	0	00:00	0.00
JUNCT_500	DIVIDER	0.38	3.00	5306.68	0	00:32	3.00
JUNCT_501	DIVIDER	0.45	3.00	5234.97	0	00:28	3.00
JUNCT_502	DIVIDER	0.57	3.13	5191.92	0	00:50	3.13
JUNCT_413	DIVIDER	0.23	1.27	5203.18	0	00:56	1.27
JUNCT_503	DIVIDER	0.37	2.17	5151.99	0	01:08	2.17
STOR_1060	STORAGE	0.76	5.00	5175.00	0	01:34	5.00
STORAGE_PONDB	STORAGE	7.69	9.17	5100.67	0	01:16	9.17
STORAGE_PONDA	STORAGE	5.86	10.27	5149.17	0	00:51	10.27

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent	
JUNCT_410	JUNCTION	672.48	672.48	0	00:41	13.1	13.1	0.000	
JUNCT_411	JUNCTION	531.11	531.11	0	00:36	7.56	7.56	0.000	
JUNCT_412	JUNCTION	494.23	494.23	0	00:36	7.31	7.31	0.000	
JUNCT_414	JUNCTION	300.81	300.81	0	00:41	6.22	6.22	0.000	
JUNCT_415	JUNCTION	237.05	237.05	0	00:41	5.6	5.6	0.000	
JUNCT_1060B	JUNCTION	0.00	644.00	0	01:33	0	24.8	0.000	
JUNCT_1060A	JUNCTION	0.00	222.00	0	00:47	0	16.9	0.000	
JUNCT_416U	JUNCTION	178.89	178.89	0	00:46	4.73	4.73	0.000	
JUNCT_417U	JUNCTION	351.26	351.26	0	00:36	4.71	4.71	0.000	
JUNCT_418	JUNCTION	118.34	118.34	0	00:51	4.13	4.13	0.000	
JUNCT_P50	JUNCTION	0.00	673.94	0	00:48	0	27.9	0.000	
JUNCT_424	JUNCTION	121.06	121.06	0	00:51	3.87	3.87	0.000	
JUNCT_P100	JUNCTION	405.80	405.80	0	00:41	7.11	7.11	0.000	
JUNCT_P200	JUNCTION	150.70	150.70	0	00:36	2.38	2.38	0.000	
JUNCT_P300	JUNCTION	231.51	231.51	0	00:41	4.54	4.54	0.000	
JUNCT_PONDA	JUNCTION	0.00	30.95	0	00:51	0	1.65	0.000	
JUNCT_P400	JUNCTION	24.38	24.38	0	00:36	0.467	0.467	0.000	
JUNCT_P500	JUNCTION	45.71	45.71	0	00:41	0.938	0.938	0.000	
JUNCT_P600	JUNCTION	110.76	110.76	0	00:41	2.13	2.13	0.000	
JUNCT_P700	JUNCTION	90.63	90.63	0	00:56	3.65	3.65	0.000	
JUNCT_P800	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	gal
JUNCT_P51	JUNCTION	0.00	261.73	0	00:46	0	6.65	0.000	
OUTFALL_900	OUTFALL	0.00	762.66	0	01:22	0	34.1	0.000	
OUTFALL_P90	OUTFALL	0.00	854.93	0	01:16	0	37.5	0.000	

SPILLWAY-OFL-PONDA	OUTFALL	0.00	65.38	0	00:51	0	0.534	0.000
JUNCT_500	DIVIDER	0.00	672.48	0	00:41	0	13.1	0.000
JUNCT_501	DIVIDER	0.00	1330.26	0	00:36	0	28.4	-0.000
JUNCT_502	DIVIDER	0.00	1791.57	0	00:50	0	42.8	0.000
JUNCT_413	DIVIDER	46.33	46.33	0	00:56	1.9	1.9	0.000
JUNCT_503	DIVIDER	0.00	713.22	0	01:08	0	29.6	0.000
STOR_1060	STORAGE	0.00	1903.63	0	00:57	0	48.4	0.046
STORAGE_PONDB	STORAGE	0.00	982.22	0	00:59	0	41.7	0.228
STORAGE_PONDA	STORAGE	0.00	150.70	0	00:36	0	2.38	0.172

PEAK 500-YR FLOW INTO POND B - ULTIMATE CONDITION
SPILLWAY CAPACITY 1020 CFS > 982 CFS

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 gal	Maximum Ponded Volume 1000 ft3
STOR_1060	0.52	917.66	0 01:05	6.668	0.000

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STOR_1060	278.812	15	0	0	1875.000	100	0 01:04	866.00
STORAGE_PONDB	669.939	51	0	0	1147.828	88	0 01:15	854.93
STORAGE_PONDA	58.221	33	0	0	152.326	86	0 00:51	96.34

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OUTFALL_900	99.17	106.48	762.66	34.121

OUTFALL_P90	99.03	117.06	854.93	37.456
SPILLWAY-OFL-PONDA	5.14	32.14	65.38	0.534
System	67.78	255.68	1611.92	72.110

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
410	DUMMY	672.48	0	00:41			
500	CONDUIT	310.57	0	00:37	7.83	1.00	1.00
500_OVERFLOW	CONDUIT	310.87	0	00:52	9.46	0.01	0.13
411	DUMMY	531.11	0	00:36			
412	DUMMY	494.23	0	00:36			
501	CONDUIT	448.88	0	00:31	8.28	1.00	1.00
501_OVERFLOW	CONDUIT	824.82	0	00:51	6.92	0.03	0.20
502	CONDUIT	323.43	0	00:31	5.90	1.00	1.00
502_OVERFLOW	CONDUIT	1421.86	0	00:57	5.52	0.07	0.31
413_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
413	CONDUIT	46.21	0	00:58	4.14	0.17	0.42
414	DUMMY	300.81	0	00:41			
415	DUMMY	237.05	0	00:41			
1060B	CONDUIT	644.15	0	01:36	4.06	0.02	0.17
417U	DUMMY	351.26	0	00:36			
503	CONDUIT	24.01	0	00:23	6.34	1.00	1.00
503_OVERFLOW	CONDUIT	653.82	0	01:26	6.38	0.02	0.21
418	DUMMY	118.34	0	00:51			
1060A	CONDUIT	222.00	0	01:11	20.48	0.41	0.45
424	CONDUIT	120.26	0	00:53	5.65	0.30	0.55
P100	DUMMY	405.80	0	00:41			
P50	CONDUIT	585.00	0	01:02	5.53	0.58	0.76
P200	DUMMY	150.70	0	00:36			
P400	DUMMY	24.38	0	00:36			
P500	CONDUIT	45.03	0	00:43	2.72	0.06	0.24
P600	DUMMY	110.76	0	00:41			
P800	DUMMY	0.00	0	00:00			
P700	CONDUIT	87.74	0	01:10	2.35	0.03	0.23
PONDA	CONDUIT	30.82	0	01:01	9.41	0.79	0.67
P51	CONDUIT	259.67	0	00:49	4.71	0.33	0.59
416U	DUMMY	178.89	0	00:46			
P300	CONDUIT	230.67	0	00:42	16.63	0.78	0.67
OUTLET_1060B	DUMMY	644.00	0	01:33			
OUTLET_1060A	DUMMY	222.00	0	00:47			

OUTLET_PONDA	DUMMY	30.95	0	00:51
OUTLET_PONDB	DUMMY	854.93	0	01:16
SPILLWAY-PONDA	DUMMY	65.38	0	00:51

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
500	0.68	0.68	0.68	0.01	0.68
501	0.90	0.90	0.90	0.88	0.90
502	1.27	1.27	1.27	0.01	1.27
503	2.83	2.83	2.83	2.82	2.83

Analysis begun on: Mon Apr 16 10:44:05 2018
Analysis ended on: Mon Apr 16 10:44:05 2018
Total elapsed time: < 1 sec

EXISTING CONDITION (POND B, DRAINAGEWAY 2 NORTH/SOUTH INPUTS)

								Maximum Depression Storage (Watershed in)		Infiltration			
Catchment Name	Print Mode	Raingage	Area (mi^2)	Distance to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Horton's Decay Coefficient (1/seconds)	Final Rate (in/hr)	DCIA Level
410	3		0.249	0.492	1.123	0.008	60	0.38	0.1	4.14	0.0018	0.58	0
411	3		0.14	0.308	0.586	0.022	64	0.38	0.1	3.55	0.0018	0.54	0
412	3		0.136	0.337	0.61	0.023	63.2	0.38	0.1	4	0.0018	0.57	0
413	3		0.046	0.298	0.58	0.022	14.7	0.38	0.1	4.5	0.0018	0.6	0
414	3		0.131	0.419	0.673	0.022	39.2	0.38	0.1	4.5	0.0018	0.6	0
415	3		0.125	0.286	0.585	0.023	26	0.38	0.1	4.1	0.0018	0.57	0
416	3		0.14	0.283	0.662	0.018	24.1	0.38	0.1	4.48	0.0018	0.6	0
417	3		0.063	0.424	0.842	0.021	63.9	0.38	0.1	4.19	0.0018	0.58	0
418	3		0.091	0.391	0.904	0.014	28.1	0.38	0.1	4.03	0.0018	0.57	0
424	3		0.1	0.259	0.608	0.024	3.7	0.38	0.1	4.5	0.0018	0.6	0
P100	3		0.143	0.286	0.701	0.013	49.6	0.38	0.1	4.35	0.0018	0.59	0
P200	3		0.047	0.178	0.369	0.019	52.1	0.38	0.1	4.5	0.0018	0.6	0
P300	3		0.088	0.328	0.744	0.013	55	0.38	0.1	4.5	0.0018	0.6	0
P400	3		0.009	0.131	0.22	0.018	57.4	0.38	0.1	4.5	0.0018	0.6	0
P500	3		0.018	0.19	0.347	0.014	57.4	0.38	0.1	4.5	0.0018	0.6	0
P600	3		0.042	0.184	0.511	0.012	52.5	0.38	0.1	4.5	0.0018	0.6	0
P700	3		0.091	0.316	0.58	0.011	3.2	0.38	0.1	3.77	0.0018	0.55	0

ULTIMATE CONDITION (POND B, DRAINAGEWAY 2 NORTH/SOUTH INPUTS)

								Maximum Depression Storage (Watershed in)		Infiltration			
Catchment Name	Print Mode	Raingage	Area (mi^2)	Distance to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Horton's Decay Coefficient (1/seconds)	Final Rate (in/hr)	DCIA Level
410	3		0.249	0.492	1.123	0.008	60	0.38	0.1	4.14	0.0018	0.58	0
411	3		0.14	0.308	0.586	0.022	64	0.38	0.1	3.55	0.0018	0.54	0
412	3		0.136	0.337	0.61	0.023	63.2	0.38	0.1	4	0.0018	0.57	0
413	3		0.046	0.298	0.58	0.022	14.7	0.38	0.1	4.5	0.0018	0.6	0
414	3		0.131	0.419	0.673	0.022	39.2	0.38	0.1	4.5	0.0018	0.6	0
415	3		0.125	0.286	0.585	0.023	26	0.38	0.1	4.1	0.0018	0.57	0
416U	3		0.113	0.213	0.532	0.018	16.7	0.38	0.1	4.48	0.0018	0.6	0
417U	3		0.09	0.099	0.842	0.021	68.9	0.38	0.1	4.19	0.0018	0.58	0
418	3		0.091	0.391	0.904	0.014	28.1	0.38	0.1	4.03	0.0018	0.57	0
424	3		0.1	0.259	0.608	0.024	3.7	0.38	0.1	4.5	0.0018	0.6	0
P100	3		0.143	0.286	0.701	0.013	49.6	0.38	0.1	4.35	0.0018	0.59	0
P200	3		0.047	0.178	0.369	0.019	52.1	0.38	0.1	4.5	0.0018	0.6	0
P300	3		0.088	0.328	0.744	0.013	55	0.38	0.1	4.5	0.0018	0.6	0
P400	3		0.009	0.131	0.22	0.018	57.4	0.38	0.1	4.5	0.0018	0.6	0
P500	3		0.018	0.19	0.347	0.014	57.4	0.38	0.1	4.5	0.0018	0.6	0
P600	3		0.042	0.184	0.511	0.012	52.5	0.38	0.1	4.5	0.0018	0.6	0
P700	3		0.091	0.316	0.58	0.011	3.2	0.38	0.1	3.77	0.0018	0.55	0

PROJECT: PARKDALE – PH. II DRAINAGE

SHEET TITLE: DRAINAGEWAY 1 – EXISTING VS PROPOSED RUNOFF COMPARISON

SWMM DESIGN POINT	EXISTING 2YR (CFS)	PROPOSED 2YR (CFS)	EXISTING 100YR (CFS)	PROPOSED 100YR (CFS)
506	6.9	6.9	157.3	157.3
507A	7.1	6.9	220.5	161.0
507B	6.4	6.3	302.7	241.5
508A	6.2	6.2	318.8	255.9

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

Parkdale Subdivision
Drainageway 1 - Predevelopment (2-yr)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 10/03/2017 01:00:00
Ending Date 10/03/2017 13:00:00
Antecedent Dry Days 0.0
Report Time Step 00:15:00
Routing Time Step ..... 30.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.754	0.246
External Outflow	0.805	0.262
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000

```
Initial Stored Volume ....          0.000          0.000
Final Stored Volume ......          0.003          0.001
Continuity Error (%) .....         -7.236
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****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	30.00 sec
Average Time Step	:	30.00 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent Not Converging	:	0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
JUNCT_430	JUNCTION	0.00	0.00	5165.51	0 00:00	0.00
JUNCT_431A	JUNCTION	0.00	0.00	5144.81	0 00:00	0.00
JUNCT_431B	JUNCTION	0.00	0.00	5114.91	0 00:00	0.00
JUNCT_432A	JUNCTION	0.00	0.00	5108.71	0 00:00	0.00
JUNCT_508A	JUNCTION	0.09	0.43	5109.13	0 01:23	0.42
OUTFALL_PARKDALE	OUTFALL	0.00	0.00	5108.60	0 00:00	0.00
JUNCT_506	DIVIDER	0.05	0.38	5165.88	0 00:40	0.38
JUNCT_507A	DIVIDER	0.05	0.37	5145.17	0 00:51	0.35
JUNCT_507B	DIVIDER	0.08	0.44	5115.34	0 01:10	0.44

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
JUNCT_430	JUNCTION	6.91	6.91	0 00:40	0.205	0.205	0.000
JUNCT_431A	JUNCTION	0.60	0.60	0 00:35	0.0122	0.0122	0.000
JUNCT_431B	JUNCTION	0.76	0.76	0 00:45	0.0206	0.0206	0.000
JUNCT_432A	JUNCTION	0.27	0.27	0 00:40	0.00765	0.00765	0.000
JUNCT_508A	JUNCTION	0.00	6.23	0 01:23	0	0.262	0.000
OUTFALL_PARKDALE	OUTFALL	0.00	6.23	0 01:23	0	0.262	0.000
JUNCT_506	DIVIDER	0.00	6.91	0 00:40	0	0.205	0.000
JUNCT_507A	DIVIDER	0.00	7.07	0 00:50	0	0.22	0.000
JUNCT_507B	DIVIDER	0.00	6.40	0 01:10	0	0.253	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OUTFALL_PARKDALE	97.64	0.83	6.23	0.262
System	97.64	0.83	6.23	0.262

****
Link Flow Summary
****

	Maximum	Time of Max	Maximum	Max/	Max/

Link	Type	|Flow| CFS	Occurrence days	Occurrence hr:min	|Veloc| ft/sec	Full Flow	Full Depth
430	DUMMY	6.91	0	00:40			
506	CONDUIT	6.62	0	00:51	2.04	0.02	0.12
507A	CONDUIT	5.93	0	01:11	1.73	0.02	0.11
431A	DUMMY	0.60	0	00:35			
431B	DUMMY	0.76	0	00:45			
506_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
507A_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
507B	CONDUIT	6.10	0	01:23	1.29	0.03	0.14
432A	DUMMY	0.27	0	00:40			
508A	DUMMY	6.23	0	01:23			
507B_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Oct 06 13:48:48 2017
Analysis ended on: Fri Oct 06 13:48:48 2017
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

Parkdale Subdivision
Drainageway 1 - Predevelopment (100-yr)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 10/03/2017 01:00:00
Ending Date 10/03/2017 13:00:00
Antecedent Dry Days 0.0
Report Time Step 00:15:00
Routing Time Step ..... 30.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	31.278	10.192
External Outflow	31.938	10.408
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000

Initial Stored Volume	0.000	0.000
Final Stored Volume	0.003	0.001
Continuity Error (%)	-2.121	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	30.00 sec
Average Time Step	:	30.00 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent Not Converging	:	0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
JUNCT_430	JUNCTION	0.00	0.00	5165.51	0 00:00	0.00
JUNCT_431A	JUNCTION	0.00	0.00	5144.81	0 00:00	0.00
JUNCT_431B	JUNCTION	0.00	0.00	5114.91	0 00:00	0.00
JUNCT_432A	JUNCTION	0.00	0.00	5108.71	0 00:00	0.00
JUNCT_508A	JUNCTION	0.50	3.00	5111.70	0 00:48	3.00
OUTFALL_PARKDALE	OUTFALL	0.00	0.00	5108.60	0 00:00	0.00
JUNCT_506	DIVIDER	0.28	2.09	5167.59	0 00:50	2.06
JUNCT_507A	DIVIDER	0.32	2.45	5147.25	0 00:51	2.38
JUNCT_507B	DIVIDER	0.49	3.00	5117.90	0 00:44	3.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
JUNCT_430	JUNCTION	157.34	157.34	0 00:50	4.83	4.83	0.000
JUNCT_431A	JUNCTION	68.47	68.47	0 00:45	1.61	1.61	0.000
JUNCT_431B	JUNCTION	90.04	90.04	0 00:50	2.73	2.73	0.000
JUNCT_432A	JUNCTION	32.40	32.40	0 00:50	1.02	1.02	0.000
JUNCT_508A	JUNCTION	0.00	318.76	0 01:07	0	10.4	0.000
OUTFALL_PARKDALE	OUTFALL	0.00	318.76	0 01:07	0	10.4	0.000
JUNCT_506	DIVIDER	0.00	157.34	0 00:50	0	4.83	0.000
JUNCT_507A	DIVIDER	0.00	220.54	0 00:51	0	6.45	0.000
JUNCT_507B	DIVIDER	0.00	302.71	0 00:56	0	9.23	-0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OUTFALL_PARKDALE	98.06	32.84	318.76	10.407
System	98.06	32.84	318.76	10.407

****
Link Flow Summary
****

	Maximum	Time of Max	Maximum	Max/	Max/

Link	Type	|Flow| CFS	Occurrence days	Occurrence hr:min	|Veloc| ft/sec	Full Flow	Full Depth
430	DUMMY	157.34	0	00:50			
506	CONDUIT	156.50	0	00:52	5.30	0.48	0.69
507A	CONDUIT	216.57	0	00:57	5.24	0.65	0.81
431A	DUMMY	68.47	0	00:45			
431B	DUMMY	90.04	0	00:50			
506_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
507A_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
507B	CONDUIT	213.72	0	00:48	3.82	1.00	1.00
432A	DUMMY	32.40	0	00:50			
508A	DUMMY	318.76	0	01:07			
507B_OVERFLOW	CONDUIT	76.95	0	01:08	2.76	0.01	0.08

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
507B	0.67	0.67	0.67	0.01	0.67

Analysis begun on: Fri Oct 06 13:49:46 2017
Analysis ended on: Fri Oct 06 13:49:46 2017
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

Parkdale Subdivision
Drainageway 1 - Post-Development (2-yr)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 10/03/2017 01:00:00
Ending Date 10/03/2017 13:00:00
Antecedent Dry Days 0.0
Report Time Step 00:15:00
Routing Time Step ..... 30.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.808	0.263
External Outflow	0.863	0.281
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.004	0.001
Continuity Error (%)	-7.275	

```
*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :    30.00 sec
Average Time Step           :    30.00 sec
Maximum Time Step           :    30.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.00
Percent Not Converging      :     0.00


******************
Node Depth Summary
******************

-------------------------------------------------------------------------------
                            Average  Maximum  Maximum  Time of Max    Reported
                              Depth    Depth      HGL   Occurrence   Max Depth
Node                 Type      Feet     Feet     Feet  days hr:min        Feet
-------------------------------------------------------------------------------
JUNCT_430            JUNCTION  0.00     0.00  5165.51     0  00:00        0.00
JUNCT_431A           JUNCTION  0.00     0.00  5144.81     0  00:00        0.00
JUNCT_431B           JUNCTION  0.00     0.00  5114.91     0  00:00        0.00
JUNCT_432A           JUNCTION  0.00     0.00  5108.71     0  00:00        0.00
JUNCT_508A           JUNCTION  0.06     0.28  5108.98     0  01:27        0.28
OUTFALL_PARKDALE     OUTFALL   0.00     0.00  5108.60     0  00:00        0.00
JUNCT_506            DIVIDER   0.04     0.29  5165.79     0  00:40        0.29
JUNCT_507A           DIVIDER   0.05     0.36  5145.16     0  00:51        0.34
JUNCT_507B           DIVIDER   0.06     0.32  5115.22     0  01:12        0.32


*******************
Node Inflow Summary
*******************

-------------------------------------------------------------------------------------------------
                            Maximum  Maximum                  Lateral       Total        Flow
                            Lateral    Total  Time of Max      Inflow      Inflow     Balance
                             Inflow   Inflow   Occurrence      Volume      Volume       Error
Node                 Type       CFS      CFS  days hr:min    10^6 gal    10^6 gal     Percent
-------------------------------------------------------------------------------------------------
JUNCT_430            JUNCTION  6.91     6.91     0  00:40       0.205       0.205       0.000
```

JUNCT_431A	JUNCTION	0.33	0.33	0	00:50	0.0167	0.0167	0.000
JUNCT_431B	JUNCTION	0.76	0.76	0	00:45	0.0206	0.0206	0.000
JUNCT_432A	JUNCTION	0.47	0.47	0	00:50	0.0208	0.0208	0.000
JUNCT_508A	JUNCTION	0.00	6.22	0	01:26	0	0.281	0.000
OUTFALL_PARKDALE	OUTFALL	0.00	6.22	0	01:26	0	0.281	0.000
JUNCT_506	DIVIDER	0.00	6.91	0	00:40	0	0.205	0.000
JUNCT_507A	DIVIDER	0.00	6.93	0	00:51	0	0.225	0.000
JUNCT_507B	DIVIDER	0.00	6.27	0	01:11	0	0.258	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OUTFALL_PARKDALE	98.13	0.89	6.22	0.281
System	98.13	0.89	6.22	0.281

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
430	DUMMY	6.91	0 00:40			
506	CONDUIT	6.60	0 00:51	2.12	0.01	0.09
507A	CONDUIT	5.82	0 01:12	1.71	0.02	0.11
431A	DUMMY	0.33	0 00:50			
431B	DUMMY	0.76	0 00:45			
506_OVERFLOW	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
507A_OVERFLOW	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
507B	CONDUIT	5.90	0 01:27	1.20	0.01	0.08
432A	DUMMY	0.47	0 00:50			

508A	DUMMY	6.22	0	01:26			
507B_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Oct 06 13:47:38 2017
Analysis ended on: Fri Oct 06 13:47:38 2017
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

Parkdale Subdivision
Drainageway 1 - Predevelopment (100-yr)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 10/03/2017 01:00:00
Ending Date 10/03/2017 13:00:00
Antecedent Dry Days 0.0
Report Time Step 00:15:00
Routing Time Step ..... 30.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	26.021	8.479
External Outflow	26.276	8.563
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000

Initial Stored Volume	0.000	0.000
Final Stored Volume	0.004	0.001
Continuity Error (%)	-0.998	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	30.00 sec
Average Time Step	:	30.00 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent Not Converging	:	0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
JUNCT_430	JUNCTION	0.00	0.00	5165.51	0 00:00	0.00
JUNCT_431A	JUNCTION	0.00	0.00	5144.81	0 00:00	0.00
JUNCT_431B	JUNCTION	0.00	0.00	5114.91	0 00:00	0.00
JUNCT_432A	JUNCTION	0.00	0.00	5108.71	0 00:00	0.00
JUNCT_508A	JUNCTION	0.34	2.28	5110.98	0 01:02	2.27
OUTFALL_PARKDALE	OUTFALL	0.00	0.00	5108.60	0 00:00	0.00
JUNCT_506	DIVIDER	0.22	1.67	5167.17	0 00:50	1.64
JUNCT_507A	DIVIDER	0.29	2.08	5146.88	0 00:52	2.03
JUNCT_507B	DIVIDER	0.34	2.29	5117.19	0 00:58	2.28

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
JUNCT_430	JUNCTION	157.34	157.34	0 00:50	4.83	4.83	0.000
JUNCT_431A	JUNCTION	4.53	4.53	0 01:00	0.209	0.209	0.000
JUNCT_431B	JUNCTION	90.04	90.04	0 00:50	2.73	2.73	0.000
JUNCT_432A	JUNCTION	15.86	15.86	0 01:00	0.708	0.708	0.000
JUNCT_508A	JUNCTION	0.00	255.85	0 01:02	0	8.56	0.000
OUTFALL_PARKDALE	OUTFALL	0.00	255.85	0 01:02	0	8.56	0.000
JUNCT_506	DIVIDER	0.00	157.34	0 00:50	0	4.83	0.000
JUNCT_507A	DIVIDER	0.00	160.96	0 00:52	0	5.04	0.000
JUNCT_507B	DIVIDER	0.00	241.47	0 00:58	0	7.83	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OUTFALL_PARKDALE	98.47	26.91	255.85	8.562
System	98.47	26.91	255.85	8.562

****
Link Flow Summary
****

	Maximum	Time of Max	Maximum	Max/	Max/

Link	Type	|Flow| CFS	Occurrence days	Occurrence hr:min	|Veloc| ft/sec	Full Flow	Full Depth
430	DUMMY	157.34	0	00:50			
506	CONDUIT	156.50	0	00:52	5.69	0.30	0.55
507A	CONDUIT	157.21	0	01:00	4.78	0.48	0.68
431A	DUMMY	4.53	0	01:00			
431B	DUMMY	90.04	0	00:50			
506_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
507A_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
507B	CONDUIT	240.07	0	01:02	4.06	0.43	0.65
432A	DUMMY	15.86	0	01:00			
508A	DUMMY	255.85	0	01:02			
507B_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Oct 06 13:46:43 2017
Analysis ended on: Fri Oct 06 13:46:43 2017
Total elapsed time: < 1 sec

DRAINAGEWAY 1 - POST-DEVELOPMENT CUHP INPUTS

Basin Management

This sheet is used to enter the subcatchment parameters. The user may use all of Excel's cut and paste functions to build the model. The user may also use the Basin management sheet to enter subcatchments one at a time. The user should avoid entering values in columns where the heading is green.

The possible values for print modes are:

1 Catchment Summary Pages
2 Summary and Unit Hydrograph
3 Summary, Unit Hydrograph, and Storm Hydrograph

								Maximum Depression Storage (Watershed in)		Infiltration			
Catchment Name	Print Mode	Raingage	Area (mi^2)	Distance to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Horton's Decay Coefficient (1/seconds)	Final Rate (in/hr)	DCIA Level
430	3	OSP-100YR	0.173	0.378	0.724	0.024	10.8	0.38	0.1	4.5	0.0018	0.6	0
431A	3	OSP-100YR	0.007	0.138	0.271	0.014	18.8	0.38	0.1	4.5	0.0018	0.6	0
431B	3	OSP-100YR	0.105	0.238	0.473	0.012	2	0.38	0.1	4.5	0.0018	0.6	0
432A	3	OSP-100YR	0.026	0.206	0.257	0.005	7.63	0.38	0.1	4.5	0.0018	0.6	0

DRAINAGEWAY 1 - PRE-DEVELOPMENT CUHP INPUTS

Basin Management

This sheet is used to enter the subcatchment parameters. The user may use all of Excel's cut and paste functions to build the model. The user may also use the Basin management sheet to enter subcatchments one at a time. The user should avoid entering values in columns where the heading is green.

The possible values for print modes are:

1 Catchment Summary Pages
2 Summary and Unit Hydrograph
3 Summary, Unit Hydrograph, and Storm Hydrograph

								Maximum Depression Storage (Watershed in)		Infiltration			
Catchment Name	Print Mode	Raingage	Area (mi^2)	Distance to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Horton's Decay Coefficient (1/seconds)	Final Rate (in/hr)	DCIA Level
430	3		0.173	0.378	0.724	0.024	10.8	0.38	0.1	4.5	0.0018	0.6	0
431A	3		0.062	0.132	0.252	0.014	2	0.38	0.1	4.5	0.0018	0.6	0
431B	3		0.105	0.238	0.473	0.012	2	0.38	0.1	4.5	0.0018	0.6	0
432A	3		0.039	0.128	0.235	0.005	2	0.38	0.1	4.5	0.0018	0.6	0

PROJECT: PARKDALE – PH. II DRAINAGE

SHEET TITLE: DRAINAGEWAY 1 – LOW AREA ANALYSIS

	500-YR Volume (Acre-Ft)	500-YR WSE (Elevation)	500-YR Peak Outflow (CFS)	100-YR Volume (Acre-Ft)	100-YR WSE (Elevation)	100-YR Peak Outflow (CFS)
Existing Condition	48.570	5118.73	0.00	28.330	5117.73	0.00
Proposed Condition	24.090	5118.03	259.91	17.986	5117.59	110.80

Lowest Opening of Existing House = 5118.97

Lowest Opening of Existing Barn = 5118.60

Proposed Condition 100-YR Freeboard Calculation = [Lowest Opening of Existing Barn] - [100-YR WSE] = 5118.60 - 5117.59 = 1.01' Freeboarc

Proposed Spillway Crest Length = 92'

Proposed Spillway Crest Elevation = 5117.00

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

Parkdale Subdivision
Drainageway 1 - Low Area Analysis
Existing Conditions (100-yr)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 01/22/2018 01:00:00
Ending Date 01/22/2018 13:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 30.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	28.104	9.158
External Outflow	0.000	0.000
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000

```
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......        28.331         9.232
Continuity Error (%) .....        -0.810
```

```
*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.
```

```
*************************
Routing Time Step Summary
*************************
Minimum Time Step           :    30.00 sec
Average Time Step           :    30.00 sec
Maximum Time Step           :    30.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.00
Percent Not Converging      :     0.00
```

```
******************
Node Depth Summary
******************
```

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
JUNCT_430	JUNCTION	0.00	0.00	5165.51	0 00:00	0.00
JUNCT_431	JUNCTION	0.00	0.00	5114.70	0 00:00	0.00
JUNCT_432A	JUNCTION	0.00	0.00	5114.69	0 00:00	0.00
JUNCT_507	JUNCTION	0.31	2.10	5116.79	0 01:00	2.10
505	OUTFALL	0.00	0.00	5119.00	0 00:00	0.00
JUNCT_506	DIVIDER	0.29	2.15	5167.65	0 00:50	2.15
STOR_506	STORAGE	2.76	3.05	5117.73	0 12:00	3.05

```
******************
Node Inflow Summary
******************
```

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent	
JUNCT_430	JUNCTION	157.34	157.34	0 00:50	4.83	4.83	0.000	
JUNCT_431	JUNCTION	130.66	130.66	0 00:55	4.33	4.33	0.000	
JUNCT_432A	JUNCTION	0.00	0.00	0 00:00	0	0	0.000	gal
JUNCT_507	JUNCTION	0.00	277.63	0 00:57	0	9.23	0.000	
505	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	gal
JUNCT_506	DIVIDER	0.00	157.34	0 00:50	0	4.83	0.000	
STOR_506	STORAGE	0.00	277.63	0 00:57	0	9.23	-0.000	

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STOR_506	1085.112	31	0	0	1234.093	35	0 12:00	0.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
505	0.00	0.00	0.00	0.000
System	0.00	0.00	0.00	0.000

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
1	DUMMY	157.34	0	00:50			
506	CONDUIT	150.00	0	01:00	5.13	0.48	0.70
506_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
507	DUMMY	277.63	0	00:57			
431	DUMMY	130.66	0	00:55			
432A	DUMMY	0.00	0	00:00			
506A	DUMMY	0.00	0	00:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Jan 22 16:54:49 2018
Analysis ended on: Mon Jan 22 16:54:49 2018
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

Parkdale Subdivision
Drainageway 1 - Low Area Analysis
Existing Conditions (500-yr)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 01/22/2018 01:00:00
Ending Date 01/22/2018 13:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 30.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	48.298	15.739
External Outflow	0.000	0.000
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000

```
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......        48.569        15.827
Continuity Error (%) .....        -0.561


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :    30.00 sec
Average Time Step           :    30.00 sec
Maximum Time Step           :    30.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.00
Percent Not Converging      :     0.00


******************
Node Depth Summary
******************

-------------------------------------------------------------------------------
                                Average  Maximum  Maximum  Time of Max    Reported
                                  Depth    Depth      HGL   Occurrence   Max Depth
Node                 Type          Feet     Feet     Feet  days hr:min        Feet
-------------------------------------------------------------------------------
JUNCT_430            JUNCTION      0.00     0.00  5165.51     0  00:00        0.00
JUNCT_431            JUNCTION      0.00     0.00  5114.70     0  00:00        0.00
JUNCT_432A           JUNCTION      0.00     0.00  5114.69     0  00:00        0.00
JUNCT_507            JUNCTION      0.41     2.70  5117.39     0  00:58        2.70
505                  OUTFALL       0.00     0.00  5119.00     0  00:00        0.00
JUNCT_506            DIVIDER       0.38     2.74  5168.24     0  00:50        2.74
STOR_506             STORAGE       3.66     4.04  5118.72     0  12:00        4.04


******************
Node Inflow Summary
******************

-------------------------------------------------------------------------------------------------
```

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent	
JUNCT_430	JUNCTION	257.98	257.98	0 00:50	8.21	8.21	0.000	
JUNCT_431	JUNCTION	218.94	218.94	0 00:50	7.53	7.53	0.000	
JUNCT_432A	JUNCTION	0.00	0.00	0 00:00	0	0	0.000	gal
JUNCT_507	JUNCTION	0.00	466.68	0 00:55	0	15.8	0.000	
505	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	gal
JUNCT_506	DIVIDER	0.00	257.98	0 00:50	0	8.21	0.000	
STOR_506	STORAGE	0.00	466.68	0 00:55	0	15.8	0.000	

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STOR_506	1863.648	53	0	0	2115.686	60	0 12:00	0.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
505	0.00	0.00	0.00	0.000
System	0.00	0.00	0.00	0.000

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
1	DUMMY	257.98	0	00:50			
506	CONDUIT	250.12	0	00:58	5.84	0.81	0.90
506_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
507	DUMMY	466.68	0	00:55			
431	DUMMY	218.94	0	00:50			
432A	DUMMY	0.00	0	00:00			
506A	DUMMY	0.00	0	00:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Jan 22 16:56:25 2018
Analysis ended on: Mon Jan 22 16:56:25 2018
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

PARDKALE SUBDIVISION
DRAINAGEWAY 1 - LOW AREA ANALYSIS
PROPOSED CONDITIONS (100-YR)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 01/22/2018 01:00:00
Ending Date 01/22/2018 13:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 30.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	28.104	9.158
External Outflow	17.031	5.550
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	11.282	3.676
Continuity Error (%)	-0.744	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	30.00 sec
Average Time Step	:	30.00 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent Not Converging	:	0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
JUNCT_430	JUNCTION	0.00	0.00	5165.51	0 00:00	0.00
JUNCT_431	JUNCTION	0.00	0.00	5114.70	0 00:00	0.00
JUNCT_432A	JUNCTION	0.00	0.00	5114.69	0 00:00	0.00
JUNCT_507	JUNCTION	0.31	2.10	5116.79	0 01:00	2.10
505	JUNCTION	0.00	0.00	5114.65	0 00:00	0.00
OUTFALL_504	OUTFALL	0.00	0.00	5114.50	0 00:00	0.00
JUNCT_506	DIVIDER	0.29	2.15	5167.65	0 00:50	2.15
STOR_506	STORAGE	2.29	2.91	5117.59	0 01:54	2.91

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
JUNCT_430	JUNCTION	157.34	157.34	0 00:50	4.83	4.83	0.000
JUNCT_431	JUNCTION	130.66	130.66	0 00:55	4.33	4.33	0.000

JUNCT_432A	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	gal
JUNCT_507	JUNCTION	0.00	277.63	0	00:57	0	9.23	0.000	
505	JUNCTION	0.00	110.80	0	01:54	0	5.55	0.000	
OUTFALL_504	OUTFALL	0.00	110.80	0	01:54	0	5.55	0.000	
JUNCT_506	DIVIDER	0.00	157.34	0	00:50	0	4.83	0.000	
STOR_506	STORAGE	0.00	277.63	0	00:57	0	9.23	0.066	

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STOR_506	509.690	20	0	0	783.484	30	0 01:53	110.80

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OUTFALL_504	90.35	19.01	110.80	5.549
System	90.35	19.01	110.80	5.549

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth

1	DUMMY	157.34	0	00:50			
506	CONDUIT	150.00	0	01:00	5.13	0.48	0.70
506_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
507	DUMMY	277.63	0	00:57			
431	DUMMY	130.66	0	00:55			
432A	DUMMY	0.00	0	00:00			
505	DUMMY	110.80	0	01:54			
506A	DUMMY	110.80	0	01:54			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Apr 16 13:33:24 2018
Analysis ended on: Mon Apr 16 13:33:24 2018
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

PARKDALE SUBDIVISION
DRAINAGEWAY 1 - LOW AREA ANALYSIS
PROPOSED CONDITIONS (500-YR)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 01/22/2018 01:00:00
Ending Date 01/22/2018 13:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 30.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	48.298	15.739
External Outflow	37.224	12.130
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	11.284	3.677
Continuity Error (%)	-0.435	

```
*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :    30.00 sec
Average Time Step           :    30.00 sec
Maximum Time Step           :    30.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.00
Percent Not Converging      :     0.00


******************
Node Depth Summary
******************
```

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
JUNCT_430	JUNCTION	0.00	0.00	5165.51	0 00:00	0.00
JUNCT_431	JUNCTION	0.00	0.00	5114.70	0 00:00	0.00
JUNCT_432A	JUNCTION	0.00	0.00	5114.69	0 00:00	0.00
JUNCT_507	JUNCTION	0.41	2.70	5117.39	0 00:58	2.70
505	JUNCTION	0.00	0.00	5114.65	0 00:00	0.00
OUTFALL_504	OUTFALL	0.00	0.00	5114.50	0 00:00	0.00
JUNCT_506	DIVIDER	0.38	2.74	5168.24	0 00:50	2.74
STOR_506	STORAGE	2.38	3.35	5118.03	0 01:40	3.35

```
******************
Node Inflow Summary
******************
```

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
JUNCT_430	JUNCTION	257.98	257.98	0 00:50	8.21	8.21	0.000
JUNCT_431	JUNCTION	218.94	218.94	0 00:50	7.53	7.53	0.000

JUNCT_432A	JUNCTION	0.00	0.00	0	00:00	0	0	0.000	gal
JUNCT_507	JUNCTION	0.00	466.68	0	00:55	0	15.8	0.000	
505	JUNCTION	0.00	259.91	0	01:40	0	12.1	0.000	
OUTFALL_504	OUTFALL	0.00	259.91	0	01:40	0	12.1	0.000	
JUNCT_506	DIVIDER	0.00	257.98	0	00:50	0	8.21	0.000	
STOR_506	STORAGE	0.00	466.68	0	00:55	0	15.8	0.126	

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STOR_506	557.136	21	0	0	1049.343	40	0 01:39	259.91

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OUTFALL_504	92.22	40.70	259.91	12.129
System	92.22	40.70	259.91	12.129

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth

1	DUMMY	257.98	0	00:50			
506	CONDUIT	250.12	0	00:58	5.84	0.81	0.90
506_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
507	DUMMY	466.68	0	00:55			
431	DUMMY	218.94	0	00:50			
432A	DUMMY	0.00	0	00:00			
505	DUMMY	259.91	0	01:40			
506A	DUMMY	259.91	0	01:40			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Apr 16 13:39:30 2018
Analysis ended on: Mon Apr 16 13:39:30 2018
Total elapsed time: < 1 sec

LOW AREA ANALYSIS - EXISTING CONDITIONS - CUHP INPUT

								Maximum Depression Storage (Watershed in)		Infiltration			
Catchment Name	Print Mode	Raingage	Area (mi^2)	Distance to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Horton's Decay Coefficient (1/seconds)	Final Rate (in/hr)	DCIA Level
430	3	OSP-100YR	0.173	0.378	0.724	0.024	10.8	0.38	0.1	4.5	0.0018	0.6	0
431	3	OSP-100YR	0.166	0.361	0.728	0.017	2.1	0.38	0.1	4.5	0.0018	0.6	0
432A	3	OSP-100YR	0.0396	0.109	0.163	0.00834	6.8	0.38	0.1	4.5	0.0018	0.6	0

LOW AREA ANALYSIS - PROPOSED CONDITIONS - CUHP INPUT

								Maximum Depression Storage (Watershed in)		Infiltration			
Catchment Name	Print Mode	Raingage	Area (mi^2)	Distance to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Horton's Decay Coefficient (1/seconds)	Final Rate (in/hr)	DCIA Level
430	3	OSP-50YR	0.173	0.378	0.724	0.024	10.8	0.38	0.1	4.5	0.0018	0.6	0
431	3	OSP-50YR	0.166	0.361	0.728	0.017	2.1	0.38	0.1	4.5	0.0018	0.6	0
432A	3	OSP-50YR	0.023	0.0586	0.179	0.0177	4.36	0.38	0.1	4.5	0.0018	0.6	0

Appendix E

FIRM Maps, NRCS Soils Report

404 Permit Documentation

PARKDALE
SITE BOUNDARY

BOULDER COUNTY
Unincorporated Areas
080023

36

BOULDER COUNTY

TOWN OF ERIE

N.E. COU

MAIN STRE

5085

5087

5088

5090

5092

ZONE AE

Coal Creek

31

ERIE MUNICIPAL AIR

V

W

X

LIMIT OF FLOODWAY

CITY OF LAFAYETTE
080026

1245000 FT

Goodhue Ditch

5093

5094

5095

5096

5098

5099

5100

ERIE ROAD

Coal Creek

5101

ZONE AE

5102

5103

5104

40° 00' 00"
105° 03' 45"

BOULDER COUNTY
Unincorporated Areas
080023

R. 69 W.

R. 68 W.

T. 1 N.

T. 1 S.

1

^{495000m} E

BARON COURT

AIRPORT DRIVE

TOWN OF ERIE
080181

BASELINE ROAD

JOINS F

^{496000m} E

MAP SCALE 1" = 500'

250 0 500 1000 FEET

METER

NFIP

PANEL 0443J

FIRM

FLOOD INSURANCE RATE MAP
BOULDER COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 443 OF 615

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BOULDER COUNTY	080023	0443	J
ERIE, TOWN OF	080181	0443	J
LAFAYETTE, CITY OF	080026	0443	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

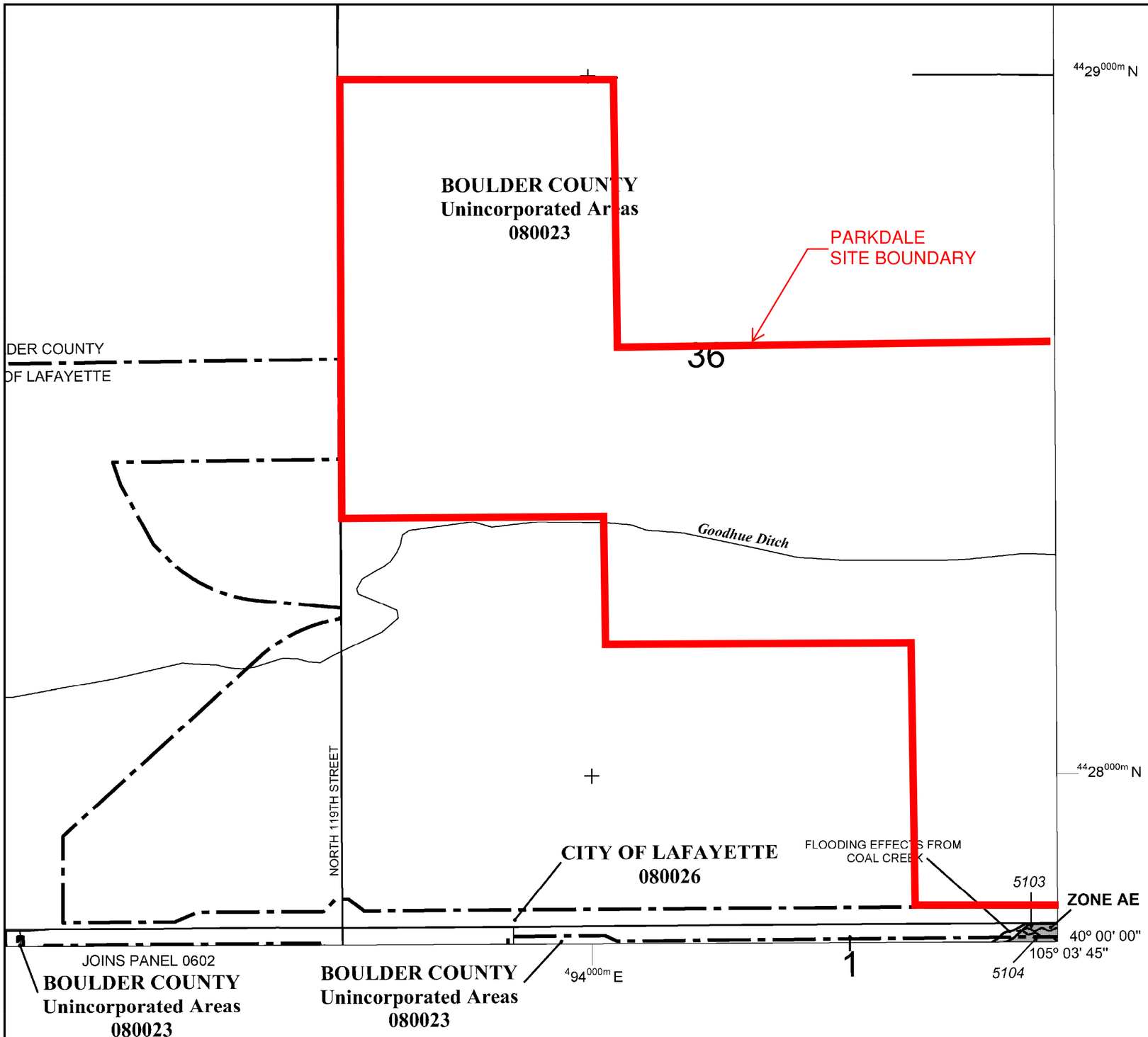
MAP NUMBER
08013C0443J

MAP REVISED
DECEMBER 18, 2012

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



IN TOWNSHIP 1 SOUTH, RANGE 69 WEST, AND TOWNSHIP 1 NORTH, RANGE 69 WEST.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

METER

NFIP

PANEL 0439J

FIRM

FLOOD INSURANCE RATE MAP

BOULDER COUNTY, COLORADO

AND INCORPORATED AREAS

PANEL 439 OF 615

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BOULDER COUNTY	080023	0439	J
ERIE, TOWN OF	080181	0439	J
LAFAYETTE, CITY OF	080026	0439	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

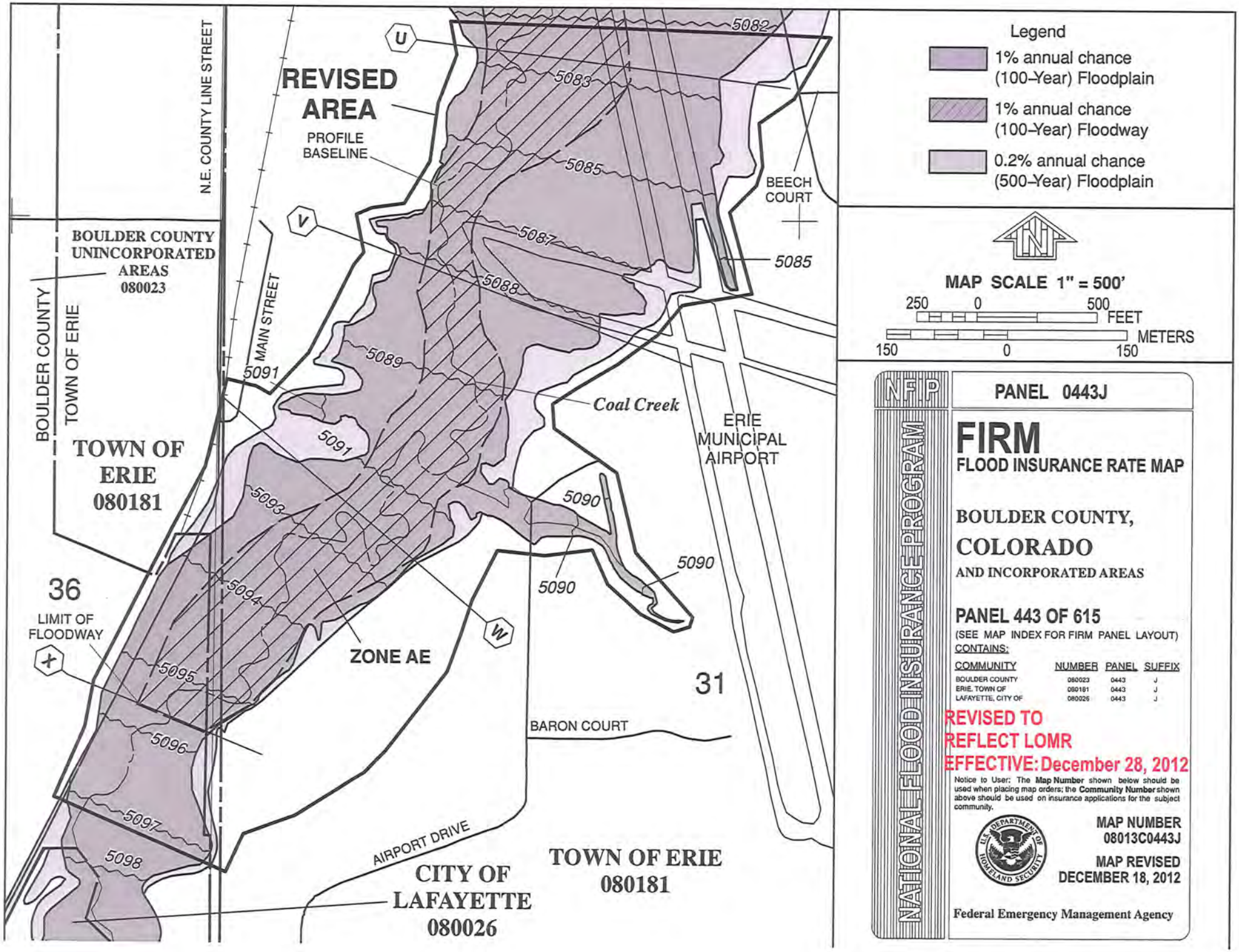
MAP NUMBER
08013C0439J

MAP REVISED
DECEMBER 18, 2012

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



Legend

- 1% annual chance (100-Year) Floodplain
- 1% annual chance (100-Year) Floodway
- 0.2% annual chance (500-Year) Floodplain

MAP SCALE 1" = 500'

250 0 500 FEET

150 0 150 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0443J

FIRM

FLOOD INSURANCE RATE MAP

BOULDER COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 443 OF 615

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BOULDER COUNTY	080023	0443	J
ERIE, TOWN OF	080181	0443	J
LAFAYETTE, CITY OF	080026	0443	J

REVISED TO REFLECT LOMR EFFECTIVE: December 28, 2012

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 08013C0443J

MAP REVISED DECEMBER 18, 2012

Federal Emergency Management Agency

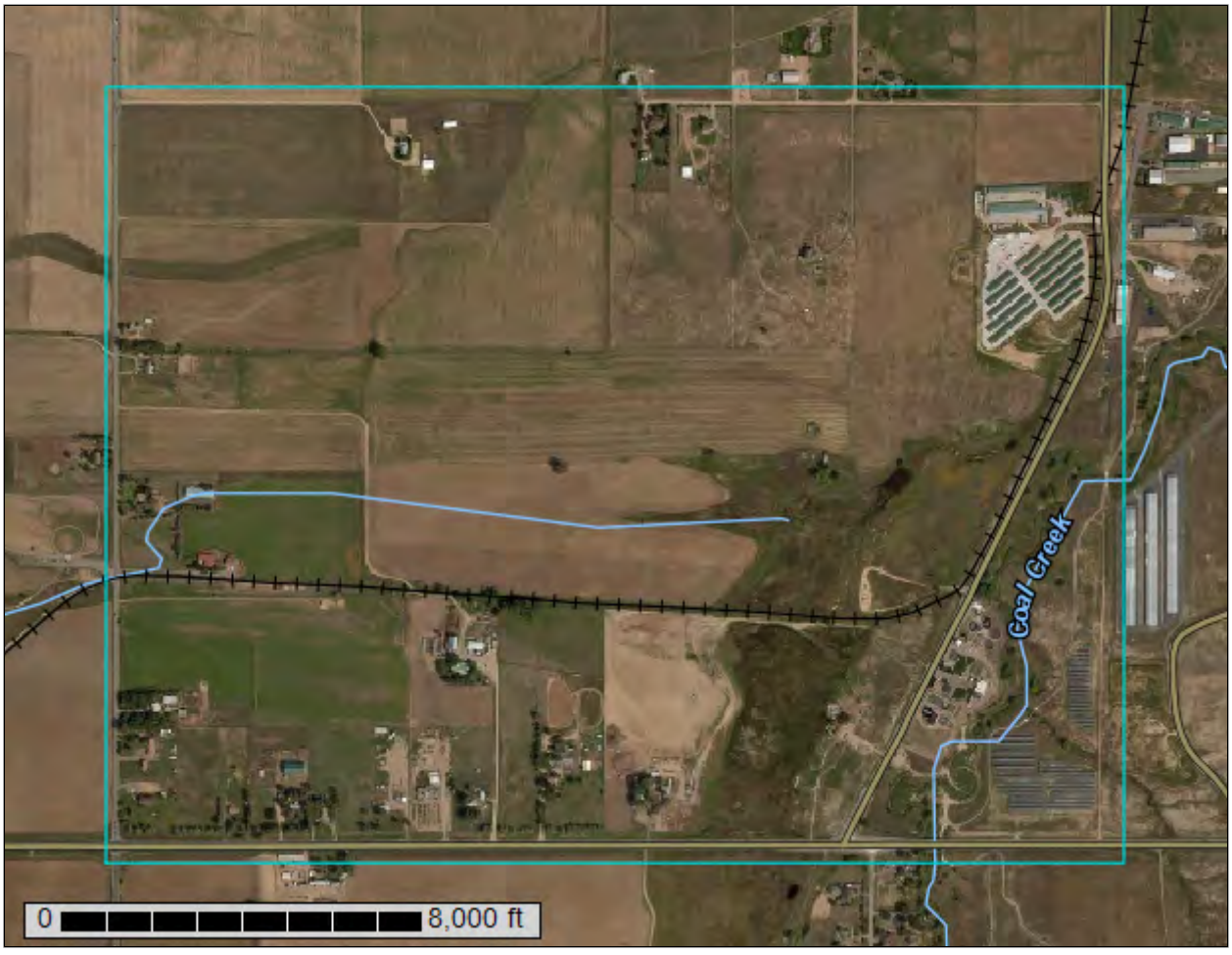
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

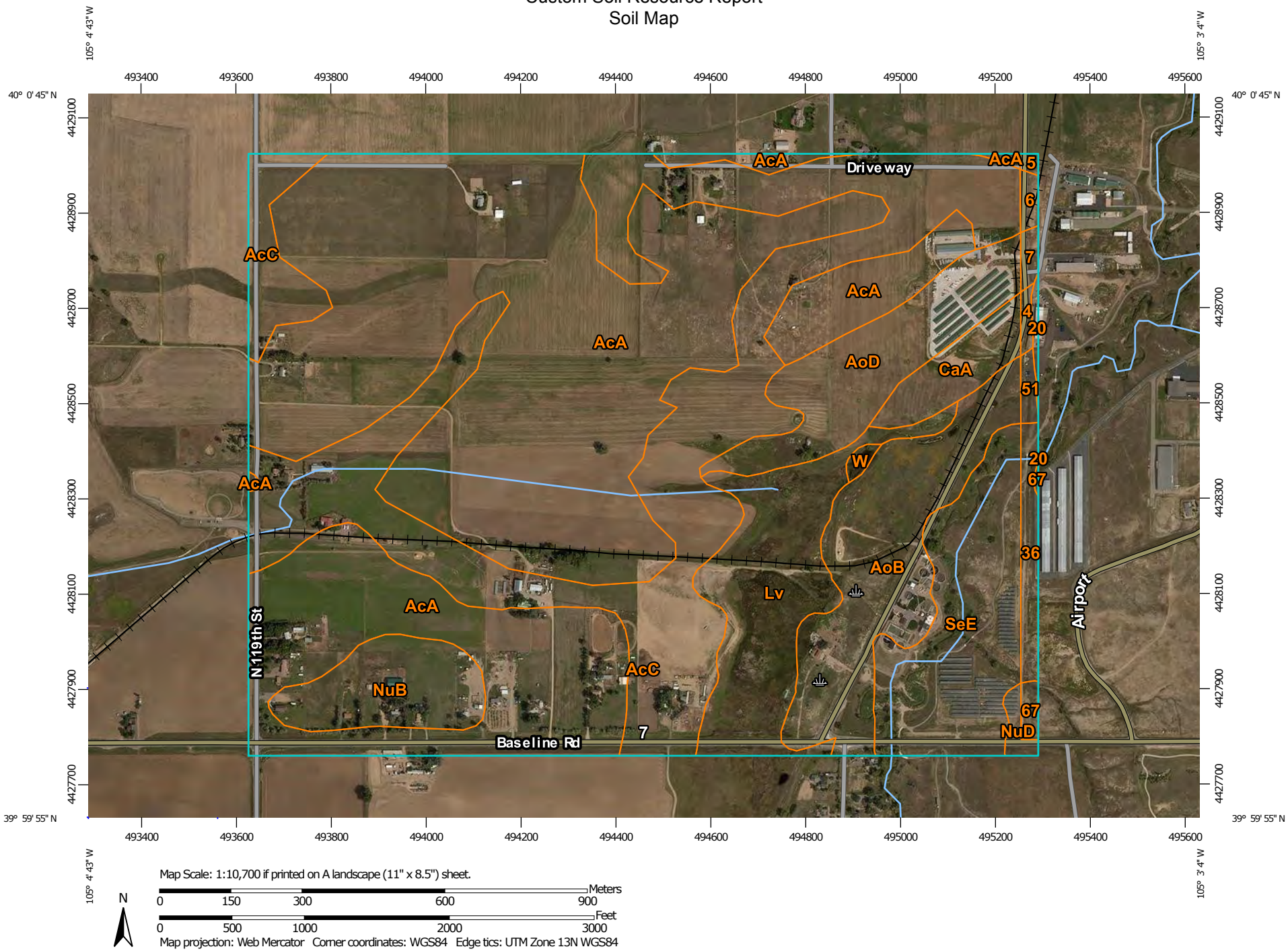
A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Boulder County Area, Colorado; and Weld County, Colorado, Southern Part



January 19, 2016

Custom Soil Resource Report
Soil Map



Map Scale: 1:10,700 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:20,000 to 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Boulder County Area, Colorado
Survey Area Data: Version 12, Sep 22, 2015

Soil Survey Area: Weld County, Colorado, Southern Part
Survey Area Data: Version 14, Sep 22, 2015

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 30, 2014—Sep 18, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting

Map Unit Legend

Boulder County Area, Colorado (CO643)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AcA	Ascalon sandy loam, 0 to 3 percent slopes	235.0	45.0%
AcC	Ascalon sandy loam, 3 to 5 percent slopes	115.9	22.2%
AoB	Ascalon-Otero complex, 0 to 3 percent slopes	38.4	7.3%
AoD	Ascalon-Otero complex, 5 to 9 percent slopes	25.6	4.9%
CaA	Calkins sandy loam, 0 to 1 percent slopes	8.7	1.7%
Lv	Loveland soils	33.6	6.4%
NuB	Nunn clay loam, 1 to 3 percent slopes	16.7	3.2%
NuD	Nunn clay loam, 5 to 9 percent slopes	1.4	0.3%
SeE	Samsil-Shingle complex, 5 to 25 percent slopes	34.7	6.6%
W	Water	0.7	0.1%
Subtotals for Soil Survey Area		**510.9**	**97.8%**
Totals for Area of Interest		**522.1**	**100.0%**

Weld County, Colorado, Southern Part (CO618)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
4	Aquolls and Aquepts, flooded	0.8	0.2%
5	Ascalon sandy loam, 0 to 3 percent slopes	0.4	0.1%
6	Ascalon sandy loam, 3 to 5 percent slopes	1.1	0.2%
7	Ascalon sandy loam, 5 to 9 percent slopes	1.1	0.2%
20	Colombo clay loam, 1 to 3 percent slopes	0.6	0.1%
36	Midway-Shingle complex, 5 to 20 percent slopes	4.8	0.9%
51	Otero sandy loam, 1 to 3 percent slopes	1.2	0.2%
67	Ulm clay loam, 3 to 5 percent slopes	1.2	0.2%
Subtotals for Soil Survey Area		**11.3**	**2.2%**
Totals for Area of Interest		**522.1**	**100.0%**

Boulder County Area, Colorado

AcA—Ascalon sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2swl3
Elevation: 3,870 to 5,960 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 135 to 160 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Ascalon and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Interfluves, plains
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind-reworked alluvium and/or calcareous sandy eolian deposits

Typical profile

Ap - 0 to 6 inches: sandy loam
Bt1 - 6 to 12 inches: sandy clay loam
Bt2 - 12 to 19 inches: sandy clay loam
Bk - 19 to 35 inches: sandy clay loam
C - 35 to 80 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: Sandy Plains (R067BY024CO)

Minor Components

Olnest

Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy Plains (R067BY024CO)

Vona

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy Plains (R067BY024CO)

AcC—Ascalon sandy loam, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2tlnt
Elevation: 3,550 to 5,970 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 135 to 160 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Ascalon and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind-reworked alluvium and/or calcareous sandy eolian deposits

Typical profile

Ap - 0 to 6 inches: sandy loam
Bt1 - 6 to 12 inches: sandy clay loam
Bt2 - 12 to 19 inches: sandy clay loam
Bk - 19 to 35 inches: sandy clay loam
C - 35 to 80 inches: sandy loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline (0.1 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: Sandy Plains (R067BY024CO), Sandy (North) Draft (April 2010) (PE 16-20) (R072XA022KS)

Minor Components

Stoneham

Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy Plains (R067BY002CO), Loamy Upland (North) (PE 16-20) (R072XA015KS)

Vona

Percent of map unit: 8 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, footslope, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy Plains (R067BY024CO), Sandy (North) Draft (April 2010) (PE 16-20) (R072XA022KS)

Platner

Percent of map unit: 2 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy Plains (R067BY002CO), Loamy Upland (North) (PE 16-20) (R072XA015KS)

AoB—Ascalon-Otero complex, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: jpr5
Elevation: 4,900 to 5,500 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 140 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Ascalon and similar soils: 60 percent
Otero and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Terraces
Landform position (three-dimensional): Side slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed loamy alluvium and/or eolian deposits

Typical profile

H1 - 0 to 6 inches: sandy loam
H2 - 6 to 18 inches: sandy clay loam, sandy loam
H2 - 6 to 18 inches: fine sandy loam, loamy fine sand, sandy loam
H3 - 18 to 60 inches:
H3 - 18 to 60 inches:
H3 - 18 to 60 inches:

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very high (about 16.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B
Ecological site: Sandy (R067XB026CO)

Description of Otero

Setting
Landform: Terraces, hills
Landform position (three-dimensional): Side slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed loamy alluvium and/or eolian deposits

Typical profile
H1 - 0 to 17 inches: sandy loam
H2 - 17 to 60 inches: sandy loam, fine sandy loam
H2 - 17 to 60 inches:

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Very high (about 12.2 inches)

Interpretive groups
Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: A
Ecological site: Sandy (R067XB026CO)

Minor Components

Kim
Percent of map unit: 5 percent

Manter
Percent of map unit: 5 percent

AoD—Ascalon-Otero complex, 5 to 9 percent slopes

Map Unit Setting
National map unit symbol: jpr7
Elevation: 4,900 to 5,500 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 140 to 155 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Ascalon and similar soils: 50 percent
Otero and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Ridges, terraces
Landform position (three-dimensional): Side slope, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed loamy alluvium and/or eolian deposits

Typical profile

H1 - 0 to 6 inches: sandy loam
H2 - 6 to 17 inches: sandy clay loam, sandy loam
H2 - 6 to 17 inches: fine sandy loam, loamy fine sand, sandy loam
H3 - 17 to 60 inches:
H3 - 17 to 60 inches:
H3 - 17 to 60 inches:

Properties and qualities

Slope: 5 to 7 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very high (about 16.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Sandy (R067XB026CO)

Description of Otero

Setting

Landform: Ridges
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed loamy alluvium over eolian deposits

Typical profile

H1 - 0 to 8 inches: sandy loam
H2 - 8 to 60 inches: sandy loam, fine sandy loam

H2 - 8 to 60 inches:

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Very high (about 13.3 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: Sandy (R067XB026CO)

Minor Components

Kim

Percent of map unit: 8 percent

Terry

Percent of map unit: 5 percent

Cascajo

Percent of map unit: 2 percent

CaA—Calkins sandy loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: jprb
Elevation: 4,900 to 5,500 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 140 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Calkins and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Calkins

Setting

Landform: Terraces, flood plains
Landform position (three-dimensional): Tread

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile
H1 - 0 to 14 inches: sandy loam
H2 - 14 to 60 inches: sandy loam

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.2 inches)

Interpretive groups
Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B
Ecological site: Sandy Bottomland (R067XB031CO)

Minor Components

Mcclave
Percent of map unit: 6 percent

Valmont
Percent of map unit: 4 percent

Lv—Loveland soils

Map Unit Setting
National map unit symbol: jps0
Elevation: 4,900 to 5,500 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 140 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Loveland and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Loveland

Setting

Landform: Flood plains, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

H1 - 0 to 11 inches: clay loam
H2 - 11 to 30 inches: clay loam, silty clay loam, loam
H2 - 11 to 30 inches: very gravelly sand, gravelly sand, gravelly coarse sand
H2 - 11 to 30 inches:
H3 - 30 to 60 inches:
H3 - 30 to 60 inches:
H3 - 30 to 60 inches:

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Available water storage in profile: Very high (about 17.4 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Ecological site: Salt Meadow (R067XB035CO)

Minor Components

Aquolls

Percent of map unit: 10 percent
Landform: Flood plains

Mcclave

Percent of map unit: 3 percent

Niwot

Percent of map unit: 2 percent

NuB—Nunn clay loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: jpsd
Elevation: 4,900 to 5,500 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 140 to 155 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Nunn and similar soils: 80 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nunn

Setting

Landform: Terraces, valley sides
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

H1 - 0 to 10 inches: clay loam
H2 - 10 to 18 inches: clay
H3 - 18 to 30 inches: clay
H4 - 30 to 60 inches: clay loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Clayey (R067XB042CO)

Minor Components

Valmont
Percent of map unit: 8 percent

Kim
Percent of map unit: 5 percent

Mollic halaquepts
Percent of map unit: 2 percent
Landform: Swales

NuD—Nunn clay loam, 5 to 9 percent slopes

Map Unit Setting
National map unit symbol: jpsg
Elevation: 4,900 to 5,500 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 140 to 155 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Nunn and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nunn

Setting
Landform: Valley sides
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile
H1 - 0 to 8 inches: clay loam
H2 - 8 to 14 inches: clay
H3 - 14 to 60 inches: clay loam

Properties and qualities
Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: High (about 11.1 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Clayey (R067XB042CO)

Minor Components

Kutch

Percent of map unit: 8 percent

Kim

Percent of map unit: 7 percent

SeE—Samsil-Shingle complex, 5 to 25 percent slopes

Map Unit Setting

National map unit symbol: jpsr
Elevation: 4,900 to 5,500 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 140 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Shingle and similar soils: 40 percent
Samsil and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Samsil

Setting

Landform: Ridges, hills
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from clayey shale

Typical profile

H1 - 0 to 3 inches: clay
H2 - 3 to 12 inches: clay, silty clay
H2 - 3 to 12 inches: weathered bedrock
H3 - 12 to 16 inches:

Properties and qualities

Slope: 5 to 25 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Well drained

Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Low (about 3.2 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Shaly Foothill (R049BY212CO)

Description of Shingle

Setting
Landform: Ridges, hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile
H1 - 0 to 4 inches: loam
H2 - 4 to 13 inches: silt loam, loam
H2 - 4 to 13 inches: weathered bedrock
H3 - 13 to 17 inches:

Properties and qualities
Slope: 5 to 25 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 3.7 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: Shaly Foothill (R049BY212CO)

Minor Components

Renohill
Percent of map unit: 6 percent

Kutch
Percent of map unit: 5 percent

Gaynor
Percent of map unit: 4 percent

W—Water

Map Unit Composition
Water: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Minor Components

Aquolls
Percent of map unit: 5 percent
Landform: Marshes

Weld County, Colorado, Southern Part

4—Aquolls and Aquepts, flooded

Map Unit Setting

National map unit symbol: 362l
Elevation: 3,600 to 4,700 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 100 to 165 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Aquolls and similar soils: 55 percent
Aquepts, flooded, and similar soils: 25 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Aquolls

Setting

Landform: Depressions, drainageways, plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Recent alluvium

Typical profile

H1 - 0 to 8 inches: variable
H2 - 8 to 60 inches: stratified sandy loam to clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 6.00 in/hr)
Depth to water table: About 6 to 36 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Moderately saline to strongly saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 6w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: D
Ecological site: Salt Meadow (R067BY035CO)

Description of Aquepts, Flooded

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Recent alluvium

Typical profile

H1 - 0 to 8 inches: variable
H2 - 8 to 60 inches: stratified sandy loam to clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 6.00 in/hr)
Depth to water table: About 6 to 36 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Moderately saline to strongly saline (8.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 6w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: D
Ecological site: Wet Meadow (R067BY038CO)

Minor Components

Thedalund

Percent of map unit: 10 percent

Haverson

Percent of map unit: 10 percent

5—Ascalon sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2swl3
Elevation: 3,870 to 5,960 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 135 to 160 days

Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Ascalon and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Interfluves, plains
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind-reworked alluvium and/or calcareous sandy eolian deposits

Typical profile

Ap - 0 to 6 inches: sandy loam
Bt1 - 6 to 12 inches: sandy clay loam
Bt2 - 12 to 19 inches: sandy clay loam
Bk - 19 to 35 inches: sandy clay loam
C - 35 to 80 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: Sandy Plains (R067BY024CO)

Minor Components

Olnest

Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy Plains (R067BY024CO)

Vona

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy Plains (R067BY024CO)

6—Ascalon sandy loam, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2tlnt
Elevation: 3,550 to 5,970 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 135 to 160 days
Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Ascalon and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind-reworked alluvium and/or calcareous sandy eolian deposits

Typical profile

Ap - 0 to 6 inches: sandy loam
Bt1 - 6 to 12 inches: sandy clay loam
Bt2 - 12 to 19 inches: sandy clay loam
Bk - 19 to 35 inches: sandy clay loam
C - 35 to 80 inches: sandy loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline (0.1 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: Sandy Plains (R067BY024CO), Sandy (North) Draft (April 2010) (PE 16-20) (R072XA022KS)

Minor Components

Stoneham

Percent of map unit: 10 percent
Landform: Interfluves
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy Plains (R067BY002CO), Loamy Upland (North) (PE 16-20) (R072XA015KS)

Vona

Percent of map unit: 8 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope, footslope, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy Plains (R067BY024CO), Sandy (North) Draft (April 2010) (PE 16-20) (R072XA022KS)

Platner

Percent of map unit: 2 percent
Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy Plains (R067BY002CO), Loamy Upland (North) (PE 16-20) (R072XA015KS)

7—Ascalon sandy loam, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2tlmx
Elevation: 3,870 to 6,070 feet
Mean annual precipitation: 13 to 16 inches

Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 135 to 160 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Ascalon and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ascalon

Setting

Landform: Interfluves
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Wind-reworked alluvium and/or calcareous sandy eolian deposits

Typical profile

Ap - 0 to 6 inches: sandy loam
Bt1 - 6 to 12 inches: sandy clay loam
Bt2 - 12 to 19 inches: sandy clay loam
Bk - 19 to 35 inches: sandy clay loam
C - 35 to 80 inches: sandy loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.1 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: Sandy Plains (R067BY024CO)

Minor Components

Stoneham

Percent of map unit: 10 percent
Landform: Interfluves
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Loamy Plains (R067BY002CO)

Manter

Percent of map unit: 5 percent
Landform: Interfluves

Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy Plains (R067BY024CO)

20—Colombo clay loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 361x
Elevation: 4,600 to 4,780 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 130 to 160 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Colombo and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Colombo

Setting

Landform: Flood plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stratified, calcareous alluvium

Typical profile

H1 - 0 to 14 inches: clay loam
H2 - 14 to 21 inches: stratified loam to clay loam
H3 - 21 to 60 inches: stratified sand to loam to clay loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Clayey Plains (R067BY042CO)

Minor Components

Dacono
Percent of map unit: 5 percent

Heldt
Percent of map unit: 5 percent

Nunn
Percent of map unit: 5 percent

36—Midway-Shingle complex, 5 to 20 percent slopes

Map Unit Setting
National map unit symbol: 362g
Elevation: 5,050 to 5,250 feet
Mean annual precipitation: 10 to 17 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 100 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition
Midway and similar soils: 50 percent
Shingle and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Midway

Setting
Landform: Ridges, hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous residuum weathered from shale

Typical profile
H1 - 0 to 7 inches: clay
H2 - 7 to 13 inches: clay
H3 - 13 to 17 inches: weathered bedrock

Properties and qualities
Slope: 5 to 20 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent

Gypsum, maximum in profile: 15 percent
Salinity, maximum in profile: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 15.0
Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Shaly Plains (R067BY045CO)

Description of Shingle

Setting

Landform: Ridges, hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from calcareous shale

Typical profile

H1 - 0 to 6 inches: loam
H2 - 6 to 18 inches: clay loam
H3 - 18 to 22 inches: unweathered bedrock

Properties and qualities

Slope: 5 to 20 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: Shaly Plains (R067BY045CO)

Minor Components

Renohill

Percent of map unit: 8 percent

Tassel

Percent of map unit: 7 percent

51—Otero sandy loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 3630
Elevation: 4,700 to 5,250 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 130 to 180 days
Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Otero and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Otero

Setting

Landform: Plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits and/or mixed outwash

Typical profile

H1 - 0 to 12 inches: sandy loam
H2 - 12 to 60 inches: fine sandy loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: Sandy Plains (R067BY024CO)

Minor Components

Kim

Percent of map unit: 10 percent

Vona

Percent of map unit: 5 percent

67—Ulm clay loam, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: 363k
Elevation: 5,070 to 5,200 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 105 to 120 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Ulm and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ulm

Setting

Landform: Plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium and/or eolian deposits derived from shale

Typical profile

H1 - 0 to 5 inches: clay loam
H2 - 5 to 17 inches: clay
H3 - 17 to 60 inches: clay loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: Clayey Plains (R067BY042CO)

Minor Components

Renohill

Percent of map unit: 11 percent

Heldt

Percent of map unit: 4 percent

Ecological Resource Consultants, Inc.
5672 Juhls Drive ~ Boulder, CO ~ 80301 ~ (303) 679-4820

September 29, 2017

KT Engineering
12500 W. 58th Ave, Suite 230
Arvada, CO 80002

RE: Parkdale Project-US Army Corps of Engineers Clean Water Act Section 404 Permit Status

This letter provide a summary of the status of the US Army Corps of Engineers (USACE) Clean Water Act Section 404 Permit for the Parkdale Project located in Erie, Boulder County.

1. An application was submitted to the USACE Denver Regulatory Office dated August 9, 2017 under a Nationwide Permit 29 (Clean Water Act Section 404) requesting authorization for 0.49 acre of impact to aquatic resources from the proposed project.

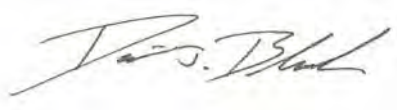
2. USACE provided notification on August 21, 2017 that the application was received, assigned file number NWO-2016-01594-Den and Project Manager Mrs. Angelle Greer.

3. Personal communication with USACE Project Manager on September 13, 2017 indicated that a permit is being processed and will be issued shortly.

4. At this date, the proposed project impacts to aquatic resources will be authorized under a Nationwide Permit 29 from the USACE Denver Regulatory. Final permit authorization is pending.

If you have any questions or require additional information please feel free to contact me.

Ecological Resource Consultants, Inc.



David J. Blauch, V.P., Senior Ecologist, P.W.S.

Appendix F

Appendix G (Conceptual Design Plan) of the Town of Erie OSP and Text Narrative

7.0 CONCEPTUAL DESIGN

7.1 PLAN DEVELOPMENT OVERVIEW

The notice to proceed with the Conceptual Design phase of the project was issued on September 25, 2013 with the Selected Plan. The Selected Plan is included in Appendix A, Project Correspondence. This Conceptual Design Report is intended to provide guidance to the project sponsors for future planning and capital improvement projects within the study area. The Selected Plan issued by the project sponsors essentially follows the Recommended Plan, presented in Section 6 of this report, with a few minor clarifications, and is based on the following principal elements, goals, and objectives:

- Minimize stormwater and flood-related damages to drainageways, public infrastructure and private property. Do this with value engineering and practicalities of implementation in mind.
- Institute an approach that balances the development in the watershed with stormwater management implementation that complements drainageway and stream stability solutions, that as a system, provide multiple benefits that include:
    - Water quality protection and enhancement
    - Water quantity resources protection
    - Preservation of natural character of the waterways and their terrestrial and aquatic habitat resource
    - Wherever possible, provide public use and access and/or trails within the corridors of identified waterways in order to provide maintenance access that will also provide for active and passive recreation of the public
- Consider the needs for new and upgraded roadway crossings when such improvements are practicable, affordable and add significant value in relation to the cost.

The Selected Plan included three deviations from the Recommended Plan as follows:

- Include the recently refurbished and expanded Wild Ridge detention pond located on Drainageway 2 near Finch Street in the master planned hydrology.
- In the narrative discussing the Drainageway 2 outfall, mention the Waneka Bishop lateral of the Goodhue Ditch which parallels Drainageway 2 and has caused much of the neighborhood difficulty on the properties along the sanitary sewer alignment. The flow should be restricted to what the ditch can convey safely with overflow going to Drainageway 2.
- For the Prince Tributary Reaches 2 and 3, design for Alternative 7 (Do Nothing) rather than Alternative 3 (Optimization of Stormwater Facilities.

The Conceptual Design Plan presented herein is intended to address existing problems observed within the study area including undersized roadway crossings, insufficient channel capacity, and risk of flooding to private property. The Conceptual Design Plan also addresses areas that have yet to be developed and are not showing signs of channel degradation. The proposed improvements in these areas are intended to be implemented when the developments take place.

Preliminary cost estimates for the Conceptual Design Plan improvements and operation and maintenance were refined from those provided in the alternatives analysis. Detailed cost estimates are provided on a reach-by-reach basis in the following section and a Conceptual Design Plan cost estimate summary is provided in Table 8-1. The Conceptual Design Map and Profile are included in Appendices H and I.

7.2 MASTER PLAN DESCRIPTION

The Conceptual Design Plan is presented in the following pages on a reach-by-reach basis. Cost estimates are provided for each reach. The Conceptual Design Map and Profile are included in Appendices H and I. The Conceptual Design Map and Profile can be viewed from this report by clicking on the links at the end of the sections. Links are also provided on the map and profile to return to the text.

COAL CREEK TRIBUTARIES

DRAINAGEWAY 2 SOUTH - REACH 1

Coal Creek to 1,100' upstream of N. 119th Street

Reach Description

Reach 1 of the Drainageway 2 South outfall is primarily located in unincorporated Boulder County. The upstream boundary of Reach 1 is the City of Lafayette city limit. The portion of Reach 1 east of County Line Road, approximately 500 feet in length, is located within the City of Lafayette. Baseline Road and its right-of-way is also located within the City of Lafayette. The upper portion of the reach, both east and west of N. 119th Street, is zoned as mixed use. Periodic localized flooding has occurred at properties located along the north side of Baseline Road just east of N. 119th Street. The most recent flooding events occurred in August and September 2013.

Problem Identification

- Localized flooding of private properties
- Undersized roadway crossings
- Insufficient channel capacity

Conceptual Design Plan Improvements

Optimization of Stormwater Facilities and Conveyance of the Minor Storm Event

The Conceptual Design Plan is to divert and convey to the north all flow above the historic flow rate. Only historic flows will be allowed to flow to the south. Conceptual Design Plan also includes a regional detention pond located in Reach 2 of this outfall.

A separate hydrologic analysis was developed for this study to determine the historic, pre-development, flows along Drainageway 2 South. The CUHP model was revised so that all subbasins had a 2% imperviousness to replicate historic conditions. The CUHP results were input into the baseline SWMM model and the results showed that the historic 100-year peak flow rate at Baseline Road and N. 119th Street (SWMM design point 503) is 644 cfs.

The proposed regional detention pond, located in Reach 2 of this outfall, reduces the 100-year peak flow from 1,253 cfs to 866 cfs at the existing abandoned railroad embankment. A recently improved detention pond located in the City of Lafayette (Wild Ridge) was added to the conceptual design SWMM model, so the peak flows presented here are different than those in the alternatives analysis section of this report. The addition of the Wild Ridge detention pond further reduced flows along Drainageway 2 South.

This alternative assumes the historic 100-year peak flow (644 cfs) continues to the south along the existing drainage path and the remaining 222 cfs will be diverted to the north and safely conveyed to Coal Creek. Low flows and minor storm events would be diverted to the proposed channel alignment until the channel capacity of 222 cfs is exceeded, at which point the remaining flow would be conveyed to the south along the existing flow path.

The proposed channel alignment is within the existing 50-foot abandoned railroad right-of-way located east of N. 119th Street. An existing sanitary sewer pipe is located just to the south of the railroad right-of-way; therefore any additional easement will have to be located to the north. The railroad right-of-way extends from N. 119th Street to County Line Road; however it is not entirely continuous. A 750' gap exists near County Line Road. The channel was designed with a target velocity of 5 ft/s and 4:1 side slopes. A culvert was also sized for the County Line Road crossing to convey the design flow of the proposed channel. The channel continues west of County Line Road to the outfall at Coal Creek.

West of N. 119th Street, in order to divert flows to the proposed channel alignment, a storm sewer is proposed starting at the north end of the existing abandoned railroad embankment and extending through N. 119th Street to the beginning of the proposed channel. The storm sewer will also bypass an existing house located just to the east of N. 119th Street and north of the railroad right-of-way. The storm sewer is required here because there is no additional room between the railroad right-of-way and the house's driveway.

The Waneka Bishop Lateral of the Goodhue Ditch runs parallel with Drainageway 2 for a portion of Reaches 1 and 2. During storm events, the Waneka Bishop Lateral intercepts flows from Drainageway 2 and conveys them downstream through private property. Property owners have stated that this causes flooding on their property, particularly those located on the east side of N. 119th Street and north of the railroad embankment. When the proposed channel improvements are implemented, care should be taken to limit the amount of flow in the Waneka Bishop Lateral to its existing conveyance capacity.

The Conceptual Design Plan is as follows:

Channel: Q = 222 cfs, normal depth = 3.3', top width = 36', bottom width = 0', slope = 0.72%, drop height = 33'
Storm Sewer (N. 119th Street): Q = 222 cfs, pipe size = 2 – 48" RCP, length = 1,200'
Culvert (County Line Road): Q = 222 cfs, 2 – 48" RCP, length = 150'

CLICK HERE TO VIEW REACH 1 MAP

CLICK HERE TO VIEW REACH 1 PROFILE

APPENDIX G
CONCEPTUAL DESIGN INFORMATION

Table G-1
Peak Flow Summary – Conceptual Design Plan

Coal Creek Tributaries			Peak Discharge (cfs) - Existing Development						Peak Discharge (cfs) - Future Development					
SWMM Node	**Location Description**	**Drainage Area (acres)**	**2-Year**	**5-Year**	**10-Year**	**25-Year**	**50-year**	**100-Year**	**2-Year**	**5-Year**	**10-Year**	**25-Year**	**50-year**	**100-Year**
500	U.S. Highway 287	157	38	93	120	194	246	296	117	214	260	365	446	515
501	N. 111th Street	334	110	245	308	479	604	726	242	451	540	772	927	1,059
502		528	130	293	375	600	764	930	261	499	603	836	1,004	1,197
503	N. 119th Street	658	12	30	39	65	82	100	49	85	101	139	168	195
900		716	69	189	288	440	549	666	350	599	807	1,085	1,285	1,538
901		26	1	7	10	19	25	31	1	7	10	19	25	31
902		13	2	6	8	13	16	20	2	6	8	13	16	20
504	N. 119th Street	64	73	202	284	523	681	821	139	333	443	688	828	921
505	E. County Line Road	314	87	250	357	592	777	954	153	383	485	759	930	1,070
903		319	88	251	359	592	778	955	154	384	489	759	930	1,071
904		31	26	47	58	81	100	115	26	47	58	81	100	115
506	N. 119th Street	111	7	34	49	96	126	158	7	34	49	96	126	158
507		217	6	49	76	163	219	278	6	50	76	163	219	278
508	E. County Line Road	284	1	51	94	210	282	350	2	70	110	226	301	375
905		303	2	51	98	224	302	373	26	75	117	238	317	399
509	N. 119th Street	56	1	13	20	44	59	74	1	13	20	44	59	74
514	E. County Line Road	184	0	35	108	334	457	573	2	111	193	417	528	640
906		211	0	10	16	32	43	54	40	70	87	118	144	162
511	N. 119th Street	67	1	21	32	71	94	120	1	21	32	71	94	120
512	N. 119th Street	42	0	8	13	28	37	48	0	8	13	28	37	48
513		229	2	45	73	165	218	278	3	46	74	166	219	279
514	E. County Line Road	289	0	35	108	334	457	573	2	111	193	417	528	640
907		303	0	35	110	340	466	584	21	115	200	424	537	644
908		135	0	4	6	13	18	23	22	36	43	56	66	77
909		65	1	22	33	68	90	113	78	139	166	221	268	314
516		42	0	9	14	31	42	53	16	37	47	74	92	111
517	E. County Line Road	156	0	2	4	9	47	109	6	23	46	120	182	246
910		221	1	13	20	41	71	151	80	130	151	198	268	368
911		61	0	8	13	29	39	50	17	38	48	75	94	112

Table G-1
Peak Flow Summary – Conceptual Design Plan

Coal Creek Tributaries			Peak Discharge (cfs) - Existing Development						Peak Discharge (cfs) - Future Development					
SWMM Node	**Location Description**	**Drainage Area (acres)**	**2-Year**	**5-Year**	**10-Year**	**25-Year**	**50-year**	**100-Year**	**2-Year**	**5-Year**	**10-Year**	**25-Year**	**50-year**	**100-Year**
912		85	22	56	74	120	153	183	22	56	74	120	153	183
521	E. County Line Road	79	0	3	5	11	14	30	9	14	21	62	104	138
522		174	88	155	188	258	315	360	95	165	199	272	331	390
913		234	92	178	216	313	386	464	104	198	239	346	425	501
914		51	6	24	33	60	78	95	31	66	84	125	157	186
523		41	12	29	37	61	77	93	12	29	37	61	77	93
526		168	10	20	27	68	95	106	10	20	27	68	95	106
528		35	3	13	18	34	45	55	3	13	18	34	45	55
529		298	11	46	66	136	183	210	19	63	84	137	188	212
530	Meller Street	489	32	77	130	263	362	470	49	99	162	295	410	515
531		572	38	91	152	317	419	551	66	142	198	367	487	624
532		636	25	81	117	187	223	258	46	111	148	196	248	262
534	E. County Line Road	61	0	1	2	4	8	21	3	10	18	47	73	88
536	E. County Line Road	686	27	86	125	193	225	267	51	119	159	207	252	276
915		877	25	94	140	233	275	338	62	146	200	312	399	491
538	E. County Line Road	27	30	54	65	88	107	126	30	54	65	88	107	126
542		128	33	91	119	195	249	300	33	91	119	195	249	300
543		234	77	170	220	361	460	559	77	170	220	361	460	559
917		323	98	228	283	449	575	706	125	260	322	471	604	741
539		69	18	50	64	101	128	152	36	73	88	128	157	184
919		159	26	72	95	164	211	259	90	165	200	294	364	431
920		34	9	22	28	45	57	69	9	22	28	45	57	69
540		88	2	17	25	51	68	87	10	30	41	73	94	116
541	Lombardi Street	319	31	86	116	209	272	347	45	121	160	274	351	436
921		387	39	111	148	263	330	427	53	145	191	321	414	520
922		29	0	6	9	17	22	28	0	6	9	17	22	28
923		48	0	7	10	19	26	33	1	7	11	20	26	34
924		59	0	9	14	25	34	43	1	10	14	26	34	44
518	E. County Line Road	202	0	1	2	7	24	33	3	14	24	34	42	47
519	E. County Line Road	148	4	15	21	32	39	40	4	15	21	32	39	40
925		438	10	32	46	88	115	145	92	156	182	244	294	343

Table G-1
Peak Flow Summary – Conceptual Design Plan

Prince Tributary			Peak Discharge (cfs) - Existing Development						Peak Discharge (cfs) - Future Development					
SWMM Node	Location Description	Drainage Area (acres)	2-Year	5-Year	10-Year	25-Year	50-year	100-Year	2-Year	5-Year	10-Year	25-Year	50-year	100-Year
300		152	7	38	59	126	170	218	39	98	129	220	283	346
302		43	27	54	67	99	124	145	27	54	68	100	125	145
303	Arapahoe Road	334	79	192	246	399	509	618	92	228	298	504	623	744
305		408	73	180	233	388	499	613	89	223	292	490	601	740
1025		408	73	194	260	446	559	676	89	247	328	548	662	804
306		533	20	66	104	210	286	377	28	84	124	242	327	422
308		780	52	121	180	335	433	557	61	147	209	375	468	608
310		77	14	52	70	123	158	194	14	52	70	123	159	194
311		920	59	143	202	375	516	682	81	188	239	413	543	711
312	Erie Parkway	1,256	2	97	206	458	626	827	19	193	302	559	723	954
313		1,303	15	103	220	479	664	884	19	206	325	595	783	1,037
315	Flatiron Drive	1,539	47	141	235	501	708	955	47	223	359	645	877	1,168
320		122	1	28	43	94	126	158	1	28	43	94	126	158
321	Erie Parkway	222	2	50	74	168	227	290	2	50	74	168	227	290
322		281	83	346	630	1,138	1,455	1,925	490	1,184	1,779	2,676	3,274	4,036
323		368	83	348	637	1,157	1,486	1,961	482	1,177	1,780	2,696	3,302	4,079
317	Lower Boulder Ditch	1,907	96	426	855	1,649	2,160	2,879	512	1,278	2,021	3,246	4,064	5,114
318	UPRR	2,081	98	428	864	1,678	2,211	2,951	515	1,297	2,050	3,307	4,154	5,233
319	Boulder & Weld Co Ditch	2,145	98	426	866	1,685	2,222	2,968	510	1,297	2,048	3,313	4,169	5,257
940		2,245	98	426	868	1,693	2,242	2,986	491	1,288	2,031	3,302	4,168	5,263

Table G-1
Peak Flow Summary – Conceptual Design Plan

Boulder Creek Tributaries			Peak Discharge (cfs) - Existing Development						Peak Discharge (cfs) - Future Development					
SWMM Node	**Location Description**	**Drainage Area (acres)**	**2-Year**	**5-Year**	**10-Year**	**25-Year**	**50-year**	**100-Year**	**2-Year**	**5-Year**	**10-Year**	**25-Year**	**50-year**	**100-Year**
950		94	3	34	49	91	120	149	3	34	49	91	120	149
700	Jasper Road	51	0	8	13	28	37	48	0	8	13	28	37	48
951		103	1	20	31	62	83	108	1	20	31	62	83	108
952		104	5	48	66	118	154	191	5	48	66	118	154	191
701	N. 109th Street	26	1	10	15	29	38	46	1	10	15	29	38	46
953		142	4	41	61	119	157	197	4	41	61	119	157	197
954		46	0	8	12	21	28	36	0	8	12	21	28	36
702	Jasper Road	25	12	53	75	137	178	242	17	62	85	150	210	298
703		155	11	80	115	219	288	362	15	88	125	231	302	381
955		231	11	88	130	229	302	401	15	96	141	238	332	427
956		95	4	30	44	83	109	136	4	30	44	83	109	136
704	N. 115th Street	66	3	22	30	56	72	90	3	22	30	56	72	90
957		95	3	31	43	79	104	129	3	31	43	79	104	129
705		66	12	34	44	76	97	118	13	34	44	76	97	119
706	UPRR	245	17	75	101	198	262	329	47	129	162	269	346	427
708	Jasper Road	590	20	84	115	224	297	374	48	138	177	300	387	477
709		738	15	87	131	278	354	429	44	134	183	348	418	523
710	Kenosha Road	814	16	100	154	292	382	473	43	147	206	361	460	570
958		859	16	108	166	311	401	500	44	156	220	373	481	601
959		52	1	9	12	23	30	39	1	9	13	23	31	40
750		1,638	12	312	573	918	1,165	1,440	12	312	573	918	1,165	1,440
712		1,774	14	329	595	975	1,247	1,552	14	329	595	974	1,247	1,552
713		2,044	16	368	645	1,096	1,423	1,787	16	369	645	1,097	1,423	1,788
714	D/S of N. 115th Street	2,121	17	378	643	1,105	1,448	1,831	17	377	643	1,105	1,449	1,831
960		2,168	17	385	642	1,107	1,458	1,850	17	385	642	1,107	1,459	1,850
715	Jasper Road	50	6	21	28	52	68	84	6	21	28	52	68	84
716		139	5	35	53	111	148	188	15	51	71	134	175	219
717	Kenosha Road	219	5	48	75	159	213	273	20	73	103	195	256	321
961		248	6	53	83	175	235	299	20	79	112	211	275	334

Table G-1
Peak Flow Summary – Conceptual Design Plan

Boulder Creek Tributaries			Peak Discharge (cfs) - Existing Development						Peak Discharge (cfs) - Future Development					
SWMM Node	**Location Description**	**Drainage Area (acres)**	**2-Year**	**5-Year**	**10-Year**	**25-Year**	**50-year**	**100-Year**	**2-Year**	**5-Year**	**10-Year**	**25-Year**	**50-year**	**100-Year**
718		104	3	37	54	100	131	163	4	38	55	101	133	164
719		145	3	52	75	140	185	229	4	53	76	141	186	230
962		250	3	74	108	207	274	343	4	75	110	208	275	344
963		80	1	20	28	52	69	87	1	20	28	52	69	87
720	Crystal View Lane	80	1	22	31	57	74	93	2	23	32	58	75	94
721		168	3	51	74	141	186	233	4	52	75	142	188	235
964		220	3	58	85	165	219	279	4	59	87	166	221	279
965		122	1	25	37	69	92	118	2	26	38	70	93	118
966		58	1	13	18	34	45	57	2	15	20	36	47	59
967		16	0	3	5	9	12	15	1	4	5	9	12	15
722		130	3	33	46	84	111	139	4	34	47	86	112	141
968		176	3	37	54	100	134	170	5	39	56	103	136	173
969		42	0	5	8	14	18	24	1	6	8	15	19	25
999		73	1	18	26	47	62	78	1	18	26	47	62	78

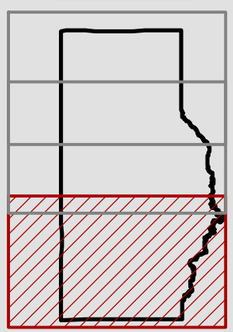
LEGEND

- Study Area Boundary
- Town of Erie
- City of Lafayette
- Subbasin Boundary
- Major Watershed Boundary
- Regional Detention Ponds

SWMM Elements

- Subbasin
- Design Point
- Conveyance Element
- Detention Facility
- Outfall
- Revised SWMM Routing

KEY MAP



N W E S

0 750 1,500 3,000 Feet

1 " = 1,500 FT

M:\2234\GIS\2234.MXD - 12/12/12 - NRT

RESPEC
720 SOUTH COLORADO BLVD, SUITE 410S
DENVER, COLORADO 80246
PHONE: 303-757-3655
FAX: 303-300-1635

TOWN OF ERIE - CITY OF LAFAYETTE - BOULDER COUNTY
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

TOWN OF ERIE OUTFALL SYSTEMS PLAN
(WEST OF COAL CREEK)

SWMM ROUTING MAP
CONCEPTUAL DESIGN PLAN

FIGURE
G-1

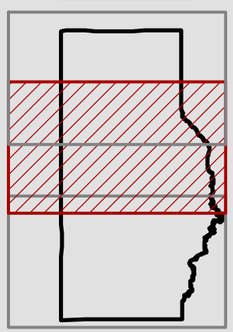
LEGEND

- Study Area Boundary
- Town of Erie
- City of Lafayette
- Subbasin Boundary
- Major Watershed Boundary
- Regional Detention Ponds

SWMM Elements

- Subbasin (XXX)
- Design Point (XXX)
- Conveyance Element (XXX)
- Detention Facility (XXX)
- Outfall (XXX)
- Revised SWMM Routing (XXX)

KEY MAP



N
W E
S

0 750 1,500 3,000 Feet

1 " = 1,500 FT

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RESPEC
CONSULTING & SERVICES
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TOWN OF ERIE - CITY OF LAFAYETTE - BOULDER COUNTY
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

TOWN OF ERIE OUTFALL SYSTEMS PLAN
(WEST OF COAL CREEK)

SWMM ROUTING MAP
CONCEPTUAL DESIGN PLAN

FIGURE
G-2

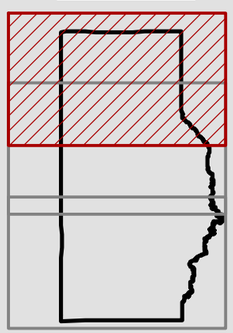
LEGEND

- Study Area Boundary
- Town of Erie
- City of Lafayette
- Subbasin Boundary
- Major Watershed Boundary
- Regional Detention Ponds

SWMM Elements

- Subbasin (XXX)
- Design Point (XXX)
- Conveyance Element (XXX)
- Detention Facility (XXX)
- Outfall (XXX)
- Revised SWMM Routing (XXX)

KEY MAP



N
W E
S

0 750 1,500 3,000 Feet

1 " = 1,500 FT

MINERAL ROAD (HWY 52)
US HIGHWAY 287
N 115TH STREET
COUNTY LINE ROAD
LOOKOUT ROAD
KENOSHA ROAD
JASPER ROAD
Boulder Creek
Bullhead Gulch
Coal Creek

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TOWN OF ERIE - CITY OF LAFAYETTE - BOULDER COUNTY
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

TOWN OF ERIE OUTFALL SYSTEMS PLAN
(WEST OF COAL CREEK)

SWMM ROUTING MAP
CONCEPTUAL DESIGN PLAN

FIGURE
G-3

Table G-2
Detention Pond Rating Curves – Conceptual Design Plan

Detention Pond 1046			
Stage (ft)	Surface Area (ft^2)	Storage (ac-ft)	Discharge (cfs)
0.0	20,000	0.0	0.00
1.0	22,464	0.5	0.32
2.0	25,056	1.0	0.82
3.0	27,776	1.6	1.47
4.0	30,624	2.3	2.22
5.0	33,600	3.0	3.08
6.0	36,704	3.9	4.02
7.0	39,936	4.7	5.04
8.0	43,296	5.7	21.49
9.0	46,784	6.7	75.65
10.0	50,400	7.8	96.35

Detention Pond 1047			
Stage (ft)	Surface Area (ft^2)	Storage (ac-ft)	Discharge (cfs)
0.0	16,200	0.0	0.00
1.0	18,304	0.4	0.41
2.0	20,536	0.8	1.07
3.0	22,896	1.3	1.90
4.0	25,384	1.9	2.88
5.0	28,000	2.5	3.98
6.0	30,744	3.2	5.20
7.0	33,616	3.9	6.52
8.0	36,616	4.7	7.53
9.0	39,744	5.6	47.01
10.0	43,000	6.6	71.10

Detention Pond 1048			
Stage (ft)	Surface Area (ft^2)	Storage (ac-ft)	Discharge (cfs)
0.0	4,550	0.0	0.00
1.0	5,694	0.1	0.41
2.0	6,966	0.3	1.07
3.0	8,366	0.4	1.90
4.0	9,894	0.6	2.88
5.0	11,550	0.9	3.98
6.0	13,334	1.2	5.20
7.0	15,246	1.5	6.52
8.0	17,286	1.9	7.53
9.0	19,454	2.3	8.38
10.0	21,750	2.8	89.06

Detention Pond 1049			
Stage (ft)	Surface Area (ft^2)	Storage (ac-ft)	Discharge (cfs)
0.0	125,000	0.0	0.00
1.0	131,064	2.9	0.66
2.0	137,256	6.0	1.73
3.0	143,576	9.2	3.09
4.0	150,024	12.6	4.68
5.0	156,600	16.1	22.50
6.0	163,304	19.8	30.33
7.0	170,136	23.6	36.42
8.0	177,096	27.6	41.60
9.0	184,184	31.8	46.20
10.0	191,400	36.1	50.37

Detention Pond 1051			
Stage (ft)	Surface Area (ft^2)	Storage (ac-ft)	Discharge (cfs)
0.0	46,200	0.0	0.00
1.0	49,704	1.1	0.58
2.0	53,336	2.3	1.51
3.0	57,096	3.6	2.70
4.0	60,984	4.9	4.09
5.0	65,000	6.4	5.65
6.0	69,144	7.9	7.38
7.0	73,416	9.5	9.26
8.0	77,816	11.3	36.24
9.0	82,344	13.1	143.76
10.0	87,000	15.0	248.44

Detention Pond 1053			
Stage (ft)	Surface Area (ft^2)	Storage (ac-ft)	Discharge (cfs)
0.0	42,000	0.0	0.00
1.0	45,344	1.0	0.20
2.0	48,816	2.1	0.54
3.0	52,416	3.2	0.95
4.0	56,144	4.5	1.45
5.0	60,000	5.8	2.00
6.0	63,984	7.2	87.86
7.0	68,096	8.8	244.19
8.0	72,336	10.4	373.43
9.0	76,704	12.1	431.00
10.0	81,200	13.9	481.73

Detention Pond 1054			
Stage (ft)	Surface Area (ft^2)	Storage (ac-ft)	Discharge (cfs)
0.0	8,100	0.0	0.00
1.0	9,604	0.2	0.20
2.0	11,236	0.4	0.54
3.0	12,996	0.7	0.95
4.0	14,884	1.0	1.45
5.0	16,900	1.4	2.00
6.0	19,044	1.8	52.02
7.0	21,316	2.3	104.54
8.0	23,716	2.8	127.71
9.0	26,244	3.4	147.27
10.0	28,900	4.0	164.50

Detention Pond 1055			
Stage (ft)	Surface Area (ft^2)	Storage (ac-ft)	Discharge (cfs)
0.0	15,000	0.0	0.00
1.0	17,064	0.4	0.20
2.0	19,256	0.8	0.54
3.0	21,576	1.3	0.95
4.0	24,024	1.8	1.45
5.0	26,600	2.4	2.00
6.0	29,304	3.0	2.61
7.0	32,136	3.7	377.00

Detention Pond 1060			
Stage (ft)	Surface Area (ft^2)	Storage (ac-ft)	Discharge (cfs)
0.0	250,000	0.00	0.00
1.0	260,064	5.85	116.55
2.0	270,256	11.94	329.65
3.0	280,576	18.26	605.61
4.0	291,024	24.83	782.43
5.0	301,600	31.63	874.79

Detention Pond 1061			
Stage (ft)	Surface Area (ft^2)	Storage (ac-ft)	Discharge (cfs)
0.0	0	0.00	0.0
0.2	4,429	0.05	1.2
1.2	33,788	0.49	8.5
2.2	70,835	1.69	7.6
3.2	74,516	3.36	23.8
3.83	76,867	4.45	29.3
4.2	78,260	5.10	36.9
4.3	78,638	5.27	40.3
5.2	82,070	6.93	96.2
5.3	82,454	7.12	97.5
6.2	85,959	8.86	107.9
6.45	86,944	9.35	110.6

Detention Pond 1029			
Stage (ft)	Surface Area (ft^2)	Storage (ac-ft)	Discharge (cfs)
0.0	220	0.00	0.00
0.5	1,080	0.01	0.09
1.0	2,446	0.03	0.20
1.5	4,320	0.07	0.36
2.0	7,775	0.14	0.51
2.5	22,679	0.31	0.72
3.0	50,890	0.73	0.91
3.5	98,637	1.59	1.15
4.0	165,920	3.11	1.38
4.5	246,465	5.48	1.66
5.0	334,205	8.81	1.91
5.5	427,094	13.18	2.21
6.0	497,465	18.48	35.00
6.5	543,316	24.46	241.67
7.0	575,373	30.88	549.20
7.5	594,598	37.59	931.17
8.0	596,418	44.43	1375.13

Detention Pond 1024			
Stage (ft)	Surface Area (ft^2)	Storage (ac-ft)	Discharge (cfs)
0.0	879,332	-	0.00
0.5	913,894	-	53.00
1.0	948,455	20.83	150.00
1.5	983,017	-	276.00
2.0	1,017,578	43.39	424.00

Detention Pond 1070			
Stage (ft)	Surface Area (ft^2)	Storage (ac-ft)	Discharge (cfs)
0.0	49,600	0.0	0.00
1.0	53,856	1.2	0.00
2.0	58,240	2.5	0.00
3.0	62,752	3.9	12.95
4.0	67,392	5.4	47.91
5.0	72,160	7.0	61.86

Detention Pond 1071			
Stage (ft)	Surface Area (ft^2)	Storage (ac-ft)	Discharge (cfs)
0.0	49,200	0.0	0.00
1.0	53,448	1.2	0.00
2.0	57,824	2.5	0.00
3.0	62,328	3.8	0.00
4.0	66,960	5.3	17.19
5.0	71,720	6.9	84.97

OLSSON ASSOCIATES
ENGINEERS • PLANNERS • SCIENTISTS • SURVEYORS
143 Union Blvd. Suite 700 Lakewood, CO 80228 720-962-6072

MEMO

Date: February 14, 2006

To: Wendi Palmer, Town of Erie
Laura Kroeger, UDFCD

From: Deb Ohlinger

Re: Erie Reach BP20 Preliminary Design

Introduction

This memorandum summarizes an evaluation of the existing conditions and presents the preliminary design of Reach BP20 improvements. A progress meeting was held on December 15, 2005, during which design alternatives were discussed. After receiving direction from the project sponsors, OA proceeded with a preliminary design of the improvements. The preliminary design consists of three primary elements: conveyance of 350 cubic feet per second (cfs) along the west side of North 111th Street upstream of the Detention Basin 1025, conveyance of 525 cfs through the Schofield Farm property and into Prince Lake No. 2, and conveyance of a 0.4-inch storm along the east side of North 111th Street downstream of Detention Basin 1025.

Hydrology

Discharges for the 2-, 5-, 10-, 50-, and 100-year and 0.4-inch storm events were obtained from Table 9 of *Erie Outfall Systems Planning, Preliminary Design: Erie and Adjacent Boulder and Weld County Areas* (OSP), prepared by Love and Associates and dated May 2001. Table 1 shows the OSP peak discharges at three locations for the future (developed) condition. Also included are the cumulative watershed areas at the design points. Design point 303 is located at North 111th Street and Arapahoe Road; design point 305 is located downstream of detention basin 1025; and design point 306 is located near the discharge of Prince Lake No. 2.

Table 1. OSP Peak Discharges at Select Locations along Reach BP20

Design Points	0.4-inch cfs	2-year cfs	5-year cfs	10-year cfs	50-year cfs	100-year cfs	Cumulative Area Acres
303	37	139	207	283	585	745	334
305	47	167	254	347	728	921	408
306	19	68	180	303	754	976	533

Existing Conditions Evaluation

A topographic survey of the site was completed in October 2005. The existing conditions were then evaluated at six locations to determine the capacity of the existing road, ditches, and right-

of-way. Figures 1A and 1B show the existing survey with project stationing. The reach between Stations 25+00 and 41+50 was evaluated to determine the available capacity between the fences on both sides of North 111th Street, as compared to the 100-year storm. The 100-year discharge at these locations is 745 cfs. The water surface elevations were set at the fence line or high points within the right-of-way and are shown in the cross sections in Figure 2. The estimated capacities are presented in Table 2.

Table 2. Estimated Capacity at Select Locations

Location	Available Capacity, cfs	Depth of Flow at Crown, ft
Station 26+00	446	0.4
Station 30+00	170	0.1
Station 36+00	356	0.0
Station 38+00	664	0.9

On the east side of North 111th Street, the reach between Stations 10+00 and 25+00 was evaluated with comparison to the 0.4-inch storm presented in the OSP. The peak discharge for this storm along this reach would be 47 cfs. The flow area for this reach was considered to be between the edge of pavement and the right-of-way south and east of North 111th Street, as shown in the cross sections in Figure 2. Table 3 shows the estimated capacities.

Table 3. Estimated Capacity at Select Locations

Location	Available Capacity, cfs
Station 14+00	7
Station 19+00	48

Preliminary Channel Design

Channel along North 111th Street

At the December 2005 meeting, it was decided that OA would develop alternatives to convey 350 cfs south of Station 27+00 and 525 cfs north of Station 27+00 while maintaining a 12-foot wide travel lane clear of water. This flow rate is approximately equal to the 10-year discharge at OSP design point 305. The existing 42-inch diameter pipe on the east side of North 111th Street was evaluated to estimate its capacity, since it carries a portion of the target 350 cfs. The pipe has capacity to carry approximately 168 cfs, however, the flow that can enter the pipe is limited at the upstream end. The pipe entrance was evaluated to determine the quantity of water that could enter the culvert. It was estimated that 75 cfs could enter the culvert. Due to limited available headwater depth, there is no opportunity to improve the pipe inlet.

Channel geometries were estimated for the design discharge of 350 cfs, minus the 75 cfs that is carried in the existing 42-inch pipe. The design criteria were longitudinal slope of 0.6%, 3:1 channel side slopes, maximum depth of five feet, maximum velocity of 7 feet per second, and maximum Froude number of 0.8. Channels with depths of three and four feet were developed at Stations 26+00, 30+00, 36+00, and 38+00. To reduce conflicts with utilities, the three-foot-deep channel is recommended. Table 4 shows the channel geometries.

Table 4. Channel Geometry Stations 24+50 to 41+00

	Station 24+50 to 27+00	Station 27+00 to 41+00
Design discharge, cfs	350	275
Bottom width, ft	12	9
Top width (minimum), ft	30	27
Depth of flow, ft	3	3

The channel would require grade stabilization, and it should be noted that the channel would be deeper and wider downstream of the grade control structures. Approximately six grade control structures, ranging in height from 1 to 3 feet, would be needed. Figures 1A and 1B show the estimated extents of the proposed channel grading. Figure 2 shows the channel superimposed on the existing cross sections at Stations 26+00, 30+00, 36+00, and 38+00. Figure 2 also shows the existing utilities, for which the depths of some were estimated. 8-foot high by 4-foot wide box culverts would be needed at three road crossings. Discharge from the existing 42-inch pipe would outlet into the channel around Station 26+50. A diversion structure to divert up to 47 cfs to the east side of North 111th Street would be constructed near Station 24+70.

Adjustments to the water and gas utilities may be needed. Potholing is recommended to verify the depth and location of the utilities. Discussions with the utility owners will be needed to determine their requirements to relocate the utilities and whether relocation will be needed.

Channel through Schofield Farm Property

Two scenarios for conveying the design discharge through the Schofield Farm Property were investigated. One scenario was a large, swale-like channel that could potentially be farmed. During the December 2005 progress meeting, this scenario was discussed. It was determined that it could be difficult to maintain irrigation across the swale, that different crops and growth stages would impact the conveyance capacity, flow velocities and erosion potential of the swale, and that over time, the swale could be modified due to farming practices.

The second scenario, a trapezoidal channel located along the farmstead property line that would convey 525 cfs, and have a depth of five feet, was developed. The resulting channel has a bottom width of 4 feet, and side slopes of 3:1. The top width would range from approximately 40 to 80 feet. The proposed alignment is shown in Figure 1A. Access could be provided across the channel between the farmstead and the fields via a low-water crossing. Two or three 24-inch diameter pipes could be installed under the crossing to convey low flows.

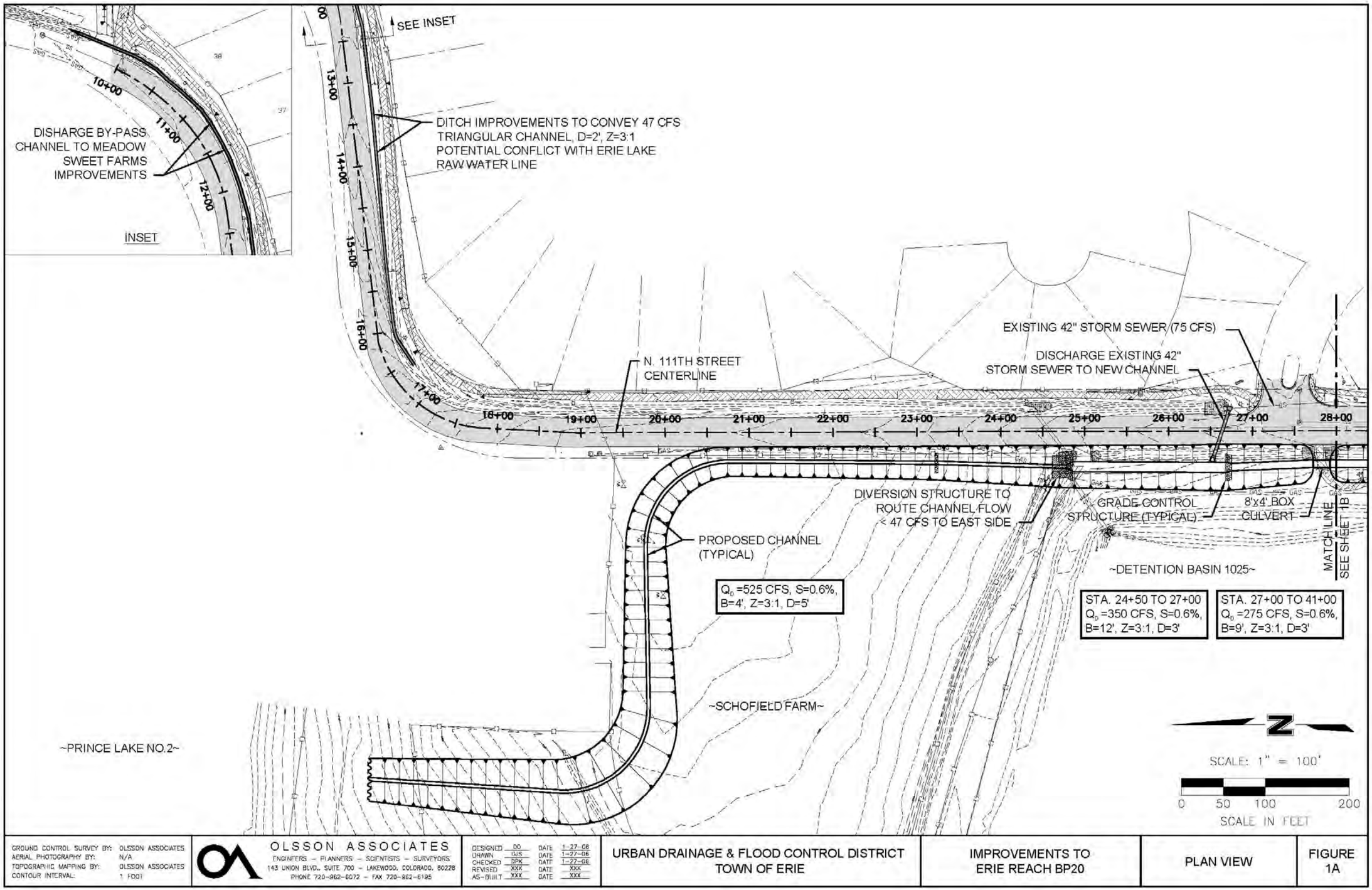
Conveyance of 0.4-inch Storm Downstream of Schofield Farm

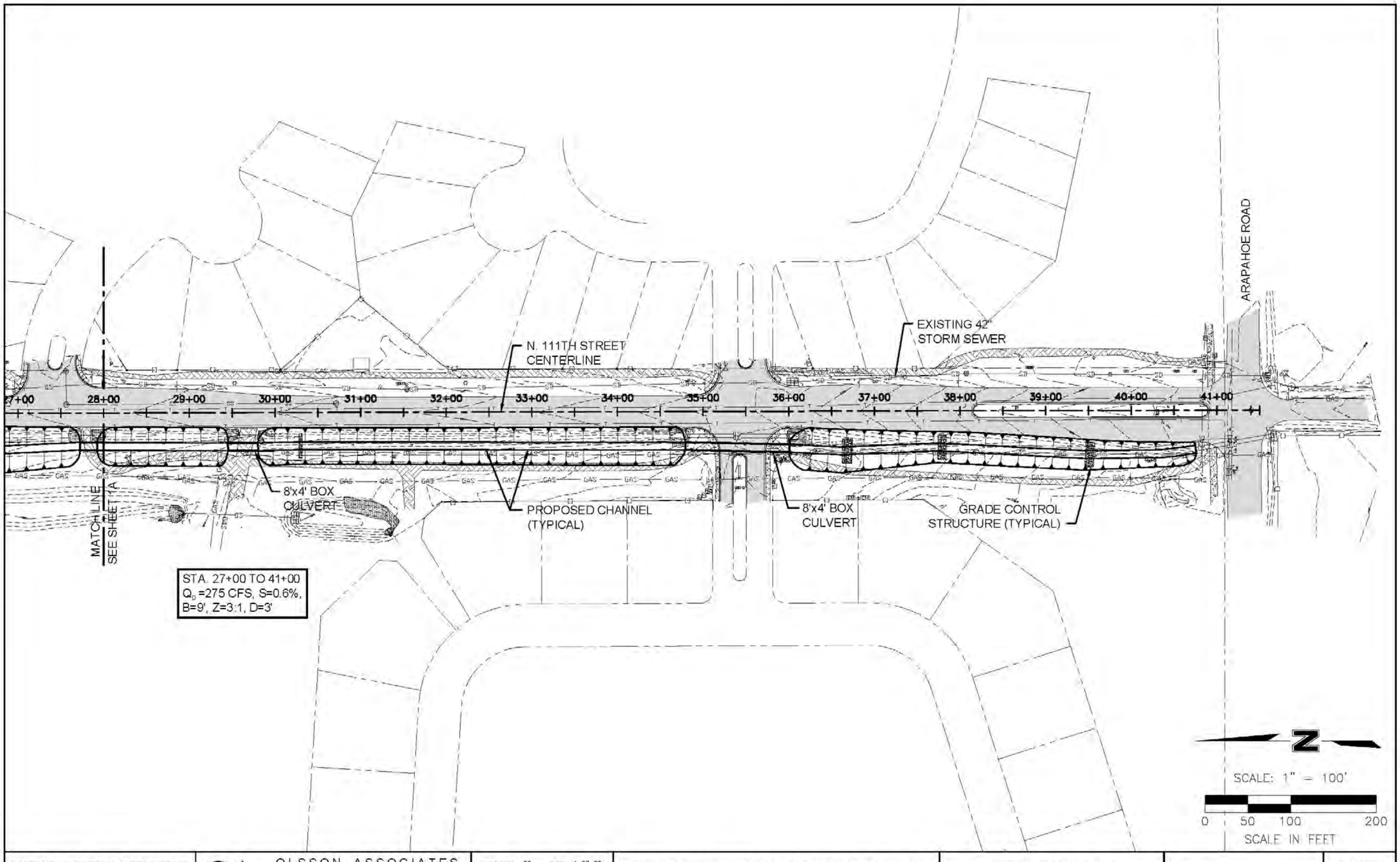
A portion of the reach intended to convey the 0.4-inch storm east and south of North 111th Street around Prince Lake No. 2 has enough capacity to do so, based on the existing conditions geometry at Station 19+00. Farther downstream, at Station 14+00, the capacity is approximately 7 cfs. In order to convey the 0.4-inch storm discharge of 47 cfs, a triangular channel approximately two feet deep, with 3 to 1 sideslopes and a top width of 12 feet would be required.

The channel improvements needed to convey the 0.4-inch storm could conflict with the Erie Lake Raw Water Line. A storm sewer alternative or adjustment of the raw water line design should be considered. For an estimated slope of 2.0%, a 30-inch diameter pipe would be required to convey the 0.4-inch storm. Adjustments to the raw water line may also be needed to

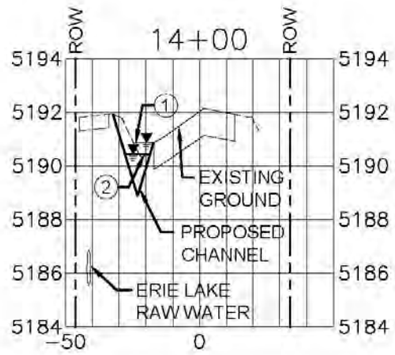
accommodate a storm sewer. OA recommends that the location of the raw water line be staked in the field so that the project sponsors can review the water line location with respect to the existing street and trail and proposed drainage improvements.

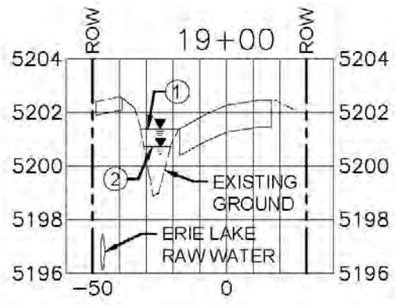
The *Preliminary Drainage Report for Meadow Sweet Farms, Erie Colorado*, dated May 13, 2005, shows Pond 1027 at the outlet of Prince Lake No 2, north and east of the curved portion of North 111th Street. It also shows a swale (designated D-D in the report) that collects local drainage and crosses under North 111th Street in a 12-foot by 4-foot box culvert. Discharge from the 0.4-inch storm could be conveyed to either proposed structure.

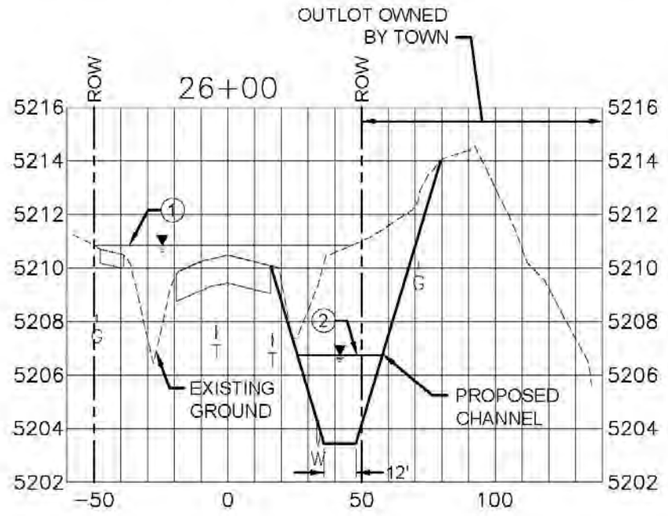

SEE INSET
DITCH IMPROVEMENTS TO CONVEY 47 CFS
TRIANGULAR CHANNEL, D=2', Z=3:1
POTENTIAL CONFLICT WITH ERIE LAKE
RAW WATER LINE
DISHARGE BY-PASS
CHANNEL TO MEADOW
SWEET FARMS
IMPROVEMENTS
INSET
10+00
11+00
12+00
13+00
14+00
15+00
16+00
17+00
18+00
19+00
20+00
21+00
22+00
23+00
24+00
25+00
26+00
27+00
28+00
N. 111TH STREET
CENTERLINE
EXISTING 42" STORM SEWER (75 CFS)
DISCHARGE EXISTING 42"
STORM SEWER TO NEW CHANNEL
DIVERSION STRUCTURE TO
ROUTE CHANNEL FLOW
< 47 CFS TO EAST SIDE
GRADE CONTROL
STRUCTURE (TYPICAL)
8'x4' BOX
CULVERT
MATCHLINE
SEE SHEET 1B
PROPOSED CHANNEL
(TYPICAL)
~DETENTION BASIN 1025~
Q_0 =525 CFS, S=0.6%,
B=4', Z=3:1, D=5'
STA. 24+50 TO 27+00
Q_0 =350 CFS, S=0.6%,
B=12', Z=3:1, D=3'
STA. 27+00 TO 41+00
Q_0 =275 CFS, S=0.6%,
B=9', Z=3:1, D=3'
~SCHOFIELD FARM~
~PRINCE LAKE NO.2~
N
SCALE: 1" = 100'
0 50 100 200
SCALE IN FEET
GROUND CONTROL SURVEY BY: OLSSON ASSOCIATES
AERIAL PHOTOGRAPHY BY: N/A
TOPOGRAPHIC MAPPING BY: OLSSON ASSOCIATES
CONTOUR INTERVAL: 1 FOOT
OLSSON ASSOCIATES
ENGINEERS – PLANNERS – SCIENTISTS – SURVEYORS
143 UNION BLVD., SUITE 700 – LAKEWOOD, COLORADO, 80228
PHONE 720-962-6072 – FAX 720-962-6195
DESIGNED DO DATE 1-27-06
DRAWN CJS DATE 1-27-06
CHECKED DPK DATE 1-27-06
REVISED XXX DATE XXX
AS-BUILT XXX DATE XXX
URBAN DRAINAGE & FLOOD CONTROL DISTRICT
TOWN OF ERIE
IMPROVEMENTS TO
ERIE REACH BP20
PLAN VIEW
FIGURE
1A

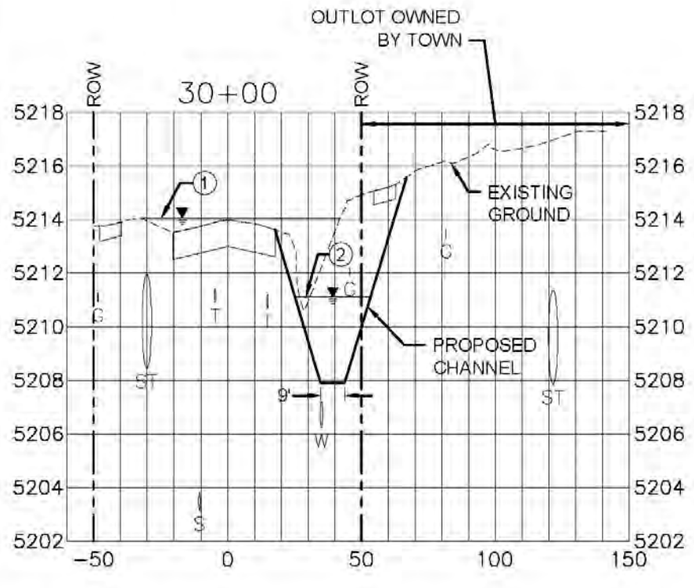


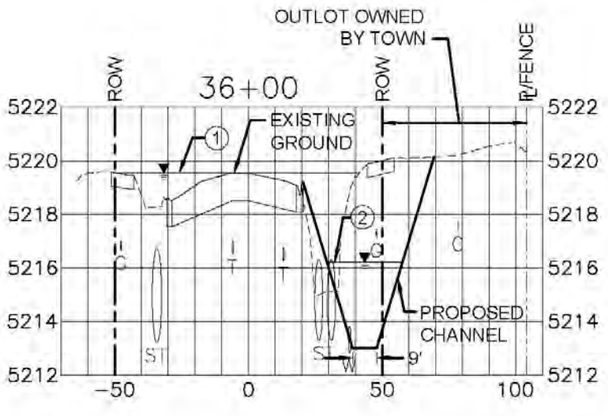
GROUND CONTROL SURVEY BY: OLSSON ASSOCIATES AERIAL PHOTOGRAPHY BY: N/A TOPOGRAPHIC MAPPING BY: OLSSON ASSOCIATES CONTOUR INTERVAL: 1 FOOT	OLSSON ASSOCIATES ENGINEERS – PLANNERS – SCIENTISTS – SURVEYORS 143 UNION BLVD., SUITE 700 – LAKEWOOD, COLORADO, 80228 PHONE 720-962-6072 – FAX 720-962-6195	DESIGNED DD DATE 1-27-06 DRAWN DJS DATE 1-27-06 CHECKED DPK DATE 1-27-06 REVISED XXX DATE XXX AS-BUILT XXX DATE XXX	URBAN DRAINAGE & FLOOD CONTROL DISTRICT TOWN OF ERIE	IMPROVEMENTS TO ERIE REACH BP20	PLAN VIEW	FIGURE 1B

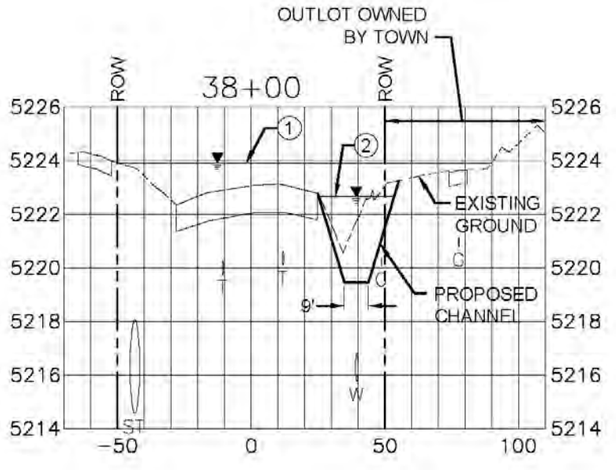












① WATER SURFACE USED TO ESTIMATE FLOW CAPACITY OF THE EXISTING R.O.W.
② APPROXIMATE DESIGN WATER SURFACE ELEVATION.

HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 5'

0 25 50 100
SCALE IN FEET

GROUND CONTROL SURVEY BY: OLSSON ASSOCIATES AERIAL PHOTOGRAPHY BY: N/A TOPOGRAPHIC MAPPING BY: OLSSON ASSOCIATES CONTOUR INTERVAL: 1 FOOT	OLSSON ASSOCIATES ENGINEERS – PLANNERS – SCIENTISTS – SURVEYORS 143 UNION BLVD., SUITE 700 – LAKEWOOD, COLORADO, 80228 PHONE 720-962-6072 – FAX 720-962-6195	DESIGNED DD DATE 1-27-06 DRAWN DJS DATE 1-27-06 CHECKED DPK DATE 1-27-06 REVISED XXX DATE XXX AS-BUILT XXX DATE XXX	URBAN DRAINAGE & FLOOD CONTROL DISTRICT TOWN OF ERIE	IMPROVEMENTS TO ERIE REACH BP20	TYPICAL CROSS-SECTIONS	FIGURE 2

```
[TITLE]
Town of Erie Outfall Systems Plan (OSP) (West of Coal Creek)
Conceptual Design Plan
RESPEC, January 2014

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         HORTON
FLOW_ROUTING         KINWAVE
START_DATE           01/01/2013
START_TIME           00:00:00
REPORT_START_DATE    01/01/2013
REPORT_START_TIME    00:00:00
END_DATE             01/01/2013
END_TIME             12:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:05:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        YES
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[FILES]
USE INFLOWS "L:\2234\Conceptual Design\CUHP_SWMM\Future\CUHP\100-Year\100yr Future SWMM Output.txt"

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
CONSTANT     0.0
DRY_ONLY     NO

[JUNCTIONS]
;;               Invert     Max.       Init.      Surcharge  Ponded
;;Name           Elev.      Depth      Depth      Depth      Area
;;-------------- ---------- ---------- ---------- ---------- ----------
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JUNCT_201        5248.57    0          0          0          0
JUNCT_202        5261.57    0          0          0          0
JUNCT_203        5228.12    0          0          0          0
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JUNCT_205        5207.35    0          0          0          0
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JUNCT_442        5125.99    0          0          0          0
JUNCT_443        5125.99    0          0          0          0
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```

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JUNCT_627        5055.94    0          0          0          0
JUNCT_628        5075.78    0          0          0          0
JUNCT_629        5026.64    0          0          0          0
JUNCT_630        5026.64    0          0          0          0
JUNCT_631        5026.64    0          0          0          0
JUNCT_633        5002.18    0          0          0          0
JUNCT_634        4973.82    0          0          0          0
JUNCT_638        5020.62    0          0          0          0
JUNCT_639        5003.94    0          0          0          0
JUNCT_640        4979.49    0          0          0          0
JUNCT_641        4968.61    0          0          0          0
JUNCT_645        4981.95    0          0          0          0
JUNCT_646        4976.29    0          0          0          0
JUNCT_647        4961.01    0          0          0          0
JUNCT_648        4965.05    0          0          0          0
JUNCT_650        5014.28    0          0          0          0
JUNCT_651        4967.96    0          0          0          0
JUNCT_652        4959.41    0          0          0          0
JUNCT_655        4955.79    0          0          0          0
JUNCT_656        4950.07    0          0          0          0
JUNCT_657        4949.33    0          0          0          0
JUNCT_658        5058.46    0          0          0          0
JUNCT_659        4959.50    0          0          0          0
JUNCT_660        4948.38    0          0          0          0
JUNCT_661        4956.99    0          0          0          0
JUNCT_700        5021.12    0          0          0          0
JUNCT_701        5071.81    0          0          0          0
JUNCT_704        4998.94    0          0          0          0
JUNCT_715        5020.61    0          0          0          0
JUNCT_718        4981.94    0          0          0          0
JUNCT_720        5014.27    0          0          0          0

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name          Elev.      Type       Time Series      Gate
;;--------------- ---------- ---------- ---------------- ----
OUTFALL_900      5086.34    FREE                        NO
OUTFALL_901      5085.40    FREE                        NO
OUTFALL_902      5079.04    FREE                        NO
OUTFALL_903      5077.76    FREE                        NO
OUTFALL_904      5072.77    FREE                        NO
OUTFALL_905      5068.22    FREE                        NO
OUTFALL_906      5068.22    FREE                        NO
OUTFALL_907      5065.70    FREE                        NO
OUTFALL_908      5064.45    FREE                        NO
OUTFALL_909      5053.07    FREE                        NO
OUTFALL_910      5048.38    FREE                        NO
OUTFALL_911      5040.71    FREE                        NO
OUTFALL_912      5032.24    FREE                        NO
OUTFALL_913      5024.28    FREE                        NO
OUTFALL_914      5019.89    FREE                        NO
OUTFALL_915      5015.83    FREE                        NO
OUTFALL_917      5000.57    FREE                        NO
OUTFALL_919      4987.73    FREE                        NO
OUTFALL_920      4982.64    FREE                        NO
OUTFALL_921      4983.75    FREE                        NO
OUTFALL_922      4982.78    FREE                        NO
OUTFALL_923      4956.05    FREE                        NO
OUTFALL_924      4959.43    FREE                        NO
OUTFALL_925      5041.47    FREE                        NO
OUTFALL_940      4997.40    FREE                        NO
OUTFALL_950      5004.37    FREE                        NO
OUTFALl_951      5004.92    FREE                        NO
OUTFALL_952      4994.44    FREE                        NO
OUTFALL_953      4987.84    FREE                        NO
OUTFALL_954      4987.83    FREE                        NO
OUTFALL_955      4985.58    FREE                        NO
OUTFALL_956      4986.24    FREE                        NO
OUTFALL_957      4981.84    FREE                        NO
OUTFALL_958      4975.80    FREE                        NO
OUTFALL_959      4972.47    FREE                        NO
OUTFALL_960      4973.81    FREE                        NO
OUTFALL_961      4968.60    FREE                        NO
OUTFALL_962      4961.00    FREE                        NO
OUTFALL_963      4965.04    FREE                        NO
OUTFALL_964      4959.40    FREE                        NO
OUTFALL_965      4955.78    FREE                        NO
OUTFALL_966      4950.06    FREE                        NO
OUTFALL_967      4949.32    FREE                        NO
OUTFALL_968      4948.37    FREE                        NO
OUTFALL_969      4956.98    FREE                        NO
OUTFALL_999      5058.45    FREE                        NO
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[DIVIDERS]
;;               Invert     Diverted         Divider
;;Name          Elev.      Link             Type       Parameters
;;--------------- ---------- ---------------- ---------- ----------
JUNCT_1020       5068.05    1020_OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_1025       5207.32    1025_OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_1026       5183.21    1026_OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_1043       5148.52    1043_OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_1045       5046.02    10458            TABULAR    DIVERSION_1045   0     0          0          0
JUNCT_200        5262.09    200_OVERFLOW     CUTOFF     0          0          0          0          0
JUNCT_221        5060.50    221_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_300        5248.56    300_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_303        5228.11    303_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_306        5173.31    306_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_308        5163.74    308_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_310        5176.39    310_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_311        5150.95    311_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_312        5095.36    312_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_313        5068.07    313_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_315        5051.97    315_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_317        5036.75    317_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_318        5025.97    318_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_319        5013.48    319_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_320        5109.88    320_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_322        5050.45    322_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_413        5201.91    413_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_454        5149.68    454_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_460        5122.34    460_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_469        5064.35    469_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_479        5096.62    479_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_498        5025.32    498_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_500        5303.68    500_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_501        5231.97    501_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_502        5188.79    502_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_503        5149.82    503_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_504        5169.99    504_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_505        5092.31    505_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_506        5165.50    506_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_507        5114.69    507_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_508        5099.91    508_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_511        5195.97    511_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_512        5194.82    512_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_513        5125.98    513_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_514        5099.73    514_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_516        5141.61    516_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_517        5075.03    517_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_518        5086.16    518_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_519        5071.49    519_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_521        5065.78    521_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_522        5048.92    522_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_523        5179.15    523_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_525        5046.53    525_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_526        5138.78    526_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_529        5121.73    529_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_530        5080.00    530_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_531        5067.60    531_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_532        5046.00    532_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_534        5052.67    534_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_536        5040.47    536_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_538        5035.85    538_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_539        5012.40    539_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_540        5007.80    540_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_541        4991.21    541_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_542        5020.03    542_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_543        5017.91    543_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_702        5015.83    702_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_703        4988.61    703_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_705        5124.31    705_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_706        5052.48    706_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_708        5013.87    708_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_709        4996.11    709_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_710        4986.04    710_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_712        5055.93    712_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_713        5026.63    713_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_714        5002.17    714_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_716        5003.93    716_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_717        4979.48    717_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_719        4976.28    719_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_721        4967.95    721_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_722        4959.49    722_OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_750        5074.13    750_OVERFLOW     OVERFLOW   0          0          0          0
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[STORAGE]
;;               Invert   Max.     Init.    Storage    Curve                    Ponded   Evap.
;;Name          Elev.    Depth    Depth    Curve      Params                   Area     Frac.
Infiltration Parameters
;;--------------- -------- -------- -------- ---------- -------- -------- -------- -------- -------- -----------
-----------
STOR_1024        5173.32  3        0        TABULAR    STORAGE_CURVE_1024       0        0
STOR_1025        5207.33  9        0        TABULAR    STORAGE_CURVE_1025       0        0
STOR_1026        5183.22  6.14     0        TABULAR    STORAGE_CURVE_1026       0        0
STOR_1029        5095.37  8        0        TABULAR    STORAGE_CURVE_1029       0        0
STOR_1041        5138.79  7.4      0        TABULAR    STORAGE_CURVE_1041       0        0
STOR_1042        5079.90  8.2      0        TABULAR    STORAGE_CURVE_1042       0        0
STOR_1043        5148.52  7.98     0        TABULAR    STORAGE_CURVE_1043       0        0
STOR_1044        5121.73  5.99     0        TABULAR    STORAGE_CURVE_1044       0        0
STOR_1045A       5046.03  9.5      0        TABULAR    STORAGE_CURVE_1045_PONDA         0        0
STOR_1045B       5046.01  9.5      0        TABULAR    STORAGE_CURVE_1045_PONDB         0        0
STOR_1046        5052.68  10       0        TABULAR    STORAGE_CURVE_1046       0        0
STOR_1047        5065.79  10       0        TABULAR    STORAGE_CURVE_1047       0        0
STOR_1048        5065.79  10       0        TABULAR    STORAGE_CURVE_1048       0        0
STOR_1049        5086.17  10       0        TABULAR    STORAGE_CURVE_1049       0        0
STOR_1050        5071.50  12       0        TABULAR    STORAGE_CURVE_1050       0        0
STOR_1051        5075.04  10       0        TABULAR    STORAGE_CURVE_1051       0        0
STOR_1053        5099.74  10       0        TABULAR    STORAGE_CURVE_1053       0        0
STOR_1054        5104.38  10       0        TABULAR    STORAGE_CURVE_1054       0        0
STOR_1055        5099.92  10       0        TABULAR    STORAGE_CURVE_1055       0        0
STOR_1056        5046.54  5.5      0        TABULAR    STORAGE_CURVE_1056       0        0
STOR_1060        5170     5        0        TABULAR    STORAGE_CURVE_1060       0        0
STOR_1061        5188.80  7.2      0        TABULAR    STORAGE_CURVE_1061       0        0
STOR_1070        5015.84  5        0        TABULAR    STORAGE_CURVE_1070       0        0
STOR_1071        5027.95  5        0        TABULAR    STORAGE_CURVE_1071       0        0

[CONDUITS]
;;               Inlet            Outlet                    Manning    Inlet      Outlet     Init.      Max.
;;Name          Node             Node             Length   N          Offset     Offset     Flow       Flow
;;--------------- ---------------- ---------------- -------- ---------- ---------- ---------- ---------- -----
-----
1020_OVERFLOW    JUNCT_1020       JUNCT_322        1600     .056       0          0          0          0
1025_OVERFLOW    JUNCT_1025       STOR_1024        1810     .056       0          0          0          0
1026_OVERFLOW    JUNCT_1026       JUNCT_308        1100     .056       0          0          0          0
1043_OVERFLOW    JUNCT_1043       STOR_1041        1025     .044       0          0          0          0
1045A            JUNCT_1045       JUNCT_532        1        0.01       0          0          0          0
1045B            JUNCT_1045       STOR_1045B       1        0.01       0          0          0          0
200              JUNCT_200        JUNCT_300        2435     .044       0          0          0          0
200_OVERFLOW     JUNCT_200        JUNCT_300        2435     .056       0          0          0          0
201              JUNCT_201        JUNCT_300        1        0.01       0          0          0          0
202              JUNCT_202        JUNCT_302        1        0.01       0          0          0          0
203              JUNCT_203        JUNCT_303        1        0.01       0          0          0          0
204              JUNCT_204        JUNCT_303        1        0.01       0          0          0          0
205              JUNCT_205        STOR_1025        1        0.01       0          0          0          0
206              JUNCT_206        STOR_1026        1        0.01       0          0          0          0
207              JUNCT_207        STOR_1026        1        0.01       0          0          0          0
208              JUNCT_208        JUNCT_308        1690     .038       0          0          0          0
209              JUNCT_209        STOR_1024        1        0.01       0          0          0          0
210              JUNCT_210        JUNCT_308        1        0.01       0          0          0          0
211              JUNCT_211        JUNCT_308        1        0.01       0          0          0          0
212              JUNCT_212        JUNCT_310        1        0.01       0          0          0          0
213              JUNCT_213        JUNCT_311        1        0.01       0          0          0          0
215              JUNCT_215        STOR_1029        1        0.01       0          0          0          0
216              JUNCT_216        STOR_1029        1        0.01       0          0          0          0
217              JUNCT_217        STOR_1029        1        0.01       0          0          0          0
218              JUNCT_218        STOR_1029        1        0.01       0          0          0          0
219              JUNCT_219        JUNCT_313        1        0.01       0          0          0          0
220              JUNCT_220        JUNCT_313        1        0.01       0          0          0          0
221              JUNCT_221        JUNCT_315        2675     .044       0          0          0          0
221_OVERFLOW     JUNCT_221        JUNCT_315        2675     0.056      0          0          0          0
222              JUNCT_222        JUNCT_315        1        0.01       0          0          0          0
235              JUNCT_235        JUNCT_320        1        0.01       0          0          0          0
236              JUNCT_236        JUNCT_321        1        0.01       0          0          0          0
237              JUNCT_237        JUNCT_322        1        0.01       0          0          0          0
238              JUNCT_238        JUNCT_323        1        0.01       0          0          0          0
240              JUNCT_240        JUNCT_318        1        0.01       0          0          0          0
241              JUNCT_241        JUNCT_318        1        0.01       0          0          0          0
242              JUNCT_242        JUNCT_319        1        0.01       0          0          0          0
243              JUNCT_243        OUTFALL_940      1        0.01       0          0          0          0
300              JUNCT_300        JUNCT_303        1010     .038       0          0          0          0
300_OVERFLOW     JUNCT_300        JUNCT_303        1010     .056       0          0          0          0
302              JUNCT_302        JUNCT_303        1580     .044       0          0          0          0
303              JUNCT_303        JUNCT_305        1600     .02        0          0          0          0
303_OVERFLOW     JUNCT_303        JUNCT_305        1600     .044       0          0          0          0
305              JUNCT_305        JUNCT_1025       1        0.01       0          0          0          0
306              JUNCT_306        JUNCT_308        1550     .044       0          0          0          0
306_OVERFLOW     JUNCT_306        JUNCT_308        1550     .056       0          0          0          0
308              JUNCT_308        JUNCT_311        900      .038       0          0          0          0
308_OVERFLOW     JUNCT_308        JUNCT_311        900      0.056      0          0          0          0
310              JUNCT_310        JUNCT_311        1820     .044       0          0          0          0
310_OVERFLOW     JUNCT_310        JUNCT_311        1820     0.056      0          0          0          0
311              JUNCT_311        STOR_1029        3635     .038       0          0          0          0
311_OVERFLOW     JUNCT_311        STOR_1029        3635     0.056      0          0          0          0
312              JUNCT_312        JUNCT_313        2140     .038       0          0          0          0
312_OVERFLOW     JUNCT_312        JUNCT_313        2140     0.056      0          0          0          0
313              JUNCT_313        JUNCT_315        1350     .038       0          0          0          0
313_OVERFLOW     JUNCT_313        JUNCT_315        1350     0.056      0          0          0          0
315              JUNCT_315        JUNCT_317        2735     .038       0          0          0          0
315_OVERFLOW     JUNCT_315        JUNCT_317        2735     0.056      0          0          0          0
317              JUNCT_317        JUNCT_318        1115     .044       0          0          0          0
317_OVERFLOW     JUNCT_317        JUNCT_318        1115     .056       0          0          0          0
318              JUNCT_318        JUNCT_319        1820     .044       0          0          0          0
318_OVERFLOW     JUNCT_318        JUNCT_319        1820     .056       0          0          0          0
319              JUNCT_319        OUTFALL_940      2865     .044       0          0          0          0
319_OVERFLOW     JUNCT_319        OUTFALL_940      2865     .056       0          0          0          0
320              JUNCT_320        JUNCT_321        1690     .02        0          0          0          0
320_OVERFLOW     JUNCT_320        JUNCT_321        1690     .044       0          0          0          0
321              JUNCT_321        JUNCT_322        2560     .044       0          0          0          0
322              JUNCT_322        JUNCT_323        2050     .044       0          0          0          0
322_OVERFLOW     JUNCT_322        JUNCT_323        2050     .056       0          0          0          0
323              JUNCT_323        JUNCT_317        1        0.01       0          0          0          0
400              JUNCT_400        OUTFALL_900      1        0.01       0          0          0          0
401              JUNCT_401        OUTFALL_901      1        0.01       0          0          0          0
410              JUNCT_410        JUNCT_500        1        0.01       0          0          0          0
411              JUNCT_411        JUNCT_501        1        0.01       0          0          0          0
412              JUNCT_412        JUNCT_501        1        0.01       0          0          0          0
413              JUNCT_413        STOR_1061        714      .044       0          0          0          0
413_OVERFLOW     JUNCT_413        STOR_1061        714      0.056      0          0          0          0
414              JUNCT_414        STOR_1061        1        0.01       0          0          0          0
415              JUNCT_415        JUNCT_502        1        0.01       0          0          0          0
416              JUNCT_416        STOR_1060        1        0.01       0          0          0          0
417              JUNCT_417        JUNCT_503        1        0.01       0          0          0          0
418              JUNCT_418        OUTFALL_900      1        0.01       0          0          0          0
419              JUNCT_419        JUNCT_503        1        0.01       0          0          0          0
423              JUNCT_423        OUTFALL_902      1        0.01       0          0          0          0
424              JUNCT_424        JUNCT_504        1        0.01       0          0          0          0
425              JUNCT_425        JUNCT_505        1        0.01       0          0          0          0
426              JUNCT_426        JUNCT_505        1        0.01       0          0          0          0
427              JUNCT_427        JUNCT_505        1        0.01       0          0          0          0
428              JUNCT_428        OUTFALL_903      1        0.01       0          0          0          0
429              JUNCT_429        OUTFALL_904      1        0.01       0          0          0          0
430              JUNCT_430        JUNCT_506        1        0.01       0          0          0          0
431              JUNCT_431        JUNCT_507        1        0.01       0          0          0          0
432              JUNCT_432        STOR_1055        1        0.01       0          0          0          0
433              JUNCT_433        OUTFALL_905      1        0.01       0          0          0          0
435              JUNCT_435        JUNCT_509        1        0.01       0          0          0          0
436              JUNCT_436        STOR_1054        1        0.01       0          0          0          0
437              JUNCT_437        OUTFALL_906      1        0.01       0          0          0          0
440              JUNCT_440        JUNCT_511        1        0.01       0          0          0          0
441              JUNCT_441        JUNCT_512        1        0.01       0          0          0          0
442              JUNCT_442        JUNCT_513        1        0.01       0          0          0          0
443              JUNCT_443        JUNCT_513        1        0.01       0          0          0          0
444              JUNCT_444        STOR_1053        1        0.01       0          0          0          0
445              JUNCT_445        OUTFALL_907      1        0.01       0          0          0          0
446              JUNCT_446        STOR_1053        1        0.01       0          0          0          0
447              JUNCT_447        OUTFALL_908      1        0.01       0          0          0          0
448              JUNCT_448        OUTFALL_909      1        0.01       0          0          0          0
449              JUNCT_449        OUTFALL_925      1        0.01       0          0          0          0
450              JUNCT_450        JUNCT_516        1        0.01       0          0          0          0
451              JUNCT_451        STOR_1051        1        0.01       0          0          0          0
452              JUNCT_452        OUTFALL_910      1        0.01       0          0          0          0
453              JUNCT_453        OUTFALL_911      1        0.01       0          0          0          0
454              JUNCT_454        STOR_1049        3080     .044       0          0          0          0
454_OVERFLOW     JUNCT_454        STOR_1049        3080     .056       0          0          0          0
455              JUNCT_455        STOR_1050        1        0.01       0          0          0          0
456              JUNCT_456        STOR_1049        1        0.01       0          0          0          0
457              JUNCT_457        STOR_1050        1        0.01       0          0          0          0
458              JUNCT_458        JUNCT_522        1        0.01       0          0          0          0
459              JUNCT_459        OUTFALL_912      1        0.01       0          0          0          0
460              JUNCT_460        STOR_1050        1840     .013       0          0          0          0
460_OVERFLOW     JUNCT_460        STOR_1050        1840     .056       0          0          0          0
461              JUNCT_461        STOR_1048        1        0.01       0          0          0          0
462              JUNCT_462        STOR_1047        1        0.01       0          0          0          0
463              JUNCT_463        JUNCT_522        1        0.01       0          0          0          0
464              JUNCT_464        OUTFALL_913      1        0.01       0          0          0          0
465              JUNCT_465        OUTFALL_914      1        0.01       0          0          0          0
466              JUNCT_466        OUTFALL_915      1        0.01       0          0          0          0
467              JUNCT_467        OUTFALL_915      1        0.01       0          0          0          0
468              JUNCT_468        STOR_1056        1        0.01       0          0          0          0
469              JUNCT_469        STOR_1046        1535     .044       0          0          0          0
469_OVERFLOW     JUNCT_469        STOR_1046        1535     .056       0          0          0          0
470              JUNCT_470        JUNCT_523        1        0.01       0          0          0          0
471              JUNCT_471        STOR_1043        1        0.01       0          0          0          0
472              JUNCT_472        JUNCT_528        1        0.01       0          0          0          0
473              JUNCT_473        JUNCT_526        1        0.01       0          0          0          0
474              JUNCT_474        STOR_1041        1        0.01       0          0          0          0
475              JUNCT_475        STOR_1044        1        0.01       0          0          0          0
476              JUNCT_476        STOR_1042        1        0.01       0          0          0          0
477              JUNCT_477        JUNCT_530        1        0.01       0          0          0          0
478              JUNCT_478        JUNCT_531        1        0.01       0          0          0          0
479              JUNCT_479        JUNCT_530        1080     .044       0          0          0          0
479_OVERFLOW     JUNCT_479        JUNCT_530        1080     .056       0          0          0          0
480              JUNCT_480        STOR_1046        1        0.01       0          0          0          0
481              JUNCT_481        STOR_1045A       1        0.01       0          0          0          0
482              JUNCT_482        JUNCT_536        1        0.01       0          0          0          0
```

483	JUNCT_483	JUNCT_538	1	0.01	0	0	0	0
484	JUNCT_484	JUNCT_543	1	0.01	0	0	0	0
485	JUNCT_485	JUNCT_542	1	0.01	0	0	0	0
486	JUNCT_486	OUTFALL_917	1	0.01	0	0	0	0
487	JUNCT_487	JUNCT_539	1	0.01	0	0	0	0
488	JUNCT_488	OUTFALL_919	1	0.01	0	0	0	0
489	JUNCT_489	OUTFALL_920	1	0.01	0	0	0	0
490	JUNCT_490	JUNCT_540	1	0.01	0	0	0	0
491	JUNCT_491	JUNCT_541	1	0.01	0	0	0	0
492	JUNCT_492	JUNCT_541	1	0.01	0	0	0	0
493	JUNCT_493	OUTFALL_921	770	.038	0	0	0	0
494	JUNCT_494	OUTFALL_921	1	0.01	0	0	0	0
495	JUNCT_495	OUTFALL_922	1	0.01	0	0	0	0
496	JUNCT_496	OUTFALL_923	1	0.01	0	0	0	0
497	JUNCT_497	OUTFALL_924	1	0.01	0	0	0	0
498	JUNCT_498	JUNCT_541	3990	.038	0	0	0	0
498_OVERFLOW	JUNCT_498	JUNCT_541	3990	.056	0	0	0	0
499	JUNCT_499	OUTFALL_919	1	0.01	0	0	0	0
500	JUNCT_500	JUNCT_501	3160	.044	0	0	0	0
500_OVERFLOW	JUNCT_500	JUNCT_501	3160	0.044	0	0	0	0
501	JUNCT_501	JUNCT_502	2625	.038	0	0	0	0
501_OVERFLOW	JUNCT_501	JUNCT_502	2625	0.056	0	0	0	0
502	JUNCT_502	STOR_1060	2200	.038	0	0	0	0
502_OVERFLOW	JUNCT_502	STOR_1060	2200	0.056	0	0	0	0
503	JUNCT_503	OUTFALL_900	4390	.02	0	0	0	0
503_OVERFLOW	JUNCT_503	OUTFALL_900	4390	.044	0	0	0	0
504	JUNCT_504	JUNCT_505	5080	.044	0	0	0	0
504_OVERFLOW	JUNCT_504	JUNCT_505	5080	0.056	0	0	0	0
505	JUNCT_505	OUTFALL_903	595	.044	0	0	0	0
505_OVERFLOW	JUNCT_505	OUTFALL_903	595	.056	0	0	0	0
506	JUNCT_506	JUNCT_507	3660	.044	0	0	0	0
506_OVERFLOW	JUNCT_506	JUNCT_507	3660	.056	0	0	0	0
507	JUNCT_507	STOR_1055	2145	.044	0	0	0	0
507_OVERFLOW	JUNCT_507	STOR_1055	2145	.056	0	0	0	0
508	JUNCT_508	OUTFALL_905	1165	.044	0	0	0	0
508_OVERFLOW	JUNCT_508	OUTFALL_905	1165	.056	0	0	0	0
509	JUNCT_509	STOR_1054	5635	.044	0	0	0	0
511	JUNCT_511	JUNCT_513	3510	.044	0	0	0	0
511_OVERFLOW	JUNCT_511	JUNCT_513	3510	.056	0	0	0	0
512	JUNCT_512	JUNCT_513	2985	.02	0	0	0	0
512_OVERFLOW	JUNCT_512	JUNCT_513	2985	.044	0	0	0	0
513	JUNCT_513	STOR_1053	2515	.044	0	0	0	0
513_OVERFLOW	JUNCT_513	STOR_1053	400	0.01	0	0	0	0
514	JUNCT_514	OUTFALL_907	860	.044	0	0	0	0
514_OVERFLOW	JUNCT_514	OUTFALL_907	860	.056	0	0	0	0
516	JUNCT_516	STOR_1051	2410	.044	0	0	0	0
516_OVERFLOW	JUNCT_516	STOR_1051	2410	.056	0	0	0	0
517	JUNCT_517	OUTFALL_910	2570	.044	0	0	0	0
517_OVERFLOW	JUNCT_517	OUTFALL_910	2570	.056	0	0	0	0
518	JUNCT_518	OUTFALL_925	3500	.044	0	0	0	0
518_OVERFLOW	JUNCT_518	OUTFALL_925	3500	.056	0	0	0	0
519	JUNCT_519	OUTFALL_925	3930	.013	0	0	0	0
519_OVERFLOW	JUNCT_519	OUTFALL_925	3930	.056	0	0	0	0
521	JUNCT_521	JUNCT_522	1735	.044	0	0	0	0
521_OVERFLOW	JUNCT_521	JUNCT_522	1735	.056	0	0	0	0
522	JUNCT_522	OUTFALL_913	2280	.044	0	0	0	0
522_OVERFLOW	JUNCT_522	OUTFALL_913	2280	.056	0	0	0	0
523	JUNCT_523	STOR_1043	1615	.02	0	0	0	0
523_OVERFLOW	JUNCT_523	STOR_1043	1615	.044	0	0	0	0
525	JUNCT_525	JUNCT_536	617	.02	0	0	0	0
525_OVERFLOW	JUNCT_525	JUNCT_536	617	.044	0	0	0	0
526	JUNCT_526	JUNCT_529	1605	.044	0	0	0	0
526_OVERFLOW	JUNCT_526	JUNCT_529	1605	.056	0	0	0	0
528	JUNCT_528	STOR_1044	2605	.044	0	0	0	0
529	JUNCT_529	STOR_1042	2450	.038	0	0	0	0
529_OVERFLOW	JUNCT_529	STOR_1042	2450	.056	0	0	0	0
530	JUNCT_530	JUNCT_531	1430	.044	0	0	0	0
530_OVERFLOW	JUNCT_530	JUNCT_531	1430	.056	0	0	0	0
531	JUNCT_531	STOR_1045A	1645	.044	0	0	0	0
531_OVERFLOW	JUNCT_531	STOR_1045A	1645	.044	0	0	0	0
532	JUNCT_532	JUNCT_536	1650	.044	0	0	0	0
532_OVERFLOW	JUNCT_532	JUNCT_536	1650	.056	0	0	0	0
534	JUNCT_534	OUTFALL_915	750	.02	0	0	0	0
534_OVERFLOW	JUNCT_534	OUTFALL_915	750	.044	0	0	0	0
536	JUNCT_536	OUTFALL_915	3535	.044	0	0	0	0
536_OVERFLOW	JUNCT_536	OUTFALL_915	3535	.056	0	0	0	0
538	JUNCT_538	JUNCT_543	3305	.02	0	0	0	0
538_OVERFLOW	JUNCT_538	JUNCT_543	3305	.044	0	0	0	0
539	JUNCT_539	OUTFALL_919	2050	.02	0	0	0	0
539_OVERFLOW	JUNCT_539	OUTFALL_919	2050	.044	0	0	0	0
540	JUNCT_540	JUNCT_541	4780	.038	0	0	0	0
540_OVERFLOW	JUNCT_540	JUNCT_541	4780	.056	0	0	0	0
541	JUNCT_541	OUTFALL_921	1560	.038	0	0	0	0
541_OVERFLOW	JUNCT_541	OUTFALL_921	1560	.038	0	0	0	0
542	JUNCT_542	JUNCT_543	1040	.013	0	0	0	0
542_OVERFLOW	JUNCT_542	JUNCT_543	1040	.044	0	0	0	0
543	JUNCT_543	OUTFALL_917	2050	.013	0	0	0	0
543_OVERFLOW	JUNCT_543	OUTFALL_917	2050	.044	0	0	0	0
600	JUNCT_600	OUTFALL_950	1	0.01	0	0	0	0
601	JUNCT_601	JUNCT_700	1	0.01	0	0	0	0
602	JUNCT_602	OUTFALL_951	1	0.01	0	0	0	0
603	JUNCT_603	OUTFALL_952	1	0.01	0	0	0	0
604	JUNCT_604	JUNCT_701	1	0.01	0	0	0	0
605	JUNCT_605	OUTFALL_953	1	0.01	0	0	0	0
606	JUNCT_606	OUTFALL_954	1	0.01	0	0	0	0
607	JUNCT_607	JUNCT_702	1	0.01	0	0	0	0
608	JUNCT_608	JUNCT_703	1	0.01	0	0	0	0
609	JUNCT_609	OUTFALL_955	1	0.01	0	0	0	0
610	JUNCT_610	OUTFALL_956	1	0.01	0	0	0	0
611	JUNCT_611	JUNCT_704	1	0.01	0	0	0	0
612	JUNCT_612	OUTFALL_957	1	0.01	0	0	0	0
613	JUNCT_613	JUNCT_705	1	0.01	0	0	0	0
614	JUNCT_614	JUNCT_702	1	0.01	0	0	0	0
615	JUNCT_615	STOR_1071	1	0.01	0	0	0	0
616	JUNCT_616	JUNCT_706	1	0.01	0	0	0	0
617	JUNCT_617	JUNCT_706	1	0.01	0	0	0	0
618	JUNCT_618	STOR_1070	1	0.01	0	0	0	0
619	JUNCT_619	JUNCT_708	1	0.01	0	0	0	0
620	JUNCT_620	JUNCT_709	1	0.01	0	0	0	0
621	JUNCT_621	JUNCT_709	1	0.01	0	0	0	0
622	JUNCT_622	JUNCT_710	1	0.01	0	0	0	0
623	JUNCT_623	OUTFALL_958	1	0.01	0	0	0	0
624	JUNCT_624	OUTFALL_959	1	0.01	0	0	0	0
627	JUNCT_627	JUNCT_712	1	0.01	0	0	0	0
628	JUNCT_628	JUNCT_712	1015	.044	0	0	0	0
629	JUNCT_629	JUNCT_713	1	0.01	0	0	0	0
630	JUNCT_630	JUNCT_713	1	0.01	0	0	0	0
631	JUNCT_631	JUNCT_713	1	0.01	0	0	0	0
633	JUNCT_633	JUNCT_714	1	0.01	0	0	0	0
634	JUNCT_634	OUTFALL_960	1	0.01	0	0	0	0
638	JUNCT_638	JUNCT_715	1	0.01	0	0	0	0
639	JUNCT_639	JUNCT_716	1	0.01	0	0	0	0
640	JUNCT_640	JUNCT_717	1	0.01	0	0	0	0
641	JUNCT_641	OUTFALL_961	1	0.01	0	0	0	0
645	JUNCT_645	JUNCT_718	1	0.01	0	0	0	0
646	JUNCT_646	JUNCT_719	1	0.01	0	0	0	0
647	JUNCT_647	OUTFALL_962	1	0.01	0	0	0	0
648	JUNCT_648	OUTFALL_963	1	0.01	0	0	0	0
650	JUNCT_650	JUNCT_720	1	0.01	0	0	0	0
651	JUNCT_651	JUNCT_721	1	0.01	0	0	0	0
652	JUNCT_652	OUTFALL_964	1	0.01	0	0	0	0
655	JUNCT_655	OUTFALL_965	1	0.01	0	0	0	0
656	JUNCT_656	OUTFALL_966	1	0.01	0	0	0	0
657	JUNCT_657	OUTFALL_967	1	0.01	0	0	0	0
658	JUNCT_658	OUTFALL_999	1	0.01	0	0	0	0
659	JUNCT_659	JUNCT_722	1	0.01	0	0	0	0
660	JUNCT_660	OUTFALL_968	1	0.01	0	0	0	0
661	JUNCT_661	OUTFALL_969	1	0.01	0	0	0	0
700	JUNCT_700	OUTFALL_951	2280	.044	0	0	0	0
701	JUNCT_701	OUTFALL_953	3290	.044	0	0	0	0
702	JUNCT_702	JUNCT_703	3715	.044	0	0	0	0
703	JUNCT_703	OUTFALL_955	1995	.044	0	0	0	0
1020	JUNCT_1020	JUNCT_322	1600	.038	0	0	0	0
1025	JUNCT_1025	STOR_1024	1810	.044	0	0	0	0
1026	JUNCT_1026	JUNCT_308	1100	.044	0	0	0	0
1043	JUNCT_1043	STOR_1041	1025	.02	0	0	0	0
1060	JUNCT_1060	JUNCT_750	1	0.01	0	0	0	0
702_OVERFLOW	JUNCT_702	JUNCT_703	3715	.056	0	0	0	0
703_OVERFLOW	JUNCT_703	OUTFALL_955	1995	.056	0	0	0	0
704	JUNCT_704	OUTFALL_957	870	.044	0	0	0	0
705	JUNCT_705	JUNCT_706	2700	.02	0	0	0	0
705_OVERFLOW	JUNCT_705	JUNCT_706	2700	.044	0	0	0	0
708	JUNCT_706	JUNCT_708	1285	.02	0	0	0	0
706_OVERFLOW	JUNCT_706	JUNCT_708	1285	.044	0	0	0	0
708	JUNCT_708	JUNCT_709	4465	.044	0	0	0	0
708_OVERFLOW	JUNCT_708	JUNCT_709	4465	.056	0	0	0	0
709	JUNCT_709	JUNCT_710	2265	.044	0	0	0	0
709_OVERFLOW	JUNCT_709	JUNCT_710	2265	.056	0	0	0	0
710	JUNCT_710	OUTFALL_958	1090	.044	0	0	0	0
710_OVERFLOW	JUNCT_710	OUTFALL_958	1090	.056	0	0	0	0
712	JUNCT_712	JUNCT_713	1735	.038	0	0	0	0
712_OVERFLOW	JUNCT_712	JUNCT_713	1735	.056	0	0	0	0
713	JUNCT_713	JUNCT_714	2415	.038	0	0	0	0
713_OVERFLOW	JUNCT_713	JUNCT_714	2415	.056	0	0	0	0
714	JUNCT_714	OUTFALL_960	2340	.044	0	0	0	0
714_OVERFLOW	JUNCT_714	OUTFALL_960	2340	.056	0	0	0	0
715	JUNCT_715	JUNCT_716	2640	.044	0	0	0	0
716	JUNCT_716	JUNCT_717	2780	.044	0	0	0	0
716_OVERFLOW	JUNCT_716	JUNCT_717	2780	.056	0	0	0	0
717	JUNCT_717	OUTFALL_961	1685	.044	0	0	0	0
717_OVERFLOW	JUNCT_717	OUTFALL_961	1685	.056	0	0	0	0
718	JUNCT_718	JUNCT_719	745	.044	0	0	0	0
719	JUNCT_719	OUTFALL_962	2525	.044	0	0	0	0
719_OVERFLOW	JUNCT_719	OUTFALL_962	2525	.056	0	0	0	0
720	JUNCT_720	JUNCT_721	2045	.044	0	0	0	0
721	JUNCT_721	OUTFALL_964	2210	.044	0	0	0	0
721_OVERFLOW	JUNCT_721	OUTFALL_964	2210	.056	0	0	0	0
722	JUNCT_722	OUTFALL_968	1925	.02	0	0	0	0
722_OVERFLOW	JUNCT_722	OUTFALL_968	1925	.044	0	0	0	0
750	JUNCT_750	JUNCT_712	1900	.044	0	0	0	0

```
750_OVERFLOW     JUNCT_750       JUNCT_712       1900       .056       0          0          0          0

[OUTLETS]
;;
;;Name           Inlet           Outlet          Outflow    Outlet          Qcoeff/                Qexpon     Flap
;;               Node            Node            Height     Type            QTable                 ---------- Gate
;;-------------- --------------- --------------- ---------- --------------- ---------------------- ---------- ----
OUTLET_1024      STOR_1024       JUNCT_306       0          TABULAR/DEPTH   RATING_CURVE_1024                 NO
OUTLET_1025      STOR_1025       JUNCT_1025      0          TABULAR/DEPTH   RATING_CURVE_1025                 NO
OUTLET_1026      STOR_1026       JUNCT_1026      0          TABULAR/DEPTH   RATING_CURVE_1026                 NO
OUTLET_1029      STOR_1029       JUNCT_312       0          TABULAR/DEPTH   RATING_CURVE_1029                 NO
OUTLET_1041      STOR_1041       JUNCT_526       0          TABULAR/DEPTH   RATING_CURVE_1041                 NO
OUTLET_1042      STOR_1042       JUNCT_530       0          TABULAR/DEPTH   RATING_CURVE_1042                 NO
OUTLET_1043      STOR_1043       JUNCT_1043      0          TABULAR/DEPTH   RATING_CURVE_1043                 NO
OUTLET_1044      STOR_1044       JUNCT_529       0          TABULAR/DEPTH   RATING_CURVE_1044                 NO
OUTLET_1045A     STOR_1045A      JUNCT_1045      0          TABULAR/DEPTH   RATING_CURVE_1045_PONDA
NO
OUTLET_1045B     STOR_1045B      JUNCT_532       0          TABULAR/HEAD    RATING_CURVE_1045_PONDB
NO
OUTLET_1046      STOR_1046       JUNCT_534       0          TABULAR/DEPTH   RATING_CURVE_1046                 NO
OUTLET_1047      STOR_1047       JUNCT_521       0          TABULAR/DEPTH   RATING_CURVE_1047                 NO
OUTLET_1048      STOR_1048       JUNCT_521       0          TABULAR/DEPTH   RATING_CURVE_1048                 NO
OUTLET_1049      STOR_1049       JUNCT_518       0          TABULAR/DEPTH   RATING_CURVE_1049                 NO
OUTLET_1050      STOR_1050       JUNCT_519       0          TABULAR/DEPTH   RATING_CURVE_1050                 NO
OUTLET_1051      STOR_1051       JUNCT_517       0          TABULAR/HEAD    RATING_CURVE_1051                 NO
OUTLET_1053      STOR_1053       JUNCT_514       0          TABULAR/HEAD    RATING_CURVE_1053                 NO
OUTLET_1054      STOR_1054       JUNCT_514       0          TABULAR/DEPTH   RATING_CURVE_1054                 NO
OUTLET_1055      STOR_1055       JUNCT_508       0          TABULAR/DEPTH   RATING_CURVE_1055                 NO
OUTLET_1056      STOR_1056       JUNCT_525       0          TABULAR/DEPTH   RATING_CURVE_1056                 NO
OUTLET_1060      STOR_1060       JUNCT_504       0          TABULAR/DEPTH   RATING_CURVE_1060                 NO
OUTLET_1061      STOR_1061       JUNCT_502       0          TABULAR/DEPTH   RATING_CURVE_1061                 NO
OUTLET_1070      STOR_1070       JUNCT_702       0          TABULAR/DEPTH   RATING_CURVE_1070                 NO
OUTLET_1071      STOR_1071       JUNCT_702       0          TABULAR/DEPTH   RATING_CURVE_1071                 NO

[XSECTIONS]
;;Link           Shape           Geom1           Geom2      Geom3      Geom4      Barrels
;;-------------- --------------- --------------- ---------- ---------- ---------- ----------
1020_OVERFLOW    TRAPEZOIDAL     10              38         20         20         1
1025_OVERFLOW    TRAPEZOIDAL     10              56         20         20         1
1026_OVERFLOW    TRAPEZOIDAL     10              56         20         20         1
1043_OVERFLOW    TRAPEZOIDAL     10              22         20         20         1
1045A            DUMMY           0               0          0          0          1
1045B            DUMMY           0               0          0          0          1
200              TRAPEZOIDAL     3               5          3          3          1
200_OVERFLOW     TRAPEZOIDAL     10              46         20         20         1
201              DUMMY           0               0          0          0          1
202              DUMMY           0               0          0          0          1
203              DUMMY           0               0          0          0          1
204              DUMMY           0               0          0          0          1
205              DUMMY           0               0          0          0          1
206              DUMMY           0               0          0          0          1
207              DUMMY           0               0          0          0          1
208              TRAPEZOIDAL     3               5          3          3          1
209              DUMMY           0               0          0          0          1
210              DUMMY           0               0          0          0          1
211              DUMMY           0               0          0          0          1
212              DUMMY           0               0          0          0          1
213              DUMMY           0               0          0          0          1
215              DUMMY           0               0          0          0          1
216              DUMMY           0               0          0          0          1
217              DUMMY           0               0          0          0          1
218              DUMMY           0               0          0          0          1
219              DUMMY           0               0          0          0          1
220              DUMMY           0               0          0          0          1
221              TRAPEZOIDAL     3               5          3          3          1
221_OVERFLOW     TRAPEZOIDAL     10              38         20         20         1
222              DUMMY           0               0          0          0          1
235              DUMMY           0               0          0          0          1
236              DUMMY           0               0          0          0          1
237              DUMMY           0               0          0          0          1
238              DUMMY           0               0          0          0          1
240              DUMMY           0               0          0          0          1
241              DUMMY           0               0          0          0          1
242              DUMMY           0               0          0          0          1
243              DUMMY           0               0          0          0          1
300              TRAPEZOIDAL     2               8          3          3          1
300_OVERFLOW     TRAPEZOIDAL     10              40         20         20         1
302              TRAPEZOIDAL     3               8          3          3          1
303              TRAPEZOIDAL     .5              8          3          3          1
303_OVERFLOW     TRAPEZOIDAL     10              22         20         20         1
305              DUMMY           0               0          0          0          1
306              TRAPEZOIDAL     3               10         3          3          1
306_OVERFLOW     TRAPEZOIDAL     10              56         20         20         1
308              TRAPEZOIDAL     1.5             10         3          3          1
308_OVERFLOW     TRAPEZOIDAL     10              38         20         20         1
310              TRAPEZOIDAL     3               8          3          3          1
310_OVERFLOW     TRAPEZOIDAL     10              52         20         20         1
311              TRAPEZOIDAL     3               10         3          3          1
311_OVERFLOW     TRAPEZOIDAL     10              56         20         20         1
312              TRAPEZOIDAL     3               10         3          3          1
312_OVERFLOW     TRAPEZOIDAL     10              56         20         20         1
313              TRAPEZOIDAL     3               10         3          3          1
313_OVERFLOW     TRAPEZOIDAL     10              38         20         20         1
315              TRAPEZOIDAL     1.5             10         3          3          1
315_OVERFLOW     TRAPEZOIDAL     10              38         20         20         1
317              TRAPEZOIDAL     3               5          3          3          1
317_OVERFLOW     TRAPEZOIDAL     10              46         20         20         1
318              TRAPEZOIDAL     3               10         3          3          1
318_OVERFLOW     TRAPEZOIDAL     10              56         20         20         1
319              TRAPEZOIDAL     3               10         3          3          1
319_OVERFLOW     TRAPEZOIDAL     10              56         20         20         1
320              TRAPEZOIDAL     .5              8          3          3          1
320_OVERFLOW     TRAPEZOIDAL     10              22         20         20         1
321              TRAPEZOIDAL     3               10         3          3          1
322              TRAPEZOIDAL     3               10         3          3          1
322_OVERFLOW     TRAPEZOIDAL     10              56         20         20         1
323              DUMMY           0               0          0          0          1
400              DUMMY           0               0          0          0          1
401              DUMMY           0               0          0          0          1
410              DUMMY           0               0          0          0          1
411              DUMMY           0               0          0          0          1
412              DUMMY           0               0          0          0          1
413              TRAPEZOIDAL     3               5          3          3          1
413_OVERFLOW     TRAPEZOIDAL     10              46         20         20         1
414              DUMMY           0               0          0          0          1
415              DUMMY           0               0          0          0          1
416              DUMMY           0               0          0          0          1
417              DUMMY           0               0          0          0          1
418              DUMMY           0               0          0          0          1
419              DUMMY           0               0          0          0          1
423              DUMMY           0               0          0          0          1
424              DUMMY           0               0          0          0          1
425              DUMMY           0               0          0          0          1
426              DUMMY           0               0          0          0          1
427              DUMMY           0               0          0          0          1
428              DUMMY           0               0          0          0          1
429              DUMMY           0               0          0          0          1
430              DUMMY           0               0          0          0          1
431              DUMMY           0               0          0          0          1
432              DUMMY           0               0          0          0          1
433              DUMMY           0               0          0          0          1
435              DUMMY           0               0          0          0          1
436              DUMMY           0               0          0          0          1
437              DUMMY           0               0          0          0          1
440              DUMMY           0               0          0          0          1
441              DUMMY           0               0          0          0          1
442              DUMMY           0               0          0          0          1
443              DUMMY           0               0          0          0          1
444              DUMMY           0               0          0          0          1
445              DUMMY           0               0          0          0          1
446              DUMMY           0               0          0          0          1
447              DUMMY           0               0          0          0          1
448              DUMMY           0               0          0          0          1
449              DUMMY           0               0          0          0          1
450              DUMMY           0               0          0          0          1
451              DUMMY           0               0          0          0          1
452              DUMMY           0               0          0          0          1
453              DUMMY           0               0          0          0          1
454              TRAPEZOIDAL     3               8          3          3          1
454_OVERFLOW     TRAPEZOIDAL     10              52         20         20         1
455              DUMMY           0               0          0          0          1
456              DUMMY           0               0          0          0          1
457              DUMMY           0               0          0          0          1
458              DUMMY           0               0          0          0          1
459              DUMMY           0               0          0          0          1
460              CIRCULAR        3.5             0          0          0          1
460_OVERFLOW     TRAPEZOIDAL     10              56         20         20         1
461              DUMMY           0               0          0          0          1
462              DUMMY           0               0          0          0          1
463              DUMMY           0               0          0          0          1
464              DUMMY           0               0          0          0          1
465              DUMMY           0               0          0          0          1
466              DUMMY           0               0          0          0          1
467              DUMMY           0               0          0          0          1
468              DUMMY           0               0          0          0          1
469              TRAPEZOIDAL     3               5          3          3          1
469_OVERFLOW     TRAPEZOIDAL     10              56         20         20         1
470              DUMMY           0               0          0          0          1
471              DUMMY           0               0          0          0          1
472              DUMMY           0               0          0          0          1
473              DUMMY           0               0          0          0          1
474              DUMMY           0               0          0          0          1
475              DUMMY           0               0          0          0          1
476              DUMMY           0               0          0          0          1
477              DUMMY           0               0          0          0          1
478              DUMMY           0               0          0          0          1
479              TRAPEZOIDAL     3               5          3          3          1
479_OVERFLOW     TRAPEZOIDAL     10              56         20         20         1
480              DUMMY           0               0          0          0          1
481              DUMMY           0               0          0          0          1
482              DUMMY           0               0          0          0          1
```

483	DUMMY	0	0	0	0	1
484	DUMMY	0	0	0	0	1
485	DUMMY	0	0	0	0	1
486	DUMMY	0	0	0	0	1
487	DUMMY	0	0	0	0	1
488	DUMMY	0	0	0	0	1
489	DUMMY	0	0	0	0	1
490	DUMMY	0	0	0	0	1
491	DUMMY	0	0	0	0	1
492	DUMMY	0	0	0	0	1
493	TRAPEZOIDAL	3	10	3	3	1
494	DUMMY	0	0	0	0	1
495	DUMMY	0	0	0	0	1
496	DUMMY	0	0	0	0	1
497	DUMMY	0	0	0	0	1
498	TRAPEZOIDAL	3	8	3	3	1
498_OVERFLOW	TRAPEZOIDAL	10	52	20	20	1
499	DUMMY	0	0	0	0	1
500	TRAPEZOIDAL	3	5	3	3	1
500_OVERFLOW	TRAPEZOIDAL	10	22	20	20	1
501	TRAPEZOIDAL	3	10	3	3	1
501_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
502	TRAPEZOIDAL	3	10	3	3	1
502_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
503	TRAPEZOIDAL	.5	8	3	3	1
503_OVERFLOW	TRAPEZOIDAL	10	22	20	20	1
504	TRAPEZOIDAL	3	8	3	3	1
504_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
505	TRAPEZOIDAL	3	10	3	3	1
505_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
506	TRAPEZOIDAL	3	8	3	3	1
506_OVERFLOW	TRAPEZOIDAL	10	52	20	20	1
507	TRAPEZOIDAL	3	10	3	3	1
507_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
508	TRAPEZOIDAL	3	10	3	3	1
508_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
509	TRAPEZOIDAL	3	8	3	3	1
511	TRAPEZOIDAL	3	8	8	8	1
511_OVERFLOW	TRAPEZOIDAL	10	52	20	20	1
512	TRAPEZOIDAL	.5	8	3	3	1
512_OVERFLOW	TRAPEZOIDAL	10	22	20	20	1
513	TRAPEZOIDAL	3	10	3	3	1
513_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
514	TRAPEZOIDAL	3	10	3	3	1
514_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
516	TRAPEZOIDAL	3	8	3	3	1
516_OVERFLOW	TRAPEZOIDAL	10	52	20	20	1
517	TRAPEZOIDAL	3	10	3	3	1
517_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
518	TRAPEZOIDAL	3	8	3	3	1
518_OVERFLOW	TRAPEZOIDAL	10	52	20	20	1
519	CIRCULAR	4.33	0	0	0	1
519_OVERFLOW	TRAPEZOIDAL	10	52	20	20	1
521	TRAPEZOIDAL	3	8	3	3	1
521_OVERFLOW	TRAPEZOIDAL	10	52	20	20	1
522	TRAPEZOIDAL	3	10	3	3	1
522_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
523	TRAPEZOIDAL	.5	8	3	3	1
523_OVERFLOW	TRAPEZOIDAL	10	22	20	20	1
525	TRAPEZOIDAL	.5	8	3	3	1
525_OVERFLOW	TRAPEZOIDAL	10	22	20	20	1
526	TRAPEZOIDAL	3	8	3	3	1
526_OVERFLOW	TRAPEZOIDAL	10	52	20	20	1
528	TRAPEZOIDAL	3	10	3	3	1
529	TRAPEZOIDAL	3	10	3	3	1
529_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
530	TRAPEZOIDAL	3	10	3	3	1
530_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
531	TRAPEZOIDAL	3	10	3	3	1
531_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
532	TRAPEZOIDAL	3	10	3	3	1
532_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
534	TRAPEZOIDAL	.5	8	3	3	1
534_OVERFLOW	TRAPEZOIDAL	10	22	20	20	1
536	TRAPEZOIDAL	5	45	4	4	1
536_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
538	TRAPEZOIDAL	.5	8	3	3	1
538_OVERFLOW	TRAPEZOIDAL	10	22	20	20	1
539	TRAPEZOIDAL	.5	8	3	3	1
539_OVERFLOW	TRAPEZOIDAL	10	22	20	20	1
540	TRAPEZOIDAL	3	8	3	3	1
540_OVERFLOW	TRAPEZOIDAL	10	52	20	20	1
541	TRAPEZOIDAL	3	10	3	3	1
541_OVERFLOW	TRAPEZOIDAL	10	56	20	20	1
542	CIRCULAR	2.5	0	0	0	1
542_OVERFLOW	TRAPEZOIDAL	10	22	20	20	1
543	CIRCULAR	4.5	0	0	0	1
543_OVERFLOW	TRAPEZOIDAL	10	22	20	20	1
600	DUMMY	0	0	0	0	1
601	DUMMY	0	0	0	0	1
602	DUMMY	0	0	0	0	1
603	DUMMY	0	0	0	0	1
604	DUMMY	0	0	0	0	1
605	DUMMY	0	0	0	0	1
606	DUMMY	0	0	0	0	1
607	DUMMY	0	0	0	0	1
608	DUMMY	0	0	0	0	1
609	DUMMY	0	0	0	0	1
610	DUMMY	0	0	0	0	1
611	DUMMY	0	0	0	0	1
612	DUMMY	0	0	0	0	1
613	DUMMY	0	0	0	0	1
614	DUMMY	0	0	0	0	1
615	DUMMY	0	0	0	0	1
616	DUMMY	0	0	0	0	1
617	DUMMY	0	0	0	0	1
618	DUMMY	0	0	0	0	1
619	DUMMY	0	0	0	0	1
620	DUMMY	0	0	0	0	1
621	DUMMY	0	0	0	0	1
622	DUMMY	0	0	0	0	1
623	DUMMY	0	0	0	0	1
624	DUMMY	0	0	0	0	1
627	DUMMY	0	0	0	0	1
628	TRAPEZOIDAL	3	5	3	3	1
629	DUMMY	0	0	0	0	1
630	DUMMY	0	0	0	0	1
631	DUMMY	0	0	0	0	1
633	DUMMY	0	0	0	0	1
634	DUMMY	0	0	0	0	1
638	DUMMY	0	0	0	0	1
639	DUMMY	0	0	0	0	1
640	DUMMY	0	0	0	0	1
641	DUMMY	0	0	0	0	1
645	DUMMY	0	0	0	0	1
646	DUMMY	0	0	0	0	1
647	DUMMY	0	0	0	0	1
648	DUMMY	0	0	0	0	1
650	DUMMY	0	0	0	0	1
651	DUMMY	0	0	0	0	1
652	DUMMY	0	0	0	0	1
655	DUMMY	0	0	0	0	1
656	DUMMY	0	0	0	0	1
657	DUMMY	0	0	0	0	1
658	DUMMY	0	0	0	0	1
659	DUMMY	0	0	0	0	1
660	DUMMY	0	0	0	0	1
661	DUMMY	0	0	0	0	1
700	TRAPEZOIDAL	3	8	3	3	1
701	TRAPEZOIDAL	3	8	3	3	1
702	TRAPEZOIDAL	3	8	3	3	1
703	TRAPEZOIDAL	3	10	3	3	1
1020	TRAPEZOIDAL	1.5	10	3	3	1
1025	TRAPEZOIDAL	3	10	3	3	1
1026	TRAPEZOIDAL	3	10	3	3	1
1043	TRAPEZOIDAL	.5	8	3	3	1
1060	DUMMY	0	0	0	0	1
702_OVERFLOW	TRAPEZOIDAL	10	84	20	20	1
703_OVERFLOW	TRAPEZOIDAL	10	84	20	20	1
704	TRAPEZOIDAL	3	8	3	3	1
705	TRAPEZOIDAL	.5	8	3	3	1
705_OVERFLOW	TRAPEZOIDAL	10	33	20	20	1
708	TRAPEZOIDAL	.5	8	3	3	1
706_OVERFLOW	TRAPEZOIDAL	10	33	20	20	1
708	TRAPEZOIDAL	3	10	3	3	1
708_OVERFLOW	TRAPEZOIDAL	10	84	20	20	1
709	TRAPEZOIDAL	3	10	3	3	1
709_OVERFLOW	TRAPEZOIDAL	10	84	20	20	1
710	TRAPEZOIDAL	3	10	3	3	1
710_OVERFLOW	TRAPEZOIDAL	10	84	20	20	1
712	TRAPEZOIDAL	3	10	3	3	1
712_OVERFLOW	TRAPEZOIDAL	10	84	20	20	1
713	TRAPEZOIDAL	3	10	3	3	1
713_OVERFLOW	TRAPEZOIDAL	10	84	20	20	1
714	TRAPEZOIDAL	3	10	3	3	1
714_OVERFLOW	TRAPEZOIDAL	10	84	20	20	1
715	TRAPEZOIDAL	3	8	3	3	1
716	TRAPEZOIDAL	3	10	3	3	1
716_OVERFLOW	TRAPEZOIDAL	10	84	20	20	1
717	TRAPEZOIDAL	3	10	3	3	1
717_OVERFLOW	TRAPEZOIDAL	10	84	20	20	1
718	TRAPEZOIDAL	3	8	3	3	1
719	TRAPEZOIDAL	3	10	3	3	1
719_OVERFLOW	TRAPEZOIDAL	10	84	20	20	1
720	TRAPEZOIDAL	3	8	3	3	1
721	TRAPEZOIDAL	3	10	3	3	1
721_OVERFLOW	TRAPEZOIDAL	10	84	20	20	1
722	TRAPEZOIDAL	.5	8	3	3	1
722_OVERFLOW	TRAPEZOIDAL	10	33	20	20	1
750	TRAPEZOIDAL	3	10	3	3	1

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750_OVERFLOW     TRAPEZOIDAL  10              84         20         20         1

[LOSSES]
;;Link           Inlet      Outlet     Average    Flap Gate
;;-------------- ---------- ---------- ---------- ----------

[INFLOWS]
;;                                                Param      Units      Scale      Baseline   Baseline
;;Node           Parameter  Time Series            Type       Factor     Factor     Value      Pattern
;;-------------- ---------- ---------------------- ---------- ---------- ---------- ---------- --------
JUNCT_1060       FLOW       CV_Fu_100yr            FLOW       1.0        1.0
JUNCT_400        FLOW       CC_Fu_100yr            FLOW       1.0        1.0
JUNCT_1020       FLOW       ET_Fu_100yr            FLOW       1.0        1.0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
DIVERSION_1045   Diversion   0          0
DIVERSION_1045               1.0        0
DIVERSION_1045               130        0
DIVERSION_1045               164        0
DIVERSION_1045               410        160
DIVERSION_1045               740        510
DIVERSION_1045               2442       1442

RATING_CURVE_1024 Rating     0          0.00
RATING_CURVE_1024            .5         53.00
RATING_CURVE_1024            1          150.00
RATING_CURVE_1024            1.5        276.00
RATING_CURVE_1024            2.0        424.00

RATING_CURVE_1025 Rating     0          0
RATING_CURVE_1025            1          0
RATING_CURVE_1025            2          0
RATING_CURVE_1025            3          0
RATING_CURVE_1025            4          0
RATING_CURVE_1025            5          0
RATING_CURVE_1025            6          57.88
RATING_CURVE_1025            7          63.76
RATING_CURVE_1025            8          69.13
RATING_CURVE_1025            9          74.12

RATING_CURVE_1026 Rating     0          31.12
RATING_CURVE_1026            1          43.57
RATING_CURVE_1026            2          56.02
RATING_CURVE_1026            3          76.32
RATING_CURVE_1026            4          100.32
RATING_CURVE_1026            4.5        112.32
RATING_CURVE_1026            5          160
RATING_CURVE_1026            6          480
RATING_CURVE_1026            6.14       536

RATING_CURVE_1028 Rating     0.0        0.00
RATING_CURVE_1028            0.5        4.26
RATING_CURVE_1028            1.0        12.04
RATING_CURVE_1028            1.5        22.12
RATING_CURVE_1028            2.0        34.05
RATING_CURVE_1028            2.5        47.59
RATING_CURVE_1028            3.0        62.56
RATING_CURVE_1028            3.5        78.83
RATING_CURVE_1028            4.0        93.07
RATING_CURVE_1028            4.5        103.44
RATING_CURVE_1028            5.0        112.87
RATING_CURVE_1028            5.5        121.56
RATING_CURVE_1028            6.0        129.67
RATING_CURVE_1028            6.5        137.31
RATING_CURVE_1028            7.0        144.54
RATING_CURVE_1028            7.5        151.43
RATING_CURVE_1028            8.0        158.01
RATING_CURVE_1028            8.5        164.34
RATING_CURVE_1028            9.0        170.42
RATING_CURVE_1028            9.5        176.30

RATING_CURVE_1029 Rating     0.0        0.00
RATING_CURVE_1029            0.5        0.09
RATING_CURVE_1029            1.0        0.20
RATING_CURVE_1029            1.5        0.36
RATING_CURVE_1029            2.0        0.51
RATING_CURVE_1029            2.5        0.72
RATING_CURVE_1029            3.0        0.91
RATING_CURVE_1029            3.5        1.15
RATING_CURVE_1029            4.0        1.38
RATING_CURVE_1029            4.5        1.66
RATING_CURVE_1029            5.0        1.91
RATING_CURVE_1029            5.5        2.21
RATING_CURVE_1029            6.0        35.00
RATING_CURVE_1029            6.5        241.67
RATING_CURVE_1029            7.0        549.20
RATING_CURVE_1029            7.5        931.17
RATING_CURVE_1029            8.0        1375.13

RATING_CURVE_1040 Rating     0.01       0.01
RATING_CURVE_1040            2.8        22
RATING_CURVE_1040            10.2       48
RATING_CURVE_1040            11.13      147
RATING_CURVE_1040            12.6       296
RATING_CURVE_1040            20.5       644
RATING_CURVE_1040            28.4       991

RATING_CURVE_1041 Rating     0.0        0.00
RATING_CURVE_1041            0.4        0.99
RATING_CURVE_1041            1.4        6.46
RATING_CURVE_1041            2.4        14.50
RATING_CURVE_1041            2.9        19.26
RATING_CURVE_1041            3.4        24.45
RATING_CURVE_1041            3.9        30.04
RATING_CURVE_1041            4.4        36.00
RATING_CURVE_1041            5.4        85.00
RATING_CURVE_1041            5.9        94.20
RATING_CURVE_1041            6.4        102.00
RATING_CURVE_1041            6.9        109.00
RATING_CURVE_1041            7.4        115.00

RATING_CURVE_1042 Rating     0          0
RATING_CURVE_1042            1          4.1
RATING_CURVE_1042            2          12.7
RATING_CURVE_1042            3          17.4
RATING_CURVE_1042            4          21.1
RATING_CURVE_1042            5          36.1
RATING_CURVE_1042            6          83
RATING_CURVE_1042            7          228.2
RATING_CURVE_1042            8.2        637.4

RATING_CURVE_1043 Rating     0          0.07
RATING_CURVE_1043            1          1.55
RATING_CURVE_1043            2          5.98
RATING_CURVE_1043            3          14.28
RATING_CURVE_1043            4          27.70
RATING_CURVE_1043            5          117.67
RATING_CURVE_1043            6          130.50
RATING_CURVE_1043            7          142.18
RATING_CURVE_1043            7.98       152.75

RATING_CURVE_1044 Rating     0          0
RATING_CURVE_1044            1          .27
RATING_CURVE_1044            2          .77
RATING_CURVE_1044            3.06       1.43
RATING_CURVE_1044            4          69.03
RATING_CURVE_1044            4.32       72.84
RATING_CURVE_1044            5          104.92
RATING_CURVE_1044            5.99       115.80

RATING_CURVE_1045_PONDA Rating     0          0
RATING_CURVE_1045_PONDA            .5         .5
RATING_CURVE_1045_PONDA            1.5        1.5
RATING_CURVE_1045_PONDA            2.5        62.50
RATING_CURVE_1045_PONDA            3.5        98.76
RATING_CURVE_1045_PONDA            4.5        128.24
RATING_CURVE_1045_PONDA            5.5        154.67
RATING_CURVE_1045_PONDA            6.5        181.10
RATING_CURVE_1045_PONDA            7.5        203.31
RATING_CURVE_1045_PONDA            8.5        222.00
RATING_CURVE_1045_PONDA            9.5        748.00

RATING_CURVE_1045_PONDB Rating     0          0
RATING_CURVE_1045_PONDB            1.5        0
RATING_CURVE_1045_PONDB            3.5        8.0
RATING_CURVE_1045_PONDB            5.5        27.0
RATING_CURVE_1045_PONDB            7.5        37.0
RATING_CURVE_1045_PONDB            9.5        41.0

RATING_CURVE_1046 Rating     0.00       0.00
RATING_CURVE_1046            1.00       0.32
RATING_CURVE_1046            2.00       0.82
RATING_CURVE_1046            3.00       1.47
RATING_CURVE_1046            4.00       2.22
RATING_CURVE_1046            5.00       3.08
RATING_CURVE_1046            6.00       4.02
RATING_CURVE_1046            7.00       5.04
RATING_CURVE_1046            8.00       21.49
RATING_CURVE_1046            9.00       75.65
RATING_CURVE_1046            10.00      96.35

RATING_CURVE_1047 Rating     0.0        0.00
RATING_CURVE_1047            1.0        0.41
RATING_CURVE_1047            2.0        1.07
RATING_CURVE_1047            3.0        1.90
RATING_CURVE_1047            4.0        2.88
RATING_CURVE_1047            5.0        3.98
RATING_CURVE_1047            6.0        5.20
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RATING_CURVE_1047          7.0       6.52
RATING_CURVE_1047          8.0       7.53
RATING_CURVE_1047          9.0       47.01
RATING_CURVE_1047          10.0      71.10

RATING_CURVE_1048 Rating   0.0       0.00
RATING_CURVE_1048          1.0       0.41
RATING_CURVE_1048          2.0       1.07
RATING_CURVE_1048          3.0       1.90
RATING_CURVE_1048          4.0       2.88
RATING_CURVE_1048          5.0       3.98
RATING_CURVE_1048          6.0       5.20
RATING_CURVE_1048          7.0       6.52
RATING_CURVE_1048          8.0       7.53
RATING_CURVE_1048          9.0       8.38
RATING_CURVE_1048          10.0      89.06

RATING_CURVE_1049 Rating   0.00      0.00
RATING_CURVE_1049          1.00      0.66
RATING_CURVE_1049          2.00      1.73
RATING_CURVE_1049          3.00      3.09
RATING_CURVE_1049          4.00      4.68
RATING_CURVE_1049          5.00      22.50
RATING_CURVE_1049          6.00      30.33
RATING_CURVE_1049          7.00      36.42
RATING_CURVE_1049          8.00      41.60
RATING_CURVE_1049          9.00      46.20
RATING_CURVE_1049          10.00     50.37

RATING_CURVE_1050 Rating   0         0
RATING_CURVE_1050          4.5       .63
RATING_CURVE_1050          6.5       2.02
RATING_CURVE_1050          8.5       18.64
RATING_CURVE_1050          10.5      38.95
RATING_CURVE_1050          11.61     41

RATING_CURVE_1051 Rating   0.00      0.00
RATING_CURVE_1051          1.00      0.58
RATING_CURVE_1051          2.00      1.51
RATING_CURVE_1051          3.00      2.70
RATING_CURVE_1051          4.00      4.09
RATING_CURVE_1051          5.00      5.65
RATING_CURVE_1051          6.00      7.38
RATING_CURVE_1051          7.00      9.26
RATING_CURVE_1051          8.00      36.24
RATING_CURVE_1051          9.00      143.76
RATING_CURVE_1051          10.00     248.44

RATING_CURVE_1053 Rating   0.00      0.00
RATING_CURVE_1053          1.00      0.20
RATING_CURVE_1053          2.00      0.54
RATING_CURVE_1053          3.00      0.95
RATING_CURVE_1053          4.00      1.45
RATING_CURVE_1053          5.00      2.00
RATING_CURVE_1053          6.00      87.86
RATING_CURVE_1053          7.00      244.19
RATING_CURVE_1053          8.00      373.43
RATING_CURVE_1053          9.00      431.00
RATING_CURVE_1053          10.00     481.73

RATING_CURVE_1054 Rating   0.00      0.00
RATING_CURVE_1054          1.00      0.20
RATING_CURVE_1054          2.00      0.54
RATING_CURVE_1054          3.00      0.95
RATING_CURVE_1054          4.00      1.45
RATING_CURVE_1054          5.00      2.00
RATING_CURVE_1054          6.00      52.02
RATING_CURVE_1054          7.00      104.54
RATING_CURVE_1054          8.00      127.71
RATING_CURVE_1054          9.00      147.27
RATING_CURVE_1054          10.00     164.50

RATING_CURVE_1055 Rating   0.00      0.00
RATING_CURVE_1055          1.00      0.20
RATING_CURVE_1055          2.00      0.54
RATING_CURVE_1055          3.00      0.95
RATING_CURVE_1055          4.00      1.45
RATING_CURVE_1055          5.00      2.00
RATING_CURVE_1055          6.00      2.61
RATING_CURVE_1055          7.00      377

RATING_CURVE_1056 Rating   0         0
RATING_CURVE_1056          .5        0
RATING_CURVE_1056          1.0       0
RATING_CURVE_1056          1.5       0
RATING_CURVE_1056          2.0       0
RATING_CURVE_1056          2.5       10.82
RATING_CURVE_1056          3.0       19.88
RATING_CURVE_1056          3.5       32.71
RATING_CURVE_1056          4.0       34.71
RATING_CURVE_1056          4.5       36.6
RATING_CURVE_1056          5.0       38.4
RATING_CURVE_1056          5.5       40.12

RATING_CURVE_1060 Rating   0         0.00
RATING_CURVE_1060          1         116.55
RATING_CURVE_1060          2         329.65
RATING_CURVE_1060          3         605.61
RATING_CURVE_1060          4         782.43
RATING_CURVE_1060          5         874.79

RATING_CURVE_1061 Rating   0.0       0.0
RATING_CURVE_1061          0.2       1.2
RATING_CURVE_1061          1.2       8.5
RATING_CURVE_1061          2.2       7.6
RATING_CURVE_1061          3.2       23.8
RATING_CURVE_1061          3.83      29.3
RATING_CURVE_1061          4.2       36.9
RATING_CURVE_1061          4.3       40.3
RATING_CURVE_1061          5.2       96.2
RATING_CURVE_1061          5.3       97.5
RATING_CURVE_1061          6.2       107.9
RATING_CURVE_1061          6.45      110.6

RATING_CURVE_1070 Rating   0.00      0.00
RATING_CURVE_1070          1.00      0.00
RATING_CURVE_1070          2.00      0.00
RATING_CURVE_1070          3.00      12.95
RATING_CURVE_1070          4.00      47.91
RATING_CURVE_1070          5.00      61.86

RATING_CURVE_1071 Rating   0.00      0.00
RATING_CURVE_1071          1.00      0.00
RATING_CURVE_1071          2.00      0.00
RATING_CURVE_1071          3.00      0.00
RATING_CURVE_1071          4.00      17.19
RATING_CURVE_1071          5.00      84.97

STORAGE_CURVE_1024 Storage 0.0       879332
STORAGE_CURVE_1024         0.5       913894
STORAGE_CURVE_1024         1.0       948455
STORAGE_CURVE_1024         1.5       983017
STORAGE_CURVE_1024         2.0       1017578

STORAGE_CURVE_1025 Storage 0         6277
STORAGE_CURVE_1025         1         7793
STORAGE_CURVE_1025         2         9399
STORAGE_CURVE_1025         3         11079
STORAGE_CURVE_1025         4         12865
STORAGE_CURVE_1025         5         45167
STORAGE_CURVE_1025         6         80281
STORAGE_CURVE_1025         7         101450
STORAGE_CURVE_1025         8         122841
STORAGE_CURVE_1025         9         134256

STORAGE_CURVE_1026 Storage 0         768
STORAGE_CURVE_1026         1         8649
STORAGE_CURVE_1026         2         41711
STORAGE_CURVE_1026         3         88994
STORAGE_CURVE_1026         4         132639
STORAGE_CURVE_1026         5         142902
STORAGE_CURVE_1026         6         174095
STORAGE_CURVE_1026         6.14      174095

STORAGE_CURVE_1028 Storage 0.0       0
STORAGE_CURVE_1028         0.5       504
STORAGE_CURVE_1028         1.0       2480
STORAGE_CURVE_1028         1.5       5676
STORAGE_CURVE_1028         2.0       10248
STORAGE_CURVE_1028         2.5       16428
STORAGE_CURVE_1028         3.0       22087
STORAGE_CURVE_1028         3.5       26926
STORAGE_CURVE_1028         4.0       31899
STORAGE_CURVE_1028         4.5       37242
STORAGE_CURVE_1028         5.0       43242
STORAGE_CURVE_1028         5.5       49623
STORAGE_CURVE_1028         6.0       55926
STORAGE_CURVE_1028         6.5       62027
STORAGE_CURVE_1028         7.0       67996
STORAGE_CURVE_1028         7.5       73162
STORAGE_CURVE_1028         8.0       79834
STORAGE_CURVE_1028         8.5       92871
STORAGE_CURVE_1028         9.0       95509
STORAGE_CURVE_1028         9.5       95509

STORAGE_CURVE_1029 Storage 0.0       220
STORAGE_CURVE_1029         0.5       1080
STORAGE_CURVE_1029         1.0       2446
STORAGE_CURVE_1029         1.5       4320
STORAGE_CURVE_1029         2.0       7775
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STORAGE_CURVE_1029          2.5         22679
STORAGE_CURVE_1029          3.0         50890
STORAGE_CURVE_1029          3.5         98637
STORAGE_CURVE_1029          4.0         165920
STORAGE_CURVE_1029          4.5         246465
STORAGE_CURVE_1029          5.0         334205
STORAGE_CURVE_1029          5.5         427094
STORAGE_CURVE_1029          6.0         497465
STORAGE_CURVE_1029          6.5         543316
STORAGE_CURVE_1029          7.0         575373
STORAGE_CURVE_1029          7.5         594598
STORAGE_CURVE_1029          8.0         596418

STORAGE_CURVE_1041 Storage  0.0         0
STORAGE_CURVE_1041          0.4         5190
STORAGE_CURVE_1041          1.4         42795
STORAGE_CURVE_1041          2.4         80400
STORAGE_CURVE_1041          2.9         83292
STORAGE_CURVE_1041          3.4         86185
STORAGE_CURVE_1041          3.9         89078
STORAGE_CURVE_1041          4.4         91970
STORAGE_CURVE_1041          5.4         101115
STORAGE_CURVE_1041          5.9         105698
STORAGE_CURVE_1041          6.4         110260
STORAGE_CURVE_1041          6.9         114695
STORAGE_CURVE_1041          7.4         119130

STORAGE_CURVE_1042 Storage  0           0
STORAGE_CURVE_1042          1           6030
STORAGE_CURVE_1042          2           16745
STORAGE_CURVE_1042          3           29802
STORAGE_CURVE_1042          4           46186
STORAGE_CURVE_1042          5           62186
STORAGE_CURVE_1042          6           70532
STORAGE_CURVE_1042          7           79398
STORAGE_CURVE_1042          8.2         89500

STORAGE_CURVE_1043 Storage  0           204
STORAGE_CURVE_1043          1           11325
STORAGE_CURVE_1043          2           36928
STORAGE_CURVE_1043          3           61630
STORAGE_CURVE_1043          4           80542
STORAGE_CURVE_1043          5           94002
STORAGE_CURVE_1043          6           102462
STORAGE_CURVE_1043          7           110391
STORAGE_CURVE_1043          7.98        114424

STORAGE_CURVE_1044 Storage  0           3411
STORAGE_CURVE_1044          1           13374
STORAGE_CURVE_1044          2           36600
STORAGE_CURVE_1044          3.06        67531
STORAGE_CURVE_1044          4           115054
STORAGE_CURVE_1044          4.32        121210
STORAGE_CURVE_1044          5           174157
STORAGE_CURVE_1044          5.99        222382

STORAGE_CURVE_1045_PONDA Storage    0           0
STORAGE_CURVE_1045_PONDA            .5          41818
STORAGE_CURVE_1045_PONDA            1.5         81022
STORAGE_CURVE_1045_PONDA            2.5         100624
STORAGE_CURVE_1045_PONDA            3.5         109336
STORAGE_CURVE_1045_PONDA            4.5         116741
STORAGE_CURVE_1045_PONDA            5.5         124582
STORAGE_CURVE_1045_PONDA            6.5         131987
STORAGE_CURVE_1045_PONDA            7.5         139828
STORAGE_CURVE_1045_PONDA            8.5         147668
STORAGE_CURVE_1045_PONDA            9.5         155509

STORAGE_CURVE_1045_PONDB Storage    0           0
STORAGE_CURVE_1045_PONDB            1.5         16117
STORAGE_CURVE_1045_PONDB            3.5         89298
STORAGE_CURVE_1045_PONDB            5.5         220414
STORAGE_CURVE_1045_PONDB            7.5         310147
STORAGE_CURVE_1045_PONDB            9.5         328878

STORAGE_CURVE_1046 Storage  0.00        20000.0
STORAGE_CURVE_1046          1.00        22464.0
STORAGE_CURVE_1046          2.00        25056.0
STORAGE_CURVE_1046          3.00        27776.0
STORAGE_CURVE_1046          4.00        30624.0
STORAGE_CURVE_1046          5.00        33600.0
STORAGE_CURVE_1046          6.00        36704.0
STORAGE_CURVE_1046          7.00        39936.0
STORAGE_CURVE_1046          8.00        43296.0
STORAGE_CURVE_1046          9.00        46784.0
STORAGE_CURVE_1046          10.00       50400.0

STORAGE_CURVE_1047 Storage  0.0         16200
STORAGE_CURVE_1047          1.0         18304
STORAGE_CURVE_1047          2.0         20536
STORAGE_CURVE_1047          3.0         22896
STORAGE_CURVE_1047          4.0         25384
STORAGE_CURVE_1047          5.0         28000
STORAGE_CURVE_1047          6.0         30744
STORAGE_CURVE_1047          7.0         33616
STORAGE_CURVE_1047          8.0         36616
STORAGE_CURVE_1047          9.0         39744
STORAGE_CURVE_1047          10.0        43000

STORAGE_CURVE_1048 Storage  0.0         4550
STORAGE_CURVE_1048          1.0         5694
STORAGE_CURVE_1048          2.0         6966
STORAGE_CURVE_1048          3.0         8366
STORAGE_CURVE_1048          4.0         9894
STORAGE_CURVE_1048          5.0         11550
STORAGE_CURVE_1048          6.0         13334
STORAGE_CURVE_1048          7.0         15246
STORAGE_CURVE_1048          8.0         17286
STORAGE_CURVE_1048          9.0         19454
STORAGE_CURVE_1048          10.0        21750

STORAGE_CURVE_1049 Storage  0.00        125000.0
STORAGE_CURVE_1049          1.00        131064.0
STORAGE_CURVE_1049          2.00        137256.0
STORAGE_CURVE_1049          3.00        143576.0
STORAGE_CURVE_1049          4.00        150024.0
STORAGE_CURVE_1049          5.00        156600.0
STORAGE_CURVE_1049          6.00        163304.0
STORAGE_CURVE_1049          7.00        170136.0
STORAGE_CURVE_1049          8.00        177096.0
STORAGE_CURVE_1049          9.00        184184.0
STORAGE_CURVE_1049          10.00       191400.0

STORAGE_CURVE_1050 Storage  0           1
STORAGE_CURVE_1050          4.5         21444
STORAGE_CURVE_1050          6.5         68032
STORAGE_CURVE_1050          8.5         130804
STORAGE_CURVE_1050          10.5        211142
STORAGE_CURVE_1050          11.61       273644

STORAGE_CURVE_1051 Storage  0.00        46200.0
STORAGE_CURVE_1051          1.00        49704.0
STORAGE_CURVE_1051          2.00        53336.0
STORAGE_CURVE_1051          3.00        57096.0
STORAGE_CURVE_1051          4.00        60984.0
STORAGE_CURVE_1051          5.00        65000.0
STORAGE_CURVE_1051          6.00        69144.0
STORAGE_CURVE_1051          7.00        73416.0
STORAGE_CURVE_1051          8.00        77816.0
STORAGE_CURVE_1051          9.00        82344.0
STORAGE_CURVE_1051          10.00       87000.0

STORAGE_CURVE_1053 Storage  0.0         42000.0
STORAGE_CURVE_1053          1.0         45344.0
STORAGE_CURVE_1053          2.0         48816.0
STORAGE_CURVE_1053          3.0         52416.0
STORAGE_CURVE_1053          4.0         56144.0
STORAGE_CURVE_1053          5.0         60000.0
STORAGE_CURVE_1053          6.0         63984.0
STORAGE_CURVE_1053          7.0         68096.0
STORAGE_CURVE_1053          8.0         72336.0
STORAGE_CURVE_1053          9.0         76704.0
STORAGE_CURVE_1053          10.0        81200.0

STORAGE_CURVE_1054 Storage  0.00        8100.0
STORAGE_CURVE_1054          1.00        9604.0
STORAGE_CURVE_1054          2.00        11236.0
STORAGE_CURVE_1054          3.00        12996.0
STORAGE_CURVE_1054          4.00        14884.0
STORAGE_CURVE_1054          5.00        16900.0
STORAGE_CURVE_1054          6.00        19044.0
STORAGE_CURVE_1054          7.00        21316.0
STORAGE_CURVE_1054          8.00        23716.0
STORAGE_CURVE_1054          9.00        26244.0
STORAGE_CURVE_1054          10.00       28900.0

STORAGE_CURVE_1055 Storage  0.00        15000.0
STORAGE_CURVE_1055          1.00        17064.0
STORAGE_CURVE_1055          2.00        19256.0
STORAGE_CURVE_1055          3.00        21576.0
STORAGE_CURVE_1055          4.00        24024.0
STORAGE_CURVE_1055          5.00        26600.0
STORAGE_CURVE_1055          6.00        29304.0
STORAGE_CURVE_1055          7.00        32136.0

STORAGE_CURVE_1056 Storage  0           7820
STORAGE_CURVE_1056          .5          10985
STORAGE_CURVE_1056          1.0         16566
STORAGE_CURVE_1056          1.5         18165
STORAGE_CURVE_1056          2.0         19864
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STORAGE_CURVE_1056          2.5         21367
STORAGE_CURVE_1056          3.0         22954
STORAGE_CURVE_1056          3.5         24503
STORAGE_CURVE_1056          4.0         26129
STORAGE_CURVE_1056          4.5         27687
STORAGE_CURVE_1056          5.0         29362
STORAGE_CURVE_1056          5.5         31043

STORAGE_CURVE_1060 Storage  0           250000.0
STORAGE_CURVE_1060          1           260064.0
STORAGE_CURVE_1060          2           270256.0
STORAGE_CURVE_1060          3           280576.0
STORAGE_CURVE_1060          4           291024.0
STORAGE_CURVE_1060          5           301600.0

STORAGE_CURVE_1061 Storage  0.00        0
STORAGE_CURVE_1061          0.20        4429
STORAGE_CURVE_1061          1.20        33788
STORAGE_CURVE_1061          2.20        70835
STORAGE_CURVE_1061          3.20        74516
STORAGE_CURVE_1061          3.83        76867
STORAGE_CURVE_1061          4.20        78260
STORAGE_CURVE_1061          4.30        78638
STORAGE_CURVE_1061          5.20        82070
STORAGE_CURVE_1061          5.30        82454
STORAGE_CURVE_1061          6.20        85959
STORAGE_CURVE_1061          6.45        86944

STORAGE_CURVE_1070 Storage  0.00        49600.0
STORAGE_CURVE_1070          1.00        53856.0
STORAGE_CURVE_1070          2.00        58240.0
STORAGE_CURVE_1070          3.00        62752.0
STORAGE_CURVE_1070          4.00        67392.0
STORAGE_CURVE_1070          5.00        72160.0

STORAGE_CURVE_1071 Storage  0.00        49200.0
STORAGE_CURVE_1071          1.00        53448.0
STORAGE_CURVE_1071          2.00        57824.0
STORAGE_CURVE_1071          3.00        62328.0
STORAGE_CURVE_1071          4.00        66960.0
STORAGE_CURVE_1071          5.00        71720.0

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
CC_Fu_100yr                 0          0
CC_Fu_100yr                 0.25       9.8
CC_Fu_100yr                 0.333      46.4
CC_Fu_100yr                 0.5        368.8
CC_Fu_100yr                 0.667      1197.9
CC_Fu_100yr                 0.75       1944.2
CC_Fu_100yr                 0.833      1240
CC_Fu_100yr                 1          924.6
CC_Fu_100yr                 1.167      678
CC_Fu_100yr                 1.5        292.5
CC_Fu_100yr                 1.75       157.2
CC_Fu_100yr                 2          103.4
CC_Fu_100yr                 2.5        20.4
CC_Fu_100yr                 3          2.3
CC_Fu_100yr                 3.5        0
CC_Fu_100yr                 4          0
CC_Fu_100yr                 8          0

CC_Fu_10yr                  0          0
CC_Fu_10yr                  0.25       3.1
CC_Fu_10yr                  0.333      20.1
CC_Fu_10yr                  0.5        188.5
CC_Fu_10yr                  0.667      600.1
CC_Fu_10yr                  0.75       703.7
CC_Fu_10yr                  0.833      670.7
CC_Fu_10yr                  1          509.5
CC_Fu_10yr                  1.167      373.4
CC_Fu_10yr                  1.5        163.1
CC_Fu_10yr                  1.75       91.6
CC_Fu_10yr                  2          63.3
CC_Fu_10yr                  2.5        12.8
CC_Fu_10yr                  3          1.4
CC_Fu_10yr                  3.5        0
CC_Fu_10yr                  4          0
CC_Fu_10yr                  8          0

CC_Fu_25yr                  0          0
CC_Fu_25yr                  0.25       4.2
CC_Fu_25yr                  0.333      27.3
CC_Fu_25yr                  0.5        255.8
CC_Fu_25yr                  0.667      814.4
CC_Fu_25yr                  0.75       955
CC_Fu_25yr                  0.833      910.2
CC_Fu_25yr                  1          691.4
CC_Fu_25yr                  1.167      506.7
CC_Fu_25yr                  1.5        221.3
CC_Fu_25yr                  1.75       124.3
CC_Fu_25yr                  2          85.9
CC_Fu_25yr                  2.5        17.4
CC_Fu_25yr                  3          1.9
CC_Fu_25yr                  3.5        0
CC_Fu_25yr                  4          0
CC_Fu_25yr                  8          0

CC_Fu_2yr                   0          0
CC_Fu_2yr                   0.25       0
CC_Fu_2yr                   0.333      4.3
CC_Fu_2yr                   0.5        83.2
CC_Fu_2yr                   0.667      267.7
CC_Fu_2yr                   0.75       304.5
CC_Fu_2yr                   0.833      287.8
CC_Fu_2yr                   1          219.9
CC_Fu_2yr                   1.167      164
CC_Fu_2yr                   1.5        78
CC_Fu_2yr                   1.75       47.3
CC_Fu_2yr                   2          35.1
CC_Fu_2yr                   2.5        7.4
CC_Fu_2yr                   3          0
CC_Fu_2yr                   3.5        0
CC_Fu_2yr                   4          0
CC_Fu_2yr                   8          0

CC_Fu_50yr                  0          0
CC_Fu_50yr                  0.25       6.8
CC_Fu_50yr                  0.333      36.7
CC_Fu_50yr                  0.5        304.7
CC_Fu_50yr                  0.667      982.2
CC_Fu_50yr                  0.75       1120.5
CC_Fu_50yr                  0.833      1045.9
CC_Fu_50yr                  1          787.1
CC_Fu_50yr                  1.167      579
CC_Fu_50yr                  1.5        249.2
CC_Fu_50yr                  1.75       135.3
CC_Fu_50yr                  2          90.1
CC_Fu_50yr                  2.5        17.8
CC_Fu_50yr                  3          2
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CC_Fu_50yr                  4          0
CC_Fu_50yr                  8          0

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CC_Fu_5yr                   0.833      495.8
CC_Fu_5yr                   1          381.9
CC_Fu_5yr                   1.167      279.7
CC_Fu_5yr                   1.5        124.8
CC_Fu_5yr                   1.75       72.1
CC_Fu_5yr                   2          51.3
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CC_Fu_5yr                   3          0
CC_Fu_5yr                   3.5        0
CC_Fu_5yr                   4          0
CC_Fu_5yr                   8          0

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CV_Fu_100yr                 0.75       646.5
CV_Fu_100yr                 1          1240.4
CV_Fu_100yr                 1.167      1421
CV_Fu_100yr                 1.25       1439.7
CV_Fu_100yr                 1.333      1414.2
CV_Fu_100yr                 1.75       1071.6
CV_Fu_100yr                 2          856.3
CV_Fu_100yr                 2.5        557.9
CV_Fu_100yr                 3          365.2
CV_Fu_100yr                 3.5        239.4
CV_Fu_100yr                 4          157
CV_Fu_100yr                 5          67.5
CV_Fu_100yr                 6          29
CV_Fu_100yr                 8          0

CV_Fu_10yr                  0          0
CV_Fu_10yr                  0.417      0.1
CV_Fu_10yr                  0.5        12.1
CV_Fu_10yr                  0.75       216.7
CV_Fu_10yr                  1          472.3
CV_Fu_10yr                  1.167      560.2
CV_Fu_10yr                  1.25       573
CV_Fu_10yr                  1.333      566.3
CV_Fu_10yr                  1.75       432.2
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CV_Fu_10yr	6	11.4
CV_Fu_10yr	8	0
CV_Fu_25yr	0	0
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CV_Fu_25yr	0.5	19.4
CV_Fu_25yr	0.75	347.2
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CV_Fu_25yr	1.167	897.5
CV_Fu_25yr	1.25	918
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CV_Fu_25yr	2.5	352.1
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CV_Fu_2yr	1.167	11.8
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CV_Fu_5yr	4	34.1
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[REPORT]
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
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Units      None

[COORDINATES]
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JUNCT_540        -3000.000        63000.000
JUNCT_541        -1500.000        63000.000
JUNCT_542        -3000.000        51000.000
JUNCT_543        -1500.000        51000.000
JUNCT_702        12000.000        15000.000
JUNCT_703        13500.000        15000.000
JUNCT_705        7500.000         24000.000
JUNCT_706        9000.000         24000.000
JUNCT_708        10500.000        24000.000
JUNCT_709        12000.000        24000.000
JUNCT_710        13500.000        24000.000
JUNCT_712        10500.000        30000.000
JUNCT_713        12000.000        30000.000
JUNCT_714        13500.000        30000.000
JUNCT_716        12000.000        33000.000
JUNCT_717        13500.000        33000.000
JUNCT_719        13500.000        36000.000
JUNCT_721        13500.000        42000.000
JUNCT_722        13500.000        54000.000
JUNCT_750        9750.000         30800.000
STOR_1024        -28500.000       0.000
STOR_1025        -30750.000       800.000
STOR_1026        -28500.000       -1600.000
STOR_1029        -24000.000       0.000
STOR_1041        -13500.000       45000.000
STOR_1042        -9000.000        45000.000
STOR_1043        -16500.000       45000.000
STOR_1044        -11250.000       44200.000
STOR_1045A       -4500.000        45000.000
STOR_1045B       -3375.000        45800.000
STOR_1046        -750.000         44200.000
STOR_1047        -3000.000        38200.104
STOR_1048        -3000.000        39800.000
STOR_1049        -750.000         33800.000
STOR_1050        -3000.000        34500.000
STOR_1051        -1500.000        30000.000
STOR_1053        -1500.000        21000.000
STOR_1054        -1500.000        20200.000
STOR_1055        -1500.000        15000.000
STOR_1056        -3000.000        43400.000
STOR_1060        -2500.000        0.000
STOR_1061        -3000.000        400.000
STOR_1070        11250.000        15400.000
STOR_1071        11250.000        14600.000

[VERTICES]
;;Link           X-Coord          Y-Coord
;;-------------- ---------------- ----------
1020_OVERFLOW    -20745.477       3025.475
1025_OVERFLOW    -29763.247       -249.719
1026_OVERFLOW    -27748.885       -411.168
1043_OVERFLOW    -14669.176       44672.294
200_OVERFLOW     -35646.315       -255.261
221_OVERFLOW     -21746.775       489.689
300_OVERFLOW     -34206.707       -223.505
303_OVERFLOW     -32671.831       -244.676
306_OVERFLOW     -27733.425       -136.509
308_OVERFLOW     -26721.356       -215.068
310_OVERFLOW     -26253.387       -486.493
311_OVERFLOW     -25143.899       -215.068
312_OVERFLOW     -23146.247       -179.345
```

313_OVERFLOW	-22179.366	-233.200
315_OVERFLOW	-20556.580	-251.332
317_OVERFLOW	-19298.234	-215.695
318_OVERFLOW	-17808.458	-203.163
319_OVERFLOW	-16232.327	-230.937
320_OVERFLOW	-23711.495	1326.126
322_OVERFLOW	-21057.926	1303.535
413_OVERFLOW	-2892.383	706.403
454_OVERFLOW	-1880.684	33551.442
460_OVERFLOW	-3740.204	34948.655
469_OVERFLOW	-554.694	43635.505
479_OVERFLOW	-7810.363	44200.356
498_OVERFLOW	-2227.709	63436.872
500_OVERFLOW	-5637.934	-284.100
501_OVERFLOW	-4199.092	-264.656
502_OVERFLOW	-2873.991	-100.438
503_OVERFLOW	-1213.918	-3288.120
504_OVERFLOW	-1890.185	-115.401
505_OVERFLOW	-1209.681	-272.543
506_OVERFLOW	-4048.896	14671.999
507_OVERFLOW	-2541.913	14702.078
508_OVERFLOW	-505.259	14813.376
511_OVERFLOW	-3729.090	21375.669
512_OVERFLOW	-3737.159	20552.625
513_OVERFLOW	-2554.634	20717.495
514_OVERFLOW	-561.146	20830.276
516_OVERFLOW	-2730.754	29750.640
517_OVERFLOW	-506.000	29803.383
518_OVERFLOW	-115.039	34151.705
519_OVERFLOW	-1204.518	34852.667
521_OVERFLOW	-2104.149	38848.754
522_OVERFLOW	-1168.875	38705.731
523_OVERFLOW	-17706.656	44714.481
525_OVERFLOW	-1914.348	44194.769
526_OVERFLOW	-11716.071	44728.544
529_OVERFLOW	-10169.206	44728.544
530_OVERFLOW	-7187.976	44728.544
531_OVERFLOW	-5753.610	44742.606
532_OVERFLOW	-2793.376	44772.871
534_OVERFLOW	-140.456	44616.484
536_OVERFLOW	-1292.166	44800.497
538_OVERFLOW	-1851.737	51803.131
539_OVERFLOW	-1210.720	56730.332
540_OVERFLOW	-2687.428	62751.703
541_OVERFLOW	-1221.181	62745.506
542_OVERFLOW	-2666.862	50709.646
543_OVERFLOW	-1242.955	50729.019
702_OVERFLOW	12470.327	14668.742
703_OVERFLOW	13858.211	14672.253
705_OVERFLOW	7769.602	23755.494
706_OVERFLOW	9259.821	23755.494
708_OVERFLOW	10739.510	23768.828
709_OVERFLOW	12282.089	23762.480
710_OVERFLOW	13780.231	23768.828
712_OVERFLOW	10755.487	29753.458
713_OVERFLOW	12262.236	29753.458
714_OVERFLOW	13768.985	29742.772
716_OVERFLOW	12293.321	32750.135
717_OVERFLOW	13780.231	32776.727
719_OVERFLOW	13753.763	35755.958
721_OVERFLOW	13831.016	41727.493
722_OVERFLOW	13773.883	53782.461
750_OVERFLOW	9763.046	30448.059

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

Town of Erie Outfall Systems Plan (OSP) (West of Coal Creek)
Conceptual Design Plan
RESPEC, January 2014

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date ..... JAN-01-2013 00:00:00
Ending Date ..... JAN-01-2013 12:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:05:00
Routing Time Step ..... 60.00 sec

*************************          Volume         Volume
Flow Routing Continuity       acre-feet       10^6 gal
*************************     ---------      ---------
Dry Weather Inflow .....          0.000          0.000
Wet Weather Inflow .....          0.000          0.000
Groundwater Inflow .....          0.000          0.000
RDII Inflow ............          0.000          0.000
External Inflow ........       2438.772        794.710
External Outflow .......       2437.008        794.136
Internal Outflow .......          0.000          0.000
Storage Losses .........          0.000          0.000
Initial Stored Volume ....        0.000          0.000
Final Stored Volume ......       65.039         21.194
Continuity Error (%) .....       -2.595

*******************************
Highest Flow Instability Indexes
*******************************
Link 1043 (8)
Link 1026 (8)
Link 526 (5)
Link OUTLET_1026 (5)
Link OUTLET_1041 (2)

*************************
Routing Time Step Summary
*************************
Minimum Time Step           :    60.00 sec
Average Time Step           :    60.00 sec
Maximum Time Step           :    60.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.00

******************
Node Depth Summary
******************

                                 Average  Maximum  Maximum  Time of Max
                                   Depth    Depth      HGL   Occurrence
Node                 Type         Feet     Feet     Feet  days hr:min
-------------------------------------------------------------------------
JUNCT_1060           JUNCTION     0.00     0.00  5074.14     0  00:00
JUNCT_201            JUNCTION     0.00     0.00  5248.57     0  00:00
JUNCT_202            JUNCTION     0.00     0.00  5261.57     0  00:00
JUNCT_203            JUNCTION     0.00     0.00  5228.12     0  00:00
JUNCT_204            JUNCTION     0.00     0.00  5228.12     0  00:00
JUNCT_205            JUNCTION     0.00     0.00  5207.35     0  00:00
JUNCT_206            JUNCTION     0.00     0.00  5183.23     0  00:00
JUNCT_207            JUNCTION     0.00     0.00  5183.23     0  00:00
JUNCT_208            JUNCTION     0.14     1.04  5201.93     0  00:50
JUNCT_209            JUNCTION     0.00     0.00  5173.33     0  00:00
JUNCT_210            JUNCTION     0.00     0.00  5163.75     0  00:00
JUNCT_211            JUNCTION     0.00     0.00  5163.75     0  00:00
JUNCT_212            JUNCTION     0.00     0.00  5176.40     0  00:00
JUNCT_213            JUNCTION     0.00     0.00  5150.96     0  00:00
JUNCT_215            JUNCTION     0.00     0.00  5095.38     0  00:00
JUNCT_216            JUNCTION     0.00     0.00  5095.38     0  00:00
JUNCT_217            JUNCTION     0.00     0.00  5095.38     0  00:00
JUNCT_218            JUNCTION     0.00     0.00  5095.38     0  00:00
JUNCT_219            JUNCTION     0.00     0.00  5068.08     0  00:00
JUNCT_220            JUNCTION     0.00     0.00  5068.08     0  00:00
JUNCT_222            JUNCTION     0.00     0.00  5051.98     0  00:00
JUNCT_235            JUNCTION     0.00     0.00  5109.89     0  00:00
JUNCT_236            JUNCTION     0.00     0.00  5084.05     0  00:00
JUNCT_237            JUNCTION     0.00     0.00  5050.46     0  00:00
JUNCT_238            JUNCTION     0.00     0.00  5036.77     0  00:00
JUNCT_240            JUNCTION     0.00     0.00  5025.98     0  00:00
JUNCT_241            JUNCTION     0.00     0.00  5025.98     0  00:00
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JUNCT_243            JUNCTION     0.00     0.00  4997.41     0  00:00
JUNCT_302            JUNCTION     0.15     1.85  5263.41     0  00:35
JUNCT_305            JUNCTION     0.28     2.27  5209.61     0  00:53
JUNCT_321            JUNCTION     0.38     2.75  5086.79     0  00:56
JUNCT_323            JUNCTION     1.69     5.13  5041.89     0  01:25
JUNCT_400            JUNCTION     0.00     0.00  5086.35     0  00:00
JUNCT_401            JUNCTION     0.00     0.00  5085.41     0  00:00
JUNCT_410            JUNCTION     0.00     0.00  5303.69     0  00:00
JUNCT_411            JUNCTION     0.00     0.00  5231.98     0  00:00
JUNCT_412            JUNCTION     0.00     0.00  5231.98     0  00:00
JUNCT_414            JUNCTION     0.00     0.00  5188.81     0  00:00
JUNCT_415            JUNCTION     0.00     0.00  5188.80     0  00:00
JUNCT_416            JUNCTION     0.00     0.00  5170.01     0  00:00
JUNCT_417            JUNCTION     0.00     0.00  5149.83     0  00:00
JUNCT_418            JUNCTION     0.00     0.00  5086.35     0  00:00
JUNCT_419            JUNCTION     0.00     0.00  5149.83     0  00:00
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JUNCT_426            JUNCTION     0.00     0.00  5092.32     0  00:00
JUNCT_427            JUNCTION     0.00     0.00  5092.32     0  00:00
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JUNCT_429            JUNCTION     0.00     0.00  5072.78     0  00:00
JUNCT_430            JUNCTION     0.00     0.00  5165.51     0  00:00
JUNCT_431            JUNCTION     0.00     0.00  5114.70     0  00:00
JUNCT_432            JUNCTION     0.00     0.00  5099.93     0  00:00
JUNCT_433            JUNCTION     0.00     0.00  5068.23     0  00:00
JUNCT_435            JUNCTION     0.00     0.00  5193.70     0  00:00
JUNCT_436            JUNCTION     0.00     0.00  5104.39     0  00:00
JUNCT_437            JUNCTION     0.00     0.00  5068.23     0  00:00
JUNCT_440            JUNCTION     0.00     0.00  5195.98     0  00:00
JUNCT_441            JUNCTION     0.00     0.00  5194.83     0  00:00
JUNCT_442            JUNCTION     0.00     0.00  5125.99     0  00:00
JUNCT_443            JUNCTION     0.00     0.00  5125.99     0  00:00
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JUNCT_445            JUNCTION     0.00     0.00  5065.71     0  00:00
JUNCT_446            JUNCTION     0.00     0.00  5099.75     0  00:00
JUNCT_447            JUNCTION     0.00     0.00  5064.46     0  00:00
JUNCT_448            JUNCTION     0.00     0.00  5053.08     0  00:00
JUNCT_449            JUNCTION     0.00     0.00  5041.48     0  00:00
JUNCT_450            JUNCTION     0.00     0.00  5141.62     0  00:00
JUNCT_451            JUNCTION     0.00     0.00  5075.05     0  00:00
JUNCT_452            JUNCTION     0.00     0.00  5048.39     0  00:00
JUNCT_453            JUNCTION     0.00     0.00  5040.72     0  00:00
JUNCT_455            JUNCTION     0.00     0.00  5071.51     0  00:00
JUNCT_456            JUNCTION     0.00     0.00  5086.18     0  00:00
JUNCT_457            JUNCTION     0.00     0.00  5071.51     0  00:00
JUNCT_458            JUNCTION     0.00     0.00  5048.93     0  00:00
JUNCT_459            JUNCTION     0.00     0.00  5032.25     0  00:00
JUNCT_461            JUNCTION     0.00     0.00  5065.80     0  00:00
JUNCT_462            JUNCTION     0.00     0.00  5065.80     0  00:00
JUNCT_463            JUNCTION     0.00     0.00  5048.93     0  00:00
JUNCT_464            JUNCTION     0.00     0.00  5024.29     0  00:00
JUNCT_465            JUNCTION     0.00     0.00  5019.90     0  00:00
JUNCT_466            JUNCTION     0.00     0.00  5015.84     0  00:00
JUNCT_467            JUNCTION     0.00     0.00  5015.84     0  00:00
JUNCT_468            JUNCTION     0.00     0.00  5046.55     0  00:00
JUNCT_470            JUNCTION     0.00     0.00  5179.16     0  00:00
JUNCT_471            JUNCTION     0.00     0.00  5148.53     0  00:00
JUNCT_472            JUNCTION     0.00     0.00  5149.88     0  00:00
JUNCT_473            JUNCTION     0.00     0.00  5138.79     0  00:00
JUNCT_474            JUNCTION     0.00     0.00  5138.80     0  00:00
JUNCT_475            JUNCTION     0.00     0.00  5121.74     0  00:00
JUNCT_476            JUNCTION     0.00     0.00  5079.91     0  00:00
JUNCT_477            JUNCTION     0.00     0.00  5080.01     0  00:00
JUNCT_478            JUNCTION     0.00     0.00  5067.61     0  00:00
JUNCT_480            JUNCTION     0.00     0.00  5052.69     0  00:00
JUNCT_481            JUNCTION     0.00     0.00  5046.04     0  00:00
JUNCT_482            JUNCTION     0.00     0.00  5040.48     0  00:00
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JUNCT_487            JUNCTION     0.00     0.00  5012.41     0  00:00
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JUNCT_490	JUNCTION	0.00	0.00	5007.81	0	00:00
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JUNCT_493	JUNCTION	0.27	2.05	4988.10	0	00:50
JUNCT_494	JUNCTION	0.00	0.00	4983.76	0	00:00
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JUNCT_497	JUNCTION	0.00	0.00	4959.44	0	00:00
JUNCT_499	JUNCTION	0.00	0.00	4987.74	0	00:00
JUNCT_509	JUNCTION	0.19	1.46	5185.15	0	00:50
JUNCT_528	JUNCTION	0.14	1.21	5151.08	0	00:45
JUNCT_600	JUNCTION	0.00	0.00	5004.38	0	00:00
JUNCT_601	JUNCTION	0.00	0.00	5021.13	0	00:00
JUNCT_602	JUNCTION	0.00	0.00	5004.93	0	00:00
JUNCT_603	JUNCTION	0.00	0.00	4994.45	0	00:00
JUNCT_604	JUNCTION	0.00	0.00	5071.82	0	00:00
JUNCT_605	JUNCTION	0.00	0.00	4987.85	0	00:00
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JUNCT_607	JUNCTION	0.00	0.00	5015.84	0	00:00
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JUNCT_610	JUNCTION	0.00	0.00	4986.25	0	00:00
JUNCT_611	JUNCTION	0.00	0.00	4998.95	0	00:00
JUNCT_612	JUNCTION	0.00	0.00	4981.85	0	00:00
JUNCT_613	JUNCTION	0.00	0.00	5124.32	0	00:00
JUNCT_614	JUNCTION	0.00	0.00	5015.84	0	00:00
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JUNCT_617	JUNCTION	0.00	0.00	5052.49	0	00:00
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JUNCT_623	JUNCTION	0.00	0.00	4975.81	0	00:00
JUNCT_624	JUNCTION	0.00	0.00	4972.48	0	00:00
JUNCT_627	JUNCTION	0.00	0.00	5055.94	0	00:00
JUNCT_628	JUNCTION	0.25	1.04	5076.82	0	01:10
JUNCT_629	JUNCTION	0.00	0.00	5026.64	0	00:00
JUNCT_630	JUNCTION	0.00	0.00	5026.64	0	00:00
JUNCT_631	JUNCTION	0.00	0.00	5026.64	0	00:00
JUNCT_633	JUNCTION	0.00	0.00	5002.18	0	00:00
JUNCT_634	JUNCTION	0.00	0.00	4973.82	0	00:00
JUNCT_638	JUNCTION	0.00	0.00	5020.62	0	00:00
JUNCT_639	JUNCTION	0.00	0.00	5003.94	0	00:00
JUNCT_640	JUNCTION	0.00	0.00	4979.49	0	00:00
JUNCT_641	JUNCTION	0.00	0.00	4968.61	0	00:00
JUNCT_645	JUNCTION	0.00	0.00	4981.95	0	00:00
JUNCT_646	JUNCTION	0.00	0.00	4976.29	0	00:00
JUNCT_647	JUNCTION	0.00	0.00	4961.01	0	00:00
JUNCT_648	JUNCTION	0.00	0.00	4965.05	0	00:00
JUNCT_650	JUNCTION	0.00	0.00	5014.28	0	00:00
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JUNCT_652	JUNCTION	0.00	0.00	4959.41	0	00:00
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JUNCT_656	JUNCTION	0.00	0.00	4950.07	0	00:00
JUNCT_657	JUNCTION	0.00	0.00	4949.33	0	00:00
JUNCT_658	JUNCTION	0.00	0.00	5058.46	0	00:00
JUNCT_659	JUNCTION	0.00	0.00	4959.50	0	00:00
JUNCT_660	JUNCTION	0.00	0.00	4948.38	0	00:00
JUNCT_661	JUNCTION	0.00	0.00	4956.99	0	00:00
JUNCT_700	JUNCTION	0.27	1.39	5022.51	0	01:05
JUNCT_701	JUNCTION	0.09	0.96	5072.77	0	00:40
JUNCT_704	JUNCTION	0.21	1.47	5000.41	0	00:50
JUNCT_715	JUNCTION	0.22	1.91	5022.52	0	00:45
JUNCT_718	JUNCTION	0.31	2.55	4984.49	0	00:45
JUNCT_720	JUNCTION	0.23	1.45	5015.72	0	00:55
OUTFALL_900	OUTFALL	0.13	1.00	5087.34	0	00:57
OUTFALL_901	OUTFALL	0.00	0.00	5085.40	0	00:00
OUTFALL_902	OUTFALL	0.00	0.00	5079.04	0	00:00
OUTFALL_903	OUTFALL	0.93	3.00	5080.76	0	00:49
OUTFALL_904	OUTFALL	0.00	0.00	5072.77	0	00:00
OUTFALL_905	OUTFALL	0.45	2.60	5070.82	0	00:59
OUTFALL_906	OUTFALL	0.00	0.00	5068.22	0	00:00
OUTFALL_907	OUTFALL	0.64	3.00	5068.70	0	01:05
OUTFALL_908	OUTFALL	0.00	0.00	5064.45	0	00:00
OUTFALL_909	OUTFALL	0.00	0.00	5053.07	0	00:00
OUTFALL_910	OUTFALL	0.57	2.65	5051.03	0	01:02
OUTFALL_911	OUTFALL	0.00	0.00	5040.71	0	00:00
OUTFALL_912	OUTFALL	0.00	0.00	5032.24	0	00:00
OUTFALL_913	OUTFALL	0.62	3.00	5027.28	0	00:39
OUTFALL_914	OUTFALL	0.00	0.00	5019.89	0	00:00
OUTFALL_915	OUTFALL	0.80	1.55	5017.38	0	02:05
OUTFALL_917	OUTFALL	0.65	4.50	5005.07	0	00:31
OUTFALL_919	OUTFALL	0.13	1.11	4988.84	0	00:51
OUTFALL_920	OUTFALL	0.00	0.00	4982.64	0	00:00
OUTFALL_921	OUTFALL	0.70	3.00	4986.75	0	00:42
OUTFALL_922	OUTFALL	0.00	0.00	4982.78	0	00:00
OUTFALL_923	OUTFALL	0.00	0.00	4956.05	0	00:00
OUTFALL_924	OUTFALL	0.00	0.00	4959.43	0	00:00
OUTFALL_925	OUTFALL	0.99	1.51	5042.98	0	01:51
OUTFALL_940	OUTFALL	2.30	6.04	5003.44	0	01:42
OUTFALL_950	OUTFALL	0.00	0.00	5004.37	0	00:00
OUTFALL_951	OUTFALL	0.28	1.37	5006.29	0	01:13
OUTFALL_952	OUTFALL	0.00	0.00	4994.44	0	00:00
OUTFALL_953	OUTFALL	0.11	0.93	4988.77	0	00:54
OUTFALL_954	OUTFALL	0.00	0.00	4987.83	0	00:00
OUTFALL_955	OUTFALL	1.07	3.00	4988.58	0	00:46
OUTFALL_956	OUTFALL	0.00	0.00	4986.24	0	00:00
OUTFALL_957	OUTFALL	0.21	1.47	4983.31	0	00:52
OUTFALL_958	OUTFALL	0.82	3.00	4978.80	0	00:53
OUTFALL_959	OUTFALL	0.00	0.00	4972.47	0	00:00
OUTFALL_960	OUTFALL	1.29	3.00	4976.81	0	00:45
OUTFALL_961	OUTFALL	0.53	3.00	4971.60	0	00:50
OUTFALL_962	OUTFALL	0.39	2.91	4963.91	0	00:58
OUTFALL_963	OUTFALL	0.00	0.00	4965.04	0	00:00
OUTFALL_964	OUTFALL	0.50	3.00	4962.40	0	00:50
OUTFALL_965	OUTFALL	0.00	0.00	4955.78	0	00:00
OUTFALL_966	OUTFALL	0.00	0.00	4950.06	0	00:00
OUTFALL_967	OUTFALL	0.00	0.00	4949.32	0	00:00
OUTFALL_968	OUTFALL	0.22	1.05	4949.42	0	01:13
OUTFALL_969	OUTFALL	0.00	0.00	4956.98	0	00:00
OUTFALL_999	OUTFALL	0.00	0.00	5058.45	0	00:00
JUNCT_1020	DIVIDER	1.25	4.86	5072.91	0	01:15
JUNCT_1025	DIVIDER	0.49	3.00	5210.32	0	00:37
JUNCT_1026	DIVIDER	0.34	2.10	5185.31	0	01:12
JUNCT_1043	DIVIDER	0.26	1.04	5149.56	0	01:17
JUNCT_1045	DIVIDER	0.00	0.00	5046.02	0	00:00
JUNCT_200	DIVIDER	0.13	1.80	5263.89	0	00:35
JUNCT_221	DIVIDER	0.34	3.00	5063.50	0	00:30
JUNCT_300	DIVIDER	0.30	2.00	5250.56	0	00:39
JUNCT_303	DIVIDER	0.33	2.27	5230.38	0	00:49
JUNCT_306	DIVIDER	1.23	3.00	5176.31	0	01:05
JUNCT_308	DIVIDER	1.28	3.00	5166.74	0	01:09
JUNCT_310	DIVIDER	0.19	2.38	5178.77	0	00:40
JUNCT_311	DIVIDER	1.16	3.00	5153.95	0	00:37
JUNCT_312	DIVIDER	1.30	3.00	5098.36	0	00:55
JUNCT_313	DIVIDER	1.38	3.00	5071.07	0	00:55
JUNCT_315	DIVIDER	1.54	3.32	5055.29	0	01:32
JUNCT_317	DIVIDER	2.27	5.51	5042.26	0	01:29
JUNCT_318	DIVIDER	2.32	5.78	5031.75	0	01:31
JUNCT_319	DIVIDER	2.30	6.07	5019.55	0	01:35
JUNCT_320	DIVIDER	0.14	0.99	5110.87	0	00:50
JUNCT_322	DIVIDER	1.67	5.15	5055.60	0	01:21
JUNCT_413	DIVIDER	0.19	1.07	5202.98	0	00:55
JUNCT_454	DIVIDER	0.24	3.00	5152.68	0	00:31
JUNCT_460	DIVIDER	0.15	1.98	5124.32	0	00:35
JUNCT_469	DIVIDER	0.21	2.61	5066.96	0	00:35
JUNCT_479	DIVIDER	0.18	2.10	5098.72	0	00:35
JUNCT_498	DIVIDER	0.21	1.90	5027.22	0	00:45
JUNCT_500	DIVIDER	0.35	3.00	5306.68	0	00:34
JUNCT_501	DIVIDER	0.41	3.00	5234.97	0	00:29
JUNCT_502	DIVIDER	0.70	3.00	5191.79	0	00:30
JUNCT_503	DIVIDER	0.11	1.14	5150.96	0	00:40
JUNCT_504	DIVIDER	0.90	3.00	5172.99	0	00:47
JUNCT_505	DIVIDER	0.99	3.00	5095.31	0	00:48
JUNCT_506	DIVIDER	0.29	2.15	5167.65	0	00:50
JUNCT_507	DIVIDER	0.47	3.00	5117.69	0	00:49
JUNCT_508	DIVIDER	0.45	2.60	5102.51	0	00:58
JUNCT_511	DIVIDER	0.22	1.41	5197.38	0	00:50
JUNCT_512	DIVIDER	0.09	0.50	5195.32	0	00:38
JUNCT_513	DIVIDER	0.51	2.85	5128.83	0	01:02
JUNCT_514	DIVIDER	0.64	3.00	5102.73	0	01:05
JUNCT_516	DIVIDER	0.14	1.50	5143.11	0	00:40
JUNCT_517	DIVIDER	0.57	2.68	5077.71	0	00:55
JUNCT_518	DIVIDER	0.79	1.18	5087.34	0	01:44
JUNCT_519	DIVIDER	1.00	1.51	5073.00	0	01:45
JUNCT_521	DIVIDER	0.54	2.20	5067.98	0	00:47
JUNCT_522	DIVIDER	0.67	3.00	5051.92	0	00:33
JUNCT_523	DIVIDER	0.08	0.66	5179.81	0	00:40
JUNCT_525	DIVIDER	0.07	0.50	5047.03	0	00:39
JUNCT_526	DIVIDER	0.72	1.88	5140.66	0	02:00
JUNCT_529	DIVIDER	0.78	2.03	5123.76	0	01:40
JUNCT_530	DIVIDER	1.13	3.00	5083.00	0	00:40
JUNCT_531	DIVIDER	1.14	3.00	5070.60	0	00:38
JUNCT_532	DIVIDER	1.85	3.00	5049.00	0	00:58
JUNCT_534	DIVIDER	0.16	0.50	5053.17	0	00:46
JUNCT_536	DIVIDER	1.87	3.00	5043.47	0	01:06
JUNCT_538	DIVIDER	0.09	1.17	5037.02	0	00:35
JUNCT_539	DIVIDER	0.12	1.16	5013.56	0	00:40
JUNCT_540	DIVIDER	0.39	2.43	5010.23	0	00:55
JUNCT_541	DIVIDER	0.70	3.00	4994.21	0	00:38
JUNCT_542	DIVIDER	0.43	2.50	5022.53	0	00:22
JUNCT_543	DIVIDER	0.67	4.50	5022.41	0	00:28
JUNCT_702	DIVIDER	0.76	3.00	5018.83	0	00:42
JUNCT_703	DIVIDER	1.03	3.00	4991.61	0	00:38
JUNCT_705	DIVIDER	0.09	0.58	5124.89	0	00:45
JUNCT_706	DIVIDER	0.17	1.26	5053.74	0	00:50

JUNCT_708	DIVIDER	0.51	3.00	5016.87	0	00:34
JUNCT_709	DIVIDER	0.82	3.00	4999.11	0	00:42
JUNCT_710	DIVIDER	0.87	3.00	4989.04	0	00:49
JUNCT_712	DIVIDER	1.22	3.00	5058.93	0	00:40
JUNCT_713	DIVIDER	1.22	3.00	5029.63	0	00:38
JUNCT_714	DIVIDER	1.28	3.00	5005.17	0	00:40
JUNCT_716	DIVIDER	0.36	2.64	5006.57	0	00:52
JUNCT_717	DIVIDER	0.51	3.00	4982.48	0	00:45
JUNCT_719	DIVIDER	0.36	2.97	4979.25	0	00:48
JUNCT_721	DIVIDER	0.47	3.00	4970.95	0	00:40
JUNCT_722	DIVIDER	0.21	1.07	4960.56	0	01:00
JUNCT_750	DIVIDER	1.19	3.00	5077.13	0	00:37
STOR_1024	STORAGE	0.50	1.99	5175.31	0	01:36
STOR_1025	STORAGE	5.14	7.68	5215.01	0	01:19
STOR_1026	STORAGE	0.82	5.12	5188.34	0	01:12
STOR_1029	STORAGE	5.97	7.53	5102.90	0	01:28
STOR_1041	STORAGE	2.46	6.54	5145.33	0	02:03
STOR_1042	STORAGE	3.77	7.42	5087.32	0	00:59
STOR_1043	STORAGE	1.71	6.32	5154.84	0	01:17
STOR_1044	STORAGE	3.13	5.79	5127.52	0	01:13
STOR_1045A	STORAGE	3.59	9.26	5055.29	0	01:21
STOR_1045B	STORAGE	4.08	7.08	5053.09	0	02:32
STOR_1046	STORAGE	5.72	9.61	5062.29	0	01:04
STOR_1047	STORAGE	5.48	9.85	5075.64	0	00:58
STOR_1048	STORAGE	4.15	9.96	5075.75	0	00:44
STOR_1049	STORAGE	5.93	9.29	5095.46	0	01:44
STOR_1050	STORAGE	8.47	11.26	5082.76	0	01:45
STOR_1051	STORAGE	5.82	9.96	5085.02	0	00:55
STOR_1053	STORAGE	5.13	9.97	5109.71	0	01:16
STOR_1054	STORAGE	4.57	9.92	5114.30	0	01:26
STOR_1055	STORAGE	5.20	7.00	5106.92	0	00:58
STOR_1056	STORAGE	2.08	3.99	5050.53	0	00:59
STOR_1060	STORAGE	0.65	4.90	5174.90	0	01:25
STOR_1061	STORAGE	1.77	6.11	5194.91	0	01:21
STOR_1070	STORAGE	2.47	4.88	5020.72	0	01:46
STOR_1071	STORAGE	3.16	4.98	5032.93	0	01:28

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
JUNCT_1060	JUNCTION	1439.70	1439.70	0	01:15	69.182	69.182
JUNCT_201	JUNCTION	84.30	84.30	0	00:50	2.656	2.656
JUNCT_202	JUNCTION	145.39	145.39	0	00:35	2.441	2.441
JUNCT_203	JUNCTION	147.47	147.47	0	00:40	2.787	2.787
JUNCT_204	JUNCTION	260.28	260.28	0	00:35	4.348	4.348
JUNCT_205	JUNCTION	208.01	208.01	0	00:40	3.992	3.992
JUNCT_206	JUNCTION	122.22	122.22	0	00:50	3.639	3.639
JUNCT_207	JUNCTION	196.76	196.76	0	00:40	4.162	4.162
JUNCT_208	JUNCTION	39.96	39.96	0	00:50	1.231	1.231
JUNCT_209	JUNCTION	183.83	183.83	0	00:50	5.172	5.172
JUNCT_210	JUNCTION	62.09	62.09	0	00:40	1.352	1.352
JUNCT_211	JUNCTION	59.68	59.68	0	00:50	1.885	1.885
JUNCT_212	JUNCTION	194.44	194.44	0	00:40	3.508	3.508
JUNCT_213	JUNCTION	172.85	172.85	0	00:40	3.327	3.327
JUNCT_215	JUNCTION	124.05	124.05	0	00:50	4.057	4.057
JUNCT_216	JUNCTION	56.69	56.69	0	00:55	2.039	2.039
JUNCT_217	JUNCTION	259.98	259.98	0	00:45	6.373	6.373
JUNCT_218	JUNCTION	196.06	196.06	0	00:40	4.365	4.365
JUNCT_219	JUNCTION	99.79	99.79	0	00:50	3.254	3.254
JUNCT_220	JUNCTION	78.54	78.54	0	00:45	2.345	2.345
JUNCT_222	JUNCTION	180.91	180.91	0	00:45	4.521	4.521
JUNCT_235	JUNCTION	158.43	158.43	0	00:50	4.986	4.986
JUNCT_236	JUNCTION	145.15	145.15	0	00:50	4.071	4.071
JUNCT_237	JUNCTION	59.17	59.17	0	01:00	2.484	2.484
JUNCT_238	JUNCTION	98.64	98.64	0	00:55	3.810	3.810
JUNCT_240	JUNCTION	46.12	46.12	0	01:00	2.032	2.032
JUNCT_241	JUNCTION	211.35	211.35	0	00:45	5.778	5.778
JUNCT_242	JUNCTION	104.89	104.89	0	00:45	2.964	2.964
JUNCT_243	JUNCTION	124.48	124.48	0	00:55	4.587	4.587
JUNCT_302	JUNCTION	0.00	145.39	0	00:35	0.000	2.441
JUNCT_305	JUNCTION	0.00	740.34	0	00:53	0.000	17.864
JUNCT_321	JUNCTION	0.00	290.28	0	00:56	0.000	9.126
JUNCT_323	JUNCTION	0.00	4079.08	0	01:25	0.000	168.234
JUNCT_400	JUNCTION	1344.20	1344.20	0	00:45	26.495	26.495
JUNCT_401	JUNCTION	31.32	31.32	0	00:55	1.195	1.195
JUNCT_410	JUNCTION	514.68	514.68	0	00:40	9.884	9.884
JUNCT_411	JUNCTION	408.04	408.04	0	00:35	5.738	5.738
JUNCT_412	JUNCTION	377.40	377.40	0	00:35	5.539	5.539
JUNCT_414	JUNCTION	222.88	222.88	0	00:40	4.553	4.553
JUNCT_415	JUNCTION	172.21	172.21	0	00:40	4.006	4.006
JUNCT_416	JUNCTION	97.16	97.16	0	00:50	3.081	3.081
JUNCT_417	JUNCTION	119.80	119.80	0	00:40	2.563	2.563
JUNCT_418	JUNCTION	85.82	85.82	0	00:50	2.969	2.969
JUNCT_419	JUNCTION	85.68	85.68	0	00:35	1.258	1.258
JUNCT_423	JUNCTION	19.83	19.83	0	00:50	0.698	0.698
JUNCT_424	JUNCTION	85.75	85.75	0	00:50	2.653	2.653
JUNCT_425	JUNCTION	127.16	127.16	0	01:00	5.259	5.259
JUNCT_426	JUNCTION	191.50	191.50	0	00:45	4.482	4.482
JUNCT_427	JUNCTION	54.19	54.19	0	00:55	2.237	2.237
JUNCT_428	JUNCTION	12.93	12.93	0	00:35	0.247	0.247
JUNCT_429	JUNCTION	114.64	114.64	0	00:35	1.881	1.881
JUNCT_430	JUNCTION	157.52	157.52	0	00:50	4.838	4.838
JUNCT_431	JUNCTION	131.00	131.00	0	00:55	4.344	4.344
JUNCT_432	JUNCTION	170.91	170.91	0	00:40	3.450	3.450
JUNCT_433	JUNCTION	91.75	91.75	0	00:35	1.256	1.256
JUNCT_435	JUNCTION	74.41	74.41	0	00:50	2.283	2.283
JUNCT_436	JUNCTION	128.61	128.61	0	01:00	5.577	5.577
JUNCT_437	JUNCTION	161.69	161.69	0	00:30	1.924	1.924
JUNCT_440	JUNCTION	119.83	119.83	0	00:50	4.245	4.245
JUNCT_441	JUNCTION	47.64	47.64	0	00:55	1.702	1.702
JUNCT_442	JUNCTION	110.05	110.05	0	00:55	4.090	4.090
JUNCT_443	JUNCTION	16.65	16.65	0	01:05	0.855	0.855
JUNCT_444	JUNCTION	154.57	154.57	0	00:40	3.237	3.237
JUNCT_445	JUNCTION	71.68	71.68	0	00:30	0.973	0.973
JUNCT_446	JUNCTION	260.80	260.80	0	00:40	6.033	6.033
JUNCT_447	JUNCTION	77.26	77.26	0	00:35	1.090	1.090
JUNCT_448	JUNCTION	314.18	314.18	0	00:35	4.025	4.025
JUNCT_449	JUNCTION	341.71	341.71	0	00:40	5.828	5.828
JUNCT_450	JUNCTION	110.66	110.66	0	00:40	2.243	2.243
JUNCT_451	JUNCTION	562.92	562.92	0	00:35	7.023	7.023
JUNCT_452	JUNCTION	270.53	270.53	0	00:40	4.564	4.564
JUNCT_453	JUNCTION	112.26	112.26	0	00:40	2.523	2.523
JUNCT_455	JUNCTION	153.49	153.49	0	00:40	3.509	3.509
JUNCT_456	JUNCTION	302.05	302.05	0	00:40	4.990	4.990
JUNCT_457	JUNCTION	147.14	147.14	0	00:35	2.730	2.730
JUNCT_458	JUNCTION	224.04	224.04	0	00:35	3.743	3.743
JUNCT_459	JUNCTION	183.34	183.34	0	00:40	4.363	4.363
JUNCT_461	JUNCTION	142.78	142.78	0	00:35	1.926	1.926
JUNCT_462	JUNCTION	248.53	248.53	0	00:35	3.328	3.328
JUNCT_463	JUNCTION	150.96	150.96	0	00:35	2.375	2.375
JUNCT_464	JUNCTION	137.58	137.58	0	00:40	3.112	3.112
JUNCT_465	JUNCTION	186.18	186.18	0	00:35	2.800	2.800
JUNCT_466	JUNCTION	102.29	102.29	0	00:50	3.139	3.139
JUNCT_467	JUNCTION	202.77	202.77	0	00:40	3.923	3.923
JUNCT_468	JUNCTION	77.23	77.23	0	00:35	1.199	1.199
JUNCT_470	JUNCTION	93.11	93.11	0	00:40	2.108	2.108
JUNCT_471	JUNCTION	203.61	203.61	0	00:40	4.008	4.008
JUNCT_472	JUNCTION	55.27	55.27	0	00:45	1.550	1.550
JUNCT_473	JUNCTION	32.03	32.03	0	00:40	0.698	0.698
JUNCT_474	JUNCTION	73.40	73.40	0	00:40	1.821	1.821
JUNCT_475	JUNCTION	366.08	366.08	0	00:35	5.139	5.139
JUNCT_476	JUNCTION	290.91	290.91	0	00:40	6.246	6.246
JUNCT_477	JUNCTION	117.98	117.98	0	00:35	1.866	1.866
JUNCT_478	JUNCTION	160.14	160.14	0	00:45	4.260	4.260
JUNCT_480	JUNCTION	155.25	155.25	0	00:35	2.097	2.097
JUNCT_481	JUNCTION	149.88	149.88	0	00:40	3.324	3.324
JUNCT_482	JUNCTION	126.64	126.64	0	00:35	1.860	1.860
JUNCT_483	JUNCTION	125.69	125.69	0	00:35	1.680	1.680
JUNCT_484	JUNCTION	275.58	275.58	0	00:35	4.110	4.110
JUNCT_485	JUNCTION	300.03	300.03	0	00:40	6.476	6.476
JUNCT_486	JUNCTION	295.05	295.05	0	00:40	5.141	5.141
JUNCT_487	JUNCTION	184.01	184.01	0	00:40	4.137	4.137
JUNCT_488	JUNCTION	201.44	201.44	0	00:35	3.346	3.346
JUNCT_489	JUNCTION	68.97	68.97	0	00:45	1.748	1.748
JUNCT_490	JUNCTION	116.37	116.37	0	00:55	4.250	4.250
JUNCT_491	JUNCTION	65.90	65.90	0	01:10	3.507	3.507
JUNCT_492	JUNCTION	233.22	233.22	0	00:45	5.862	5.862
JUNCT_493	JUNCTION	90.07	90.07	0	00:50	2.766	2.766
JUNCT_494	JUNCTION	11.69	11.69	0	00:55	0.496	0.496
JUNCT_495	JUNCTION	28.22	28.22	0	01:05	1.335	1.335
JUNCT_496	JUNCTION	33.81	33.81	0	01:15	2.180	2.180
JUNCT_497	JUNCTION	43.55	43.55	0	01:15	2.719	2.719
JUNCT_499	JUNCTION	104.49	104.49	0	00:40	2.151	2.151
JUNCT_509	JUNCTION	0.00	74.41	0	00:50	0.000	2.283
JUNCT_528	JUNCTION	0.00	55.27	0	00:45	0.000	1.550
JUNCT_600	JUNCTION	148.93	148.93	0	00:45	4.085	4.085
JUNCT_601	JUNCTION	48.08	48.08	0	01:05	2.120	2.120
JUNCT_602	JUNCTION	66.59	66.59	0	00:55	2.356	2.356
JUNCT_603	JUNCTION	190.90	190.90	0	00:45	4.698	4.698
JUNCT_604	JUNCTION	46.38	46.38	0	00:40	1.096	1.096
JUNCT_605	JUNCTION	154.38	154.38	0	00:50	5.112	5.112
JUNCT_606	JUNCTION	36.05	36.05	0	01:15	2.070	2.070
JUNCT_607	JUNCTION	43.57	43.57	0	00:45	1.170	1.170
JUNCT_608	JUNCTION	156.35	156.35	0	00:55	5.860	5.860
JUNCT_609	JUNCTION	71.15	71.15	0	01:05	3.412	3.412
JUNCT_610	JUNCTION	135.79	135.79	0	00:50	4.190	4.190
JUNCT_611	JUNCTION	89.87	89.87	0	00:50	2.994	2.994
JUNCT_612	JUNCTION	40.04	40.04	0	00:50	1.300	1.300
JUNCT_613	JUNCTION	118.82	118.82	0	00:45	3.273	3.273
JUNCT_614	JUNCTION	195.33	195.33	0	00:50	5.892	5.892
JUNCT_615	JUNCTION	141.54	141.54	0	00:50	4.431	4.431
JUNCT_616	JUNCTION	97.61	97.61	0	00:50	2.989	2.989

JUNCT_617	JUNCTION	241.63	241.63	0	00:45	5.861	5.861
JUNCT_618	JUNCTION	126.73	126.73	0	00:50	4.441	4.441
JUNCT_619	JUNCTION	59.15	59.15	0	00:40	1.319	1.319
JUNCT_620	JUNCTION	73.35	73.35	0	01:05	3.368	3.368
JUNCT_621	JUNCTION	52.29	52.29	0	01:10	2.823	2.823
JUNCT_622	JUNCTION	103.33	103.33	0	00:50	3.519	3.519
JUNCT_623	JUNCTION	54.29	54.29	0	00:55	2.016	2.016
JUNCT_624	JUNCTION	39.50	39.50	0	01:15	2.392	2.392
JUNCT_627	JUNCTION	193.29	193.29	0	00:45	4.834	4.834
JUNCT_628	JUNCTION	24.14	24.14	0	01:10	1.330	1.330
JUNCT_629	JUNCTION	88.82	88.82	0	01:00	3.654	3.654
JUNCT_630	JUNCTION	138.73	138.73	0	01:00	5.883	5.883
JUNCT_631	JUNCTION	64.23	64.23	0	01:00	2.541	2.541
JUNCT_633	JUNCTION	113.84	113.84	0	00:50	3.350	3.350
JUNCT_634	JUNCTION	55.28	55.28	0	00:55	2.059	2.059
JUNCT_638	JUNCTION	84.09	84.09	0	00:45	2.269	2.269
JUNCT_639	JUNCTION	151.00	151.00	0	00:45	4.237	4.237
JUNCT_640	JUNCTION	112.90	112.90	0	00:50	3.789	3.789
JUNCT_641	JUNCTION	32.24	32.24	0	01:00	1.371	1.371
JUNCT_645	JUNCTION	164.01	164.01	0	00:45	4.560	4.560
JUNCT_646	JUNCTION	68.76	68.76	0	00:45	1.852	1.852
JUNCT_647	JUNCTION	122.64	122.64	0	00:55	4.765	4.765
JUNCT_648	JUNCTION	87.27	87.27	0	01:00	3.607	3.607
JUNCT_650	JUNCTION	94.03	94.03	0	00:55	3.418	3.418
JUNCT_651	JUNCTION	156.50	156.50	0	00:45	3.853	3.853
JUNCT_652	JUNCTION	49.77	49.77	0	01:05	2.352	2.352
JUNCT_655	JUNCTION	118.31	118.31	0	01:05	5.452	5.452
JUNCT_656	JUNCTION	58.75	58.75	0	01:05	2.751	2.751
JUNCT_657	JUNCTION	15.26	15.26	0	01:05	0.748	0.748
JUNCT_658	JUNCTION	78.22	78.22	0	01:00	3.299	3.299
JUNCT_659	JUNCTION	140.96	140.96	0	01:00	5.965	5.965
JUNCT_660	JUNCTION	36.60	36.60	0	01:10	2.158	2.158
JUNCT_661	JUNCTION	24.50	24.50	0	01:25	1.958	1.958
JUNCT_700	JUNCTION	0.00	48.08	0	01:05	0.000	2.120
JUNCT_701	JUNCTION	0.00	46.38	0	00:40	0.000	1.096
JUNCT_704	JUNCTION	0.00	89.87	0	00:50	0.000	2.994
JUNCT_715	JUNCTION	0.00	84.09	0	00:45	0.000	2.269
JUNCT_718	JUNCTION	0.00	164.01	0	00:45	0.000	4.560
JUNCT_720	JUNCTION	0.00	94.03	0	00:55	0.000	3.418
OUTFALL_900	OUTFALL	0.00	1537.71	0	00:45	0.000	33.607
OUTFALL_901	OUTFALL	0.00	31.32	0	00:55	0.000	1.195
OUTFALL_902	OUTFALL	0.00	19.83	0	00:50	0.000	0.698
OUTFALL_903	OUTFALL	0.00	1070.60	0	01:34	0.000	52.074
OUTFALL_904	OUTFALL	0.00	114.64	0	00:35	0.000	1.881
OUTFALL_905	OUTFALL	0.00	398.55	0	00:59	0.000	13.539
OUTFALL_906	OUTFALL	0.00	161.69	0	00:30	0.000	1.924
OUTFALL_907	OUTFALL	0.00	644.15	0	01:22	0.000	27.461
OUTFALL_908	OUTFALL	0.00	77.26	0	00:35	0.000	1.090
OUTFALL_909	OUTFALL	0.00	314.18	0	00:35	0.000	4.025
OUTFALL_910	OUTFALL	0.00	367.71	0	00:57	0.000	12.240
OUTFALL_911	OUTFALL	0.00	112.26	0	00:40	0.000	2.523
OUTFALL_912	OUTFALL	0.00	183.34	0	00:40	0.000	4.363
OUTFALL_913	OUTFALL	0.00	500.95	0	00:57	0.000	14.287
OUTFALL_914	OUTFALL	0.00	186.18	0	00:35	0.000	2.800
OUTFALL_915	OUTFALL	0.00	491.42	0	01:09	0.000	44.988
OUTFALL_917	OUTFALL	0.00	740.63	0	00:51	0.000	18.035
OUTFALL_919	OUTFALL	0.00	431.05	0	00:44	0.000	9.735
OUTFALL_920	OUTFALL	0.00	68.97	0	00:45	0.000	1.748
OUTFALL_921	OUTFALL	0.00	520.36	0	01:07	0.000	20.093
OUTFALL_922	OUTFALL	0.00	28.22	0	01:05	0.000	1.335
OUTFALL_923	OUTFALL	0.00	33.81	0	01:15	0.000	2.180
OUTFALL_924	OUTFALL	0.00	43.55	0	01:15	0.000	2.719
OUTFALL_925	OUTFALL	0.00	343.00	0	00:40	0.000	21.006
OUTFALL_940	OUTFALL	0.00	5263.25	0	01:42	0.000	259.293
OUTFALL_950	OUTFALL	0.00	148.93	0	00:45	0.000	4.085
OUTFALL_951	OUTFALL	0.00	107.62	0	01:06	0.000	4.500
OUTFALL_952	OUTFALL	0.00	190.90	0	00:45	0.000	4.698
OUTFALL_953	OUTFALL	0.00	196.79	0	00:52	0.000	6.240
OUTFALL_954	OUTFALL	0.00	36.05	0	01:15	0.000	2.070
OUTFALL_955	OUTFALL	0.00	427.32	0	01:47	0.000	24.488
OUTFALL_956	OUTFALL	0.00	135.79	0	00:50	0.000	4.190
OUTFALL_957	OUTFALL	0.00	129.02	0	00:51	0.000	4.296
OUTFALL_958	OUTFALL	0.00	600.90	0	01:36	0.000	28.136
OUTFALL_959	OUTFALL	0.00	39.50	0	01:15	0.000	2.392
OUTFALL_960	OUTFALL	0.00	1850.12	0	01:35	0.000	94.740
OUTFALL_961	OUTFALL	0.00	333.82	0	01:15	0.000	12.057
OUTFALL_962	OUTFALL	0.00	344.46	0	00:58	0.000	11.266
OUTFALL_963	OUTFALL	0.00	87.27	0	01:00	0.000	3.607
OUTFALL_964	OUTFALL	0.00	279.30	0	01:13	0.000	10.016
OUTFALL_965	OUTFALL	0.00	118.31	0	01:05	0.000	5.452
OUTFALL_966	OUTFALL	0.00	58.75	0	01:05	0.000	2.751
OUTFALL_967	OUTFALL	0.00	15.26	0	01:05	0.000	0.748
OUTFALL_968	OUTFALL	0.00	173.23	0	01:12	0.000	8.247
OUTFALL_969	OUTFALL	0.00	24.50	0	01:25	0.000	1.958
OUTFALL_999	OUTFALL	0.00	78.22	0	01:00	0.000	3.299
JUNCT_1020	DIVIDER	3753.80	3753.80	0	01:15	151.651	151.651
JUNCT_1025	DIVIDER	0.00	804.36	0	00:53	0.000	21.353
JUNCT_1026	DIVIDER	0.00	199.07	0	01:12	0.000	7.805
JUNCT_1043	DIVIDER	0.00	134.22	0	01:17	0.000	6.158
JUNCT_1045	DIVIDER	0.00	620.23	0	01:21	0.000	32.565

JUNCT_200	DIVIDER	338.13	338.13	0	00:35	5.169	5.169
JUNCT_221	DIVIDER	193.78	193.78	0	00:40	3.853	3.853
JUNCT_300	DIVIDER	0.00	345.78	0	00:50	0.000	8.150
JUNCT_303	DIVIDER	0.00	743.82	0	00:49	0.000	17.790
JUNCT_306	DIVIDER	0.00	421.79	0	01:36	0.000	26.641
JUNCT_308	DIVIDER	0.00	608.26	0	01:37	0.000	39.053
JUNCT_310	DIVIDER	0.00	194.44	0	00:40	0.000	3.508
JUNCT_311	DIVIDER	0.00	710.88	0	01:12	0.000	45.934
JUNCT_312	DIVIDER	0.00	953.76	0	01:28	0.000	58.560
JUNCT_313	DIVIDER	0.00	1036.69	0	01:33	0.000	64.478
JUNCT_315	DIVIDER	0.00	1167.90	0	01:32	0.000	73.675
JUNCT_317	DIVIDER	0.00	5113.77	0	01:29	0.000	242.563
JUNCT_318	DIVIDER	0.00	5233.23	0	01:31	0.000	250.528
JUNCT_319	DIVIDER	0.00	5256.82	0	01:35	0.000	253.925
JUNCT_320	DIVIDER	0.00	158.43	0	00:50	0.000	4.986
JUNCT_322	DIVIDER	0.00	4036.47	0	01:21	0.000	163.614
JUNCT_413	DIVIDER	33.13	33.13	0	00:55	1.331	1.331
JUNCT_454	DIVIDER	540.88	540.88	0	00:35	7.097	7.097
JUNCT_460	DIVIDER	102.43	102.43	0	00:35	1.610	1.610
JUNCT_469	DIVIDER	132.21	132.21	0	00:35	1.960	1.960
JUNCT_479	DIVIDER	118.22	118.22	0	00:35	2.148	2.148
JUNCT_498	DIVIDER	111.58	111.58	0	00:45	2.785	2.785
JUNCT_500	DIVIDER	0.00	514.68	0	00:40	0.000	9.884
JUNCT_501	DIVIDER	0.00	1058.58	0	00:38	0.000	21.499
JUNCT_502	DIVIDER	0.00	1196.00	0	00:52	0.000	32.011
JUNCT_503	DIVIDER	0.00	195.27	0	00:40	0.000	3.822
JUNCT_504	DIVIDER	0.00	921.15	0	01:22	0.000	38.454
JUNCT_505	DIVIDER	0.00	1069.67	0	01:33	0.000	51.801
JUNCT_506	DIVIDER	0.00	157.52	0	00:50	0.000	4.838
JUNCT_507	DIVIDER	0.00	277.90	0	00:57	0.000	9.255
JUNCT_508	DIVIDER	0.00	375.14	0	00:58	0.000	12.263
JUNCT_511	DIVIDER	0.00	119.83	0	00:50	0.000	4.245
JUNCT_512	DIVIDER	0.00	47.64	0	00:55	0.000	1.702
JUNCT_513	DIVIDER	0.00	279.02	0	01:02	0.000	11.025
JUNCT_514	DIVIDER	0.00	640.05	0	01:17	0.000	26.480
JUNCT_516	DIVIDER	0.00	110.66	0	00:40	0.000	2.243
JUNCT_517	DIVIDER	0.00	246.37	0	00:55	0.000	7.651
JUNCT_518	DIVIDER	0.00	47.42	0	01:44	0.000	8.500
JUNCT_519	DIVIDER	0.00	40.35	0	01:45	0.000	6.727
JUNCT_521	DIVIDER	0.00	137.96	0	00:47	0.000	4.785
JUNCT_522	DIVIDER	0.00	389.60	0	00:47	0.000	10.886
JUNCT_523	DIVIDER	0.00	93.11	0	00:40	0.000	2.108
JUNCT_525	DIVIDER	0.00	34.67	0	00:59	0.000	0.975
JUNCT_526	DIVIDER	0.00	106.02	0	02:00	0.000	8.708
JUNCT_529	DIVIDER	0.00	212.10	0	01:40	0.000	15.035
JUNCT_530	DIVIDER	0.00	515.30	0	00:54	0.000	25.295
JUNCT_531	DIVIDER	0.00	624.04	0	01:02	0.000	29.694
JUNCT_532	DIVIDER	0.00	262.46	0	01:51	0.000	31.728
JUNCT_534	DIVIDER	0.00	98.24	0	01:04	0.000	3.329
JUNCT_536	DIVIDER	0.00	276.26	0	01:56	0.000	34.710
JUNCT_538	DIVIDER	0.00	125.69	0	00:35	0.000	1.680
JUNCT_539	DIVIDER	0.00	184.01	0	00:40	0.000	4.137
JUNCT_540	DIVIDER	0.00	116.37	0	00:55	0.000	4.250
JUNCT_541	DIVIDER	0.00	435.72	0	01:00	0.000	16.650
JUNCT_542	DIVIDER	0.00	300.03	0	00:40	0.000	6.476
JUNCT_543	DIVIDER	0.00	559.11	0	00:46	0.000	12.705
JUNCT_702	DIVIDER	0.00	298.11	0	01:12	0.000	13.870
JUNCT_703	DIVIDER	0.00	381.21	0	01:41	0.000	20.173
JUNCT_705	DIVIDER	0.00	118.82	0	00:45	0.000	3.273
JUNCT_706	DIVIDER	0.00	426.76	0	00:50	0.000	12.221
JUNCT_708	DIVIDER	0.00	476.82	0	00:51	0.000	13.583
JUNCT_709	DIVIDER	0.00	523.36	0	01:20	0.000	21.941
JUNCT_710	DIVIDER	0.00	569.85	0	01:31	0.000	26.053
JUNCT_712	DIVIDER	0.00	1552.39	0	01:18	0.000	75.794
JUNCT_713	DIVIDER	0.00	1787.64	0	01:23	0.000	88.023
JUNCT_714	DIVIDER	0.00	1831.03	0	01:29	0.000	92.135
JUNCT_716	DIVIDER	0.00	218.69	0	00:52	0.000	6.560
JUNCT_717	DIVIDER	0.00	320.57	0	00:59	0.000	10.404
JUNCT_719	DIVIDER	0.00	230.45	0	00:48	0.000	6.415
JUNCT_721	DIVIDER	0.00	235.13	0	00:51	0.000	7.284
JUNCT_722	DIVIDER	0.00	140.96	0	01:00	0.000	5.965
JUNCT_750	DIVIDER	0.00	1439.70	0	01:15	0.000	69.182
STOR_1024	STORAGE	0.00	961.11	0	00:58	0.000	26.820
STOR_1025	STORAGE	0.00	208.01	0	00:40	0.000	3.992
STOR_1026	STORAGE	0.00	309.49	0	00:45	0.000	7.801
STOR_1029	STORAGE	0.00	1063.27	0	00:50	0.000	63.259
STOR_1041	STORAGE	0.00	184.55	0	01:03	0.000	8.013
STOR_1042	STORAGE	0.00	396.54	0	00:49	0.000	21.307
STOR_1043	STORAGE	0.00	272.81	0	00:44	0.000	6.161
STOR_1044	STORAGE	0.00	370.37	0	00:35	0.000	6.723
STOR_1045A	STORAGE	0.00	707.58	0	01:07	0.000	33.143
STOR_1045B	STORAGE	0.00	385.25	0	01:21	0.000	7.838
STOR_1046	STORAGE	0.00	250.00	0	00:37	0.000	4.067
STOR_1047	STORAGE	0.00	248.53	0	00:35	0.000	3.328
STOR_1048	STORAGE	0.00	142.78	0	00:35	0.000	1.926
STOR_1049	STORAGE	0.00	763.35	0	00:44	0.000	12.581
STOR_1050	STORAGE	0.00	396.84	0	00:40	0.000	7.848
STOR_1051	STORAGE	0.00	618.13	0	00:35	0.000	9.274
STOR_1053	STORAGE	0.00	575.38	0	00:57	0.000	20.332
STOR_1054	STORAGE	0.00	190.73	0	01:05	0.000	7.975

STOR_1055	STORAGE	0.00	377.45	0	00:56	0.000	12.889
STOR_1056	STORAGE	0.00	77.23	0	00:35	0.000	1.199
STOR_1060	STORAGE	0.00	1252.75	0	01:00	0.000	35.824
STOR_1061	STORAGE	0.00	245.06	0	00:40	0.000	5.885
STOR_1070	STORAGE	0.00	126.73	0	00:50	0.000	4.441
STOR_1071	STORAGE	0.00	141.54	0	00:50	0.000	4.431

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Node Surcharge Summary
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Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
JUNCT_1060	JUNCTION	12.02	0.000	0.000
JUNCT_201	JUNCTION	12.02	0.000	0.000
JUNCT_202	JUNCTION	12.02	0.000	0.000
JUNCT_203	JUNCTION	12.02	0.000	0.000
JUNCT_204	JUNCTION	12.02	0.000	0.000
JUNCT_205	JUNCTION	12.02	0.000	0.000
JUNCT_206	JUNCTION	12.02	0.000	0.000
JUNCT_207	JUNCTION	12.02	0.000	0.000
JUNCT_209	JUNCTION	12.02	0.000	0.000
JUNCT_210	JUNCTION	12.02	0.000	0.000
JUNCT_211	JUNCTION	12.02	0.000	0.000
JUNCT_212	JUNCTION	12.02	0.000	0.000
JUNCT_213	JUNCTION	12.02	0.000	0.000
JUNCT_215	JUNCTION	12.02	0.000	0.000
JUNCT_216	JUNCTION	12.02	0.000	0.000
JUNCT_217	JUNCTION	12.02	0.000	0.000
JUNCT_218	JUNCTION	12.02	0.000	0.000
JUNCT_219	JUNCTION	12.02	0.000	0.000
JUNCT_220	JUNCTION	12.02	0.000	0.000
JUNCT_222	JUNCTION	12.02	0.000	0.000
JUNCT_235	JUNCTION	12.02	0.000	0.000
JUNCT_236	JUNCTION	12.02	0.000	0.000
JUNCT_237	JUNCTION	12.02	0.000	0.000
JUNCT_238	JUNCTION	12.02	0.000	0.000
JUNCT_240	JUNCTION	12.02	0.000	0.000
JUNCT_241	JUNCTION	12.02	0.000	0.000
JUNCT_242	JUNCTION	12.02	0.000	0.000
JUNCT_243	JUNCTION	12.02	0.000	0.000
JUNCT_400	JUNCTION	12.02	0.000	0.000
JUNCT_401	JUNCTION	12.02	0.000	0.000
JUNCT_410	JUNCTION	12.02	0.000	0.000
JUNCT_411	JUNCTION	12.02	0.000	0.000
JUNCT_412	JUNCTION	12.02	0.000	0.000
JUNCT_414	JUNCTION	12.02	0.000	0.000
JUNCT_415	JUNCTION	12.02	0.000	0.000
JUNCT_416	JUNCTION	12.02	0.000	0.000
JUNCT_417	JUNCTION	12.02	0.000	0.000
JUNCT_418	JUNCTION	12.02	0.000	0.000
JUNCT_419	JUNCTION	12.02	0.000	0.000
JUNCT_423	JUNCTION	12.02	0.000	0.000
JUNCT_424	JUNCTION	12.02	0.000	0.000
JUNCT_425	JUNCTION	12.02	0.000	0.000
JUNCT_426	JUNCTION	12.02	0.000	0.000
JUNCT_427	JUNCTION	12.02	0.000	0.000
JUNCT_428	JUNCTION	12.02	0.000	0.000
JUNCT_429	JUNCTION	12.02	0.000	0.000
JUNCT_430	JUNCTION	12.02	0.000	0.000
JUNCT_431	JUNCTION	12.02	0.000	0.000
JUNCT_432	JUNCTION	12.02	0.000	0.000
JUNCT_433	JUNCTION	12.02	0.000	0.000
JUNCT_435	JUNCTION	12.02	0.000	0.000
JUNCT_436	JUNCTION	12.02	0.000	0.000
JUNCT_437	JUNCTION	12.02	0.000	0.000
JUNCT_440	JUNCTION	12.02	0.000	0.000
JUNCT_441	JUNCTION	12.02	0.000	0.000
JUNCT_442	JUNCTION	12.02	0.000	0.000
JUNCT_443	JUNCTION	12.02	0.000	0.000
JUNCT_444	JUNCTION	12.02	0.000	0.000
JUNCT_445	JUNCTION	12.02	0.000	0.000
JUNCT_446	JUNCTION	12.02	0.000	0.000
JUNCT_447	JUNCTION	12.02	0.000	0.000
JUNCT_448	JUNCTION	12.02	0.000	0.000
JUNCT_449	JUNCTION	12.02	0.000	0.000
JUNCT_450	JUNCTION	12.02	0.000	0.000
JUNCT_451	JUNCTION	12.02	0.000	0.000
JUNCT_452	JUNCTION	12.02	0.000	0.000
JUNCT_453	JUNCTION	12.02	0.000	0.000
JUNCT_455	JUNCTION	12.02	0.000	0.000
JUNCT_456	JUNCTION	12.02	0.000	0.000
JUNCT_457	JUNCTION	12.02	0.000	0.000
JUNCT_458	JUNCTION	12.02	0.000	0.000
JUNCT_459	JUNCTION	12.02	0.000	0.000
JUNCT_461	JUNCTION	12.02	0.000	0.000
JUNCT_462	JUNCTION	12.02	0.000	0.000
JUNCT_463	JUNCTION	12.02	0.000	0.000
JUNCT_464	JUNCTION	12.02	0.000	0.000
JUNCT_465	JUNCTION	12.02	0.000	0.000
JUNCT_466	JUNCTION	12.02	0.000	0.000
JUNCT_467	JUNCTION	12.02	0.000	0.000
JUNCT_468	JUNCTION	12.02	0.000	0.000
JUNCT_470	JUNCTION	12.02	0.000	0.000
JUNCT_471	JUNCTION	12.02	0.000	0.000
JUNCT_472	JUNCTION	12.02	0.000	0.000
JUNCT_473	JUNCTION	12.02	0.000	0.000
JUNCT_474	JUNCTION	12.02	0.000	0.000
JUNCT_475	JUNCTION	12.02	0.000	0.000
JUNCT_476	JUNCTION	12.02	0.000	0.000
JUNCT_477	JUNCTION	12.02	0.000	0.000
JUNCT_478	JUNCTION	12.02	0.000	0.000
JUNCT_480	JUNCTION	12.02	0.000	0.000
JUNCT_481	JUNCTION	12.02	0.000	0.000
JUNCT_482	JUNCTION	12.02	0.000	0.000
JUNCT_483	JUNCTION	12.02	0.000	0.000
JUNCT_484	JUNCTION	12.02	0.000	0.000
JUNCT_485	JUNCTION	12.02	0.000	0.000
JUNCT_486	JUNCTION	12.02	0.000	0.000
JUNCT_487	JUNCTION	12.02	0.000	0.000
JUNCT_488	JUNCTION	12.02	0.000	0.000
JUNCT_489	JUNCTION	12.02	0.000	0.000
JUNCT_490	JUNCTION	12.02	0.000	0.000
JUNCT_491	JUNCTION	12.02	0.000	0.000
JUNCT_492	JUNCTION	12.02	0.000	0.000
JUNCT_494	JUNCTION	12.02	0.000	0.000
JUNCT_495	JUNCTION	12.02	0.000	0.000
JUNCT_496	JUNCTION	12.02	0.000	0.000
JUNCT_497	JUNCTION	12.02	0.000	0.000
JUNCT_499	JUNCTION	12.02	0.000	0.000
JUNCT_600	JUNCTION	12.02	0.000	0.000
JUNCT_601	JUNCTION	12.02	0.000	0.000
JUNCT_602	JUNCTION	12.02	0.000	0.000
JUNCT_603	JUNCTION	12.02	0.000	0.000
JUNCT_604	JUNCTION	12.02	0.000	0.000
JUNCT_605	JUNCTION	12.02	0.000	0.000
JUNCT_606	JUNCTION	12.02	0.000	0.000
JUNCT_607	JUNCTION	12.02	0.000	0.000
JUNCT_608	JUNCTION	12.02	0.000	0.000
JUNCT_609	JUNCTION	12.02	0.000	0.000
JUNCT_610	JUNCTION	12.02	0.000	0.000
JUNCT_611	JUNCTION	12.02	0.000	0.000
JUNCT_612	JUNCTION	12.02	0.000	0.000
JUNCT_613	JUNCTION	12.02	0.000	0.000
JUNCT_614	JUNCTION	12.02	0.000	0.000
JUNCT_615	JUNCTION	12.02	0.000	0.000
JUNCT_616	JUNCTION	12.02	0.000	0.000
JUNCT_617	JUNCTION	12.02	0.000	0.000
JUNCT_618	JUNCTION	12.02	0.000	0.000
JUNCT_619	JUNCTION	12.02	0.000	0.000
JUNCT_620	JUNCTION	12.02	0.000	0.000
JUNCT_621	JUNCTION	12.02	0.000	0.000
JUNCT_622	JUNCTION	12.02	0.000	0.000
JUNCT_623	JUNCTION	12.02	0.000	0.000
JUNCT_624	JUNCTION	12.02	0.000	0.000
JUNCT_627	JUNCTION	12.02	0.000	0.000
JUNCT_629	JUNCTION	12.02	0.000	0.000
JUNCT_630	JUNCTION	12.02	0.000	0.000
JUNCT_631	JUNCTION	12.02	0.000	0.000
JUNCT_633	JUNCTION	12.02	0.000	0.000
JUNCT_634	JUNCTION	12.02	0.000	0.000
JUNCT_638	JUNCTION	12.02	0.000	0.000
JUNCT_639	JUNCTION	12.02	0.000	0.000
JUNCT_640	JUNCTION	12.02	0.000	0.000
JUNCT_641	JUNCTION	12.02	0.000	0.000
JUNCT_645	JUNCTION	12.02	0.000	0.000
JUNCT_646	JUNCTION	12.02	0.000	0.000
JUNCT_647	JUNCTION	12.02	0.000	0.000
JUNCT_648	JUNCTION	12.02	0.000	0.000
JUNCT_650	JUNCTION	12.02	0.000	0.000
JUNCT_651	JUNCTION	12.02	0.000	0.000
JUNCT_652	JUNCTION	12.02	0.000	0.000
JUNCT_655	JUNCTION	12.02	0.000	0.000
JUNCT_656	JUNCTION	12.02	0.000	0.000
JUNCT_657	JUNCTION	12.02	0.000	0.000
JUNCT_658	JUNCTION	12.02	0.000	0.000
JUNCT_659	JUNCTION	12.02	0.000	0.000
JUNCT_660	JUNCTION	12.02	0.000	0.000
JUNCT_661	JUNCTION	12.02	0.000	0.000
JUNCT_1045	DIVIDER	12.02	0.000	0.000
STOR_1025	STORAGE	12.02	7.683	1.317
STOR_1026	STORAGE	12.02	5.122	1.018
STOR_1044	STORAGE	4.27	2.790	0.200
STOR_1045B	STORAGE	12.02	7.082	2.418
STOR_1047	STORAGE	12.02	9.845	0.155

STOR_1048	STORAGE	12.02	9.961	0.039
STOR_1050	STORAGE	3.17	1.260	0.740
STOR_1054	STORAGE	10.23	6.921	0.079
STOR_1056	STORAGE	12.02	3.990	1.510
STOR_1070	STORAGE	12.02	4.879	0.121
STOR_1071	STORAGE	12.02	4.976	0.024

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Node Flooding Summary
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No nodes were flooded.

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Storage Volume Summary
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Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STOR_1024	461.486	16	0	1890.124	64	0 01:35	421.79
STOR_1025	89.058	19	0	294.904	64	0 01:19	67.43
STOR_1026	43.054	8	0	361.699	69	0 01:11	199.07
STOR_1029	872.812	45	0	1653.049	85	0 01:27	953.76
STOR_1041	128.094	22	0	476.949	83	0 02:03	103.96
STOR_1042	102.265	27	0	305.442	82	0 00:58	371.51
STOR_1043	58.453	11	0	368.920	67	0 01:17	134.22
STOR_1044	117.077	23	0	465.689	92	0 01:12	113.61
STOR_1045A	312.709	29	0	1023.651	96	0 01:20	620.23
STOR_1045B	400.643	25	0	832.286	52	0 02:31	34.91
STOR_1046	162.510	48	0	322.045	94	0 01:04	88.24
STOR_1047	129.129	45	0	278.920	98	0 00:58	67.37
STOR_1048	37.247	31	0	120.125	99	0 00:44	85.89
STOR_1049	867.027	55	0	1438.124	92	0 01:43	47.42
STOR_1050	400.851	38	0	855.309	81	0 01:45	40.35
STOR_1051	338.437	52	0	653.818	100	0 00:54	246.37
STOR_1053	267.328	44	0	603.545	100	0 01:15	480.41
STOR_1054	58.296	33	0	172.197	99	0 01:26	163.13
STOR_1055	110.312	41	0	161.315	60	0 00:57	375.14
STOR_1056	32.029	27	0	75.457	64	0 00:59	34.67
STOR_1060	172.921	13	0	1340.811	98	0 01:24	865.70
STOR_1061	80.925	17	0	377.649	80	0 01:20	106.88
STOR_1070	137.020	45	0	294.517	97	0 01:45	60.18
STOR_1071	179.199	60	0	299.360	99	0 01:27	83.33

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Outfall Loading Summary
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Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
OUTFALL_900	100.00	103.86	1537.71	33.607
OUTFALL_901	40.22	9.18	31.32	1.195
OUTFALL_902	37.73	5.72	19.83	0.698
OUTFALL_903	99.31	162.05	1070.80	52.074
OUTFALL_904	22.05	26.37	114.64	1.881
OUTFALL_905	99.31	42.13	398.55	13.539
OUTFALL_906	18.59	31.99	161.69	1.924
OUTFALL_907	99.31	85.46	644.15	27.461
OUTFALL_908	19.97	16.86	77.26	1.090
OUTFALL_909	19.28	64.53	314.18	4.025
OUTFALL_910	99.31	38.09	367.71	12.240
OUTFALL_911	27.60	28.25	112.26	2.523
OUTFALL_912	28.99	46.51	183.34	4.363
OUTFALL_913	99.31	44.46	500.95	14.287
OUTFALL_914	22.05	39.23	186.18	2.800
OUTFALL_915	99.31	140.01	491.42	44.998
OUTFALL_917	99.31	56.12	740.63	18.035
OUTFALL_919	67.55	44.54	431.05	9.735
OUTFALL_920	29.68	18.20	68.97	1.748
OUTFALL_921	98.34	63.15	520.36	20.093
OUTFALL_922	47.43	8.70	28.22	1.335
OUTFALL_923	65.74	10.25	33.81	2.180
OUTFALL_924	64.08	13.11	43.55	2.719
OUTFALL_925	99.31	65.38	343.00	21.006
OUTFALL_940	98.61	612.59	5263.25	259.293
OUTFALL_950	32.32	39.06	148.93	4.085
OUTFALL_951	98.34	14.14	107.62	4.500
OUTFALL_952	30.10	48.24	190.90	4.698
OUTFALL_953	99.03	19.47	196.79	6.240
OUTFALL_954	57.70	11.09	36.05	2.070
OUTFALL_955	98.47	76.85	427.32	24.488
OUTFALL_956	35.78	36.19	135.79	4.190
OUTFALL_957	57.28	23.18	129.02	4.296
OUTFALL_958	98.20	88.55	600.90	28.136
OUTFALL_959	62.83	11.77	39.50	2.392
OUTFALL_960	98.20	298.16	1850.12	94.740
OUTFALL_961	98.61	37.78	333.82	12.057
OUTFALL_962	98.47	35.36	344.46	11.266
OUTFALL_963	43.69	25.52	87.27	3.607
OUTFALL_964	97.92	31.61	279.30	10.016
OUTFALL_965	49.65	33.93	118.31	5.452
OUTFALL_966	49.38	17.22	58.75	2.751
OUTFALL_967	49.93	4.63	15.26	0.748
OUTFALL_968	89.74	28.40	173.23	8.247
OUTFALL_969	80.03	7.56	24.50	1.958
OUTFALL_999	44.38	22.97	78.22	3.299
System	66.79	2888.43	13647.90	794.077

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Link Flow Summary
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Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
1020_OVERFLOW	CONDUIT	3652.60	0 01:21	5.61	0.18	0.49
1025_OVERFLOW	CONDUIT	378.03	0 00:59	5.58	0.01	0.13
1026_OVERFLOW	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
1043_OVERFLOW	CONDUIT	114.68	0 01:22	2.67	0.01	0.10
1045A	DUMMY	234.98	0 01:21			
1045B	DUMMY	385.25	0 01:21			
200	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
200_OVERFLOW	CONDUIT	261.81	0 00:51	2.45	0.02	0.15
201	DUMMY	84.30	0 00:50			
202	DUMMY	145.39	0 00:35			
203	DUMMY	147.47	0 00:40			
204	DUMMY	260.28	0 00:35			
205	DUMMY	208.01	0 00:40			
206	DUMMY	122.22	0 00:50			
207	DUMMY	196.76	0 00:40			
208	CONDUIT	39.70	0 00:52	4.73	0.11	0.35
209	DUMMY	183.83	0 00:50			
210	DUMMY	62.09	0 00:40			
211	DUMMY	59.68	0 00:50			
212	DUMMY	194.44	0 00:40			
213	DUMMY	172.85	0 00:40			
215	DUMMY	124.05	0 00:50			
216	DUMMY	56.69	0 00:55			
217	DUMMY	259.98	0 00:45			
218	DUMMY	196.06	0 00:40			
219	DUMMY	99.79	0 00:50			
220	DUMMY	78.54	0 00:45			
221	CONDUIT	116.41	0 00:42	3.11	1.00	1.00
221_OVERFLOW	CONDUIT	59.83	0 01:04	2.79	0.01	0.08
222	DUMMY	180.91	0 00:45			
235	DUMMY	158.43	0 00:50			
236	DUMMY	145.15	0 00:50			
237	DUMMY	59.17	0 01:00			
238	DUMMY	98.64	0 00:55			
240	DUMMY	46.12	0 01:00			
241	DUMMY	211.35	0 00:45			
242	DUMMY	104.89	0 00:45			
243	DUMMY	124.48	0 00:55			
300	CONDUIT	190.90	0 00:40	6.92	1.00	1.00
300_OVERFLOW	CONDUIT	150.07	0 00:56	4.18	0.01	0.09
302	CONDUIT	142.60	0 00:41	5.86	0.37	0.61
303	CONDUIT	22.75	0 00:22	4.92	1.00	1.00
303_OVERFLOW	CONDUIT	717.59	0 00:53	4.79	0.03	0.23
305	DUMMY	740.34	0 00:53			
306	CONDUIT	237.49	0 01:09	4.22	1.00	1.00
306_OVERFLOW	CONDUIT	179.63	0 01:47	2.75	0.01	0.12
309	CONDUIT	109.10	0 00:33	5.05	1.00	1.00
308_OVERFLOW	CONDUIT	498.53	0 01:40	3.64	0.02	0.18
310	CONDUIT	189.51	0 00:43	5.44	0.61	0.78
310_OVERFLOW	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
311	CONDUIT	432.77	0 00:43	7.69	1.00	1.00
311_OVERFLOW	CONDUIT	236.98	0 01:28	4.86	0.01	0.11
312	CONDUIT	395.22	0 00:58	7.03	1.00	1.00
312_OVERFLOW	CONDUIT	552.72	0 01:35	4.30	0.02	0.17
313	CONDUIT	382.20	0 00:57	6.79	1.00	1.00
313_OVERFLOW	CONDUIT	652.47	0 01:38	4.77	0.03	0.22
315	CONDUIT	68.27	0 00:35	3.21	1.00	1.00
315_OVERFLOW	CONDUIT	1085.28	0 01:42	3.22	0.07	0.33
317	CONDUIT	202.69	0 00:38	4.86	1.00	1.00
317_OVERFLOW	CONDUIT	4905.39	0 01:31	5.72	0.24	0.55
318	CONDUIT	250.38	0 00:39	4.44	1.00	1.00
318_OVERFLOW	CONDUIT	4964.73	0 01:35	5.06	0.28	0.58

319	CONDUIT	226.43	0	00:45	4.10	1.00	1.00
319_OVERFLOW	CONDUIT	4968.69	0	01:42	4.75	0.31	0.60
320	CONDUIT	24.69	0	00:32	5.28	1.00	1.00
320_OVERFLOW	CONDUIT	130.05	0	00:59	3.23	0.00	0.10
321	CONDUIT	287.15	0	01:01	5.84	0.83	0.91
322	CONDUIT	246.99	0	00:38	4.38	1.00	1.00
322_OVERFLOW	CONDUIT	3758.89	0	01:25	4.71	0.21	0.51
323	DUMMY	4079.08	0	01:25			
400	DUMMY	1344.20	0	00:45			
401	DUMMY	31.32	0	00:55			
410	DUMMY	514.68	0	00:40			
411	DUMMY	408.04	0	00:35			
412	DUMMY	377.40	0	00:35			
413	CONDUIT	33.03	0	00:57	3.77	0.12	0.36
413_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
414	DUMMY	222.88	0	00:40			
415	DUMMY	172.21	0	00:40			
416	DUMMY	97.16	0	00:50			
417	DUMMY	119.80	0	00:40			
418	DUMMY	85.82	0	00:50			
419	DUMMY	85.68	0	00:35			
423	DUMMY	19.83	0	00:50			
424	DUMMY	85.75	0	00:50			
425	DUMMY	127.16	0	01:00			
426	DUMMY	191.50	0	00:45			
427	DUMMY	54.19	0	00:55			
428	DUMMY	12.93	0	00:35			
429	DUMMY	114.64	0	00:35			
430	DUMMY	157.52	0	00:50			
431	DUMMY	131.00	0	00:55			
432	DUMMY	170.91	0	00:40			
433	DUMMY	91.75	0	00:35			
435	DUMMY	74.41	0	00:50			
436	DUMMY	128.61	0	01:00			
437	DUMMY	161.69	0	00:30			
440	DUMMY	119.83	0	00:50			
441	DUMMY	47.64	0	00:55			
442	DUMMY	110.05	0	00:55			
443	DUMMY	16.65	0	01:05			
444	DUMMY	154.57	0	00:40			
445	DUMMY	71.68	0	00:30			
446	DUMMY	260.80	0	00:40			
447	DUMMY	77.26	0	00:35			
448	DUMMY	314.18	0	00:35			
449	DUMMY	341.71	0	00:40			
450	DUMMY	110.66	0	00:40			
451	DUMMY	562.92	0	00:35			
452	DUMMY	270.53	0	00:40			
453	DUMMY	112.26	0	00:40			
454	CONDUIT	378.22	0	00:36	7.89	1.00	1.00
454_OVERFLOW	CONDUIT	116.83	0	00:44	5.61	0.00	0.05
455	DUMMY	153.49	0	00:40			
456	DUMMY	302.05	0	00:40			
457	DUMMY	147.14	0	00:35			
458	DUMMY	224.04	0	00:35			
459	DUMMY	183.34	0	00:40			
460	CONDUIT	100.52	0	00:37	18.25	0.60	0.56
460_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
461	DUMMY	142.78	0	00:35			
462	DUMMY	248.53	0	00:35			
463	DUMMY	150.96	0	00:35			
464	DUMMY	137.58	0	00:40			
465	DUMMY	186.18	0	00:35			
466	DUMMY	102.29	0	00:50			
467	DUMMY	202.77	0	00:40			
468	DUMMY	77.23	0	00:35			
469	CONDUIT	121.67	0	00:41	4.07	0.68	0.83
469_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
470	DUMMY	93.11	0	00:40			
471	DUMMY	203.61	0	00:40			
472	DUMMY	55.27	0	00:45			
473	DUMMY	32.03	0	00:40			
474	DUMMY	73.40	0	00:40			
475	DUMMY	366.08	0	00:35			
476	DUMMY	290.91	0	00:40			
477	DUMMY	117.98	0	00:35			
478	DUMMY	160.14	0	00:45			
479	CONDUIT	116.95	0	00:41	5.04	0.46	0.69
479_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
480	DUMMY	155.25	0	00:35			
481	DUMMY	149.88	0	00:40			
482	DUMMY	126.64	0	00:35			
483	DUMMY	125.69	0	00:35			
484	DUMMY	275.58	0	00:35			
485	DUMMY	300.03	0	00:40			
486	DUMMY	295.05	0	00:40			
487	DUMMY	184.01	0	00:40			
488	DUMMY	201.44	0	00:35			
489	DUMMY	68.97	0	00:45			
490	DUMMY	116.37	0	00:55			
491	DUMMY	65.90	0	01:10			
492	DUMMY	233.22	0	00:45			
493	CONDUIT	89.80	0	00:52	2.74	0.47	0.68
494	DUMMY	11.69	0	00:55			
495	DUMMY	28.22	0	01:05			
496	DUMMY	33.81	0	01:15			
497	DUMMY	43.55	0	01:15			
498	CONDUIT	100.20	0	00:58	4.37	0.36	0.59
498_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
499	DUMMY	104.49	0	00:40			
500	CONDUIT	310.57	0	00:38	7.64	1.00	1.00
500_OVERFLOW	CONDUIT	162.56	0	00:52	9.09	0.00	0.10
501	CONDUIT	448.88	0	00:32	8.17	1.00	1.00
501_OVERFLOW	CONDUIT	521.18	0	00:50	6.78	0.02	0.16
502	CONDUIT	323.43	0	00:34	5.85	1.00	1.00
502_OVERFLOW	CONDUIT	840.01	0	01:01	5.21	0.04	0.24
503	CONDUIT	24.01	0	00:27	5.35	1.00	1.00
503_OVERFLOW	CONDUIT	130.97	0	00:57	5.64	0.00	0.10
504	CONDUIT	325.69	0	00:55	6.77	1.00	1.00
504_OVERFLOW	CONDUIT	569.66	0	01:40	7.03	0.02	0.17
505	CONDUIT	472.71	0	00:49	8.33	1.00	1.00
505_OVERFLOW	CONDUIT	596.63	0	01:35	4.51	0.02	0.15
506	CONDUIT	150.04	0	01:00	5.13	0.48	0.70
506_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
507	CONDUIT	250.91	0	00:56	4.49	1.00	1.00
507_OVERFLOW	CONDUIT	23.86	0	01:12	2.20	0.00	0.03
508	CONDUIT	374.31	0	00:59	8.11	0.75	0.87
508_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
509	CONDUIT	65.91	0	01:13	4.28	0.21	0.45
511	CONDUIT	114.26	0	01:02	4.50	0.17	0.46
511_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
512	CONDUIT	30.33	0	00:44	6.50	1.00	1.00
512_OVERFLOW	CONDUIT	14.22	0	01:16	3.95	0.00	0.03
513	CONDUIT	277.41	0	01:09	5.32	0.90	0.95
513_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
514	CONDUIT	601.46	0	01:05	10.57	1.00	1.00
514_OVERFLOW	CONDUIT	37.21	0	01:22	3.84	0.00	0.03
516	CONDUIT	106.15	0	00:46	5.94	0.24	0.49
516_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
517	CONDUIT	239.41	0	01:02	5.14	0.78	0.88
517_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
518	CONDUIT	47.36	0	01:59	3.50	0.16	0.39
518_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
519	CONDUIT	40.35	0	01:51	8.85	0.26	0.35
519_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
521	CONDUIT	131.02	0	00:53	4.34	0.50	0.71
521_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
522	CONDUIT	314.21	0	00:39	5.70	1.00	1.00
522_OVERFLOW	CONDUIT	77.70	0	00:57	3.97	0.00	0.05
523	CONDUIT	27.50	0	00:30	5.91	1.00	1.00
523_OVERFLOW	CONDUIT	60.08	0	00:50	3.94	0.00	0.06
525	CONDUIT	19.79	0	00:41	4.21	1.00	1.00
525_OVERFLOW	CONDUIT	14.82	0	01:04	2.36	0.00	0.04
526	CONDUIT	105.93	0	02:05	4.14	0.39	0.63
526_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
528	CONDUIT	51.88	0	00:57	3.36	0.17	0.39
529	CONDUIT	212.01	0	01:45	6.51	0.46	0.68
529_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
530	CONDUIT	281.45	0	00:43	4.98	1.00	1.00
530_OVERFLOW	CONDUIT	212.75	0	01:04	2.89	0.01	0.12
531	CONDUIT	346.11	0	00:41	6.15	1.00	1.00
531_OVERFLOW	CONDUIT	268.79	0	01:09	4.32	0.01	0.10
532	CONDUIT	174.98	0	01:06	3.10	1.00	1.00
532_OVERFLOW	CONDUIT	87.02	0	01:58	1.96	0.01	0.09
534	CONDUIT	44.28	0	00:47	9.36	1.00	1.00
534_OVERFLOW	CONDUIT	43.92	0	01:07	4.30	0.00	0.04
536	CONDUIT	275.60	0	02:05	3.52	0.12	0.31
536_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
538	CONDUIT	14.71	0	00:26	3.57	1.00	1.00
538_OVERFLOW	CONDUIT	72.78	0	00:51	3.86	0.00	0.09
539	CONDUIT	21.90	0	00:26	4.76	1.00	1.00
539_OVERFLOW	CONDUIT	147.14	0	00:51	4.06	0.01	0.11
540	CONDUIT	104.86	0	01:18	3.27	0.58	0.76
540_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
541	CONDUIT	242.01	0	00:42	4.33	1.00	1.00
541_OVERFLOW	CONDUIT	189.08	0	01:09	3.53	0.01	0.10
542	CONDUIT	19.99	0	02:03	4.69	1.08	1.00
542_OVERFLOW	CONDUIT	261.65	0	00:49	2.20	0.03	0.22
543	CONDUIT	195.54	0	01:29	13.73	1.08	1.00
543_OVERFLOW	CONDUIT	352.63	0	00:54	6.04	0.02	0.18
600	DUMMY	148.93	0	00:45			
601	DUMMY	48.08	0	01:05			
602	DUMMY	66.59	0	00:55			
603	DUMMY	190.90	0	00:45			
604	DUMMY	46.38	0	00:40			
605	DUMMY	154.38	0	00:50			
606	DUMMY	36.05	0	01:15			
607	DUMMY	43.57	0	00:45			
608	DUMMY	156.35	0	00:55			
609	DUMMY	71.15	0	01:05			

610	DUMMY	135.79	0	00:50			
611	DUMMY	89.87	0	00:50			
612	DUMMY	40.04	0	00:50			
613	DUMMY	118.82	0	00:45			
614	DUMMY	195.33	0	00:50			
615	DUMMY	141.54	0	00:50			
616	DUMMY	97.61	0	00:50			
617	DUMMY	241.63	0	00:45			
618	DUMMY	126.73	0	00:50			
619	DUMMY	59.15	0	00:40			
620	DUMMY	73.35	0	01:05			
621	DUMMY	52.29	0	01:10			
622	DUMMY	103.33	0	00:50			
623	DUMMY	54.29	0	00:55			
624	DUMMY	39.50	0	01:15			
627	DUMMY	193.29	0	00:45			
628	CONDUIT	23.95	0	01:17	2.90	0.11	0.34
629	DUMMY	88.82	0	01:00			
630	DUMMY	138.73	0	01:00			
631	DUMMY	64.23	0	01:00			
633	DUMMY	113.84	0	00:50			
634	DUMMY	55.28	0	00:55			
638	DUMMY	84.09	0	00:45			
639	DUMMY	151.00	0	00:45			
640	DUMMY	112.90	0	00:50			
641	DUMMY	32.24	0	01:00			
645	DUMMY	164.01	0	00:45			
646	DUMMY	68.76	0	00:45			
647	DUMMY	122.64	0	00:55			
648	DUMMY	87.27	0	01:00			
650	DUMMY	94.03	0	00:55			
651	DUMMY	156.50	0	00:45			
652	DUMMY	49.77	0	01:05			
655	DUMMY	118.31	0	01:05			
656	DUMMY	58.75	0	01:05			
657	DUMMY	15.26	0	01:05			
658	DUMMY	78.22	0	01:00			
659	DUMMY	140.96	0	01:00			
660	DUMMY	36.60	0	01:10			
661	DUMMY	24.50	0	01:25			
700	CONDUIT	47.23	0	01:13	2.90	0.21	0.46
701	CONDUIT	43.27	0	00:54	4.46	0.10	0.31
702	CONDUIT	225.44	0	00:59	4.56	1.00	1.00
703	CONDUIT	117.79	0	00:46	2.19	1.00	1.00
1020	CONDUIT	95.99	0	00:29	4.48	1.00	1.00
1025	CONDUIT	414.28	0	00:40	7.47	1.00	1.00
1026	CONDUIT	198.63	0	01:14	7.45	0.49	0.70
1043	CONDUIT	19.45	0	00:39	4.12	1.00	1.00
1060	DUMMY	1439.70	0	01:15			
702_OVERFLOW	CONDUIT	66.35	0	01:41	2.88	0.00	0.04
703_OVERFLOW	CONDUIT	263.55	0	01:49	1.94	0.03	0.17
704	CONDUIT	89.42	0	00:52	4.91	0.24	0.49
705	CONDUIT	32.57	0	00:32	6.99	1.00	1.00
705_OVERFLOW	CONDUIT	78.02	0	00:58	4.10	0.00	0.05
706	CONDUIT	34.62	0	00:26	7.41	1.00	1.00
706_OVERFLOW	CONDUIT	390.65	0	00:52	5.39	0.01	0.13
708	CONDUIT	190.62	0	00:46	3.71	1.00	1.00
708_OVERFLOW	CONDUIT	219.03	0	01:22	3.63	0.01	0.11
709	CONDUIT	201.53	0	00:50	3.68	1.00	1.00
709_OVERFLOW	CONDUIT	307.49	0	01:34	3.08	0.02	0.14
710	CONDUIT	292.96	0	00:53	5.23	1.00	1.00
710_OVERFLOW	CONDUIT	275.06	0	01:37	3.11	0.01	0.11
712	CONDUIT	454.82	0	00:44	8.05	1.00	1.00
712_OVERFLOW	CONDUIT	1093.03	0	01:24	4.55	0.03	0.20
713	CONDUIT	352.21	0	00:42	6.32	1.00	1.00
713_OVERFLOW	CONDUIT	1419.22	0	01:29	4.13	0.06	0.26
714	CONDUIT	332.75	0	00:45	5.97	1.00	1.00
714_OVERFLOW	CONDUIT	1483.18	0	01:35	4.44	0.05	0.25
715	CONDUIT	78.01	0	00:58	3.24	0.37	0.61
716	CONDUIT	214.05	0	01:01	4.69	0.76	0.87
716_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
717	CONDUIT	229.62	0	00:50	4.14	1.00	1.00
717_OVERFLOW	CONDUIT	75.12	0	01:16	2.80	0.00	0.06
718	CONDUIT	162.81	0	00:48	4.12	0.71	0.85
719	CONDUIT	221.84	0	00:58	4.14	0.94	0.97
719_OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
720	CONDUIT	93.22	0	00:58	5.25	0.24	0.48
721	CONDUIT	187.99	0	00:50	3.45	1.00	1.00
721_OVERFLOW	CONDUIT	43.29	0	01:13	2.00	0.00	0.04
722	CONDUIT	15.18	0	00:34	3.29	1.00	1.00
722_OVERFLOW	CONDUIT	121.51	0	01:13	2.20	0.01	0.10
750	CONDUIT	295.82	0	00:41	5.27	1.00	1.00
750_OVERFLOW	CONDUIT	1131.58	0	01:21	3.76	0.05	0.23
OUTLET_1024	DUMMY	421.79	0	01:36			
OUTLET_1025	DUMMY	67.43	0	01:19			
OUTLET_1026	DUMMY	199.07	0	01:12			
OUTLET_1029	DUMMY	953.76	0	01:28			
OUTLET_1041	DUMMY	103.96	0	02:03			
OUTLET_1042	DUMMY	371.51	0	00:59			
OUTLET_1043	DUMMY	134.22	0	01:17			
OUTLET_1044	DUMMY	113.61	0	01:13			
OUTLET_1045A	DUMMY	620.23	0	01:21			
OUTLET_1045B	DUMMY	34.91	0	02:32			
OUTLET_1046	DUMMY	88.24	0	01:04			
OUTLET_1047	DUMMY	67.37	0	00:58			
OUTLET_1048	DUMMY	85.89	0	00:44			
OUTLET_1049	DUMMY	47.42	0	01:44			
OUTLET_1050	DUMMY	40.35	0	01:45			
OUTLET_1051	DUMMY	246.37	0	00:55			
OUTLET_1053	DUMMY	480.41	0	01:16			
OUTLET_1054	DUMMY	163.13	0	01:26			
OUTLET_1055	DUMMY	375.14	0	00:58			
OUTLET_1056	DUMMY	34.67	0	00:59			
OUTLET_1060	DUMMY	865.70	0	01:25			
OUTLET_1061	DUMMY	106.88	0	01:21			
OUTLET_1070	DUMMY	60.18	0	01:46			
OUTLET_1071	DUMMY	83.33	0	01:28			

****
Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
1045A	0.01	0.01	0.01	12.02	0.01
1045B	0.01	0.01	0.01	12.02	0.01
201	0.01	0.01	0.01	12.02	0.01
202	0.01	0.01	0.01	12.02	0.01
203	0.01	0.01	0.01	12.02	0.01
204	0.01	0.01	0.01	12.02	0.01
205	0.01	0.01	0.01	12.02	0.01
206	0.01	0.01	0.01	12.02	0.01
207	0.01	0.01	0.01	12.02	0.01
209	0.01	0.01	0.01	12.02	0.01
210	0.01	0.01	0.01	12.02	0.01
211	0.01	0.01	0.01	12.02	0.01
212	0.01	0.01	0.01	12.02	0.01
213	0.01	0.01	0.01	12.02	0.01
215	0.01	0.01	0.01	12.02	0.01
216	0.01	0.01	0.01	12.02	0.01
217	0.01	0.01	0.01	12.02	0.01
218	0.01	0.01	0.01	12.02	0.01
219	0.01	0.01	0.01	12.02	0.01
220	0.01	0.01	0.01	12.02	0.01
221	0.37	0.57	0.45	0.45	0.57
222	0.01	0.01	0.01	12.02	0.01
235	0.01	0.01	0.01	12.02	0.01
236	0.01	0.01	0.01	12.02	0.01
237	0.01	0.01	0.01	12.02	0.01
238	0.01	0.01	0.01	12.02	0.01
240	0.01	0.01	0.01	12.02	0.01
241	0.01	0.01	0.01	12.02	0.01
242	0.01	0.01	0.01	12.02	0.01
243	0.01	0.01	0.01	12.02	0.01
300	0.67	0.68	0.68	0.68	0.68
303	2.25	2.28	2.28	0.01	2.28
305	0.01	0.01	0.01	12.02	0.01
306	1.62	1.68	1.65	1.65	1.68
308	3.33	3.37	3.37	3.37	3.37
311	1.78	1.88	1.83	0.01	1.88
312	2.20	2.25	2.23	2.23	2.25
313	2.38	2.42	2.42	0.01	2.42
315	4.75	4.85	4.82	4.82	4.85
317	5.05	5.10	5.07	5.07	5.10
318	4.87	4.93	4.90	4.90	4.93
319	5.07	5.20	5.13	5.13	5.20
320	1.95	2.00	1.98	0.01	2.00
322	3.78	3.85	3.82	3.82	3.85
323	0.01	0.01	0.01	12.02	0.01
400	0.01	0.01	0.01	12.02	0.01
401	0.01	0.01	0.01	12.02	0.01
410	0.01	0.01	0.01	12.02	0.01
411	0.01	0.01	0.01	12.02	0.01
412	0.01	0.01	0.01	12.02	0.01
414	0.01	0.01	0.01	12.02	0.01
415	0.01	0.01	0.01	12.02	0.01
416	0.01	0.01	0.01	12.02	0.01
417	0.01	0.01	0.01	12.02	0.01
418	0.01	0.01	0.01	12.02	0.01
419	0.01	0.01	0.01	12.02	0.01
423	0.01	0.01	0.01	12.02	0.01
424	0.01	0.01	0.01	12.02	0.01
425	0.01	0.01	0.01	12.02	0.01
426	0.01	0.01	0.01	12.02	0.01
427	0.01	0.01	0.01	12.02	0.01
428	0.01	0.01	0.01	12.02	0.01

429	0.01	0.01	0.01	12.02	0.01
430	0.01	0.01	0.01	12.02	0.01
431	0.01	0.01	0.01	12.02	0.01
432	0.01	0.01	0.01	12.02	0.01
433	0.01	0.01	0.01	12.02	0.01
435	0.01	0.01	0.01	12.02	0.01
436	0.01	0.01	0.01	12.02	0.01
437	0.01	0.01	0.01	12.02	0.01
440	0.01	0.01	0.01	12.02	0.01
441	0.01	0.01	0.01	12.02	0.01
442	0.01	0.01	0.01	12.02	0.01
443	0.01	0.01	0.01	12.02	0.01
444	0.01	0.01	0.01	12.02	0.01
445	0.01	0.01	0.01	12.02	0.01
446	0.01	0.01	0.01	12.02	0.01
447	0.01	0.01	0.01	12.02	0.01
448	0.01	0.01	0.01	12.02	0.01
449	0.01	0.01	0.01	12.02	0.01
450	0.01	0.01	0.01	12.02	0.01
451	0.01	0.01	0.01	12.02	0.01
452	0.01	0.01	0.01	12.02	0.01
453	0.01	0.01	0.01	12.02	0.01
454	0.15	0.23	0.18	0.18	0.23
455	0.01	0.01	0.01	12.02	0.01
456	0.01	0.01	0.01	12.02	0.01
457	0.01	0.01	0.01	12.02	0.01
458	0.01	0.01	0.01	12.02	0.01
459	0.01	0.01	0.01	12.02	0.01
461	0.01	0.01	0.01	12.02	0.01
462	0.01	0.01	0.01	12.02	0.01
463	0.01	0.01	0.01	12.02	0.01
464	0.01	0.01	0.01	12.02	0.01
465	0.01	0.01	0.01	12.02	0.01
466	0.01	0.01	0.01	12.02	0.01
467	0.01	0.01	0.01	12.02	0.01
468	0.01	0.01	0.01	12.02	0.01
470	0.01	0.01	0.01	12.02	0.01
471	0.01	0.01	0.01	12.02	0.01
472	0.01	0.01	0.01	12.02	0.01
473	0.01	0.01	0.01	12.02	0.01
474	0.01	0.01	0.01	12.02	0.01
475	0.01	0.01	0.01	12.02	0.01
476	0.01	0.01	0.01	12.02	0.01
477	0.01	0.01	0.01	12.02	0.01
478	0.01	0.01	0.01	12.02	0.01
480	0.01	0.01	0.01	12.02	0.01
481	0.01	0.01	0.01	12.02	0.01
482	0.01	0.01	0.01	12.02	0.01
483	0.01	0.01	0.01	12.02	0.01
484	0.01	0.01	0.01	12.02	0.01
485	0.01	0.01	0.01	12.02	0.01
486	0.01	0.01	0.01	12.02	0.01
487	0.01	0.01	0.01	12.02	0.01
488	0.01	0.01	0.01	12.02	0.01
489	0.01	0.01	0.01	12.02	0.01
490	0.01	0.01	0.01	12.02	0.01
491	0.01	0.01	0.01	12.02	0.01
492	0.01	0.01	0.01	12.02	0.01
494	0.01	0.01	0.01	12.02	0.01
495	0.01	0.01	0.01	12.02	0.01
496	0.01	0.01	0.01	12.02	0.01
497	0.01	0.01	0.01	12.02	0.01
499	0.01	0.01	0.01	12.02	0.01
500	0.42	0.48	0.47	0.01	0.48
501	0.70	0.75	0.73	0.73	0.75
502	1.08	1.15	1.12	0.01	1.15
503	1.20	1.30	1.25	1.25	1.30
504	1.43	1.57	1.50	1.50	1.57
505	1.72	1.73	1.72	0.01	1.73
507	0.28	0.40	0.32	0.01	0.40
512	0.78	0.86	0.83	0.83	0.86
514	0.47	0.47	0.47	0.01	0.47
522	0.32	0.42	0.35	0.01	0.42
523	1.02	1.07	1.05	1.05	1.07
525	0.82	0.85	0.83	0.01	0.85
530	1.00	1.05	1.02	1.02	1.05
531	1.10	1.15	1.13	1.13	1.15
532	3.07	3.20	3.12	3.12	3.20
534	0.83	0.85	0.83	0.83	0.85
538	0.85	0.98	0.92	0.01	0.98
539	1.40	1.47	1.43	1.43	1.47
541	1.02	1.08	1.05	0.01	1.08
542	1.60	1.65	1.63	0.05	1.65
543	0.95	1.00	0.97	1.02	1.00
600	0.01	0.01	0.01	12.02	0.01
601	0.01	0.01	0.01	12.02	0.01
602	0.01	0.01	0.01	12.02	0.01
603	0.01	0.01	0.01	12.02	0.01
604	0.01	0.01	0.01	12.02	0.01
605	0.01	0.01	0.01	12.02	0.01
606	0.01	0.01	0.01	12.02	0.01
607	0.01	0.01	0.01	12.02	0.01
608	0.01	0.01	0.01	12.02	0.01
609	0.01	0.01	0.01	12.02	0.01
610	0.01	0.01	0.01	12.02	0.01
611	0.01	0.01	0.01	12.02	0.01
612	0.01	0.01	0.01	12.02	0.01
613	0.01	0.01	0.01	12.02	0.01
614	0.01	0.01	0.01	12.02	0.01
615	0.01	0.01	0.01	12.02	0.01
616	0.01	0.01	0.01	12.02	0.01
617	0.01	0.01	0.01	12.02	0.01
618	0.01	0.01	0.01	12.02	0.01
619	0.01	0.01	0.01	12.02	0.01
620	0.01	0.01	0.01	12.02	0.01
621	0.01	0.01	0.01	12.02	0.01
622	0.01	0.01	0.01	12.02	0.01
623	0.01	0.01	0.01	12.02	0.01
624	0.01	0.01	0.01	12.02	0.01
627	0.01	0.01	0.01	12.02	0.01
629	0.01	0.01	0.01	12.02	0.01
630	0.01	0.01	0.01	12.02	0.01
631	0.01	0.01	0.01	12.02	0.01
633	0.01	0.01	0.01	12.02	0.01
634	0.01	0.01	0.01	12.02	0.01
638	0.01	0.01	0.01	12.02	0.01
639	0.01	0.01	0.01	12.02	0.01
640	0.01	0.01	0.01	12.02	0.01
641	0.01	0.01	0.01	12.02	0.01
645	0.01	0.01	0.01	12.02	0.01
646	0.01	0.01	0.01	12.02	0.01
647	0.01	0.01	0.01	12.02	0.01
648	0.01	0.01	0.01	12.02	0.01
650	0.01	0.01	0.01	12.02	0.01
651	0.01	0.01	0.01	12.02	0.01
652	0.01	0.01	0.01	12.02	0.01
655	0.01	0.01	0.01	12.02	0.01
656	0.01	0.01	0.01	12.02	0.01
657	0.01	0.01	0.01	12.02	0.01
658	0.01	0.01	0.01	12.02	0.01
659	0.01	0.01	0.01	12.02	0.01
660	0.01	0.01	0.01	12.02	0.01
661	0.01	0.01	0.01	12.02	0.01
702	0.70	0.98	0.78	0.78	0.98
703	2.10	2.23	2.18	2.18	2.23
1020	5.25	5.30	5.28	5.28	5.30
1025	0.77	0.82	0.78	0.01	0.82
1043	2.33	2.37	2.37	2.37	2.37
1060	0.01	0.01	0.01	12.02	0.01
705	1.30	1.37	1.33	0.01	1.37
706	1.98	2.00	2.00	0.01	2.00
708	0.90	1.10	1.02	1.02	1.10
709	1.50	1.63	1.55	0.01	1.63
710	1.55	1.62	1.57	1.57	1.62
712	2.25	2.32	2.27	2.27	2.32
713	2.78	2.85	2.82	0.01	2.85
714	2.95	3.03	2.98	2.98	3.03
717	0.62	0.70	0.67	0.67	0.70
721	0.40	0.57	0.45	0.01	0.57
722	3.03	3.12	3.08	3.08	3.12
750	2.60	2.67	2.63	0.01	2.67

Analysis begun on: Mon Jan 20 09:54:48 2014
Analysis ended on: Mon Jan 20 09:54:48 2014
Total elapsed time: < 1 sec

APPENDIX H
CONCEPTUAL DESIGN MAP

CLICK HERE TO VIEW FULL-SIZE MAP

CLICK HERE TO VIEW PRESET 11 X 17 PRINTABLE MAPS

APPENDIX I
CONCEPTUAL DESIGN PROFILE

CLICK HERE TO VIEW FULL-SIZE PROFILE

CLICK HERE TO VIEW PRESET 11 X 17 PRINTABLE PROFILES

STREET DATA TABLE

STREET CLASSIFICATION	ROW WIDTH	FL-FL WIDTH	CURB TYPE	SIDEWALK WIDTH
LOCAL STREET	60'	34'	MOUNTABLE	5'
COLLECTOR STREET	80'	52'	VERTICAL	5'
MINOR ARTERIAL	60' TO SECTION LINE 120' ULTIMATE SECTION	38' TO SECTION LINE 72' ULTIMATE SECTION	VERTICAL	8'
PRINCIPAL ARTERIAL	140'	100'	VERTICAL	8'
COUNTY LINE ROAD RE-ALIGNMENT (ROAD O)	80'	36'	VERTICAL	8'

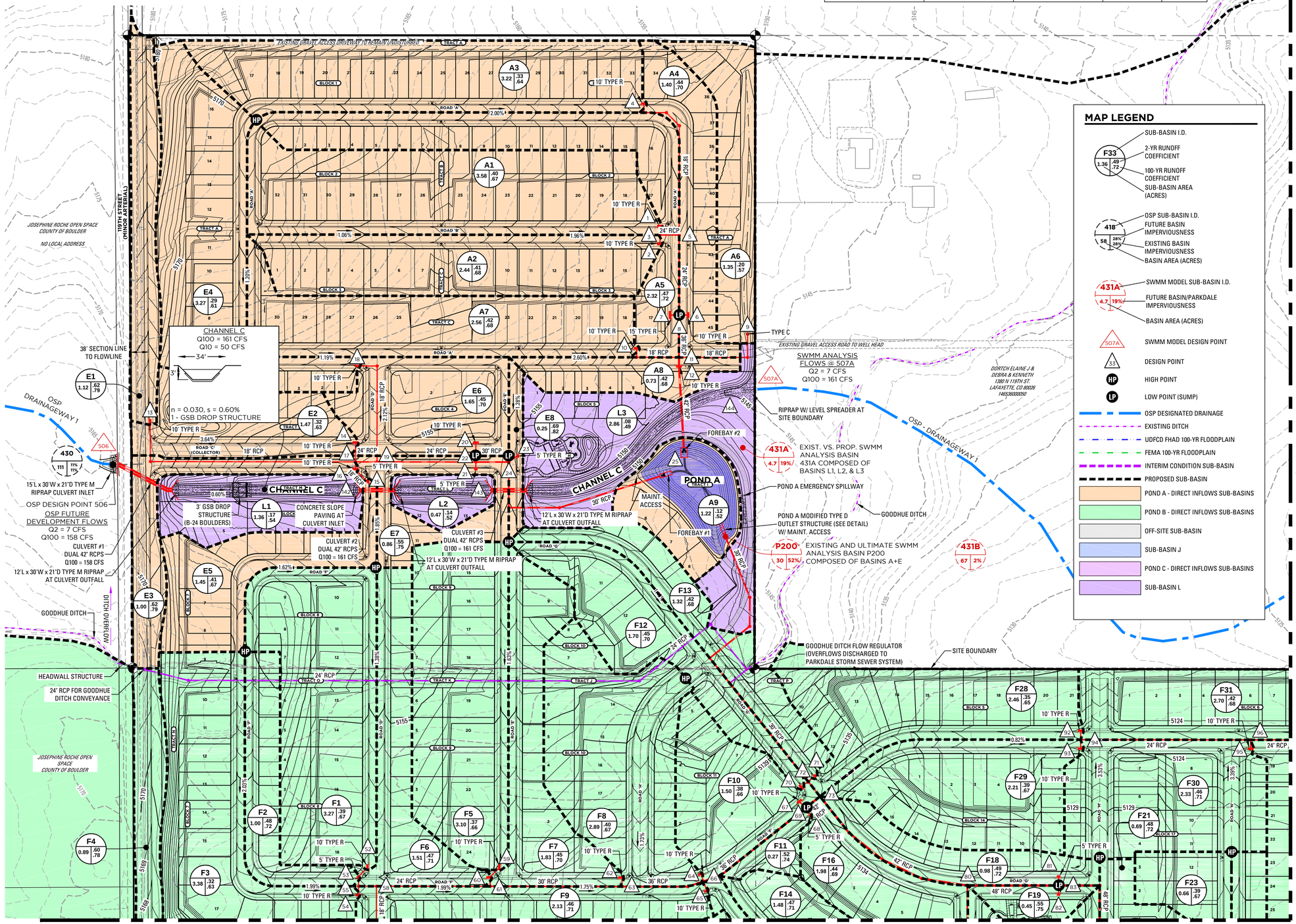
GENERAL DRAINAGE MAP NOTES

1. ALL STREETS ARE LOCAL UNLESS OTHERWISE NOTED. PLEASE SEE STREET DATA TABLE FOR ROW WIDTH, FLOWLINE WIDTH, CURB TYPE AND SIDEWALK WIDTH.

N

100 0 50 100 200

SCALE: 1"= 100' HORIZ.



MAP LEGEND

- SUB-BASIN I.D.
- 2-YR RUNOFF COEFFICIENT
- 100-YR RUNOFF COEFFICIENT
- SUB-BASIN AREA (ACRES)
- OSP SUB-BASIN I.D.
- FUTURE BASIN IMPERVIOUSNESS
- EXISTING BASIN IMPERVIOUSNESS
- BASIN AREA (ACRES)
- SWMM MODEL SUB-BASIN I.D.
- FUTURE BASIN/PARKDALE IMPERVIOUSNESS
- BASIN AREA (ACRES)
- SWMM MODEL DESIGN POINT
- DESIGN POINT
- HIGH POINT
- LOW POINT (SUMP)
- OSP DESIGNATED DRAINAGE
- EXISTING DITCH
- UDFCD FHAD 100-YR FLOODPLAIN
- FEMA 100-YR FLOODPLAIN
- INTERIM CONDITION SUB-BASIN
- PROPOSED SUB-BASIN
- POND A - DIRECT INFLOWS SUB-BASINS
- POND B - DIRECT INFLOWS SUB-BASINS
- OFF-SITE SUB-BASIN
- SUB-BASIN J
- POND C - DIRECT INFLOWS SUB-BASINS
- SUB-BASIN L

DESIGN POINT	BASIN	DEVELOPED RUNOFF DIRECT RUNOFF Q2 CFS	DIRECT RUNOFF Q100 CFS	ROUTED FLOWRATES Q2 CFS	ROUTED FLOWRATES Q100 CFS
1	A1	3.2	14.7	-	-
2	A2	2.3	10.1	-	-
3	A1+A2	-	-	5.5	16.9
4	A3	2.4	12.5	-	-
5	A1+A2+A3	-	-	7.6	24.6
6	A4	1.5	6.5	-	-
7	A5	2.6	10.7	-	-
8	A1+A2+A3+A4+A5	-	-	11.2	53.9
9	A6	0.6	4.5	-	-
10	A7	2.6	11.4	-	-
11	A1 THRU A7	-	-	14.0	65.3
12	A8	1.0	4.2	14.7	68.2
13	E1	2.0	6.8	-	-
14	E2	1.2	6.4	-	-
15	E5	1.4	6.3	-	-
16	E3	1.8	6.1	2.9	7.9
17	E1+E2+E3+E5	-	-	5.8	18.4
18	E4	2.0	11.2	-	-
19	E1+E2+E3+E4+E5	-	-	6.9	23.7
20	E6	2.1	8.8	-	-
21	E7	1.2	4.4	-	-
22	E1 THRU E7	-	-	9.2	39.2
23	E8	0.6	1.9	-	-
24	E1 THRU E8	-	-	9.6	40.3
25	A9	0.4	4.4	-	-
26	B1	5.2	20.7	-	-
27	B2	6.6	24.9	-	-
28	B1+B2	-	-	11.2	29.8
29	B6	3.9	25.4	-	-
30	B5	1.8	6.1	5.0	29.3
31	B4	2.1	10.4	6.5	41.9
32	B1+B2+B4+B5+B6	-	-	14.2	62.4
33	B3	1.8	6.8	15.3	71.8
34	B9	2.4	10.2	-	-
35	B1+B2+B3+B4+B5+B6+B9	-	-	16.7	78.5
36	B10	1.0	5.5	17.0	81.3
37	B11	2.8	2.9	17.6	82.9
38	B8	2.7	11.4	-	-
39	B7	3.6	15.1	-	-
40	B7+B8	-	-	6.1	14.3
41	C1	2.3	10.3	-	-
42	C2	0.5	2.4	-	-
43	B7+B8+C1+C2	-	-	8.1	23.5
44	C4	1.1	3.1	-	-
45	C3	1.3	6.4	-	-
46	C3+C4	-	-	2.1	7.8
47	B7+B8+C1+C2+C3+C4	-	-	9.8	29.6
48	D1	3.4	16.9	-	-
49	D2	0.4	1.6	-	-
50	D1+D2	-	-	3.7	17.9
52	F1	3.3	15.2	-	-
53	F2	1.3	5.4	4.6	12.2
54	F3	2.5	13.1	-	-
55	F1+F2+F3	-	-	6.5	23.8
56	F4	1.5	5.3	-	-
57	F4A	0.1	2.1	1.5	6.7
58	F1+F2+F3+F4+F4A	-	-	7.8	29.5
59	F5	2.5	11.9	-	-
60	F6	2.0	8.1	4.0	16.6
61	F1+F2+F3+F4+F4A+F5+F6	-	-	11.4	44.7
62	F7	2.0	8.2	-	-
63	F1 THRU F7	-	-	13.0	52.3
64	F8	2.6	11.8	-	-
65	F9	2.2	9.4	-	-
66	F1 THRU F9	-	-	17.2	68.3
67	F10	1.6	7.6	-	-
68	F11	0.5	1.8	-	-
69	F1 THRU F11	-	-	18.4	81.0
70	F12	2.0	8.2	-	-
71	F13	1.5	6.5	-	-
72	F12+F13	-	-	3.4	10.4
73	F1 THRU F13	-	-	21.0	89.1
74	F14	1.4	6.2	-	-
75	F15	2.3	9.4	-	-
76	F14+F15	-	-	3.6	11.6
77	F16	2.3	9.9	-	-
78	F17	1.5	6.4	-	-
79	F14+F15+F16+F17	-	-	6.8	30.5
80	F1 THRU F17	-	-	26.7	115.2
81	F18	1.3	5.3	-	-
82	F19	0.8	3.0	-	-
83	F1 THRU F19	-	-	27.8	120.0
84	F20	1.5	6.3	-	-
85	F1 THRU F20	-	-	28.5	123.8
86	F23	0.6	2.8	-	-
87	F21	1.0	4.0	1.4	4.3
88	F25	0.9	4.0	-	-
89	F24	1.1	5.1	1.9	5.8
90	F22	1.1	4.5	2.9	8.2
91	F1 THRU F25	-	-	31.9	133.2
92	F28	2.0	9.8	-	-
93	F29	2.1	9.7	-	-
94	F28+F29	-	-	4.0	12.8
95	F30	2.7	11.0	-	-
96	F28+F29+F30	-	-	6.2	20.7
97	F33	1.0	5.5	-	-
98	F34	1.6	6.7	2.5	11.8
99	F31	2.7	11.6	5.0	24.4
100	F32	2.0	9.0	-	-
101	F28 THRU F34	-	-	12.7	53.1
102	F26	1.2	5.2	13.2	57.0
103	F27	1.5	6.4	-	-
104	F1 THRU F34	-	-	44.5	194.2
105	F35	1.5	4.2	-	-
106	F1 THRU F35	-	-	44.5	195.3
107	F1 THRU F35+D1+D2	-	-	46.8	206.7
108	D3	2.5	7.0	-	-
109	F1 THRU F35+D1+D2+D3	-	-	48.3	210.3
110	G1	2.7	11.2	-	-
111	G2	1.4	5.8	-	-
112	G1+G2	-	-	4.0	10.7
113	G3	2.2	9.4	-	-
114	G1+G2+G3	-	-	5.8	22.4
115	G4	1.4	5.1	6.9	27.2
504	OSP BASIN 424	1.0	86.0	-	-
116	G5	1.3	9.3	-	-
117	G6	0.3	36.0	1.3	43.2
118	G5+G6+OSP 424	-	-	2.3	129.2
119	FUT. DUAL 48" RCPS	131.0	222.0	-	-
120	G11	0.5	1.8	-	-
121	G12	0.4	1.1	0.8	2.9
122	G7	48.5	163.3	-	-
P50	CHANNEL A	135.0	534.0	-	-
123	G8	0.4	15.3	-	-
124	G9A	1.3	15.1	-	-
P50	G1 THRU G8+G11+G12+OSP 424	-	-	135.0	534.0
125	G9	1.1	55.6	-	-
126	G10	0.3	34.7	-	-
127	I2	2.9	9.3	-	-
128	I1	2.6	10.6	5.1	18.6
P50	BOX CULVERT	-	-	135.0	534.0
503	OSP 417+418+UPSTREAM	-	-	311.0	1514.0
900	OSP 416+417+418+UPSTREAM	-	-	275.0	1536.0
133	J3	0.3	12.8	-	-
134	J1	2.9	10.2	-	-
135	J2	2.2	7.6	-	-
136	J1+J2	-	-	5.2	18.0
137	K1	1.7	14.3	-	-
138	K2	0.7	2.2	2.1	15.6
139	K3	0.7	2.1	2.5	16.7
140	K4	0.0	0.7	-	-
140	K1+K2+K3+K4	-	-	2.5	17.1
506	OSP 430	7.0	158.0	-	-
142	L1	0.5	4.3	-	-
143	L2	0.2	1.9	-	-
144	L3	0.4	7.1	-	-
507A	OSP BASIN 430+431A	-	-	7.0	161.0
507B	OSP BASIN 430+431A+431B	-	-	6.0	242.0
146	OS1	0.5	22.0	-	-
147	L4	0.6	9.3	-	-
508A	OSP BASINS 430+431A+431B+432A	-	-	6.0	296.0
148	J4	1.0	19.2	-	-

DATE SUBMITTED: 05.19.2017

REVISION NO.	DATE
1	10.02.2017
2	01.23.2018
3	04.16.2018
4	
5	

PREPARED FOR:
OEO, LLC
7353 SOUTH ALTON WAY
CENTENNIAL, CO 80112
303.770.9111

SCALE: 1" = 100' | JOB NO: 0043-1532 | BY: OKK

SHEET 1 OF 5

KT ENGINEERING
ENGINEERS • SURVEYORS
12500 W. 58th AVE. #230
ARVADA, CO 80002
PH: 720.638.5190

MATCHLINE - SEE SHEET 1

MATCHLINE - SEE SHEET 4

TINA AND STEVE ZAKANAY
1130 N. 119TH ST.
LAFAYETTE, CO.
RN 2331762

CITY OF LAFAYETTE
597 N. 119TH ST.
LAFAYETTE, CO.

MAIL:
1290 S. PUBLIC RD.
LAFAYETTE, CO. 80026
146535400024

119TH STREET (MINOR ARTERIAL)

TERENCE R. BUSS
1010 N. 119TH ST.
LAFAYETTE, CO. 80026-9411
146536000017

EXIST. 24" RCP CULVERT

OSP - DRAINAGEWAY 2 NORTH

OSP DESIGN POINT 504
OSP FUTURE DEVELOPMENT FLOWS
Q2 = 1 CFS
Q100 = 86 CFS

NEIL S. BRESLER
1002 N. 119TH ST.
LAFAYETTE, CO. 80026-9411
146536000016
LSP-88-0002

WANEKA BISHOP LATERAL

DUAL 48" RCP CULVERTS PER OSP (DIVERSION PIPES FROM FUTURE REGIONAL DETENTION POND - BY OTHERS)
MAX. CONVEYANCE PER OSP = 222 CFS

DITCH OVERFLOW

BASIN 416 MODIFIED TO 416U TO ACCOUNT FOR LESS AREA AREA CONVEYED TO REG. POND IN ULTIMATE SWMM MODEL W/ REG. POND

CITY OF LAFAYETTE
597 N. 119TH ST.
LAFAYETTE, CO.

MAIL:
1290 S. PUBLIC RD.
LAFAYETTE, CO. 80026
146535400024

DITCH OVERFLOW

CHARLES & LOIS WANEKA
11781 BASELINE RD.
LAFAYETTE, CO. 80026-9416
146535400012

FUTURE REGIONAL DETENTION POND OUTFLOWS (BY OTHERS)
Q100 = 644 CFS

W/O REGIONAL DETENTION
Q100 = 1514 CFS

SWMM ANALYSIS FLOWS
@ 503 W/ REG. POND (ULT)
Q2 = 71 CFS, Q100 = 646 CFS

SWMM ANALYSIS FLOWS
@ 503 W/O REG. POND (EX)
Q2 = 311 CFS, Q100 = 1,514 CFS

BASIN 417 MODIFIED TO 417U TO ACCOUNT FOR ADDITIONAL AREA CONVEYED TO DP 503 IN ULTIMATE SWMM MODEL W/ REG. POND

STATE HIGHWAY NO. 7 (BASELINE ROAD)

OSP - DRAINAGEWAY 2 SOUTH

CHANNEL A TO DP 116
Q100 = 129 CFS
29.6'
3.7'
n = 0.030, s = 0.55%
NO DROPS

14'L x 46'W TYPE M RIPRAP TO CULVERT INLET
CULVERT #5
DOUBLE 6'W x 5'H BOX
Q100 = 534 CFS
GROUTED BOULDER STILLING BASIN AT CULVERT OUTFALL (B-24 BOULDERS) (27'L x 48'W)

SWMM ANALYSIS FLOWS @ P50
Q2 = 135 CFS
Q100 = 534 CFS

P100 91 50% SWMM ANALYSIS BASIN P100 COMPOSED OF ALL G+I BASINS (EXCEPT G9, G10)

ARLENE PENNER
12177 BASELINE RD.
LAFAYETTE, CO. 80026
146536000019

CHANNEL A DP P50 TO DP 121
Q100 = 534 CFS
Q10 = 296 CFS
54'
4.75'
16'
n = 0.030, s = 0.30%
3 - GSB DROP STRUCTURES

JOE & ELLA MASTERS
12257 BASELINE RD.
LAFAYETTE, CO. 80026-9418
146536000027

14'L x 46'W TYPE M RIPRAP TO CULVERT INLET

3' GSB DROP STRUCTURE (B-24 BOULDERS)

CULVERT #6
DOUBLE 6'W x 5'H BOX
Q100 = 534 CFS

3' GSB DROP STRUCTURE AT CULVERT OUTLET (B-24 BOULDERS) (27'L x 48'W)

MAP LEGEND

- SUB-BASIN I.D.
- 2-YR RUNOFF COEFFICIENT
- 100-YR RUNOFF COEFFICIENT
- SUB-BASIN AREA (ACRES)
- OSP SUB-BASIN I.D.
- FUTURE BASIN IMPERVIOUSNESS
- EXISTING BASIN IMPERVIOUSNESS
- BASIN AREA (ACRES)
- SWMM MODEL SUB-BASIN I.D.
- FUTURE BASIN/PARKDALE IMPERVIOUSNESS
- BASIN AREA (ACRES)
- SWMM MODEL DESIGN POINT
- DESIGN POINT
- HIGH POINT
- LOW POINT (SUMP)
- OSP DESIGNATED DRAINAGE
- EXISTING DITCH
- UDFCD FHAD 100-YR FLOODPLAIN
- FEMA 100-YR FLOODPLAIN
- INTERIM CONDITION SUB-BASIN
- PROPOSED SUB-BASIN
- POND A - DIRECT INFLOWS SUB-BASINS
- POND B - DIRECT INFLOWS SUB-BASINS
- OFF-SITE SUB-BASIN
- SUB-BASIN J
- POND C - DIRECT INFLOWS SUB-BASINS
- SUB-BASIN L

N

100 0 50 100 200
SCALE: 1"= 100' HORIZ.

GENERAL DRAINAGE MAP NOTES

1. ALL STREETS ARE LOCAL UNLESS OTHERWISE NOTED. PLEASE SEE STREET DATA TABLE FOR ROW WIDTH, FLOWLINE WIDTH, CURB TYPE AND SIDEWALK WIDTH.

STREET DATA TABLE

STREET CLASSIFICATION	ROW WIDTH	FL-FL WIDTH	CURB TYPE	SIDEWALK WIDTH
LOCAL STREET	60'	34'	MOUNTABLE	5'
COLLECTOR STREET	80'	52'	VERTICAL	5'
MINOR ARTERIAL	60' TO SECTION LINE 120' ULTIMATE SECTION	38' TO SECTION LINE 72' ULTIMATE SECTION	VERTICAL	8'
PRINCIPAL ARTERIAL	140'	100'	VERTICAL	8'
COUNTY LINE ROAD RE-ALIGNMENT (ROAD O)	80'	36'	VERTICAL	8'

DEVELOPED RUNOFF

DESIGN POINT	BASIN	DIRECT RUNOFF Q2 CFS	DIRECT RUNOFF Q100 CFS	ROUTED FLOWRATES Q2 CFS	ROUTED FLOWRATES Q100 CFS
1	A1	3.2	14.7	-	-
2	A2	2.3	10.1	-	-
3	A1+A2	-	-	5.5	16.9
4	A3	2.4	12.5	-	-
5	A1+A2+A3	-	-	7.6	24.6
6	A4	1.5	6.5	-	-
7	A5	2.6	10.7	-	-
8	A1+A2+A3+A4+A5	-	-	11.2	53.9
9	A6	0.6	4.5	-	-
10	A7	2.6	11.4	-	-
11	A1 THRU A7	-	-	14.0	65.3
12	A8	1.0	4.2	14.7	68.2
13	E1	2.0	6.8	-	-
14	E2	1.2	6.4	-	-
15	E5	1.4	6.3	-	-
16	E3	1.8	6.1	2.9	7.9
17	E1+E2+E3+E5	-	-	5.8	18.4
18	E4	2.0	11.2	-	-
19	E1+E2+E3+E4+E5	-	-	6.9	23.7
20	E6	2.1	8.8	-	-
21	E7	1.2	4.4	-	-
22	E1 THRU E7	-	-	9.2	39.2
23	E8	0.6	1.9	-	-
24	E1 THRU E8	-	-	9.6	40.3
25	A9	0.4	4.4	-	-
26	B1	5.2	20.7	-	-
27	B2	0.6	24.9	-	-
28	B1+B2	-	-	11.2	29.8
29	B6	3.9	25.4	-	-
30	B5	1.8	6.1	5.0	29.3
31	B4	2.1	10.4	6.5	41.9
32	B1+B2+B4+B5+B6	-	-	14.2	62.4
33	B3	1.8	6.8	15.3	71.8
34	B9	2.4	10.2	-	-
35	B1+B2+B3+B4+B5+B6+B9	-	-	16.7	78.5
36	B10	1.0	5.5	17.0	81.3
37	B11	2.8	2.9	17.6	82.9
38	B8	2.7	11.4	-	-
39	B7	3.6	15.1	-	-
40	B7+B8	-	-	6.1	14.3
41	C1	2.3	10.3	-	-
42	C2	0.5	2.4	-	-
43	B7+B8+C1+C2	-	-	8.1	23.5
44	C4	1.1	3.1	-	-
45	C3	1.3	6.4	-	-
46	C3+C4	-	-	2.1	7.8
47	B7+B8+C1+C2+C3+C4	-	-	9.8	29.6
48	D1	3.4	16.9	-	-
49	D2	0.4	1.6	-	-
50	D1+D2	-	-	3.7	17.9
51	F1	3.3	15.2	-	-
52	F2	1.3	5.4	4.6	12.2
53	F3	2.5	13.1	-	-
54	F1+F2+F3	-	-	6.5	23.8
55	F4	1.5	5.3	-	-
56	F4A	0.1	2.1	1.5	6.7
57	F1+F2+F3+F4+F4A	-	-	7.8	29.5
58	F5	2.5	11.9	-	-
59	F6	2.0	8.1	4.0	16.6
60	F1+F2+F3+F4+F4A+F5+F6	-	-	11.4	44.7
61	F7	2.0	8.2	-	-
62	F1 THRU F7	-	-	13.0	52.3
63	F8	2.6	11.8	-	-
64	F9	2.2	9.4	-	-
65	F1 THRU F9	-	-	17.2	68.3
66	F10	1.6	7.6	-	-
67	F11	0.5	1.8	-	-
68	F1 THRU F11	-	-	18.4	81.0
69	F12	2.0	8.2	-	-
70	F13	1.5	6.5	-	-
71	F12+F13	-	-	3.4	10.4
72	F1 THRU F13	-	-	21.0	89.1
73	F14	1.4	6.2	-	-
74	F15	2.3	9.4	-	-
75	F14+F15	-	-	3.6	11.6
76	F16	2.3	9.9	-	-
77	F17	1.5	6.4	-	-
78	F14+F15+F16+F17	-	-	6.8	30.5
79	F1 THRU F17	-	-	26.7	115.2
80	F18	1.3	5.3	-	-
81	F19	0.8	3.0	-	-
82	F1 THRU F19	-	-	27.8	120.0
83	F20	1.5	6.3	-	-
84	F1 THRU F20	-	-	28.5	123.8
85	F23	0.6	2.8	-	-
86	F21	1.0	4.0	1.4	4.3
87	F25	0.9	4.0	-	-
88	F24	1.1	5.1	1.9	5.8
89	F22	1.1	4.5	2.9	8.2
90	F1 THRU F25	-	-	31.9	133.2
91	F28	2.0	9.8	-	-
92	F29	2.1	9.7	-	-
93	F28+F29	-	-	4.0	12.8
94	F30	2.7	11.0	-	-
95	F28+F29+F30	-	-	6.2	20.7
96	F33	1.0	5.5	-	-
97	F34	1.6	6.7	2.5	11.8
98	F31	2.7	11.6	5.0	24.4
99	F32	2.0	9.0	-	-
100	F28 THRU F34	-	-	12.7	53.1
101	F26	1.2	5.2	13.2	57.0
102	F27	1.5	6.4	-	-
103	F1 THRU F34	-	-	44.5	194.2
104	F35	1.5	4.2	-	-
105	F1 THRU F35	-	-	44.5	195.3
106	F1 THRU F35+D1+D2	-	-	46.8	206.7
107	D3	2.5	7.0	-	-
108	F1 THRU F35+D1+D2+D3	-	-	48.3	210.3
109	G1	2.7	11.2	-	-
110	G2	1.4	5.8	-	-
111	G1+G2	-	-	4.0	10.7
112	G3	2.2	9.4	-	-
113	G1+G2+G3	-	-	5.8	22.4
114	G4	1.4	5.1	6.9	27.2
504	OSP BASIN 424	1.0	86.0	-	-
115	G5	1.3	9.3	-	-
116	G6	0.3	36.0	1.3	43.2
116	G5+G6+OSP 424	-	-	2.3	129.2
117	FUT. DUAL 48" RCPS	121.0	222.0	-	-
118	G11	0.5	1.8	-	-
119	G12	0.4	1.1	0.8	2.9
120	G7	48.5	163.3	-	-
P50	CHANNEL A	135.0	534.0	-	-
121	G8	0.4	15.3	-	-
122	G9A	1.3	15.1	-	-
P30	G1 THRU G8+G11+G12+OSP 424	-	-	135.0	534.0
123	G9	1.1	55.6	-	-
124	G10	0.3	34.7	-	-
125	I2	2.9	9.3	-	-
126	J1	2.6	10.6	5.1	18.6
P50	BOX CULVERT	-	-	135.0	534.0
503	OSP 417+416+UPSTREAM	-	-	311.0	1514.0
900	OSP 416+417+418+UPSTREAM	-	-	275.0	1536.0
133	J3	0.3	12.8	-	-
134	J1	2.9	10.2	-	-
135	I2	2.2	7.6	-	-
136	J1+I2	-	-	5.2	18.0
137	K1	1.7	14.3	-	-
138	K2	0.7	2.2	2.1	15.6
139	K3	0.7	2.1	2.5	16.7
140	K4	0.0	0.7	-	-
140	K1+K2+K3+K4	-	-	2.5	17.1
506	OSP 430	7.0	158.0	-	-
142	L1	0.5	4.3	-	-
143	L2	0.2	1.9	-	-
144	L3	0.4	7.1	-	-
507A	OSP BASIN 430+431A	-	-	7.0	161.0
507B	OSP BASIN 430+431A+431B	-	-	6.0	242.0
146	OS1	0.5	22.0	-	-
147	L4	0.6	9.3	-	-
508A	OSP BASINS 430+431A+431B+432A	-	-	6.0	256.0
148	J4	1.0	19.2	-	-

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5	

PREPARED FOR:
OEO, LLC
7353 SOUTH ALTON WAY
CENTENNIAL, CO 80112
303.770.9111

SCALE:	JOB NO:	BY:
1" = 100'	0043-1532	OKK

SHEET 2 OF 5

KT ENGINEERING
ENGINEERS • SURVEYORS
12500 W. 58th AVE. #230
ARVADA, CO 80002
PH: 720.638.5190

GENERAL DRAINAGE MAP NOTES

1. ALL STREETS ARE LOCAL UNLESS OTHERWISE NOTED. PLEASE SEE STREET DATA TABLE FOR ROW WIDTH, FLOWLINE WIDTH, CURB TYPE AND SIDEWALK WIDTH.

STREET DATA TABLE

STREET CLASSIFICATION	ROW WIDTH	FL-FL WIDTH	CURB TYPE	SIDEWALK WIDTH
LOCAL STREET	60'	34'	MOUNTABLE	5'
COLLECTOR STREET	80'	52'	VERTICAL	5'
MINOR ARTERIAL	60' TO SECTION LINE 120' ULTIMATE SECTION	38' TO SECTION LINE 72' ULTIMATE SECTION	VERTICAL	8'
PRINCIPAL ARTERIAL	140'	100'	VERTICAL	8'
COUNTY LINE ROAD RE-ALIGNMENT (ROAD O)	80'	36'	VERTICAL	8'

N

100 0 50 100 200
SCALE: 1"= 100' HORIZ.

TEMPORARY SPILLOVER CHANNEL B
Q100 = 110 CFS
Q10 = 0 CFS
59' MIN.
6'
30' MIN.
n = 0.030, s = 0.10%
NO DROPS

MAP LEGEND

- SUB-BASIN I.D.
- 2-YR RUNOFF COEFFICIENT
- 100-YR RUNOFF COEFFICIENT
- SUB-BASIN AREA (ACRES)
- (PURPLE LABEL INDICATES INTERIM CONDITION SUBBASIN)
- OSP SUB-BASIN I.D.
- FUTURE BASIN IMPERVIOUSNESS
- EXISTING BASIN IMPERVIOUSNESS
- BASIN AREA (ACRES)
- SWMM MODEL SUB-BASIN I.D.
- FUTURE BASIN/PARKDALE IMPERVIOUSNESS
- BASIN AREA (ACRES)
- SWMM MODEL DESIGN POINT
- DESIGN POINT
- HIGH POINT
- LOW POINT (SUMP)
- OSP DESIGNATED DRAINAGE
- EXISTING DITCH
- UDFCD FHAD 100-YR FLOODPLAIN
- FEMA 100-YR FLOODPLAIN
- INTERIM CONDITION SUB-BASIN
- PROPOSED SUB-BASIN
- POND A - DIRECT INFLOWS SUB-BASINS
- POND B - DIRECT INFLOWS SUB-BASINS
- OFF-SITE SUB-BASIN
- SUB-BASIN J
- POND C - DIRECT INFLOWS SUB-BASINS
- SUB-BASIN L

MATCHLINE - SEE SHEET 1

EXISTING GRAVEL ROAD

TEMPORARY LOW AREA
92'W OVERFLOW WEIR
CREST ELEVATION = 5117.00

EXIST. 500-YR MAX. WSE ELEVATION = 5118.72

PROP. 500-YR MAX. WSE ELEVATION = 5118.03

PROP. 100-YR MAX WSE ELEVATION = 5117.59

EXIST. BARN

EXIST. BARN
LOWEST ENTRY: +/-5118.60
(PROP. 100-YR FREEBOARD = 1.01')

SWMM ANALYSIS BASIN 432A COMPOSED OF BASINS OS1 AND L4

OSP DESIGN POINT 507

SWMM ANALYSIS
FLOWS @ 507B
Q2 = 6 CFS
Q100 = 242 CFS

OSP - DRAINAGEWAY 1

DRAINAGEWAY 1 TO BE ULTIMATELY CONVEYED WITH THE COUNTY LINE ROAD EXTENSION.

EXISTING DRIVEWAY

EXISTING HOUSE

EXIST. HOUSE
LOWEST ENTRY: +/-5118.97
(PROP. 100-YR FREEBOARD = 1.38')

LAUREL & DANA POWELL
12512 ARAPAHOE RD
LAFAYETTE, CO 80026
146536000011

BART SCHICHTEL
12514 ARAPAHOE RD
LAFAYETTE, CO 80026
146536000010

KANO
12400 ARAPAHOE RD
LAFAYETTE, CO 80026
146536000017

FUTURE COUNTY LINE ROAD EXTENSION

DONALD JUNG
12428 ARAPAHOE RD.
LAFAYETTE, CO 80026
146536000008

CHANNEL B OVERFLOW PATH

SWMM ANALYSIS
FLOWS @ 508A
Q2 = 6 CFS
Q100 = 256 CFS
(DP 508A SWMM ANALYSIS IGNORES LOW AREA AS DEPICTED IN THE ERIE OSP)

EXISTING LIMITS OF POOLING
500-YR MAX. POOL ELEV = 5118.72

JMJC ELEVEN LLC
1401 E. COUNTY LINE ROAD
ERIE, CO 80026
146536001001

EXISTING STRUCTURE

EXISTING STRUCTURE

STORAGE UNITS

STORAGE UNITS

STORAGE UNITS

TRI COUNTY SELF STORAGE
1401 E COUNTY LINE RD
ERIE, CO 80026
146536002002

BLDG ELEV = 5114

BLDG ELEV = 5104

UDFCD FHAD 100-YR FLOODPLAIN

TRI-COUNTY STORAGE DETENTION POND OUTLET STRUCTURE

TYPE D INLET

EXTEND EXIST. 36" RCP

EXISTING WETLANDS (TYP.) ±13.2 ACRES

TRAIL TO SERVE AS MAINT. ACCESS

REGIONAL EURV POND B

FOREBAY #4

FOREBAY #5

POND B MODIFIED TYPE D OUTLET STRUCTURE (SEE DETAIL)

GROUTED BOULDER (B24) OVERFLOW SPILLWAY
190'W x 1.60'H

GROUTED BOULDER (B24) CHANNEL TO COAL CREEK

MAINT. ACCESS

RIPRAP OUTLET PROTECTION
TOWN OF ERIE
NO LOCAL ADDRESS
146536001001

POND C

EXIST. AND ULTIMATE SWMM ANALYSIS BASIN P500 COMPOSED OF BASINS B1-B6, B9-B11

EXIST. AND ULTIMATE SWMM ANALYSIS BASIN P500 COMPOSED OF BASINS C, B7, B8

COUNTY LINE ROAD (PRINCIPAL ARTERIAL)

(RE-ALIGNMENT COUNTY LINE ROAD)

MATCHLINE - SEE SHEET 4

DEVELOPED RUNOFF

DESIGN POINT	BASIN	DIRECT RUNOFF Q2 CFS	DIRECT RUNOFF Q100 CFS	ROUTED FLOWRATES Q2 CFS	ROUTED FLOWRATES Q100 CFS
1	A1	3.2	14.7	-	-
2	A2	2.3	10.1	-	-
3	A1+A2	-	-	5.5	16.9
4	A3	2.4	12.5	-	-
5	A1+A2+A3	-	-	7.6	24.6
6	A4	1.5	6.5	-	-
7	A5	2.6	10.7	-	-
8	A1+A2+A3+A4+A5	-	-	11.2	53.9
9	A6	0.6	4.5	-	-
10	A7	2.6	11.4	-	-
11	A1 THRU A7	-	-	14.0	65.3
12	A8	1.0	4.2	14.7	68.2
13	E1	2.0	6.8	-	-
14	E2	1.2	6.4	-	-
15	E5	1.4	6.3	-	-
16	E3	1.9	6.1	2.9	7.9
17	E1+E2+E3+E5	-	-	5.8	18.4
18	E4	2.0	11.2	-	-
19	E1+E2+E3+E4+E5	-	-	6.9	23.7
20	E6	2.1	8.8	-	-
21	E7	1.2	4.4	-	-
22	E1 THRU E7	-	-	9.2	39.2
23	E8	0.6	1.9	-	-
24	E1 THRU E8	-	-	9.6	40.3
25	A9	0.4	4.4	-	-
26	B1	5.2	20.7	-	-
27	B2	6.6	24.9	-	-
28	B1+B2	-	-	11.2	29.8
29	B6	3.9	25.4	-	-
30	B5	1.8	6.1	5.0	29.3
31	B4	2.1	10.4	6.5	41.9
32	B1+B2+B4+B5+B6	-	-	14.2	62.4
33	B3	1.8	6.8	15.3	71.8
34	B9	2.4	10.2	-	-
35	B1+B2+B3+B4+B5+B6+B9	-	-	16.7	78.5
36	B10	1.0	5.5	17.0	81.3
37	B11	2.8	2.9	17.6	82.9
38	B8	2.7	11.4	-	-
39	B7	3.6	15.1	-	-
40	B7+B8	-	-	6.1	14.3
41	C1	2.3	10.3	-	-
42	C2	0.3	2.4	-	-
43	B7+B8+C1+C2	-	-	8.1	23.5
44	C4	1.1	3.1	-	-
45	C3	1.3	6.4	-	-
46	C3+C4	-	-	2.1	7.8
47	B7+B8+C1+C2+C3+C4	-	-	9.8	29.6
48	D1	3.4	16.9	-	-
49	D2	0.4	1.6	-	-
50	D1+D2	-	-	3.7	17.9
52	F1	3.3	15.2	-	-
53	F2	1.3	5.4	4.6	12.2
54	F3	2.5	13.1	-	-
55	F1+F2+F3	-	-	6.5	23.8
56	F4	1.5	5.3	-	-
57	F4A	0.1	2.1	1.5	6.7
58	F1+F2+F3+F4+F4A	-	-	7.8	29.5
59	F5	2.5	11.9	-	-
60	F6	2.0	8.1	4.0	16.6
61	F1+F2+F3+F4+F4A+F5+F6	-	-	11.4	44.7
62	F7	2.0	8.2	-	-
63	F1 THRU F7	-	-	13.0	52.3
64	F8	2.6	11.8	-	-
65	F9	2.2	9.4	-	-
66	F1 THRU F9	-	-	17.2	68.3
67	F10	1.6	7.6	-	-
68	F11	0.5	1.8	-	-
69	F1 THRU F11	-	-	18.4	81.0
70	F12	2.0	8.2	-	-
71	F13	1.5	6.5	-	-
72	F12+F13	-	-	3.4	10.4
73	F1 THRU F13	-	-	21.0	89.1
74	F14	1.4	6.2	-	-
75	F15	2.3	9.4	-	-
76	F14+F15	-	-	3.6	11.6
77	F16	2.3	9.9	-	-
78	F17	1.5	6.4	-	-
79	F14+F15+F16+F17	-	-	6.8	30.5
80	F1 THRU F17	-	-	26.7	115.2
81	F18	1.3	5.3	-	-
82	F19	0.8	3.0	-	-
83	F1 THRU F19	-	-	27.8	120.0
84	F20	1.5	6.3	-	-
85	F1 THRU F20	-	-	28.5	123.8
86	F23	0.6	2.8	-	-
87	F21	1.0	4.0	1.4	4.3
88	F25	0.9	4.0	-	-
89	F24	1.1	5.1	1.9	5.8
90	F22	1.1	4.5	2.9	8.2
91	F1 THRU F25	-	-	31.9	133.2
92	F28	2.0	9.8	-	-
93	F29	2.1	9.7	-	-
94	F28+F29	-	-	4.0	12.8
95	F30	2.7	11.0	-	-
96	F28+F29+F30	-	-	6.2	20.7
97	F33	1.0	5.5	-	-
98	F34	1.6	6.7	2.5	11.8
99	F31	2.7	11.6	5.0	24.4
100	F32	2.0	9.0	-	-
101	F28 THRU F34	-	-	12.7	53.1
102	F26	1.2	5.2	13.2	57.0
103	F27	1.5	6.4	-	-
104	F1 THRU F34	-	-	44.5	194.2
105	F35	1.5	4.2	-	-
106	F1 THRU F35	-	-	44.5	195.3
107	F1 THRU F35+D1+D2	-	-	46.8	206.7
108	D3	2.5	7.0	-	-
108	F1 THRU F35+D1+D2+D3	-	-	48.3	210.3
109	G1	2.7	11.2	-	-
110	G2	1.4	5.8	-	-
111	G1+G2	-	-	4.0	10.7
112	G3	2.2	9.4	-	-
113	G1+G2+G3	-	-	5.8	22.4
114	G4	1.4	5.1	6.9	27.2
504	OSP BASIN 424	1.0	86.0	-	-
115	G5	1.3	9.3	-	-
116	G6	0.3	36.0	1.3	43.2
116	G5+G6+OSP 424	-	-	2.3	129.2
117	FUT. DUAL 48" RCPS	121.0	222.0	-	-
118	G11	0.5	1.8	-	-
119	G12	0.4	1.1	0.8	2.9
120	G7	48.6	163.3	-	-
P50	CHANNEL A	135.0	534.0	-	-
121	G8	0.4	15.3	-	-
122	G9A	1.3	15.1	-	-
P50	G1 THRU G8+G11+G12+OSP 424	-	-	135.0	534.0
123	G9	1.1	55.6	-	-
124	G10	0.3	34.7	-	-
125	I2	2.9	9.3	-	-
126	I1	2.6	10.6	5.1	18.6
P50	BOX CULVERT	-	-	135.0	534.0
503	OSP 417+416+UPSTREAM	-	-	311.0	1514.0
502	OSP 416+417+418+UPSTREAM	-	-	275.0	1536.0
133	J3	0.3	12.8	-	-
134	J1	2.9	19.2	-	-
135	J2	2.2	7.6	-	-
136	J1+J2	-	-	5.2	18.0
137	K1	1.7	14.3	-	-
138	K2	0.7	2.2	2.1	15.6
139	K3	0.7	2.1	2.5	16.7
140	K4	0.0	0.7	-	-
140	K1+K2+K3+K4	-	-	2.5	17.1
506	OSP 430	7.0	158.0	-	-
142	L1	0.5	4.3	-	-
143	L2	0.2	1.9	-	-
144	L3	0.4	7.1	-	-
507A	OSP BASIN 430+431A	-	-	7.0	161.0
507B	OSP BASIN 430+431A+431B	-	-	6.0	242.0
146	OS1	0.5	22.0	-	-
147	L4	0.6	9.3	-	-
508A	OSP BASINS 430+431A+431B+432A	-	-	6.0	256.0
148	J4	1.0	19.2	-	-

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7353 SOUTH ALTON WAY
CENTENNIAL, CO 80112
303.770.9111

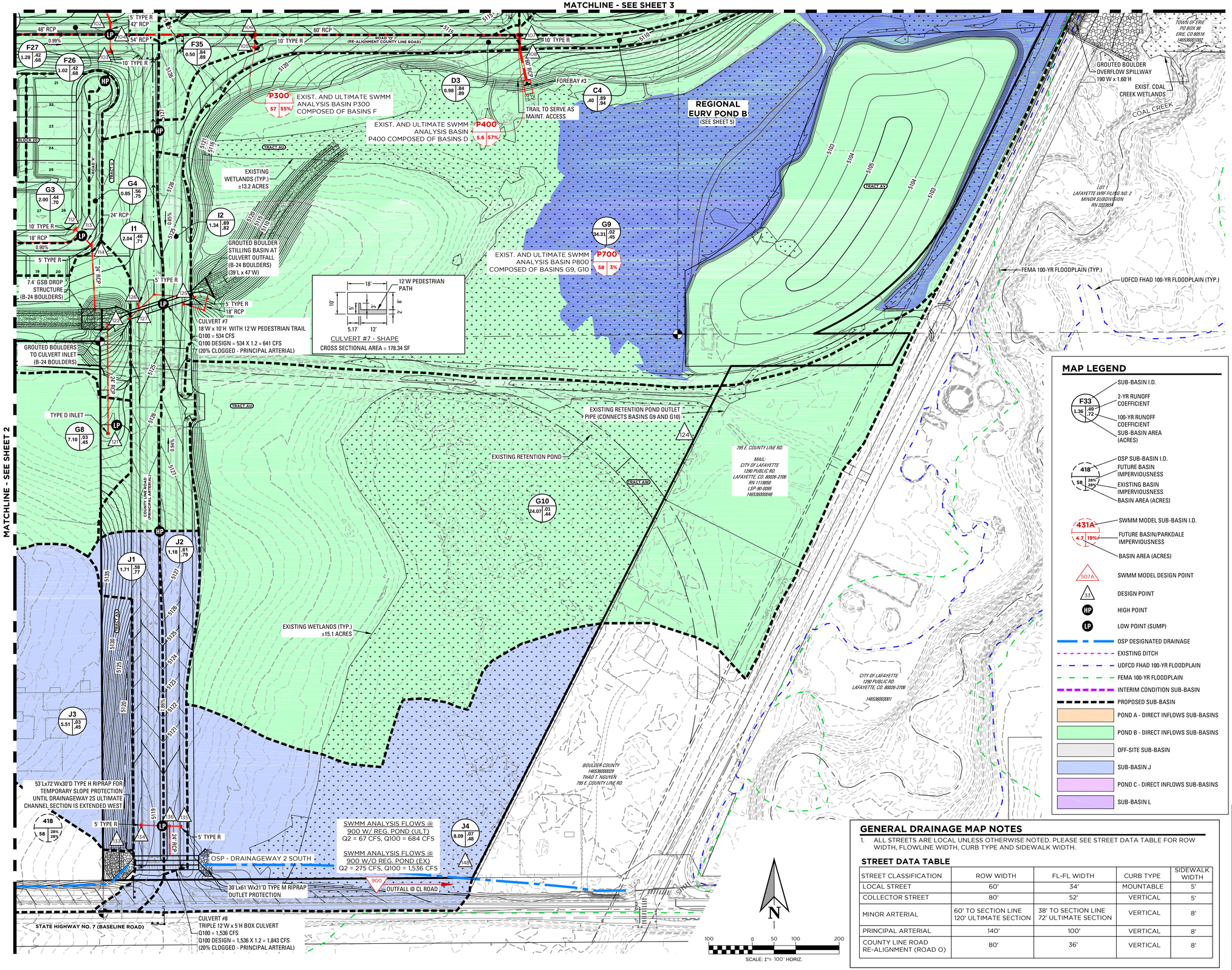
SCALE: 1" = 100' | JOB NO: 0043-1532 | BY: OKK

SHEET 3 OF 5

KT ENGINEERING
ENGINEERS • SURVEYORS
12500 W. 58th AVE. #230
ARVADA, CO 80002
PH: 720.638.5190

MATCHLINE - SEE SHEET 3

MATCHLINE - SEE SHEET 2



MAP LEGEND

- SUB-BASIN I.D.
- 2-YR RUNOFF COEFFICIENT
- 100-YR RUNOFF COEFFICIENT
- SUB-BASIN AREA (ACRES)
- OSP SUB-BASIN I.D.
- FUTURE BASIN IMPERVIOUSNESS
- EXISTING BASIN IMPERVIOUSNESS
- BASIN AREA (ACRES)
- SWMM MODEL SUB-BASIN I.D.
- FUTURE BASIN/PARKDALE IMPERVIOUSNESS
- BASIN AREA (ACRES)
- SWMM MODEL DESIGN POINT
- DESIGN POINT
- HIGH POINT
- LOW POINT (SUMP)
- OSP DESIGNATED DRAINAGE
- EXISTING DITCH
- UDFCD FHAD 100-YR FLOODPLAIN
- FEMA 100-YR FLOODPLAIN
- INTERIM CONDITION SUB-BASIN
- PROPOSED SUB-BASIN
- POND A - DIRECT INFLOWS SUB-BASINS
- POND B - DIRECT INFLOWS SUB-BASINS
- OFF-SITE SUB-BASIN
- SUB-BASIN J
- POND C - DIRECT INFLOWS SUB-BASINS
- SUB-BASIN L

GENERAL DRAINAGE MAP NOTES

1. ALL STREETS ARE LOCAL UNLESS OTHERWISE NOTED. PLEASE SEE STREET DATA TABLE FOR ROW WIDTH, FLOWLINE WIDTH, CURB TYPE AND SIDEWALK WIDTH.

STREET DATA TABLE

STREET CLASSIFICATION	ROW WIDTH	FL-FL WIDTH	CURB TYPE	SIDEWALK WIDTH
LOCAL STREET	60'	34'	MOUNTABLE	5'
COLLECTOR STREET	80'	52'	VERTICAL	5'
MINOR ARTERIAL	60' TO SECTION LINE 120' ULTIMATE SECTION	38' TO SECTION LINE 72' ULTIMATE SECTION	VERTICAL	8'
PRINCIPAL ARTERIAL	140'	100'	VERTICAL	8'
COUNTY LINE ROAD RE-ALIGNMENT (ROAD O)	80'	36'	VERTICAL	8'

DEVELOPED RUNOFF

DESIGN POINT	BASIN	DIRECT RUNOFF Q2 CFS	DIRECT RUNOFF Q100 CFS	ROUTED FLOWRATES Q2 CFS	ROUTED FLOWRATES Q100 CFS
1	A1	3.2	14.7	-	-
2	A2	2.3	10.1	-	-
3	A1+A2	-	-	5.5	16.9
4	A3	2.4	12.5	-	-
5	A1+A2+A3	-	-	7.6	24.6
6	A4	1.5	6.5	-	-
7	A5	2.6	10.7	-	-
8	A1+A2+A3+A4+A5	-	-	11.2	53.9
9	A6	0.6	4.5	-	-
10	A7	2.6	11.4	-	-
11	A1 THRU A7	-	-	14.0	65.3
12	A8	1.0	4.2	14.7	68.2
13	E1	2.0	6.8	-	-
14	E2	1.2	6.4	-	-
15	E5	1.4	6.3	-	-
16	E3	1.8	6.1	2.9	7.9
17	E1+E2+E3+E5	-	-	5.8	18.4
18	E4	2.0	11.2	-	-
19	E1+E2+E3+E4+E5	-	-	6.9	23.7
20	E6	2.1	8.8	-	-
21	E7	1.2	4.4	-	-
22	E1 THRU E7	-	-	9.2	39.2
23	E8	0.6	1.9	-	-
24	E1 THRU E8	-	-	9.6	40.3
25	A9	0.4	4.4	-	-
26	B1	5.2	20.7	-	-
27	B2	6.6	24.9	-	-
28	B1+B2	-	-	11.2	29.8
29	B6	3.9	25.4	-	-
30	B5	1.8	6.1	5.0	29.3
31	B4	2.1	10.4	6.5	41.9
32	B1+B2+B4+B5+B6	-	-	14.2	62.4
33	B3	1.8	6.8	15.3	71.8
34	B9	2.4	10.2	-	-
35	B1+B2+B3+B4+B5+B6+B9	-	-	16.7	78.5
36	B10	1.0	5.5	17.0	81.3
37	B11	2.8	2.9	17.6	82.9
38	B8	2.7	11.4	-	-
39	B7	3.6	15.1	-	-
40	B7+B8	-	-	6.1	14.3
41	C1	2.3	10.3	-	-
42	C2	0.5	2.4	-	-
43	B7+B8+C1+C2	-	-	8.1	23.5
44	C4	1.1	3.1	-	-
45	C3	1.3	6.4	-	-
46	C3+C4	-	-	2.1	7.8
47	B7+B8+C1+C2+C3+C4	-	-	9.8	29.6
48	D1	3.4	16.9	-	-
49	D2	0.4	1.6	-	-
50	D1+D2	-	-	3.7	17.9
52	F1	3.3	15.2	-	-
53	F2	1.3	5.4	4.6	12.2
54	F3	2.5	13.1	-	-
55	F1+F2+F3	-	-	6.5	23.8
56	F4	1.5	5.3	-	-
57	F4A	0.1	2.1	1.5	6.7
58	F1+F2+F3+F4+F4A	-	-	7.8	29.5
59	F5	2.5	11.9	-	-
60	F6	2.0	8.1	4.0	16.6
61	F1+F2+F3+F4+F4A+F5+F6	-	-	11.4	44.7
62	F7	2.0	8.2	-	-
63	F1 THRU F7	-	-	13.0	52.3
64	F8	2.6	11.8	-	-
65	F9	2.2	9.4	-	-
66	F1 THRU F9	-	-	17.2	68.3
67	F10	1.6	7.6	-	-
68	F11	0.5	1.8	-	-
69	F1 THRU F11	-	-	18.4	81.0
70	F12	2.0	8.2	-	-
71	F13	1.5	6.5	-	-
72	F12+F13	-	-	3.4	10.4
73	F1 THRU F13	-	-	21.0	89.1
74	F14	1.4	6.2	-	-
75	F15	2.3	9.4	-	-
76	F14+F15	-	-	3.6	11.6
77	F16	2.3	9.9	-	-
78	F17	1.5	6.4	-	-
79	F14+F15+F16+F17	-	-	6.8	30.5
80	F1 THRU F17	-	-	26.7	115.2
81	F18	1.3	5.3	-	-
82	F19	0.8	3.0	-	-
83	F1 THRU F19	-	-	27.8	120.0
84	F20	1.5	6.3	-	-
85	F1 THRU F20	-	-	28.5	123.8
86	F23	0.6	2.8	-	-
87	F21	1.0	4.0	1.4	4.3
88	F25	0.9	4.0	-	-
89	F24	1.1	5.1	1.9	5.8
90	F22	1.1	4.5	2.9	8.2
91	F1 THRU F25	-	-	31.9	133.2
92	F28	2.0	9.8	-	-
93	F29	2.1	9.7	-	-
94	F28+F29	-	-	4.0	12.8
95	F30	2.7	11.0	-	-
96	F29+F30	-	-	6.2	20.7
97	F33	1.0	5.5	-	-
98	F34	1.6	6.7	2.5	11.8
99	F31	2.7	11.6	5.0	24.4
100	F32	2.0	9.0	-	-
101	F28 THRU F34	-	-	12.7	53.1
102	F26	1.2	5.2	13.2	57.0
103	F27	1.5	6.4	-	-
104	F1 THRU F34	-	-	44.5	194.2
105	F35	1.5	4.2	-	-
106	F1 THRU F35	-	-	44.5	195.3
107	F1 THRU F35+D1+D2	-	-	46.8	206.7
108	D3	2.5	7.0	-	-
108	F1 THRU F35+D1+D2+D3	-	-	48.3	210.3
109	G1	2.7	11.2	-	-
110	G2	1.4	5.8	-	-
111	G1+G2	-	-	4.0	10.7
112	G3	2.2	9.4	-	-
113	G1+G2+G3	-	-	5.8	22.4
114	G4	1.4	5.1	6.9	27.2
504	OSP BASIN 424	1.0	86.0	-	-
115	G5	1.3	9.3	-	-
116	G6	0.3	36.0	1.3	43.2
116	G5+G6+OSP 424	-	-	2.3	129.2
117	FUT. DUAL 48" RCPS	121.0	222.0	-	-
118	G11	0.5	1.8	-	-
119	G12	0.4	1.1	0.8	2.9
120	G7	48.5	163.3	-	-
P50	CHANNEL A	135.0	534.0	-	-
121	G8	0.4	15.3	-	-
122	G5A	1.3	15.1	-	-
P59	G1 THRU G8+G11+G12+OSP 424	-	-	135.0	534.0
123	G9	1.1	55.6	-	-
124	G10	0.3	34.7	-	-
125	I2	2.9	9.3	-	-
126	I1	2.6	10.6	5.1	18.6
P59	BOX CULVERT	-	-	135.0	534.0
503	OSP 417+416+UPSTREAM	-	-	311.0	1514.0
900	OSP 416+417+418+UPSTREAM	-	-	275.0	1536.0
133	J3	0.3	12.8	-	-
134	J1	2.9	10.2	-	-
135	J2	2.2	7.6	-	-
136	J1+J2	-	-	5.2	18.0
137	K1	1.7	14.3	-	-
138	K2	0.7	2.2	2.1	15.6
139	K3	0.7	2.1	2.5	16.7
140	K4	0.0	0.7	-	-
140	K1+K2+K3+K4	-	-	2.5	17.1
506	OSP 430	7.0	158.0	-	-
162	L1	0.5	4.3	-	-
143	L2	0.2	1.9	-	-
144	L3	0.4	7.1	-	-
507A	OSP BASIN 430+431A	-	-	7.0	161.0
507B	OSP BASIN 430+431A+431B	-	-	6.0	242.0
146	OS1	0.5	22.0	-	-
147	L4	0.6	9.3	-	-
508A	OSP BASINS 430+431A+431B+432A	-	-	6.0	256.0
148	J4	1.0	19.2	-	-

DATE SUBMITTED: 05.19.2017

REVISION NO.	DATE
1	10.02.2017
2	01.23.2018
3	04.16.2018
4	
5	

PREPARED FOR:
OEO, LLC
7353 SOUTH ALTON WAY
CENTENNIAL, CO 80112
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SCALE: 1" = 100' | JOB NO: 0043-1532 | BY: OKK

SHEET 4 OF 5

KT ENGINEERING
ENGINEERS • SURVEYORS
12500 W. 58th AVE. #230
ARVADA, CO 80002
PH: 720.638.5190

POND B DATA TABLE

WATERSHED AREA (INTERIM) : 344.08 ACRES @ 34.59% IMPERVIOUS
WATERSHED AREA (ULTIMATE) : 946 ACRES @ 42.46% IMPERVIOUS
(WHEN REGIONAL POND 1060 IS CONSTRUCTED)

INTERIM CONDITION

STAGE	PEAK OUTFLOW	STORAGE VOLUME	PONDING DEPTH
WQCV	2.2 CFS	4.733 AC-FT	5.37 FT
EURV	3.3 CFS	12.197AC-FT	7.50 FT
2-YR	2.9 CFS	7.345 AC-FT	6.35 FT
5-YR	3.4 CFS	12.810 AC-FT	7.61 FT
10-YR	51.3 CFS	16.202 AC-FT	8.09 FT
SPILLWAY BEGINS TO OVERTOP IN EVENTS BETWEEN 5-YEAR AND 10-YEAR STORMS			

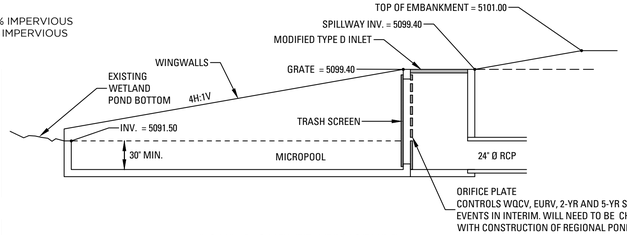
ULTIMATE CONDITION

STAGE	PEAK OUTFLOW	STORAGE VOLUME	PONDING DEPTH
WQCV	6.9 CFS	14.703 AC-FT	7.89 FT
SPILLWAY BEGINS TO OVERTOP IN EVENTS BETWEEN WQCV AND 2-YEAR STORMS			

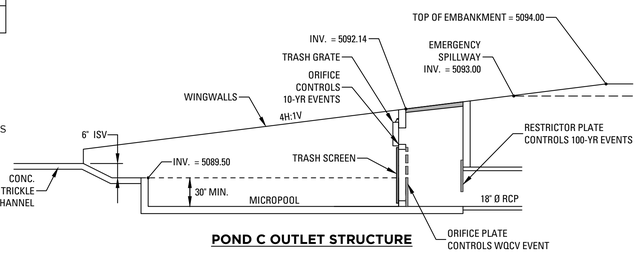
POND C DATA TABLE

WATERSHED AREA: 5.73 ACRES @ 31.09% IMPERVIOUS

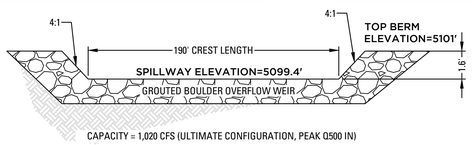
STAGE	PEAK OUTFLOW	STORAGE VOLUME	PONDING DEPTH
WQCV	0.03 CFS	0.074 AC-FT	1.08 FT
10-YR	0.6 CFS	0.269 AC-FT	2.08 FT
100-YR	4.4 CFS	0.417 AC-FT	2.66 FT



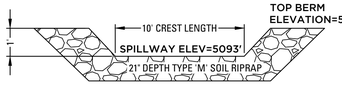
POND B OUTLET STRUCTURE



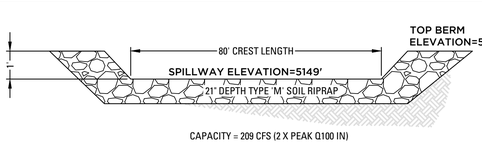
POND C OUTLET STRUCTURE



POND B OUTLET SPILLWAY



POND C OUTLET SPILLWAY

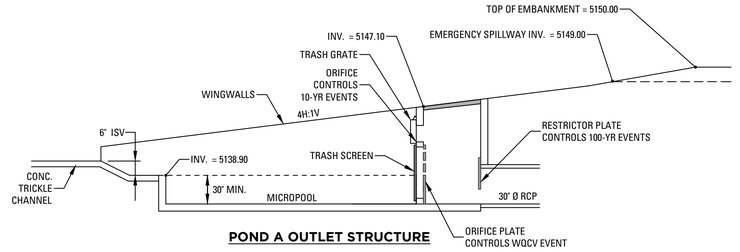


POND A OUTLET SPILLWAY

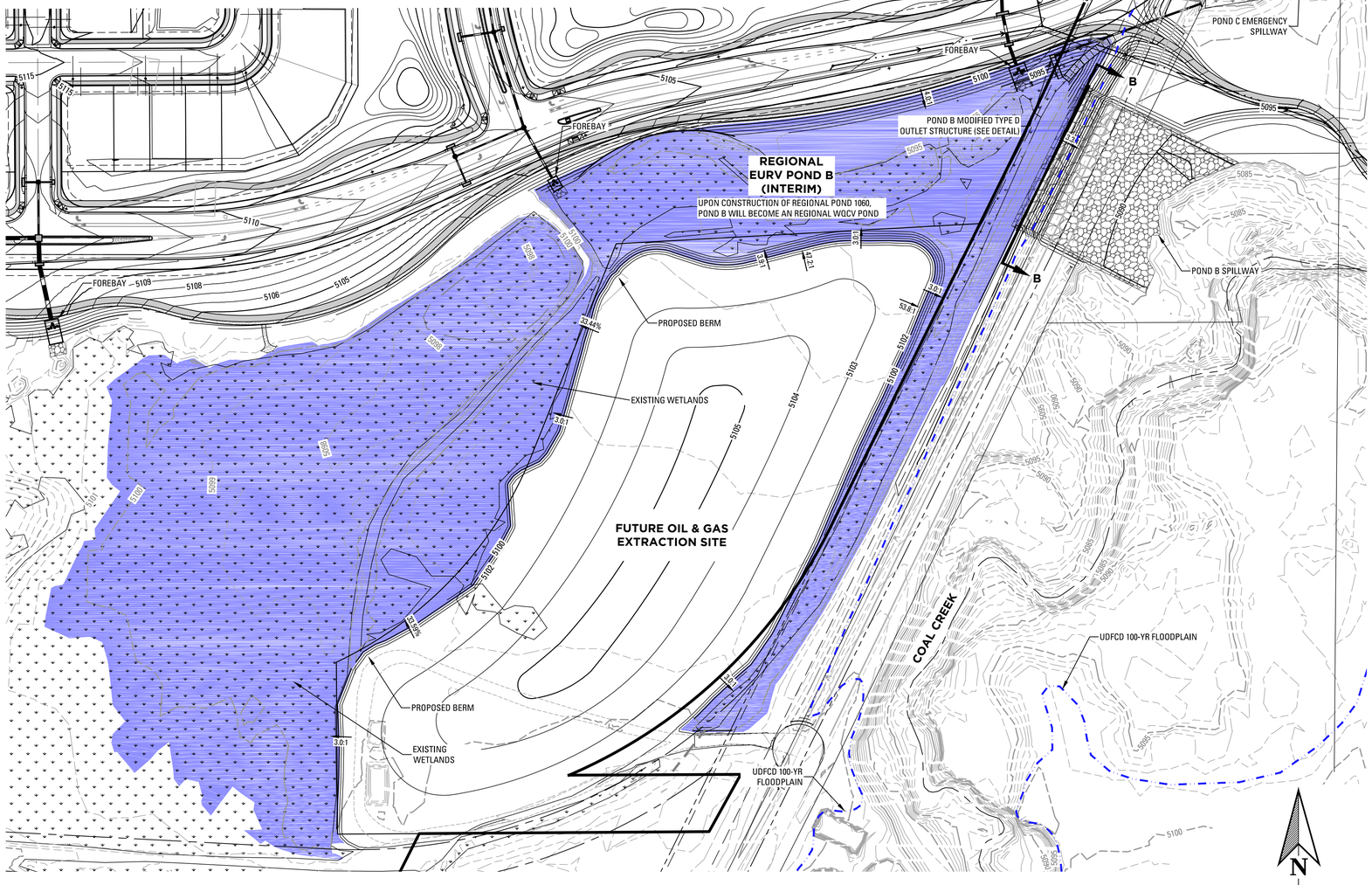
POND A DATA TABLE

WATERSHED AREA: 29.89 ACRES @ 52.13% IMPERVIOUS

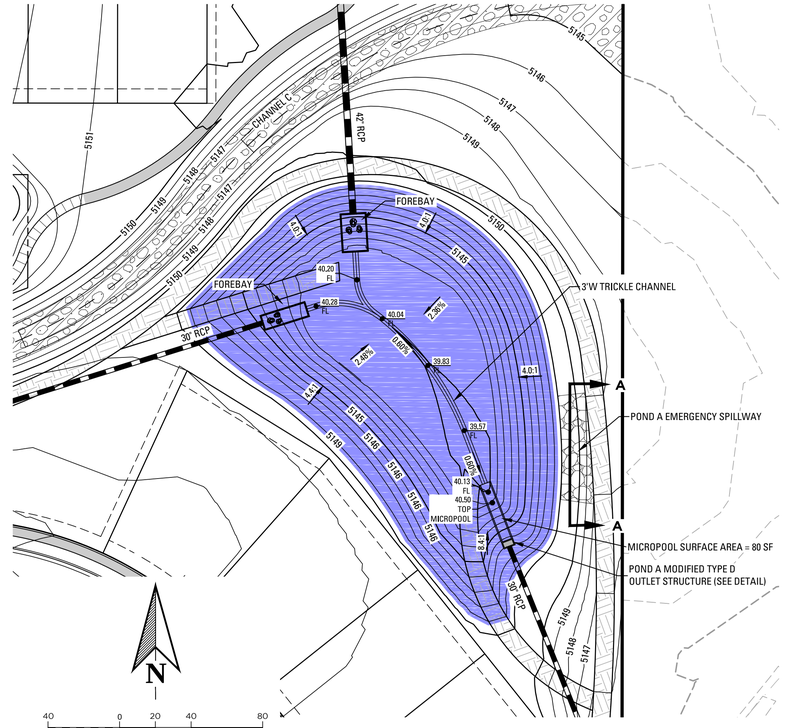
STAGE	PEAK OUTFLOW	STORAGE VOLUME	PONDING DEPTH
WQCV	0.2 CFS	0.528 AC-FT	3.77 FT
10-YR	4.2 CFS	2.250 AC-FT	8.16 FT
100-YR	29.9 CFS	3.088 AC-FT	9.64 FT



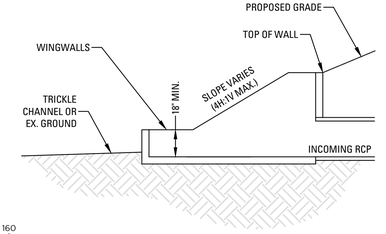
POND A OUTLET STRUCTURE



POND B & POND C



POND A



FOREBAY DETAIL

DATE SUBMITTED: 05.19.2017

REVISION NO.	DATE
1	10.02.2017
2	01.23.2018
3	04.16.2018
4	
5	

PREPARED FOR:
OEO, LLC
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303.770.9111

SCALE: | JOB NO: 0043-1532 | BY: OKK

SHEET 5 OF 5

KT ENGINEERING
ENGINEERS • SURVEYORS
12500 W. 58th AVE. #230
ARVADA, CO 80002
PH: 720.638.5190

DEVELOPED RUNOFF

DESIGN POINT	BASIN	DIRECT RUNOFF Q2 CFS	DIRECT RUNOFF Q100 CFS	ROUTED FLOWRATES Q2 CFS	ROUTED FLOWRATES Q100 CFS
1	A1	3.2	14.7	-	-
2	A2	2.3	10.1	-	-
3	A1+A2	-	-	5.5	16.9
4	A3	2.4	12.5	-	-
5	A1+A2+A3	-	-	7.6	24.6
6	A4	1.5	6.5	-	-
7	A5	2.6	10.7	-	-
8	A1+A2+A3+A4+A5	-	-	11.2	53.9
9	A6	0.6	4.5	-	-
10	A7	2.6	11.4	-	-
11	A1 THRU A7	-	-	14.0	65.3
12	A8	1.0	4.2	14.7	68.2
13	E1	2.0	6.8	-	-
14	E2	1.2	6.4	-	-
15	E5	1.4	6.3	-	-
16	E3	1.8	6.1	2.9	7.9
17	E1+E2+E3+E5	-	-	5.8	18.4
18	E4	2.0	11.2	-	-
19	E1+E2+E3+E4+E5	-	-	6.9	23.7
20	E6	2.1	8.8	-	-
21	E7	1.2	4.4	-	-
22	E1 THRU E7	-	-	9.2	39.2
23	E8	0.6	1.9	-	-
24	E1 THRU E8	-	-	9.6	40.3
25	A9	0.4	4.4	-	-
26	B1	5.2	20.7	-	-
27	B2	6.6	24.9	-	-
28	B1+B2	-	-	11.2	29.8
29	B6	3.9	25.4	-	-
30	B5	1.8	6.1	5.0	29.3
31	B4	2.1	10.4	6.5	41.9
32	B1+B2+B4+B5+B6	-	-	14.2	62.4
33	B3	1.8	6.8	15.3	71.8
34	B9	2.4	10.2	-	-
35	B1+B2+B3+B4+B5+B6+B9	-	-	16.7	78.5
36	B10	1.0	5.5	17.0	81.3
37	B11	2.8	2.9	17.6	82.9
38	B8	2.7	11.4	-	-
39	B7	3.6	15.1	-	-
40	B7+B8	-	-	6.1	14.3
41	C1	2.3	10.3	-	-
42	C2	0.5	2.4	-	-
43	B7+B8+C1+C2	-	-	8.1	23.5
44	C4	1.1	3.1	-	-
45	C3	1.3	6.4	-	-
46	C3+C4	-	-	2.1	7.8
47	B7+B8+C1+C2+C3+C4	-	-	9.8	29.6
48	D1	3.4	16.9	-	-
49	D2	0.4	1.6	-	-
50	D1+D2	-	-	3.7	17.9
52	F1	3.3	15.2	-	-
53	F2	1.3	5.4	4.6	12.2
54	F3	2.5	13.1	-	-
55	F1+F2+F3	-	-	6.5	23.8
56	F4	1.5	5.3	-	-
57	F4A	0.1	2.1	1.5	6.7
58	F1+F2+F3+F4+F4A	-	-	7.8	29.5
59	F5	2.5	11.9	-	-
60	F6	2.0	8.1	4.0	16.6
61	F1+F2+F3+F4+F4A+F5+F6	-	-	11.4	44.7
62	F7	2.0	8.2	-	-
63	F1 THRU F7	-	-	13.0	52.3
64	F8	2.6	11.8	-	-
65	F9	2.2	9.4	-	-
66	F1 THRU F9	-	-	17.2	68.3
67	F10	1.6	7.6	-	-
68	F11	0.5	1.8	-	-
69	F1 THRU F11	-	-	18.4	81.0
70	F12	2.0	8.2	-	-
71	F13	1.5	6.5	-	-
72	F12+F13	-	-	3.4	10.4
73	F1 THRU F13	-	-	21.0	89.1
74	F14	1.4	6.2	-	-
75	F15	2.3	9.4	-	-
76	F14+F15	-	-	3.6	11.6
77	F16	2.3	9.9	-	-
78	F17	1.5	6.4	-	-
79	F14+F15+F16+F17	-	-	6.8	30.5
80	F1 THRU F17	-	-	27.8	115.2
81	F18	1.3	5.3	-	-
82	F15	0.8	3.0	-	-
83	F1 THRU F19	-	-	27.8	120.0
84	F20	1.5	6.3	-	-
85	F1 THRU F20	-	-	28.5	123.8
86	F23	0.6	2.8	-	-
87	F21	1.0	4.0	1.4	4.3
88	F26	0.9	4.0	-	-
89	F24	1.1	5.1	1.9	5.8
90	F22	1.1	4.5	2.9	8.2
91	F1 THRU F25	-	-	31.9	133.2
92	F28	2.0	9.8	-	-
93	F29	2.1	9.7	-	-
94	F28+F29	-	-	4.0	12.8
95	F30	2.7	11.0	-	-
96	F28+F29+F30	-	-	6.2	20.7
97	F33	1.0	5.5	-	-
98	F34	1.6	6.7	2.5	11.8
99	F31	2.7	11.6	5.0	24.4
100	F32	2.0	9.0	-	-
101	F28 THRU F34	-	-	12.7	53.1
102	F26	1.2	5.2	13.2	57.0
103	F27	1.5	6.4	-	-
104	F1 THRU F34	-	-	44.5	194.2
105	F35	1.5	4.2	-	-
106	F1 THRU F35	-	-	44.5	195.3
107	F1 THRU F35+D1+D2	-	-	46.8	206.7
108	D3	2.5	7.0	-	-
108	F1 THRU F35+D1+D2+D3	-	-	48.3	210.3
109	G1	2.7	11.2	-	-
110	G2	1.4	5.8	-	-
111	G1+G2	-	-	4.0	10.7
112	G3	2.2	9.4	-	-
113	G1+G2+G3	-	-	5.8	22.4
114	G4	1.4	5.1	6.9	27.2
504	OSP BASIN 424	1.0	88.0	-	-
115	G5	1.3	9.3	-	-
116	G6	0.3	36.0	1.3	43.2
117	G5+G6+OSP 424	-	-	2.3	129.2
117	FUT. DUAL 48" RCPS	121.0	222.0		
118	G11	0.5	1.8	-	-
119	G12	0.4	1.1	0.8	2.9
120	G7	48.5	163.3	-	-
P50	CHANNEL A	135.0	534.0	-	-
121	G8	0.4	15.3	-	-
122	G5A	1.3	15.1	-	-
P50	G1 THRU G8+G11+G12+OSP 424	-	-	135.0	534.0
123	G9	1.1	55.6	-	-
124	G10	0.3	34.7	-	-
125	I2	2.9	9.3	-	-
126	I1	2.6	10.6	5.1	18.6
P50	BOX CULVERT	-	-	135.0	534.0
500	OSP 417+416+UPSTREAM	-	-	311.0	1514.0
900	OSP 416+417+418+UPSTREAM	-	-	275.0	1536.0
133	J3	0.3	12.8	-	-
134	J1	2.9	10.2	-	-
135	J2	2.2	7.6	-	-
136	J1+J2	-	-	5.2	18.0
137	K1	1.7	14.3	-	-
138	K2	0.7	2.2	2.1	15.6
139	K3	0.7	2.1	2.5	16.7
140	K4	0.0	0.7	-	-
140	K1+K2+K3+K4	-	-	2.5	17.1
506	OSP 430	7.0	158.0	-	-
142	L1	0.5	4.3	-	-
143	L2	0.2	1.9	-	-
144	L3	0.4	7.1	-	-
507A	OSP BASIN 430+431A			7.0	161.0
507B	OSP BASIN 430+431A+431B			6.0	242.0
146	OS1	0.5	22.0		
147	L4	0.6	9.3		
508A	OSP BASINS 430+431A+431B+432A			6.0	256.0
148	J4	1.0	19.2		

PARKDALE
OVERALL DRAINAGE PLAN

SCALE: 1"= 100' HORIZ.

DATE SUBMITTED:	05.19.2017
REVISION NO.	DATE
1	10.02.2017
2	01.23.2018
3	04.16.2018
4	
5	
PREPARED FOR:	OEG, LLC 7353 SOUTH ALTON WAY CENTENNIAL, CO 80112 303.770.9111
SCALE:	1" = 100'
JOB NO:	0043-1533
DRAWN BY:	DKK
SHEET 1 OF 1	

KT ENGINEERING
ENGINEERS + SURVEYORS
12500 W. 58th AVE. #230
ARVADA, CO 80002
PH: 720.836.5190

Traffic Report

LSC TRANSPORTATION CONSULTANTS, INC.

1889 York Street
Denver, CO 80206
(303) 333-1105
FAX (303) 333-1107
E-mail: lsc@lscdenver.com

May 25, 2017

Mr. Corey Elliott
OEO, LLC
7353 S. Alton Way, Suite A-100
Englewood, CO 80112

Re: Parkdale
Traffic Impact Analysis
Erie, CO
LSC #160131

Dear Mr. Elliott:

In response to your request, LSC Transportation Consultants, Inc. has prepared this Traffic Impact Analysis for the proposed Parkdale residential development. As shown on Figure 1, the site is located north of E. Baseline Road (SH 7), east of N. 119th Street, and west of County Line Road in Erie, Colorado.

REPORT CONTENTS

The report contains the following: the existing roadway and traffic conditions in the vicinity of the site including the lane geometries, traffic controls, posted speed limits, etc.; the existing weekday peak-hour traffic volumes; the existing daily traffic volumes in the area; the typical site-generated traffic volume projections for the site; the assignment of the projected traffic volumes to the area roadways; the projected short-term and long-term background and resulting total traffic volumes on the area roadways; the site's projected traffic impacts; and any recommended roadway improvements to mitigate growth in background traffic or the site's traffic impacts.

LAND USE AND ACCESS

The existing site is primarily agricultural and large ranch properties and is proposed to include about 102 duplex homes, about 124 townhomes, and about 542 single-family detached homes. Access is proposed to N. 119th Street and relocated County Line Road. Figure 2 shows the conceptual site plan.

ROADWAY AND TRAFFIC CONDITIONS

Area Roadways

The major roadways in the site's vicinity are shown on Figure 1 and are described below.

- **Baseline Road (SH 7)** is an east-west, two-lane state highway south of the site. The intersections with N. 119th Street and County Line Road are signalized with auxiliary turn lanes.

The posted speed limit in the vicinity of N. 119th Street is 45 mph and in the vicinity of County Line Road is 55 mph. The *Erie Transportation Master Plan* shows a four-lane cross-section by 2030. A four-lane cross-section is assumed by 2037 between N. 119th Street and County Line Road.

- **N. 119th Street** is a north-south, two-lane arterial roadway west of the site. The intersections with Baseline Road (SH 7) and Arapahoe Road are signalized with auxiliary turn lanes. The posted speed limit in the vicinity of the site is 40 mph. The *Erie Transportation Master Plan* assumes a two-lane principal arterial in 2030 and a six-lane principal arterial for buildout conditions. A four-lane arterial is assumed by 2037.

- **County Line Road** is a north-south, two-lane arterial roadway east of the site. The posted speed limit in the vicinity of the site is 50 mph. The *Erie Transportation Master Plan* assumes a two-lane principal arterial in 2030 and a six-lane principal arterial for buildout conditions. A four-lane arterial is assumed by 2037. The applicant is coordinating with Town staff to realign County Line Road through the proposed site. A partial realignment is assumed by 2025 with the full realignment assumed by 2037.

- **Arapahoe Road** is an east-west, two-lane arterial roadway north of the site. The posted speed limit in the vicinity of the site is 40 mph. The *Erie Transportation Master Plan* assumes a two-lane minor arterial in 2030 and a four-lane minor arterial for buildout conditions. A four-lane minor arterial is assumed by 2037.

Existing Traffic Conditions

Figure 3 shows the existing lane geometries, traffic controls, posted speed limits, and traffic volumes in the site's vicinity on a typical weekday. The weekday peak-hour traffic volumes and daily traffic volumes are from the attached traffic counts conducted by Counter Measures in February, 2016.

2025 and 2037 Background Traffic

Figure 4 shows the estimated 2025 background traffic, lane geometry, and traffic control and Figure 5 shows the estimated 2037 background traffic, lane geometry, and traffic control. The 2025 and 2037 background traffic is based on an annual growth rate between two and three percent. The growth on County Line Road is consistent with the December, 2016 *Four Corners TIA* by LSC. Both scenarios assume County Line Road and its intersection with Baseline Road (SH 7) is relocated to the west as shown in Figure 2. Partial realignment is assumed by 2025 and is shown in Figure 4. Full realignment is assumed by 2037 and is shown in Figure 5.

Existing, 2025, and 2037 Background Levels of Service

Level of service (LOS) is a quantitative measure of the level of congestion or delay at an intersection. Level of service is indicated on a scale from "A" to "F." LOS A is indicative of little congestion or delay and LOS F is indicative of a high level of congestion or delay. Attached are specific level of service definitions for signalized and unsignalized intersections.

The intersections in Figures 3, 4, and 5 were analyzed as appropriate to determine the existing, 2025, and 2037 background levels of service using Synchro. Table 1 shows the level of service analysis results. The level of service reports are attached.

- **Arapahoe Road/N. 119th Street:** This signalized intersection currently operates at an overall LOS "F" during the morning peak-hour and LOS "C" during the afternoon peak-hour. By 2025 it is expected to operate at LOS "D" during the morning peak-hour and LOS "C" during the afternoon peak-hour with a modification to the existing traffic signal timings. In 2037, with implementation of the recommended improvements, both peak-hours are expected to operate at LOS "C".

- **Arapahoe Road/County Line Road:** This signalized intersection currently operates at an overall LOS "A" during the morning peak-hour and LOS "B" during the afternoon peak-hour. By 2025, both peak-hours are expected to operate at LOS "B" and are expected to do so through 2037 with the recommended improvements.

- **SH 7 (E. Baseline Road)/N. 119th Street:** This signalized intersection currently operates at an overall LOS "E" during the morning peak-hour and LOS "F" during the afternoon peak-hour. By 2025, with implementation of the recommended improvements, the intersection is expected to operate at LOS "C" during the morning peak-hour and LOS "D" during the afternoon peak-hour and is expected to do so through 2037.

- **SH 7 (E. Baseline Road)/County Line Road:** This signalized intersection currently operates at an overall LOS "C" during the morning peak-hour and LOS "B" during the afternoon peak-hour. By 2025, the intersection is expected to be relocated and operate at LOS "D" during the morning peak-hour and LOS "C" during the afternoon peak-hour. The westbound through movement is expected to operate at LOS "F" during the morning peak-hour in 2025 and is expected to do so until two westbound through lanes are provided. In 2037, with implementation of the recommended improvements, the intersection is expected to operate at LOS "C" during both peak-hours.

- **County Line Road/Three-Quarter Site Access:** All movements at this future unsignalized intersection are expected to operate at LOS "B" or better during both peak-hours through 2037.

- **County Line Road/Main Site Access/Old E. County Line Road:** This future signalized intersection is expected to operate at LOS "A" during both peak-hours through 2037.

- **Old County Line Road/RIRO Site Access:** All movements at this future unsignalized intersection are expected to operate at LOS "A" during both peak-hours through 2037.

- **Old County Line Road/Full Movement Site Access:** All movements at this future unsignalized intersection are expected to operate at LOS "A" during both peak-hours through 2037.

- **N. 119th Street/W. Three-Quarter Movement Site Access:** All movements at this future unsignalized intersection are expected to operate at LOS "B" or better during both peak-hours through 2037.

TRIP GENERATION

Table 2 shows the estimated typical weekday, morning peak-hour, and afternoon peak-hour trip generation for the site based on the rates from *Trip Generation, 9th Edition,* 2012, by the Institute of Transportation Engineers (ITE).

The proposed land use on the site is projected to generate about 6,473 new vehicle-trips on the average weekday, with about half entering and half exiting the site during a 24-hour period. During the morning peak-hour, which generally occurs for one hour between 6:30 and 8:30 a.m., about 119 vehicles would enter and about 387 vehicles would exit the site. During the afternoon peak-hour, which generally occurs for one hour between 4:00 and 6:30 p.m., about 420 vehicles would enter and about 240 vehicles would exit the site.

TRIP DISTRIBUTION

Figure 6 shows the estimated directional distribution of the site-generated traffic volumes on the area roadways. The estimates were based on the location of the site with respect to the regional population, employment, and activity centers; and the site's proposed land use.

TRIP ASSIGNMENT

Figures 7a and 7b show an assignment of the short-term and long-term site-generated traffic volumes based on the directional distribution percentages (from Figure 6) and the trip generation estimate (from Table 2). The short-term assignment assumes partial realignment of County Line Road and the long-term assignment assumes full realignment.

2025 AND 2037 TOTAL TRAFFIC

Figure 8 shows the 2025 total traffic which is the sum of the 2025 background traffic volumes (from Figure 4) and the short-term site-generated traffic volumes (from Figure 7a). Figure 8 also shows the recommended 2025 lane geometry and traffic control.

Figure 9 shows the 2037 total traffic which is the sum of 2037 background traffic volumes (from Figure 5) and the long-term site-generated traffic volumes (from Figure 7b). Figure 9 also shows the recommended 2037 lane geometry and traffic control. Figure 8 indicates specific turn lane lengths based on the existing posted speed limits shown in Figure 3 with the exception of County Line Road which was assumed to reduce to 45 mph after redevelopment.

PROJECTED LEVELS OF SERVICE

The intersections in Figures 8 and 9 were analyzed to determine the 2025 and 2037 total levels of service. Table 1 shows the level of service analysis results. The level of service reports are attached.

- **Arapahoe Road/N. 119th Street:** This signalized intersection is expected to operate at an overall LOS "D" during the morning peak-hour and LOS "C" during the afternoon peak-hour through 2025. In 2037, with implementation of the recommended improvements, both peak-hours are expected to operate at LOS "C".

- **N. 119th Street/W. Full Movement Site Access:** This future signalized intersection is expected to operate at LOS "A" during both peak-hours through 2037.

- **Arapahoe Road/County Line Road:** This signalized intersection is expected to operate at an overall LOS "A" during the morning peak-hour and LOS "B" during the afternoon peak-hour through 2025. In 2037, with implementation of the recommended improvements both peak-hours are expected to operate at LOS "B".

- **(SH 7) E. Baseline Road/N. 119th Street:** This signalized intersection is expected to operate at an overall LOS "C" during the morning peak-hour and LOS "D" during the afternoon peak-hour through 2037 with implementation of the recommended improvements. The eastbound through movement is expected to operate at LOS "F" during the afternoon peak-hour in 2025 and is expected to do so until two eastbound lanes are provided. The northbound right-turn movement is projected to operate at LOS "F" by 2037 which can be mitigated by providing a right-turn acceleration lane on SH 7.

- **(SH 7) E. Baseline Road/County Line Road:** This signalized intersection is expected to operate at an overall LOS "D" during the morning peak-hour and LOS "C" during the afternoon peak-hour through 2025. By 2037, with implementation of the recommended improvements, the intersection is expected to operate at LOS "C" during both peak-hours.

- **County Line Road/Three-Quarter Site Access:** All movements at this unsignalized intersection are expected to operate at LOS "B" or better through 2037.

- **County Line Road/Main Site Access/Old E. County Line Road:** All movements at this unsignalized intersection are expected to operate at LOS "E" or better through 2025. By 2037 this intersection is expected to be signalized and as such is expected to operate at LOS "B" during both peak-hours.

- **Old County Line Road/RIRO Site Access:** All movements at this unsignalized intersection are expected to operate at LOS "B" or better through 2037.

- **Old County Line Road/Full Movement Site Access:** All movements at this unsignalized intersection are expected to operate at LOS "D" or better through 2037. Overall operations will improve to LOS "B" or better once the full realignment of County Line Road is complete.

- **N. 119th Street/W. Three-Quarter Movement Site Access:** All movements at this unsignalized intersection are expected to operate at LOS "B" or better through 2037.

CONCLUSIONS AND RECOMMENDATIONS

Trip Generation

1. The site is projected to generate about 6,473 vehicle-trips on the average weekday, with about half entering and half exiting during a 24-hour period. During the morning peak-hour, about 119 vehicles would enter and about 387 vehicles would exit the site. During the afternoon peak-hour, about 420 vehicles would enter and about 240 vehicles would exit.

Projected Levels of Service

2. All movements at the intersections analyzed are expected to operate at acceptable levels of service during both morning and afternoon peak-hours through 2037 with the recommended lane geometry and traffic control.

Conclusions

3. The impact of the growth in background traffic and the impact of the Parkdale residential development can be accommodated by the existing and proposed roadway network with the recommended improvements shown in Figures 8 and 9.

Recommendations

4. Figure 8 shows the recommended improvements for 2025 and identifies if each improvement is needed to mitigate existing or growth in background traffic or only because of the impact of the site.

5. Figure 9 shows the recommended improvements for 2037.

6. The section of relocated County Line Road between Baseline Road (SH 7) and the primary site access where the interim County Line Road alignment will turn to the east will be constructed as a four-lane cross-section with the appropriate auxiliary turn lanes and traffic control. Figure 8 shows this segment of County Line Road is expected to carry around 12,700 vehicles per day at site buildout in 2025. A two-lane roadway with the appropriate auxiliary turn lanes, traffic control, and access spacing has a capacity of about 16,000 vehicles per day.

* * * * *

We trust this information will assist you in planning for the proposed Parkdale residential development.

Respectfully submitted,

LSC Transportation Consultants, Inc.

By: _____
Christopher S. McGranahan, P.E., PTOE
Principal

COLORADO LICENSED CHRISTOPHER S. MCGRANAHAN 39018 PROFESSIONAL ENGINEER

5-25-17

CSM/wc

Enclosure: Tables 1 and 2
Figures 1 - 9
Traffic Count Reports
Level of Service Definitions
Level of Service Reports

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Table 1 (Page 1 of 2)
Intersection Levels of Service Analysis
Parkdale
Erie, CO
LSC #160131; May, 2017

Intersection Location	Traffic Control	Existing Traffic Level of Service AM	Existing Traffic Level of Service PM	2025 Background Traffic Level of Service AM	2025 Background Traffic Level of Service PM	2025 Total Traffic Level of Service AM	2025 Total Traffic Level of Service PM	2037 Background Traffic Level of Service AM	2037 Background Traffic Level of Service PM	2037 Total Traffic Level of Service AM	2037 Total Traffic Level of Service PM
Arapahoe Road/N. 119th Street	Signalized										
EB Left		C	C	C	C	C	B	C	C	C	C
EB Through/Right		C	D	C	D	C	D	--	--	--	--
EB Through		--	--	--	--	--	--	C	C	C	C
EB Right		--	--	--	--	--	--	C	C	C	C
WB Left		C	D	B	C	B	C	C	C	C	C
WB Through/Right		F	C	D	C	D	C	--	--	--	--
WB Through		--	--	--	--	--	--	D	C	D	C
WB Right		--	--	--	--	--	--	C	C	C	C
NB Left		B	B	C	B	D	B	C	B	D	B
NB Through/Right		B	B	C	B	B	A	--	--	--	--
NB Through		--	--	--	--	--	--	A	A	A	A
NB Right		--	--	--	--	--	--	A	A	A	A
SB Left		B	B	C	B	C	C	B	B	B	B
SB Through		C	B	D	C	C	C	C	B	C	C
SB Right		C	B	C	C	C	B	C	B	C	B
Entire Intersection Delay (sec /veh)		98.7	25.7	36.0	30.3	37.2	30.8	25.1	21.3	26.3	21.1
Entire Intersection LOS		F	C	D	C	D	C	C	C	C	C
N. 119th Street/West Full Movement Site Access	Signalized										
WB Left		--	--	--	--	D	D	--	--	D	D
WB Right		--	--	--	--	C	C	--	--	C	C
NB Left/U-Turn		--	--	--	--	A	A	--	--	A	A
NB Through		--	--	--	--	A	A	--	--	A	A
NB Right		--	--	--	--	A	A	--	--	A	A
SB Left		--	--	--	--	A	A	--	--	A	A
SB Through		--	--	--	--	A	A	--	--	A	A
Entire Intersection Delay (sec /veh)		--	--	--	--	9.6	6.4	--	--	7.8	5.9
Entire Intersection LOS		--	--	--	--	A	A	--	--	A	A
Arapahoe Road/County Line Road	Signalized										
EB Left		C	C	D	D	D	D	D	D	D	D
EB Through/Right		C	B	C	C	C	C	C	C	C	C
WB Left/Through/Right		B	A	D	D	D	D	D	D	D	D
NB Left		A	A	A	A	A	A	A	A	A	A
NB Through/Right		A	A	A	A	A	A	A	A	A	A
SB Left		A	A	A	A	A	A	A	A	A	A
SB Through		A	A	B	B	A	B	A	B	A	B
SB Right		A	A	A	A	A	A	A	A	A	A
Entire Intersection Delay (sec /veh)		5.9	10.3	10.8	17.0	9.6	15.8	12.7	17.0	13.0	17.3
Entire Intersection LOS		A	B	B	B	A	B	B	B	B	B
SH 7 (Baseline Road)/N. 119th Street	Signalized										
EB Left		C	B	B	B	C	B	D	D	D	D
EB Through/Right		C	D	B	D	C	F	--	--	--	--
EB Through		--	--	--	--	--	--	C	C	C	D
EB Right		--	--	--	--	--	--	B	B	C	B
WB Left		C	C	C	D	B	D	D	D	D	D
WB Through/Right		F	C	--	--	--	--	--	--	--	--
WB Through		--	--	C	C	C	C	B	C	C	C
WB Right		--	--	B	B	B	B	B	B	B	B
NB Left/Through		D	F	--	--	--	--	--	--	--	--
NB Left		--	--	C	C	C	C	D	D	D	D
NB Through		--	--	D	D	C	C	C	D	C	D
NB Right		F	F	D	E	C	D	C	F	C	F
SB Left/Through/Right		F	E	--	--	--	--	--	--	--	--
SB Left		--	--	C	D	C	D	D	D	D	D
SB Through		--	--	D	C	D	C	C	C	C	C
SB Right		--	--	C	C	C	C	C	C	C	C
Entire Intersection Delay (sec /veh)		79.2	142.6	27.8	45.3	25.0	50.5	29.5	43.1	30.2	46.5
Entire Intersection LOS		E	F	C	D	C	D	C	D	C	D

Table 1 (Page 2 of 2)
Intersection Levels of Service Analysis
Parkdale
Erie, CO
LSC #160131; May, 2017

Intersection Location	Traffic Control	Existing Traffic Level of Service AM	Existing Traffic Level of Service PM	2025 Background Traffic Level of Service AM	2025 Background Traffic Level of Service PM	2025 Total Traffic Level of Service AM	2025 Total Traffic Level of Service PM	2037 Background Traffic Level of Service AM	2037 Background Traffic Level of Service PM	2037 Total Traffic Level of Service AM	2037 Total Traffic Level of Service PM
SH 7 (Baseline Road)/County Line Road	Signalized										
EB Left		B	A	C	B	C	B	D	D	D	D
EB Through		A	B	A	C	A	C	A	B	A	B
WB Through		B	B	F	B	F	C	C	B	C	C
WB Right		A	B	A	A	A	A	A	A	A	A
SB Left		E	E	D	D	D	D	D	D	D	D
SB Right		D	D	C	C	C	C	C	C	C	C
Entire Intersection Delay (sec /veh)		21.2	19.0	38.2	21.3	39.4	25.2	21.0	20.2	23.7	21.1
Entire Intersection LOS		C	B	D	C	D	C	C	C	C	C
County Line Road/Three-Quarter Site Access											
WB Right		--	--	--	--	B	B	--	--	B	B
SB Left		--	--	--	--	A	A	--	--	A	B
EB Right		--	--	--	--	--	--	B	B	B	B
NB Left		--	--	--	--	--	--	A	B	A	B
Critical Movement Delay (sec./veh)		--	--	--	--	10.5	10.8	10.8	12.3	11.9	12.9
County Line Road/Main Site Access/Old E. County Line Road	AWSC										
NB Left		--	--	--	--	D	E	--	--	--	--
NB Right		--	--	--	--	B	B	--	--	--	--
EB Through		--	--	--	--	--	--	--	--	--	--
EB Right		--	--	--	--	--	--	--	--	--	--
WB Left		--	--	--	--	A	A	--	--	--	--
WB Through		--	--	--	--	--	--	--	--	--	--
Critical Movement Delay (sec./veh)		--	--	--	--	34.2	41.1	--	--	--	--
	Signalized										
EB Left		--	--	--	--	--	--	D	D	D	D
EB Through		--	--	--	--	--	--	A	A	D	D
EB Right		--	--	--	--	--	--	D	D	D	D
WB Left		--	--	--	--	--	--	D	D	D	D
WB Through/Right		--	--	--	--	--	--	D	D	D	D
NB Left		--	--	--	--	--	--	A	A	A	A
NB Through		--	--	--	--	--	--	A	A	A	A
NB Right		--	--	--	--	--	--	A	A	A	A
SB Left		--	--	--	--	--	--	A	A	A	A
SB Through		--	--	--	--	--	--	A	A	A	B
SB Right		--	--	--	--	--	--	A	A	A	A
Entire Intersection Delay (sec /veh)		--	--	--	--	--	--	5.8	5.3	11.7	10.9
Entire Intersection LOS		--	--	--	--	--	--	A	A	B	B
Old County Line Road/RIRO Site Access											
SB Right		--	--	--	--	B	B	A	A	A	A
Critical Movement Delay (sec./veh)		--	--	--	--	11.9	11.7	8.4	8.5	8.8	8.7
Old County Line Road/Full Movement Site Access	TWSC										
EB Left		--	--	--	--	A	A	A	A	A	A
SB Left		--	--	--	--	C	D	A	A	A	B
SB Right		--	--	--	--	B	B	A	A	A	A
Critical Movement Delay (sec./veh)		--	--	--	--	23.8	27.4	8.8	8.9	9.2	10.3
N. 119th Street/West Three-Quarter Movement Site Access	TWSC										
WB Right		--	--	--	--	B	B	B	B	B	B
SB Left		--	--	--	--	A	A	A	A	A	A
Critical Movement Delay (sec./veh)		--	--	--	--	10.3	10.9	10.2	11.0	10.6	11.6

Table 2
ESTIMATED TRAFFIC GENERATION
Parkdale
Erie, CO
LSC #160131; May, 2017

Land Use Description	Trip Generation Units	Trip Generation Rates [1]					Total Trips Generated				
		Average Weekday	AM Peak-Hour In	AM Peak-Hour Out	PM Peak-Hour In	PM Peak-Hour Out	Average Weekday	AM Peak-Hour In	AM Peak-Hour Out	PM Peak-Hour In	PM Peak-Hour Out
Duplex or Townhome [2]	226 DU [3]	5.81	0.075	0.365	0.348	0.172	1,313	17	82	79	39
Single-Family Detached [4]	542 DU	9.52	0.188	0.563	0.630	0.370	5,160	102	305	341	201
Total =	**768** DU						**6,473**	**119**	**387**	**420**	**240**

Notes:
(1) Source: *Trip Generation*, Institute of Transportation Engineers, 9th Edition, 2012.
(2) ITE Land Use No. 230 - Residential Condominium/Townhouse
(3) DU = Dwelling Unit
(4) ITE Land Use No. 210 - Single-Family Detached Housing

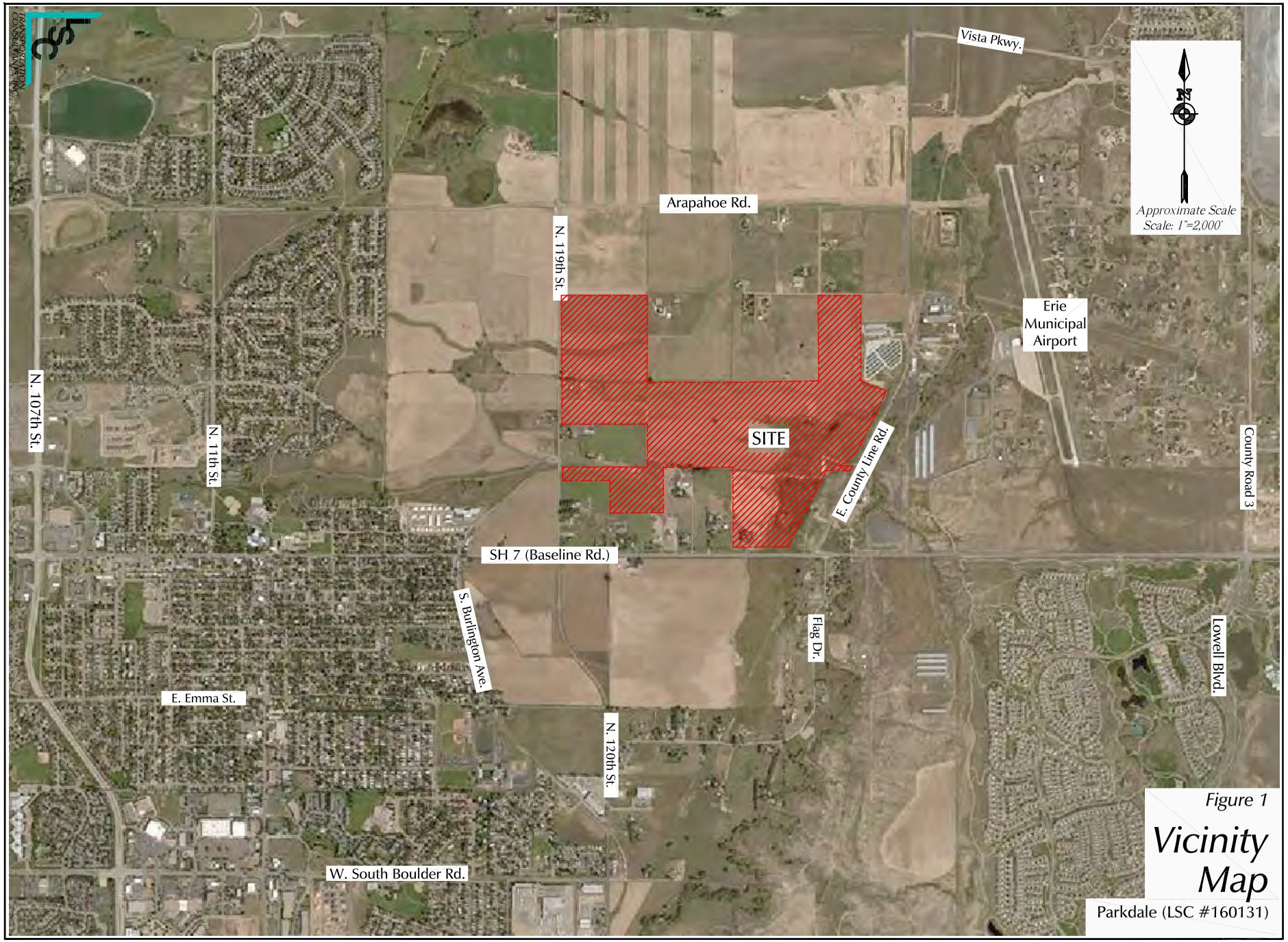


Figure 1

Vicinity Map

Parkdale (LSC #160131)

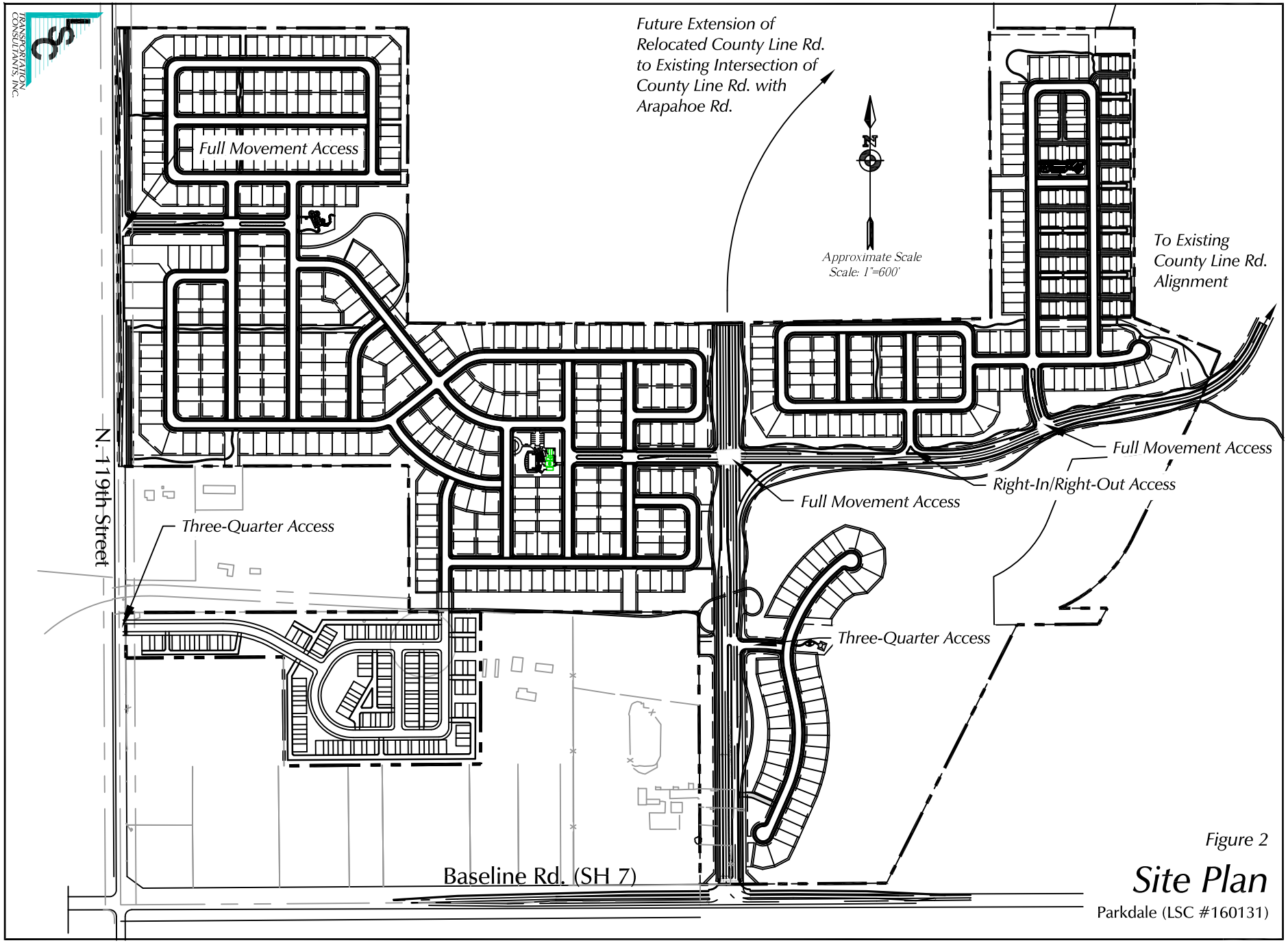
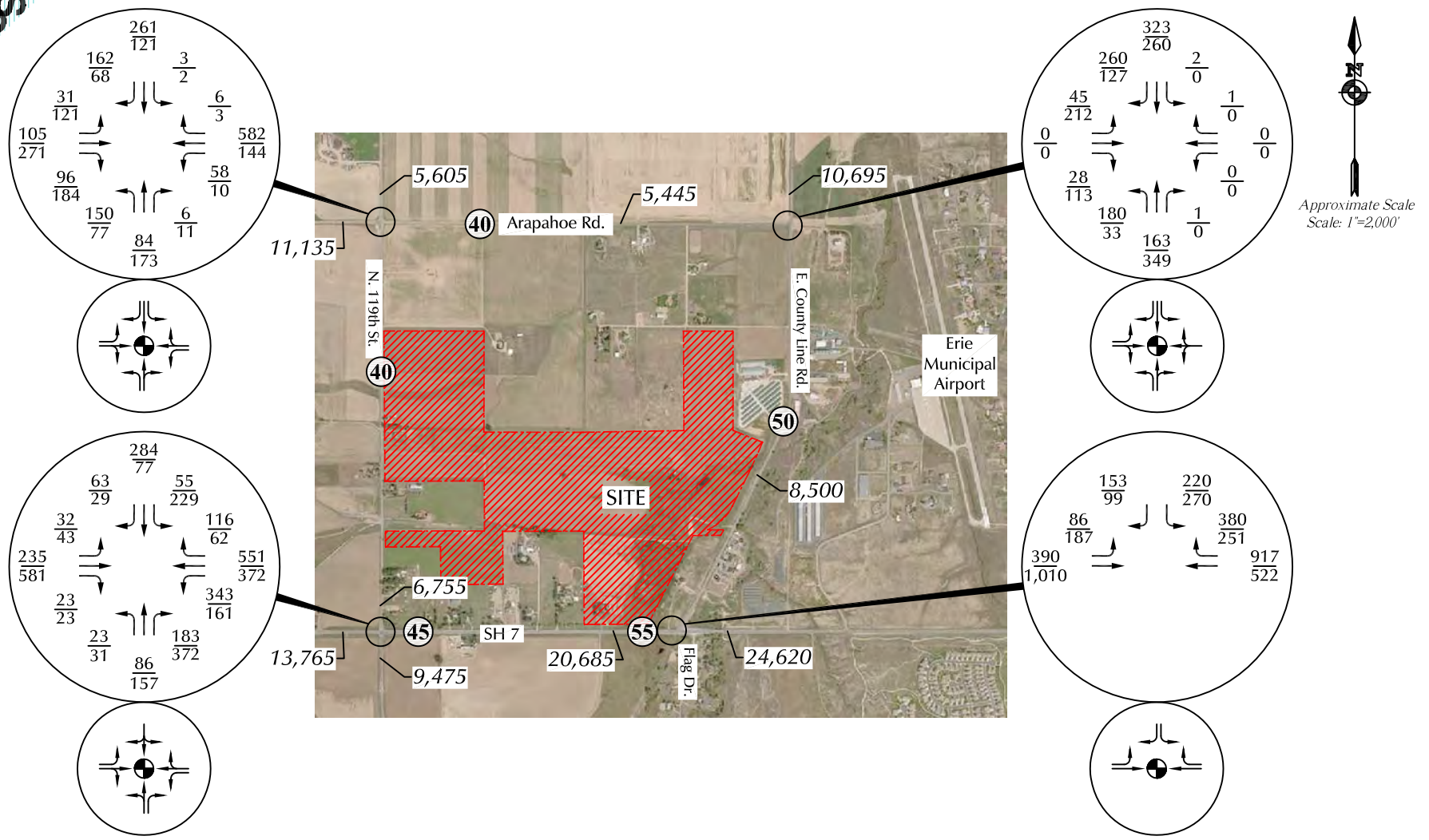


Figure 2

Site Plan

Parkdale (LSC #160131)



LEGEND:

= Stop Sign

= Traffic Signal

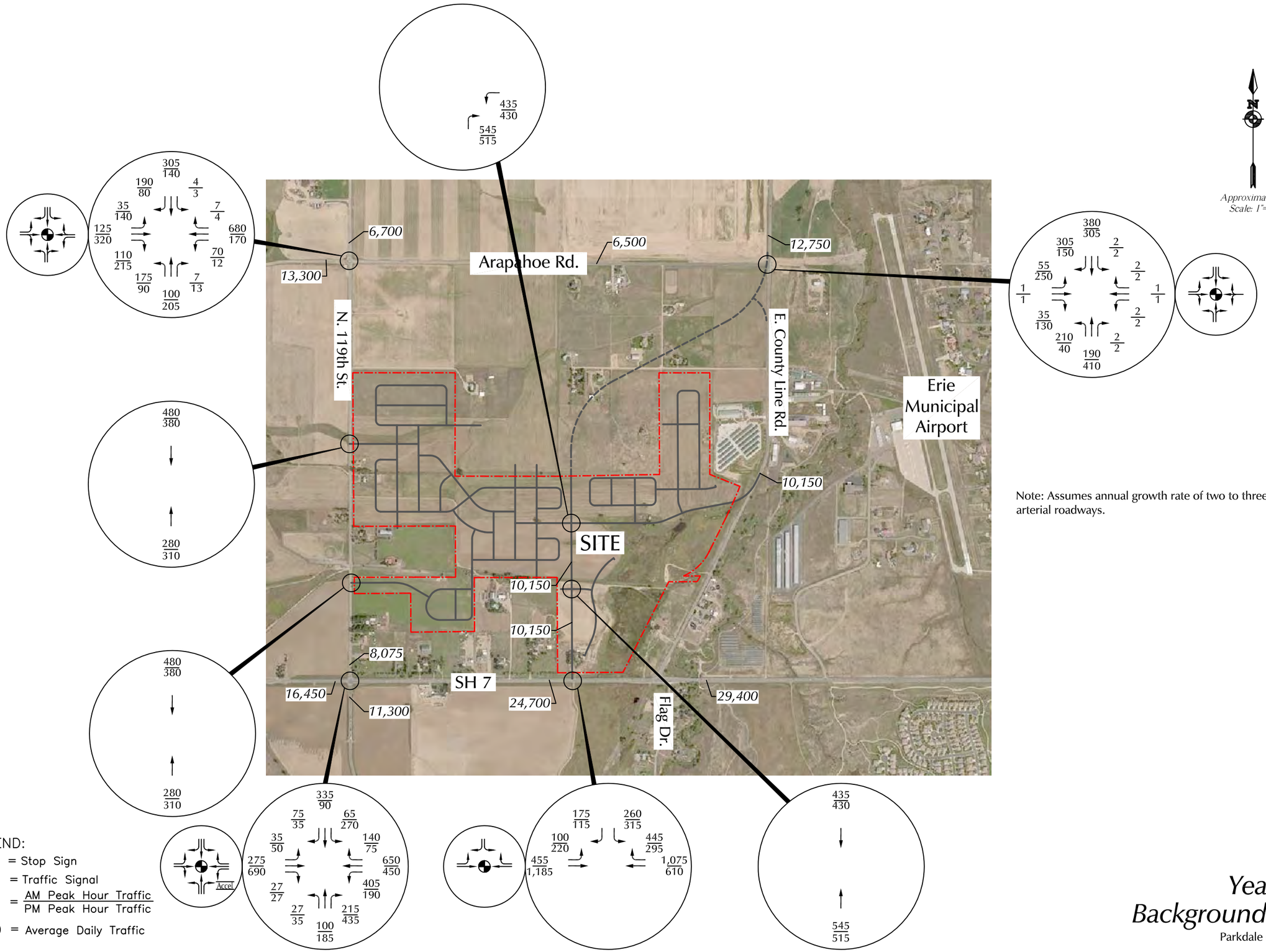
$\frac{26}{35}$ = $\frac{\text{AM Peak Hour Traffic}}{\text{PM Peak Hour Traffic}}$

2,500 = Average Daily Traffic

Figure 3

Existing Traffic, Lane Geometry and Traffic Control

Parkdale (LSC #160131)



Approximate Scale
Scale: 1"= 1,200'

Note: Assumes annual growth rate of two to three percent on arterial roadways.

LEGEND:

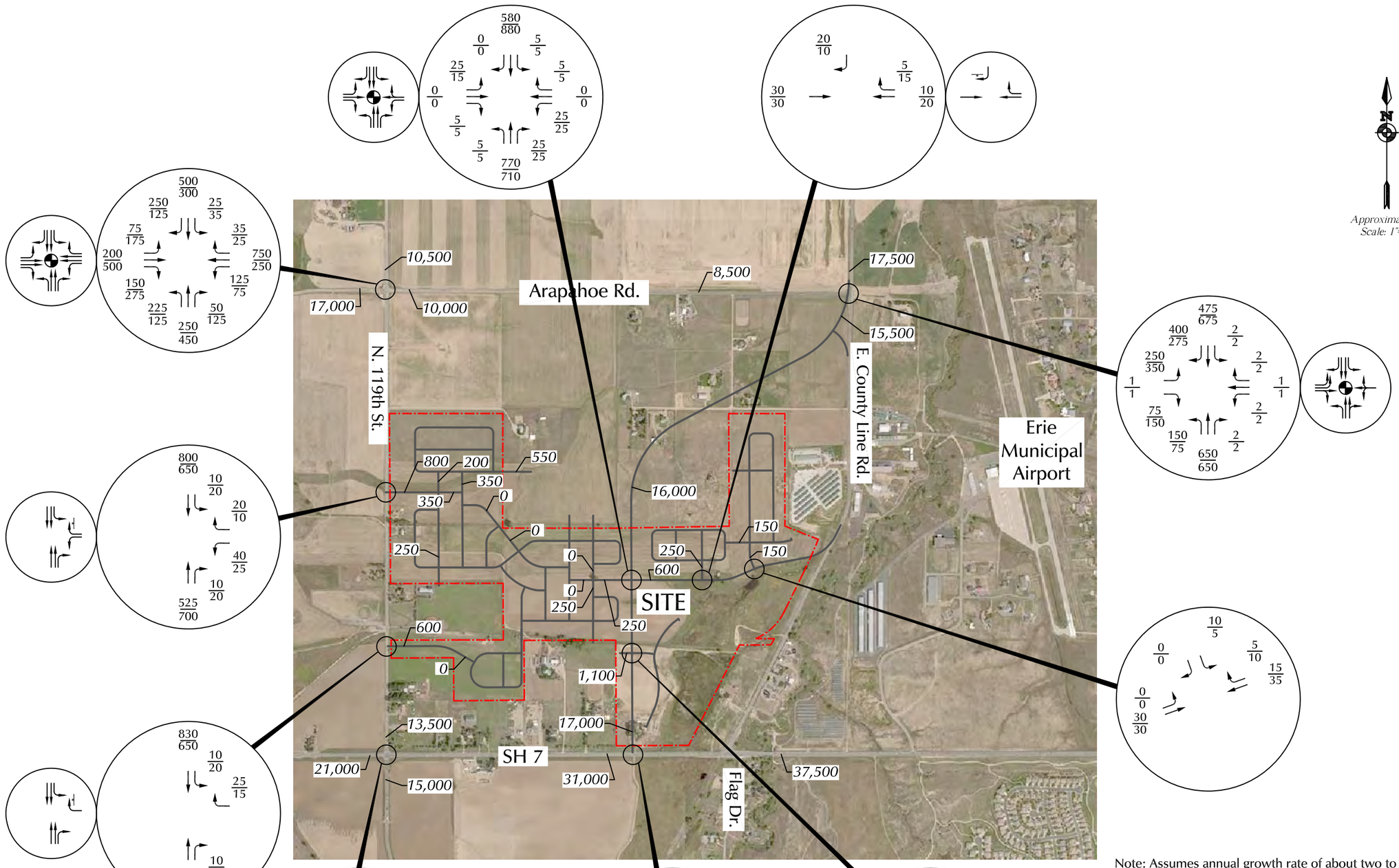
- ⊦ = Stop Sign
- = Traffic Signal
- 26/35 = AM Peak Hour Traffic / PM Peak Hour Traffic
- 2,500 = Average Daily Traffic

LSC TRANSPORTATION CONSULTANTS, INC.

Figure 4

Year 2025 Background Traffic

Parkdale (LSC #160131)



Approximate Scale
Scale: 1"= 1,200'

Note: Assumes annual growth rate of about two to three percent on the arterial roadways.

LEGEND:

= Stop Sign

= Traffic Signal

$\frac{26}{35}$ = $\frac{\text{AM Peak Hour Traffic}}{\text{PM Peak Hour Traffic}}$

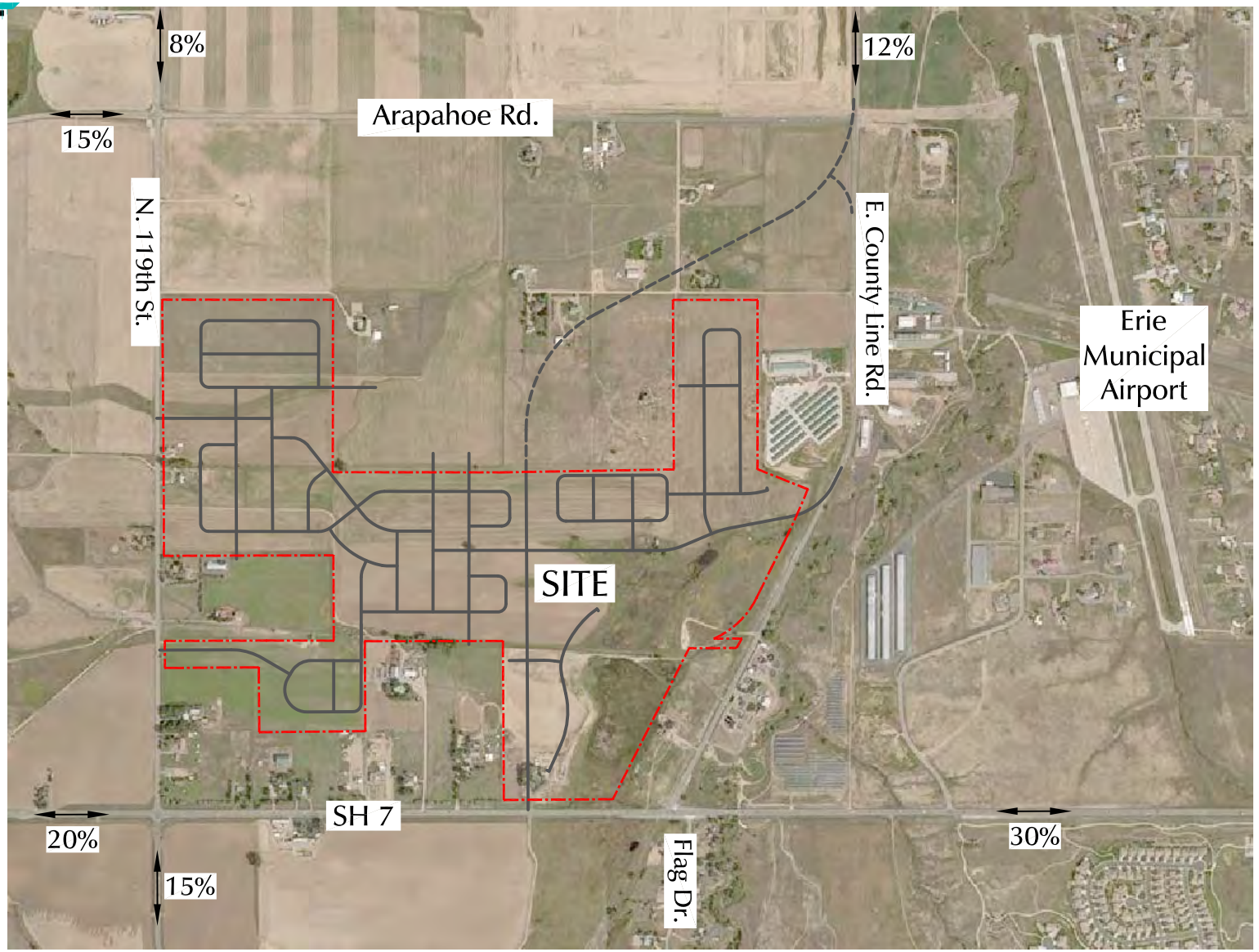
2,500 = Average Daily Traffic

LSC TRANSPORTATION CONSULTANTS, INC.

Figure 5

Year 2037 Background Traffic

Parkdale (LSC #160131)



N

Approximate Scale
Scale: 1"=1,200'

LEGEND:

25% = Percent Directional Distribution

Figure 6

Directional Distribution of Site-Generated Traffic

Parkdale (LSC #160131)

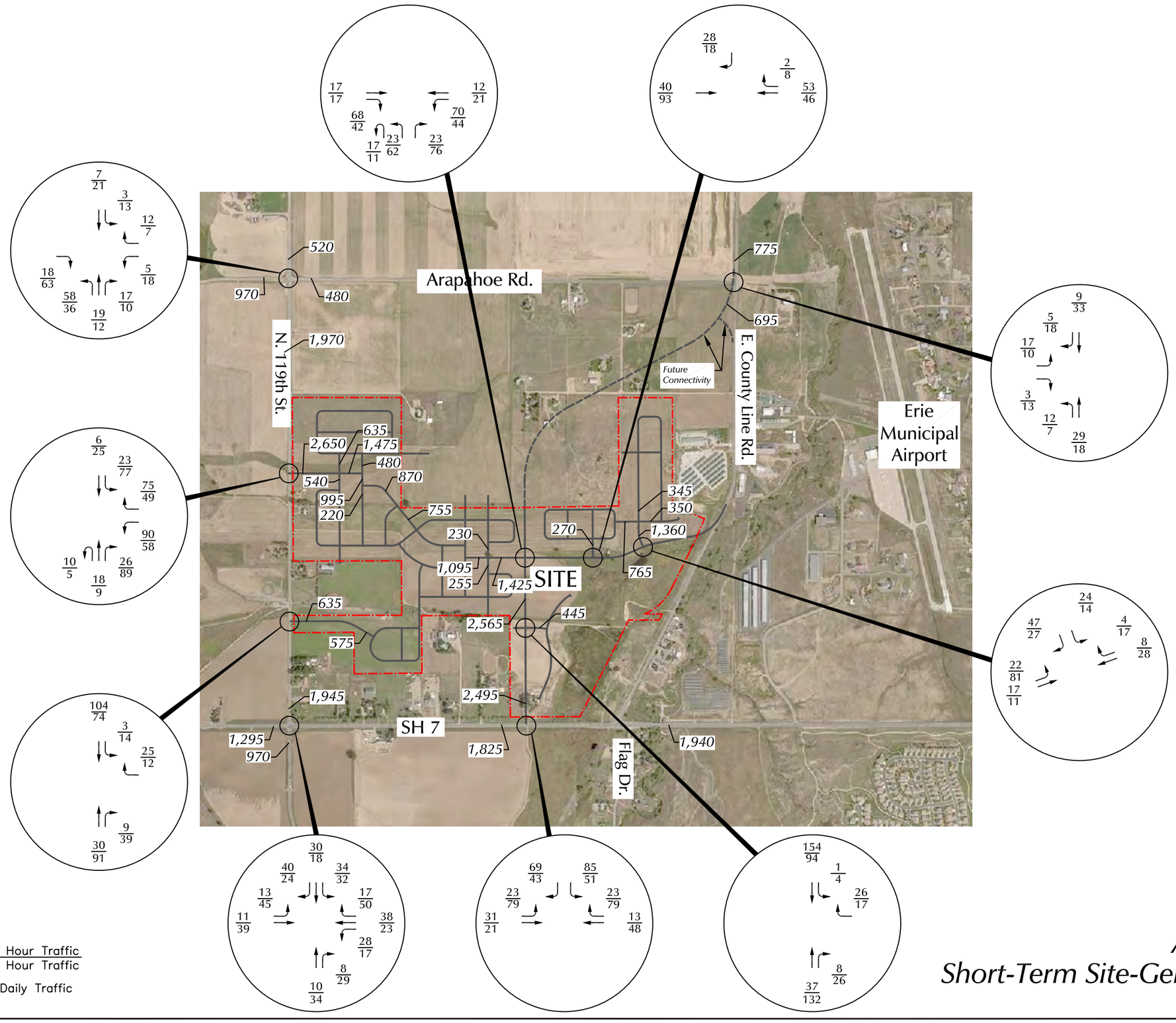
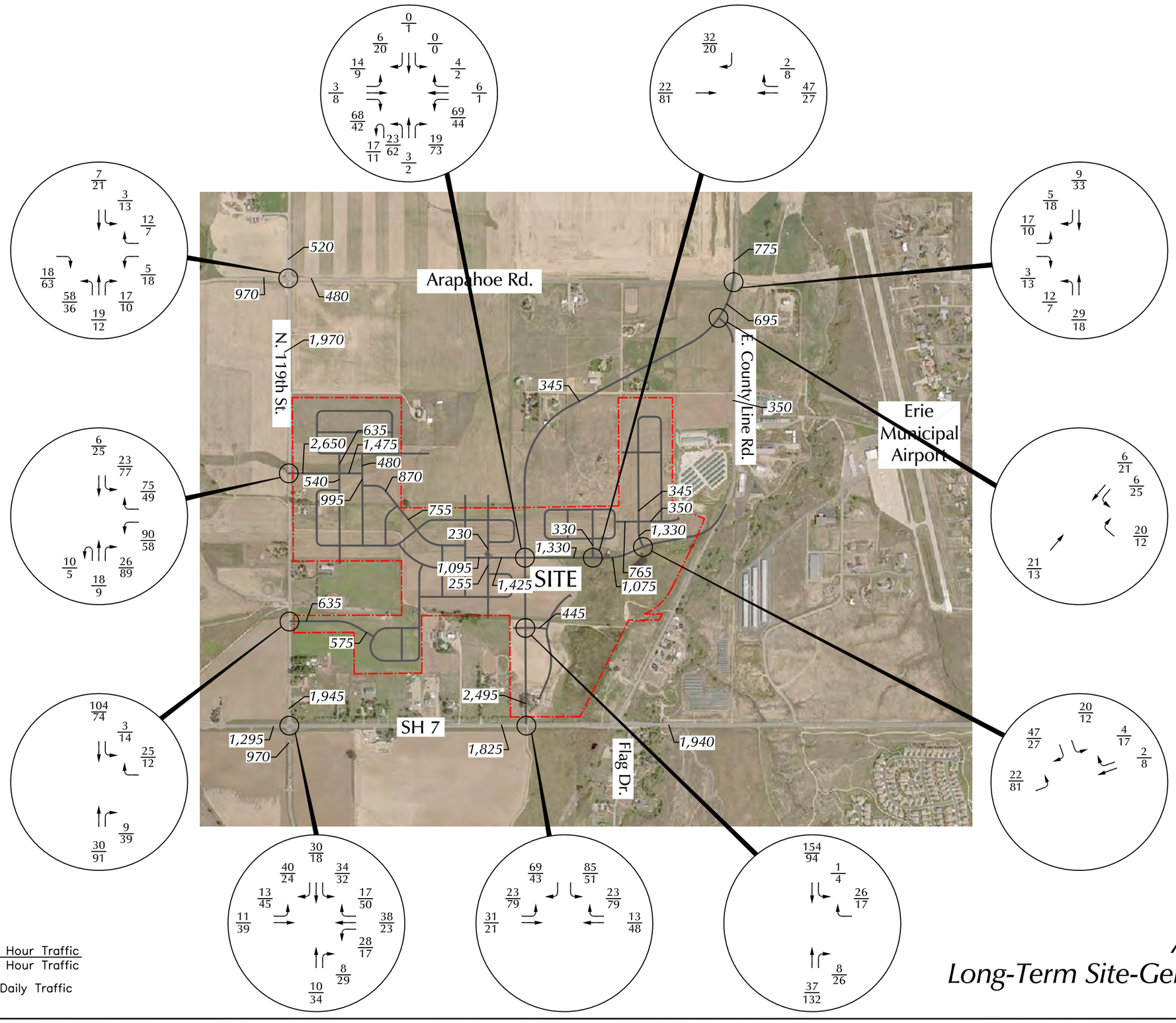


Figure 7a

Assignment of Short-Term Site-Generated Traffic

Parkdale (LSC #160131)



Approximate Scale
Scale: 1"= 1,200'

LEGEND:
26/35 = AM Peak Hour Traffic / PM Peak Hour Traffic
2,500 = Average Daily Traffic

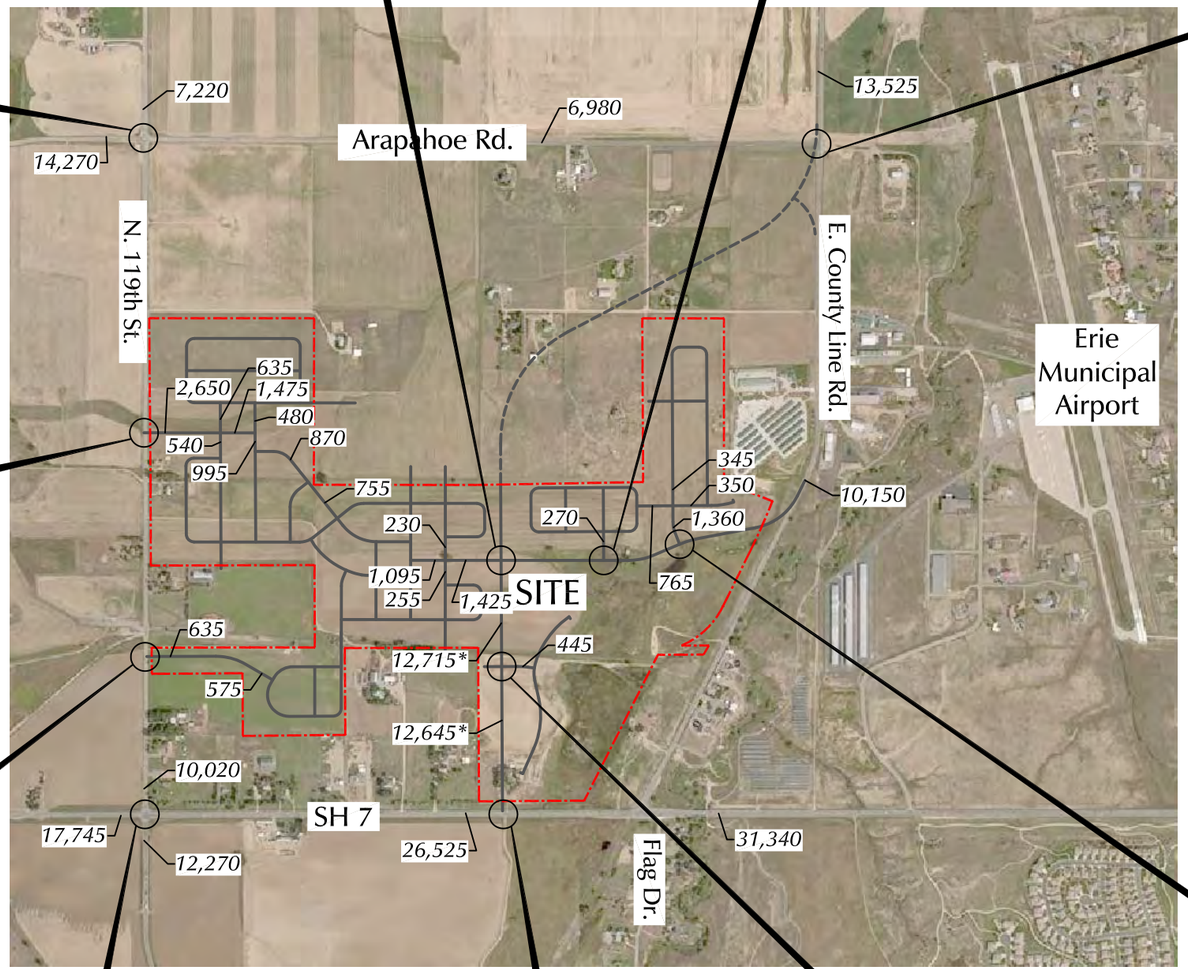
LSC TRANSPORTATION CONSULTANTS, INC.

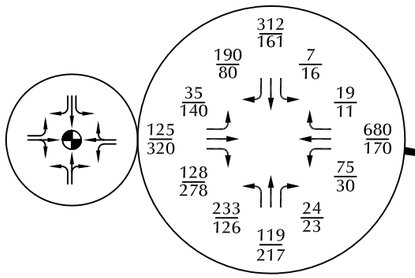
Figure 7b

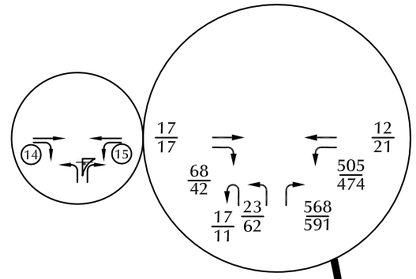
Assignment of Long-Term Site-Generated Traffic

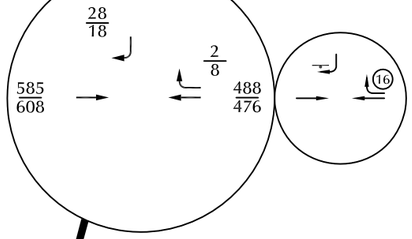
Parkdale (LSC #160131)

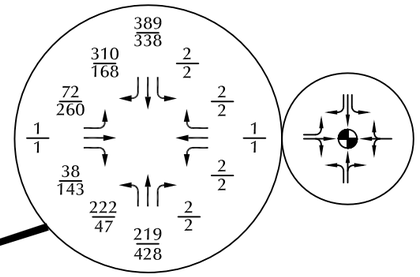
* Note: The daily capacity of a two lane roadway with the appropriate auxiliary turn lanes, traffic control and access spacing is about 16,000vpd.

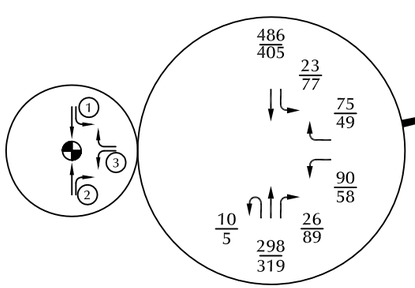


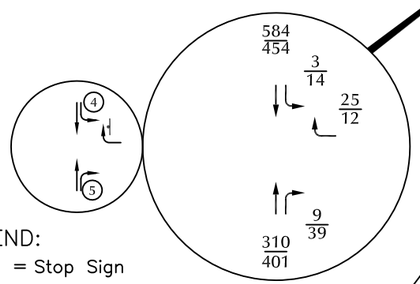


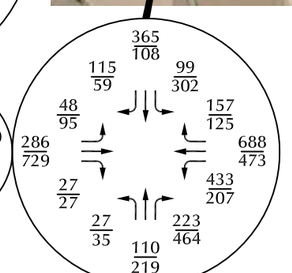


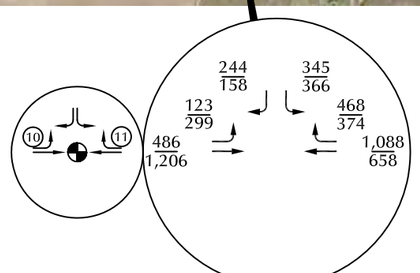


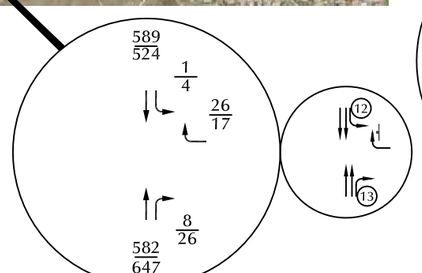


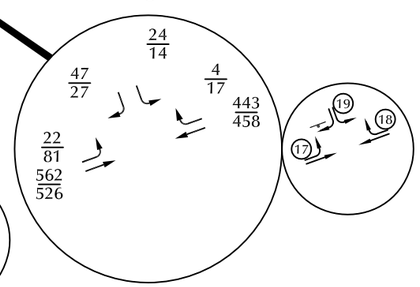














Approximate Scale
Scale: 1"= 1,200'

① SBLT = 325 feet + 145 foot transition taper (1)
② NBRT = 225 feet + 145 foot transition taper (1)
③ WBLT = 200 feet + 120 foot transition taper (1)
④ SBLT = 260 feet + 145 foot transition taper (1)
⑤ NBRT = 225 feet + 145 foot transition taper (1)
⑥ SBLT = 525 feet + 145 foot transition taper (2)
⑦ SBRT = 225 feet + 145 foot transition taper (2)
⑧ NBLT = 330 feet + 145 foot transition taper (2)
⑨ WBRT = 275 feet + 160 foot transition taper (2)
⑩ EBLT = 680 feet + 220 foot transition taper (1)
⑪ WBRT = 380 feet + 220 foot transition taper (1)
⑫ SBLT = 280 feet + 160 foot transition taper (1)
⑬ NBRT = 275 feet + 160 foot transition taper (1)
⑭ EBRT = 200 feet + 120 foot transition taper (1)
⑮ WBLT = 600 feet + 160 foot transition taper (1)
⑯ WBRT = 275 feet + 160 foot transition taper (1)
⑰ EBLT = 355 feet + 160 foot transition taper (1)
⑱ WBRT = 275 feet + 160 foot transition taper (1)
⑲ SBLT = 100 feet + 100 foot transition taper (1)

(1) = needed to mitigate site impact or relocation of County Line Road

(2) = needed to mitigate existing or 2025 background traffic

LEGEND:

= Stop Sign

= Traffic Signal

26/35 = AM Peak Hour Traffic / PM Peak Hour Traffic

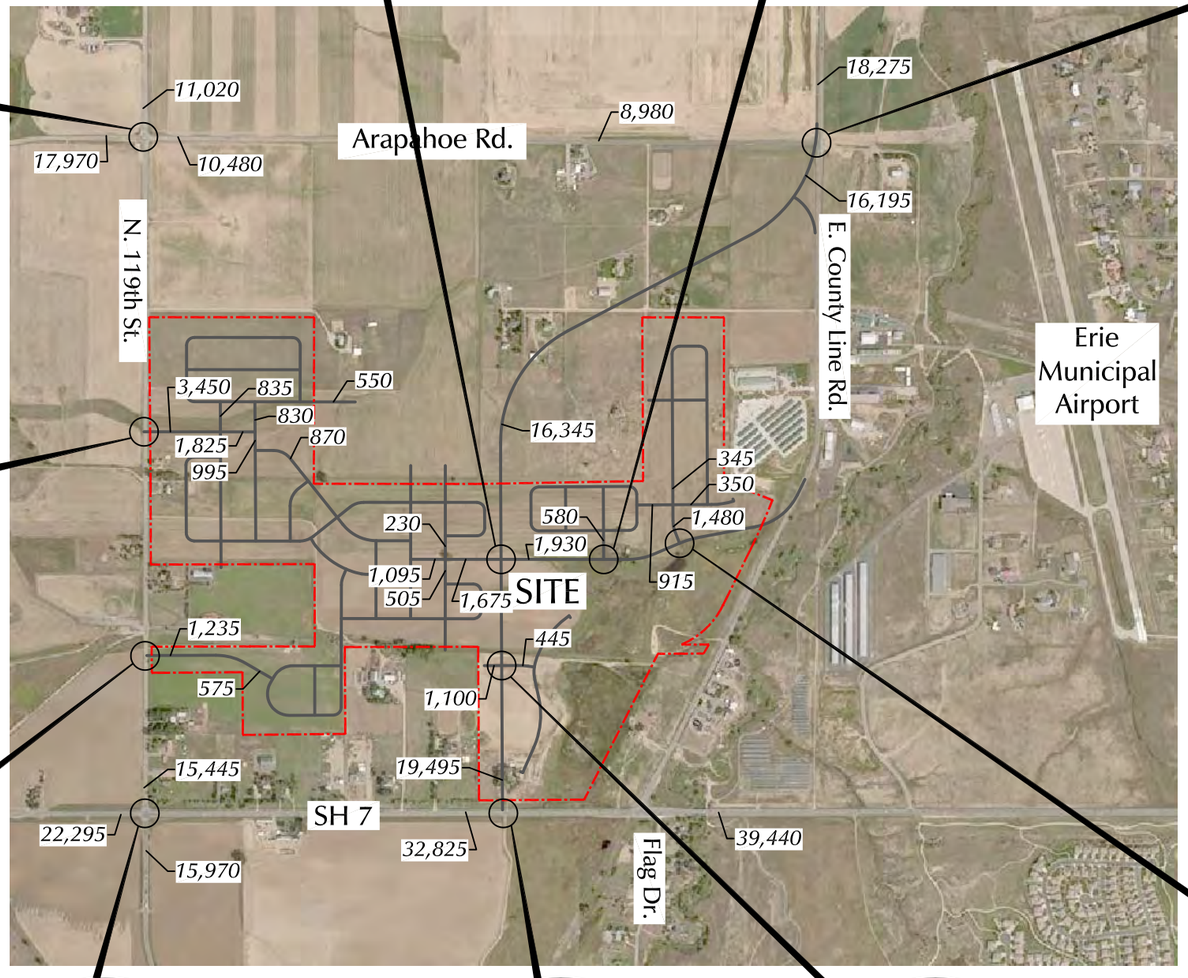
2,500 = Average Daily Traffic

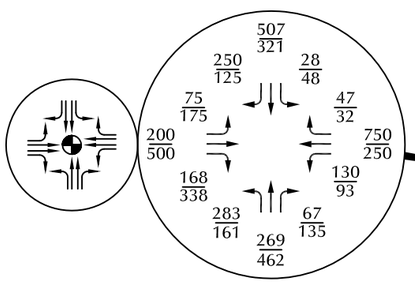
LSC TRANSPORTATION CONSULTANTS, INC.

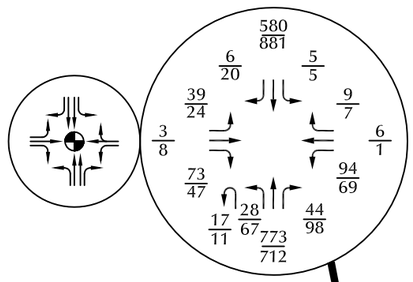
Figure 8

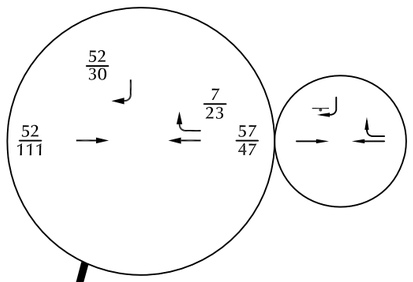
Year 2025 Total Traffic

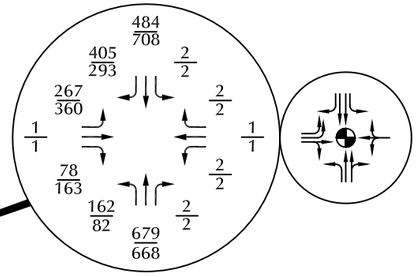
Parkdale (LSC #160131)

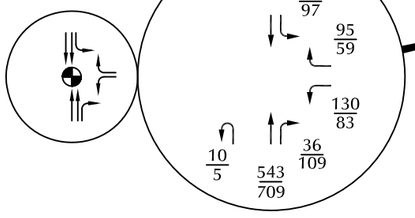


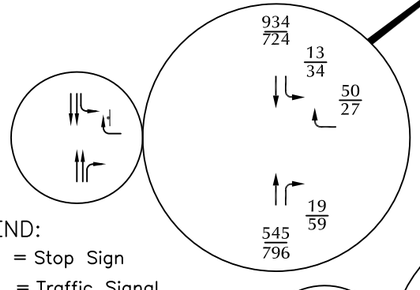


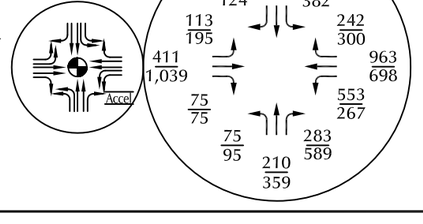


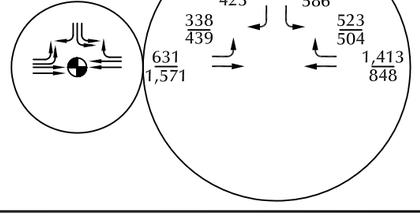


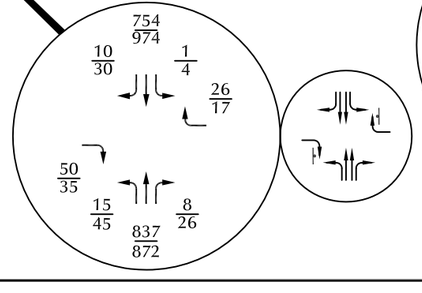


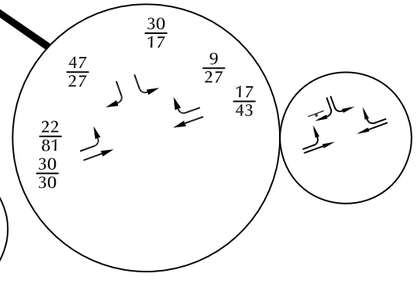


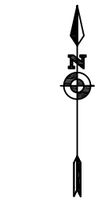












LEGEND:

- ⊦ = Stop Sign
- ⊕ = Traffic Signal
- 26/35 = AM Peak Hour Traffic / PM Peak Hour Traffic
- 2,500 = Average Daily Traffic

LSC TRANSPORTATION CONSULTANTS, INC.

Approximate Scale
Scale: 1"= 1,200'

Figure 9

Year 2037 Total Traffic

Parkdale (LSC #160131)

COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: 119TH ST
E/W STREET: ARAPAHOE RD
CITY: ERIE
COUNTY: WELD

File Name : 119TARAP
Site Code : 00000022
Start Date : 2/4/2016
Page No : 1

Groups Printed- VEHICLES

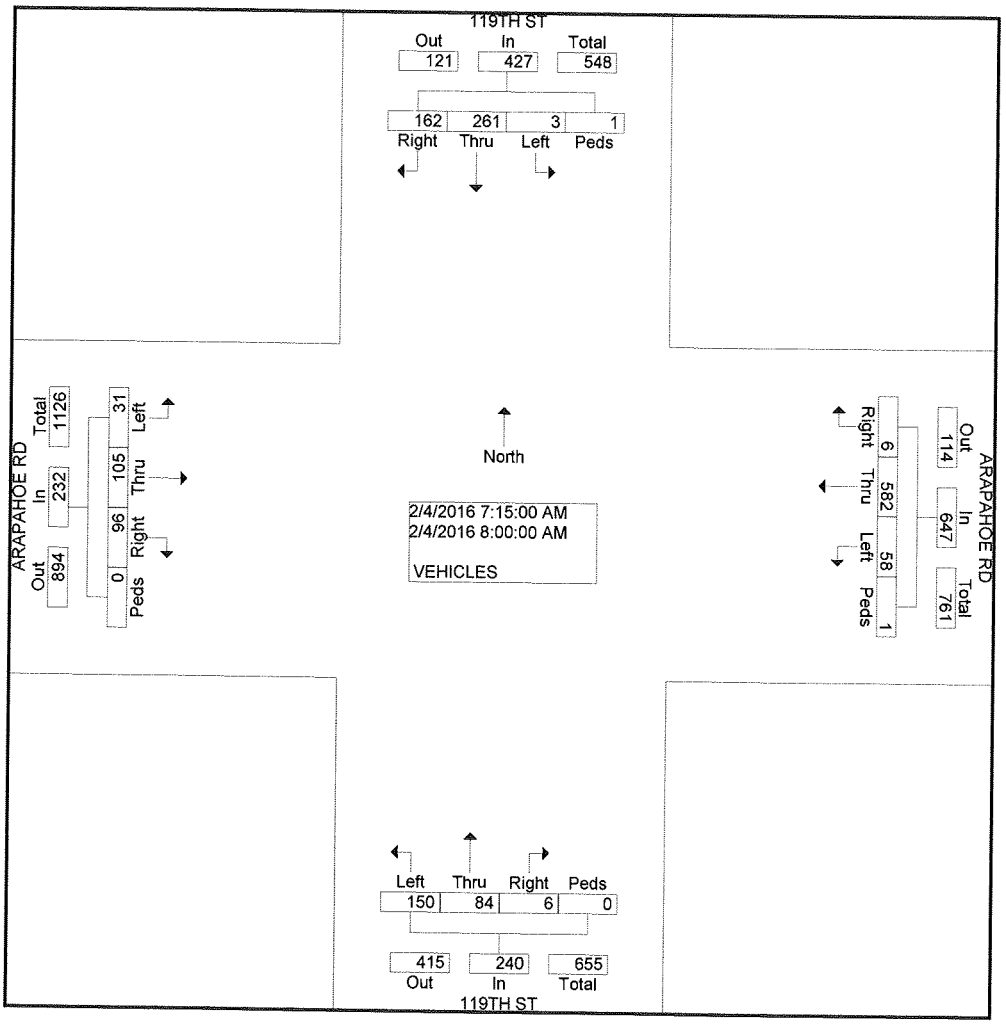
	119TH ST Southbound				ARAPAHOE RD Westbound				119TH ST Northbound				ARAPAHOE RD Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:30 AM	0	21	19	1	1	45	0	0	51	6	1	0	2	9	16	1	173
06:45 AM	1	42	29	0	2	57	3	0	51	9	1	0	7	6	11	0	219
Total	1	63	48	1	3	102	3	0	102	15	2	0	9	15	27	1	392
07:00 AM	1	44	27	0	7	99	2	0	47	15	1	0	4	12	13	0	272
07:15 AM	1	55	33	0	8	133	2	0	36	12	1	0	8	13	30	0	332
07:30 AM	1	103	60	0	28	162	2	1	45	13	2	0	6	28	29	0	480
07:45 AM	1	58	38	1	16	179	0	0	26	35	3	0	10	39	20	0	426
Total	4	260	158	1	59	573	6	1	154	75	7	0	28	92	92	0	1510
08:00 AM	0	45	31	0	6	108	2	0	43	24	0	0	7	25	17	0	308
08:15 AM	0	27	33	0	6	132	3	0	41	11	3	0	8	24	13	0	301
Total	0	72	64	0	12	240	5	0	84	35	3	0	15	49	30	0	609
04:00 PM	0	29	15	0	7	33	2	0	22	41	2	0	39	79	45	1	315
04:15 PM	0	24	15	0	2	37	1	0	15	41	2	0	27	61	53	0	278
04:30 PM	0	38	19	0	2	39	1	0	27	45	6	0	26	58	45	0	306
04:45 PM	0	28	20	0	5	33	1	0	17	43	1	0	35	77	37	0	297
Total	0	119	69	0	16	142	5	0	81	170	11	0	127	275	180	1	1196
05:00 PM	2	31	14	0	1	35	0	0	18	44	2	0	33	75	49	0	304
05:15 PM	0	23	22	0	5	35	1	0	24	50	4	0	34	84	43	0	325
05:30 PM	2	35	20	0	4	41	0	0	24	49	6	0	43	69	53	0	346
05:45 PM	3	28	14	0	3	35	1	0	20	46	1	0	39	74	46	0	310
Total	7	117	70	0	13	146	2	0	86	189	13	0	149	302	191	0	1285
Grand Total	12	631	409	2	103	1203	21	1	507	484	36	0	328	733	520	2	4992
Apprch %	1.1	59.9	38.8	0.2	7.8	90.6	1.6	0.1	49.4	47.1	3.5	0.0	20.7	46.3	32.8	0.1	
Total %	0.2	12.6	8.2	0.0	2.1	24.1	0.4	0.0	10.2	9.7	0.7	0.0	6.6	14.7	10.4	0.0	

COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: 119TH ST
E/W STREET: ARAPAHOE RD
CITY: ERIE
COUNTY: WELD

File Name : 119TARAP
Site Code : 00000022
Start Date : 2/4/2016
Page No : 2

	119TH ST Southbound					ARAPAHOE RD Westbound					119TH ST Northbound					ARAPAHOE RD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 06:30 AM to 08:30 AM - Peak 1 of 1																					
Intersection	07:15 AM																				
Volume	3	261	162	1	427	58	582	6	1	647	150	84	6	0	240	31	105	96	0	232	1546
Percent	0.7	61.1	37.9	0.2		9.0	90.0	0.9	0.2		62.5	35.0	2.5	0.0		13.4	45.3	41.4	0.0		
07:30 Volume	1	103	60	0	164	28	162	2	1	193	45	13	2	0	60	6	28	29	0	63	480
Peak Factor																					0.805
High Int.	07:30 AM					07:45 AM					08:00 AM					07:45 AM					
Volume	1	103	60	0	164	16	179	0	0	195	43	24	0	0	67	10	39	20	0	69	
Peak Factor					0.651					0.829					0.896					0.841	

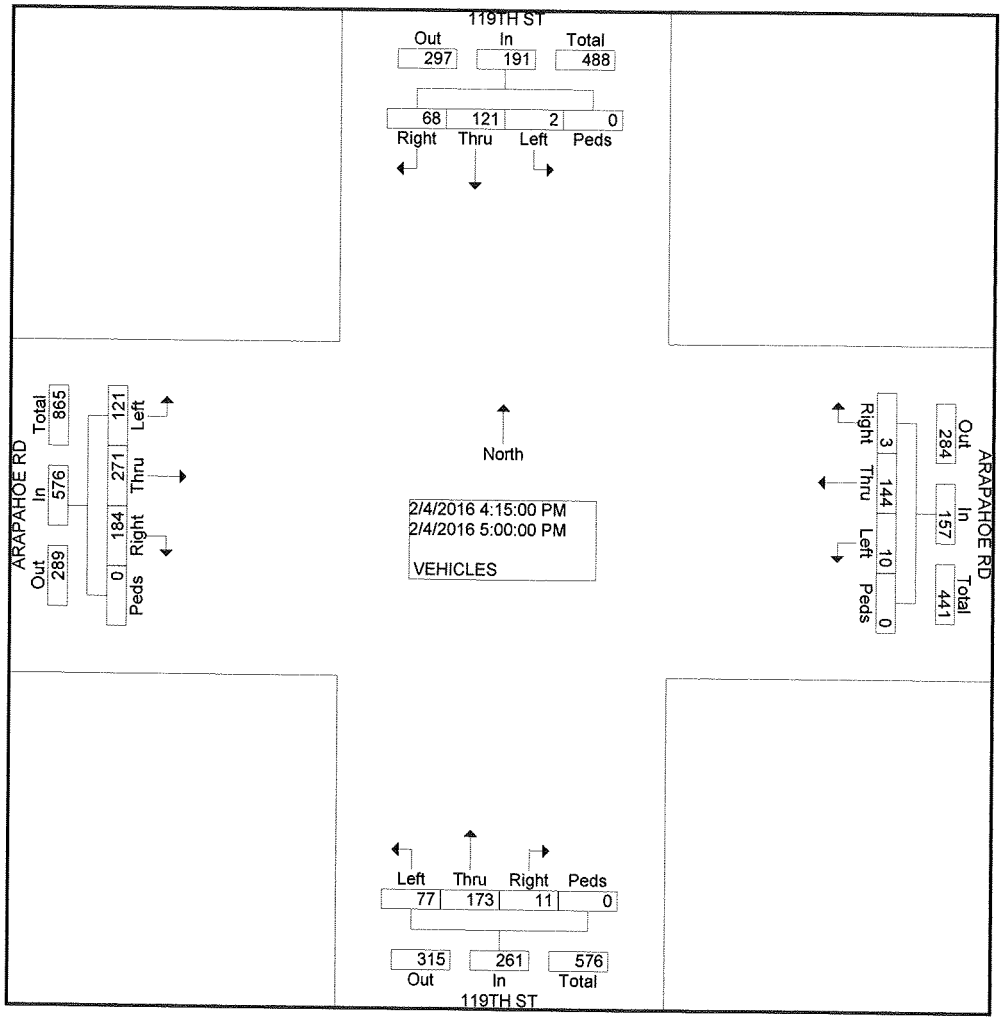


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	119TH ST Southbound					ARAPAHOE RD Westbound					119TH ST Northbound					ARAPAHOE RD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:15 PM to 05:00 PM - Peak 1 of 1																					
Intersection	04:15 PM																				
Volume	2	121	68	0	191	10	144	3	0	157	77	173	11	0	261	121	271	184	0	576	1185
Percent	1.0	63.4	35.6	0.0		6.4	91.7	1.9	0.0		29.5	66.3	4.2	0.0		21.0	47.0	31.9	0.0		
04:30 Volume	0	38	19	0	57	2	39	1	0	42	27	45	6	0	78	26	58	45	0	129	306
Peak Factor																					0.968
High Int.	04:30 PM					04:30 PM					04:30 PM					05:00 PM					
Volume	0	38	19	0	57	2	39	1	0	42	27	45	6	0	78	33	75	49	0	157	
Peak Factor					0.838					0.935					0.837					0.917	



COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: COUNTY LINE RD
E/W STREET: ARAPAHOE RD
CITY: ERIE
COUNTY: WELD

File Name : COUNARAP
Site Code : 00000008
Start Date : 2/3/2016
Page No : 1

Groups Printed- VEHICLES

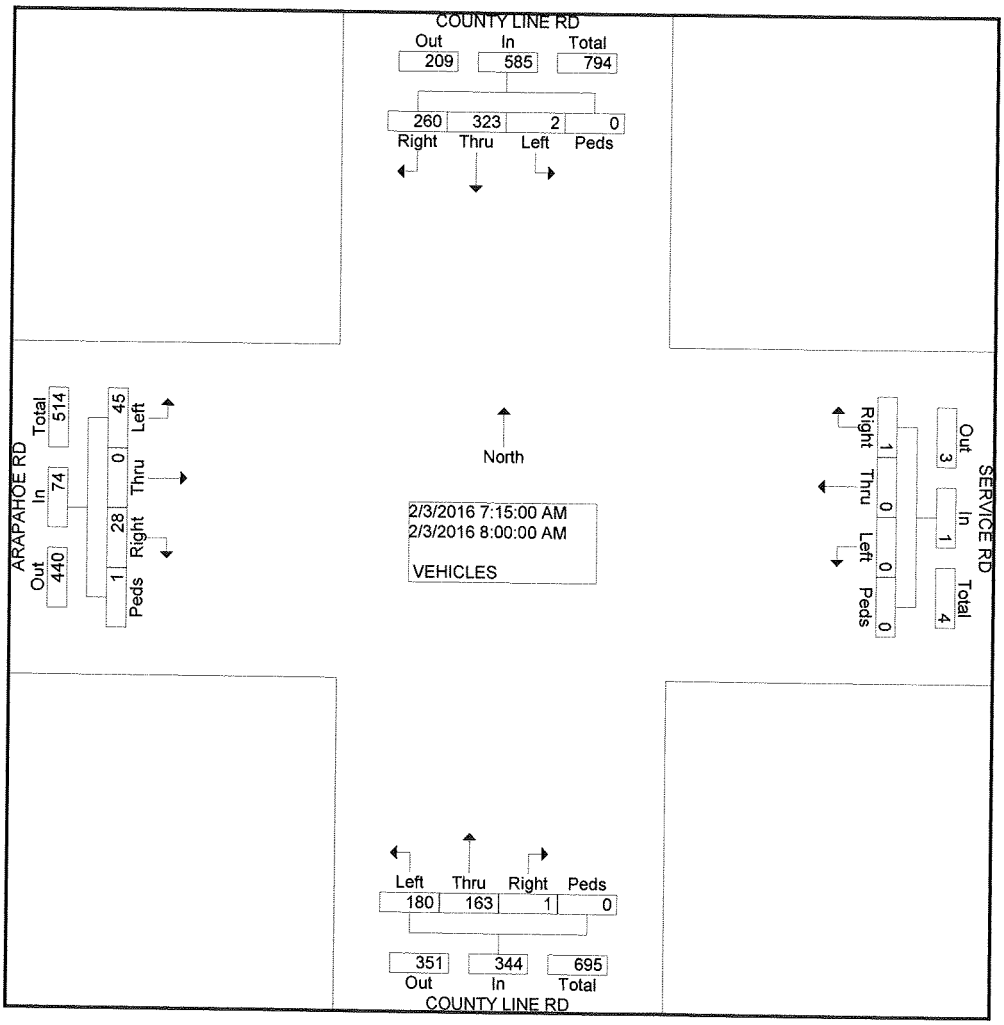
	COUNTY LINE RD Southbound				SERVICE RD Westbound				COUNTY LINE RD Northbound				ARAPAHOE RD Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:30 AM	0	62	23	0	0	0	0	0	19	22	0	0	2	0	3	0	131
06:45 AM	0	51	34	0	0	0	0	0	20	19	0	0	6	1	1	0	132
Total	0	113	57	0	0	0	0	0	39	41	0	0	8	1	4	0	263
07:00 AM	0	55	50	0	1	0	1	0	31	40	0	0	3	1	2	0	184
07:15 AM	0	85	64	0	0	0	0	0	46	35	1	0	8	0	2	0	241
07:30 AM	0	115	83	0	0	0	0	0	48	27	0	0	11	0	6	1	291
07:45 AM	0	67	59	0	0	0	0	0	52	52	0	0	9	0	11	0	250
Total	0	322	256	0	1	0	1	0	177	154	1	0	31	1	21	1	966
08:00 AM	2	56	54	0	0	0	1	0	34	49	0	0	17	0	9	0	222
08:15 AM	0	80	52	0	1	0	0	0	50	51	0	0	10	0	3	0	247
Total	2	136	106	0	1	0	1	0	84	100	0	0	27	0	12	0	469
04:00 PM	0	53	26	1	0	0	0	0	2	74	0	0	55	0	20	0	231
04:15 PM	0	77	27	0	0	0	0	0	8	75	0	0	42	0	23	0	252
04:30 PM	0	63	34	0	0	0	0	0	7	81	0	0	50	0	28	0	263
04:45 PM	0	54	32	0	0	0	0	0	9	90	0	0	70	0	28	0	283
Total	0	247	119	1	0	0	0	0	26	320	0	0	217	0	99	0	1029
05:00 PM	0	66	34	0	0	0	0	0	9	103	0	0	50	0	34	0	296
05:15 PM	0	68	31	0	0	0	0	0	9	97	0	0	60	0	22	0	287
05:30 PM	0	59	30	0	0	0	0	0	11	105	0	0	53	0	21	0	279
05:45 PM	0	57	23	0	0	0	0	0	10	99	0	0	54	0	27	0	270
Total	0	250	118	0	0	0	0	0	39	404	0	0	217	0	104	0	1132
Grand Total	2	1068	656	1	2	0	2	0	365	1019	1	0	500	2	240	1	3859
Apprch %	0.1	61.8	38.0	0.1	50.0	0.0	50.0	0.0	26.4	73.6	0.1	0.0	67.3	0.3	32.3	0.1	
Total %	0.1	27.7	17.0	0.0	0.1	0.0	0.1	0.0	9.5	26.4	0.0	0.0	13.0	0.1	6.2	0.0	

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N/S STREET: COUNTY LINE RD
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File Name : COUNARAP
Site Code : 00000008
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Page No : 2

	COUNTY LINE RD Southbound					SERVICE RD Westbound					COUNTY LINE RD Northbound					ARAPAHOE RD Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 07:15 AM to 08:00 AM - Peak 1 of 1																					
Intersection	07:15 AM																				
Volume	2	323	260	0	585	0	0	1	0	1	180	163	1	0	344	45	0	28	1	74	1004
Percent	0.3	55.2	44.4	0.0		0.0	0.0	100.0	0.0		52.3	47.4	0.3	0.0		60.8	0.0	37.8	1.4		
07:30 Volume	0	115	83	0	198	0	0	0	0	0	48	27	0	0	75	11	0	6	1	18	291
Peak Factor																					0.863
High Int.	07:30 AM					08:00 AM					07:45 AM					08:00 AM					
Volume	0	115	83	0	198	0	0	1	0	1	52	52	0	0	104	17	0	9	0	26	
Peak Factor					0.739					0.250					0.827					0.712	

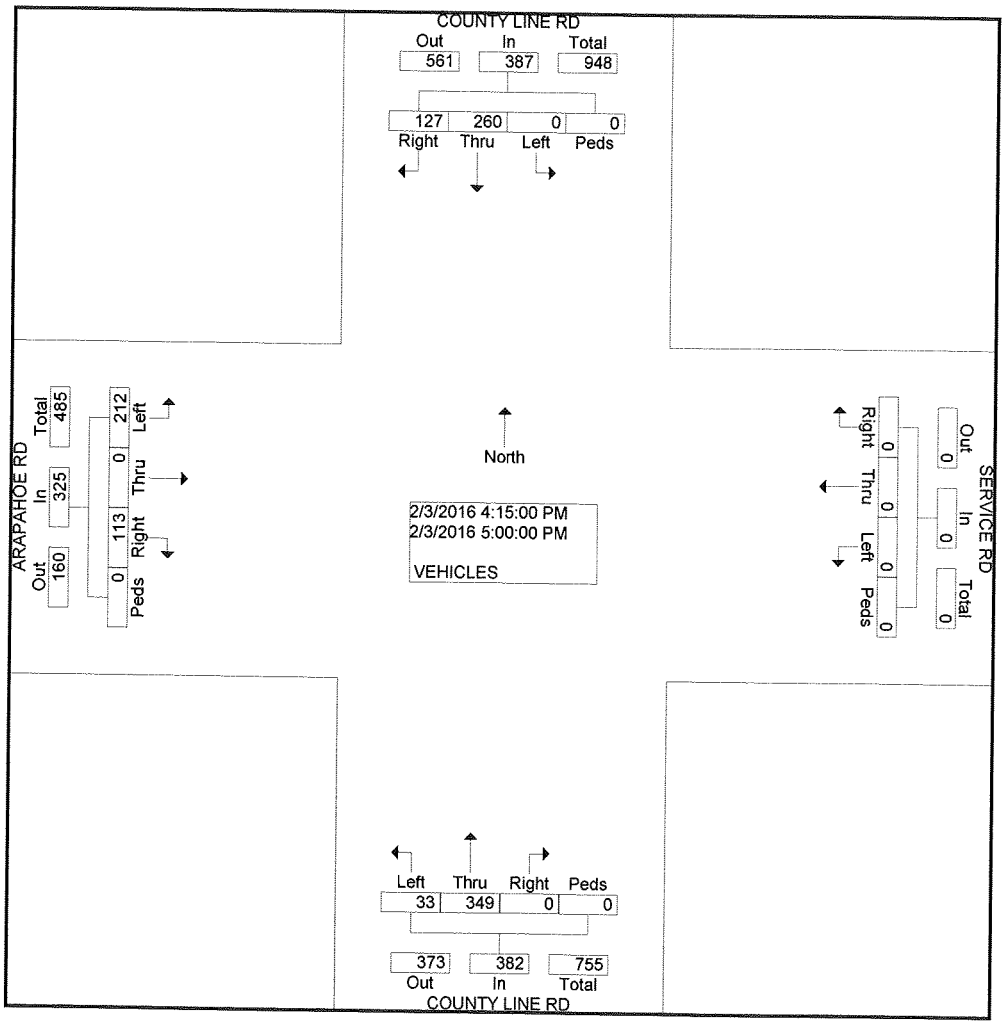


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Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:15 PM to 05:00 PM - Peak 1 of 1																					
Intersection	04:15 PM																				
Volume	0	260	127	0	387	0	0	0	0	0	33	349	0	0	382	212	0	113	0	325	1094
Percent	0.0	67.2	32.8	0.0		0.0	0.0	0.0	0.0		8.6	91.4	0.0	0.0		65.2	0.0	34.8	0.0		
05:00 Volume	0	66	34	0	100	0	0	0	0	0	9	103	0	0	112	50	0	34	0	84	296
Peak Factor																					0.924
High Int.	04:15 PM										05:00 PM					04:45 PM					
Volume	0	77	27	0	104	0	0	0	0	0	9	103	0	0	112	70	0	28	0	98	
Peak Factor					0.930										0.853					0.829	



COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: 119TH ST
E/W STREET: BASELINE RD (SH-7)
CITY: ERIE
COUNTY: WELD

File Name : 119TBASE
Site Code : 00000001
Start Date : 2/4/2016
Page No : 1

Groups Printed- VEHICLES

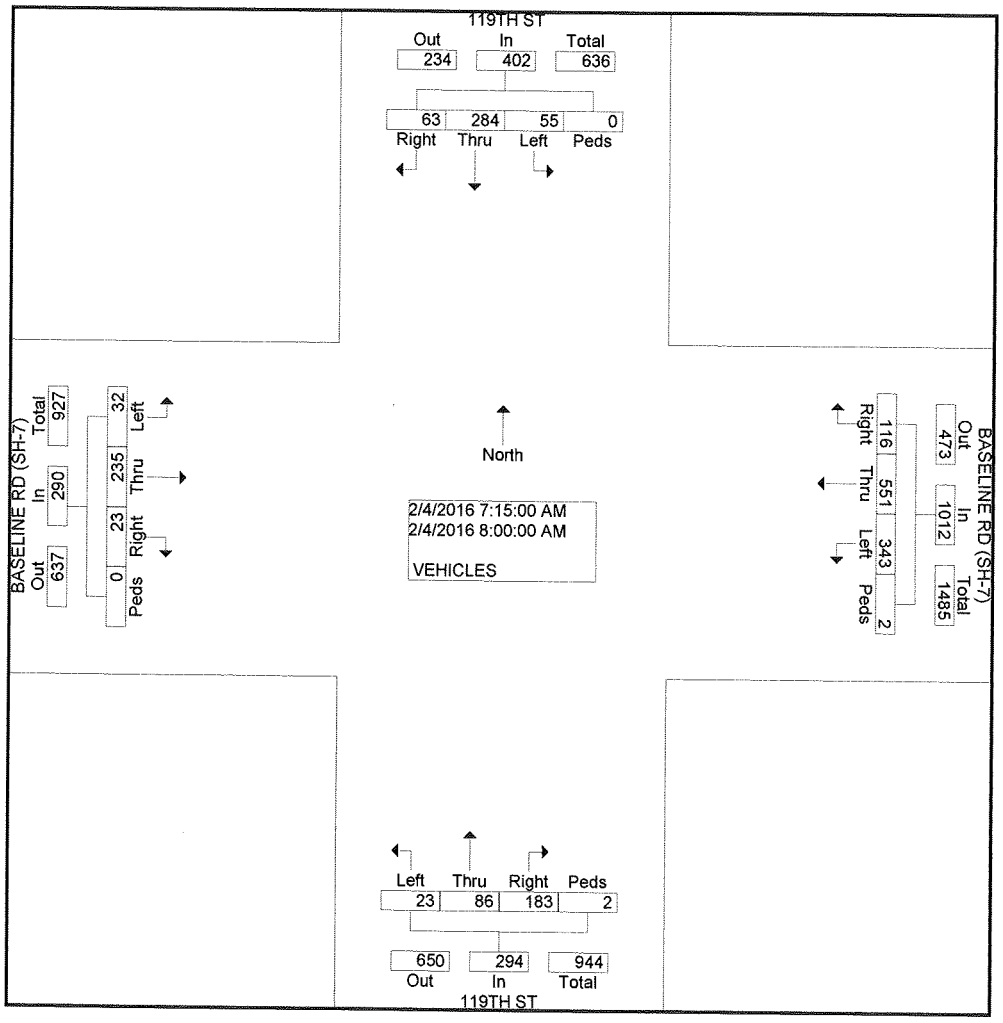
	119TH ST Southbound				BASELINE RD (SH-7) Westbound				119TH ST Northbound				BASELINE RD (SH-7) Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:30 AM	14	25	2	0	68	92	50	2	2	4	15	0	0	42	1	0	317
06:45 AM	7	38	6	0	94	88	52	0	0	10	15	0	1	46	6	0	363
Total	21	63	8	0	162	180	102	2	2	14	30	0	1	88	7	0	680
07:00 AM	12	45	5	0	68	123	49	0	7	9	23	0	2	62	5	0	410
07:15 AM	19	52	9	0	94	130	31	1	5	16	30	1	4	50	7	0	449
07:30 AM	9	96	13	0	97	142	29	1	7	17	39	1	5	65	6	0	527
07:45 AM	8	84	33	0	67	135	20	0	7	37	67	0	10	67	3	0	538
Total	48	277	60	0	326	530	129	2	26	79	159	2	21	244	21	0	1924
08:00 AM	19	52	8	0	85	144	36	0	4	16	47	0	13	53	7	0	484
08:15 AM	15	22	12	0	70	136	41	0	6	10	30	0	10	56	4	0	412
Total	34	74	20	0	155	280	77	0	10	26	77	0	23	109	11	0	896
04:00 PM	52	20	11	0	42	87	21	0	10	26	99	0	11	127	7	0	513
04:15 PM	60	16	7	0	49	90	17	0	10	41	97	0	9	139	7	0	542
04:30 PM	63	18	8	0	40	99	20	0	5	34	94	0	15	149	3	0	548
04:45 PM	51	34	8	0	37	86	14	0	10	36	91	0	7	138	6	0	518
Total	226	88	34	0	168	362	72	0	35	137	381	0	42	553	23	0	2121
05:00 PM	55	9	6	0	35	97	11	0	6	46	90	0	12	155	7	0	529
05:15 PM	51	15	6	0	41	89	21	0	7	42	87	0	19	149	2	0	529
05:30 PM	62	20	5	0	29	76	15	0	5	46	83	0	14	172	6	0	533
05:45 PM	47	30	2	0	34	72	26	0	5	30	82	0	18	139	7	0	492
Total	215	74	19	0	139	334	73	0	23	164	342	0	63	615	22	0	2083
Grand Total	544	576	141	0	950	1686	453	4	96	420	989	2	150	1609	84	0	7704
Apprch %	43.1	45.7	11.2	0.0	30.7	54.5	14.6	0.1	6.4	27.9	65.6	0.1	8.1	87.3	4.6	0.0	
Total %	7.1	7.5	1.8	0.0	12.3	21.9	5.9	0.1	1.2	5.5	12.8	0.0	1.9	20.9	1.1	0.0	

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CITY: ERIE
COUNTY: WELD

File Name : 119TBASE
Site Code : 00000001
Start Date : 2/4/2016

	119TH ST Southbound					BASELINE RD (SH-7) Westbound					119TH ST Northbound					BASELINE RD (SH-7) Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 06:30 AM to 08:30 AM - Peak 1 of 1																					
Intersection	07:15 AM																				
Volume	55	284	63	0	402	343	551	116	2	1012	23	86	183	2	294	32	235	23	0	290	1998
Percent	13.7	70.6	15.7	0.0		33.9	54.4	11.5	0.2		7.8	29.3	62.2	0.7		11.0	81.0	7.9	0.0		
07:45 Volume	8	84	33	0	125	67	135	20	0	222	7	37	67	0	111	10	67	3	0	80	538
Peak Factor																					0.928
High Int.	07:45 AM					07:30 AM					07:45 AM					07:45 AM					
Volume	8	84	33	0	125	97	142	29	1	269	7	37	67	0	111	10	67	3	0	80	
Peak Factor					0.804					0.941					0.662					0.906	

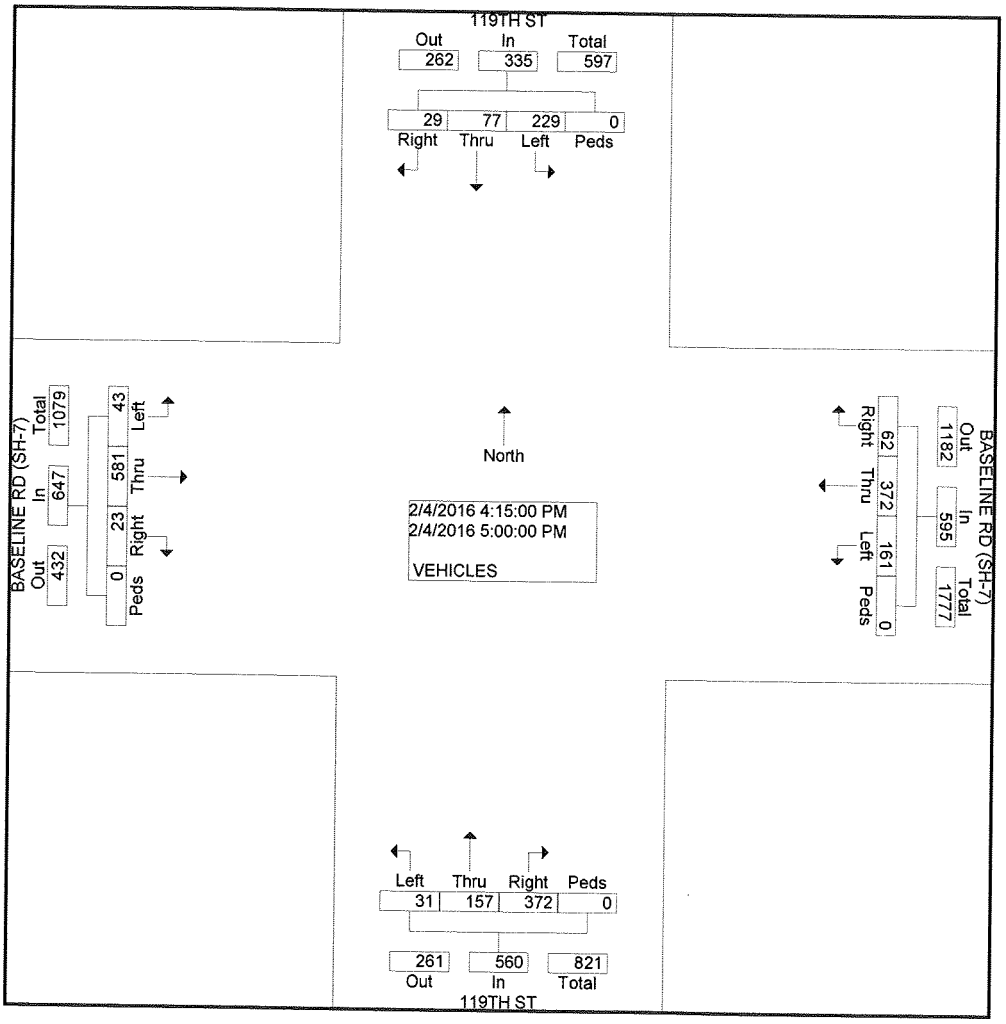


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	119TH ST Southbound					BASELINE RD (SH-7) Westbound					119TH ST Northbound					BASELINE RD (SH-7) Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:15 PM																				
Volume	229	77	29	0	335	161	372	62	0	595	31	157	372	0	560	43	581	23	0	647	2137
Percent	68.4	23.0	8.7	0.0		27.1	62.5	10.4	0.0		5.5	28.0	66.4	0.0		6.6	89.8	3.6	0.0		
04:30 Volume	63	18	8	0	89	40	99	20	0	159	5	34	94	0	133	15	149	3	0	167	548
Peak Factor																					0.975
High Int.	04:45 PM					04:30 PM					04:15 PM					05:00 PM					
Volume	51	34	8	0	93	40	99	20	0	159	10	41	97	0	148	12	155	7	0	174	
Peak Factor					0.901					0.936					0.946					0.930	



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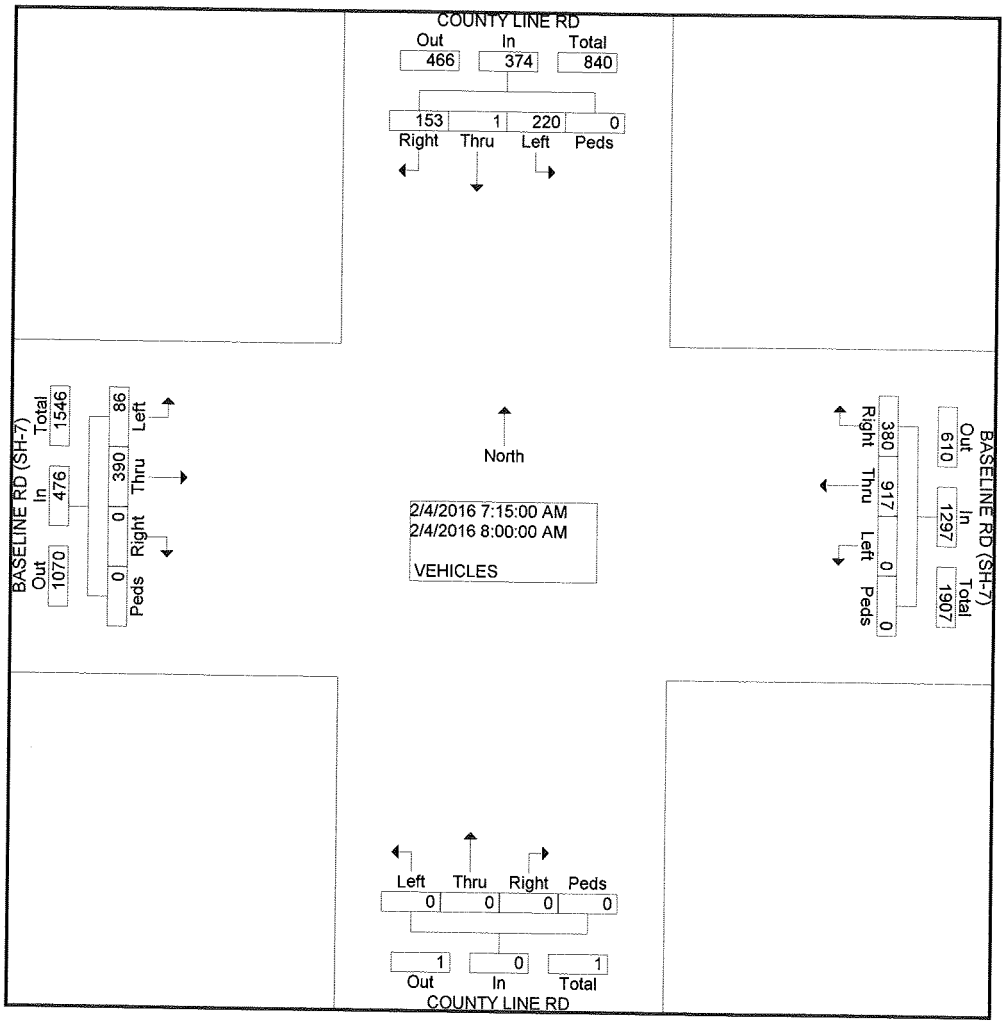
	COUNTY LINE RD Southbound				BASELINE RD (SH-7) Westbound				COUNTY LINE RD Northbound				BASELINE RD (SH-7) Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:30 AM	27	0	36	0	0	203	37	0	0	0	0	0	5	68	0	0	376
06:45 AM	30	0	20	0	0	215	64	0	0	0	0	0	5	64	0	0	398
Total	57	0	56	0	0	418	101	0	0	0	0	0	10	132	0	0	774
07:00 AM	46	1	39	0	0	199	58	1	0	0	0	0	10	80	0	0	434
07:15 AM	41	0	46	0	0	244	85	0	0	0	0	0	19	83	0	0	518
07:30 AM	79	1	44	0	0	245	88	0	0	0	0	0	12	101	0	0	570
07:45 AM	59	0	33	0	0	214	98	0	0	0	0	0	30	120	0	0	554
Total	225	2	162	0	0	902	329	1	0	0	0	0	71	384	0	0	2076
08:00 AM	41	0	30	0	0	214	109	0	0	0	0	0	25	86	0	0	505
08:15 AM	38	2	26	0	0	211	78	0	0	0	0	0	19	82	0	0	456
Total	79	2	56	0	0	425	187	0	0	0	0	0	44	168	0	0	961
04:00 PM	71	0	30	0	0	131	47	0	0	0	0	0	38	238	0	0	555
04:15 PM	58	0	30	0	0	145	70	0	0	0	0	0	44	258	0	0	605
04:30 PM	69	1	27	0	0	127	52	0	0	0	0	0	46	265	0	0	587
04:45 PM	68	0	23	0	0	115	61	0	0	0	0	0	42	231	0	0	540
Total	266	1	110	0	0	518	230	0	0	0	0	0	170	992	0	0	2287
05:00 PM	75	0	19	0	0	135	68	0	0	0	0	0	55	256	0	0	608
05:15 PM	72	0	20	0	3	121	84	0	0	0	0	0	37	253	0	0	590
05:30 PM	71	0	15	0	0	113	61	0	0	0	0	0	48	268	0	0	576
05:45 PM	62	0	18	0	0	119	55	0	0	0	0	0	41	233	0	0	528
Total	280	0	72	0	3	488	268	0	0	0	0	0	181	1010	0	0	2302
Grand Total	907	5	456	0	3	2751	1115	1	0	0	0	0	476	2686	0	0	8400
Apprch %	66.3	0.4	33.3	0.0	0.1	71.1	28.8	0.0	0.0	0.0	0.0	0.0	15.1	84.9	0.0	0.0	
Total %	10.8	0.1	5.4	0.0	0.0	32.8	13.3	0.0	0.0	0.0	0.0	0.0	5.7	32.0	0.0	0.0	

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	COUNTY LINE RD Southbound					BASELINE RD (SH-7) Westbound					COUNTY LINE RD Northbound					BASELINE RD (SH-7) Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 06:30 AM to 08:30 AM - Peak 1 of 1																					
Intersection	07:15 AM																				
Volume	220	1	153	0	374	0	917	380	0	1297	0	0	0	0	0	86	390	0	0	476	2147
Percent	58.8	0.3	40.9	0.0		0.0	70.7	29.3	0.0		0.0	0.0	0.0	0.0		18.1	81.9	0.0	0.0		
07:30 Volume	79	1	44	0	124	0	245	88	0	333	0	0	0	0	0	12	101	0	0	113	570
Peak Factor																					0.942
High Int.	07:30 AM					07:30 AM					6:15:00 AM					07:45 AM					
Volume	79	1	44	0	124	0	245	88	0	333	0	0	0	0	0	30	120	0	0	150	
Peak Factor					0.754					0.974										0.793	

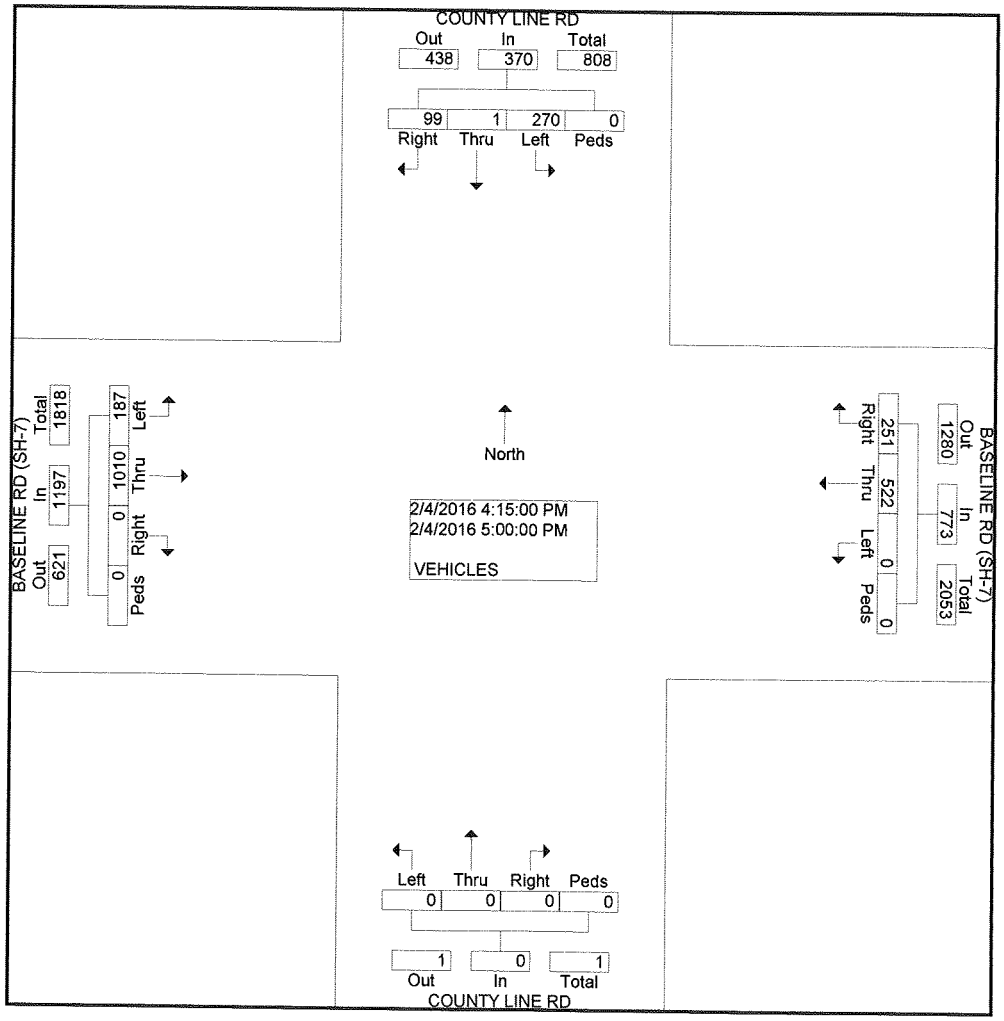


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COUNTY: WELD

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Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:15 PM																				
Volume	270	1	99	0	370	0	522	251	0	773	0	0	0	0	0	187	1010	0	0	1197	2340
Percent	73.0	0.3	26.8	0.0		0.0	67.5	32.5	0.0		0.0	0.0	0.0	0.0		15.6	84.4	0.0	0.0		
05:00 Volume	75	0	19	0	94	0	135	68	0	203	0	0	0	0	0	55	256	0	0	311	608
Peak Factor																					0.962
High Int. Volume	04:30 PM 69	1	27	0	97	04:15 PM 0	145	70	0	215	0	0	0	0	0	04:30 PM 46	265	0	0	311	
Peak Factor					0.954					0.899										0.962	



Agency Name:Counter Measures Inc

Site ID:020968000000
Station Name:
Description:COUNTY LINE RD N/O ARAPAHOE RD
City:ERIE
County:WELD

2/10/2016	Lane 1 (North)	Lane 2 (South)	All Lanes
00:00	16	9	25
01:00	10	5	15
02:00	6	2	8
03:00	5	13	18
04:00	18	35	53
05:00	31	88	119
06:00	106	314	420
07:00	206	709	915
08:00	275	476	751
09:00	193	360	553
10:00	228	318	546
11:00	261	342	603
12:00	338	310	648
13:00	322	310	632
14:00	352	306	658
15:00	513	448	961
16:00	501	392	893
17:00	623	397	1020
18:00	475	252	727
19:00	282	186	468
20:00	205	107	312
21:00	130	80	210
22:00	64	36	100
23:00	28	11	39
AM Peak Hour	08:00 - 08:59	07:00 - 07:59	07:00 - 07:59
AM Peak Value	275	709	915
PM Peak Hour	17:00 - 17:59	15:00 - 15:59	17:00 - 17:59
PM Peak Value	623	448	1020
Total	5188	5506	10694
Percentages	48.51%	51.49%	100.00%

Agency Name:Counter Measures Inc

Site ID:020953000000
Station Name:
Description:ARAPAHOE RD W/O COUNTY LINE RD
City:ERIE
County:WELD

2/10/2016	Lane 1 (East)	Lane 2 (West)	All Lanes
00:00	10	3	13
01:00	5	1	6
02:00	1	2	3
03:00	0	4	4
04:00	2	5	7
05:00	8	40	48
06:00	27	181	208
07:00	75	516	591
08:00	97	401	498
09:00	111	201	312
10:00	100	163	263
11:00	152	178	330
12:00	172	146	318
13:00	168	136	304
14:00	183	151	334
15:00	205	182	387
16:00	298	183	481
17:00	339	166	505
18:00	256	95	351
19:00	121	63	184
20:00	108	44	152
21:00	64	32	96
22:00	30	9	39
23:00	8	3	11
AM Peak Hour	11:00 - 11:59	07:00 - 07:59	07:00 - 07:59
AM Peak Value	152	516	591
PM Peak Hour	17:00 - 17:59	16:00 - 16:59	17:00 - 17:59
PM Peak Value	339	183	505
Total	2540	2905	5445
Percentages	46.65%	53.35%	100.00%

Agency Name:Counter Measures Inc

Site ID:020971000000
Station Name:
Description:ARAPAHOE RD W/O 119TH ST
City:ERIE
County:WELD

2/10/2016	Lane 1 (East)	Lane 2 (West)	All Lanes
00:00	24	8	32
01:00	10	5	15
02:00	6	8	14
03:00	1	11	12
04:00	10	32	42
05:00	20	156	176
06:00	83	404	487
07:00	186	779	965
08:00	207	640	847
09:00	213	367	580
10:00	223	259	482
11:00	358	316	674
12:00	359	224	583
13:00	347	225	572
14:00	440	229	669
15:00	620	318	938
16:00	718	295	1013
17:00	846	267	1113
18:00	610	208	818
19:00	318	121	439
20:00	209	95	304
21:00	146	60	206
22:00	68	36	104
23:00	35	13	48
AM Peak Hour	11:00 - 11:59	07:00 - 07:59	07:00 - 07:59
AM Peak Value	358	779	965
PM Peak Hour	17:00 - 17:59	15:00 - 15:59	17:00 - 17:59
PM Peak Value	846	318	1113
Total	6057	5076	11133
Percentages	54.41%	45.59%	100.00%

Agency Name:Counter Measures Inc

Site ID:020952000000
Station Name:
Description:119TH ST N/O ARAPAHOE RD
City:ERIE
County:WELD

2/10/2016	Lane 1 (North)	Lane 2 (South)	All Lanes
00:00	9	5	14
01:00	5	3	8
02:00	2	2	4
03:00	2	3	5
04:00	0	21	21
05:00	5	57	62
06:00	38	156	194
07:00	119	474	593
08:00	125	276	401
09:00	83	180	263
10:00	135	144	279
11:00	133	233	366
12:00	135	137	272
13:00	151	130	281
14:00	175	160	335
15:00	286	200	486
16:00	277	226	503
17:00	399	210	609
18:00	237	128	365
19:00	149	73	222
20:00	123	33	156
21:00	74	27	101
22:00	28	18	46
23:00	13	5	18
AM Peak Hour	10:00 - 10:59	07:00 - 07:59	07:00 - 07:59
AM Peak Value	135	474	593
PM Peak Hour	17:00 - 17:59	16:00 - 16:59	17:00 - 17:59
PM Peak Value	399	226	609
Total	2703	2901	5604
Percentages	48.23%	51.77%	100.00%

Agency Name:Counter Measures Inc

Site ID:020964000000
Station Name:
Description:119TH ST S/O SH-7
City:ERIE
County:WELD

2/10/2016	Lane 1 (North)	Lane 2 (South)	All Lanes
00:00	13	4	17
01:00	4	5	9
02:00	17	5	22
03:00	5	7	12
04:00	18	39	57
05:00	43	117	160
06:00	121	412	533
07:00	277	710	987
08:00	180	490	670
09:00	185	280	465
10:00	190	241	431
11:00	247	264	511
12:00	251	257	508
13:00	259	276	535
14:00	328	289	617
15:00	546	346	892
16:00	526	290	816
17:00	598	296	894
18:00	318	183	501
19:00	187	142	329
20:00	158	69	227
21:00	100	72	172
22:00	35	38	73
23:00	18	17	35
AM Peak Hour	07:00 - 07:59	07:00 - 07:59	07:00 - 07:59
AM Peak Value	277	710	987
PM Peak Hour	17:00 - 17:59	15:00 - 15:59	17:00 - 17:59
PM Peak Value	598	346	894
Total	4624	4849	9473
Percentages	48.81%	51.19%	100.00%

Agency Name:Counter Measures Inc

Site ID:020957000000
Station Name:
Description:119TH ST N/O SH-7
City:ERIE
County:WELD

2/10/2016	Lane 1 (North)	Lane 2 (South)	All Lanes
00:00	5	10	15
01:00	4	6	10
02:00	5	4	9
03:00	8	2	10
04:00	20	19	39
05:00	104	43	147
06:00	199	140	339
07:00	298	464	762
08:00	218	278	496
09:00	158	190	348
10:00	158	150	308
11:00	147	166	313
12:00	160	157	317
13:00	181	175	356
14:00	200	233	433
15:00	297	346	643
16:00	261	341	602
17:00	304	371	675
18:00	193	179	372
19:00	102	100	202
20:00	99	56	155
21:00	53	57	110
22:00	26	32	58
23:00	14	23	37
AM Peak Hour	07:00 - 07:59	07:00 - 07:59	07:00 - 07:59
AM Peak Value	298	464	762
PM Peak Hour	17:00 - 17:59	17:00 - 17:59	17:00 - 17:59
PM Peak Value	304	371	675
Total	3214	3542	6756
Percentages	47.57%	52.43%	100.00%

Agency Name:Counter Measures Inc

Site ID:020961000000
Station Name:
Description:COUNTY LINE RD N/O SH-7
City:ERIE
County:WELD

2/10/2016	Lane 1 (North)	Lane 2 (South)	All Lanes
00:00	7	8	15
01:00	7	4	11
02:00	5	1	6
03:00	6	11	17
04:00	24	25	49
05:00	36	59	95
06:00	174	201	375
07:00	460	401	861
08:00	386	271	657
09:00	169	253	422
10:00	193	208	401
11:00	199	264	463
12:00	239	237	476
13:00	217	242	459
14:00	265	225	490
15:00	399	359	758
16:00	344	378	722
17:00	436	392	828
18:00	308	237	545
19:00	199	166	365
20:00	132	90	222
21:00	86	68	154
22:00	43	33	76
23:00	21	11	32
AM Peak Hour	07:00 - 07:59	07:00 - 07:59	07:00 - 07:59
AM Peak Value	460	401	861
PM Peak Hour	17:00 - 17:59	17:00 - 17:59	17:00 - 17:59
PM Peak Value	436	392	828
Total	4355	4144	8499
Percentages	51.24%	48.76%	100.00%

Agency Name:Counter Measures Inc

Site ID:020973000000
Station Name:
Description:SH-7 W/O COUNTY LINE RD
City:ERIE
County:WELD

2/10/2016	Lane 1 (West)	Lane 2 (East)	All Lanes
00:00	20	39	59
01:00	16	27	43
02:00	21	28	49
03:00	27	14	41
04:00	82	43	125
05:00	312	111	423
06:00	853	236	1089
07:00	1104	466	1570
08:00	973	454	1427
09:00	675	455	1130
10:00	618	473	1091
11:00	649	584	1233
12:00	570	589	1159
13:00	620	614	1234
14:00	581	728	1309
15:00	694	1029	1723
16:00	630	1104	1734
17:00	574	1163	1737
18:00	479	827	1306
19:00	385	457	842
20:00	221	359	580
21:00	173	272	445
22:00	91	125	216
23:00	60	61	121
AM Peak Hour	07:00 - 07:59	11:00 - 11:59	07:00 - 07:59
AM Peak Value	1104	584	1570
PM Peak Hour	15:00 - 15:59	17:00 - 17:59	17:00 - 17:59
PM Peak Value	694	1163	1737
Total	10428	10258	20686
Percentages	50.41%	49.59%	100.00%

Agency Name:Counter Measures Inc

Site ID:020972000000
Station Name:
Description:SH-7 W/O 119TH ST
City:ERIE
County:WELD

2/10/2016	Lane 1 (West)	Lane 2 (East)	All Lanes
00:00	16	22	38
01:00	10	19	29
02:00	15	14	29
03:00	15	7	22
04:00	33	24	57
05:00	127	69	196
06:00	383	152	535
07:00	680	338	1018
08:00	629	323	952
09:00	469	317	786
10:00	438	360	798
11:00	501	447	948
12:00	430	453	883
13:00	419	442	861
14:00	417	493	910
15:00	482	632	1114
16:00	509	679	1188
17:00	434	670	1104
18:00	319	546	865
19:00	274	285	559
20:00	146	237	383
21:00	111	170	281
22:00	58	87	145
23:00	37	25	62
AM Peak Hour	07:00 - 07:59	11:00 - 11:59	07:00 - 07:59
AM Peak Value	680	447	1018
PM Peak Hour	16:00 - 16:59	16:00 - 16:59	16:00 - 16:59
PM Peak Value	509	679	1188
Total	6952	6811	13763
Percentages	50.51%	49.49%	100.00%

Agency Name:Counter Measures Inc

Site ID:020958000000
Station Name:
Description:SH-7 E/O COUNTY LINE RD
City:ERIE
County:WELD

2/10/2016	Lane 1 (West)	Lane 2 (East)	All Lanes
00:00	22	43	65
01:00	18	25	43
02:00	26	26	52
03:00	29	18	47
04:00	88	57	145
05:00	329	139	468
06:00	929	325	1254
07:00	1467	783	2250
08:00	1168	597	1765
09:00	724	610	1334
10:00	691	588	1279
11:00	699	720	1419
12:00	676	707	1383
13:00	691	728	1419
14:00	710	812	1522
15:00	817	1212	2029
16:00	754	1332	2086
17:00	732	1381	2113
18:00	549	931	1480
19:00	420	498	918
20:00	276	396	672
21:00	193	297	490
22:00	114	140	254
23:00	73	58	131
AM Peak Hour	07:00 - 07:59	07:00 - 07:59	07:00 - 07:59
AM Peak Value	1467	783	2250
PM Peak Hour	15:00 - 15:59	17:00 - 17:59	17:00 - 17:59
PM Peak Value	817	1381	2113
Total	12195	12423	24618
Percentages	49.54%	50.46%	100.00%

LEVEL OF SERVICE DEFINITIONS

From *Highway Capacity Manual*, Transportation Research Board, 2010

SIGNALIZED INTERSECTION LEVEL OF SERVICE (LOS)

LOS	Average Vehicle Delay sec/vehicle	Operational Characteristics
A	<10 seconds	Describes operations with low control delay, up to 10 sec/veh. This LOS occurs when progression is extremely favorable and most vehicles arrive during the green phase. Many vehicles do not stop at all. Short cycle lengths may tend to contribute to low delay values.
B	10 to 20 seconds	Describes operations with control delay greater than 10 seconds and up to 20 sec/veh. This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of delay.
C	20 to 35 seconds	Describes operations with control delay greater than 20 and up to 35 sec/veh. These higher delays may result from only fair progression, longer cycle length, or both. Individual cycle failures may begin to appear at this level. Cycle failure occurs when a given green phase does not serve queued vehicles, and overflows occur. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.
D	35 to 55 seconds	Describes operations with control delay greater than 35 and up to 55 sec/veh. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, and high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	55 to 80 seconds	Describes operations with control delay greater than 55 and up to 80 sec/veh. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent.
F	>80 seconds	Describes operations with control delay in excess of 80 sec/veh. This level, considered unacceptable to most drivers, often occurs with over-saturation, that is, when arrival flow rates exceed the capacity of lane groups. It may also occur at high v/c ratios with many individual cycle failures. Poor progression and long cycle lengths may also contribute significantly to high delay levels.

LEVEL OF SERVICE DEFINITIONS

From *Highway Capacity Manual*, Transportation Research Board, 2010

UNSIGNALIZED INTERSECTION LEVEL OF SERVICE (LOS)

Applicable to Two-Way Stop Control, All-Way Stop Control, and Roundabouts

LOS	Average Vehicle Control Delay	Operational Characteristics
A	<10 seconds	Normally, vehicles on the stop-controlled approach only have to wait up to 10 seconds before being able to clear the intersection. Left-turning vehicles on the uncontrolled street do not have to wait to make their turn.
B	10 to 15 seconds	Vehicles on the stop-controlled approach will experience delays before being able to clear the intersection. The delay could be up to 15 seconds. Left-turning vehicles on the uncontrolled street may have to wait to make their turn.
C	15 to 25 seconds	Vehicles on the stop-controlled approach can expect delays in the range of 15 to 25 seconds before clearing the intersection. Motorists may begin to take chances due to the long delays, thereby posing a safety risk to through traffic. Left-turning vehicles on the uncontrolled street will now be required to wait to make their turn causing a queue to be created in the turn lane.
D	25 to 35 seconds	This is the point at which a traffic signal may be warranted for this intersection. The delays for the stop-controlled intersection are not considered to be excessive. The length of the queue may begin to block other public and private access points.
E	35 to 50 seconds	The delays for all critical traffic movements are considered to be unacceptable. The length of the queues for the stop-controlled approaches as well as the left-turn movements are extremely long. There is a high probability that this intersection will meet traffic signal warrants. The ability to install a traffic signal is affected by the location of other existing traffic signals. Consideration may be given to restricting the accesses by eliminating the left-turn movements from and to the stop-controlled approach.
F	>50 seconds	The delay for the critical traffic movements are probably in excess of 100 seconds. The length of the queues are extremely long. Motorists are selecting alternative routes due to the long delays. The only remedy for these long delays is installing a traffic signal or restricting the accesses. The potential for accidents at this intersection are extremely high due to motorist taking more risky chances. If the median permits, motorists begin making two-stage left-turns.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	31	105	96	58	582	6	150	84	6	3	261	162
Future Volume (veh/h)	31	105	96	58	582	6	150	84	6	3	261	162
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	38	130	119	72	719	7	185	104	7	4	322	200
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	140	320	293	358	512	5	449	881	59	571	716	609
Arrive On Green	0.03	0.36	0.36	0.28	0.28	0.28	0.08	0.51	0.51	0.38	0.38	0.38
Sat Flow, veh/h	1774	897	821	1126	1842	18	1774	1726	116	1277	1863	1583
Grp Volume(v), veh/h	38	0	249	72	0	726	185	0	111	4	322	200
Grp Sat Flow(s),veh/h/ln	1774	0	1718	1126	0	1860	1774	0	1842	1277	1863	1583
Q Serve(g_s), s	1.3	0.0	9.8	4.6	0.0	25.0	5.4	0.0	2.8	0.2	11.6	8.0
Cycle Q Clear(g_c), s	1.3	0.0	9.8	7.4	0.0	25.0	5.4	0.0	2.8	0.2	11.6	8.0
Prop In Lane	1.00		0.48	1.00		0.01	1.00		0.06	1.00		1.00
Lane Grp Cap(c), veh/h	140	0	612	358	0	517	449	0	940	571	716	609
V/C Ratio(X)	0.27	0.00	0.41	0.20	0.00	1.41	0.41	0.00	0.12	0.01	0.45	0.33
Avail Cap(c_a), veh/h	238	0	706	358	0	517	462	0	940	571	716	609
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.98	0.00	0.98	0.87	0.00	0.87	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.4	0.0	21.8	27.2	0.0	32.5	14.5	0.0	11.5	17.1	20.6	19.5
Incr Delay (d2), s/veh	1.0	0.0	0.4	0.3	0.0	193.6	0.5	0.0	0.2	0.0	2.0	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	4.7	1.5	0.0	40.5	2.6	0.0	1.5	0.1	6.3	3.7
LnGrp Delay(d),s/veh	25.5	0.0	22.2	27.5	0.0	226.1	15.0	0.0	11.7	17.1	22.6	20.9
LnGrp LOS	C		C	C		F	B		B	B	C	C
Approach Vol, veh/h		287			798			296			526	
Approach Delay, s/veh		22.7			208.2			13.8			22.0	
Approach LOS		C			F			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		51.9		38.1	11.3	40.6	7.1	31.0
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0	4.0	6.0
Max Green Setting (Gmax), s		41.0		37.0	8.0	29.0	8.0	25.0
Max Q Clear Time (g_c+I1), s		4.8		11.8	7.4	13.6	3.3	27.0
Green Ext Time (p_c), s		3.3		7.2	0.0	2.7	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	98.7
HCM 2010 LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	0	28	0	0	1	180	163	1	2	323	260
Future Volume (veh/h)	45	0	28	0	0	1	180	163	1	2	323	260
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	52	0	33	0	0	1	209	190	1	2	376	302
Adj No. of Lanes	1	1	0	0	1	0	1	1	0	1	1	1
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	266	0	117	0	0	117	583	1192	6	879	1199	1019
Arrive On Green	0.07	0.00	0.07	0.00	0.00	0.07	0.64	0.64	0.64	0.64	0.64	0.64
Sat Flow, veh/h	1410	0	1583	0	0	1583	758	1851	10	1187	1863	1583
Grp Volume(v), veh/h	52	0	33	0	0	1	209	0	191	2	376	302
Grp Sat Flow(s),veh/h/ln	1410	0	1583	0	0	1583	758	0	1861	1187	1863	1583
Q Serve(g_s), s	1.6	0.0	0.9	0.0	0.0	0.0	7.5	0.0	1.8	0.0	4.0	3.7
Cycle Q Clear(g_c), s	1.6	0.0	0.9	0.0	0.0	0.0	11.5	0.0	1.8	1.8	4.0	3.7
Prop In Lane	1.00		1.00	0.00		1.00	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	266	0	117	0	0	117	583	0	1198	879	1199	1019
V/C Ratio(X)	0.20	0.00	0.28	0.00	0.00	0.01	0.36	0.00	0.16	0.00	0.31	0.30
Avail Cap(c_a), veh/h	927	0	859	0	0	859	583	0	1198	879	1199	1019
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.7	0.0	19.4	0.0	0.0	19.0	6.1	0.0	3.1	3.5	3.5	3.5
Incr Delay (d2), s/veh	0.4	0.0	1.3	0.0	0.0	0.0	1.7	0.0	0.3	0.0	0.7	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.4	0.0	0.0	0.0	1.8	0.0	1.0	0.0	2.2	1.8
LnGrp Delay(d),s/veh	20.1	0.0	20.7	0.0	0.0	19.0	7.8	0.0	3.4	3.5	4.2	4.2
LnGrp LOS	C		C			B	A		A	A	A	A
Approach Vol, veh/h		85			1			400			680	
Approach Delay, s/veh		20.3			19.0			5.7			4.2	
Approach LOS		C			B			A			A	

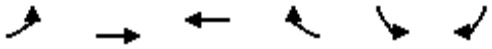
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		35.0		9.3		35.0		9.3
Change Period (Y+Rc), s		6.5		6.0		6.5		6.0
Max Green Setting (Gmax), s		28.5		24.0		28.5		24.0
Max Q Clear Time (g_c+I1), s		13.5		3.6		6.0		2.0
Green Ext Time (p_c), s		4.9		0.2		5.7		0.2

Intersection Summary	
HCM 2010 Ctrl Delay	5.9
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	235	23	343	551	116	23	86	183	55	284	63
Future Volume (veh/h)	32	235	23	343	551	116	23	86	183	55	284	63
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1900	1863	1863	1900	1863	1900
Adj Flow Rate, veh/h	34	253	25	369	592	125	25	92	197	59	305	68
Adj No. of Lanes	1	1	0	1	1	0	0	1	1	0	1	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	196	467	46	469	507	107	51	188	206	57	292	65
Arrive On Green	0.07	0.28	0.28	0.13	0.34	0.34	0.13	0.13	0.13	0.23	0.23	0.23
Sat Flow, veh/h	1774	1669	165	1774	1492	315	394	1449	1583	246	1271	283
Grp Volume(v), veh/h	34	0	278	369	0	717	117	0	197	432	0	0
Grp Sat Flow(s),veh/h/ln	1774	0	1834	1774	0	1807	1843	0	1583	1800	0	0
Q Serve(g_s), s	1.3	0.0	12.9	13.0	0.0	34.0	5.9	0.0	12.4	23.0	0.0	0.0
Cycle Q Clear(g_c), s	1.3	0.0	12.9	13.0	0.0	34.0	5.9	0.0	12.4	23.0	0.0	0.0
Prop In Lane	1.00		0.09	1.00		0.17	0.21		1.00	0.14		0.16
Lane Grp Cap(c), veh/h	196	0	513	469	0	614	240	0	206	414	0	0
V/C Ratio(X)	0.17	0.00	0.54	0.79	0.00	1.17	0.49	0.00	0.96	1.04	0.00	0.00
Avail Cap(c_a), veh/h	196	0	513	469	0	614	240	0	206	414	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.56	0.00	0.56	1.00	0.00	1.00	0.88	0.00	0.00
Uniform Delay (d), s/veh	25.5	0.0	30.6	23.9	0.0	33.0	40.4	0.0	43.2	38.5	0.0	0.0
Incr Delay (d2), s/veh	1.9	0.0	4.1	7.4	0.0	85.2	1.5	0.0	50.4	53.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	7.1	4.3	0.0	31.4	3.1	0.0	8.3	17.5	0.0	0.0
LnGrp Delay(d),s/veh	27.4	0.0	34.6	31.3	0.0	118.2	41.9	0.0	93.6	91.7	0.0	0.0
LnGrp LOS	C		C	C		F	D		F	F		
Approach Vol, veh/h		312			1086			314			432	
Approach Delay, s/veh		33.8			88.7			74.4			91.7	
Approach LOS		C			F			E			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	18.0	34.0		19.0	12.0	40.0		29.0
Change Period (Y+Rc), s	5.0	6.0		6.0	5.0	6.0		6.0
Max Green Setting (Gmax), s	13.0	28.0		13.0	7.0	34.0		23.0
Max Q Clear Time (g_c+I1), s	15.0	14.9		14.4	3.3	36.0		25.0
Green Ext Time (p_c), s	0.0	5.1		0.0	0.0	0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	79.2
HCM 2010 LOS	E



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	86	390	917	380	220	153
Future Volume (veh/h)	86	390	917	380	220	153
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	91	415	976	404	234	163
Adj No. of Lanes	1	1	1	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	253	1393	1229	1045	270	241
Arrive On Green	0.04	0.75	0.66	0.66	0.15	0.15
Sat Flow, veh/h	1774	1863	1863	1583	1774	1583
Grp Volume(v), veh/h	91	415	976	404	234	163
Grp Sat Flow(s),veh/h/ln	1774	1863	1863	1583	1774	1583
Q Serve(g_s), s	1.7	7.9	41.2	12.8	14.2	10.7
Cycle Q Clear(g_c), s	1.7	7.9	41.2	12.8	14.2	10.7
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	253	1393	1229	1045	270	241
V/C Ratio(X)	0.36	0.30	0.79	0.39	0.87	0.68
Avail Cap(c_a), veh/h	387	1393	1229	1045	339	302
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.82	0.82	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.6	4.5	13.4	8.5	45.6	44.1
Incr Delay (d2), s/veh	0.7	0.5	5.3	1.1	17.4	4.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	4.2	22.7	5.9	8.3	9.4
LnGrp Delay(d),s/veh	16.3	4.9	18.7	9.6	63.0	48.3
LnGrp LOS	B	A	B	A	E	D
Approach Vol, veh/h		506	1380		397	
Approach Delay, s/veh		7.0	16.1		56.9	
Approach LOS		A	B		E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		88.3		21.7	9.7	78.6		
Change Period (Y+Rc), s		6.0		5.0	5.0	6.0		
Max Green Setting (Gmax), s		78.0		21.0	13.0	60.0		
Max Q Clear Time (g_c+I1), s		9.9		16.2	3.7	43.2		
Green Ext Time (p_c), s		17.4		0.6	0.1	10.0		

Intersection Summary	
HCM 2010 Ctrl Delay	21.2
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	121	271	184	10	144	3	77	173	11	2	121	68
Future Volume (veh/h)	121	271	184	10	144	3	77	173	11	2	121	68
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	125	279	190	10	148	3	79	178	11	2	125	70
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	365	326	222	137	360	7	662	958	59	626	855	727
Arrive On Green	0.07	0.32	0.32	0.20	0.20	0.20	0.05	0.55	0.55	0.46	0.46	0.46
Sat Flow, veh/h	1774	1034	704	920	1819	37	1774	1736	107	1189	1863	1583
Grp Volume(v), veh/h	125	0	469	10	0	151	79	0	189	2	125	70
Grp Sat Flow(s),veh/h/ln	1774	0	1738	920	0	1856	1774	0	1844	1189	1863	1583
Q Serve(g_s), s	4.8	0.0	22.8	0.9	0.0	6.4	2.0	0.0	4.6	0.1	3.5	2.3
Cycle Q Clear(g_c), s	4.8	0.0	22.8	13.1	0.0	6.4	2.0	0.0	4.6	0.1	3.5	2.3
Prop In Lane	1.00		0.41	1.00		0.02	1.00		0.06	1.00		1.00
Lane Grp Cap(c), veh/h	365	0	548	137	0	367	662	0	1017	626	855	727
V/C Ratio(X)	0.34	0.00	0.86	0.07	0.00	0.41	0.12	0.00	0.19	0.00	0.15	0.10
Avail Cap(c_a), veh/h	394	0	715	211	0	516	735	0	1017	626	855	727
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.60	0.00	0.60	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.6	0.0	28.9	40.0	0.0	31.5	10.6	0.0	10.1	13.2	14.1	13.8
Incr Delay (d2), s/veh	0.6	0.0	8.0	0.2	0.0	0.7	0.0	0.0	0.2	0.0	0.4	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.0	12.2	0.2	0.0	3.3	1.0	0.0	2.4	0.0	1.9	1.0
LnGrp Delay(d),s/veh	25.2	0.0	36.9	40.2	0.0	32.2	10.7	0.0	10.3	13.2	14.5	14.0
LnGrp LOS	C		D	D		C	B		B	B	B	B
Approach Vol, veh/h		594			161			268			197	
Approach Delay, s/veh		34.4			32.7			10.4			14.3	
Approach LOS		C			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		55.6		34.4	8.3	47.3	10.6	23.8
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0	4.0	6.0
Max Green Setting (Gmax), s		41.0		37.0	8.0	29.0	8.0	25.0
Max Q Clear Time (g_c+I1), s		6.6		24.8	4.0	5.5	6.8	15.1
Green Ext Time (p_c), s		2.0		3.0	0.0	1.9	0.0	2.7

Intersection Summary	
HCM 2010 Ctrl Delay	25.7
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	212	0	113	0	0	0	33	349	0	0	260	127
Future Volume (veh/h)	212	0	113	0	0	0	33	349	0	0	260	127
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	230	0	123	0	0	0	36	379	0	0	283	138
Adj No. of Lanes	1	1	0	0	1	0	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	468	0	290	0	341	0	615	1058	0	143	1058	899
Arrive On Green	0.18	0.00	0.18	0.00	0.00	0.00	0.57	0.57	0.00	0.00	0.57	0.57
Sat Flow, veh/h	1774	0	1583	0	1863	0	962	1863	0	1000	1863	1583
Grp Volume(v), veh/h	230	0	123	0	0	0	36	379	0	0	283	138
Grp Sat Flow(s),veh/h/ln	1774	0	1583	0	1863	0	962	1863	0	1000	1863	1583
Q Serve(g_s), s	6.1	0.0	3.5	0.0	0.0	0.0	1.0	5.5	0.0	0.0	3.9	2.1
Cycle Q Clear(g_c), s	6.1	0.0	3.5	0.0	0.0	0.0	4.9	5.5	0.0	0.0	3.9	2.1
Prop In Lane	1.00		1.00	0.00		0.00	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	468	0	290	0	341	0	615	1058	0	143	1058	899
V/C Ratio(X)	0.49	0.00	0.42	0.00	0.00	0.00	0.06	0.36	0.00	0.00	0.27	0.15
Avail Cap(c_a), veh/h	992	0	757	0	891	0	615	1058	0	143	1058	899
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	19.2	0.0	18.2	0.0	0.0	0.0	6.8	5.9	0.0	0.0	5.5	5.1
Incr Delay (d2), s/veh	0.8	0.0	1.0	0.0	0.0	0.0	0.2	0.9	0.0	0.0	0.6	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.0	0.0	1.6	0.0	0.0	0.0	0.3	3.0	0.0	0.0	2.1	1.0
LnGrp Delay(d),s/veh	20.0	0.0	19.1	0.0	0.0	0.0	7.0	6.8	0.0	0.0	6.1	5.5
LnGrp LOS	C		B				A	A			A	A
Approach Vol, veh/h		353			0			415			421	
Approach Delay, s/veh		19.7			0.0			6.8			5.9	
Approach LOS		B						A			A	

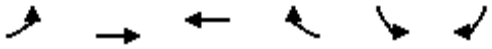
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		35.0		15.2		35.0		15.2
Change Period (Y+Rc), s		6.5		6.0		6.5		6.0
Max Green Setting (Gmax), s		28.5		24.0		28.5		24.0
Max Q Clear Time (g_c+I1), s		7.5		8.1		5.9		0.0
Green Ext Time (p_c), s		4.1		1.2		4.2		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	10.3
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	581	23	161	372	62	31	157	372	229	77	29
Future Volume (veh/h)	43	581	23	161	372	62	31	157	372	229	77	29
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1900	1863	1863	1900	1863	1900
Adj Flow Rate, veh/h	44	593	23	164	380	63	32	160	380	234	79	30
Adj No. of Lanes	1	1	0	1	1	0	0	1	1	0	1	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	361	670	26	248	586	97	34	169	174	259	87	33
Arrive On Green	0.07	0.38	0.38	0.07	0.38	0.38	0.11	0.11	0.11	0.21	0.21	0.21
Sat Flow, veh/h	1774	1781	69	1774	1559	258	308	1539	1583	1211	409	155
Grp Volume(v), veh/h	44	0	616	164	0	443	192	0	380	343	0	0
Grp Sat Flow(s),veh/h/ln	1774	0	1851	1774	0	1817	1847	0	1583	1775	0	0
Q Serve(g_s), s	1.4	0.0	31.1	5.6	0.0	20.1	10.3	0.0	11.0	18.8	0.0	0.0
Cycle Q Clear(g_c), s	1.4	0.0	31.1	5.6	0.0	20.1	10.3	0.0	11.0	18.8	0.0	0.0
Prop In Lane	1.00		0.04	1.00		0.14	0.17		1.00	0.68		0.09
Lane Grp Cap(c), veh/h	361	0	696	248	0	683	203	0	174	380	0	0
V/C Ratio(X)	0.12	0.00	0.89	0.66	0.00	0.65	0.94	0.00	2.18	0.90	0.00	0.00
Avail Cap(c_a), veh/h	361	0	696	248	0	683	203	0	174	426	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.89	0.00	0.89	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	17.9	0.0	29.2	23.0	0.0	25.7	44.2	0.0	44.5	38.3	0.0	0.0
Incr Delay (d2), s/veh	0.7	0.0	15.4	11.6	0.0	4.2	47.5	0.0	550.3	20.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	18.9	3.5	0.0	10.9	8.0	0.0	31.4	11.4	0.0	0.0
LnGrp Delay(d),s/veh	18.6	0.0	44.6	34.6	0.0	29.9	91.7	0.0	594.8	59.0	0.0	0.0
LnGrp LOS	B		D	C		C	F		F	E		
Approach Vol, veh/h		660			607			572			343	
Approach Delay, s/veh		42.8			31.2			425.9			59.0	
Approach LOS		D			C			F			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	12.0	43.6		27.4	12.0	43.6		17.0
Change Period (Y+Rc), s	5.0	6.0		6.0	5.0	6.0		6.0
Max Green Setting (Gmax), s	7.0	35.0		24.0	7.0	35.0		11.0
Max Q Clear Time (g_c+I1), s	7.6	33.1		20.8	3.4	22.1		13.0
Green Ext Time (p_c), s	0.0	1.1		0.6	0.0	5.2		0.0

Intersection Summary		
HCM 2010 Ctrl Delay		142.6
HCM 2010 LOS		F



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	187	1010	522	251	270	99
Future Volume (veh/h)	187	1010	522	251	270	99
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	195	1052	544	261	281	103
Adj No. of Lanes	1	1	1	1	1	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	481	1349	1158	984	312	278
Arrive On Green	0.06	0.72	0.62	0.62	0.18	0.18
Sat Flow, veh/h	1774	1863	1863	1583	1774	1583
Grp Volume(v), veh/h	195	1052	544	261	281	103
Grp Sat Flow(s),veh/h/ln	1774	1863	1863	1583	1774	1583
Q Serve(g_s), s	4.1	39.3	17.2	8.2	17.1	6.3
Cycle Q Clear(g_c), s	4.1	39.3	17.2	8.2	17.1	6.3
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	481	1349	1158	984	312	278
V/C Ratio(X)	0.41	0.78	0.47	0.27	0.90	0.37
Avail Cap(c_a), veh/h	540	1349	1158	984	339	302
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.28	0.28	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	8.0	9.6	11.1	9.4	44.4	40.0
Incr Delay (d2), s/veh	0.2	1.3	1.4	0.7	24.9	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	20.4	9.2	3.7	10.5	5.8
LnGrp Delay(d),s/veh	8.2	10.9	12.5	10.1	69.3	40.8
LnGrp LOS	A	B	B	B	E	D
Approach Vol, veh/h		1247	805		384	
Approach Delay, s/veh		10.5	11.7		61.7	
Approach LOS		B	B		E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		85.7		24.3	11.3	74.4		
Change Period (Y+Rc), s		6.0		5.0	5.0	6.0		
Max Green Setting (Gmax), s		78.0		21.0	10.0	63.0		
Max Q Clear Time (g_c+I1), s		41.3		19.1	6.1	19.2		
Green Ext Time (p_c), s		17.1		0.3	0.2	18.3		

Intersection Summary	
HCM 2010 Ctrl Delay	19.0
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	125	110	70	680	7	175	100	7	4	305	190
Future Volume (veh/h)	35	125	110	70	680	7	175	100	7	4	305	190
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	40	142	125	80	739	8	199	114	8	5	347	216
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.88	0.88	0.88	0.88	0.92	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	164	365	321	488	773	8	341	619	43	470	543	461
Arrive On Green	0.04	0.40	0.39	0.05	0.42	0.40	0.09	0.36	0.35	0.02	0.29	0.29
Sat Flow, veh/h	1774	915	806	1774	1839	20	1774	1721	121	1774	1863	1583
Grp Volume(v), veh/h	40	0	267	80	0	747	199	0	122	5	347	216
Grp Sat Flow(s),veh/h/ln	1774	0	1721	1774	0	1859	1774	0	1841	1774	1863	1583
Q Serve(g_s), s	1.3	0.0	11.1	2.6	0.0	39.0	7.6	0.0	4.5	0.2	16.2	11.2
Cycle Q Clear(g_c), s	1.3	0.0	11.1	2.6	0.0	39.0	7.6	0.0	4.5	0.2	16.2	11.2
Prop In Lane	1.00		0.47	1.00		0.01	1.00		0.07	1.00		1.00
Lane Grp Cap(c), veh/h	164	0	686	488	0	781	341	0	663	470	543	461
V/C Ratio(X)	0.24	0.00	0.39	0.16	0.00	0.96	0.58	0.00	0.18	0.01	0.64	0.47
Avail Cap(c_a), veh/h	237	0	705	542	0	781	341	0	663	591	543	461
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.96	0.00	0.96	0.99	0.00	0.99	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.5	0.0	21.6	16.3	0.0	28.1	22.3	0.0	22.0	24.0	30.8	29.1
Incr Delay (d2), s/veh	0.8	0.0	0.4	0.1	0.0	21.6	2.5	0.0	0.6	0.0	5.7	3.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	5.4	1.3	0.0	24.6	3.9	0.0	2.4	0.1	9.1	5.3
LnGrp Delay(d),s/veh	24.3	0.0	21.9	16.5	0.0	49.7	24.9	0.0	22.6	24.0	36.5	32.5
LnGrp LOS	C		C	B		D	C		C	C	D	C
Approach Vol, veh/h		307			827			321			568	
Approach Delay, s/veh		22.2			46.5			24.0			34.9	
Approach LOS		C			D			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.1	41.0	9.0	44.9	12.0	34.1	7.9	46.0
Change Period (Y+Rc), s	4.5	6.0	4.5	6.0	4.0	6.0	4.5	6.0
Max Green Setting (Gmax), s	7.5	24.0	7.5	40.0	8.0	24.0	7.5	40.0
Max Q Clear Time (g_c+I1), s	2.2	6.5	4.6	13.1	9.6	18.2	3.3	41.0
Green Ext Time (p_c), s	0.0	3.1	0.0	7.4	0.0	1.7	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	36.0
HCM 2010 LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	1	35	2	1	2	210	190	2	2	380	305
Future Volume (veh/h)	55	1	35	2	1	2	210	190	2	2	380	305
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	64	1	41	2	1	2	244	221	2	2	442	355
Adj No. of Lanes	1	1	0	0	1	0	1	1	0	1	1	1
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	254	6	232	72	20	24	523	1342	12	757	1093	1000
Arrive On Green	0.04	0.15	0.15	0.04	0.04	0.04	0.07	0.73	0.73	0.59	0.59	0.59
Sat Flow, veh/h	1774	38	1551	429	526	637	1774	1843	17	1153	1863	1583
Grp Volume(v), veh/h	64	0	42	5	0	0	244	0	223	2	442	355
Grp Sat Flow(s),veh/h/ln	1774	0	1589	1592	0	0	1774	0	1860	1153	1863	1583
Q Serve(g_s), s	3.0	0.0	2.1	0.0	0.0	0.0	4.5	0.0	3.3	0.1	11.6	9.6
Cycle Q Clear(g_c), s	3.0	0.0	2.1	0.2	0.0	0.0	4.5	0.0	3.3	0.1	11.6	9.6
Prop In Lane	1.00		0.98	0.40		0.40	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	254	0	238	117	0	0	523	0	1354	757	1093	1000
V/C Ratio(X)	0.25	0.00	0.18	0.04	0.00	0.00	0.47	0.00	0.16	0.00	0.40	0.35
Avail Cap(c_a), veh/h	352	0	362	152	0	0	569	0	1354	757	1093	1000
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.94	0.00	0.94	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.4	0.0	33.4	41.7	0.0	0.0	6.8	0.0	3.8	7.7	10.1	7.9
Incr Delay (d2), s/veh	0.5	0.0	0.3	0.1	0.0	0.0	0.6	0.0	0.3	0.0	1.1	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	0.9	0.1	0.0	0.0	2.3	0.0	1.8	0.0	6.2	4.4
LnGrp Delay(d),s/veh	37.8	0.0	33.7	41.9	0.0	0.0	7.5	0.0	4.0	7.7	11.2	8.9
LnGrp LOS	D		C	D			A		A	A	B	A
Approach Vol, veh/h		106			5			467			799	
Approach Delay, s/veh		36.2			41.9			5.8			10.1	
Approach LOS		D			D			A			B	

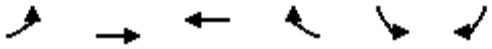
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		72.0		18.0	12.7	59.3	10.0	8.0
Change Period (Y+Rc), s		6.5		4.5	6.0	6.5	6.0	4.5
Max Green Setting (Gmax), s		58.5		20.5	9.0	43.5	9.0	5.5
Max Q Clear Time (g_c+I1), s		5.3		4.1	6.5	13.6	5.0	2.2
Green Ext Time (p_c), s		5.4		0.1	0.2	5.2	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	10.8
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	275	27	405	650	140	27	100	215	65	335	75
Future Volume (veh/h)	35	275	27	405	650	140	27	100	215	65	335	75
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	38	299	29	440	707	152	29	109	234	71	364	82
Adj No. of Lanes	1	1	0	1	1	1	1	1	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	271	812	79	570	949	863	173	403	406	331	434	469
Arrive On Green	0.04	0.49	0.49	0.06	0.51	0.51	0.04	0.22	0.22	0.05	0.23	0.23
Sat Flow, veh/h	1774	1672	162	1774	1863	1583	1774	1863	1583	1774	1863	1583
Grp Volume(v), veh/h	38	0	328	440	707	152	29	109	234	71	364	82
Grp Sat Flow(s),veh/h/ln	1774	0	1834	1774	1863	1583	1774	1863	1583	1774	1863	1583
Q Serve(g_s), s	1.1	0.0	12.3	7.0	33.0	5.3	1.4	5.4	14.2	3.4	20.5	4.2
Cycle Q Clear(g_c), s	1.1	0.0	12.3	7.0	33.0	5.3	1.4	5.4	14.2	3.4	20.5	4.2
Prop In Lane	1.00		0.09	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	271	0	891	570	949	863	173	403	406	331	434	469
V/C Ratio(X)	0.14	0.00	0.37	0.77	0.75	0.18	0.17	0.27	0.58	0.21	0.84	0.17
Avail Cap(c_a), veh/h	312	0	891	570	949	863	222	508	496	352	508	533
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.14	0.14	0.14	1.00	1.00	1.00	0.81	0.81	0.81
Uniform Delay (d), s/veh	17.1	0.0	17.7	22.9	21.3	12.6	32.9	35.9	35.7	30.8	40.2	28.7
Incr Delay (d2), s/veh	0.2	0.0	1.2	1.0	0.8	0.1	0.5	0.4	1.3	0.3	8.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	6.5	8.6	17.1	2.3	0.7	2.8	6.4	1.7	11.6	1.9
LnGrp Delay(d),s/veh	17.3	0.0	18.9	23.9	22.1	12.7	33.4	36.2	37.0	31.0	48.9	28.9
LnGrp LOS	B		B	C	C	B	C	D	D	C	D	C
Approach Vol, veh/h		366			1299			372			517	
Approach Delay, s/veh		18.7			21.6			36.5			43.3	
Approach LOS		B			C			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.0	58.5	10.7	28.8	9.4	61.0	8.9	30.6
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	6.0	45.0	6.0	29.0	6.0	45.0	6.0	29.0
Max Q Clear Time (g_c+I1), s	9.0	14.3	5.4	16.2	3.1	35.0	3.4	22.5
Green Ext Time (p_c), s	0.0	7.9	0.0	3.1	0.0	4.7	0.0	2.1

Intersection Summary	
HCM 2010 Ctrl Delay	27.8
HCM 2010 LOS	C



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	100	455	1075	445	260	175
Future Volume (veh/h)	100	455	1075	445	260	175
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	106	484	1144	473	277	186
Adj No. of Lanes	1	1	1	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	159	1253	1087	1313	435	472
Arrive On Green	0.05	0.67	0.58	0.58	0.25	0.25
Sat Flow, veh/h	1774	1863	1863	1583	1774	1583
Grp Volume(v), veh/h	106	484	1144	473	277	186
Grp Sat Flow(s),veh/h/ln	1774	1863	1863	1583	1774	1583
Q Serve(g_s), s	2.4	12.6	64.2	8.0	15.4	10.3
Cycle Q Clear(g_c), s	2.4	12.6	64.2	8.0	15.4	10.3
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	159	1253	1087	1313	435	472
V/C Ratio(X)	0.67	0.39	1.05	0.36	0.64	0.39
Avail Cap(c_a), veh/h	194	1253	1087	1313	435	472
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.94	0.94	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.9	8.0	22.9	2.3	37.1	30.7
Incr Delay (d2), s/veh	5.9	0.9	42.2	0.8	6.9	2.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	6.7	45.3	8.8	8.4	9.9
LnGrp Delay(d),s/veh	32.8	8.8	65.1	3.1	44.0	33.1
LnGrp LOS	C	A	F	A	D	C
Approach Vol, veh/h		590	1617		463	
Approach Delay, s/veh		13.1	46.9		39.7	
Approach LOS		B	D		D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		79.0		31.0	9.8	69.2		
Change Period (Y+Rc), s		6.0		5.0	5.0	6.0		
Max Green Setting (Gmax), s		73.0		26.0	7.0	61.0		
Max Q Clear Time (g_c+I1), s		14.6		17.4	4.4	66.2		
Green Ext Time (p_c), s		24.5		1.0	0.0	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	38.2
HCM 2010 LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	140	320	215	12	170	4	90	205	13	3	140	80
Future Volume (veh/h)	140	320	215	12	170	4	90	205	13	3	140	80
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	152	348	234	13	185	4	98	223	14	3	152	87
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	487	386	260	154	549	12	557	745	47	490	727	618
Arrive On Green	0.08	0.37	0.35	0.03	0.30	0.29	0.06	0.43	0.42	0.01	0.39	0.39
Sat Flow, veh/h	1774	1040	699	1774	1817	39	1774	1735	109	1774	1863	1583
Grp Volume(v), veh/h	152	0	582	13	0	189	98	0	237	3	152	87
Grp Sat Flow(s),veh/h/ln	1774	0	1739	1774	0	1856	1774	0	1844	1774	1863	1583
Q Serve(g_s), s	5.6	0.0	31.7	0.5	0.0	7.9	3.1	0.0	8.4	0.1	5.4	3.5
Cycle Q Clear(g_c), s	5.6	0.0	31.7	0.5	0.0	7.9	3.1	0.0	8.4	0.1	5.4	3.5
Prop In Lane	1.00		0.40	1.00		0.02	1.00		0.06	1.00		1.00
Lane Grp Cap(c), veh/h	487	0	646	154	0	561	557	0	791	490	727	618
V/C Ratio(X)	0.31	0.00	0.90	0.08	0.00	0.34	0.18	0.00	0.30	0.01	0.21	0.14
Avail Cap(c_a), veh/h	488	0	678	260	0	705	613	0	791	616	727	618
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.92	0.00	0.92	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.8	0.0	30.1	26.1	0.0	27.1	15.3	0.0	18.7	17.9	20.3	19.7
Incr Delay (d2), s/veh	0.4	0.0	14.7	0.2	0.0	0.4	0.1	0.0	0.9	0.0	0.7	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.8	0.0	17.9	0.2	0.0	4.1	1.5	0.0	4.5	0.0	2.9	1.6
LnGrp Delay(d),s/veh	20.2	0.0	44.8	26.4	0.0	27.5	15.4	0.0	19.6	17.9	20.9	20.2
LnGrp LOS	C		D	C		C	B		B	B	C	C
Approach Vol, veh/h		734			202			335			242	
Approach Delay, s/veh		39.7			27.4			18.4			20.6	
Approach LOS		D			C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.9	47.9	6.0	41.2	8.8	44.0	11.9	35.2
Change Period (Y+Rc), s	4.5	6.0	4.5	6.0	4.0	6.0	4.5	6.0
Max Green Setting (Gmax), s	7.5	27.0	7.5	37.0	8.0	27.0	7.5	37.0
Max Q Clear Time (g_c+I1), s	2.1	10.4	2.5	33.7	5.1	7.4	7.6	9.9
Green Ext Time (p_c), s	0.0	2.1	0.0	1.5	0.0	2.3	0.0	5.2

Intersection Summary	
HCM 2010 Ctrl Delay	30.3
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	250	1	130	2	1	2	40	410	2	2	305	150
Future Volume (veh/h)	250	1	130	2	1	2	40	410	2	2	305	150
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	272	1	141	2	1	2	43	446	2	2	332	163
Adj No. of Lanes	1	1	0	0	1	0	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	374	2	348	74	34	34	555	1217	5	594	1031	1035
Arrive On Green	0.10	0.22	0.22	0.05	0.05	0.05	0.04	0.66	0.66	0.55	0.55	0.55
Sat Flow, veh/h	1774	11	1574	329	622	634	1774	1853	8	938	1863	1583
Grp Volume(v), veh/h	272	0	142	5	0	0	43	0	448	2	332	163
Grp Sat Flow(s),veh/h/ln	1774	0	1585	1586	0	0	1774	0	1861	938	1863	1583
Q Serve(g_s), s	9.0	0.0	6.9	0.0	0.0	0.0	0.9	0.0	9.8	0.1	8.7	3.6
Cycle Q Clear(g_c), s	9.0	0.0	6.9	0.2	0.0	0.0	0.9	0.0	9.8	0.6	8.7	3.6
Prop In Lane	1.00		0.99	0.40		0.40	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	374	0	350	142	0	0	555	0	1223	594	1031	1035
V/C Ratio(X)	0.73	0.00	0.41	0.04	0.00	0.00	0.08	0.00	0.37	0.00	0.32	0.16
Avail Cap(c_a), veh/h	374	0	361	152	0	0	668	0	1223	594	1031	1035
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.40	0.00	0.40	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.1	0.0	30.0	40.4	0.0	0.0	7.6	0.0	7.0	9.2	10.9	6.0
Incr Delay (d2), s/veh	2.9	0.0	0.3	0.1	0.0	0.0	0.1	0.0	0.8	0.0	0.8	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.0	3.1	0.1	0.0	0.0	0.4	0.0	5.3	0.0	4.7	1.6
LnGrp Delay(d),s/veh	39.0	0.0	30.3	40.5	0.0	0.0	7.7	0.0	7.8	9.2	11.7	6.3
LnGrp LOS	D		C	D			A		A	A	B	A
Approach Vol, veh/h		414			5			491			497	
Approach Delay, s/veh		36.0			40.5			7.8			10.0	
Approach LOS		D			D			A			A	

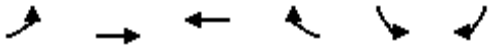
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		65.6		24.4	9.3	56.3	15.0	9.4
Change Period (Y+Rc), s		6.5		4.5	6.0	6.5	6.0	4.5
Max Green Setting (Gmax), s		58.5		20.5	9.0	43.5	9.0	5.5
Max Q Clear Time (g_c+I1), s		11.8		8.9	2.9	10.7	11.0	2.2
Green Ext Time (p_c), s		5.4		0.5	0.0	5.2	0.0	0.2

Intersection Summary		
HCM 2010 Ctrl Delay		17.0
HCM 2010 LOS		B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	690	27	190	450	75	35	185	435	270	90	35
Future Volume (veh/h)	50	690	27	190	450	75	35	185	435	270	90	35
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	53	726	28	200	474	79	37	195	458	284	95	37
Adj No. of Lanes	1	1	0	1	1	1	1	1	1	1	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	401	761	29	250	863	811	448	440	461	357	535	599
Arrive On Green	0.05	0.43	0.41	0.09	0.46	0.46	0.05	0.24	0.24	0.10	0.29	0.29
Sat Flow, veh/h	1774	1782	69	1774	1863	1583	1774	1863	1583	1774	1863	1583
Grp Volume(v), veh/h	53	0	754	200	474	79	37	195	458	284	95	37
Grp Sat Flow(s),veh/h/ln	1774	0	1851	1774	1863	1583	1774	1863	1583	1774	1863	1583
Q Serve(g_s), s	1.8	0.0	43.3	6.5	20.1	2.8	1.7	9.8	26.0	11.0	4.2	1.6
Cycle Q Clear(g_c), s	1.8	0.0	43.3	6.5	20.1	2.8	1.7	9.8	26.0	11.0	4.2	1.6
Prop In Lane	1.00		0.04	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	401	0	791	250	863	811	448	440	461	357	535	599
V/C Ratio(X)	0.13	0.00	0.95	0.80	0.55	0.10	0.08	0.44	0.99	0.80	0.18	0.06
Avail Cap(c_a), veh/h	433	0	791	250	863	811	491	440	461	357	535	599
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.82	0.82	0.82	1.00	1.00	1.00	0.99	0.99	0.99
Uniform Delay (d), s/veh	16.5	0.0	30.5	24.0	21.2	13.8	28.7	35.8	38.9	30.8	29.4	21.8
Incr Delay (d2), s/veh	0.1	0.0	22.5	13.9	2.1	0.2	0.1	0.7	40.3	11.7	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	26.9	6.9	10.8	1.3	0.8	5.1	19.0	4.2	2.2	0.7
LnGrp Delay(d),s/veh	16.6	0.0	53.0	37.9	23.3	14.0	28.8	36.5	79.2	42.5	29.6	21.8
LnGrp LOS	B		D	D	C	B	C	D	E	D	C	C
Approach Vol, veh/h		807			753			690			416	
Approach Delay, s/veh		50.6			26.2			64.4			37.7	
Approach LOS		D			C			E			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.0	51.0	15.0	30.0	10.0	55.0	9.4	35.6
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	8.0	45.0	9.0	24.0	6.0	47.0	6.0	27.0
Max Q Clear Time (g_c+I1), s	8.5	45.3	13.0	28.0	3.8	22.1	3.7	6.2
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.0	8.8	0.0	3.3

Intersection Summary	
HCM 2010 Ctrl Delay	45.3
HCM 2010 LOS	D



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	220	1185	610	295	315	115
Future Volume (veh/h)	220	1185	610	295	315	115
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	229	1234	635	307	328	120
Adj No. of Lanes	1	1	1	1	1	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	423	1311	1108	1281	380	454
Arrive On Green	0.07	0.70	0.59	0.59	0.21	0.21
Sat Flow, veh/h	1774	1863	1863	1583	1774	1583
Grp Volume(v), veh/h	229	1234	635	307	328	120
Grp Sat Flow(s),veh/h/ln	1774	1863	1863	1583	1774	1583
Q Serve(g_s), s	5.1	63.9	23.1	5.1	19.6	6.4
Cycle Q Clear(g_c), s	5.1	63.9	23.1	5.1	19.6	6.4
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	423	1311	1108	1281	380	454
V/C Ratio(X)	0.54	0.94	0.57	0.24	0.86	0.26
Avail Cap(c_a), veh/h	423	1311	1108	1281	516	576
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.41	0.41	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	10.9	14.3	13.7	2.5	41.7	30.3
Incr Delay (d2), s/veh	0.6	7.1	2.2	0.4	10.9	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	34.8	12.5	4.8	10.7	6.3
LnGrp Delay(d),s/veh	11.5	21.4	15.9	2.9	52.5	30.6
LnGrp LOS	B	C	B	A	D	C
Approach Vol, veh/h		1463	942		448	
Approach Delay, s/veh		19.8	11.6		46.6	
Approach LOS		B	B		D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		82.4		27.6	12.0	70.4		
Change Period (Y+Rc), s		6.0		5.0	5.0	6.0		
Max Green Setting (Gmax), s		68.0		31.0	7.0	56.0		
Max Q Clear Time (g_c+I1), s		65.9		21.6	7.1	25.1		
Green Ext Time (p_c), s		1.9		1.0	0.0	20.4		

Intersection Summary	
HCM 2010 Ctrl Delay	21.3
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	125	128	75	680	19	233	119	24	7	312	190
Future Volume (veh/h)	35	125	128	75	680	19	233	119	24	7	312	190
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	40	142	145	85	739	22	265	135	27	8	355	216
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.88	0.88	0.88	0.88	0.92	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	153	337	344	471	756	23	334	553	111	481	571	554
Arrive On Green	0.04	0.40	0.39	0.06	0.42	0.42	0.13	0.61	0.60	0.02	0.31	0.31
Sat Flow, veh/h	1774	846	864	1774	1800	54	1774	1508	302	1774	1863	1583
Grp Volume(v), veh/h	40	0	287	85	0	761	265	0	162	8	355	216
Grp Sat Flow(s),veh/h/ln	1774	0	1710	1774	0	1853	1774	0	1810	1774	1863	1583
Q Serve(g_s), s	1.3	0.0	12.2	2.8	0.0	40.4	8.0	0.0	4.1	0.3	16.3	10.3
Cycle Q Clear(g_c), s	1.3	0.0	12.2	2.8	0.0	40.4	8.0	0.0	4.1	0.3	16.3	10.3
Prop In Lane	1.00		0.51	1.00		0.03	1.00		0.17	1.00		1.00
Lane Grp Cap(c), veh/h	153	0	681	471	0	778	334	0	663	481	571	554
V/C Ratio(X)	0.26	0.00	0.42	0.18	0.00	0.98	0.79	0.00	0.24	0.02	0.62	0.39
Avail Cap(c_a), veh/h	218	0	701	514	0	778	334	0	663	588	571	554
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.96	0.00	0.96	0.98	0.00	0.98	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.8	0.0	22.0	16.5	0.0	28.5	26.4	0.0	13.2	22.8	29.7	24.5
Incr Delay (d2), s/veh	0.9	0.0	0.4	0.2	0.0	26.1	12.2	0.0	0.9	0.0	5.0	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	5.8	1.4	0.0	26.1	4.5	0.0	2.2	0.2	9.2	4.8
LnGrp Delay(d),s/veh	24.7	0.0	22.4	16.7	0.0	54.6	38.5	0.0	14.0	22.8	34.7	26.5
LnGrp LOS	C		C	B		D	D		B	C	C	C
Approach Vol, veh/h		327			846			427			579	
Approach Delay, s/veh		22.7			50.8			29.2			31.5	
Approach LOS		C			D			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.0	40.6	9.5	43.8	12.0	34.6	8.4	45.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	7.0	26.0	7.0	40.0	7.0	26.0	7.0	40.0
Max Q Clear Time (g_c+I1), s	2.3	6.1	4.8	14.2	10.0	18.3	3.3	42.4
Green Ext Time (p_c), s	0.0	3.5	0.0	7.6	0.0	2.3	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	37.2
HCM 2010 LOS	D



Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	90	75	10	298	26	23	486
Future Volume (vph)	90	75	10	298	26	23	486
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1583	1770	1863
Flt Permitted	0.95	1.00	0.47	1.00	1.00	0.51	1.00
Satd. Flow (perm)	1770	1583	872	1863	1583	957	1863
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	98	82	11	324	28	25	528
RTOR Reduction (vph)	0	65	0	0	9	0	0
Lane Group Flow (vph)	98	17	11	324	19	25	528
Turn Type	Prot	pt+ov	Perm	NA	Perm	pm+pt	NA
Protected Phases	8	8 1		2		1	6
Permitted Phases			2		2	6	
Actuated Green, G (s)	10.9	20.6	69.4	69.4	69.4	79.1	79.1
Effective Green, g (s)	10.9	20.6	69.4	69.4	69.4	79.1	79.1
Actuated g/C Ratio	0.11	0.21	0.69	0.69	0.69	0.79	0.79
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	192	326	605	1292	1098	795	1473
v/s Ratio Prot	c0.06	0.01		0.17		0.00	c0.28
v/s Ratio Perm			0.01		0.01	0.02	
v/c Ratio	0.51	0.05	0.02	0.25	0.02	0.03	0.36
Uniform Delay, d1	42.0	31.9	4.7	5.7	4.7	2.4	3.0
Progression Factor	1.00	1.00	0.70	0.56	0.48	1.39	1.18
Incremental Delay, d2	2.3	0.1	0.1	0.5	0.0	0.0	0.6
Delay (s)	44.3	31.9	3.4	3.6	2.3	3.4	4.2
Level of Service	D	C	A	A	A	A	A
Approach Delay (s)	38.7			3.5			4.1
Approach LOS	D			A			A

Intersection Summary			
HCM 2000 Control Delay	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	38.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	1	38	2	1	2	222	219	2	2	389	310
Future Volume (veh/h)	72	1	38	2	1	2	222	219	2	2	389	310
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	84	1	44	2	1	2	258	255	2	2	452	360
Adj No. of Lanes	1	1	0	0	1	0	1	1	0	1	1	1
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	280	5	230	73	21	25	546	1378	11	777	1161	1079
Arrive On Green	0.06	0.15	0.15	0.04	0.04	0.04	0.07	0.75	0.75	0.62	0.62	0.62
Sat Flow, veh/h	1774	35	1553	417	539	638	1774	1846	14	1118	1863	1583
Grp Volume(v), veh/h	84	0	45	5	0	0	258	0	257	2	452	360
Grp Sat Flow(s),veh/h/ln	1774	0	1589	1594	0	0	1774	0	1860	1118	1863	1583
Q Serve(g_s), s	3.9	0.0	2.2	0.0	0.0	0.0	4.3	0.0	3.7	0.1	10.9	8.4
Cycle Q Clear(g_c), s	3.9	0.0	2.2	0.2	0.0	0.0	4.3	0.0	3.7	0.1	10.9	8.4
Prop In Lane	1.00		0.98	0.40		0.40	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	280	0	235	119	0	0	546	0	1388	777	1161	1079
V/C Ratio(X)	0.30	0.00	0.19	0.04	0.00	0.00	0.47	0.00	0.19	0.00	0.39	0.33
Avail Cap(c_a), veh/h	383	0	362	152	0	0	623	0	1388	777	1161	1079
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.94	0.00	0.94	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.6	0.0	33.6	41.6	0.0	0.0	5.7	0.0	3.4	6.4	8.4	5.9
Incr Delay (d2), s/veh	0.6	0.0	0.4	0.1	0.0	0.0	0.6	0.0	0.3	0.0	1.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	0.0	1.0	0.1	0.0	0.0	2.1	0.0	2.0	0.0	5.8	3.9
LnGrp Delay(d),s/veh	37.1	0.0	34.0	41.8	0.0	0.0	6.3	0.0	3.7	6.4	9.4	6.7
LnGrp LOS	D		C	D			A		A	A	A	A
Approach Vol, veh/h		129			5			515			814	
Approach Delay, s/veh		36.0			41.8			5.0			8.2	
Approach LOS		D			D			A			A	

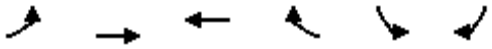
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		72.2		17.8	11.1	61.1	9.8	8.1
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s		60.0		20.5	10.5	45.0	10.5	5.5
Max Q Clear Time (g_c+I1), s		5.7		4.2	6.3	12.9	5.9	2.2
Green Ext Time (p_c), s		5.8		0.1	0.3	5.6	0.1	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	9.6
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	48	286	27	433	688	157	27	110	223	99	365	115
Future Volume (veh/h)	48	286	27	433	688	157	27	110	223	99	365	115
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	52	311	29	471	748	171	29	120	242	108	397	125
Adj No. of Lanes	1	1	0	1	1	1	1	1	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	260	608	57	633	937	913	181	401	640	366	467	474
Arrive On Green	0.05	0.36	0.36	0.19	0.50	0.50	0.04	0.22	0.22	0.07	0.25	0.25
Sat Flow, veh/h	1774	1679	157	1774	1863	1583	1774	1863	1583	1774	1863	1583
Grp Volume(v), veh/h	52	0	340	471	748	171	29	120	242	108	397	125
Grp Sat Flow(s),veh/h/ln	1774	0	1835	1774	1863	1583	1774	1863	1583	1774	1863	1583
Q Serve(g_s), s	1.8	0.0	14.5	15.5	33.3	5.1	1.2	5.4	10.7	4.5	20.3	6.0
Cycle Q Clear(g_c), s	1.8	0.0	14.5	15.5	33.3	5.1	1.2	5.4	10.7	4.5	20.3	6.0
Prop In Lane	1.00		0.09	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	260	0	665	633	937	913	181	401	640	366	467	474
V/C Ratio(X)	0.20	0.00	0.51	0.74	0.80	0.19	0.16	0.30	0.38	0.30	0.85	0.26
Avail Cap(c_a), veh/h	370	0	665	670	937	913	256	401	640	520	540	535
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.09	0.09	0.09	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.9	0.0	25.0	15.0	20.6	10.1	29.8	32.9	20.9	26.1	35.7	26.7
Incr Delay (d2), s/veh	0.4	0.0	2.8	0.4	0.7	0.0	0.4	0.4	0.4	0.4	10.9	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	7.9	7.5	17.2	2.3	0.6	2.8	4.7	2.2	11.9	2.6
LnGrp Delay(d),s/veh	20.3	0.0	27.8	15.4	21.3	10.1	30.2	33.3	21.3	26.5	46.6	27.0
LnGrp LOS	C		C	B	C	B	C	C	C	C	D	C
Approach Vol, veh/h		392			1390			391			630	
Approach Delay, s/veh		26.8			17.9			25.6			39.3	
Approach LOS		C			B			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.3	25.5	22.9	40.2	7.8	29.1	8.8	54.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	15.0	20.0	20.0	25.0	7.0	28.0	10.0	35.0
Max Q Clear Time (g_c+I1), s	6.5	12.7	17.5	16.5	3.2	22.3	3.8	35.3
Green Ext Time (p_c), s	0.1	2.5	0.4	4.5	0.0	1.8	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	25.0
HCM 2010 LOS	C



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	123	486	1088	468	345	244
Future Volume (veh/h)	123	486	1088	468	345	244
Number	7	4	8	18	1	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	131	517	1157	498	367	260
Adj No. of Lanes	1	1	1	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	181	1274	1085	1296	419	471
Arrive On Green	0.06	0.68	0.58	0.58	0.24	0.24
Sat Flow, veh/h	1774	1863	1863	1583	1774	1583
Grp Volume(v), veh/h	131	517	1157	498	367	260
Grp Sat Flow(s),veh/h/ln	1774	1863	1863	1583	1774	1583
Q Serve(g_s), s	3.1	12.1	58.3	8.3	19.9	13.8
Cycle Q Clear(g_c), s	3.1	12.1	58.3	8.3	19.9	13.8
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	181	1274	1085	1296	419	471
V/C Ratio(X)	0.73	0.41	1.07	0.38	0.88	0.55
Avail Cap(c_a), veh/h	303	1274	1085	1296	461	509
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.91	0.91	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.2	6.9	20.9	2.4	36.8	29.5
Incr Delay (d2), s/veh	5.0	0.9	46.8	0.9	16.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	6.5	43.6	8.6	11.6	12.4
LnGrp Delay(d),s/veh	31.2	7.8	67.7	3.3	52.8	30.6
LnGrp LOS	C	A	F	A	D	C
Approach Vol, veh/h		648	1655		627	
Approach Delay, s/veh		12.5	48.3		43.6	
Approach LOS		B	D		D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6	7	8
Phs Duration (G+Y+Rc), s				72.4		27.6	10.1	62.3
Change Period (Y+Rc), s				5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s				65.0		25.0	12.0	48.0
Max Q Clear Time (g_c+I1), s				14.1		21.9	5.1	60.3
Green Ext Time (p_c), s				24.6		0.7	0.2	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	39.4
HCM 2010 LOS	D

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	26	582	8	1	589
Future Vol, veh/h	0	26	582	8	1	589
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	28	633	9	1	640

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	316	0	0	633	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	4.14	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	0	680	-	-	946	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	680	-	-	946	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	680	946	-
HCM Lane V/C Ratio	-	-	0.042	0.001	-
HCM Control Delay (s)	-	-	10.5	8.8	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	10.4

Movement	EBT	EBR	WBL	WBT	NBU	NBL	NBR
Lane Configurations							
Traffic Vol, veh/h	17	68	505	12	17	23	568
Future Vol, veh/h	17	68	505	12	17	23	568
Conflicting Peds, #/hr	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	-	None
Storage Length	-	0	0	-	-	0	0
Veh in Median Storage, #	0	-	-	0	-	0	-
Grade, %	0	-	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	18	74	549	13	18	25	617

Major/Minor	Major1		Major2		Minor1		
Conflicting Flow All	0	0	18	0	0	1129	18
Stage 1	-	-	-	-	0	18	-
Stage 2	-	-	-	-	0	1111	-
Critical Hdwy	-	-	4.12	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1599	-	0	226	1061
Stage 1	-	-	-	-	0	1005	-
Stage 2	-	-	-	-	0	315	-
Platoon blocked, %	-	-		-	-		
Mov Cap-1 Maneuver	-	-	1599	-	0	148	1061
Mov Cap-2 Maneuver	-	-	-	-	0	148	-
Stage 1	-	-	-	-	0	1005	-
Stage 2	-	-	-	-	0	207	-

Approach	EB	WB	NB
HCM Control Delay, s	0	8.2	13.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	148	1061	-	-	1599	-
HCM Lane V/C Ratio	0.169	0.582	-	-	0.343	-
HCM Control Delay (s)	34.2	13	-	-	8.4	-
HCM Lane LOS	D	B	-	-	A	-
HCM 95th %tile Q(veh)	0.6	3.9	-	-	1.6	-

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↱		↱
Traffic Vol, veh/h	0	585	488	2	0	28
Future Vol, veh/h	0	585	488	2	0	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	150	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	636	530	2	0	30

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	530
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	-	0	549
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	549
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	549
HCM Lane V/C Ratio	-	-	-	0.055
HCM Control Delay (s)	-	-	-	11.9
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	22	562	443	4	24	47
Future Vol, veh/h	22	562	443	4	24	47
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	150	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	611	482	4	26	51

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	482	0	-	0	1141	482
Stage 1	-	-	-	-	482	-
Stage 2	-	-	-	-	659	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1081	-	-	-	222	584
Stage 1	-	-	-	-	621	-
Stage 2	-	-	-	-	515	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1081	-	-	-	217	584
Mov Cap-2 Maneuver	-	-	-	-	217	-
Stage 1	-	-	-	-	621	-
Stage 2	-	-	-	-	504	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	15.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1081	-	-	-	217	584
HCM Lane V/C Ratio	0.022	-	-	-	0.12	0.087
HCM Control Delay (s)	8.4	-	-	-	23.8	11.8
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.4	0.3

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	25	310	9	3	584
Future Vol, veh/h	0	25	310	9	3	584
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	27	337	10	3	635

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	337	0	0	337	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	0	705	-	-	1222	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	705	-	-	1222	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	705	1222	-
HCM Lane V/C Ratio	-	-	0.039	0.003	-
HCM Control Delay (s)	-	-	10.3	8	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	140	320	278	30	170	11	126	217	23	16	161	80
Future Volume (veh/h)	140	320	278	30	170	11	126	217	23	16	161	80
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	152	348	302	33	185	12	137	236	25	17	175	87
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	535	369	320	163	606	39	502	631	67	495	622	655
Arrive On Green	0.08	0.40	0.38	0.04	0.35	0.34	0.15	0.76	0.74	0.03	0.33	0.33
Sat Flow, veh/h	1774	922	800	1774	1731	112	1774	1656	175	1774	1863	1583
Grp Volume(v), veh/h	152	0	650	33	0	197	137	0	261	17	175	87
Grp Sat Flow(s),veh/h/ln	1774	0	1722	1774	0	1843	1774	0	1832	1774	1863	1583
Q Serve(g_s), s	5.2	0.0	36.4	1.2	0.0	7.8	4.8	0.0	4.8	0.6	6.9	3.4
Cycle Q Clear(g_c), s	5.2	0.0	36.4	1.2	0.0	7.8	4.8	0.0	4.8	0.6	6.9	3.4
Prop In Lane	1.00		0.46	1.00		0.06	1.00		0.10	1.00		1.00
Lane Grp Cap(c), veh/h	535	0	689	163	0	645	502	0	698	495	622	655
V/C Ratio(X)	0.28	0.00	0.94	0.20	0.00	0.31	0.27	0.00	0.37	0.03	0.28	0.13
Avail Cap(c_a), veh/h	535	0	689	234	0	719	508	0	698	585	622	655
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	0.98	0.00	0.98	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.1	0.0	29.4	24.5	0.0	23.7	16.6	0.0	8.0	20.5	24.5	18.2
Incr Delay (d2), s/veh	0.3	0.0	21.6	0.6	0.0	0.3	0.3	0.0	1.5	0.0	1.1	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	0.0	21.3	0.6	0.0	4.0	2.3	0.0	2.6	0.3	3.7	1.6
LnGrp Delay(d),s/veh	17.4	0.0	51.0	25.1	0.0	23.9	16.8	0.0	9.5	20.5	25.6	18.6
LnGrp LOS	B		D	C		C	B		A	C	C	B
Approach Vol, veh/h		802			230			398			279	
Approach Delay, s/veh		44.6			24.1			12.0			23.1	
Approach LOS		D			C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.9	42.1	8.0	43.0	11.6	37.4	12.0	39.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	7.0	28.0	7.0	38.0	7.0	28.0	7.0	38.0
Max Q Clear Time (g_c+I1), s	2.6	6.8	3.2	38.4	6.8	8.9	7.2	9.8
Green Ext Time (p_c), s	0.0	2.6	0.0	0.0	0.0	2.5	0.0	6.1

Intersection Summary	
HCM 2010 Ctrl Delay	30.8
HCM 2010 LOS	C



Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	58	49	5	319	89	77	405
Future Volume (vph)	58	49	5	319	89	77	405
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1583	1770	1863
Flt Permitted	0.95	1.00	0.51	1.00	1.00	0.50	1.00
Satd. Flow (perm)	1770	1583	945	1863	1583	939	1863
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	63	53	5	347	97	84	440
RTOR Reduction (vph)	0	43	0	0	27	0	0
Lane Group Flow (vph)	63	10	5	347	70	84	440
Turn Type	Prot	pt+ov	Perm	NA	Perm	pm+pt	NA
Protected Phases	8	8 1		2		1	6
Permitted Phases			2		2	6	
Actuated Green, G (s)	7.8	18.2	71.8	71.8	71.8	82.2	82.2
Effective Green, g (s)	7.8	18.2	71.8	71.8	71.8	82.2	82.2
Actuated g/C Ratio	0.08	0.18	0.72	0.72	0.72	0.82	0.82
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	138	288	678	1337	1136	816	1531
v/s Ratio Prot	c0.04	0.01		0.19		0.01	c0.24
v/s Ratio Perm			0.01		0.04	0.08	
v/c Ratio	0.46	0.03	0.01	0.26	0.06	0.10	0.29
Uniform Delay, d1	44.1	33.7	4.0	4.9	4.2	1.9	2.1
Progression Factor	1.00	1.00	0.93	0.64	0.98	0.39	0.35
Incremental Delay, d2	2.4	0.0	0.0	0.5	0.1	0.0	0.4
Delay (s)	46.5	33.7	3.7	3.6	4.2	0.8	1.1
Level of Service	D	C	A	A	A	A	A
Approach Delay (s)	40.6			3.7			1.1
Approach LOS	D			A			A

Intersection Summary			
HCM 2000 Control Delay	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	260	1	143	2	1	2	47	428	2	2	338	168
Future Volume (veh/h)	260	1	143	2	1	2	47	428	2	2	338	168
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	283	1	155	2	1	2	51	465	2	2	367	183
Adj No. of Lanes	1	1	0	0	1	0	1	1	0	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	404	2	348	74	34	34	562	1248	5	600	1086	1108
Arrive On Green	0.12	0.22	0.22	0.05	0.05	0.05	0.04	0.67	0.67	0.58	0.58	0.58
Sat Flow, veh/h	1774	10	1575	328	620	632	1774	1853	8	922	1863	1583
Grp Volume(v), veh/h	283	0	156	5	0	0	51	0	467	2	367	183
Grp Sat Flow(s),veh/h/ln	1774	0	1585	1581	0	0	1774	0	1861	922	1863	1583
Q Serve(g_s), s	10.5	0.0	7.7	0.0	0.0	0.0	0.9	0.0	9.9	0.1	9.2	3.5
Cycle Q Clear(g_c), s	10.5	0.0	7.7	0.2	0.0	0.0	0.9	0.0	9.9	1.8	9.2	3.5
Prop In Lane	1.00		0.99	0.40		0.40	1.00		0.00	1.00		1.00
Lane Grp Cap(c), veh/h	404	0	351	142	0	0	562	0	1253	600	1086	1108
V/C Ratio(X)	0.70	0.00	0.44	0.04	0.00	0.00	0.09	0.00	0.37	0.00	0.34	0.17
Avail Cap(c_a), veh/h	404	0	361	152	0	0	698	0	1253	600	1086	1108
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.32	0.00	0.32	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.8	0.0	30.3	40.3	0.0	0.0	6.6	0.0	6.4	8.6	9.7	4.6
Incr Delay (d2), s/veh	1.7	0.0	0.3	0.1	0.0	0.0	0.1	0.0	0.9	0.0	0.8	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.0	3.4	0.1	0.0	0.0	0.5	0.0	5.4	0.0	4.9	1.6
LnGrp Delay(d),s/veh	36.6	0.0	30.6	40.4	0.0	0.0	6.6	0.0	7.3	8.6	10.6	4.9
LnGrp LOS	D		C	D			A		A	A	B	A
Approach Vol, veh/h		439			5			518			552	
Approach Delay, s/veh		34.4			40.4			7.2			8.7	
Approach LOS		C			D			A			A	

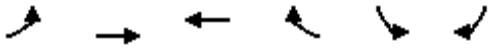
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		65.6		24.4	8.1	57.5	15.0	9.4
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s		60.0		20.5	10.5	45.0	10.5	5.5
Max Q Clear Time (g_c+I1), s		11.9		9.7	2.9	11.2	12.5	2.2
Green Ext Time (p_c), s		5.9		0.6	0.0	5.8	0.0	0.2

Intersection Summary	
HCM 2010 Ctrl Delay	15.8
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	95	729	27	207	473	125	35	219	464	302	108	59
Future Volume (veh/h)	95	729	27	207	473	125	35	219	464	302	108	59
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	100	767	28	218	498	132	37	231	488	318	114	62
Adj No. of Lanes	1	1	0	1	1	1	1	1	1	1	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	344	697	25	249	781	822	460	484	570	363	592	600
Arrive On Green	0.06	0.39	0.38	0.10	0.42	0.42	0.04	0.26	0.26	0.10	0.32	0.32
Sat Flow, veh/h	1774	1786	65	1774	1863	1583	1774	1863	1583	1774	1863	1583
Grp Volume(v), veh/h	100	0	795	218	498	132	37	231	488	318	114	62
Grp Sat Flow(s),veh/h/ln	1774	0	1851	1774	1863	1583	1774	1863	1583	1774	1863	1583
Q Serve(g_s), s	3.3	0.0	39.0	8.0	21.2	4.4	1.5	10.5	26.0	10.0	4.4	2.5
Cycle Q Clear(g_c), s	3.3	0.0	39.0	8.0	21.2	4.4	1.5	10.5	26.0	10.0	4.4	2.5
Prop In Lane	1.00		0.04	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	344	0	722	249	781	822	460	484	570	363	592	600
V/C Ratio(X)	0.29	0.00	1.10	0.87	0.64	0.16	0.08	0.48	0.86	0.88	0.19	0.10
Avail Cap(c_a), veh/h	432	0	722	249	781	822	527	484	570	363	592	600
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.74	0.74	0.74	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.3	0.0	30.5	26.2	23.0	12.6	24.9	31.3	29.6	28.8	24.8	20.1
Incr Delay (d2), s/veh	0.5	0.0	64.6	21.5	2.9	0.3	0.1	0.7	12.2	20.7	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.0	32.8	7.4	11.4	2.0	0.7	5.5	14.4	6.0	2.3	1.1
LnGrp Delay(d),s/veh	18.7	0.0	95.1	47.8	26.0	12.9	24.9	32.0	41.8	49.5	24.9	20.2
LnGrp LOS	B		F	D	C	B	C	C	D	D	C	C
Approach Vol, veh/h		895			848			756			494	
Approach Delay, s/veh		86.6			29.5			38.0			40.2	
Approach LOS		F			C			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.0	30.0	14.0	42.0	8.2	35.8	10.1	45.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	9.0	25.0	9.0	37.0	7.0	27.0	10.0	36.0
Max Q Clear Time (g_c+I1), s	12.0	28.0	10.0	41.0	3.5	6.4	5.3	23.2
Green Ext Time (p_c), s	0.0	0.0	0.0	0.0	0.0	3.9	0.1	6.8

Intersection Summary	
HCM 2010 Ctrl Delay	50.5
HCM 2010 LOS	D



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	299	1206	658	374	366	158
Future Volume (veh/h)	299	1206	658	374	366	158
Number	7	4	8	18	1	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	311	1256	685	390	381	165
Adj No. of Lanes	1	1	1	1	1	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	395	1263	992	1227	429	550
Arrive On Green	0.11	0.68	0.53	0.53	0.24	0.24
Sat Flow, veh/h	1774	1863	1863	1583	1774	1583
Grp Volume(v), veh/h	311	1256	685	390	381	165
Grp Sat Flow(s),veh/h/ln	1774	1863	1863	1583	1774	1583
Q Serve(g_s), s	7.3	66.6	27.2	7.4	20.7	7.6
Cycle Q Clear(g_c), s	7.3	66.6	27.2	7.4	20.7	7.6
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	395	1263	992	1227	429	550
V/C Ratio(X)	0.79	0.99	0.69	0.32	0.89	0.30
Avail Cap(c_a), veh/h	439	1263	992	1227	461	578
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.23	0.23	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.6	15.9	17.3	3.4	36.6	23.8
Incr Delay (d2), s/veh	2.1	10.9	3.9	0.7	17.8	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	37.3	15.0	6.8	12.3	7.6
LnGrp Delay(d),s/veh	18.7	26.9	21.2	4.0	54.4	24.1
LnGrp LOS	B	C	C	A	D	C
Approach Vol, veh/h		1567	1075		546	
Approach Delay, s/veh		25.2	15.0		45.2	
Approach LOS		C	B		D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6	7	8
Phs Duration (G+Y+Rc), s				71.8		28.2	14.5	57.3
Change Period (Y+Rc), s				5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s				65.0		25.0	12.0	48.0
Max Q Clear Time (g_c+I1), s				68.6		22.7	9.3	29.2
Green Ext Time (p_c), s				0.0		0.5	0.3	14.8

Intersection Summary	
HCM 2010 Ctrl Delay	25.2
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	17	647	26	4	524
Future Vol, veh/h	0	17	647	26	4	524
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	18	703	28	4	570

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	352	0	0	703	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	4.14	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	0	644	-	-	890	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	644	-	-	890	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.8	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	644	890	-
HCM Lane V/C Ratio	-	-	0.029	0.005	-
HCM Control Delay (s)	-	-	10.8	9.1	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	12

Movement	EBT	EBR	WBL	WBT	NBU	NBL	NBR
Lane Configurations							
Traffic Vol, veh/h	17	42	474	21	11	62	591
Future Vol, veh/h	17	42	474	21	11	62	591
Conflicting Peds, #/hr	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	-	None
Storage Length	-	150	150	-	-	0	150
Veh in Median Storage, #	0	-	-	0	-	0	-
Grade, %	0	-	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	18	46	515	23	12	67	642

Major/Minor	Major1		Major2		Minor1		
Conflicting Flow All	0	0	18	0	0	1071	18
Stage 1	-	-	-	-	0	18	-
Stage 2	-	-	-	-	0	1053	-
Critical Hdwy	-	-	4.12	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1599	-	0	244	1061
Stage 1	-	-	-	-	0	1005	-
Stage 2	-	-	-	-	0	336	-
Platoon blocked, %	-	-		-	-		
Mov Cap-1 Maneuver	-	-	1599	-	0	165	1061
Mov Cap-2 Maneuver	-	-	-	-	0	165	-
Stage 1	-	-	-	-	0	1005	-
Stage 2	-	-	-	-	0	228	-

Approach	EB	WB	NB
HCM Control Delay, s	0	8	16.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	165	1061	-	-	1599	-
HCM Lane V/C Ratio	0.408	0.605	-	-	0.322	-
HCM Control Delay (s)	41.1	13.5	-	-	8.3	-
HCM Lane LOS	E	B	-	-	A	-
HCM 95th %tile Q(veh)	1.8	4.3	-	-	1.4	-

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↱		↱
Traffic Vol, veh/h	0	608	476	8	0	18
Future Vol, veh/h	0	608	476	8	0	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	150	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	661	517	9	0	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	517
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	-	0	558
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	558
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.7
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	558
HCM Lane V/C Ratio	-	-	-	0.035
HCM Control Delay (s)	-	-	-	11.7
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.1

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	81	526	458	17	14	27
Future Vol, veh/h	81	526	458	17	14	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	150	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	88	572	498	18	15	29

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	498	0	-	0	1246	498
Stage 1	-	-	-	-	498	-
Stage 2	-	-	-	-	748	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1066	-	-	-	192	572
Stage 1	-	-	-	-	611	-
Stage 2	-	-	-	-	468	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1066	-	-	-	176	572
Mov Cap-2 Maneuver	-	-	-	-	176	-
Stage 1	-	-	-	-	611	-
Stage 2	-	-	-	-	429	-

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	17
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1066	-	-	-	176	572
HCM Lane V/C Ratio	0.083	-	-	-	0.086	0.051
HCM Control Delay (s)	8.7	-	-	-	27.4	11.6
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0.3	-	-	-	0.3	0.2

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	12	401	39	14	454
Future Vol, veh/h	0	12	401	39	14	454
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	13	436	42	15	493

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	436	0	0	436	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	0	620	-	-	1124	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	620	-	-	1124	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

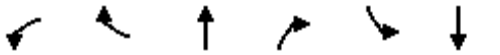
Approach	WB	NB	SB
HCM Control Delay, s	10.9	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	620	1124	-
HCM Lane V/C Ratio	-	-	0.021	0.014	-
HCM Control Delay (s)	-	-	10.9	8.2	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	75	200	150	125	750	35	225	250	50	25	500	250
Future Volume (veh/h)	75	200	150	125	750	35	225	250	50	25	500	250
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	82	217	163	136	815	38	245	272	54	27	543	272
Adj No. of Lanes	1	2	1	1	2	1	1	2	1	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	208	952	537	417	1030	503	384	1538	799	529	1384	695
Arrive On Green	0.05	0.27	0.27	0.07	0.29	0.29	0.12	0.73	0.73	0.03	0.39	0.39
Sat Flow, veh/h	1774	3539	1583	1774	3539	1583	1774	3539	1583	1774	3539	1583
Grp Volume(v), veh/h	82	217	163	136	815	38	245	272	54	27	543	272
Grp Sat Flow(s),veh/h/ln	1774	1770	1583	1774	1770	1583	1774	1770	1583	1774	1770	1583
Q Serve(g_s), s	3.3	4.8	7.6	5.5	21.2	1.7	7.0	2.4	0.9	0.9	11.0	11.6
Cycle Q Clear(g_c), s	3.3	4.8	7.6	5.5	21.2	1.7	7.0	2.4	0.9	0.9	11.0	11.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	208	952	537	417	1030	503	384	1538	799	529	1384	695
V/C Ratio(X)	0.39	0.23	0.30	0.33	0.79	0.08	0.64	0.18	0.07	0.05	0.39	0.39
Avail Cap(c_a), veh/h	247	1274	681	417	1274	612	384	1538	799	607	1384	695
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.96	0.96	0.96	0.99	0.99	0.99	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.5	28.5	24.4	23.8	32.6	23.9	18.8	8.1	6.1	17.2	21.9	19.0
Incr Delay (d2), s/veh	1.2	0.1	0.3	0.4	2.7	0.1	3.5	0.2	0.2	0.0	0.8	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	2.3	3.4	2.7	10.7	0.7	2.7	1.2	0.4	0.4	5.5	5.4
LnGrp Delay(d),s/veh	27.7	28.6	24.7	24.2	35.3	23.9	22.2	8.3	6.2	17.3	22.7	20.7
LnGrp LOS	C	C	C	C	D	C	C	A	A	B	C	C
Approach Vol, veh/h		462			989			571			842	
Approach Delay, s/veh		27.1			33.4			14.1			21.9	
Approach LOS		C			C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.6	48.5	12.0	31.9	12.0	44.1	9.8	34.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	7.0	30.0	7.0	36.0	7.0	30.0	7.0	36.0
Max Q Clear Time (g_c+I1), s	2.9	4.4	7.5	9.6	9.0	13.6	5.3	23.2
Green Ext Time (p_c), s	0.0	6.8	0.0	8.3	0.0	5.8	0.0	5.9

Intersection Summary	
HCM 2010 Ctrl Delay	25.1
HCM 2010 LOS	C



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	40	20	525	10	10	800
Future Volume (veh/h)	40	20	525	10	10	800
Number	3	18	2	12	1	6
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	43	22	571	11	11	870
Adj No. of Lanes	1	1	2	1	1	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	74	87	2814	1259	722	3037
Arrive On Green	0.04	0.04	0.80	0.80	0.03	1.00
Sat Flow, veh/h	1774	1583	3632	1583	1774	3632
Grp Volume(v), veh/h	43	22	571	11	11	870
Grp Sat Flow(s),veh/h/ln	1774	1583	1770	1583	1774	1770
Q Serve(g_s), s	2.4	1.3	3.9	0.1	0.1	0.0
Cycle Q Clear(g_c), s	2.4	1.3	3.9	0.1	0.1	0.0
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	74	87	2814	1259	722	3037
V/C Ratio(X)	0.58	0.25	0.20	0.01	0.02	0.29
Avail Cap(c_a), veh/h	444	417	2814	1259	823	3037
HCM Platoon Ratio	1.00	1.00	1.00	1.00	2.00	2.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.93	0.93
Uniform Delay (d), s/veh	47.0	45.3	2.5	2.1	1.6	0.0
Incr Delay (d2), s/veh	7.0	1.5	0.2	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.6	2.0	0.1	0.0	0.1
LnGrp Delay(d),s/veh	54.0	46.8	2.7	2.1	1.6	0.2
LnGrp LOS	D	D	A	A	A	A
Approach Vol, veh/h	65		582			881
Approach Delay, s/veh	51.6		2.7			0.2
Approach LOS	D		A			A

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	6.3	84.5				90.8		9.2
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	7.0	53.0				65.0		25.0
Max Q Clear Time (g_c+I1), s	2.1	5.9				2.0		4.4
Green Ext Time (p_c), s	0.0	13.1				13.7		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	3.3
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	250	1	75	2	1	2	150	650	2	2	475	400
Future Volume (veh/h)	250	1	75	2	1	2	150	650	2	2	475	400
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	272	1	82	2	1	2	163	707	2	2	516	435
Adj No. of Lanes	2	1	0	0	1	0	1	2	0	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	404	4	302	66	28	29	488	2578	7	525	2174	1134
Arrive On Green	0.12	0.19	0.19	0.05	0.05	0.05	0.05	0.71	0.71	0.61	0.61	0.61
Sat Flow, veh/h	3442	19	1567	342	621	642	1774	3620	10	737	3539	1583
Grp Volume(v), veh/h	272	0	83	5	0	0	163	346	363	2	516	435
Grp Sat Flow(s),veh/h/ln	1721	0	1586	1605	0	0	1774	1770	1861	737	1770	1583
Q Serve(g_s), s	7.6	0.0	4.5	0.0	0.0	0.0	3.2	7.0	7.0	0.1	6.6	10.7
Cycle Q Clear(g_c), s	7.6	0.0	4.5	0.3	0.0	0.0	3.2	7.0	7.0	0.1	6.6	10.7
Prop In Lane	1.00		0.99	0.40		0.40	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	404	0	306	124	0	0	488	1260	1325	525	2174	1134
V/C Ratio(X)	0.67	0.00	0.27	0.04	0.00	0.00	0.33	0.27	0.27	0.00	0.24	0.38
Avail Cap(c_a), veh/h	757	0	484	138	0	0	580	1260	1325	525	2174	1134
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.00	0.99	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.3	0.0	34.4	45.7	0.0	0.0	5.9	5.2	5.2	7.5	8.7	5.5
Incr Delay (d2), s/veh	1.9	0.0	0.5	0.1	0.0	0.0	0.4	0.5	0.5	0.0	0.3	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	0.0	2.0	0.1	0.0	0.0	1.5	3.5	3.7	0.0	3.3	4.9
LnGrp Delay(d),s/veh	44.2	0.0	34.8	45.8	0.0	0.0	6.3	5.7	5.7	7.5	9.0	6.5
LnGrp LOS	D		C	D			A	A	A	A	A	A
Approach Vol, veh/h		355			5			872			953	
Approach Delay, s/veh		42.0			45.8			5.8			7.9	
Approach LOS		D			D			A			A	

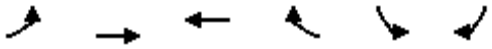
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		76.2		23.8	9.8	66.4	14.7	9.1
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s		60.0		30.5	10.5	45.0	20.5	5.5
Max Q Clear Time (g_c+I1), s		9.0		6.5	5.2	12.7	9.6	2.3
Green Ext Time (p_c), s		11.4		0.4	0.2	10.5	0.7	0.1

Intersection Summary	
HCM 2010 Ctrl Delay	12.7
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	100	400	75	525	925	225	75	200	275	250	430	150
Future Volume (veh/h)	100	400	75	525	925	225	75	200	275	250	430	150
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	109	435	82	571	1005	245	82	217	299	272	467	163
Adj No. of Lanes	2	2	1	2	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	204	1209	628	671	1689	931	189	683	614	380	880	487
Arrive On Green	0.06	0.34	0.34	0.19	0.48	0.48	0.05	0.19	0.19	0.11	0.25	0.25
Sat Flow, veh/h	3442	3539	1583	3442	3539	1583	3442	3539	1583	3442	3539	1583
Grp Volume(v), veh/h	109	435	82	571	1005	245	82	217	299	272	467	163
Grp Sat Flow(s),veh/h/ln	1721	1770	1583	1721	1770	1583	1721	1770	1583	1721	1770	1583
Q Serve(g_s), s	3.1	9.2	3.3	16.0	20.7	7.5	2.3	5.3	14.3	7.6	11.4	7.9
Cycle Q Clear(g_c), s	3.1	9.2	3.3	16.0	20.7	7.5	2.3	5.3	14.3	7.6	11.4	7.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	204	1209	628	671	1689	931	189	683	614	380	880	487
V/C Ratio(X)	0.53	0.36	0.13	0.85	0.59	0.26	0.43	0.32	0.49	0.72	0.53	0.33
Avail Cap(c_a), veh/h	379	1209	628	723	1689	931	275	743	641	551	1026	553
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.56	0.56	0.56	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.7	24.7	19.2	38.8	19.1	10.1	45.8	34.7	23.1	43.0	32.5	26.7
Incr Delay (d2), s/veh	2.2	0.8	0.4	5.3	0.9	0.4	1.6	0.3	0.6	2.5	0.5	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	4.6	1.5	8.1	10.3	3.4	1.1	2.6	6.3	3.8	5.6	3.5
LnGrp Delay(d),s/veh	47.9	25.5	19.6	44.2	20.0	10.4	47.3	35.0	23.7	45.5	33.0	27.1
LnGrp LOS	D	C	B	D	B	B	D	C	C	D	C	C
Approach Vol, veh/h		626			1821			598			902	
Approach Delay, s/veh		28.7			26.3			31.0			35.7	
Approach LOS		C			C			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	15.1	23.3	23.5	38.2	9.5	28.9	9.9	51.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	15.0	20.0	20.0	25.0	7.0	28.0	10.0	35.0
Max Q Clear Time (g_c+I1), s	9.6	16.3	18.0	11.2	4.3	13.4	5.1	22.7
Green Ext Time (p_c), s	0.4	2.0	0.5	8.4	0.0	5.2	0.1	7.7

Intersection Summary	
HCM 2010 Ctrl Delay	29.5
HCM 2010 LOS	C



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	315	600	1400	500	375	275
Future Volume (veh/h)	315	600	1400	500	375	275
Number	7	4	8	18	1	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	342	652	1522	543	408	299
Adj No. of Lanes	2	2	2	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	437	2541	1950	1192	696	521
Arrive On Green	0.13	0.72	0.55	0.55	0.20	0.20
Sat Flow, veh/h	3442	3632	3632	1583	3442	1583
Grp Volume(v), veh/h	342	652	1522	543	408	299
Grp Sat Flow(s),veh/h/ln	1721	1770	1770	1583	1721	1583
Q Serve(g_s), s	9.6	6.4	33.9	12.9	10.7	15.6
Cycle Q Clear(g_c), s	9.6	6.4	33.9	12.9	10.7	15.6
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	437	2541	1950	1192	696	521
V/C Ratio(X)	0.78	0.26	0.78	0.46	0.59	0.57
Avail Cap(c_a), veh/h	447	2541	1950	1192	895	613
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.90	0.90	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.3	4.9	17.7	4.6	36.1	27.8
Incr Delay (d2), s/veh	7.9	0.2	3.2	1.3	0.8	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	3.2	17.3	10.5	5.2	13.9
LnGrp Delay(d),s/veh	50.2	5.1	20.9	5.9	36.9	28.8
LnGrp LOS	D	A	C	A	D	C
Approach Vol, veh/h		994	2065		707	
Approach Delay, s/veh		20.6	16.9		33.5	
Approach LOS		C	B		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6	7	8
Phs Duration (G+Y+Rc), s				75.8		24.2	16.7	59.1
Change Period (Y+Rc), s				5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s				65.0		25.0	12.0	48.0
Max Q Clear Time (g_c+I1), s				8.4		17.6	11.6	35.9
Green Ext Time (p_c), s				32.9		1.6	0.1	10.4

Intersection Summary	
HCM 2010 Ctrl Delay	21.0
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	50	15	800	600	10
Future Vol, veh/h	0	50	15	800	600	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	150	-	-	150
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	54	16	870	652	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	326	652	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	670	930	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	670	930	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.8	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	930	-	670	-	-
HCM Lane V/C Ratio	0.018	-	0.081	-	-
HCM Control Delay (s)	8.9	-	10.8	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.3	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	0	5	25	0	5	5	770	25	5	580	0
Future Volume (veh/h)	25	0	5	25	0	5	5	770	25	5	580	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	27	0	5	27	0	5	5	837	27	5	630	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	160	60	51	164	0	51	640	2672	1195	516	2672	1195
Arrive On Green	0.03	0.00	0.03	0.03	0.00	0.03	0.01	0.76	0.76	0.01	0.76	0.00
Sat Flow, veh/h	1774	1863	1583	1774	0	1583	1774	3539	1583	1774	3539	1583
Grp Volume(v), veh/h	27	0	5	27	0	5	5	837	27	5	630	0
Grp Sat Flow(s),veh/h/ln	1774	1863	1583	1774	0	1583	1774	1770	1583	1774	1770	1583
Q Serve(g_s), s	1.5	0.0	0.3	1.5	0.0	0.3	0.1	7.6	0.4	0.1	5.3	0.0
Cycle Q Clear(g_c), s	1.5	0.0	0.3	1.5	0.0	0.3	0.1	7.6	0.4	0.1	5.3	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	160	60	51	164	0	51	640	2672	1195	516	2672	1195
V/C Ratio(X)	0.17	0.00	0.10	0.16	0.00	0.10	0.01	0.31	0.02	0.01	0.24	0.00
Avail Cap(c_a), veh/h	352	140	119	357	0	119	726	2672	1195	603	2672	1195
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	45.0	0.0	47.0	45.0	0.0	47.0	3.0	3.9	3.1	3.1	3.7	0.0
Incr Delay (d2), s/veh	0.5	0.0	0.8	0.5	0.0	0.8	0.0	0.3	0.0	0.0	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	0.1	0.7	0.0	0.1	0.0	3.7	0.2	0.0	2.6	0.0
LnGrp Delay(d),s/veh	45.5	0.0	47.8	45.5	0.0	47.8	3.0	4.2	3.1	3.1	3.9	0.0
LnGrp LOS	D		D	D		D	A	A	A	A	A	
Approach Vol, veh/h		32			32			869			635	
Approach Delay, s/veh		45.9			45.8			4.2			3.9	
Approach LOS		D			D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.1	80.0	7.1	7.7	5.1	80.0	7.1	7.7
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	5.5	55.5	13.5	7.5	5.5	55.5	13.5	7.5
Max Q Clear Time (g_c+I1), s	2.1	9.6	3.5	2.3	2.1	7.3	3.5	2.3
Green Ext Time (p_c), s	0.0	14.2	0.0	0.0	0.0	14.3	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	5.8
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	30	10	5	0	20
Future Vol, veh/h	0	30	10	5	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	33	11	5	0	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	14
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	-	0	1066
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	1066
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.4
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	1066
HCM Lane V/C Ratio	-	-	-	0.02
HCM Control Delay (s)	-	-	-	8.4
HCM Lane LOS	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	0.1

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	30	15	5	10	0
Future Vol, veh/h	0	30	15	5	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	33	16	5	11	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	22	0	-	0	52	19
Stage 1	-	-	-	-	19	-
Stage 2	-	-	-	-	33	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1593	-	-	-	957	1059
Stage 1	-	-	-	-	1004	-
Stage 2	-	-	-	-	989	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1593	-	-	-	957	1059
Mov Cap-2 Maneuver	-	-	-	-	957	-
Stage 1	-	-	-	-	1004	-
Stage 2	-	-	-	-	989	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1593	-	-	-	957
HCM Lane V/C Ratio	-	-	-	-	0.011
HCM Control Delay (s)	0	-	-	-	8.8
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	25	515	10	10	830
Future Vol, veh/h	0	25	515	10	10	830
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	27	560	11	11	902

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	280	0	0	560	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	4.14	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	0	717	-	-	1007	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	717	-	-	1007	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

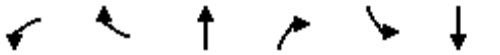
Approach	WB	NB	SB
HCM Control Delay, s	10.2	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	717	1007	-
HCM Lane V/C Ratio	-	-	0.038	0.011	-
HCM Control Delay (s)	-	-	10.2	8.6	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	175	500	275	75	250	25	125	450	125	35	300	125
Future Volume (veh/h)	175	500	275	75	250	25	125	450	125	35	300	125
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	190	543	299	82	272	27	136	489	136	38	326	136
Adj No. of Lanes	1	2	1	1	2	1	1	2	1	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	365	857	479	229	786	403	542	1683	832	486	1584	819
Arrive On Green	0.07	0.24	0.24	0.05	0.22	0.22	0.12	0.95	0.95	0.03	0.45	0.45
Sat Flow, veh/h	1774	3539	1583	1774	3539	1583	1774	3539	1583	1774	3539	1583
Grp Volume(v), veh/h	190	543	299	82	272	27	136	489	136	38	326	136
Grp Sat Flow(s),veh/h/ln	1774	1770	1583	1774	1770	1583	1774	1770	1583	1774	1770	1583
Q Serve(g_s), s	7.0	13.7	16.2	3.5	6.5	1.3	4.2	0.9	0.5	1.1	5.6	4.5
Cycle Q Clear(g_c), s	7.0	13.7	16.2	3.5	6.5	1.3	4.2	0.9	0.5	1.1	5.6	4.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	365	857	479	229	786	403	542	1683	832	486	1584	819
V/C Ratio(X)	0.52	0.63	0.62	0.36	0.35	0.07	0.25	0.29	0.16	0.08	0.21	0.17
Avail Cap(c_a), veh/h	365	1274	666	264	1274	622	559	1683	832	553	1584	819
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.99	0.99	0.99	0.98	0.98	0.98	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.4	33.9	30.0	28.6	32.8	28.3	12.5	1.3	1.1	13.8	16.8	12.7
Incr Delay (d2), s/veh	1.3	0.8	1.3	0.9	0.3	0.1	0.2	0.4	0.4	0.1	0.3	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	6.8	7.3	1.8	3.2	0.6	2.0	0.5	0.3	0.6	2.8	2.1
LnGrp Delay(d),s/veh	30.7	34.7	31.3	29.5	33.0	28.3	12.7	1.7	1.5	13.9	17.1	13.2
LnGrp LOS	C	C	C	C	C	C	B	A	A	B	B	B
Approach Vol, veh/h		1032			381			761			500	
Approach Delay, s/veh		33.0			32.0			3.7			15.8	
Approach LOS		C			C			A			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.3	52.5	10.0	29.2	11.1	49.7	12.0	27.2
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	7.0	30.0	7.0	36.0	7.0	30.0	7.0	36.0
Max Q Clear Time (g_c+I1), s	3.1	2.9	5.5	18.2	6.2	7.6	9.0	8.5
Green Ext Time (p_c), s	0.0	6.6	0.0	6.0	0.0	6.2	0.0	6.9

Intersection Summary	
HCM 2010 Ctrl Delay	21.3
HCM 2010 LOS	C



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	25	10	700	20	20	650
Future Volume (veh/h)	25	10	700	20	20	650
Number	3	18	2	12	1	6
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	27	11	761	22	22	707
Adj No. of Lanes	1	1	2	1	1	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	58	88	2812	1258	620	3070
Arrive On Green	0.03	0.03	0.79	0.79	0.05	1.00
Sat Flow, veh/h	1774	1583	3632	1583	1774	3632
Grp Volume(v), veh/h	27	11	761	22	22	707
Grp Sat Flow(s),veh/h/ln	1774	1583	1770	1583	1774	1770
Q Serve(g_s), s	1.5	0.7	5.6	0.3	0.2	0.0
Cycle Q Clear(g_c), s	1.5	0.7	5.6	0.3	0.2	0.0
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	58	88	2812	1258	620	3070
V/C Ratio(X)	0.47	0.13	0.27	0.02	0.04	0.23
Avail Cap(c_a), veh/h	444	432	2812	1258	704	3070
HCM Platoon Ratio	1.00	1.00	1.00	1.00	2.00	2.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.96	0.96
Uniform Delay (d), s/veh	47.5	44.9	2.7	2.1	1.6	0.0
Incr Delay (d2), s/veh	5.8	0.6	0.2	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.3	2.7	0.1	0.1	0.1
LnGrp Delay(d),s/veh	53.3	45.6	2.9	2.2	1.6	0.2
LnGrp LOS	D	D	A	A	A	A
Approach Vol, veh/h	38		783			729
Approach Delay, s/veh	51.0		2.9			0.2
Approach LOS	D		A			A

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	7.3	84.5				91.7		8.3
Change Period (Y+Rc), s	5.0	5.0				5.0		5.0
Max Green Setting (Gmax), s	7.0	53.0				65.0		25.0
Max Q Clear Time (g_c+I1), s	2.2	7.6				2.0		3.5
Green Ext Time (p_c), s	0.0	13.4				14.1		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	2.8
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	350	1	150	2	1	2	75	650	2	2	675	275
Future Volume (veh/h)	350	1	150	2	1	2	75	650	2	2	675	275
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	380	1	163	2	1	2	82	707	2	2	734	299
Adj No. of Lanes	2	1	0	0	1	0	1	2	0	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	453	2	356	67	31	31	413	2458	7	506	2084	1141
Arrive On Green	0.13	0.23	0.23	0.05	0.05	0.05	0.04	0.68	0.68	0.59	0.59	0.59
Sat Flow, veh/h	3442	10	1575	328	618	631	1774	3620	10	737	3539	1583
Grp Volume(v), veh/h	380	0	164	5	0	0	82	346	363	2	734	299
Grp Sat Flow(s),veh/h/ln	1721	0	1585	1577	0	0	1774	1770	1861	737	1770	1583
Q Serve(g_s), s	10.8	0.0	8.9	0.0	0.0	0.0	1.7	7.8	7.8	0.1	10.8	6.5
Cycle Q Clear(g_c), s	10.8	0.0	8.9	0.3	0.0	0.0	1.7	7.8	7.8	0.1	10.8	6.5
Prop In Lane	1.00		0.99	0.40		0.40	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	453	0	358	129	0	0	413	1201	1263	506	2084	1141
V/C Ratio(X)	0.84	0.00	0.46	0.04	0.00	0.00	0.20	0.29	0.29	0.00	0.35	0.26
Avail Cap(c_a), veh/h	533	0	404	136	0	0	520	1201	1263	506	2084	1141
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.80	0.00	0.80	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.4	0.0	33.4	45.3	0.0	0.0	7.2	6.4	6.4	8.5	10.7	4.8
Incr Delay (d2), s/veh	8.1	0.0	0.7	0.1	0.0	0.0	0.2	0.6	0.6	0.0	0.5	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.6	0.0	4.0	0.1	0.0	0.0	0.8	3.9	4.1	0.0	5.3	3.0
LnGrp Delay(d),s/veh	50.5	0.0	34.1	45.4	0.0	0.0	7.5	7.0	7.0	8.5	11.1	5.4
LnGrp LOS	D		C	D			A	A	A	A	B	A
Approach Vol, veh/h		544			5			791			1035	
Approach Delay, s/veh		45.6			45.4			7.0			9.5	
Approach LOS		D			D			A			A	

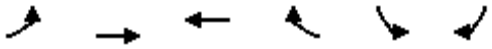
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		72.9		27.1	9.0	63.9	17.7	9.5
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s		65.0		25.5	10.5	50.0	15.5	5.5
Max Q Clear Time (g_c+I1), s		9.8		10.9	3.7	12.8	12.8	2.3
Green Ext Time (p_c), s		13.3		0.7	0.1	12.3	0.4	0.2

Intersection Summary	
HCM 2010 Ctrl Delay	17.0
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	150	1000	75	250	675	250	95	325	560	350	200	100
Future Volume (veh/h)	150	1000	75	250	675	250	95	325	560	350	200	100
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	163	1087	82	272	734	272	103	353	609	380	217	109
Adj No. of Lanes	2	2	1	2	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	264	1336	688	387	1463	876	197	743	542	482	1037	585
Arrive On Green	0.08	0.38	0.38	0.11	0.41	0.41	0.06	0.21	0.22	0.14	0.29	0.29
Sat Flow, veh/h	3442	3539	1583	3442	3539	1583	3442	3539	1583	3442	3539	1583
Grp Volume(v), veh/h	163	1087	82	272	734	272	103	353	609	380	217	109
Grp Sat Flow(s),veh/h/ln	1721	1770	1583	1721	1770	1583	1721	1770	1583	1721	1770	1583
Q Serve(g_s), s	4.6	27.6	3.1	7.6	15.4	9.3	2.9	8.8	22.0	10.7	4.6	4.7
Cycle Q Clear(g_c), s	4.6	27.6	3.1	7.6	15.4	9.3	2.9	8.8	22.0	10.7	4.6	4.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	264	1336	688	387	1463	876	197	743	542	482	1037	585
V/C Ratio(X)	0.62	0.81	0.12	0.70	0.50	0.31	0.52	0.47	1.12	0.79	0.21	0.19
Avail Cap(c_a), veh/h	379	1336	688	723	1463	876	275	743	542	551	1037	585
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.85	0.85	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.8	28.0	16.9	42.8	21.7	12.0	45.8	34.7	32.9	41.6	26.6	21.3
Incr Delay (d2), s/veh	2.4	5.5	0.4	2.0	1.0	0.8	2.2	0.5	77.1	6.7	0.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	14.5	1.4	3.7	7.7	4.2	1.4	4.3	26.5	5.5	2.3	2.1
LnGrp Delay(d),s/veh	47.1	33.5	17.2	44.7	22.8	12.8	48.0	35.1	110.0	48.2	26.7	21.5
LnGrp LOS	D	C	B	D	C	B	D	D	F	D	C	C
Approach Vol, veh/h		1332			1278			1065			706	
Approach Delay, s/veh		34.2			25.3			79.2			37.5	
Approach LOS		C			C			E			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	18.0	25.0	15.2	41.7	9.7	33.3	11.7	45.3
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	15.0	20.0	20.0	25.0	7.0	28.0	10.0	35.0
Max Q Clear Time (g_c+I1), s	12.7	24.0	9.6	29.6	4.9	6.7	6.6	17.4
Green Ext Time (p_c), s	0.3	0.0	0.6	0.0	0.0	6.5	0.1	12.0

Intersection Summary	
HCM 2010 Ctrl Delay	43.1
HCM 2010 LOS	D



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	360	1550	800	425	535	380
Future Volume (veh/h)	360	1550	800	425	535	380
Number	7	4	8	18	1	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	391	1685	870	462	582	413
Adj No. of Lanes	2	2	2	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	447	2360	1758	1187	872	607
Arrive On Green	0.13	0.67	0.50	0.50	0.25	0.25
Sat Flow, veh/h	3442	3632	3632	1583	3442	1583
Grp Volume(v), veh/h	391	1685	870	462	582	413
Grp Sat Flow(s),veh/h/ln	1721	1770	1770	1583	1721	1583
Q Serve(g_s), s	11.2	30.3	16.4	10.3	15.2	21.8
Cycle Q Clear(g_c), s	11.2	30.3	16.4	10.3	15.2	21.8
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	447	2360	1758	1187	872	607
V/C Ratio(X)	0.87	0.71	0.49	0.39	0.67	0.68
Avail Cap(c_a), veh/h	447	2360	1758	1187	895	617
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.36	0.36	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.7	10.6	16.8	4.4	33.6	25.7
Incr Delay (d2), s/veh	7.2	0.7	1.0	1.0	1.9	3.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.8	14.7	8.2	9.3	7.4	18.9
LnGrp Delay(d),s/veh	49.9	11.3	17.8	5.4	35.4	28.7
LnGrp LOS	D	B	B	A	D	C
Approach Vol, veh/h		2076	1332		995	
Approach Delay, s/veh		18.6	13.5		32.6	
Approach LOS		B	B		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6	7	8
Phs Duration (G+Y+Rc), s				70.7		29.3	17.0	53.7
Change Period (Y+Rc), s				5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s				65.0		25.0	12.0	48.0
Max Q Clear Time (g_c+I1), s				32.3		23.8	13.2	18.4
Green Ext Time (p_c), s				26.0		0.6	0.0	24.0

Intersection Summary	
HCM 2010 Ctrl Delay	20.2
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	35	45	740	880	30
Future Vol, veh/h	0	35	45	740	880	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	0	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	38	49	804	957	33

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	-	478	957	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	534	714	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	534	714	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.3	0.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	714	-	534	-	-
HCM Lane V/C Ratio	0.069	-	0.071	-	-
HCM Control Delay (s)	10.4	-	12.3	-	-
HCM Lane LOS	B	-	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	0	5	25	0	5	5	710	25	5	880	0
Future Volume (veh/h)	15	0	5	25	0	5	5	710	25	5	880	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	16	0	5	27	0	5	5	772	27	5	957	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	140	48	41	155	0	54	477	2695	1206	554	2695	1206
Arrive On Green	0.02	0.00	0.03	0.03	0.00	0.03	0.01	0.76	0.76	0.01	0.76	0.00
Sat Flow, veh/h	1774	1863	1583	1774	0	1583	1774	3539	1583	1774	3539	1583
Grp Volume(v), veh/h	16	0	5	27	0	5	5	772	27	5	957	0
Grp Sat Flow(s),veh/h/ln	1774	1863	1583	1774	0	1583	1774	1770	1583	1774	1770	1583
Q Serve(g_s), s	0.9	0.0	0.3	1.5	0.0	0.3	0.1	6.7	0.4	0.1	8.8	0.0
Cycle Q Clear(g_c), s	0.9	0.0	0.3	1.5	0.0	0.3	0.1	6.7	0.4	0.1	8.8	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	140	48	41	155	0	54	477	2695	1206	554	2695	1206
V/C Ratio(X)	0.11	0.00	0.12	0.17	0.00	0.09	0.01	0.29	0.02	0.01	0.36	0.00
Avail Cap(c_a), veh/h	348	140	119	348	0	119	563	2695	1206	640	2695	1206
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	46.1	0.0	47.6	45.6	0.0	46.8	3.1	3.6	2.9	2.9	3.9	0.0
Incr Delay (d2), s/veh	0.4	0.0	1.3	0.5	0.0	0.7	0.0	0.3	0.0	0.0	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.2	0.7	0.0	0.1	0.0	3.3	0.2	0.0	4.4	0.0
LnGrp Delay(d),s/veh	46.5	0.0	48.9	46.1	0.0	47.5	3.1	3.9	2.9	2.9	4.3	0.0
LnGrp LOS	D		D	D		D	A	A	A	A	A	
Approach Vol, veh/h		21			32			804			962	
Approach Delay, s/veh		47.1			46.4			3.9			4.3	
Approach LOS		D			D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	5.1	80.6	7.1	7.1	5.1	80.6	6.3	7.9
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	5.5	55.5	13.5	7.5	5.5	55.5	13.5	7.5
Max Q Clear Time (g_c+I1), s	2.1	8.7	3.5	2.3	2.1	10.8	2.9	2.3
Green Ext Time (p_c), s	0.0	18.4	0.0	0.0	0.0	18.1	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	5.3
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	30	20	15	0	10
Future Vol, veh/h	0	30	20	15	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	33	22	16	0	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	30
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	-	0	1044
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	1044
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.5
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	1044
HCM Lane V/C Ratio	-	-	-	0.01
HCM Control Delay (s)	-	-	-	8.5
HCM Lane LOS	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	0

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	30	35	10	5	0
Future Vol, veh/h	0	30	35	10	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	33	38	11	5	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	49	0	-	0	76	43
Stage 1	-	-	-	-	43	-
Stage 2	-	-	-	-	33	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1558	-	-	-	927	1027
Stage 1	-	-	-	-	979	-
Stage 2	-	-	-	-	989	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1558	-	-	-	927	1027
Mov Cap-2 Maneuver	-	-	-	-	927	-
Stage 1	-	-	-	-	979	-
Stage 2	-	-	-	-	989	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1558	-	-	-	927
HCM Lane V/C Ratio	-	-	-	-	0.006
HCM Control Delay (s)	0	-	-	-	8.9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	15	705	20	20	650
Future Vol, veh/h	0	15	705	20	20	650
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	16	766	22	22	707

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	383	0	0	766	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	4.14	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	0	615	-	-	843	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	615	-	-	843	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	615	843	-
HCM Lane V/C Ratio	-	-	0.027	0.026	-
HCM Control Delay (s)	-	-	11	9.4	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	75	200	168	130	750	47	283	269	67	28	507	250
Future Volume (veh/h)	75	200	168	130	750	47	283	269	67	28	507	250
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	82	217	183	141	815	51	308	292	73	30	551	272
Adj No. of Lanes	1	2	1	1	2	1	1	2	1	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	208	955	538	414	1033	507	380	1529	795	517	1381	694
Arrive On Green	0.05	0.27	0.27	0.07	0.29	0.29	0.12	0.72	0.72	0.03	0.39	0.39
Sat Flow, veh/h	1774	3539	1583	1774	3539	1583	1774	3539	1583	1774	3539	1583
Grp Volume(v), veh/h	82	217	183	141	815	51	308	292	73	30	551	272
Grp Sat Flow(s),veh/h/ln	1774	1770	1583	1774	1770	1583	1774	1770	1583	1774	1770	1583
Q Serve(g_s), s	3.3	4.8	8.6	5.7	21.2	2.3	7.0	2.7	1.2	1.0	11.2	11.7
Cycle Q Clear(g_c), s	3.3	4.8	8.6	5.7	21.2	2.3	7.0	2.7	1.2	1.0	11.2	11.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	208	955	538	414	1033	507	380	1529	795	517	1381	694
V/C Ratio(X)	0.39	0.23	0.34	0.34	0.79	0.10	0.81	0.19	0.09	0.06	0.40	0.39
Avail Cap(c_a), veh/h	247	1274	681	414	1274	615	380	1529	795	591	1381	694
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67	1.67	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.96	0.96	0.96	0.98	0.98	0.98	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.5	28.4	24.6	23.8	32.6	23.9	23.8	8.3	6.2	17.2	22.0	19.1
Incr Delay (d2), s/veh	1.2	0.1	0.4	0.5	2.6	0.1	12.1	0.3	0.2	0.0	0.9	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	2.3	3.8	2.8	10.7	1.0	6.3	1.3	0.6	0.5	5.7	5.4
LnGrp Delay(d),s/veh	27.7	28.5	25.0	24.3	35.2	24.0	35.9	8.6	6.5	17.2	22.9	20.7
LnGrp LOS	C	C	C	C	D	C	D	A	A	B	C	C
Approach Vol, veh/h		482			1007			673			853	
Approach Delay, s/veh		27.1			33.1			20.8			22.0	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.8	48.2	12.0	32.0	12.0	44.0	9.8	34.2
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	7.0	30.0	7.0	36.0	7.0	30.0	7.0	36.0
Max Q Clear Time (g_c+I1), s	3.0	4.7	7.7	10.6	9.0	13.7	5.3	23.2
Green Ext Time (p_c), s	0.0	7.1	0.0	8.3	0.0	6.0	0.0	6.0

Intersection Summary	
HCM 2010 Ctrl Delay	26.3
HCM 2010 LOS	C



Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	130	95	10	543	36	33	806
Future Volume (vph)	130	95	10	543	36	33	806
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	1770	3539	1583	1770	3539
Flt Permitted	0.95	1.00	0.32	1.00	1.00	0.39	1.00
Satd. Flow (perm)	1770	1583	604	3539	1583	723	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	103	11	590	39	36	876
RTOR Reduction (vph)	0	79	0	0	13	0	0
Lane Group Flow (vph)	141	24	11	590	26	36	876
Turn Type	Prot	pt+ov	Perm	NA	Perm	pm+pt	NA
Protected Phases	8	8 1		2		1	6
Permitted Phases			2		2	6	
Actuated Green, G (s)	13.3	23.2	66.8	66.8	66.8	76.7	76.7
Effective Green, g (s)	13.3	23.2	66.8	66.8	66.8	76.7	76.7
Actuated g/C Ratio	0.13	0.23	0.67	0.67	0.67	0.77	0.77
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	235	367	403	2364	1057	605	2714
v/s Ratio Prot	c0.08	0.02		0.17		0.00	c0.25
v/s Ratio Perm			0.02		0.02	0.04	
v/c Ratio	0.60	0.07	0.03	0.25	0.02	0.06	0.32
Uniform Delay, d1	40.8	29.9	5.6	6.6	5.6	3.0	3.6
Progression Factor	1.00	1.00	0.45	0.35	0.13	0.85	0.83
Incremental Delay, d2	4.3	0.1	0.1	0.2	0.0	0.0	0.3
Delay (s)	45.1	30.0	2.6	2.5	0.8	2.6	3.3
Level of Service	D	C	A	A	A	A	A
Approach Delay (s)	38.7			2.4			3.3
Approach LOS	D			A			A

Intersection Summary			
HCM 2000 Control Delay	7.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	267	1	78	2	1	2	162	679	2	2	484	405
Future Volume (veh/h)	267	1	78	2	1	2	162	679	2	2	484	405
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	290	1	85	2	1	2	176	738	2	2	526	440
Adj No. of Lanes	2	1	0	0	1	0	1	2	0	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	422	4	312	66	29	30	483	2557	7	505	2140	1128
Arrive On Green	0.12	0.20	0.20	0.05	0.05	0.05	0.06	0.71	0.71	0.60	0.60	0.60
Sat Flow, veh/h	3442	18	1568	339	624	642	1774	3621	10	716	3539	1583
Grp Volume(v), veh/h	290	0	86	5	0	0	176	361	379	2	526	440
Grp Sat Flow(s),veh/h/ln	1721	0	1586	1605	0	0	1774	1770	1861	716	1770	1583
Q Serve(g_s), s	8.1	0.0	4.6	0.0	0.0	0.0	3.5	7.5	7.5	0.1	6.9	11.1
Cycle Q Clear(g_c), s	8.1	0.0	4.6	0.3	0.0	0.0	3.5	7.5	7.5	0.1	6.9	11.1
Prop In Lane	1.00		0.99	0.40		0.40	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	422	0	315	124	0	0	483	1250	1314	505	2140	1128
V/C Ratio(X)	0.69	0.00	0.27	0.04	0.00	0.00	0.36	0.29	0.29	0.00	0.25	0.39
Avail Cap(c_a), veh/h	757	0	484	138	0	0	569	1250	1314	505	2140	1128
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.99	0.00	0.99	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.0	0.0	33.9	45.6	0.0	0.0	6.2	5.4	5.4	7.8	9.2	5.7
Incr Delay (d2), s/veh	2.0	0.0	0.5	0.1	0.0	0.0	0.5	0.6	0.6	0.0	0.3	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	0.0	2.0	0.1	0.0	0.0	1.7	3.8	4.0	0.0	3.4	5.1
LnGrp Delay(d),s/veh	44.0	0.0	34.4	45.8	0.0	0.0	6.7	6.0	6.0	7.8	9.4	6.7
LnGrp LOS	D		C	D			A	A	A	A	A	A
Approach Vol, veh/h		376			5			916			968	
Approach Delay, s/veh		41.8			45.8			6.1			8.2	
Approach LOS		D			D			A			A	

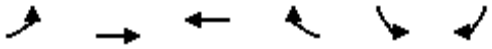
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		75.6		24.4	10.2	65.5	15.3	9.1
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s		60.0		30.5	10.5	45.0	20.5	5.5
Max Q Clear Time (g_c+I1), s		9.5		6.6	5.5	13.1	10.1	2.3
Green Ext Time (p_c), s		11.9		0.4	0.2	10.9	0.7	0.1

Intersection Summary	
HCM 2010 Ctrl Delay	13.0
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	113	411	75	553	963	242	75	210	283	284	460	190
Future Volume (veh/h)	113	411	75	553	963	242	75	210	283	284	460	190
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	123	447	82	601	1047	263	82	228	308	309	500	207
Adj No. of Lanes	2	2	1	2	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	220	1137	596	695	1625	919	189	693	630	416	927	516
Arrive On Green	0.06	0.32	0.32	0.20	0.46	0.46	0.05	0.20	0.20	0.12	0.26	0.26
Sat Flow, veh/h	3442	3539	1583	3442	3539	1583	3442	3539	1583	3442	3539	1583
Grp Volume(v), veh/h	123	447	82	601	1047	263	82	228	308	309	500	207
Grp Sat Flow(s),veh/h/ln	1721	1770	1583	1721	1770	1583	1721	1770	1583	1721	1770	1583
Q Serve(g_s), s	3.5	9.8	3.4	16.9	22.7	8.4	2.3	5.5	14.5	8.7	12.1	10.1
Cycle Q Clear(g_c), s	3.5	9.8	3.4	16.9	22.7	8.4	2.3	5.5	14.5	8.7	12.1	10.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	220	1137	596	695	1625	919	189	693	630	416	927	516
V/C Ratio(X)	0.56	0.39	0.14	0.86	0.64	0.29	0.43	0.33	0.49	0.74	0.54	0.40
Avail Cap(c_a), veh/h	379	1137	596	723	1625	919	275	743	652	551	1026	561
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.50	0.50	0.50	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.4	26.4	20.5	38.6	20.8	10.6	45.8	34.6	22.5	42.4	31.7	26.1
Incr Delay (d2), s/veh	2.2	1.0	0.5	5.6	1.0	0.4	1.6	0.3	0.6	3.8	0.5	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	4.9	1.6	8.6	11.3	3.8	1.1	2.7	6.5	4.3	6.0	4.5
LnGrp Delay(d),s/veh	47.6	27.4	21.0	44.2	21.8	11.0	47.3	34.8	23.1	46.2	32.2	26.6
LnGrp LOS	D	C	C	D	C	B	D	C	C	D	C	C
Approach Vol, veh/h		652			1911			618			1016	
Approach Delay, s/veh		30.4			27.3			30.7			35.3	
Approach LOS		C			C			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.1	23.6	24.2	36.1	9.5	30.2	10.4	49.9
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	15.0	20.0	20.0	25.0	7.0	28.0	10.0	35.0
Max Q Clear Time (g_c+I1), s	10.7	16.5	18.9	11.8	4.3	14.1	5.5	24.7
Green Ext Time (p_c), s	0.4	2.0	0.3	8.4	0.0	5.4	0.1	7.0

Intersection Summary	
HCM 2010 Ctrl Delay	30.2
HCM 2010 LOS	C



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	338	631	1413	523	460	344
Future Volume (veh/h)	338	631	1413	523	460	344
Number	7	4	8	18	1	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	367	686	1536	568	500	374
Adj No. of Lanes	2	2	2	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	447	2416	1814	1188	817	582
Arrive On Green	0.13	0.68	0.51	0.51	0.24	0.24
Sat Flow, veh/h	3442	3632	3632	1583	3442	1583
Grp Volume(v), veh/h	367	686	1536	568	500	374
Grp Sat Flow(s),veh/h/ln	1721	1770	1770	1583	1721	1583
Q Serve(g_s), s	10.4	7.6	37.4	14.0	13.0	19.6
Cycle Q Clear(g_c), s	10.4	7.6	37.4	14.0	13.0	19.6
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	447	2416	1814	1188	817	582
V/C Ratio(X)	0.82	0.28	0.85	0.48	0.61	0.64
Avail Cap(c_a), veh/h	447	2416	1814	1188	895	617
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.88	0.88	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.4	6.3	21.0	4.9	34.0	26.2
Incr Delay (d2), s/veh	10.3	0.3	5.1	1.4	1.1	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.6	3.8	19.4	12.3	6.3	17.2
LnGrp Delay(d),s/veh	52.7	6.5	26.1	6.3	35.1	28.3
LnGrp LOS	D	A	C	A	D	C
Approach Vol, veh/h		1053	2104		874	
Approach Delay, s/veh		22.6	20.7		32.2	
Approach LOS		C	C		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6	7	8
Phs Duration (G+Y+Rc), s				72.3		27.7	17.0	55.3
Change Period (Y+Rc), s				5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s				65.0		25.0	12.0	48.0
Max Q Clear Time (g_c+I1), s				9.6		21.6	12.4	39.4
Green Ext Time (p_c), s				33.7		1.2	0.0	7.7

Intersection Summary	
HCM 2010 Ctrl Delay	23.7
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	50	0	0	26	15	837	8	1	754	10
Future Vol, veh/h	0	0	50	0	0	26	15	837	8	1	754	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	0	150	-	150	150	-	150
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	54	0	0	28	16	910	9	1	820	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	-	-	410	-	-	455	820	0	0	910	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.94	-	-	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.32	-	-	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	0	0	591	0	0	552	805	-	-	744	-	-
Stage 1	0	0	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	0	0	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	-	591	-	-	552	805	-	-	744	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.7	11.9	0.2	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	805	-	-	591	552	744	-	-
HCM Lane V/C Ratio	0.02	-	-	0.092	0.051	0.001	-	-
HCM Control Delay (s)	9.6	-	-	11.7	11.9	9.8	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	0.2	0	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	39	3	73	94	6	9	17	28	773	44	5	580
Future Volume (vph)	39	3	73	94	6	9	17	28	773	44	5	580
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5			4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	0.95	1.00	1.00	0.95
Frt	1.00	1.00	0.85	1.00	0.91			1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1698			1770	3539	1583	1770	3539
Flt Permitted	0.75	1.00	1.00	0.64	1.00			0.37	1.00	1.00	0.31	1.00
Satd. Flow (perm)	1390	1863	1583	1194	1698			692	3539	1583	583	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	42	3	79	102	7	10	18	30	840	48	5	630
RTOR Reduction (vph)	0	0	74	0	9	0	0	0	0	17	0	0
Lane Group Flow (vph)	42	3	5	102	8	0	0	48	840	31	5	630
Turn Type	pm+pt	NA	Perm	pm+pt	NA		custom	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8			5	2		1	6
Permitted Phases	4		4	8			5	2		2	6	
Actuated Green, G (s)	14.5	6.7	6.7	16.9	7.9			68.9	65.2	65.2	63.7	62.6
Effective Green, g (s)	14.5	6.7	6.7	16.9	7.9			68.9	65.2	65.2	63.7	62.6
Actuated g/C Ratio	0.14	0.07	0.07	0.17	0.08			0.69	0.65	0.65	0.64	0.63
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5			4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	231	124	106	253	134			516	2307	1032	384	2215
v/s Ratio Prot	0.01	0.00		c0.04	0.00			c0.00	c0.24		0.00	0.18
v/s Ratio Perm	0.01		0.00	c0.03				0.06		0.02	0.01	
v/c Ratio	0.18	0.02	0.05	0.40	0.06			0.09	0.36	0.03	0.01	0.28
Uniform Delay, d1	37.4	43.6	43.7	36.6	42.6			5.2	7.9	6.2	6.7	8.5
Progression Factor	1.00	1.00	1.00	1.06	1.09			0.85	0.73	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	0.2	1.1	0.2			0.1	0.4	0.0	0.0	0.3
Delay (s)	37.8	43.7	43.9	39.9	46.5			4.5	6.2	6.2	6.7	8.8
Level of Service	D	D	D	D	D			A	A	A	A	A
Approach Delay (s)		41.8			40.8				6.1			8.8
Approach LOS		D			D				A			A

Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	48.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	SBR
Lane Configurations	
Traffic Volume (vph)	6
Future Volume (vph)	6
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.5
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	7
RTOR Reduction (vph)	3
Lane Group Flow (vph)	4
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Actuated Green, G (s)	62.6
Effective Green, g (s)	62.6
Actuated g/C Ratio	0.63
Clearance Time (s)	4.5
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	990
v/s Ratio Prot	
v/s Ratio Perm	0.00
v/c Ratio	0.00
Uniform Delay, d1	7.0
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	7.0
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↱		↱
Traffic Vol, veh/h	0	52	57	7	0	52
Future Vol, veh/h	0	52	57	7	0	52
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	150	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	57	62	8	0	57

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	62
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	-	0	1003
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	1003
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	1003
HCM Lane V/C Ratio	-	-	-	0.056
HCM Control Delay (s)	-	-	-	8.8
HCM Lane LOS	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	0.2

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	22	30	17	9	30	47
Future Vol, veh/h	22	30	17	9	30	47
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	150	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	33	18	10	33	51

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	18	0	-	0	98	18
Stage 1	-	-	-	-	18	-
Stage 2	-	-	-	-	80	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1599	-	-	-	901	1061
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	943	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1599	-	-	-	887	1061
Mov Cap-2 Maneuver	-	-	-	-	887	-
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	929	-

Approach	EB	WB	SB
HCM Control Delay, s	3.1	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1599	-	-	-	887	1061
HCM Lane V/C Ratio	0.015	-	-	-	0.037	0.048
HCM Control Delay (s)	7.3	-	-	-	9.2	8.6
HCM Lane LOS	A	-	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0.2

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	50	545	19	13	934
Future Vol, veh/h	0	50	545	19	13	934
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	54	592	21	14	1015

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	296	0	0	592	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	4.14	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	0	700	-	-	980	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	700	-	-	980	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.6	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	700	980	-
HCM Lane V/C Ratio	-	-	0.078	0.014	-
HCM Control Delay (s)	-	-	10.6	8.7	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	175	500	338	93	250	32	161	462	135	48	321	125
Future Volume (veh/h)	175	500	338	93	250	32	161	462	135	48	321	125
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	190	543	367	101	272	35	175	502	147	52	349	136
Adj No. of Lanes	1	2	1	1	2	1	1	2	1	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	410	971	545	261	927	475	497	1521	772	450	1409	741
Arrive On Green	0.07	0.27	0.27	0.06	0.26	0.26	0.14	0.86	0.86	0.04	0.40	0.40
Sat Flow, veh/h	1774	3539	1583	1774	3539	1583	1774	3539	1583	1774	3539	1583
Grp Volume(v), veh/h	190	543	367	101	272	35	175	502	147	52	349	136
Grp Sat Flow(s),veh/h/ln	1774	1770	1583	1774	1770	1583	1774	1770	1583	1774	1770	1583
Q Serve(g_s), s	7.0	13.1	19.8	4.1	6.1	1.6	6.0	2.8	1.4	1.7	6.6	5.0
Cycle Q Clear(g_c), s	7.0	13.1	19.8	4.1	6.1	1.6	6.0	2.8	1.4	1.7	6.6	5.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	410	971	545	261	927	475	497	1521	772	450	1409	741
V/C Ratio(X)	0.46	0.56	0.67	0.39	0.29	0.07	0.35	0.33	0.19	0.12	0.25	0.18
Avail Cap(c_a), veh/h	410	1274	681	283	1274	630	497	1521	772	506	1409	741
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.98	0.98	0.98	0.96	0.96	0.96	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.9	31.1	28.0	25.4	29.5	25.0	14.7	4.2	3.3	16.4	20.1	15.5
Incr Delay (d2), s/veh	0.8	0.5	1.9	0.9	0.2	0.1	0.4	0.6	0.5	0.1	0.4	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	6.5	8.9	2.1	3.0	0.7	2.9	1.4	0.7	0.8	3.3	2.3
LnGrp Delay(d),s/veh	26.7	31.6	29.8	26.3	29.7	25.1	15.1	4.8	3.9	16.5	20.5	16.0
LnGrp LOS	C	C	C	C	C	C	B	A	A	B	C	B
Approach Vol, veh/h		1100			408			824			537	
Approach Delay, s/veh		30.2			28.4			6.8			19.0	
Approach LOS		C			C			A			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.8	48.0	10.8	32.4	12.0	44.8	12.0	31.2
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	7.0	30.0	7.0	36.0	7.0	30.0	7.0	36.0
Max Q Clear Time (g_c+I1), s	3.7	4.8	6.1	21.8	8.0	8.6	9.0	8.1
Green Ext Time (p_c), s	0.0	6.8	0.0	5.7	0.0	6.5	0.0	7.3

Intersection Summary	
HCM 2010 Ctrl Delay	21.1
HCM 2010 LOS	C



Movement	WBL	WBR	NBU	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	83	59	5	709	109	97	675
Future Volume (vph)	83	59	5	709	109	97	675
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	1770	3539	1583	1770	3539
Flt Permitted	0.95	1.00	0.37	1.00	1.00	0.32	1.00
Satd. Flow (perm)	1770	1583	694	3539	1583	588	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	90	64	5	771	118	105	734
RTOR Reduction (vph)	0	51	0	0	37	0	0
Lane Group Flow (vph)	90	13	5	771	81	105	734
Turn Type	Prot	pt+ov	Perm	NA	Perm	pm+pt	NA
Protected Phases	8	8 1		2		1	6
Permitted Phases			2		2	6	
Actuated Green, G (s)	9.2	21.0	69.0	69.0	69.0	80.8	80.8
Effective Green, g (s)	9.2	21.0	69.0	69.0	69.0	80.8	80.8
Actuated g/C Ratio	0.09	0.21	0.69	0.69	0.69	0.81	0.81
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	162	332	478	2441	1092	555	2859
v/s Ratio Prot	c0.05	0.01		c0.22		0.01	c0.21
v/s Ratio Perm			0.01		0.05	0.14	
v/c Ratio	0.56	0.04	0.01	0.32	0.07	0.19	0.26
Uniform Delay, d1	43.4	31.5	4.8	6.1	5.1	2.4	2.3
Progression Factor	1.00	1.00	0.83	0.57	0.52	0.73	0.74
Incremental Delay, d2	4.1	0.1	0.0	0.3	0.1	0.2	0.2
Delay (s)	47.5	31.5	4.0	3.8	2.7	1.9	1.9
Level of Service	D	C	A	A	A	A	A
Approach Delay (s)	40.9			3.7			1.9
Approach LOS	D			A			A

Intersection Summary			
HCM 2000 Control Delay	5.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	360	1	163	2	1	2	82	668	2	2	708	293
Future Volume (veh/h)	360	1	163	2	1	2	82	668	2	2	708	293
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1900	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	391	1	177	2	1	2	89	726	2	2	770	318
Adj No. of Lanes	2	1	0	0	1	0	1	2	0	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	463	2	361	67	31	31	396	2447	7	496	2070	1139
Arrive On Green	0.13	0.23	0.23	0.05	0.05	0.05	0.05	0.68	0.68	0.58	0.58	0.58
Sat Flow, veh/h	3442	9	1576	327	617	629	1774	3621	10	724	3539	1583
Grp Volume(v), veh/h	391	0	178	5	0	0	89	355	373	2	770	318
Grp Sat Flow(s),veh/h/ln	1721	0	1585	1572	0	0	1774	1770	1861	724	1770	1583
Q Serve(g_s), s	11.1	0.0	9.8	0.0	0.0	0.0	1.8	8.1	8.1	0.1	11.5	7.0
Cycle Q Clear(g_c), s	11.1	0.0	9.8	0.3	0.0	0.0	1.8	8.1	8.1	0.1	11.5	7.0
Prop In Lane	1.00		0.99	0.40		0.40	1.00		0.01	1.00		1.00
Lane Grp Cap(c), veh/h	463	0	363	129	0	0	396	1196	1258	496	2070	1139
V/C Ratio(X)	0.84	0.00	0.49	0.04	0.00	0.00	0.22	0.30	0.30	0.00	0.37	0.28
Avail Cap(c_a), veh/h	533	0	404	136	0	0	501	1196	1258	496	2070	1139
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.81	0.00	0.81	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.3	0.0	33.5	45.3	0.0	0.0	7.5	6.6	6.6	8.6	11.0	4.9
Incr Delay (d2), s/veh	8.8	0.0	0.8	0.1	0.0	0.0	0.3	0.6	0.6	0.0	0.5	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.8	0.0	4.3	0.1	0.0	0.0	0.9	4.2	4.4	0.0	5.7	3.2
LnGrp Delay(d),s/veh	51.0	0.0	34.3	45.4	0.0	0.0	7.8	7.2	7.2	8.6	11.5	5.5
LnGrp LOS	D		C	D			A	A	A	A	B	A
Approach Vol, veh/h		569			5			817			1090	
Approach Delay, s/veh		45.8			45.4			7.3			9.8	
Approach LOS		D			D			A			A	

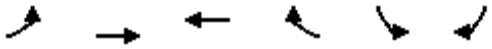
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6	7	8
Phs Duration (G+Y+Rc), s		72.6		27.4	9.1	63.5	18.0	9.5
Change Period (Y+Rc), s		5.0		4.5	4.5	5.0	4.5	4.5
Max Green Setting (Gmax), s		65.0		25.5	10.5	50.0	15.5	5.5
Max Q Clear Time (g_c+I1), s		10.1		11.8	3.8	13.5	13.1	2.3
Green Ext Time (p_c), s		14.3		0.8	0.1	13.0	0.4	0.3

Intersection Summary	
HCM 2010 Ctrl Delay	17.3
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	195	1039	75	267	698	300	95	359	589	382	218	124
Future Volume (veh/h)	195	1039	75	267	698	300	95	359	589	382	218	124
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	212	1129	82	290	759	326	103	390	640	415	237	135
Adj No. of Lanes	2	2	1	2	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	312	1285	665	406	1381	854	197	743	551	513	1068	622
Arrive On Green	0.09	0.36	0.36	0.12	0.39	0.39	0.06	0.21	0.22	0.15	0.30	0.30
Sat Flow, veh/h	3442	3539	1583	3442	3539	1583	3442	3539	1583	3442	3539	1583
Grp Volume(v), veh/h	212	1129	82	290	759	326	103	390	640	415	237	135
Grp Sat Flow(s),veh/h/ln	1721	1770	1583	1721	1770	1583	1721	1770	1583	1721	1770	1583
Q Serve(g_s), s	6.0	29.8	3.2	8.1	16.6	11.9	2.9	9.8	22.0	11.7	5.0	5.7
Cycle Q Clear(g_c), s	6.0	29.8	3.2	8.1	16.6	11.9	2.9	9.8	22.0	11.7	5.0	5.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	312	1285	665	406	1381	854	197	743	551	513	1068	622
V/C Ratio(X)	0.68	0.88	0.12	0.71	0.55	0.38	0.52	0.52	1.16	0.81	0.22	0.22
Avail Cap(c_a), veh/h	379	1285	665	723	1381	854	275	743	551	551	1068	622
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.80	0.80	0.80	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.0	29.8	17.7	42.5	23.7	13.4	45.8	35.1	32.6	41.2	26.1	20.2
Incr Delay (d2), s/veh	3.7	8.7	0.4	1.9	1.3	1.0	2.2	0.7	91.5	8.3	0.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.0	16.1	1.5	4.0	8.4	5.4	1.4	4.8	29.2	6.1	2.5	2.5
LnGrp Delay(d),s/veh	47.7	38.5	18.1	44.4	24.9	14.4	48.0	35.7	124.1	49.5	26.2	20.3
LnGrp LOS	D	D	B	D	C	B	D	D	F	D	C	C
Approach Vol, veh/h		1423			1375			1133			787	
Approach Delay, s/veh		38.7			26.5			86.8			37.5	
Approach LOS		D			C			F			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	18.9	25.0	15.8	40.3	9.7	34.2	13.1	43.0
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	15.0	20.0	20.0	25.0	7.0	28.0	10.0	35.0
Max Q Clear Time (g_c+I1), s	13.7	24.0	10.1	31.8	4.9	7.7	8.0	18.6
Green Ext Time (p_c), s	0.2	0.0	0.7	0.0	0.0	7.1	0.1	11.8

Intersection Summary	
HCM 2010 Ctrl Delay	46.5
HCM 2010 LOS	D



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	439	1571	848	504	586	423
Future Volume (veh/h)	439	1571	848	504	586	423
Number	7	4	8	18	1	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	477	1708	922	548	637	460
Adj No. of Lanes	2	2	2	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	551	2336	1628	1140	895	665
Arrive On Green	0.16	0.66	0.46	0.46	0.26	0.26
Sat Flow, veh/h	3442	3632	3632	1583	3442	1583
Grp Volume(v), veh/h	477	1708	922	548	637	460
Grp Sat Flow(s),veh/h/ln	1721	1770	1770	1583	1721	1583
Q Serve(g_s), s	13.5	31.7	19.0	14.8	16.8	23.8
Cycle Q Clear(g_c), s	13.5	31.7	19.0	14.8	16.8	23.8
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	551	2336	1628	1140	895	665
V/C Ratio(X)	0.87	0.73	0.57	0.48	0.71	0.69
Avail Cap(c_a), veh/h	551	2336	1628	1140	895	665
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.23	0.23	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.0	11.2	19.7	6.0	33.6	23.7
Incr Delay (d2), s/veh	3.7	0.5	1.4	1.5	2.7	3.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.7	15.3	9.5	12.9	8.3	20.6
LnGrp Delay(d),s/veh	44.6	11.7	21.1	7.4	36.3	26.8
LnGrp LOS	D	B	C	A	D	C
Approach Vol, veh/h		2185	1470		1097	
Approach Delay, s/veh		18.9	16.0		32.3	
Approach LOS		B	B		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6	7	8
Phs Duration (G+Y+Rc), s				70.0		30.0	20.0	50.0
Change Period (Y+Rc), s				5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s				65.0		25.0	15.0	45.0
Max Q Clear Time (g_c+I1), s				33.7		25.8	15.5	21.0
Green Ext Time (p_c), s				25.9		0.0	0.0	20.7

Intersection Summary	
HCM 2010 Ctrl Delay	21.1
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	35	0	0	17	45	872	26	4	974	30
Future Vol, veh/h	0	0	35	0	0	17	45	872	26	4	974	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	0	150	-	150	150	-	150
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	38	0	0	18	49	948	28	4	1059	33

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	-	-	529	-	-	474	1059	0	0	948	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.94	-	-	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.32	-	-	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	0	0	494	0	0	537	653	-	-	720	-	-
Stage 1	0	0	-	0	0	-	-	-	-	-	-	-
Stage 2	0	0	-	0	0	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	-	494	-	-	537	653	-	-	720	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.9	11.9	0.5	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	653	-	-	494	537	720	-	-
HCM Lane V/C Ratio	0.075	-	-	0.077	0.034	0.006	-	-
HCM Control Delay (s)	11	-	-	12.9	11.9	10	-	-
HCM Lane LOS	B	-	-	B	B	B	-	-
HCM 95th %tile Q(veh)	0.2	-	-	0.2	0.1	0	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBL	SBT
Lane Configurations												
Traffic Volume (vph)	24	8	47	69	1	7	11	67	712	98	5	881
Future Volume (vph)	24	8	47	69	1	7	11	67	712	98	5	881
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5			4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	0.95	1.00	1.00	0.95
Frt	1.00	1.00	0.85	1.00	0.87			1.00	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1614			1770	3539	1583	1770	3539
Flt Permitted	0.75	1.00	1.00	0.60	1.00			0.23	1.00	1.00	0.35	1.00
Satd. Flow (perm)	1400	1863	1583	1123	1614			427	3539	1583	653	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	9	51	75	1	8	12	73	774	107	5	958
RTOR Reduction (vph)	0	0	47	0	7	0	0	0	0	37	0	0
Lane Group Flow (vph)	26	9	4	75	2	0	0	85	774	70	5	958
Turn Type	pm+pt	NA	Perm	pm+pt	NA		custom	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4		3	8			5	2		1	6
Permitted Phases	4		4	8			5	2		2	6	
Actuated Green, G (s)	13.8	7.7	7.7	17.6	9.6			70.7	65.1	65.1	61.9	60.7
Effective Green, g (s)	13.8	7.7	7.7	17.6	9.6			70.7	65.1	65.1	61.9	60.7
Actuated g/C Ratio	0.14	0.08	0.08	0.18	0.10			0.71	0.65	0.65	0.62	0.61
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5			4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	215	143	121	249	154			377	2303	1030	417	2148
v/s Ratio Prot	0.01	0.00		c0.02	0.00			c0.01	0.22		0.00	c0.27
v/s Ratio Perm	0.01		0.00	c0.03				0.15		0.04	0.01	
v/c Ratio	0.12	0.06	0.03	0.30	0.01			0.23	0.34	0.07	0.01	0.45
Uniform Delay, d1	37.7	42.8	42.7	35.5	40.9			5.9	7.8	6.4	7.3	10.6
Progression Factor	1.00	1.00	1.00	1.07	1.16			0.83	0.70	0.49	1.00	1.00
Incremental Delay, d2	0.3	0.2	0.1	0.7	0.0			0.2	0.3	0.1	0.0	0.7
Delay (s)	38.0	43.0	42.8	38.6	47.4			5.1	5.8	3.2	7.3	11.3
Level of Service	D	D	D	D	D			A	A	A	A	B
Approach Delay (s)		41.4			39.5				5.4			11.2
Approach LOS		D			D				A			B

Intersection Summary			
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	52.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	SBR
Lane Configurations	
Traffic Volume (vph)	20
Future Volume (vph)	20
Ideal Flow (vphpl)	1900
Total Lost time (s)	4.5
Lane Util. Factor	1.00
Frt	0.85
Flt Protected	1.00
Satd. Flow (prot)	1583
Flt Permitted	1.00
Satd. Flow (perm)	1583
Peak-hour factor, PHF	0.92
Adj. Flow (vph)	22
RTOR Reduction (vph)	9
Lane Group Flow (vph)	13
Turn Type	Perm
Protected Phases	
Permitted Phases	6
Actuated Green, G (s)	60.7
Effective Green, g (s)	60.7
Actuated g/C Ratio	0.61
Clearance Time (s)	4.5
Vehicle Extension (s)	3.0
Lane Grp Cap (vph)	960
v/s Ratio Prot	
v/s Ratio Perm	0.01
v/c Ratio	0.01
Uniform Delay, d1	7.8
Progression Factor	1.00
Incremental Delay, d2	0.0
Delay (s)	7.8
Level of Service	A
Approach Delay (s)	
Approach LOS	

Intersection Summary

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑	↱		↱
Traffic Vol, veh/h	0	111	47	23	0	30
Future Vol, veh/h	0	111	47	23	0	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	0	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	121	51	25	0	33

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	-	51
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.318
Pot Cap-1 Maneuver	0	-	-	-	0	1017
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	-	1017
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	1017
HCM Lane V/C Ratio	-	-	-	0.032
HCM Control Delay (s)	-	-	-	8.7
HCM Lane LOS	-	-	-	A
HCM 95th %tile Q(veh)	-	-	-	0.1

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	81	30	43	27	17	27
Future Vol, veh/h	81	30	43	27	17	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	150	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	88	33	47	29	18	29

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	47	0	-	0	256	47
Stage 1	-	-	-	-	47	-
Stage 2	-	-	-	-	209	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1560	-	-	-	733	1022
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	826	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1560	-	-	-	692	1022
Mov Cap-2 Maneuver	-	-	-	-	692	-
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	779	-

Approach	EB	WB	SB
HCM Control Delay, s	5.4	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1560	-	-	-	692	1022
HCM Lane V/C Ratio	0.056	-	-	-	0.027	0.029
HCM Control Delay (s)	7.4	-	-	-	10.3	8.6
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0.2	-	-	-	0.1	0.1

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	27	796	59	34	724
Future Vol, veh/h	0	27	796	59	34	724
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	29	865	64	37	787

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	433	0	0	865	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	4.14	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	0	571	-	-	774	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	571	-	-	774	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.6	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	571	774	-
HCM Lane V/C Ratio	-	-	0.051	0.048	-
HCM Control Delay (s)	-	-	11.6	9.9	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.2	-

Soils Report

CTL | THOMPSON INCORPORATED

June 8, 2016

OEO, LLC
7353 South Alton Way, Suite A-100
Englewood, Colorado 80112

Attention: Corey Elliot

Subject: Addendum to Geologic and Preliminary Geotechnical Investigation
Erie Assemblage
Northeast of Baseline Road and 119th Street
Erie, Colorado
Project No. DN48,284-115

We performed a Geological and Preliminary Geotechnical Investigation for the Erie Assemblage project and presented results in a report dated May 10, 2016. We encountered very soft soils in the upper material of a few borings, but did not address the issues associated with the soft soils in our initial report. This letter presents our comments.

In three of our borings (TH-15, TH-19 and TH-22), the upper soils were very soft based on field penetration resistance tests. These borings are adjacent to the drainage (wetland) that traverses the site. Typically, soil samples are obtained by driving a sampler with blows of a 140-lb hammer falling 30 inches. In this case, the sampler advanced when the weight of the hammer was applied (without dropping hammer). Our boring logs in Appendix A have been modified to include the blow-count designation “Weight of Hammer” (WOH).

Stabilization of the very soft soils should be anticipated prior to placing fill. The stabilization may be achieved by placing 12 inches or more of recycled concrete or crushed rock with or without a), or placing 2 to 3 feet of fill to bridge over the soft soil before proper compaction of the fill can be achieved. Use of a geogrid material such as Tensar BX1100 covered by a layer of crushed rock can also be considered.

The very soft soils will settle when the weight of fill and other improvements is applied. Settlement will take some time to occur because water must drain out of the soils as they consolidate. This will likely require placement of additional fill to achieve design grades. If you desire, we can perform additional sampling and testing to provide an estimate of the amount of potential settlement and the time required for consolidation.. We recommend monitoring settlement to determine when the soft soils have consolidated to an acceptable level to allow construction of pavements and other improvements.

If you have questions regarding this letter, please call.

Very truly yours,

CTL | THOMPSON, INC.

Alexander C. Franceski, E.I.T.
Staff Engineer

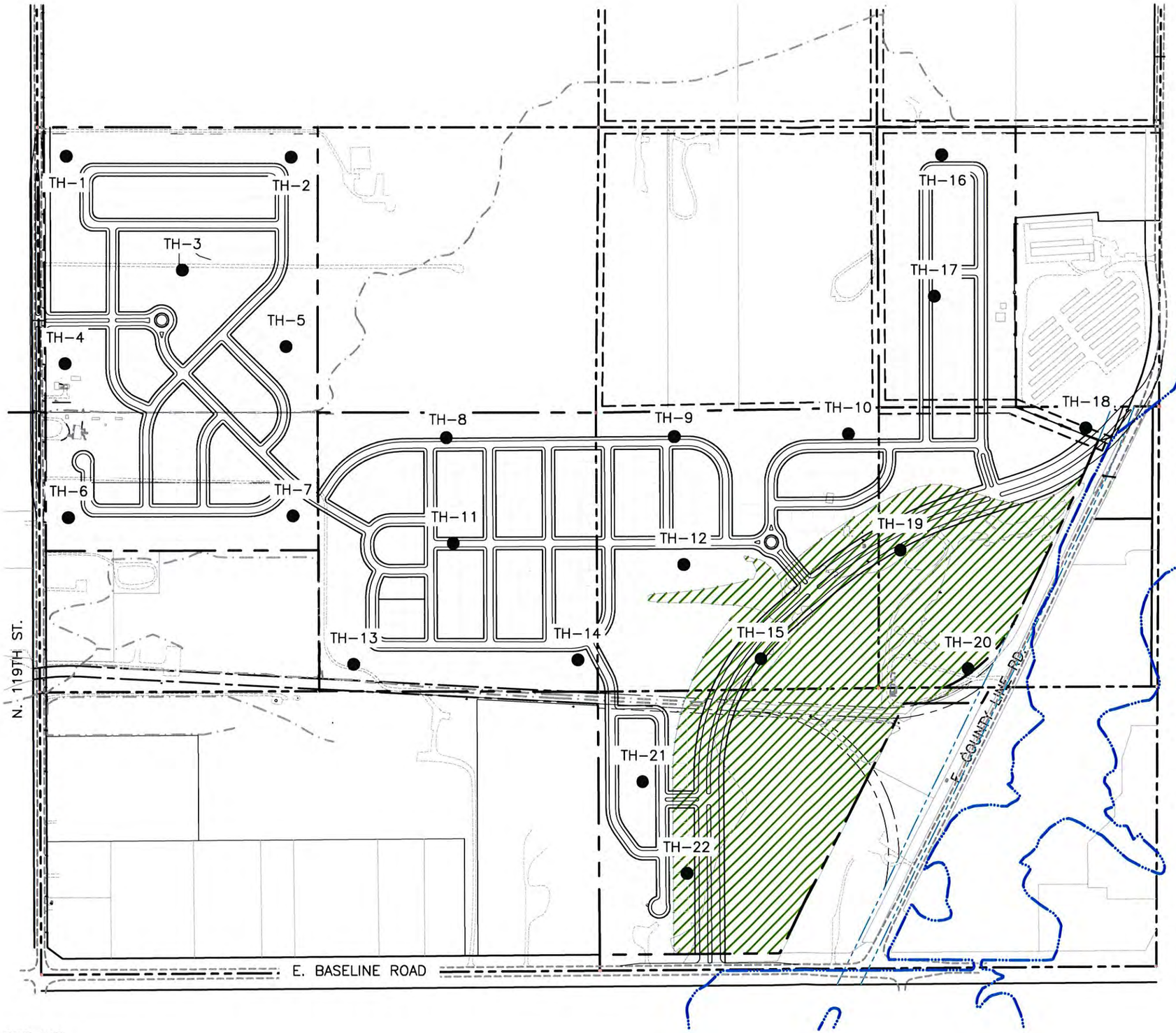
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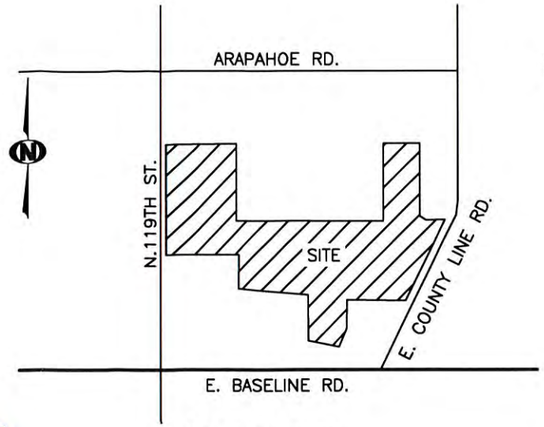


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VICINITY MAP
NOT TO SCALE

LEGEND:

TH−1 APPROXIMATE LOCATION OF EXPLORATORY BORING

ESTIMATED EXTENT OF VERY SOFT SOILS

0 250 500
SCALE: 1" = 500'

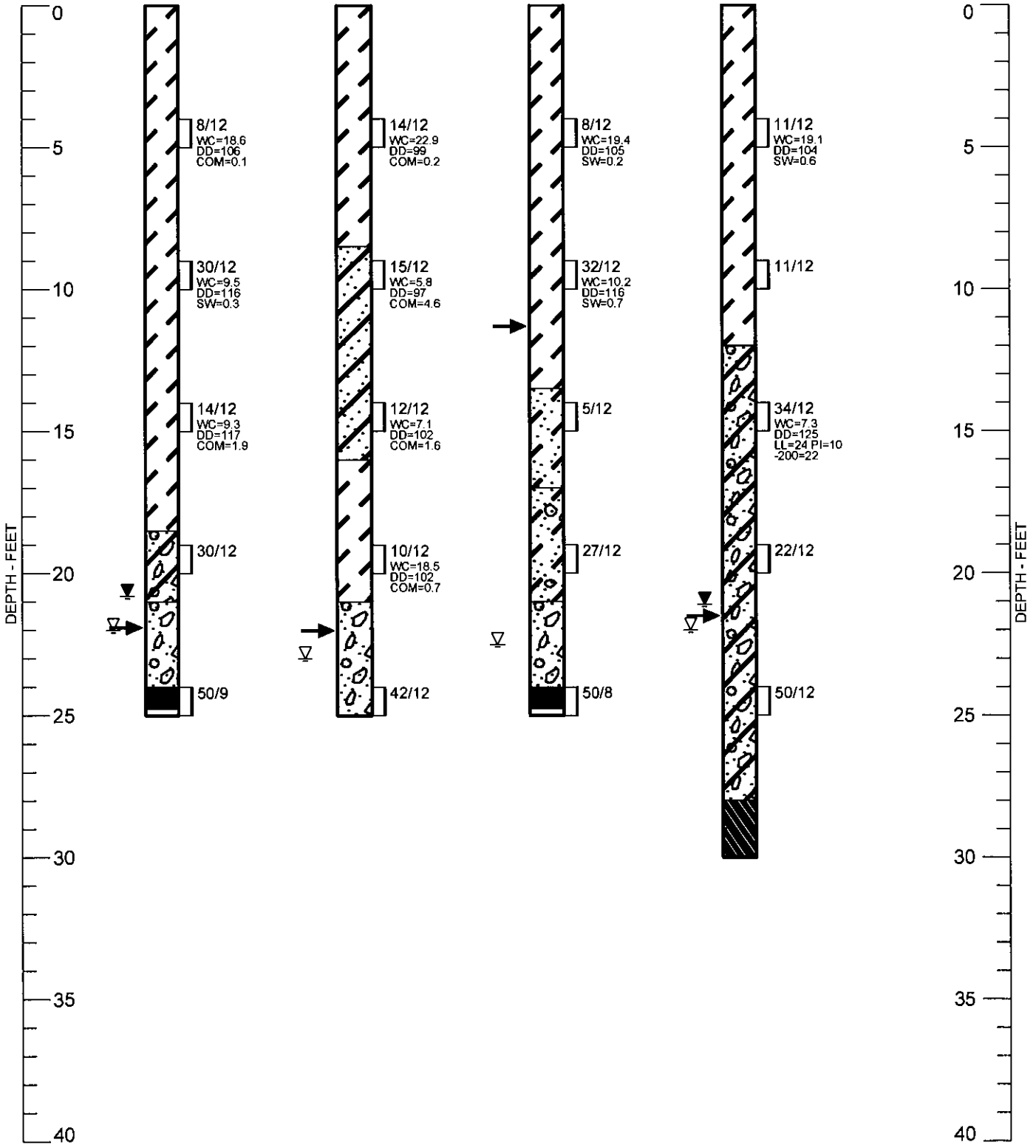
OEO, LLC
ERIE ASSEMBLAGE
Project No. DN48,284-115

Estimated Extent of Very Soft Soils

Fig. 1

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APPENDIX A
SUMMARY LOGS OF EXPLORATORY BORINGS

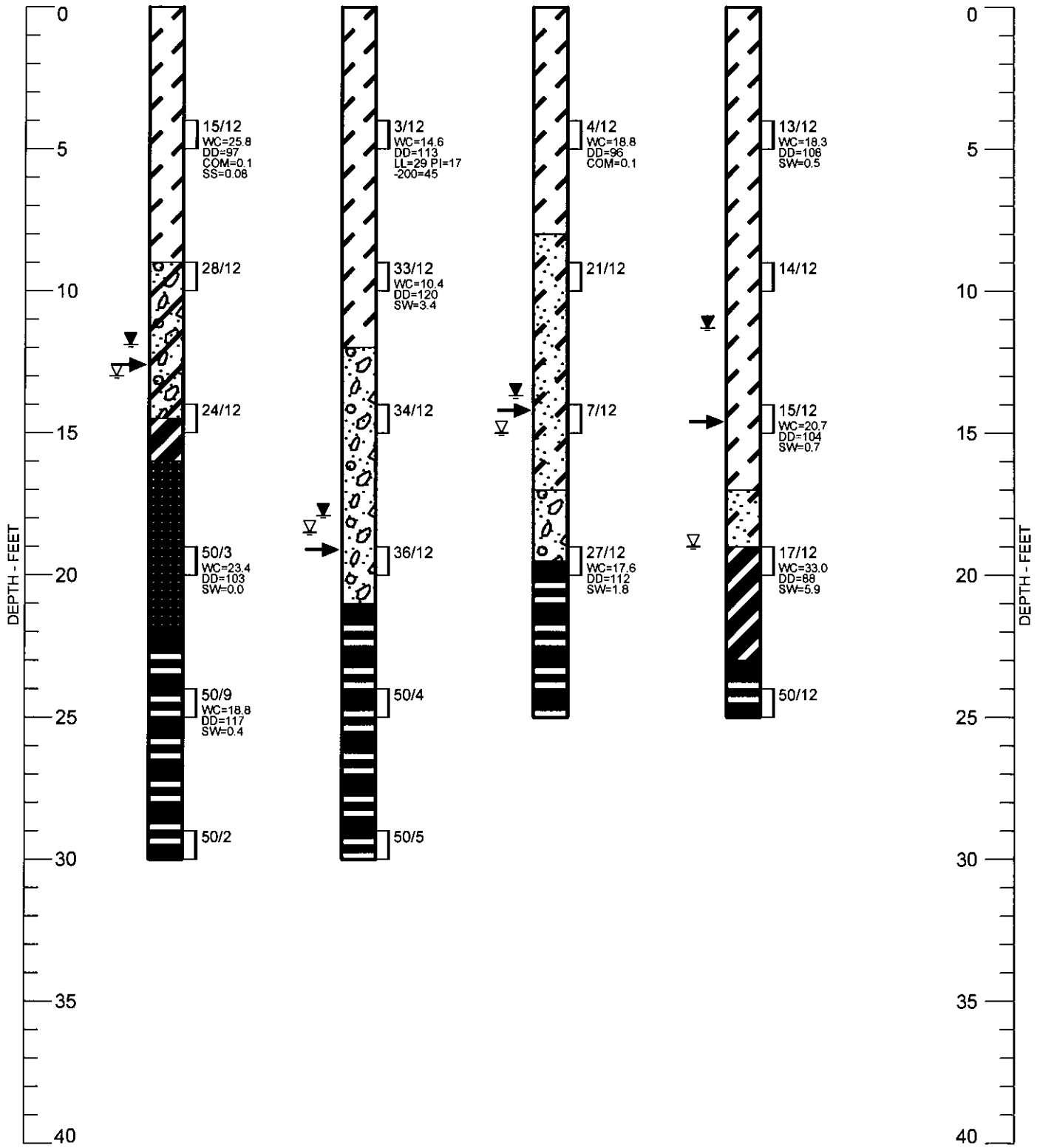


SUMMARY LOGS OF EXPLORATORYBORINGS

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PROJECT NO. DN48,284-115

FIG. A- 1

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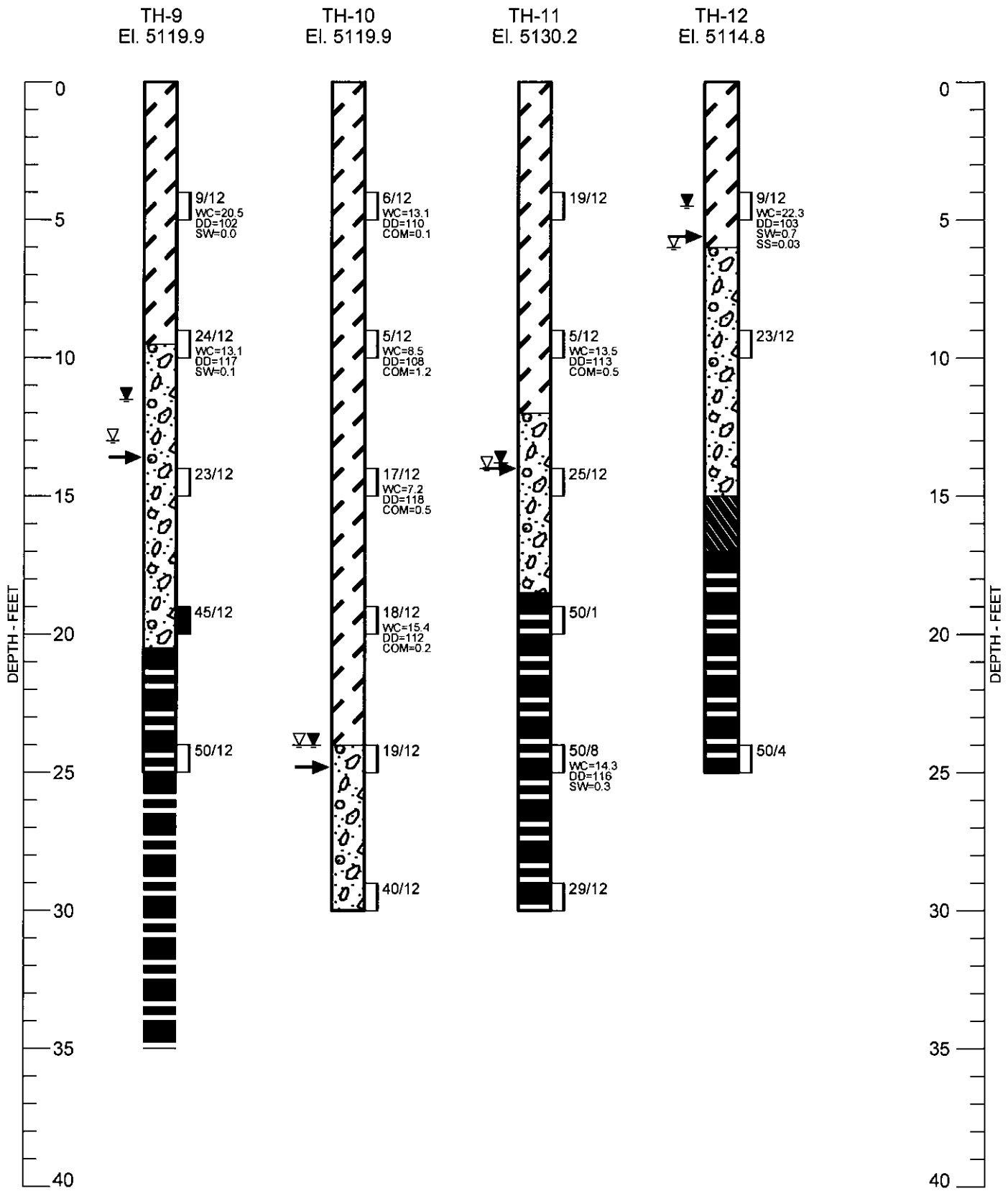


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SUMMARY LOGS OF EXPLORATORY BORINGS

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PROJECT NO. DN48,284-115

FIG. A- 2

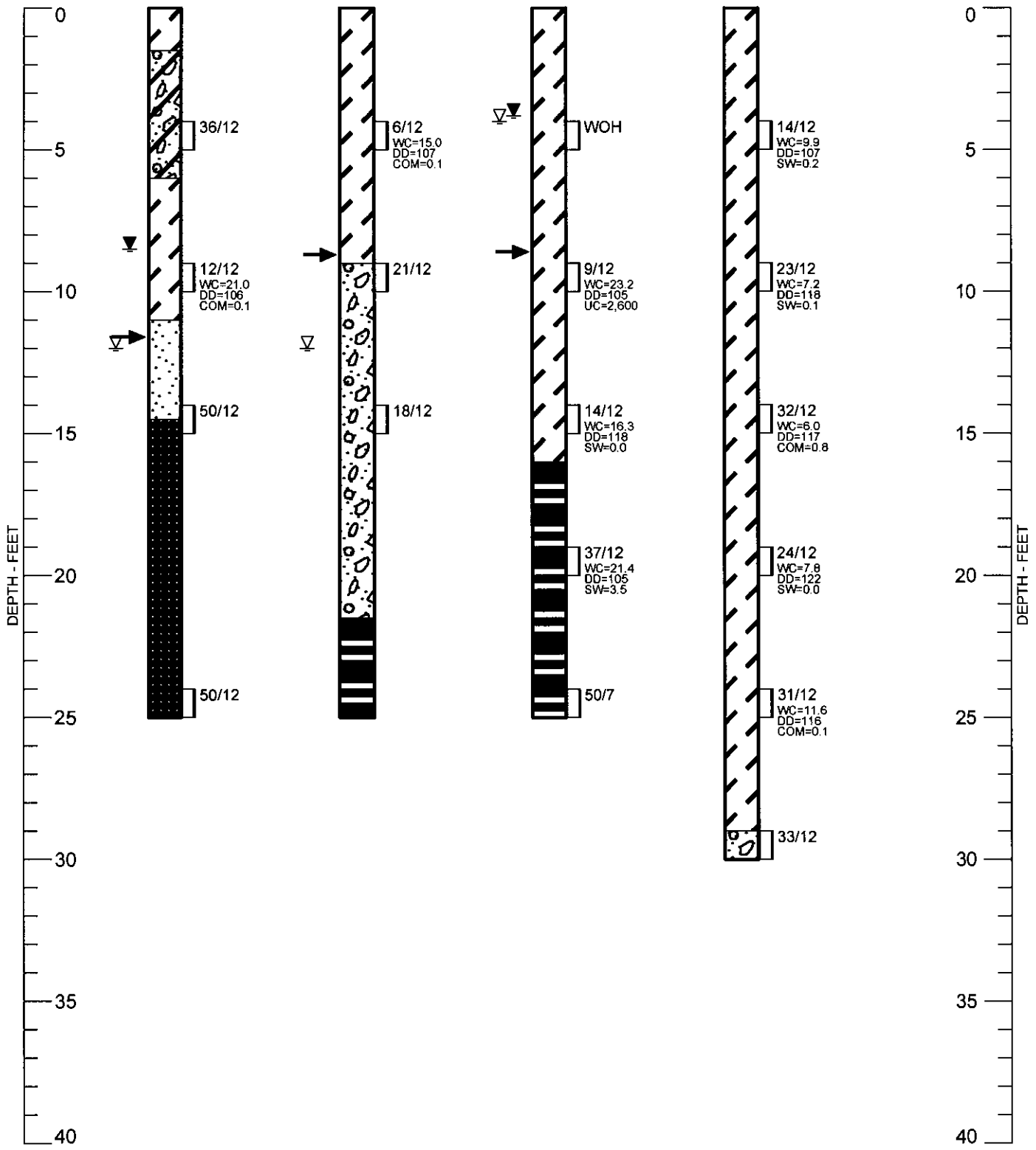


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SUMMARY LOGS OF EXPLORATORYBORINGS

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ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115

FIG. A- 3

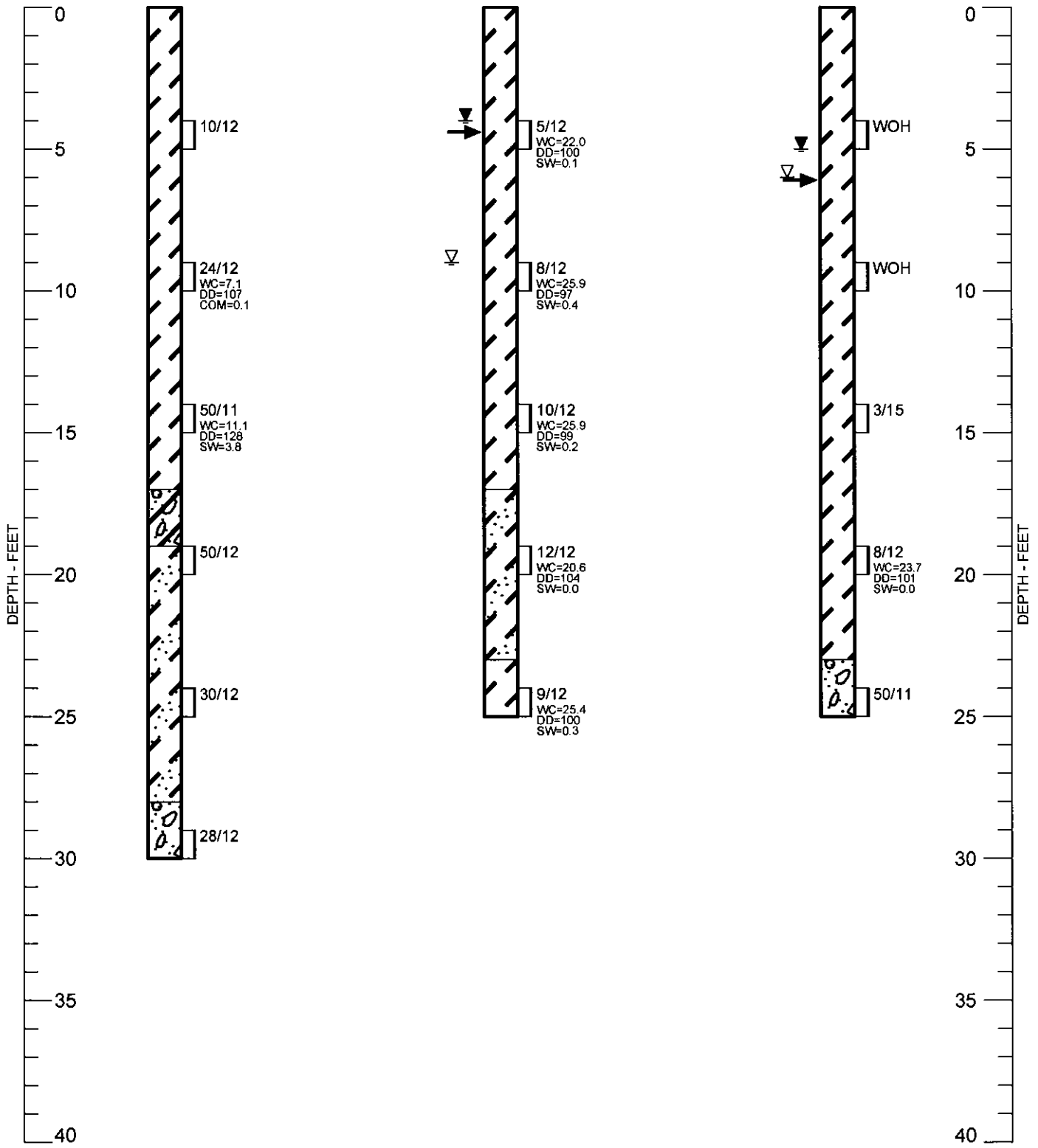


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SUMMARY LOGS OF EXPLORATORY BORINGS

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PROJECT NO. DN48,284-115

FIG. A- 4

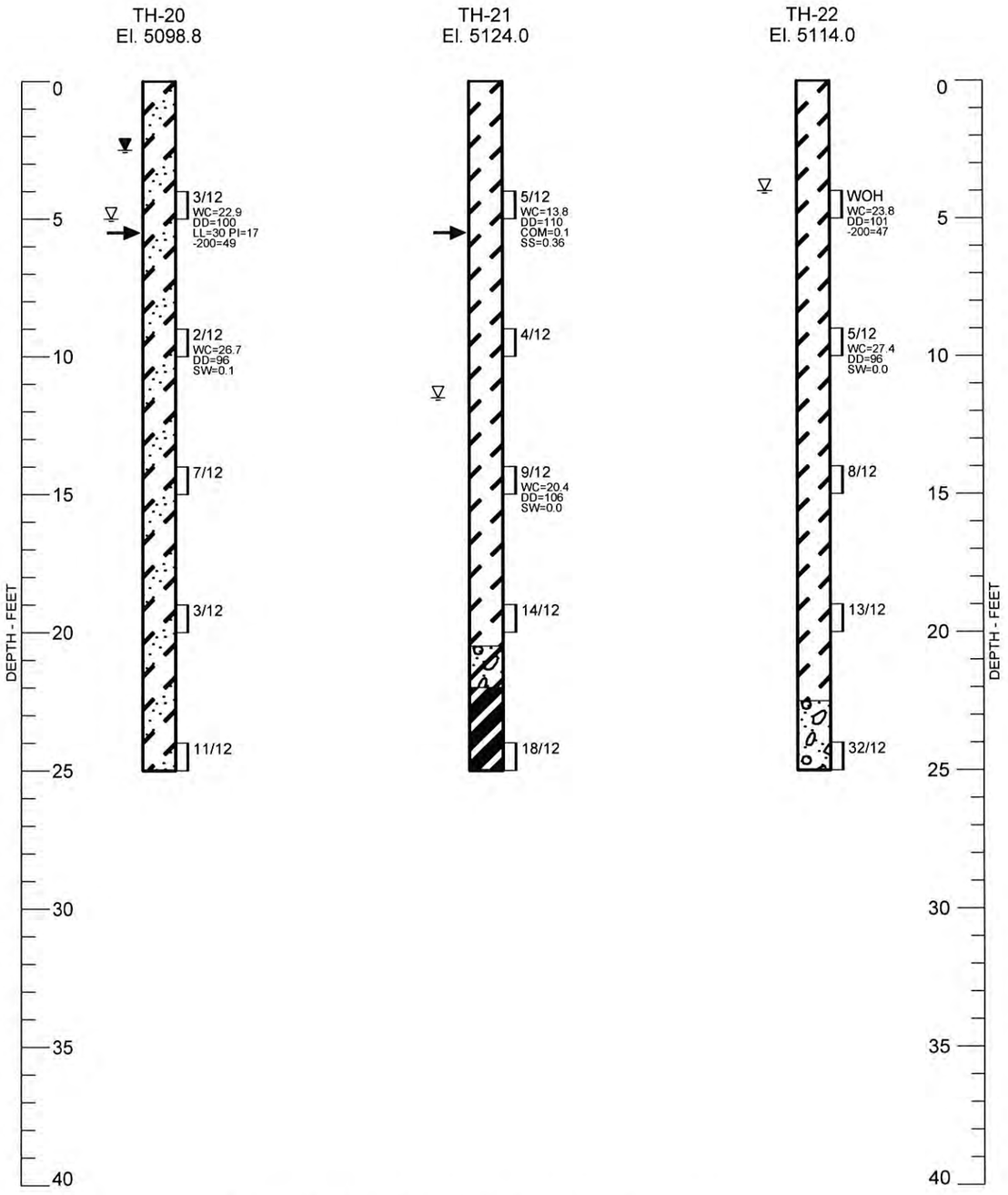


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SUMMARY LOGS OF EXPLORATORYBORINGS

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FIG. A- 5



SUMMARY LOGS OF EXPLORATORYBORINGS

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PROJECT NO. DN48,284-115

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LEGEND:

- CLAY, SANDY, SOFT TO VERY STIFF, DRY TO VERY MOIST, BROWN, TAN, WHITE, GRAY, RUST (CL).
- SAND, CLAYEY, LOOSE TO MEDIUM DENSE, SLIGHTLY MOIST TO WET, BROWN, GRAY, TAN (SC).
- SAND, SILTY, MEDIUM DENSE, SLIGHTLY MOIST TO WET, BROWN, GRAY (SM).
- GRAVEL, CLAYEY, MEDIUM DENSE TO DENSE, MOIST TO WET, BROWN, GRAY, RUST (GC).
- GRAVEL, SILTY, MEDIUM DENSE, DRY TO WET, BROWN, GRAY, RUST, WHITE, RED (GM).
- GRAVEL, SANDY, MEDIUM DENSE TO VERY DENSE, SLIGHTLY MOIST TO WET, BROWN, GRAY, WHITE (GP).
- INTERLAYERED CLAY/SAND, STIFF TO VERY STIFF, VERY LOOSE TO DENSE, DRY TO WET, BROWN, GRAY, RUST, BLACK, WHITE (CL OR SC).
- WEATHERED CLAYSTONE, MOIST, BROWN, RUST, GRAY.
- BEDROCK, CLAYSTONE, HARD, SLIGHTLY MOIST TO MOIST, BROWN, GRAY, RUST, WHITE.
- BEDROCK, SANDSTONE, HARD, MOIST, BROWN, TAN, GRAY.
- BEDROCK, INTERBEDDED CLAYSTONE/SANDSTONE, HARD, MOIST, BROWN, GRAY.
- WOH, SAMPLER ADVANCED BY WEIGHT OF HAMMER.
- DRIVE SAMPLE. THE SYMBOL 8/12 INDICATES 8 BLOWS OF AN AUTOMATIC 140-POUND HAMMER FALLING 30 INCHES WERE REQUIRED TO DRIVE A 2.5-INCH O.D. SAMPLER 12 INCHES.
- WATER LEVEL MEASURED AT TIME OF DRILLING.
- WATER LEVEL MEASURED AFTER DRILLING ON APRIL 15, 2016.
- INDICATES DEPTH OF CAVING AFTER DRILLING.

NOTES:

1. THE BORINGS WERE DRILLED ON APRIL 8 AND 12, 2016 USING 4-INCH DIAMETER, CONTINUOUS-FLIGHT SOLID-STEM AUGER AND A TRUCK-MOUNTED CME-45 DRILL RIG.
2. BORING LOCATIONS AND ELEVATIONS WERE DETERMINED BY A REPRESENTATIVE OF OUR FIRM REFERENCING THE TEMPORARY BENCHMARK SHOWN ON FIG. 1.
3. WC - INDICATES MOISTURE CONTENT (%).
   DD - INDICATES DRY DENSITY (pcf).
   SW - INDICATES SWELL WHEN WETTED UNDER APPLIED PRESSURE (%).
   COM - INDICATES COMPRESSION WHEN WETTED UNDER APPLIED PRESSURE (%).
   LL - INDICATES LIQUID LIMIT.
   PI - INDICATES PLASTICITY INDEX.
   -200 - INDICATES PASSING NO. 200 SIEVE (%).
   SS - INDICATES WATER-SOLUBLE SULFATE CONCENTRATION (%).
   UC - INDICATES UNCONFINED COMPRESSIVE STRENGTH (psf).
   pF - INDICATES SOIL SUCTION VALUE (pF).
4. THESE LOGS ARE SUBJECT TO THE EXPLANATIONS, LIMITATIONS AND CONCLUSIONS CONTAINED IN THIS REPORT.

FIG. A- 6

Geologic Report

CTL | THOMPSON INCORPORATED

GEOLOGIC AND PRELIMINARY GEOTECHNICAL INVESTIGATION ERIE ASSEMBLAGE NORTHEAST OF BASELINE ROAD AND 119TH STREET ERIE, COLORADO

Prepared for:

OEO, LLC
7353 South Alton Way, Suite A-100
Englewood, Colorado 80112

Attention: Corey Elliot

Project No. DN48,284-115

May 10, 2016

1971 West 12th Avenue | Denver, Colorado 80204 | Phone: 303-825-0777 | Fax: 303-825-4252 | www.ctlt.com

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SCOPE

This report presents the results of our Geologic and Preliminary Geotechnical Investigation for the Erie Assemblage site located northeast of Baseline Road and 119th Street in Erie, Colorado (Fig. 1). The purpose of this investigation was to evaluate subsurface conditions to assist in planning and development of the property. The scope was described in a Service Agreement dated July 2, 2015 and Contract Modification dated April 5, 2016 (Proposal DN15-0338).

This report is based on soil and groundwater conditions found in our exploratory borings, results of field and laboratory tests, engineering analysis of field and laboratory data, field reconnaissance, and our experience with similar conditions. The report contains descriptions of the soil and bedrock conditions and groundwater levels found in our exploratory borings, preliminary discussions of foundation and floor support alternatives, and preliminary design and construction criteria for site development, foundations, floor systems, pavements, surface and subsurface drainage. The preliminary discussions of foundation and floor system alternatives are intended for evaluation and planning purposes only. Additional, site-specific investigations will be necessary to design structures and improvements. A brief summary of our conclusions and recommendations follows, with more detailed design criteria presented in the report.

SUMMARY OF CONCLUSIONS

1. The primary geotechnical concern is shallow groundwater. Risks due to geotechnical concerns can be mitigated with proper planning, engineering, design and construction. We believe there are no geotechnical constraints at this site that would preclude development. Shallow groundwater may preclude full depth basements for portions of the site.

2. Subsoils encountered in our borings consisted of 1.5 to 24 feet of sandy clay, and about 2 to 16 feet of sand and gravel underlain by weathered to comparatively unweathered claystone, sandstone and interbedded claystone/sandstone bedrock. The site soils are predominantly non-expansive or low swelling.

3. Foundation and slabs of existing buildings and residences should be removed prior to site grading. Existing fill, stockpiles and debris should also be removed and replaced with densely compacted fill.

4. Groundwater was encountered during drilling in twenty borings at depths of about 4 to 24 feet below the existing ground surface. When checked after drilling on April 15, groundwater was measured in fifteen borings between 2.5 and 24 feet. Groundwater will likely be encountered during utility installation, and may preclude full depth basement construction in a portion of the site. Water levels may fluctuate with seasons and rise in response to precipitation and landscape irrigation. We recommend setting basement excavation at least 3 feet above groundwater, preferably 5 feet.

5. Based on our investigation, site soils generally include low swelling or non-expansive clay, gravel and sand at depths that will affect foundation performance. Spread footing foundations are considered appropriate where low swelling soils are encountered. Post-tensioned slab-on-grade foundations are an alternative.

6. Pavement subgrade soils may consist of sandy clay. The clay soils are considered poor pavement subgrade soils. Local streets will likely have at least 6 inches of full depth asphalt and collectors will have at least 8 inches of asphalt or an equivalent asphalt/base course section. Design-level subgrade investigations should be done prior to paving.

7. Surface drainage should be designed, constructed, and maintained to provide rapid removal of surface water away from structures and off pavements. Water should not be allowed to pond near the crests of slopes, on or adjacent to buildings, flatwork and pavements.

SITE CONDITIONS

The Erie Assemblage site is located northeast of Baseline Road and 119th Street in Erie, Colorado. The site occupies approximately 217 acres. Most of the property is being used for agriculture. A few residential and agricultural structures are present. Coal Creek meanders to the east of County Line Road. A drainage with a large marshy footprint is present on the west side of County Line Road. In general, the site slopes gently to the east.

PROPOSED DEVELOPMENT

We understand the site will be developed for residential uses. The preliminary plans show that it will contain 444 single family residences, 94 patio homes and 82 duplex units. We anticipate the residences will be one to three-story, wood framed structures. Basements may not be feasible for the whole site. Foundation loads will be relatively light and may vary from 1,000 to 3,000 pounds per lineal foot of foundation wall. Paved streets and driveways will be constructed to provide access. Buried sanitary and storm sewer, and water lines will be constructed beneath the streets.

INVESTIGATION

We drilled twenty-two exploratory borings at the approximate locations shown on Figure 1. Prior to drilling, we contacted the Utility Notification Center of Colorado and local sewer and water districts to identify locations of buried utilities. The borings were advanced to depths of 25 feet using 4-inch diameter, continuous-flight auger and a truck-mounted drill rig.

Samples of the soil and bedrock were obtained at 5-foot intervals using a 2.5-inch diameter (O.D.) modified California barrel sampler driven by a 140-pound hammer falling 30 inches. A representative of CTL | Thompson, Inc. was present during drilling to observe drilling operations, log the soil and bedrock encountered, and obtain samples for laboratory tests. The boring elevations were surveyed and staked by KT Engineering. Summary logs of borings with results of field penetration resistance tests and a portion of the laboratory data are presented in Appendix A.

The samples were returned to our laboratory where they were examined and testing was assigned by our engineers. Laboratory tests included dry density, moisture content, percent silt and clay-sized particles (passing the No. 200 sieve), Atterberg limits, swell-consolidation, unconfined compression, and water-soluble sulfate concentration. Swell-consolidation tests where performed by wetting samples under approxi-

mate overburden pressures (the weight of the overlying soil). Results of laboratory tests are presented in Appendix B and are summarized in Table B-I.

SUBSURFACE CONDITIONS

Subsoils encountered in our borings consisted of 1.5 to 24 feet of sandy clay, and about 2 to 16 feet of sand and gravel underlain by weathered to comparatively unweathered claystone, sandstone and interbedded claystone/sandstone bedrock. Some pertinent engineering characteristics are presented below.

Sandy clay was found at the ground surface to about 1.5 to 24 feet. The clay was soft to very stiff based on results of field penetration resistance tests. When wetted under approximate overburden pressures, fifteen samples swelled 0.1 to 3.8 percent, six samples did not swell and 17 samples compressed 0.1 to 1.9 percent. One sample had an unconfined compressive strength of 2,600 psf. The clay is generally low swelling.

Sand and gravel were encountered below the clay consisting of clayey to silty sand, sandy to clayey gravel and interlayered clay/sand. The sand was loose to medium dense and the gravel was medium dense to very dense. Two sample of clayey sand contained 45 and 47 percent silt and clay-sized particles (passing the No. 200 sieve). Two samples of silty sand compressed 1.6 and 4.6 percent when wetted. One sample of interlayered clay/sand contained 49 percent fines, one sample swelled 0.1 percent and one sample did not swell. One sample of silty gravel contained 22 percent fines. One sample of sandy gravel swelled 0.1 percent. The sand and gravel are judged to be low swelling and non-expansive.

Bedrock consisting of claystone, sandstone and interbedded claystone/sandstone was encountered in thirteen of our borings at depths of 14.5 to 24 feet. The bedrock was weathered to hard. Five samples of claystone swelled 0.3 to 3.5 percent and one weathered claystone sample swelled 5.9 percent. One sample of

sandstone did not swell. The sandstone is judged to be non-expansive and the claystone is low to high swelling, but at depth not likely to affect construction. Estimated bedrock surface elevation contours are presented in Fig. 2.

Groundwater

Groundwater was encountered during drilling in twenty borings at depths of about 4 to 24 feet below the existing ground surface. When checked after drilling on April 15, groundwater was measured in fifteen borings between 2.5 and 24 feet (elevations 5154 to 5090). Many of the holes had caved by April 15. Groundwater surface depths and relative elevations are shown on Fig. 3. Groundwater will likely be encountered during utility installation, and will likely preclude full depth basement construction in areas. Water levels may fluctuate with seasons and rise in response to precipitation and landscape irrigation.

SITE GEOLOGY AND GEOLOGIC HAZARDS

This section is intended to discuss concerns related to geologic hazards review that occurs during planning and zoning for land use changes. Specific requirements of Colorado House Bill 1041, “Areas and Activities of State Interest,” and Colorado Senate Bill 35, “County Planning and Building Codes,” are addressed. This portion of the report was based on field reconnaissance, examination of samples, field and laboratory data, and review of pertinent published reports.

The Erie Assemblage site is located near the foot of the Front Range. The Preliminary Geologic Map of the Erie Quadrangle, Boulder, Weld, and Adams Counties, Colorado (Colton, R.B., and Anderson, L.W.: USGS 1977, MF-882) shows the near-surface soils consist of wind-blown Loess from the Pleistocene.

Our study identified conditions on the site that constitute potential geologic hazards. These hazards can be mitigated with proper planning, engineering, design and construction. No hazard geotechnical constraints were identified within the scope of this investigation which, in our opinion, will preclude the proposed construction at the site. The hazards we identified include:

- Shallow Groundwater
- Regional issues of seismicity and radioactivity

These hazards and conceptual mitigation methods are discussed in the following sections.

Shallow Groundwater

Groundwater was measured within about 2.5 to 24 feet of the ground surface, and at less than 9 feet in borings near the southeast limits of the site. Groundwater less than about 10 feet below proposed grades will limit basement construction and affect deep utility construction. Figure 3 show the estimated extent of shallow groundwater that may preclude basements. Groundwater levels may fluctuate several feet with seasons. We recommend additional monitoring of groundwater and elevation of planned site use.

Seismicity

Based on available mapping, we found no active faults within or near the site. Significant faulting and structural discontinuities are not expected in the bedrock. The soil and bedrock units are not expected to respond unusually to seismic activity. We judge the site may classify as Site Class D.

Radioactivity

It is normal in the Front Range of Colorado and nearby eastern plains to measure radon gas in poorly ventilated spaces in contact with soil or bedrock. Radon-222 gas is considered a health hazard and is one of several radioactive products in the chain of the natural decay of uranium into stable lead. Radioactive nuclides are common in igneous and metamorphic rock in this area. Because these sources exist site, there is potential for radon gas accumulation in poorly ventilated spaces. The amount of soil gas that can accumulate is a function of many factors, including the radio-nuclide activity of the soil and bedrock, construction methods and materials, pathways for soil gas, and existence of poorly-ventilated accumulation areas. Typical mitigation methods consist of sealing soil gas entry areas and periodic ventilation of below-grade spaces and perimeter drain systems (if any). The only reliable method to determine the concentration of radon is to perform testing after construction.

Other Considerations

Erosion potential on the site is generally considered low and can be expected to increase during construction. Proper grading practices, surface drainage design, and re-vegetation efforts will be necessary. Development will increase the relative amount of impervious surfaces, which can lead to drainage problems and erosion if surface water flow is not adequately designed. Surface drainage design and evaluation of flood potential should be performed by a Civil Engineer as part of the project design.

ESTIMATED POTENTIAL GROUND HEAVE

We used the results of swell tests to estimate potential future heave of the soils and bedrock. The analysis involves dividing the soil profile into layers and modeling the performance characteristics of each layer from representative swell tests. Based on the test results and our experience, we calculated potential ground heave of less than 0.5

inches to 2.9 inches assuming the clay and bedrock will become wet and heave to a depth of 24 feet. The potential heave exceeded I inch only at TH-6, TH-8, TH-15, and TH-17.

SITE DEVELOPMENT

We believe the primary geotechnical factor that will influence site development and construction is shallow groundwater. This concern can be mitigated with proper planning, engineering, design and construction. We believe there are no geotechnical constraints at this site that would preclude development. The following sections discuss site development recommendations.

Demolition

The foundations and slabs of existing buildings and residences in the construction area should be removed. Underground features such as utilities should also be removed. Excavations resulting from demolition should be backfilled with moisture conditioned, compacted fill. Vegetation, large tree roots and organics should be removed.

Excavation

We believe the soils penetrated by our exploratory borings can be excavated with typical heavy-duty equipment. Soft soils may require stabilization of excavations and may cause instability in excavation slopes. We recommend the owner and contractor become familiar with applicable local, state and federal safety regulations, including the current Occupational Safety and Health Administration (OSHA) Excavation and Trench Safety Standards. Based on our investigation and OSHA standards, we anticipate the soils will classify as Type C soil. Based on OSHA regulations, maximum slope inclinations of 1.5:1 (horizontal to vertical) for Type C soil are required for temporary excavations in dry conditions. Seepage and saturated soils will necessitate flatter inclination.

Excavation slopes specified by OSHA are dependent upon soil types and groundwater conditions encountered. The contractor's "competent person" should identify the soils encountered in the excavations and refer to OSHA standards to determine appropriate slopes. Soil stockpiles and equipment should not be placed within a horizontal distance from the edge of the excavation equal to one-half the excavation depth. A professional engineer should design excavations deeper than 20 feet.

Slopes

We recommend permanent cut and fill slopes be designed with a maximum grade of 4:1 (horizontal:vertical). Surface drainage should not be allowed to sheet flow across slopes or pond near the crest of slopes. All cut and fill slopes should be designed and re-vegetated as soon as possible after grading to reduce potential for erosion problems. Excavation contractors should evaluate ground conditions and control slopes in accordance with OSHA criteria.

Fill

Prior to fill placement, debris, vegetation, organic matter, large tree roots and deleterious material should be substantially removed from areas to receive fill. The excavation surface should be scarified to a depth of at least 8 inches, moisture conditioned, and compacted to the criteria below. The on-site soils free of vegetation are suitable for use as site grading fill. Placement of soils derived from claystone bedrock should be avoided in the streets. Site grading fill should be placed in thin (8 inches or less) loose lifts, moisture conditioned to within 2 percent of optimum moisture content for sand and from 0 to 3 percent above optimum moisture content for clay, and compacted to at least 95 percent of standard Proctor maximum dry density (ASTM D 698). The placement and compaction of site grading fill should be observed and density tested by our representative during construction. Guideline site grading specifications are presented in Appendix C.

The properties of fill will affect the performance of foundations, slabs-on-grade, utilities, and pavements. Imported material should ideally consist of material with similar or better characteristics than the on-site soils. Imported material should be tested and approved by our firm prior to bringing to the site.

Our experience indicates fill and backfill can settle, even if properly compacted to criteria provided above. Factors that influence the amount of settlement are depth of fill, material type, degree of compaction, amount of wetting and time. The degree of compression of fill under its own weight will likely range from low for granular soils (½ percent or less), to moderate for clay/sand mixtures (1 to 2 percent), to high for highly plastic clay and claystone (2 percent or more).

Dewatering

Groundwater will likely be encountered during utility trench excavation. Temporary dewatering can likely be accomplished by sloping excavations to occasional sumps where water can be removed by pumping. The sumps should be several feet below the bottom of the excavation so that water is pumped down through the soils rather than up through the bottom of the excavations, which could potentially compromise the stability of the subsoils. Dewatering should be continuous while earthwork is underway, including hours outside of work times. If excavations will extend well below water, sheeting and/or more extensive dewatering methods will be required.

A dewatering permit may be required by the Colorado Department of Public Health and Environment. Our experience indicates periodic environmental testing may be required with these permits. Permitting requirements may influence the construction schedule. We recommend researching these requirements and permit processing times well before dewatering begins.



Utilities

Water and sewer lines are usually constructed beneath paved roads. Compaction of trench backfill can have a significant effect on the life and serviceability of pavements. Trench backfill should be placed in thin, loose lifts, and moisture conditioned to between 0 and 3 percent above optimum moisture content for clay, and within 2 percent of optimum moisture content for sand, and compacted to at least 95 percent of maximum dry density (ASTM D 698). The placement and compaction of trench fill and backfill should be observed and tested by our firm during construction.

Pavements

Pavement subgrade soils may consist of sandy clay. Clays are generally judged as poor subgrade soils. Local streets will likely have at least 6 inches of full depth asphalt and collectors will have at least 8 inches of asphalt. A design-level subgrade investigation should be done prior to paving.

BUILDING CONSTRUCTION CONSIDERATIONS

The following discussions are preliminary and are not intended for design or construction. After grading is completed, design-level investigations should be performed on a lot-specific basis.

Foundations

Based on our investigation, site soils generally include low swelling or non-expansive clay, gravel and sand at depths that will affect foundation performance. Spread footing foundations are generally considered appropriate where low-swelling soils are encountered. Post-tensioned slab-on-grade foundations are an alternative.



Slab-On-Grade Construction

Slab-on-grade basement floors are typically chosen for low swell conditions. We judge low risk conditions exist at this site. However, the presence of shallow groundwater may preclude full depth basements in portions of the site. We recommend basement excavations be at least 3 feet, and preferably 5 feet above groundwater. The performance of garage floors, driveways, sidewalks and other surface flatwork may be erratic at the site.

Structurally supported floor systems should be anticipated in all non-basement finished living areas unless post-tensioned slab foundations are used. Design and construction issues associated with structural floors include ventilation and lateral loads. Where structurally supported floors are installed over a crawl space, the required air space depends on the materials used to construct the floor and the potential expansion of the underlying soils. Building codes require a minimum clear space of 18 inches between exposed earth and untreated wood floor components.

Concrete

Concrete in contact with soil can be subject to sulfate attack. We measured water-soluble sulfate concentrations in 3 samples from this site. Concentrations were measured between 0.03 and 0.36 percent. For the higher level of sulfate concentration, ACI 332-08 *Code Requirements for Residential Concrete* indicates concrete shall be made with ASTM C150 Type V cement, or an ASTM C595 or C1157 hydraulic cement meeting high sulfate-resistant hydraulic cement (HS) designation and shall have a specified minimum compressive strength of 3000 psi at 28 days. Alternative combination of cements and supplementary cementitious materials, such as Class F fly ash, shall be permitted with acceptable test records for sulfate durability. Further testing is recommended.

Surface Drainage

The performance of improvements will be influenced by surface drainage. The ground surface around the residences should be sloped to provide positive drainage away from the foundation. We recommend a slope of at least 10 percent for the first 10 feet surrounding residences with basements. For non-basement construction, the slope should be at least 5 percent. If the distance between houses is less than 20 feet, the slope in this area should be 5 or 10 percent to the swale between houses. The swale should have a minimum slope of 2 to 2.5 percent. Variation from these criteria are acceptable in some areas. For examples, for single-family lots graded to direct drainage from the rear yard to the front, it is difficult to achieve a 10 percent slope at the high point behind the house. We believe it is acceptable to use a slope of 5 percent at this location. Roof downspouts and other water collection systems should discharge well beyond the limits of backfill.

Proper control of surface runoff is also important to control the erosion of surface soils. Sheet flow should not be directed over unprotected slopes. Water should not be allowed to pond at the crest of slopes. Permanent slopes should be prepared in such a way to reduce erosion.

Attention should be paid to compact the soils behind curb and gutter adjacent to streets and in utility trenches during the development. If surface drainage between preliminary development and construction phases is neglected, performance of the roadways, flatwork and foundations may be poor.

RECOMMENDED FUTURE INVESTIGATIONS AND SERVICES

We recommend the following investigations and services:

1. Additional monitoring of groundwater levels and elevation of planned site use;

2. Construction testing and observation during site development, and building or pavement construction, including compaction testing of grading fill, utility trench backfill, and pavements;

3. Subgrade investigation and pavement design after grading;

4. Design-level Soils and Foundation Investigations after grading; and

5. Foundation installation observations.

LIMITATIONS

Our borings were widely spaced to provide a general picture of subsurface conditions for preliminary planning of development and residence construction. We believe this investigation was conducted in a manner consistent with that level of care and skill ordinarily used by geotechnical engineers practicing in this area at this time. No warranty, express or implied, is made.

If we can be of further service in discussing either the contents of this report or the analysis of the influence of subsurface conditions on the design of the proposed development, please call.

CTL | THOMPSON, INC.

Alexander C. Franceski, E.I.T.
Staff Engineer

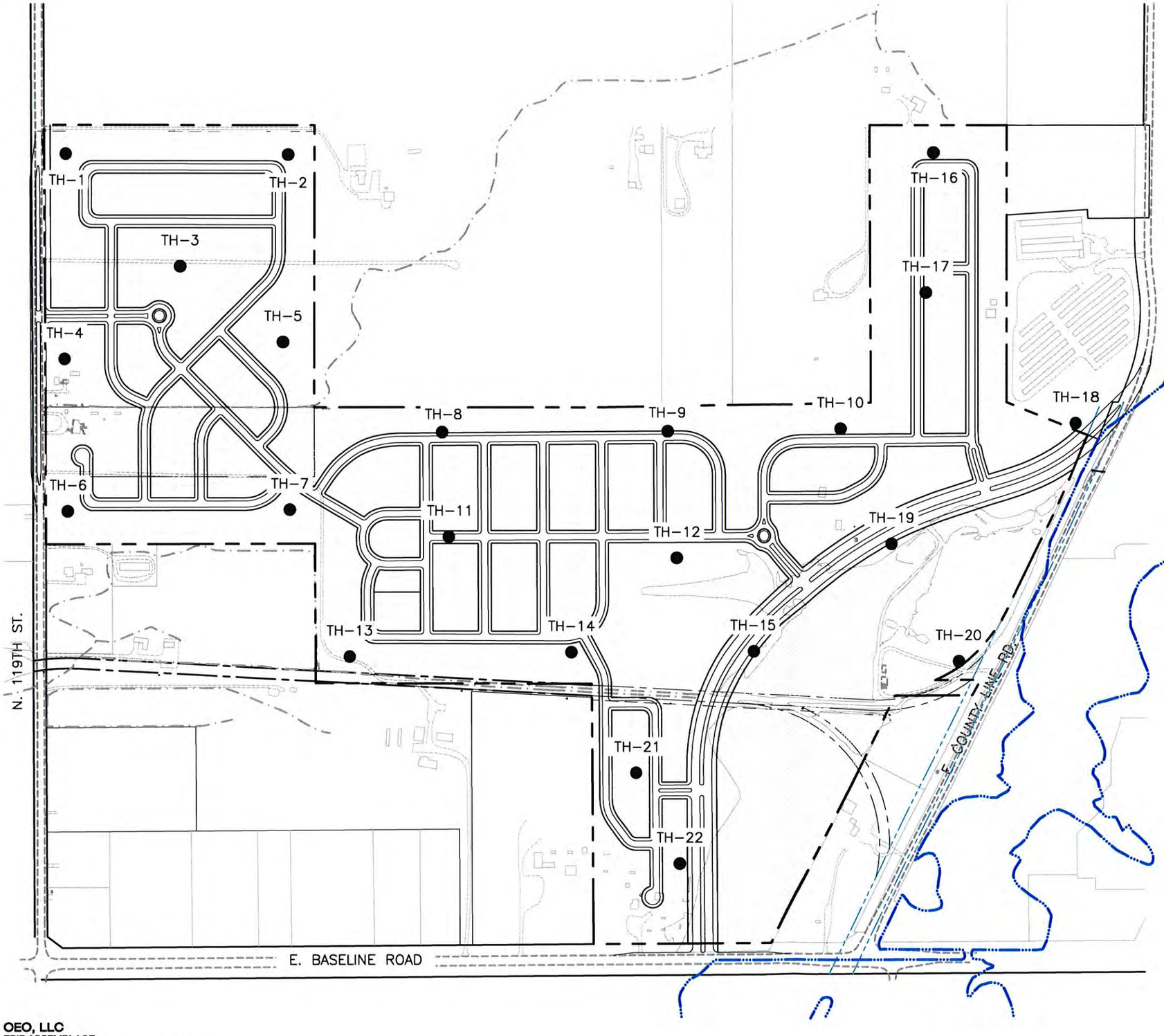
Reviewed by:

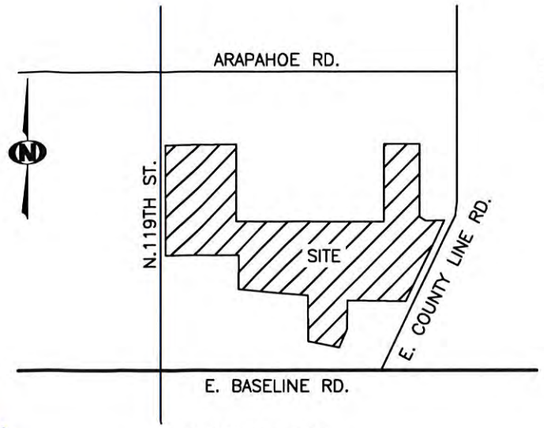
COLORADO LICENSED RONALD M. McOMBER 20243 PROFESSIONAL ENGINEER

Ronald M. McOmber, P.E.
Chairman and CEO

ACF:RMM/nn
(3 copies)

Via e-mail: coreye@e5xmanagement.com





VICINITY MAP
NOT TO SCALE

LEGEND:

TH-1 ● APPROXIMATE LOCATION OF EXPLORATORY BORING

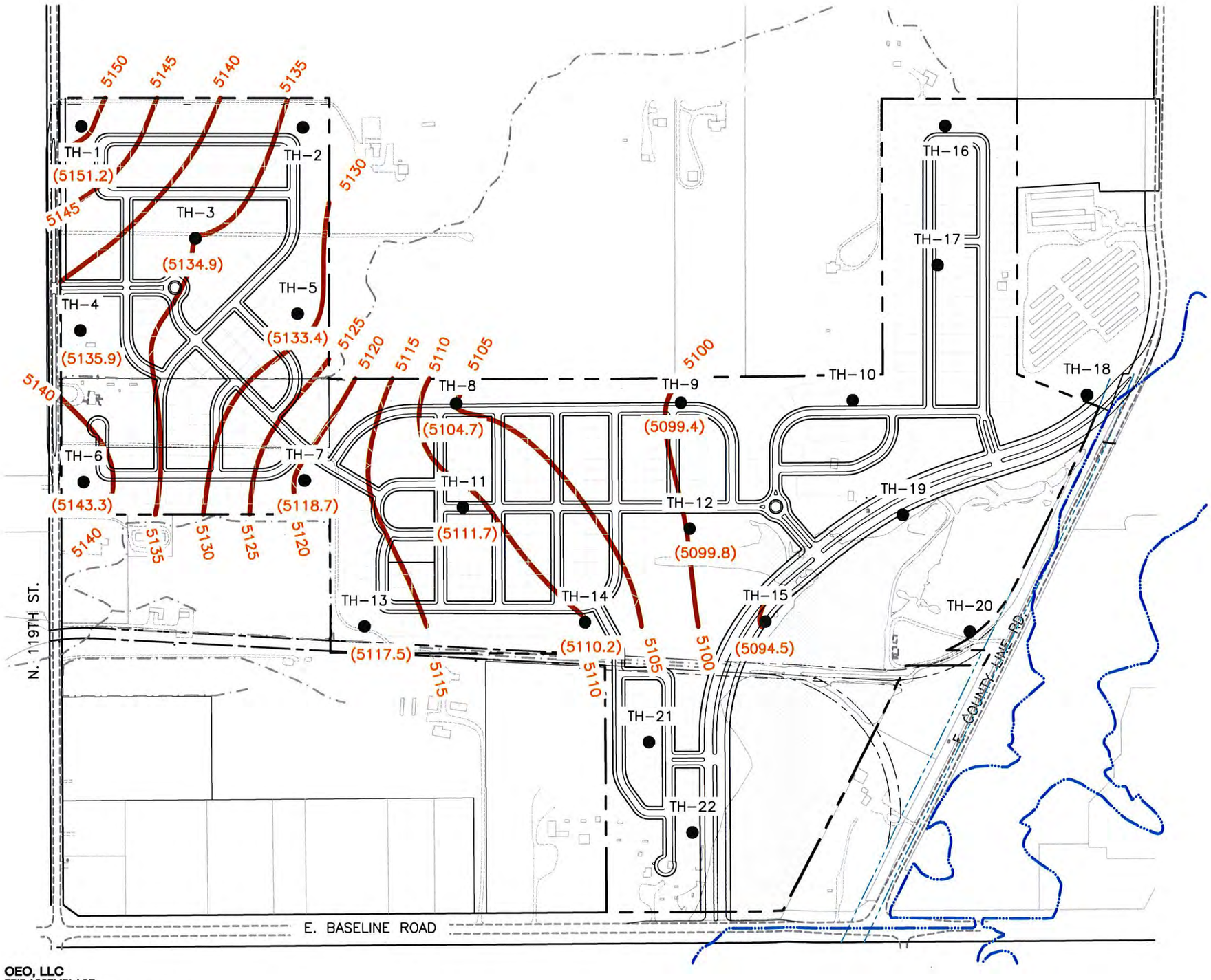
0 250 500
SCALE: 1" = 500'

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Locations of Exploratory Borings

Fig. 1

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LEGEND:

TH-1 ●	APPROXIMATE LOCATION OF EXPLORATORY BORING
(5151.2)	INDICATES ESTIMATED BEDROCK SURFACE ELEVATION (FEET)
5100	INDICATES ESTIMATED BEDROCK SURFACE ELEVATION (FEET)
NOTE:	THIS ESTIMATE WAS BASED UPON A SUBJECTIVE ANALYSIS OF DRILL HOLE DATA AND MAY NOT REFLECT LOCAL VARIATIONS.

0 250 500

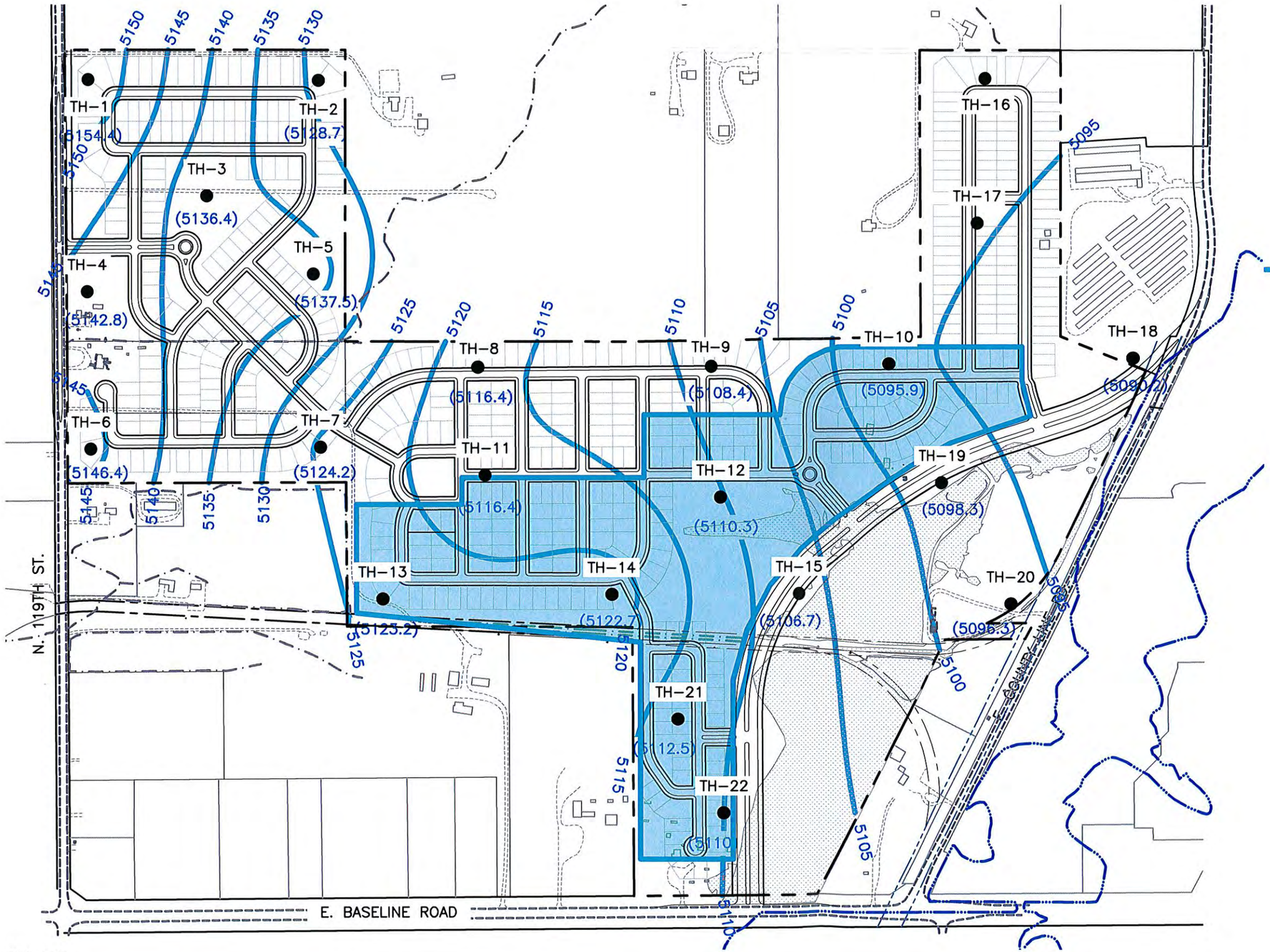
SCALE: 1" = 500'

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Estimated Bedrock Surface Elevation

Fig. 2

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LEGEND:

TH-1 ●	APPROXIMATE LOCATION OF EXPLORATORY BORING
(5151.2)	INDICATES MEASURED GROUNDWATER SURFACE ELEVATION (FEET)
5100	INDICATES ESTIMATED GROUNDWATER SURFACE ELEVATION (FEET)
▭	INDICATES AREA WHERE EXISTING GRADES ARE LESS THAN 9 FEET ABOVE ESTIMATED GROUNDWATER LEVEL.
NOTE:	THIS ESTIMATE WAS BASED UPON A SUBJECTIVE ANALYSIS OF DRILL HOLE DATA AND MAY NOT REFLECT LOCAL VARIATIONS.

N

0 250 500

SCALE: 1" = 500'

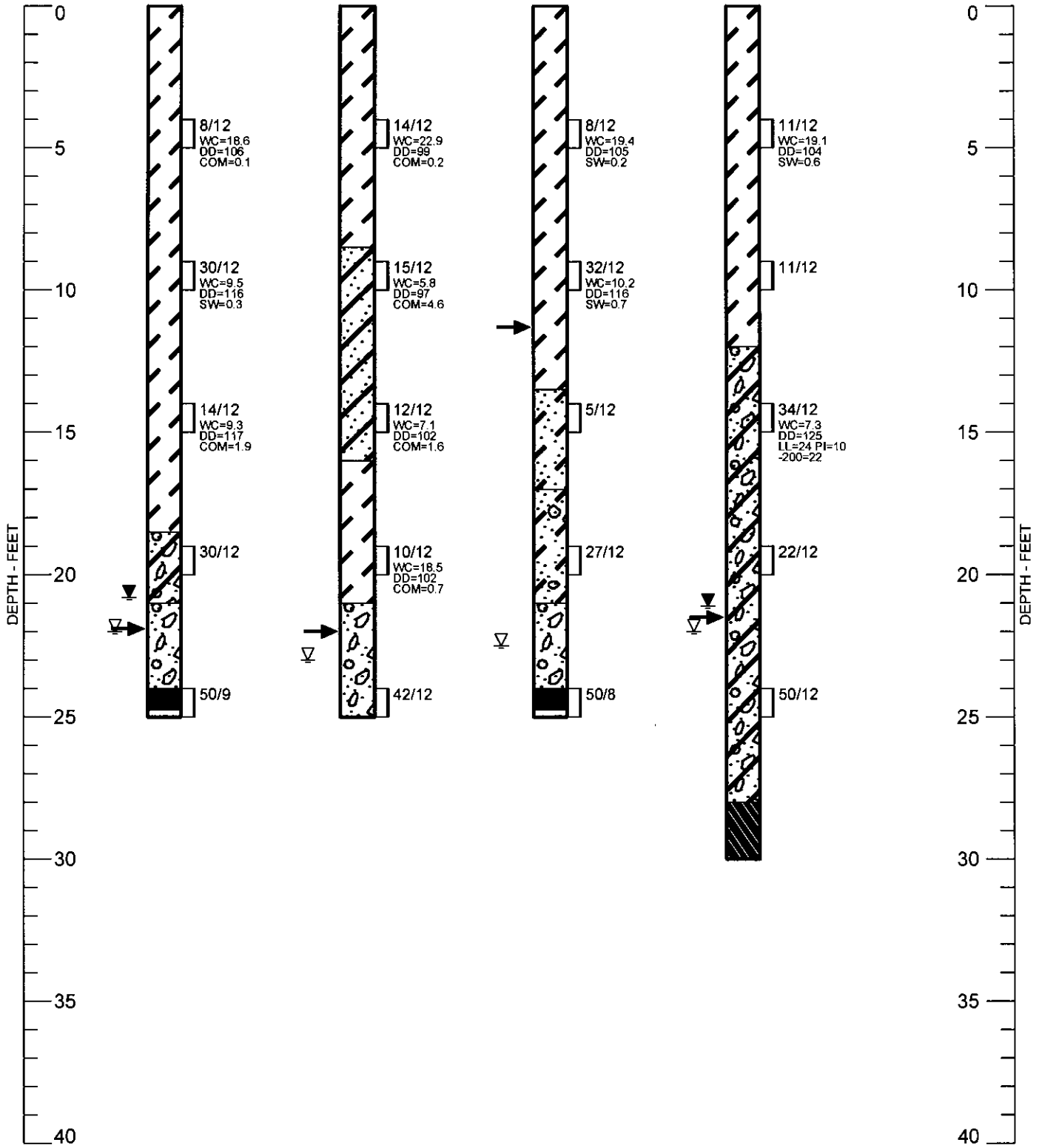
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Estimated Groundwater Surface Elevation

Fig. 3

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APPENDIX A
SUMMARY LOGS OF EXPLORATORY BORINGS

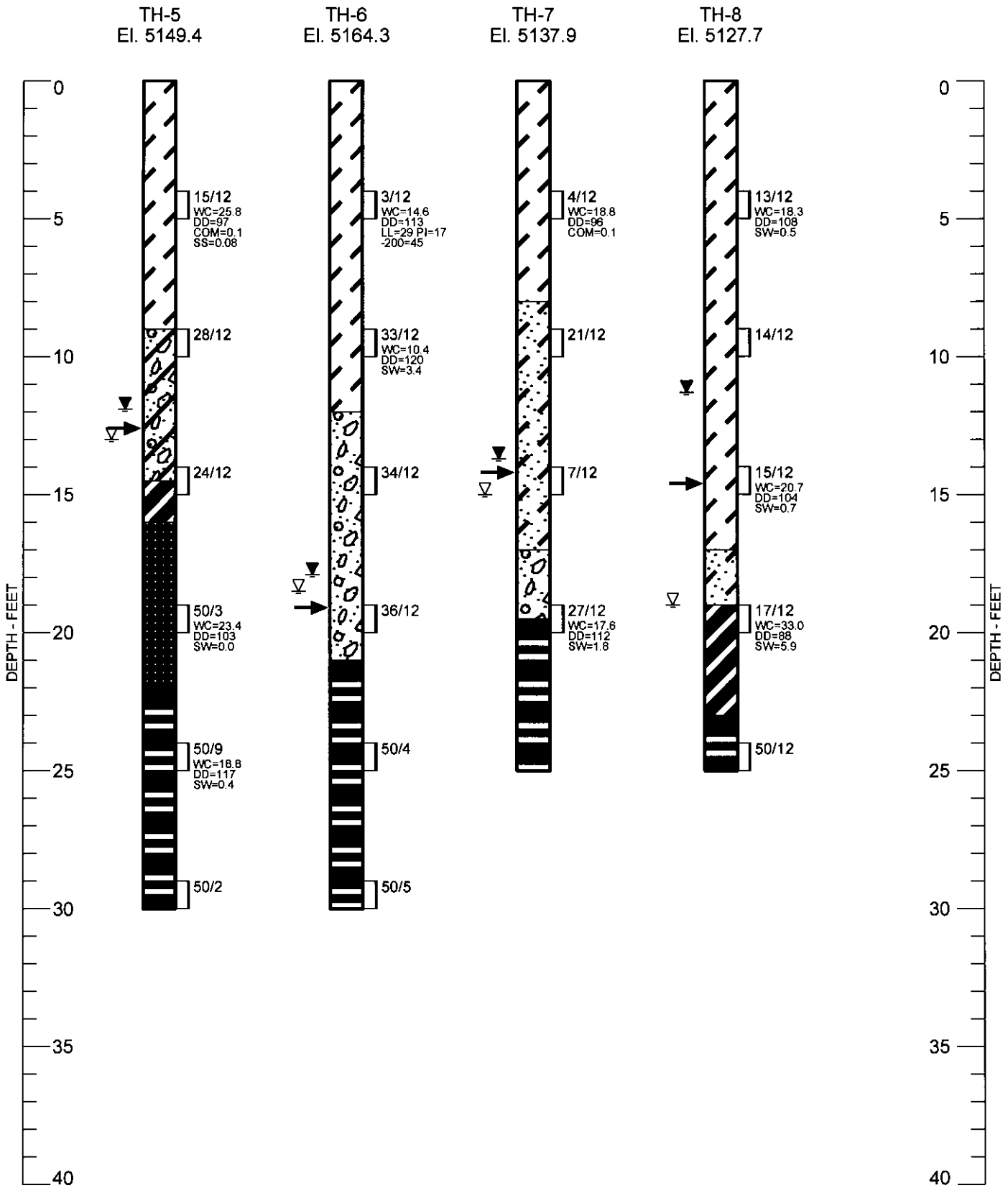


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SUMMARY LOGS OF EXPLORATORY BORINGS

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PROJECT NO. DN48,284-115

FIG. A- 1

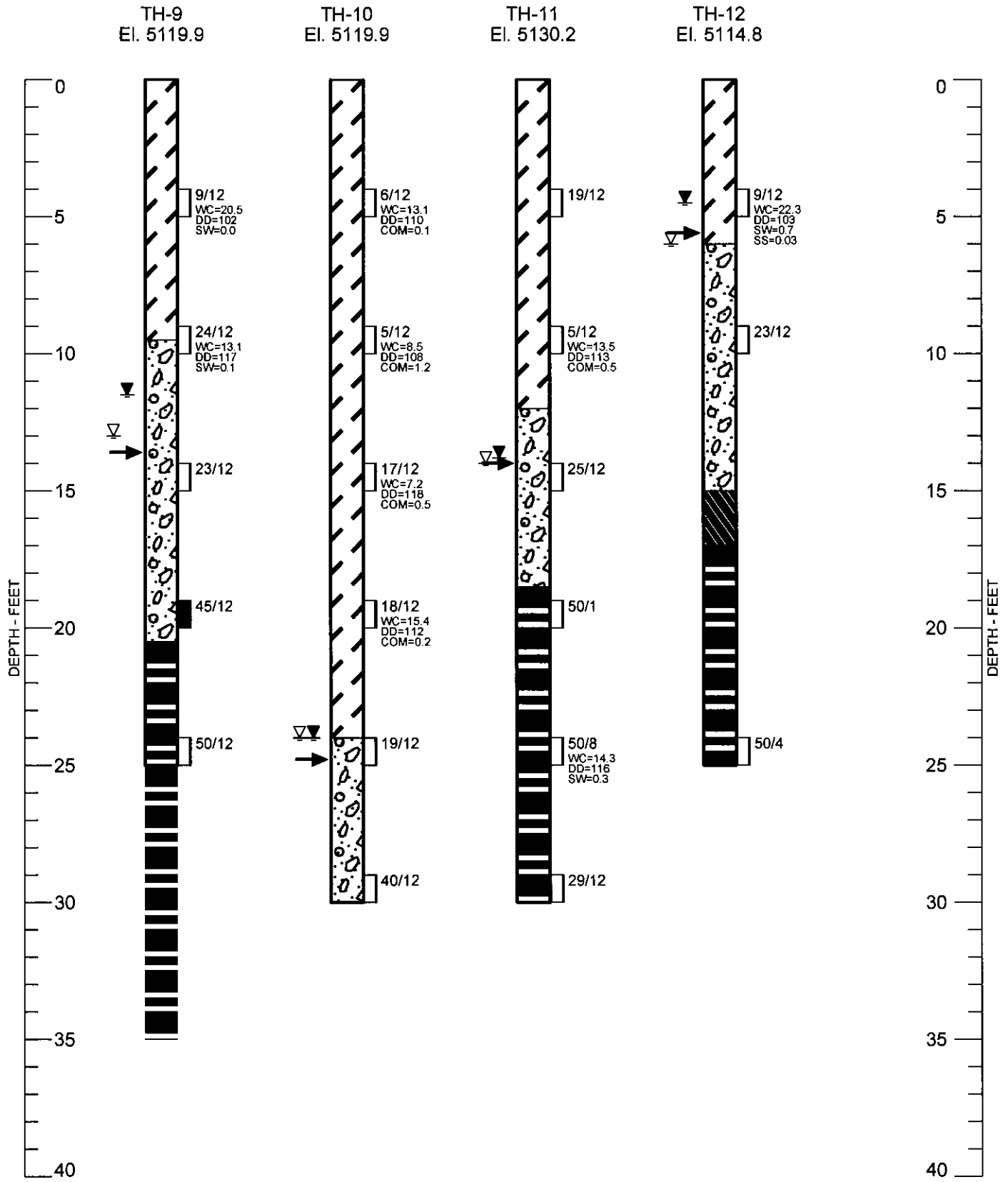


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SUMMARY LOGS OF EXPLORATORY BORINGS

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FIG. A- 2

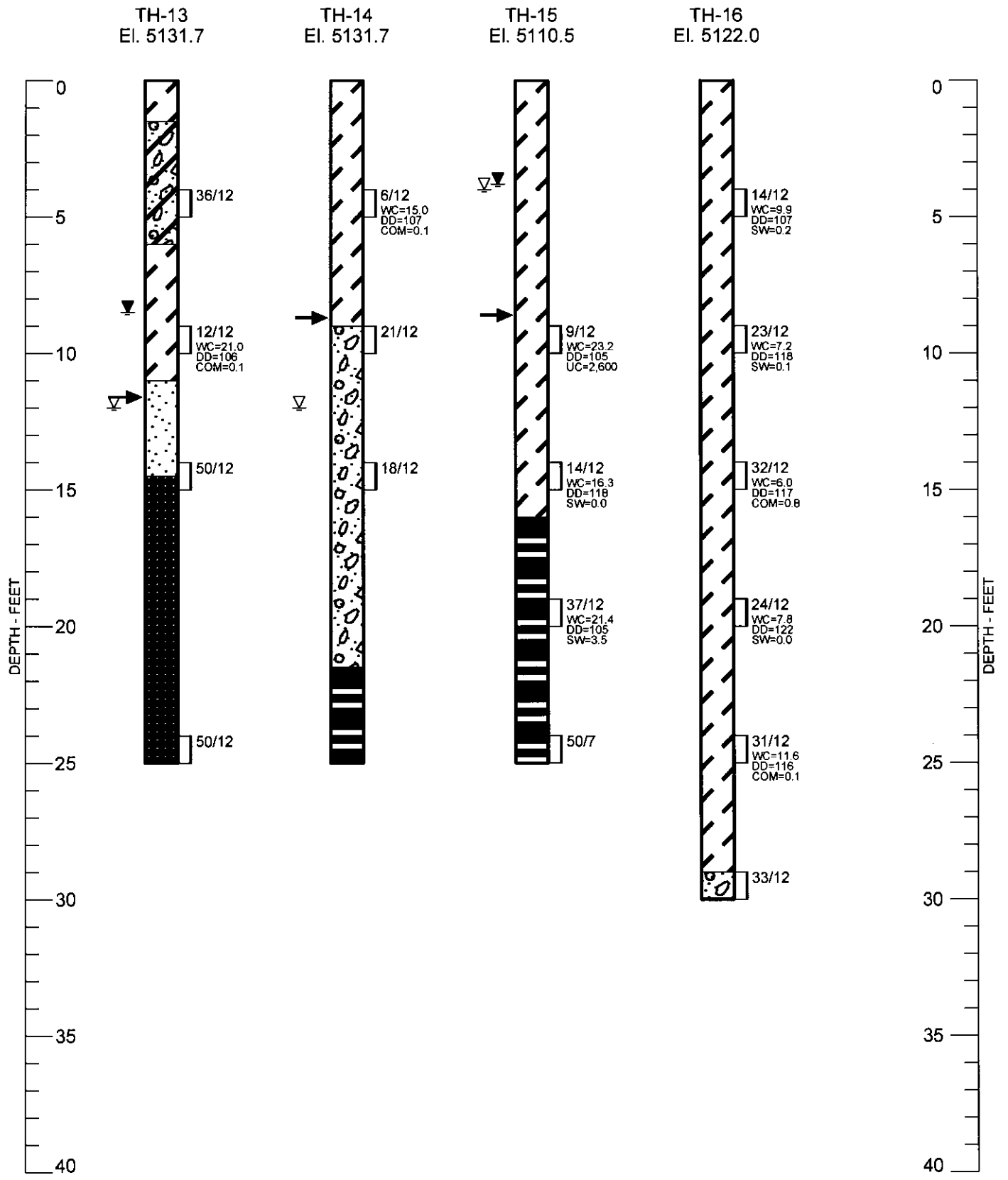


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SUMMARY LOGS OF EXPLORATORY BORINGS

OEO, LLC
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PROJECT NO. DN48,284-115

FIG. A- 3

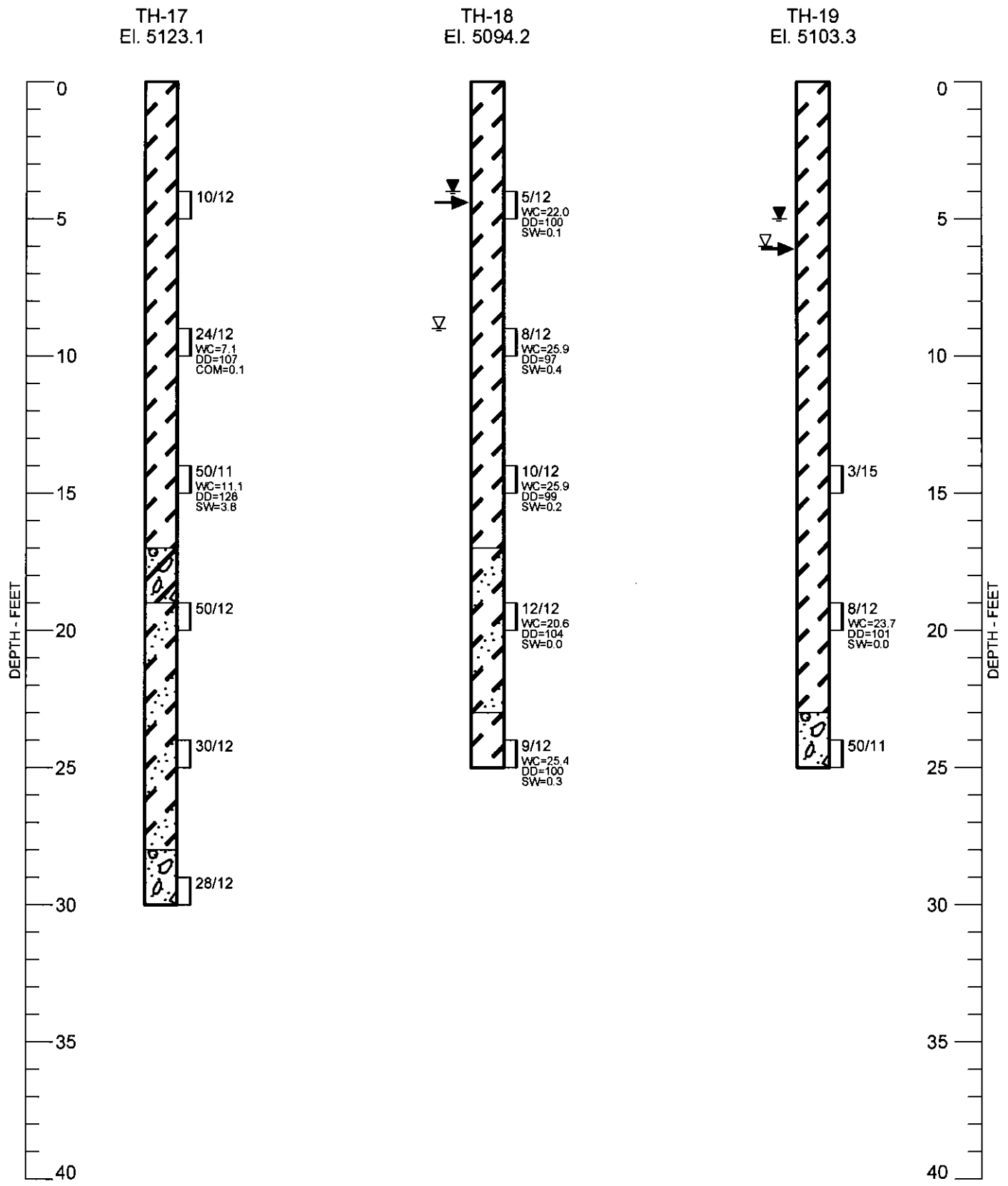


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SUMMARY LOGS OF EXPLORATORY BORINGS

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PROJECT NO. DN48,284-115

FIG. A- 4

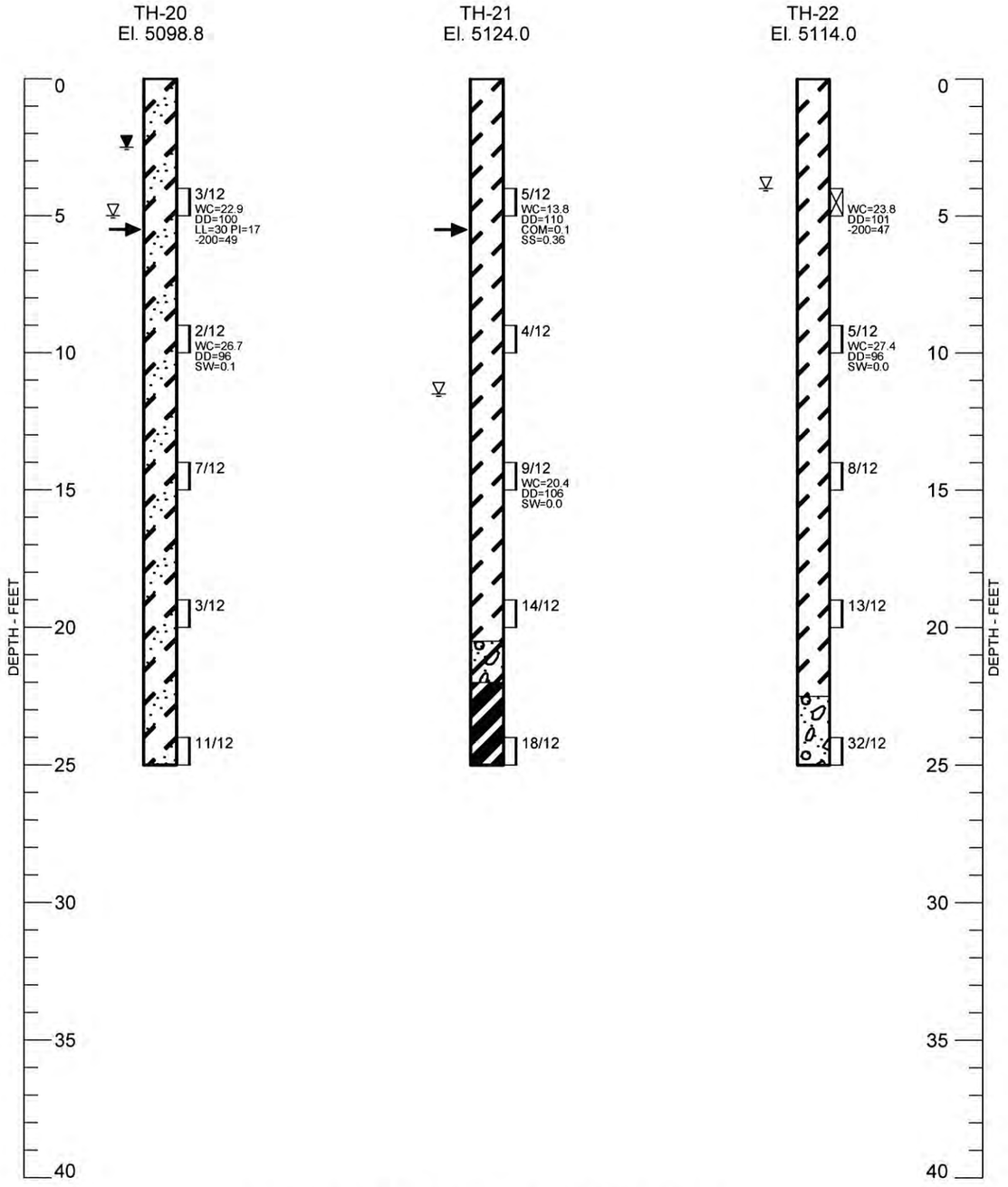


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SUMMARY LOGS OF EXPLORATORY BORINGS

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FIG. A- 5



SUMMARY LOGS OF EXPLORATORYBORINGS

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LEGEND:

- CLAY, SANDY, SOFT TO VERY STIFF, DRY TO VERY MOIST, BROWN, TAN, WHITE, GRAY, RUST (CL).
- SAND, CLAYEY, LOOSE TO MEDIUM DENSE, SLIGHTLY MOIST TO WET, BROWN, GRAY, TAN (SC).
- SAND, SILTY, MEDIUM DENSE, SLIGHTLY MOIST TO WET, BROWN, GRAY (SM).
- GRAVEL, CLAYEY, MEDIUM DENSE TO DENSE, MOIST TO WET, BROWN, GRAY, RUST (GC).
- GRAVEL, SILTY, MEDIUM DENSE, DRY TO WET, BROWN, GRAY, RUST, WHITE, RED (GM).
- GRAVEL, SANDY, MEDIUM DENSE TO VERY DENSE, SLIGHTLY MOIST TO WET, BROWN, GRAY, WHITE (GP).
- INTERLAYERED CLAY/SAND, STIFF TO VERY STIFF, VERY LOOSE TO DENSE, DRY TO WET, BROWN, GRAY, RUST, BLACK, WHITE (CL OR SC).
- WEATHERED CLAYSTONE, MOIST, BROWN, RUST, GRAY.
- BEDROCK, CLAYSTONE, HARD, SLIGHTLY MOIST TO MOIST, BROWN, GRAY, RUST, WHITE.
- BEDROCK, SANDSTONE, HARD, MOIST, BROWN, TAN, GRAY.
- BEDROCK, INTERBEDDED CLAYSTONE/SANDSTONE, HARD, MOIST, BROWN, GRAY.

DRIVE SAMPLE. THE SYMBOL 8/12 INDICATES 8 BLOWS OF AN AUTOMATIC 140-POUND HAMMER FALLING 30 INCHES WERE REQUIRED TO DRIVE A 2.5-INCH O.D. SAMPLER 12 INCHES.

WATER LEVEL MEASURED AT TIME OF DRILLING.

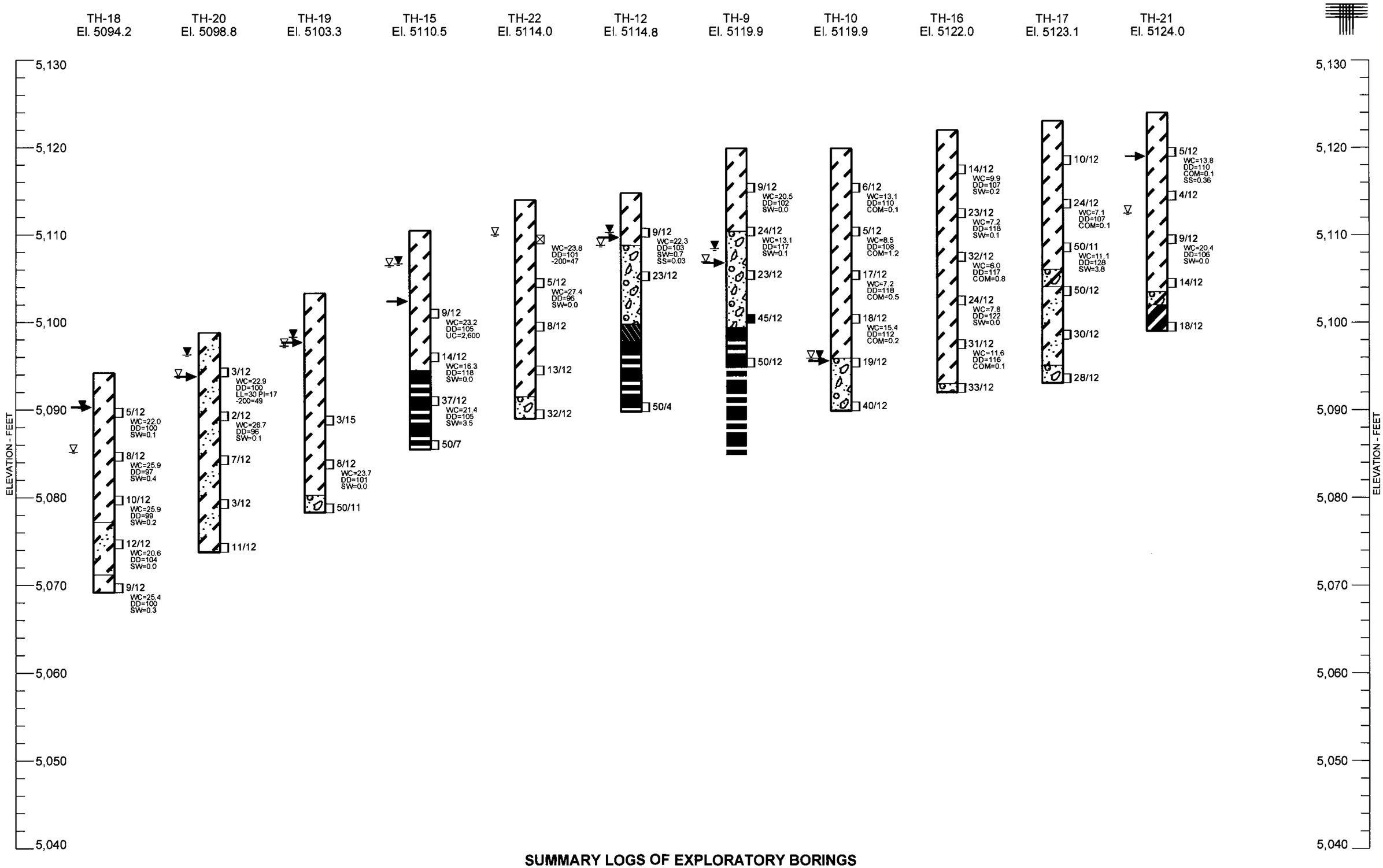
WATER LEVEL MEASURED AFTER DRILLING ON APRIL 15, 2016.

INDICATES DEPTH OF CAVING AFTER DRILLING.

NOTES:

1. THE BORINGS WERE DRILLED ON APRIL 8 AND 12, 2016 USING 4-INCH DIAMETER, CONTINUOUS-FLIGHT SOLID-STEM AUGER AND A TRUCK-MOUNTED CME-45 DRILL RIG.
2. BORING LOCATIONS AND ELEVATIONS WERE DETERMINED BY A REPRESENTATIVE OF OUR FIRM REFERENCING THE TEMPORARY BENCHMARK SHOWN ON FIG. 1.
3. WC - INDICATES MOISTURE CONTENT (%).
   DD - INDICATES DRY DENSITY (pcf).
   SW - INDICATES SWELL WHEN WETTED UNDER APPLIED PRESSURE (%).
   COM - INDICATES COMPRESSION WHEN WETTED UNDER APPLIED PRESSURE (%).
   LL - INDICATES LIQUID LIMIT.
   PI - INDICATES PLASTICITY INDEX.
   -200 - INDICATES PASSING NO. 200 SIEVE (%).
   SS - INDICATES WATER-SOLUBLE SULFATE CONCENTRATION (%).
   UC - INDICATES UNCONFINED COMPRESSIVE STRENGTH (psf).
   pF - INDICATES SOIL SUCTION VALUE (pF).
4. THESE LOGS ARE SUBJECT TO THE EXPLANATIONS, LIMITATIONS AND CONCLUSIONS CONTAINED IN THIS REPORT.

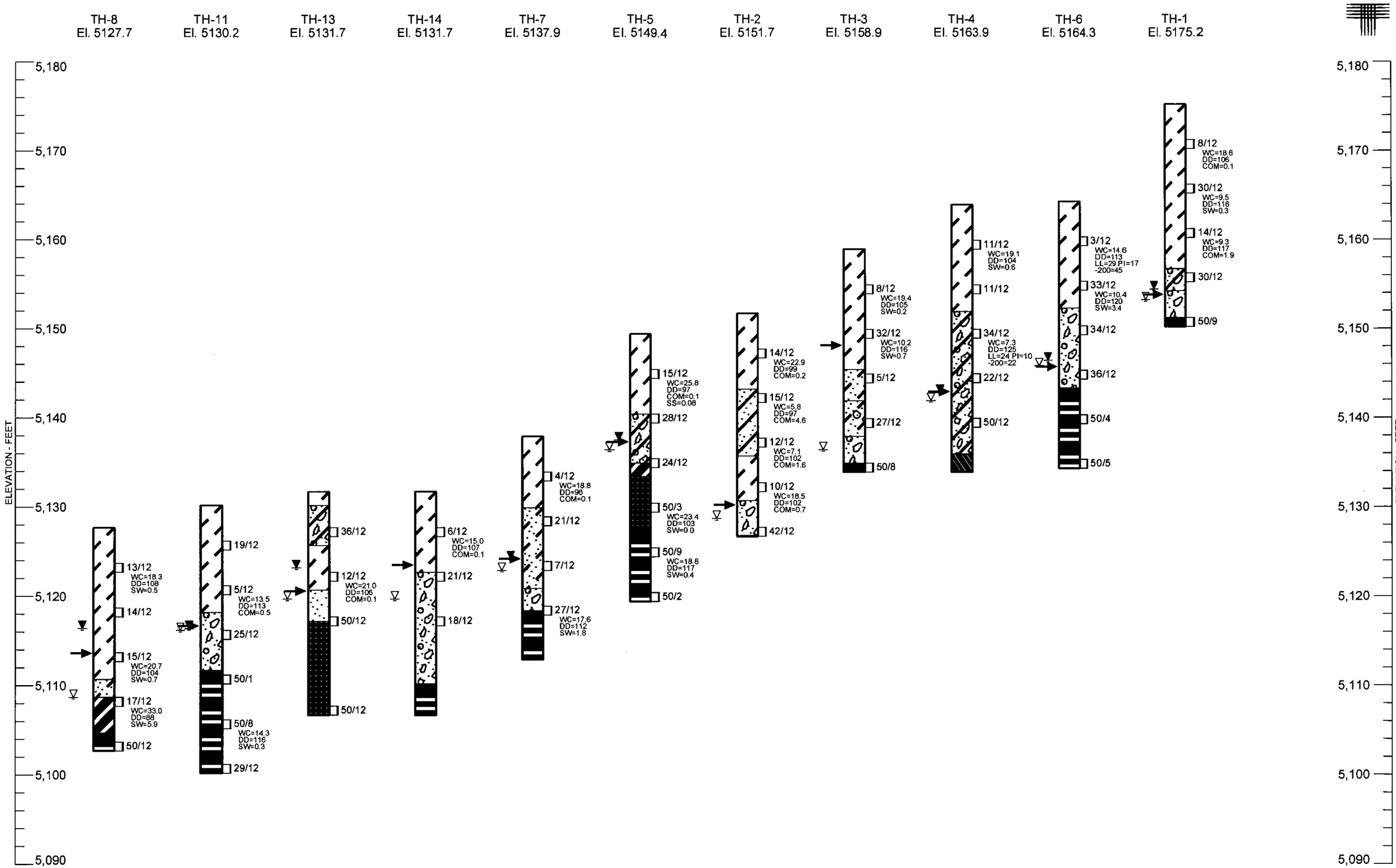
FIG. A- 6



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SUMMARY LOGS OF EXPLORATORY BORINGS

FIG. A- 7



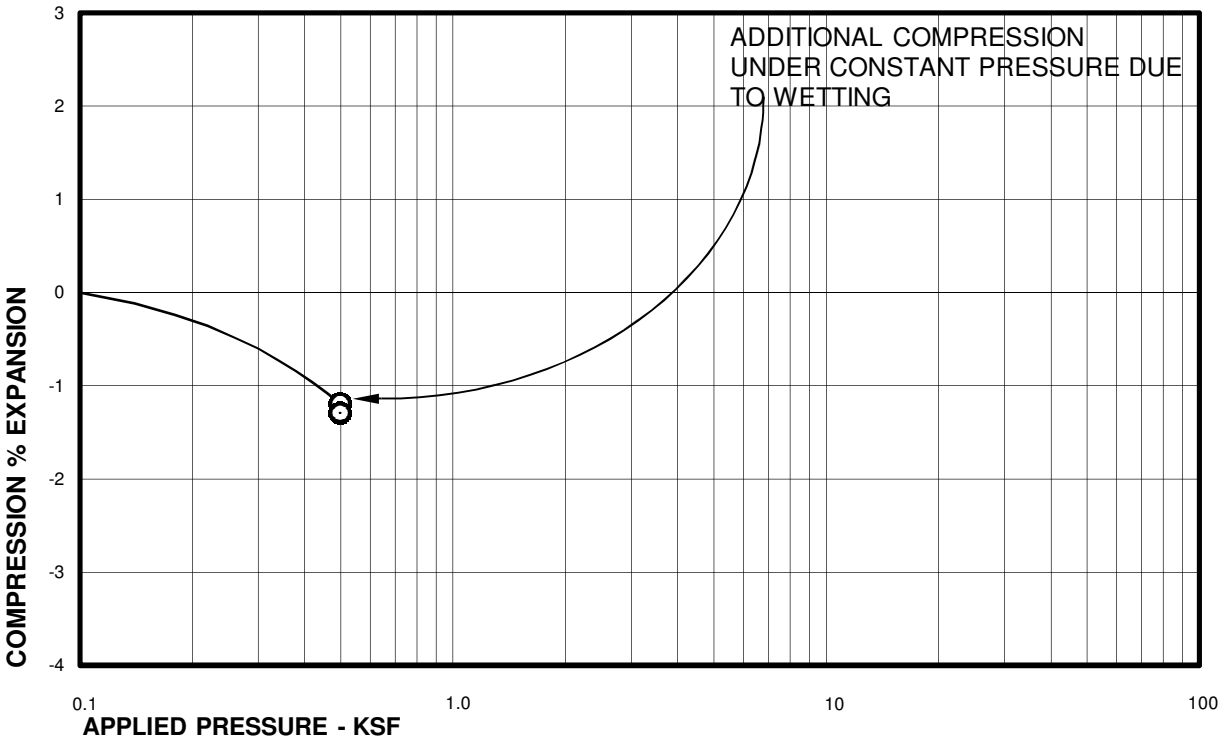
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SUMMARY LOGS OF EXPLORATORY BORINGS

PROJECT NO. DN48,284-115

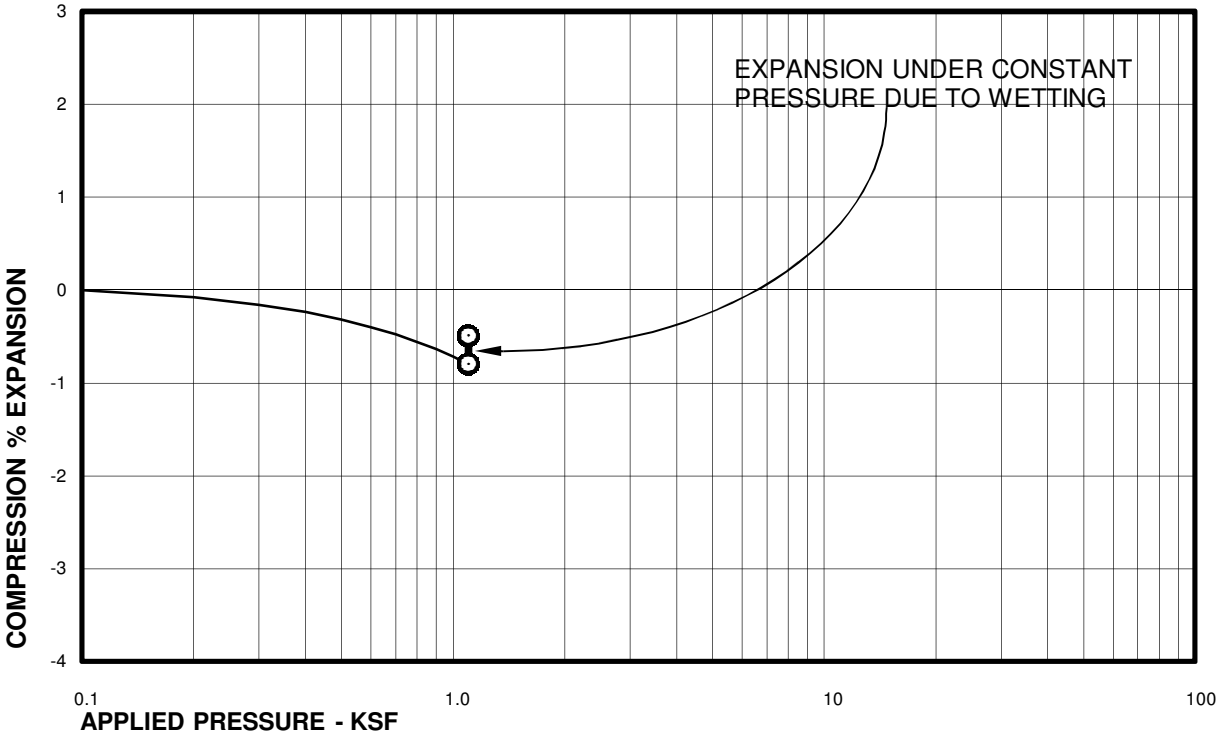
FIG. A- 8

APPENDIX B
LABORATORY TEST RESULTS



Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 106 PCF

From TH-1 AT 4 FEET MOISTURE CONTENT= 18.6 %



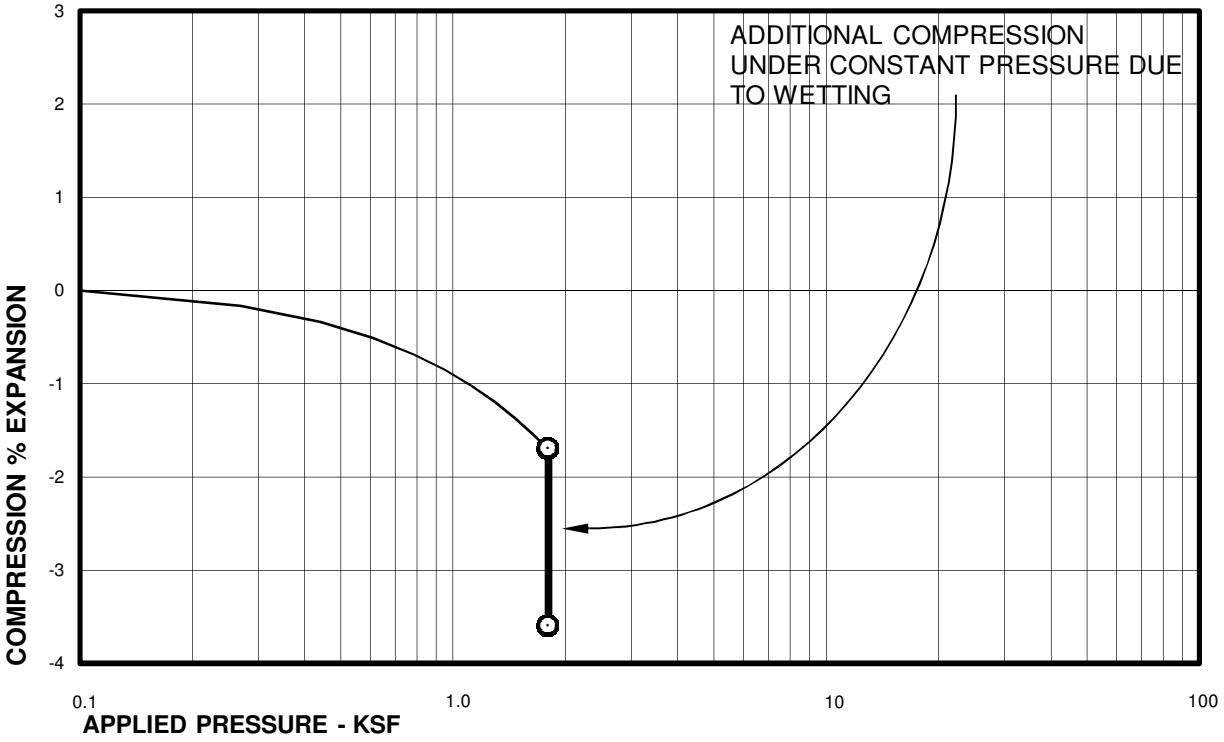
Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 116 PCF

From TH-1 AT 9 FEET MOISTURE CONTENT= 9.5 %

Swell Consolidation Test Results

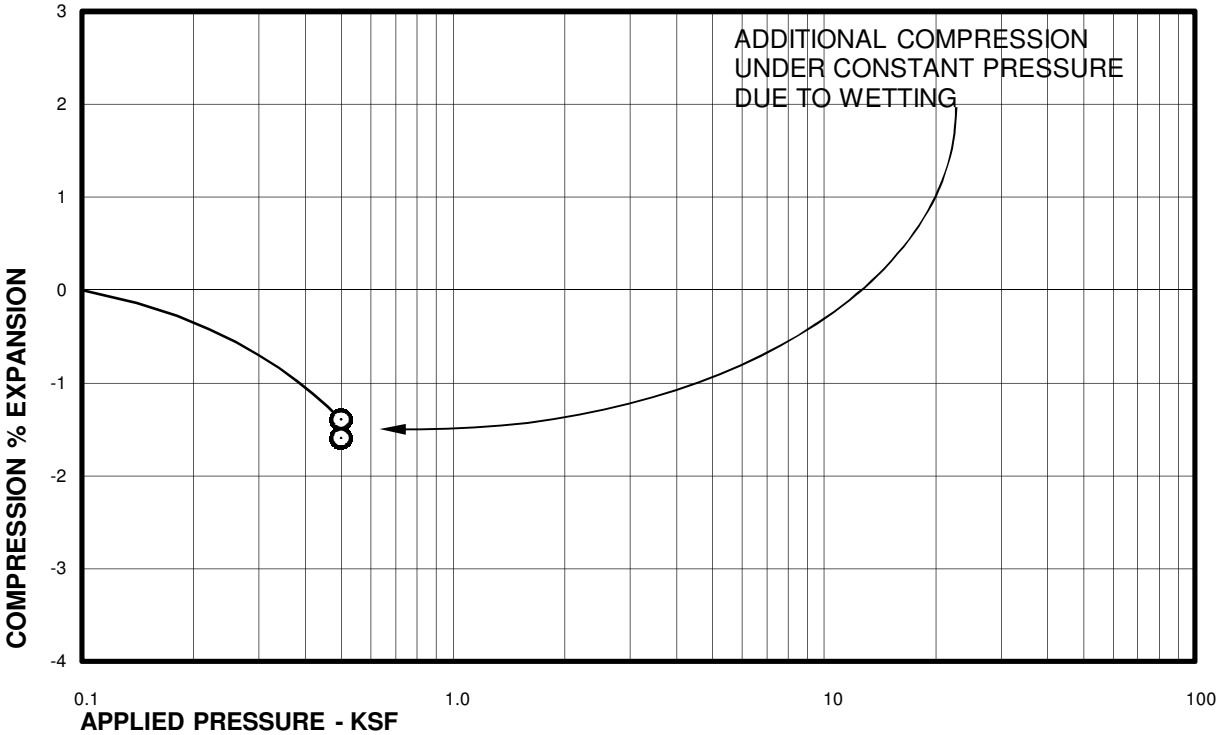
FIG. B-1

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Sample of CLAY, SANDY (CL)
From TH-1 AT 14 FEET

DRY UNIT WEIGHT= 117 PCF
MOISTURE CONTENT= 9.3 %



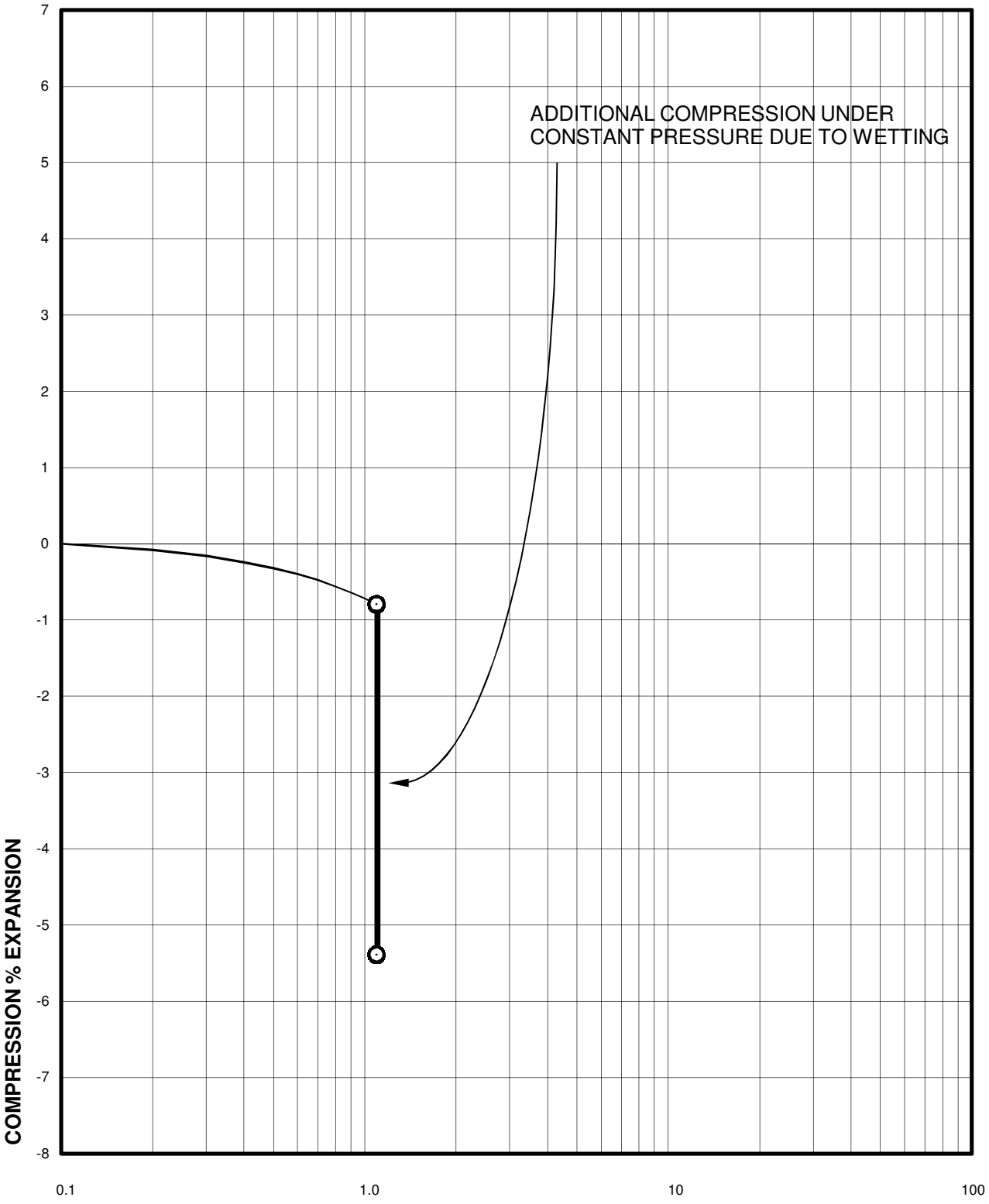
Sample of CLAY, SANDY (CL)
From TH-2 AT 4 FEET

DRY UNIT WEIGHT= 99 PCF
MOISTURE CONTENT= 22.9 %

Swell Consolidation Test Results

FIG. B-2

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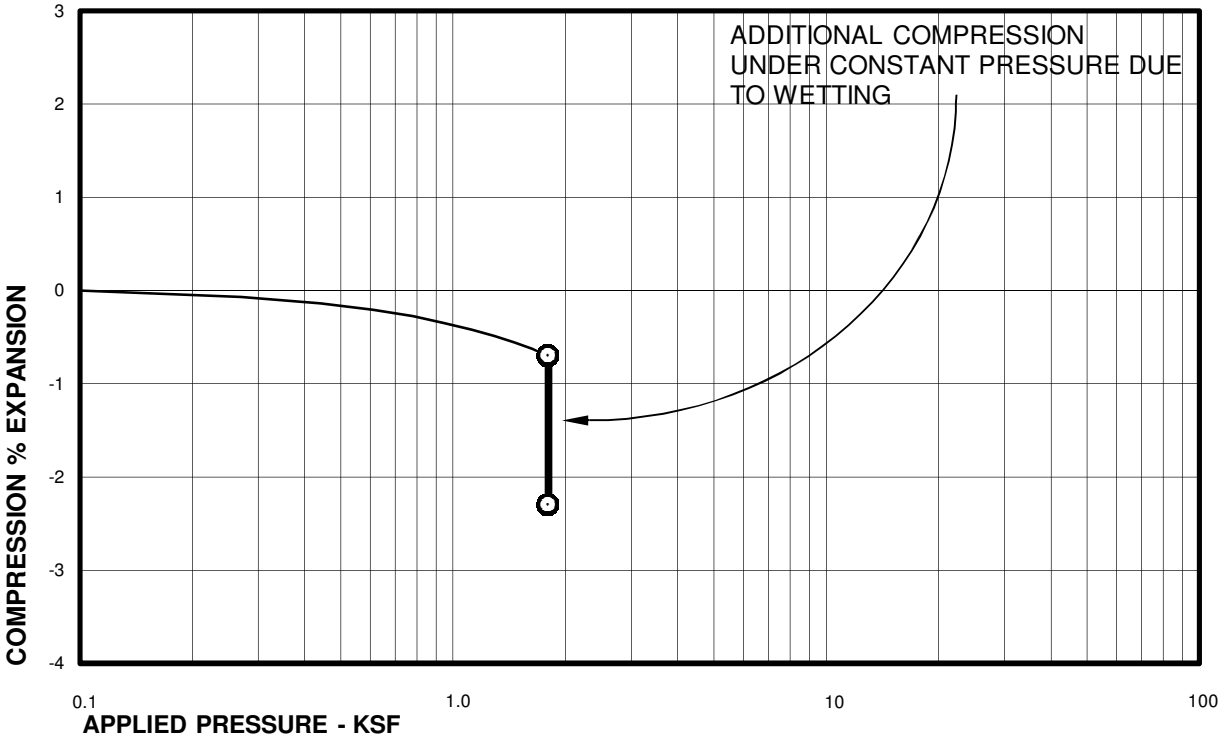
Sample of SAND, SILTY (SM)
From TH-2 AT 9 FEET

DRY UNIT WEIGHT= 97 PCF
MOISTURE CONTENT= 5.8 %

Swell Consolidation Test Results

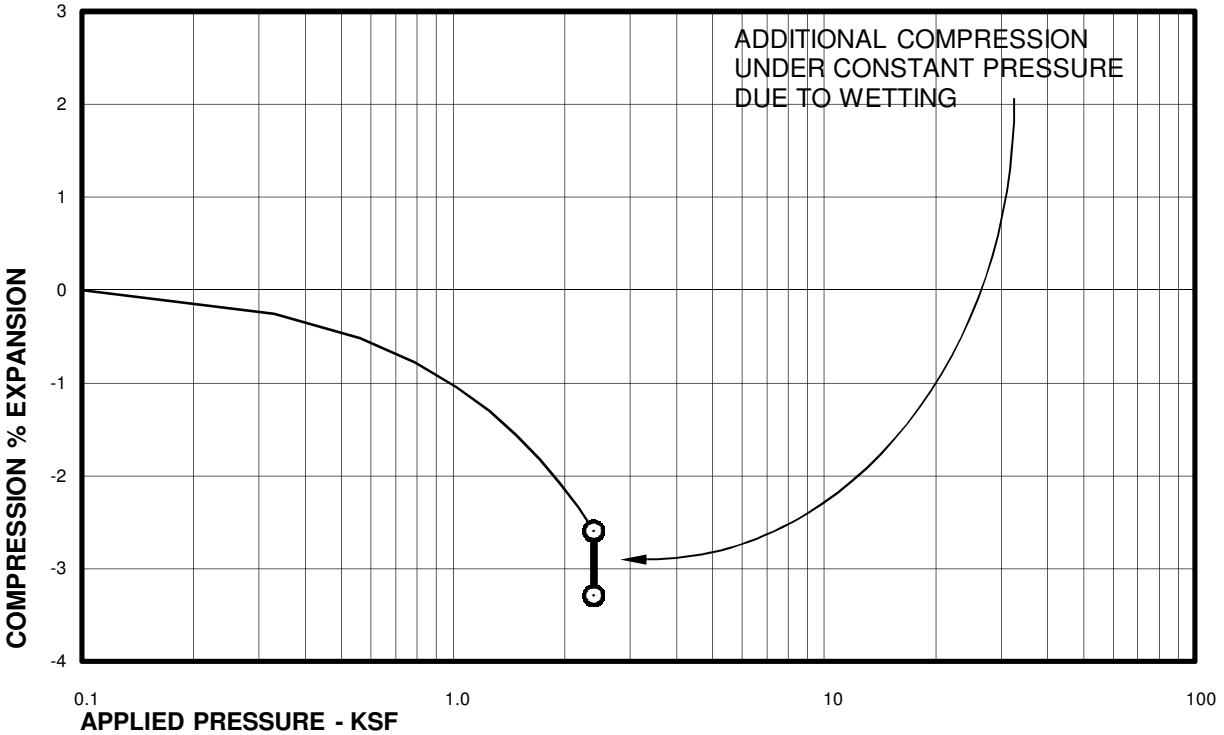
FIG. B-3

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PROJECT NO. DN48,284-115
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Sample of SAND, SILTY (SM)
From TH-2 AT 14 FEET

DRY UNIT WEIGHT= 102 PCF
MOISTURE CONTENT= 7.1 %

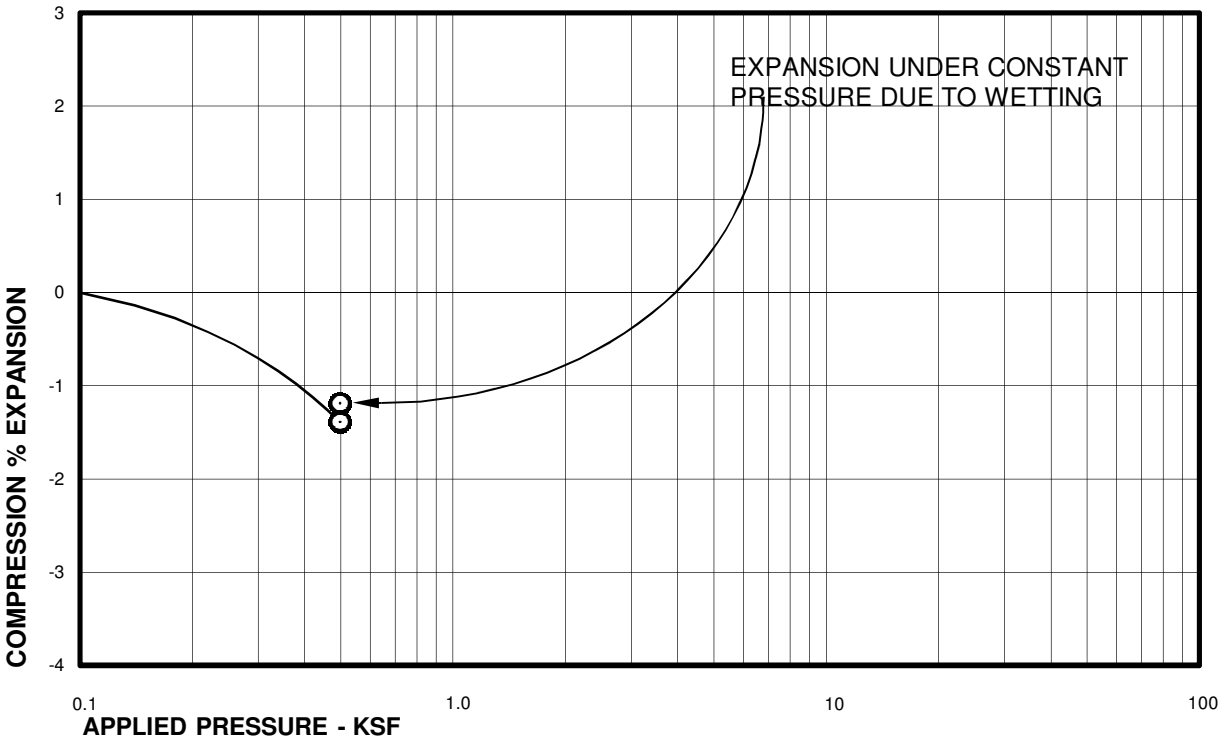


Sample of CLAY, SANDY (CL)
From TH-2 AT 19 FEET

DRY UNIT WEIGHT= 102 PCF
MOISTURE CONTENT= 18.5 %

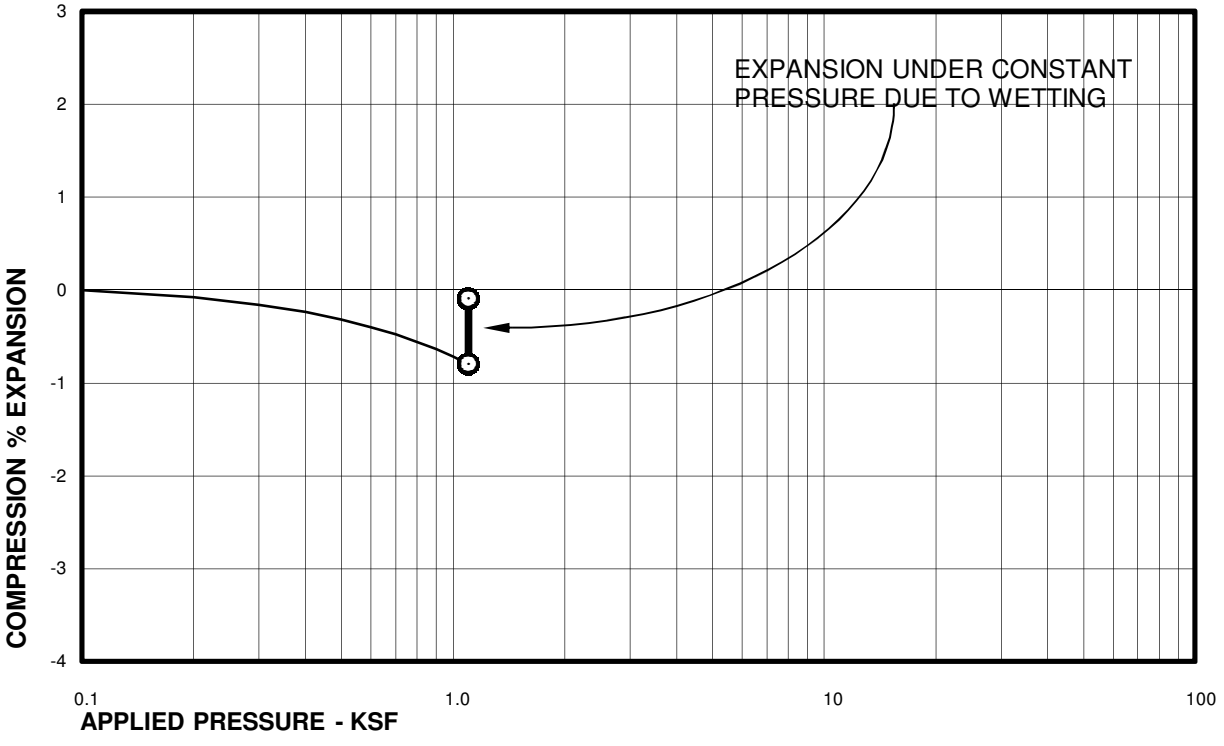
Swell Consolidation Test Results

FIG. B-4



Sample of CLAY, SANDY (CL)
From TH-3 AT 4 FEET

DRY UNIT WEIGHT= 105 PCF
MOISTURE CONTENT= 19.4 %



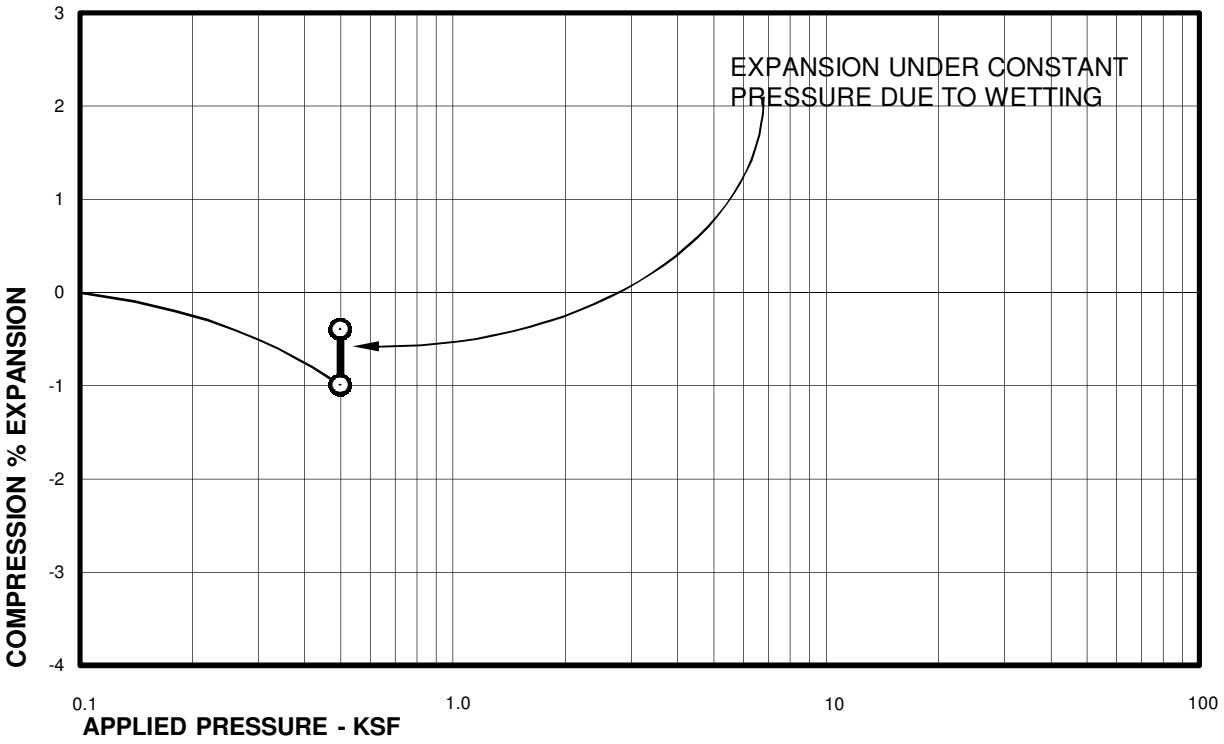
Sample of CLAY, SANDY (CL)
From TH-3 AT 9 FEET

DRY UNIT WEIGHT= 116 PCF
MOISTURE CONTENT= 10.2 %

Swell Consolidation Test Results

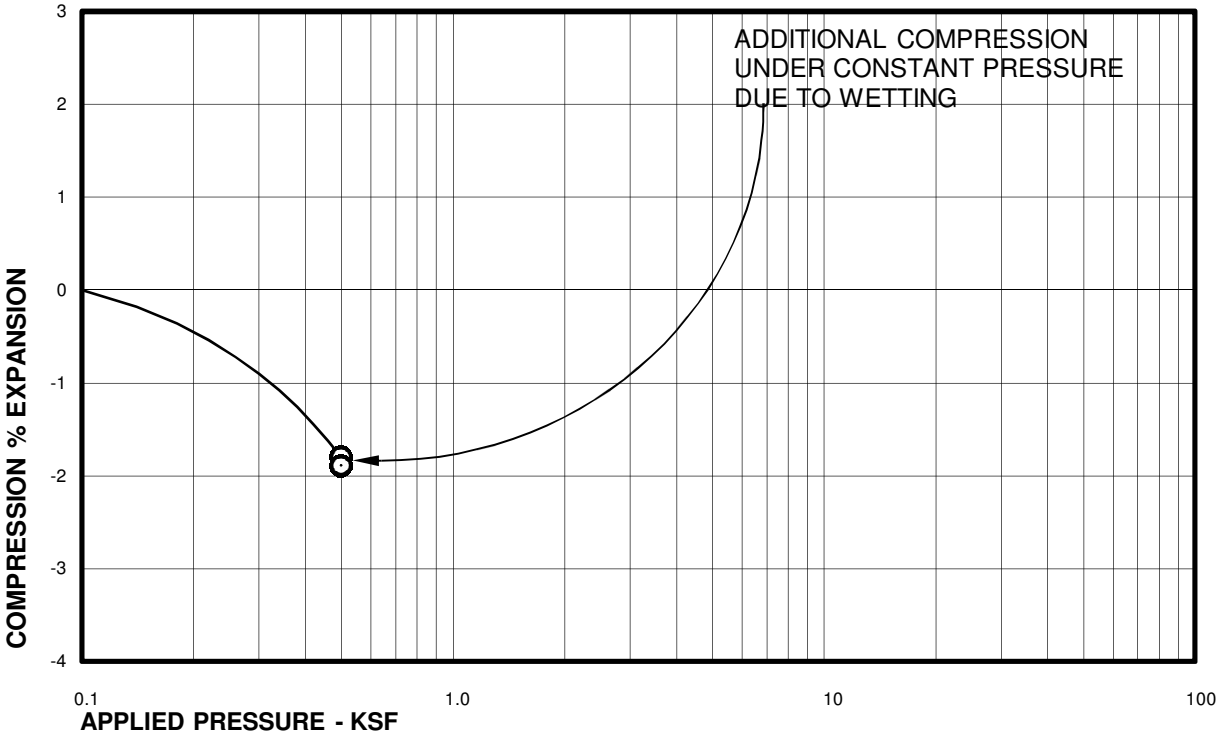
FIG. B-5

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Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 104 PCF

From TH-4 AT 4 FEET MOISTURE CONTENT= 19.1 %



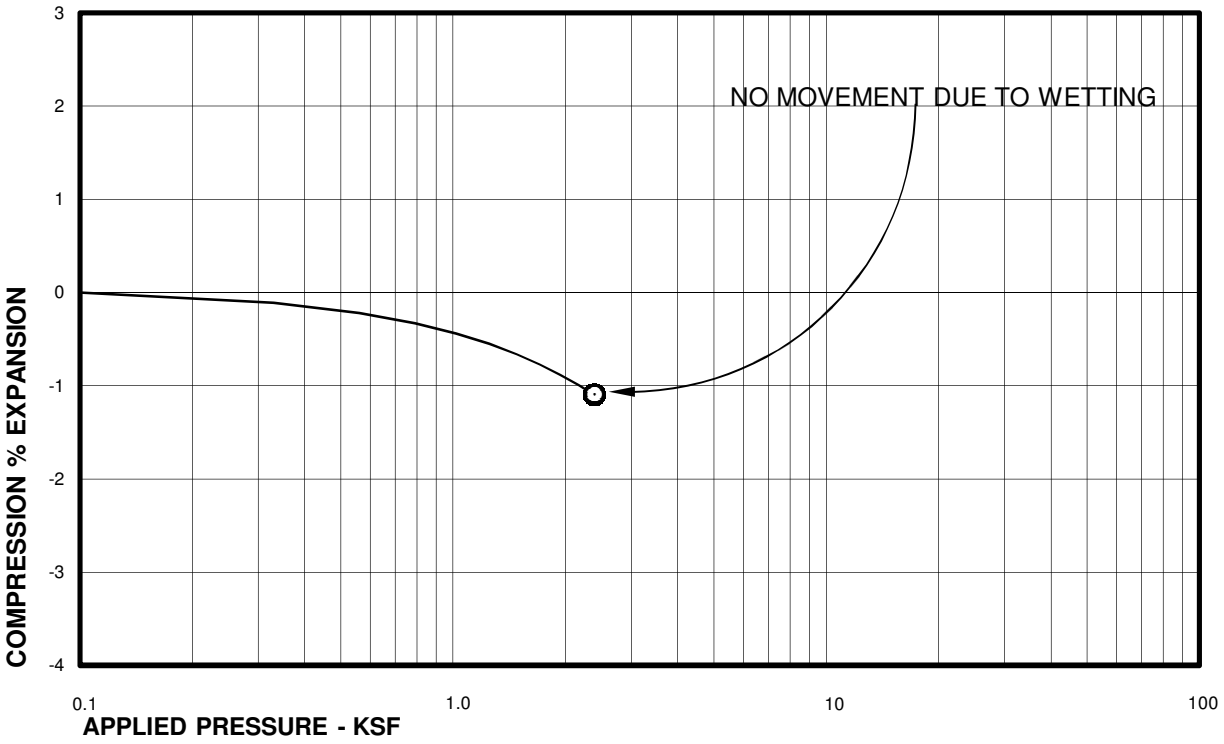
Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 97 PCF

From TH-5 AT 4 FEET MOISTURE CONTENT= 25.8 %

Swell Consolidation Test Results

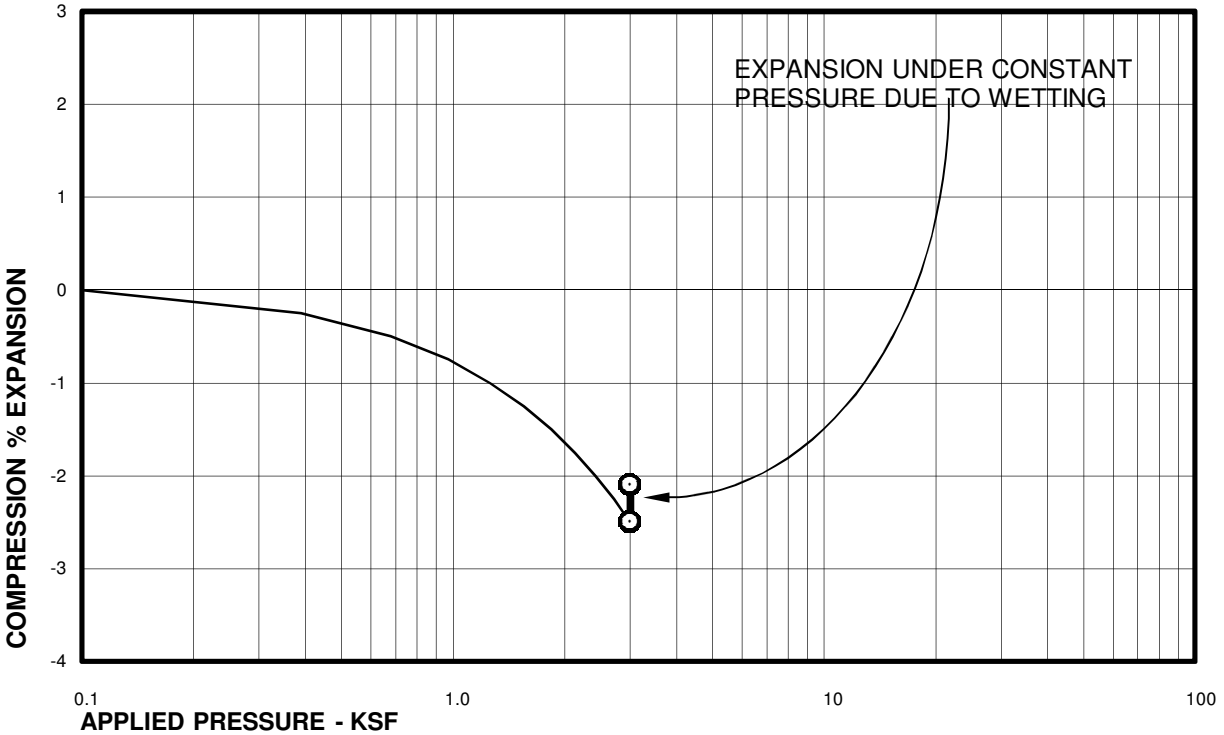
FIG. B-6

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Sample of SANDSTONE
From TH-5 AT 19 FEET

DRY UNIT WEIGHT= 103 PCF
MOISTURE CONTENT= 23.4 %



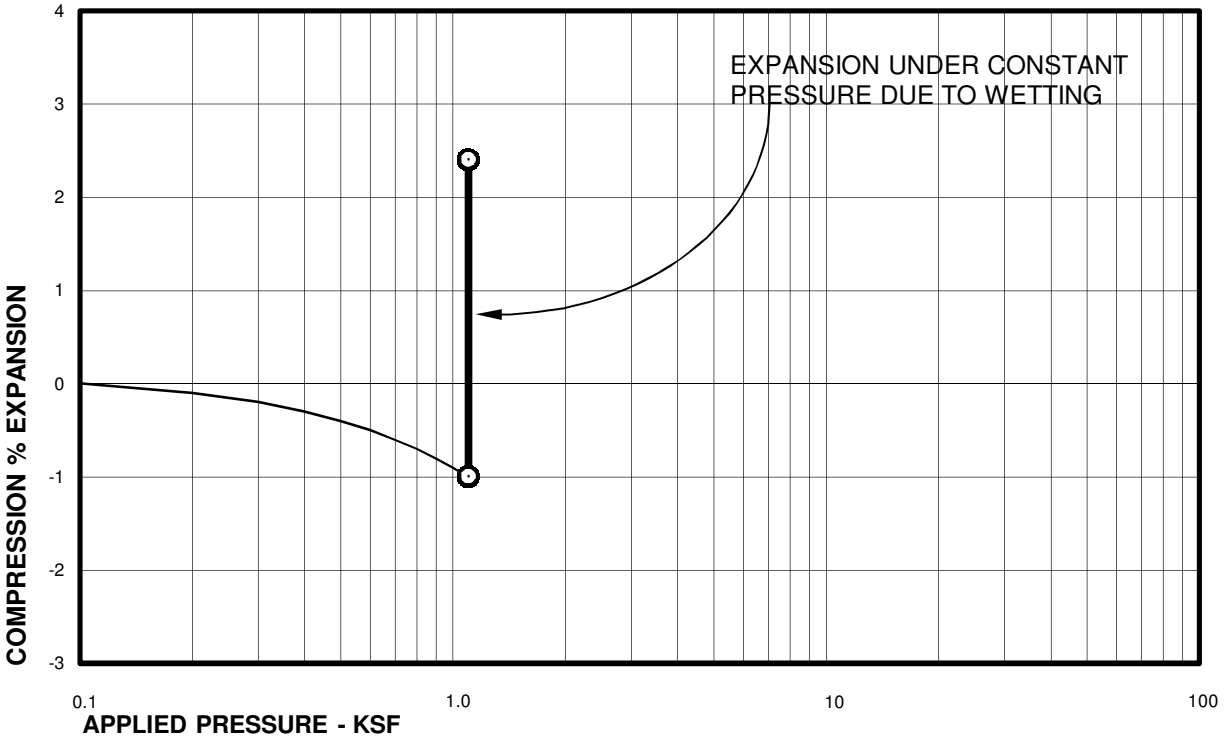
Sample of CLAYSTONE
From TH-5 AT 24 FEET

DRY UNIT WEIGHT= 117 PCF
MOISTURE CONTENT= 18.8 %

Swell Consolidation Test Results

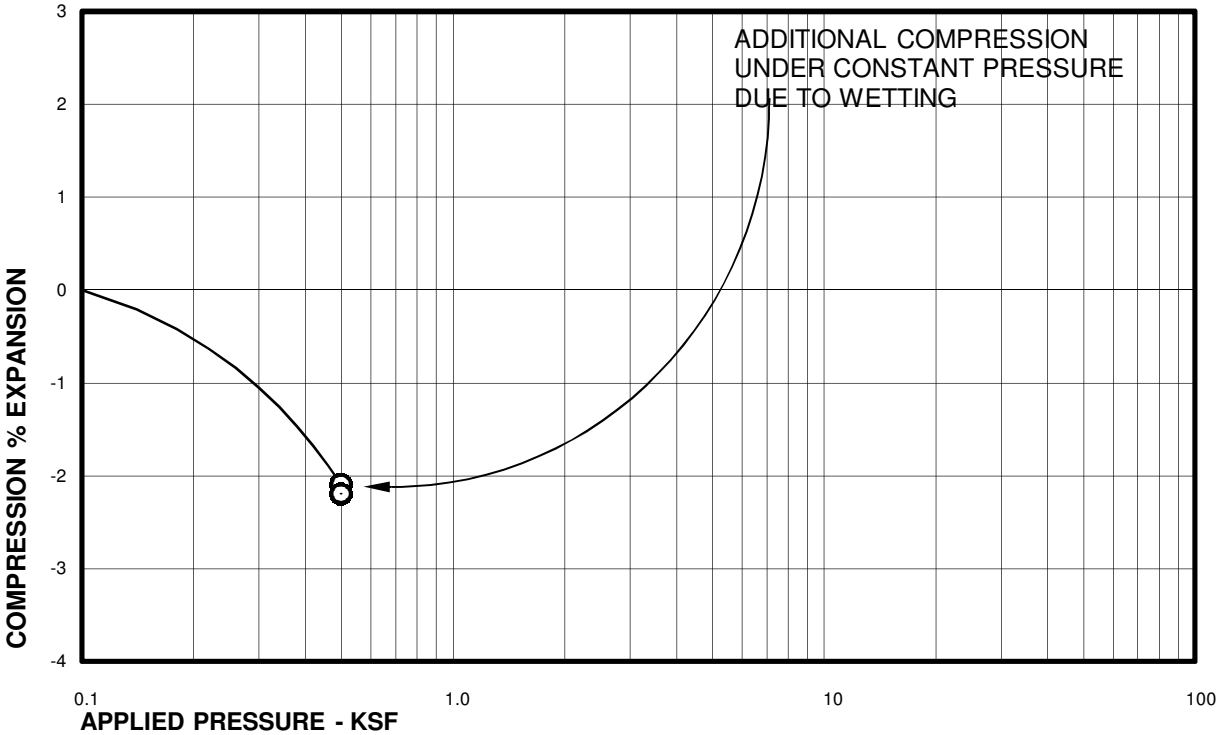
FIG. B-7

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PROJECT NO. DN48,284-115
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Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 120 PCF

From TH-6 AT 9 FEET MOISTURE CONTENT= 10.4 %



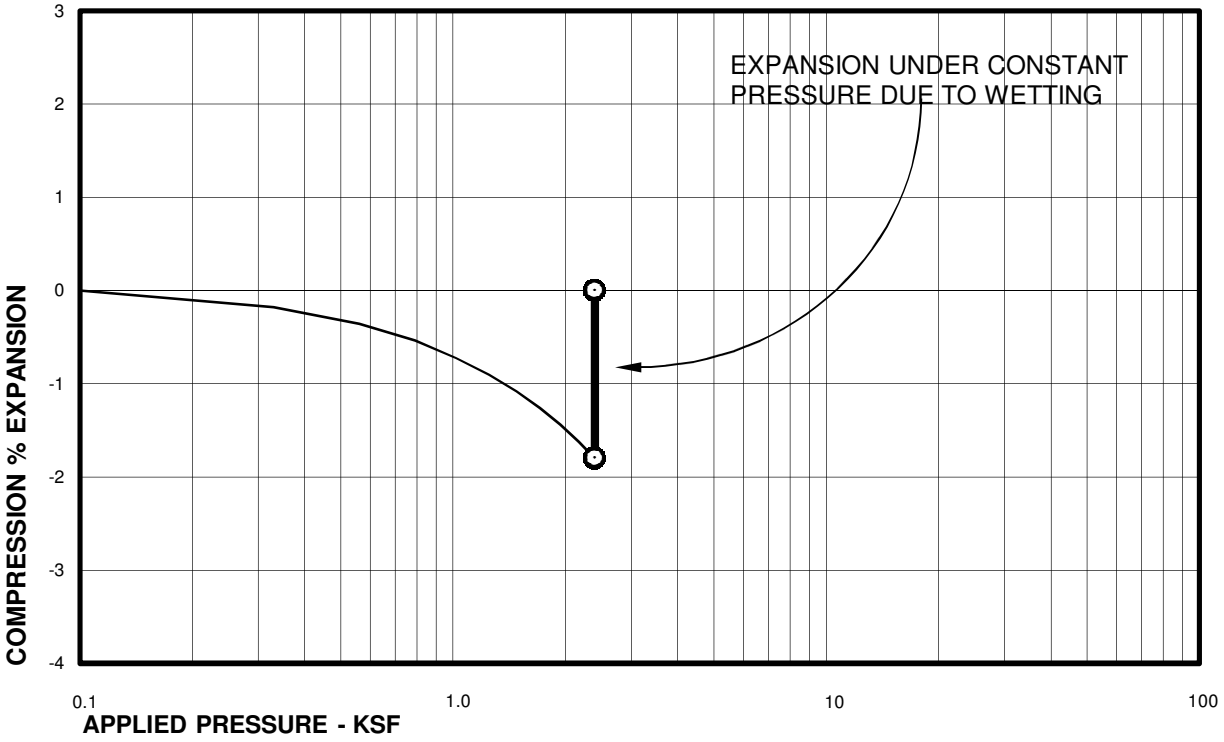
Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 96 PCF

From TH-7 AT 4 FEET MOISTURE CONTENT= 18.8 %

Swell Consolidation Test Results

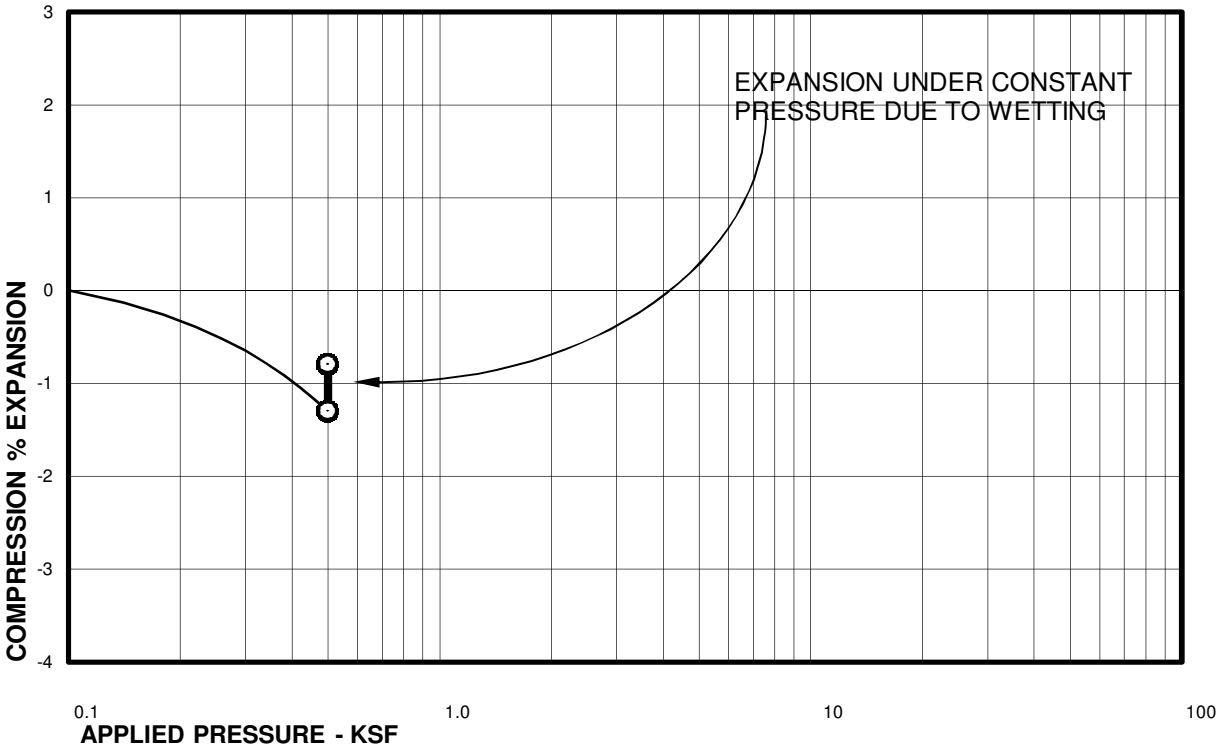
FIG. B-8

OEO, LLC
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PROJECT NO. DN48,284-115
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Sample of CLAYSTONE
From TH-7 AT 19 FEET

DRY UNIT WEIGHT= 112 PCF
MOISTURE CONTENT= 17.6 %

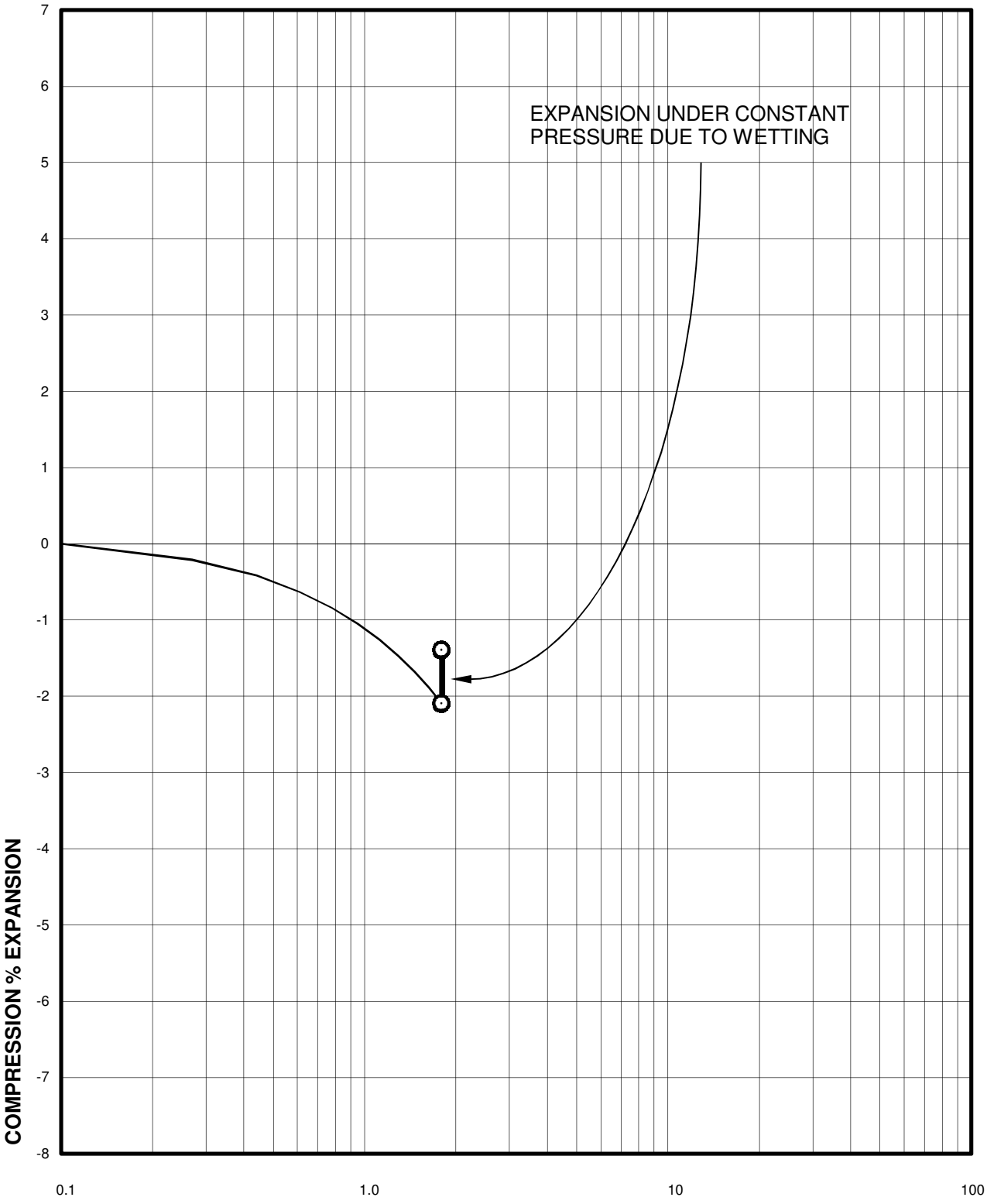


Sample of CLAY, SANDY (CL)
From TH-8 AT 4 FEET

DRY UNIT WEIGHT= 108 PCF
MOISTURE CONTENT= 18.3 %

Swell Consolidation Test Results

FIG. B-9



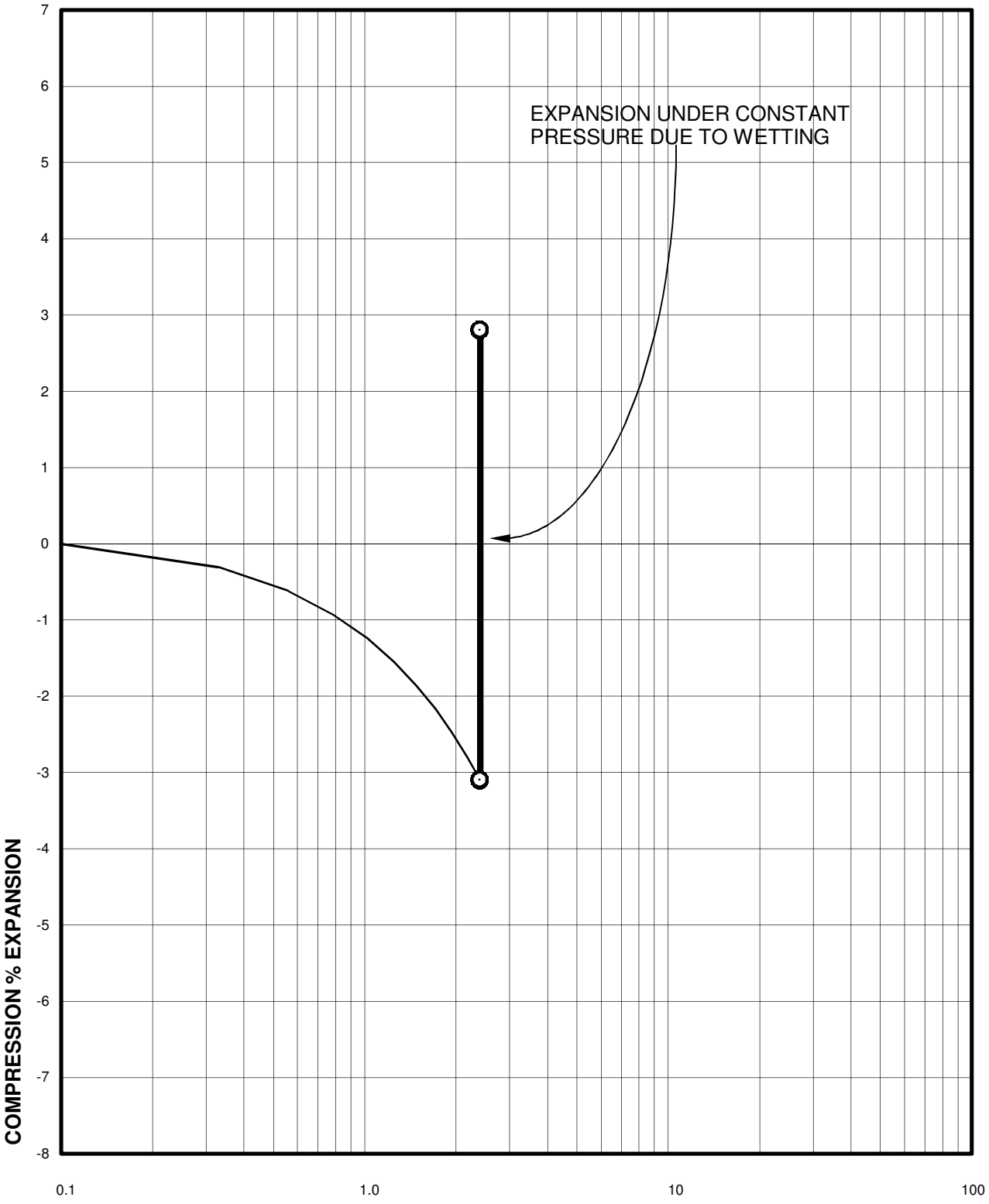
Sample of CLAY, SANDY (CL)
From TH-8 AT 14 FEET

DRY UNIT WEIGHT= 104 PCF
MOISTURE CONTENT= 20.7 %

Swell Consolidation Test Results

FIG. B-10

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



Sample of WEATHERED CLAYSTONE
From TH-8 AT 19 FEET

DRY UNIT WEIGHT= 88 PCF
MOISTURE CONTENT= 33.0 %

Swell Consolidation Test Results

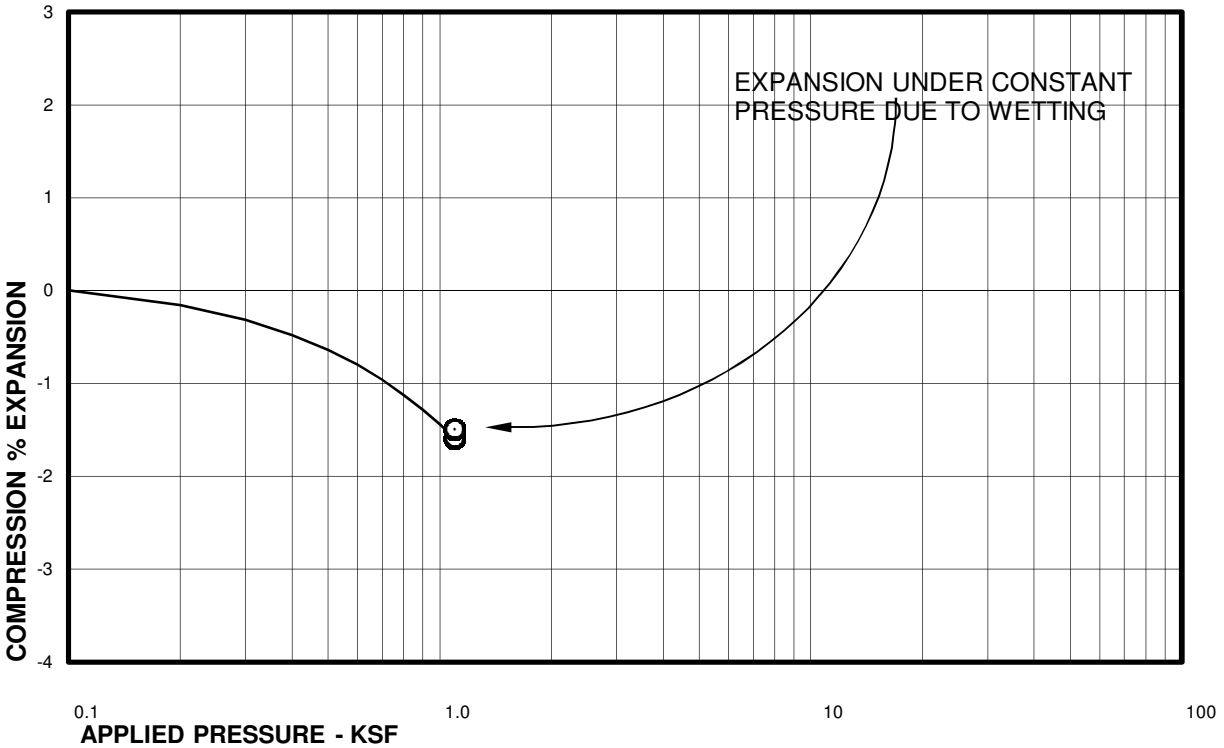
FIG. B-11

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 102 PCF

From TH-9 AT 4 FEET MOISTURE CONTENT= 20.5 %



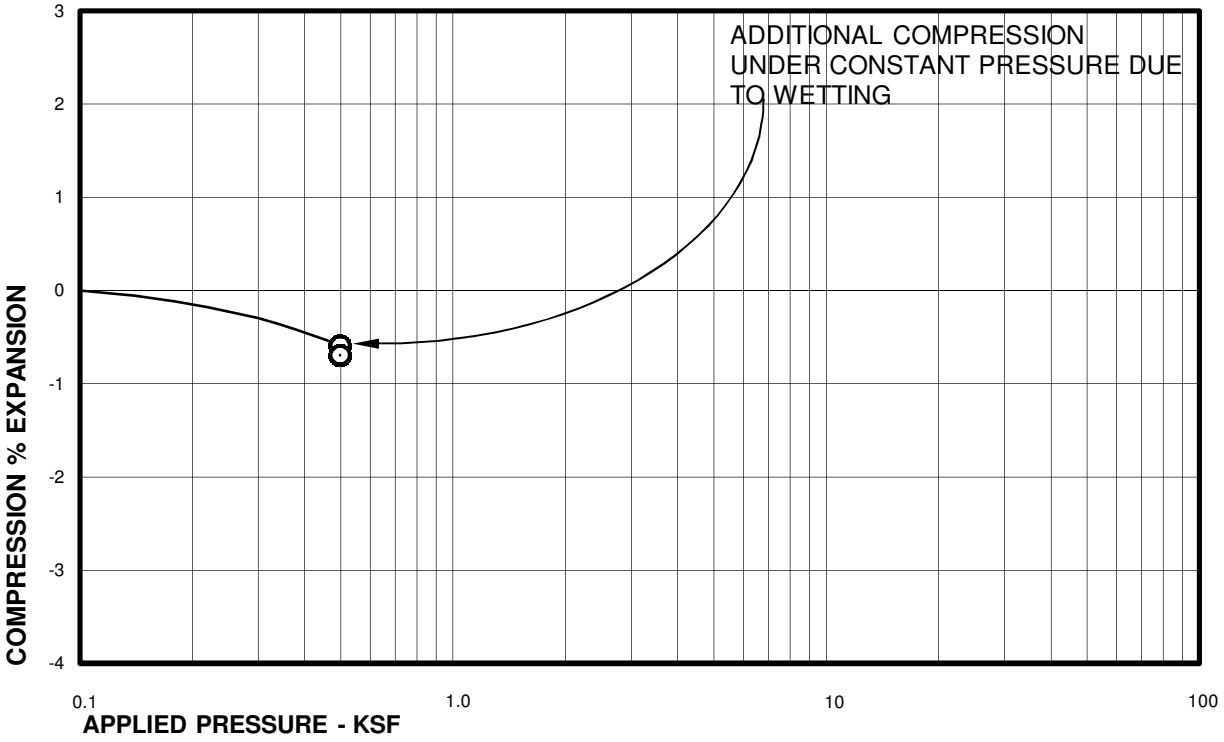
Sample of GRAVEL, CLEAN (GP) DRY UNIT WEIGHT= 117 PCF

From TH-9 AT 9 FEET MOISTURE CONTENT= 13.1 %

Swell Consolidation Test Results

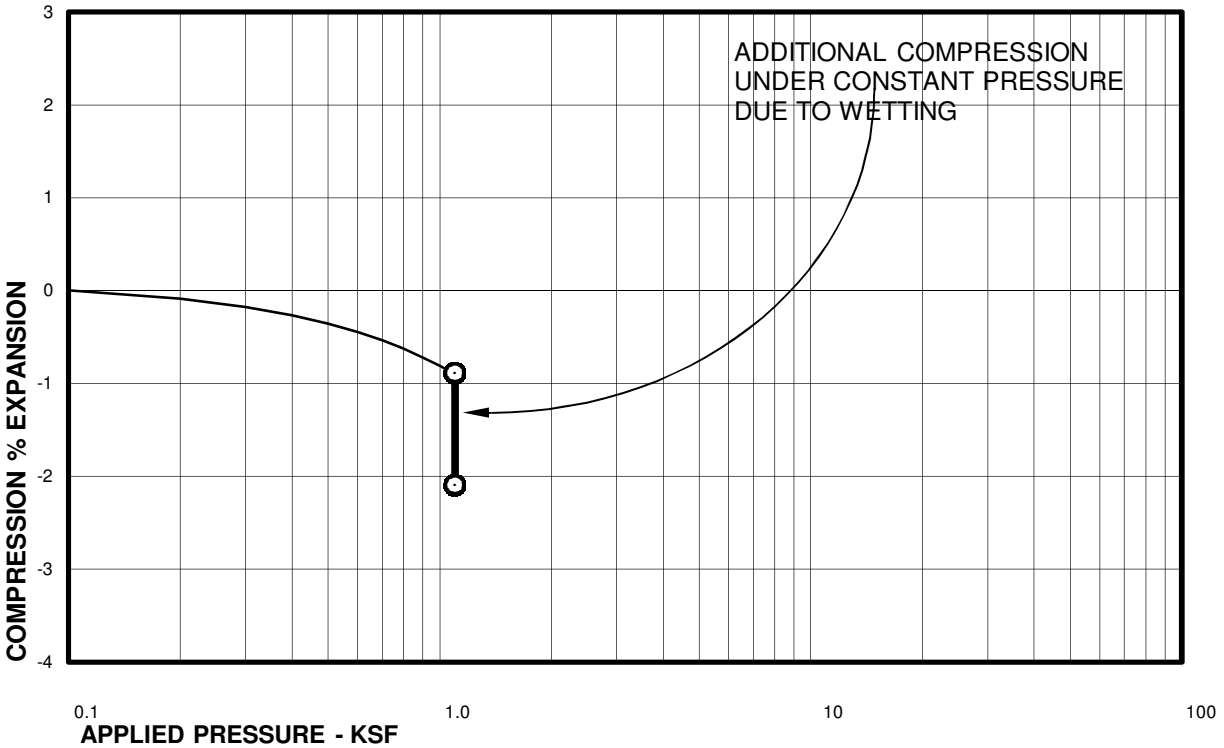
FIG. B-12

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 110 PCF

From TH-10 AT 4 FEET MOISTURE CONTENT= 13.1 %



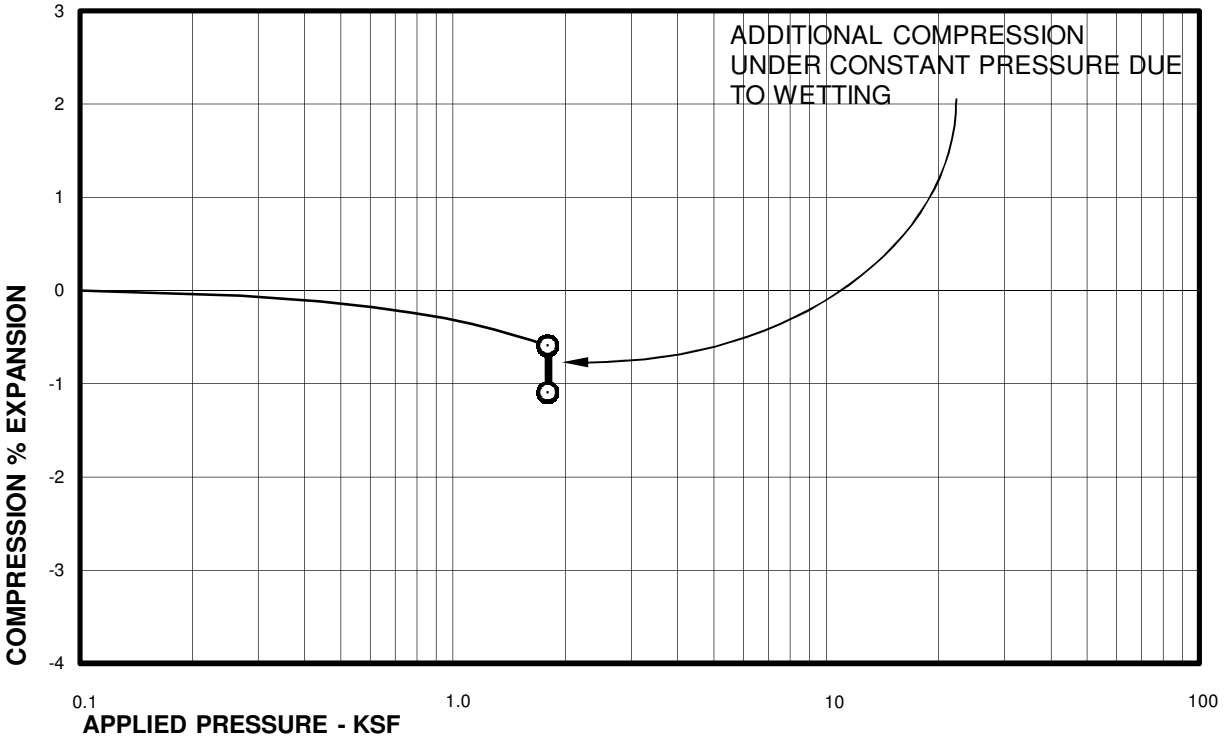
Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 108 PCF

From TH-10 AT 9 FEET MOISTURE CONTENT= 8.5 %

Swell Consolidation Test Results

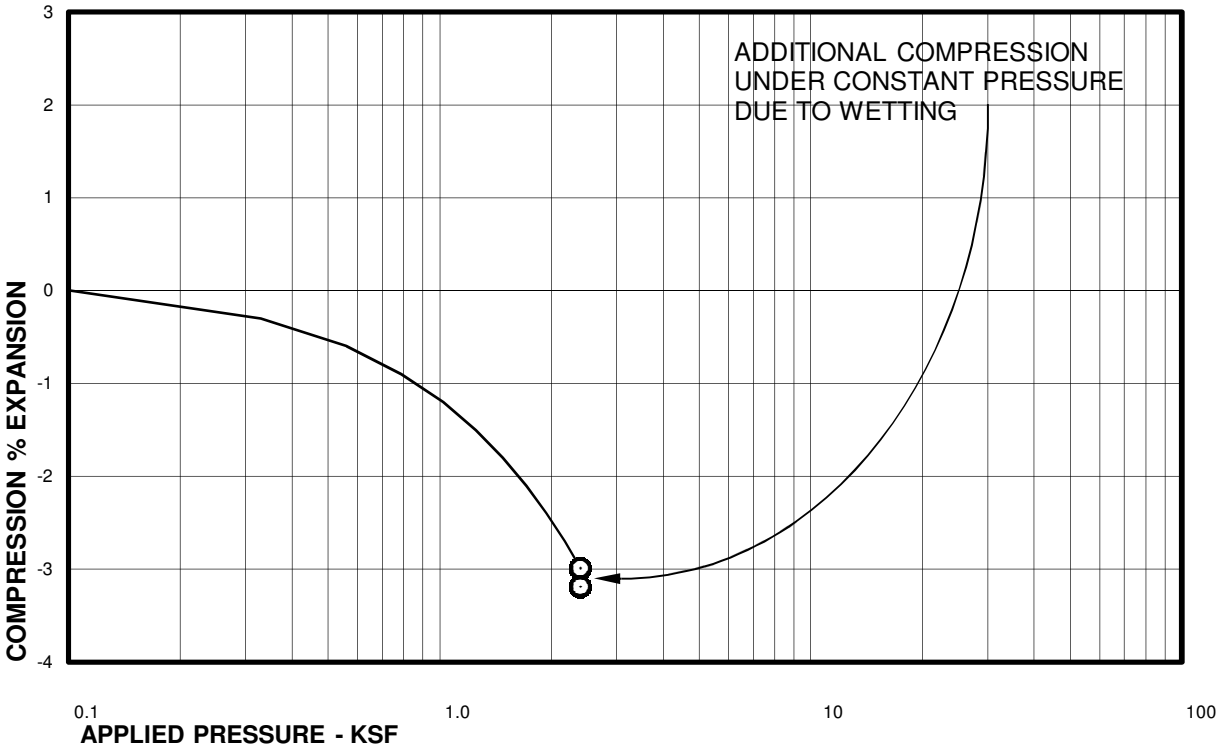
FIG. B-13

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 118 PCF

From TH-10 AT 14 FEET MOISTURE CONTENT= 7.2 %



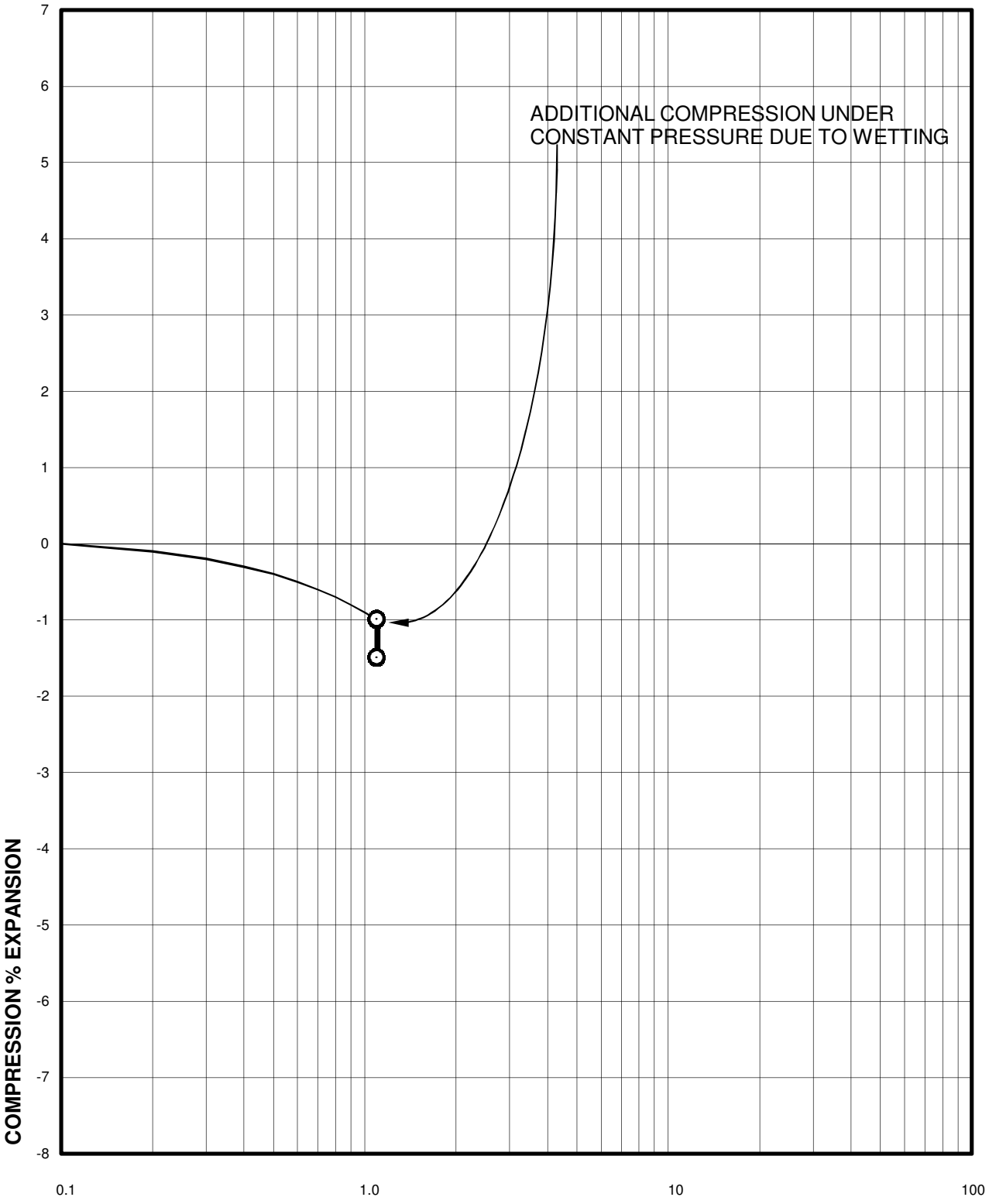
Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 112 PCF

From TH-10 AT 19 FEET MOISTURE CONTENT= 15.4 %

Swell Consolidation Test Results

FIG. B-14

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



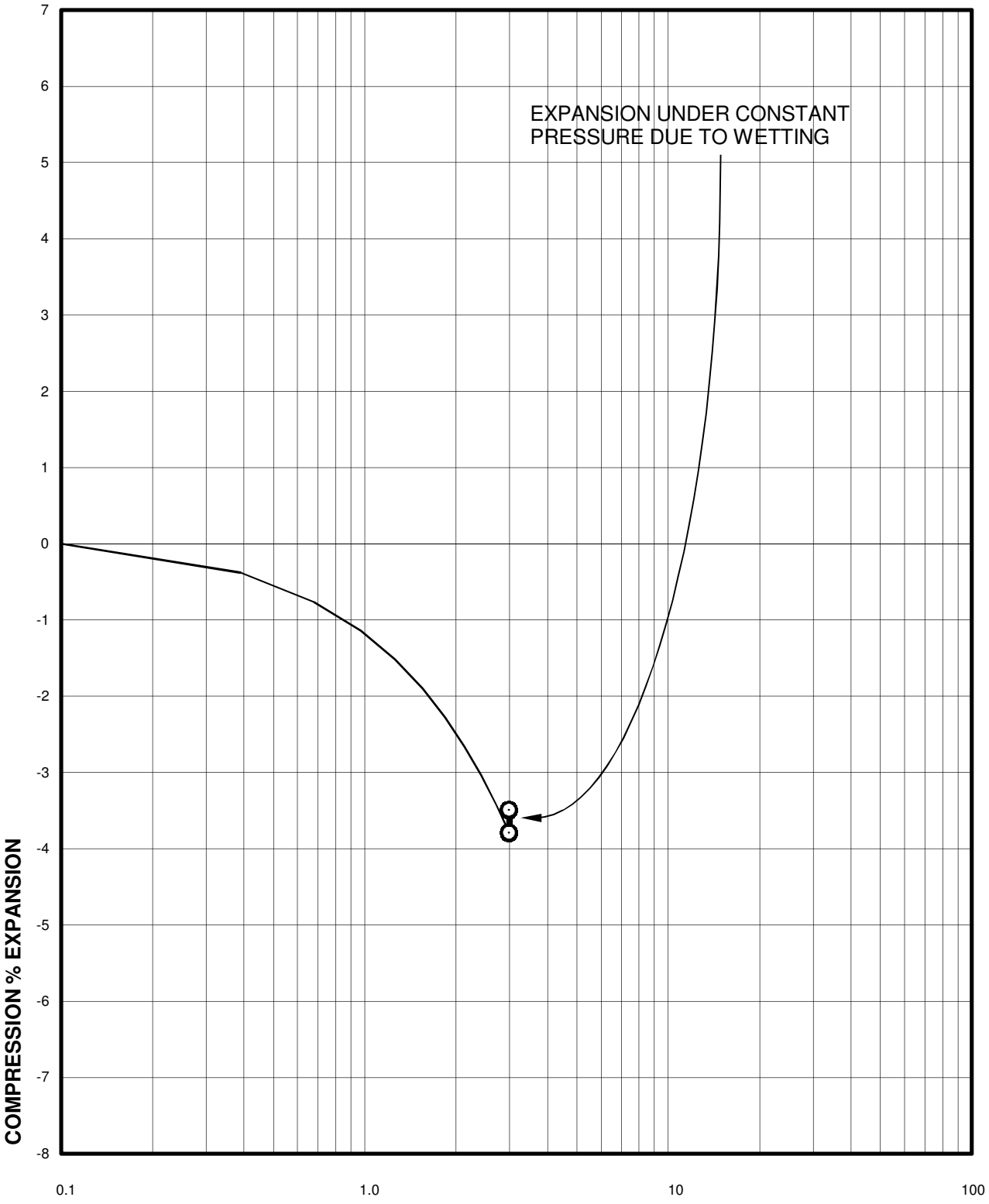
Sample of CLAY, SANDY (CL)
From TH-11 AT 9 FEET

DRY UNIT WEIGHT= 113 PCF
MOISTURE CONTENT= 13.5 %

Swell Consolidation Test Results

FIG. B-15

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



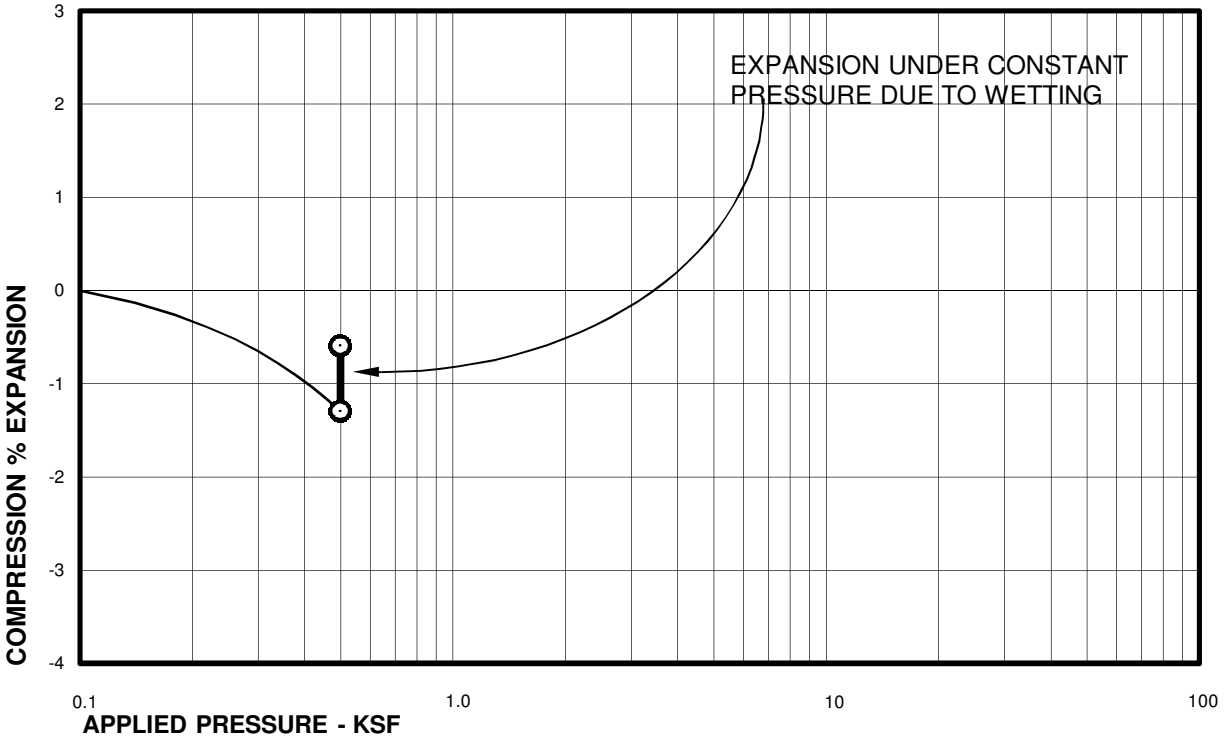
Sample of CLAYSTONE
From TH-11 AT 24 FEET

DRY UNIT WEIGHT= 116 PCF
MOISTURE CONTENT= 14.3 %

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm

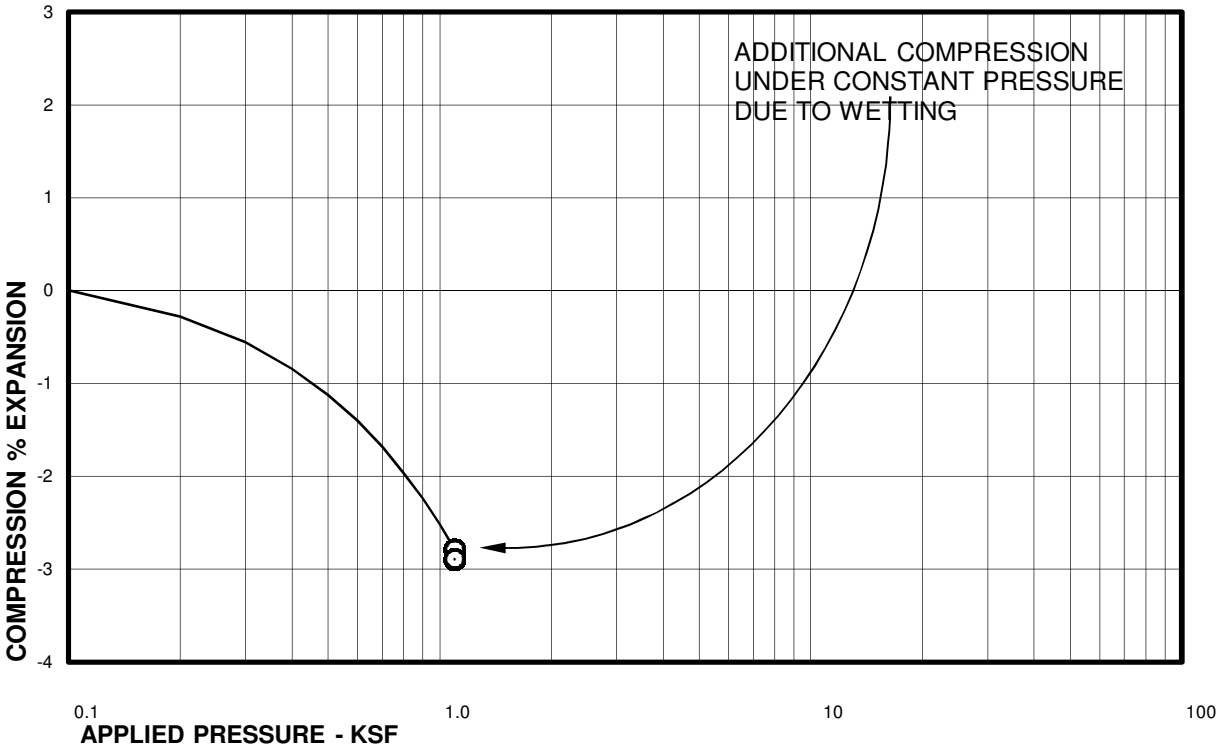
Swell Consolidation Test Results

FIG. B-16



Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 103 PCF

From TH-12 AT 4 FEET MOISTURE CONTENT= 22.3 %



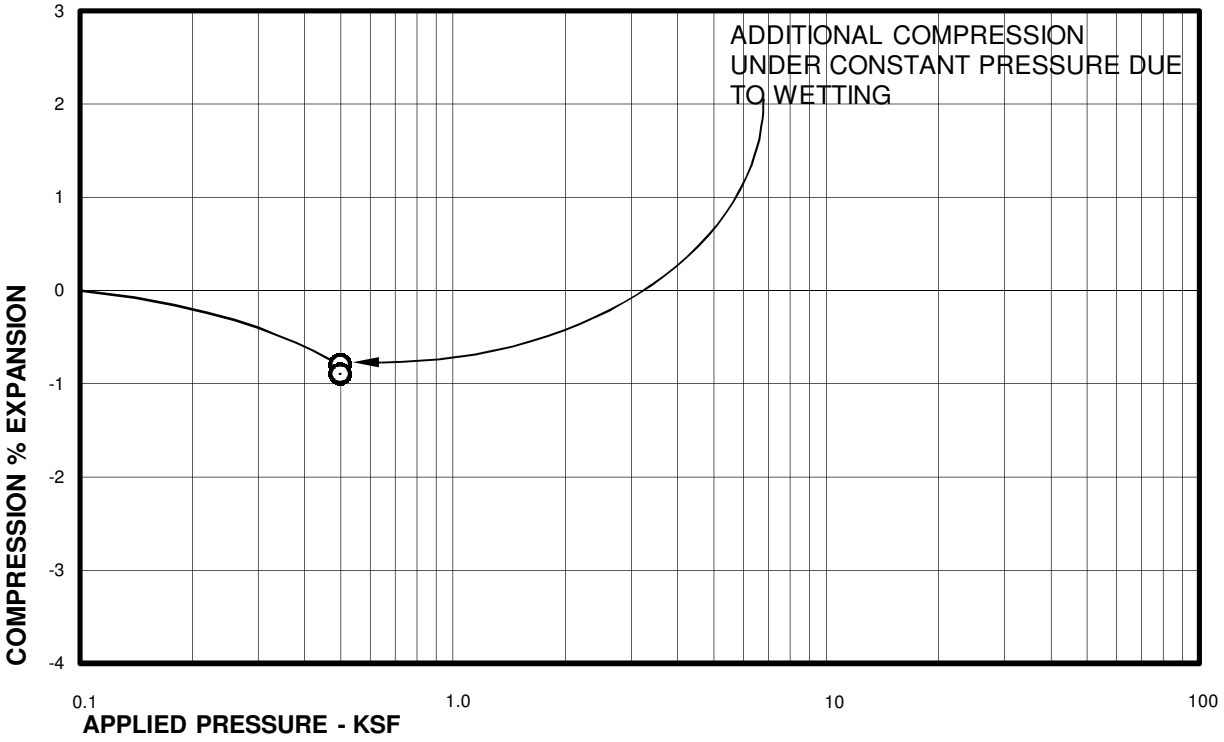
Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 106 PCF

From TH-13 AT 9 FEET MOISTURE CONTENT= 21.0 %

Swell Consolidation Test Results

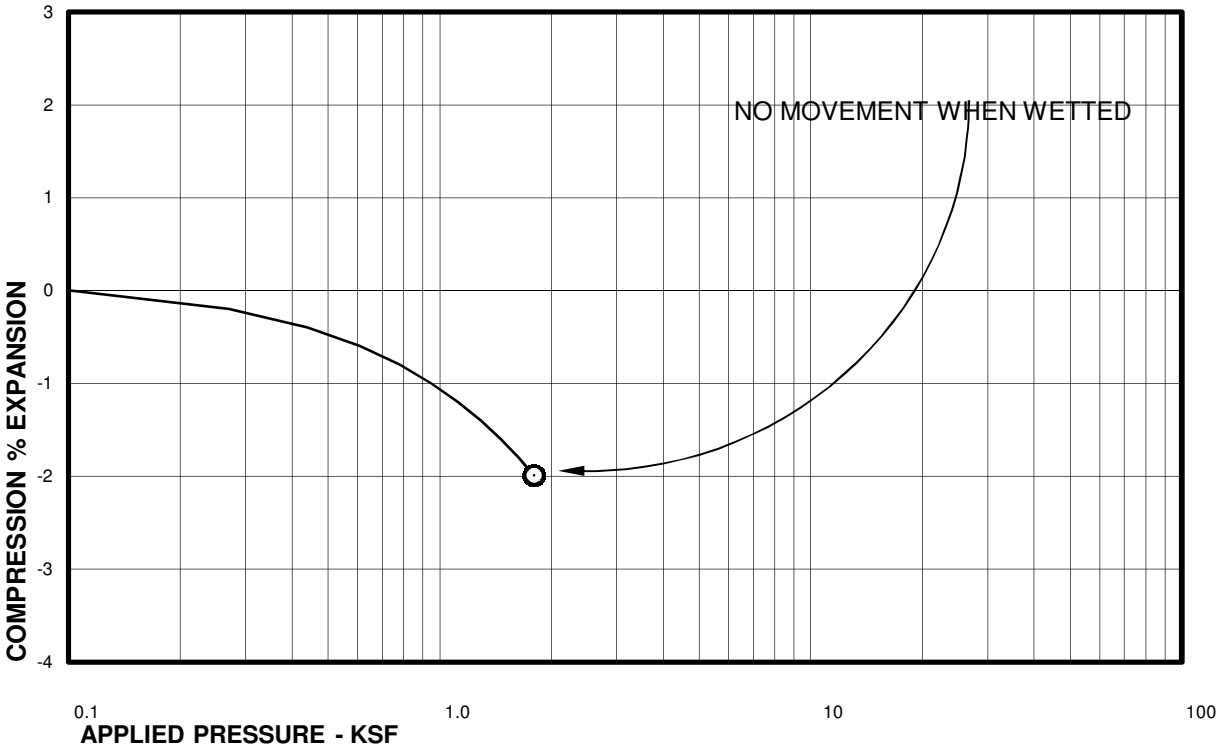
FIG. B-17

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 107 PCF

From TH-14 AT 4 FEET MOISTURE CONTENT= 15.0 %



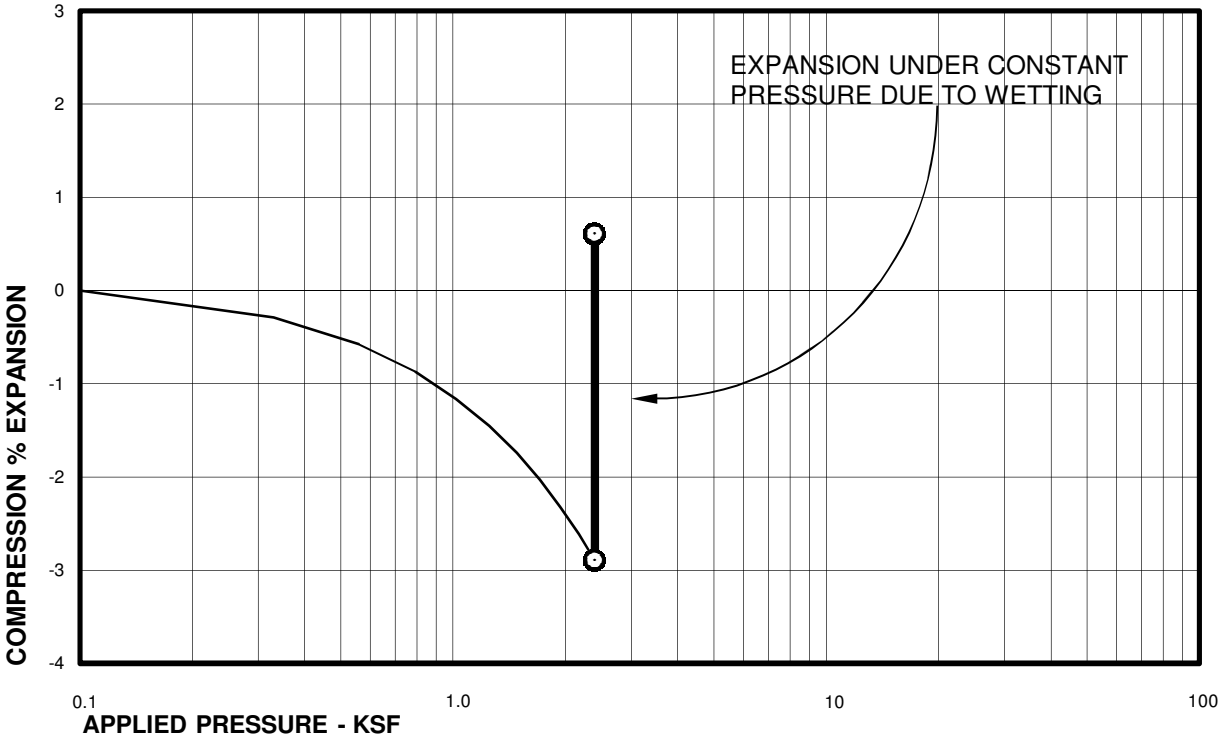
Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 118 PCF

From TH-15 AT 14 FEET MOISTURE CONTENT= 16.3 %

Swell Consolidation Test Results

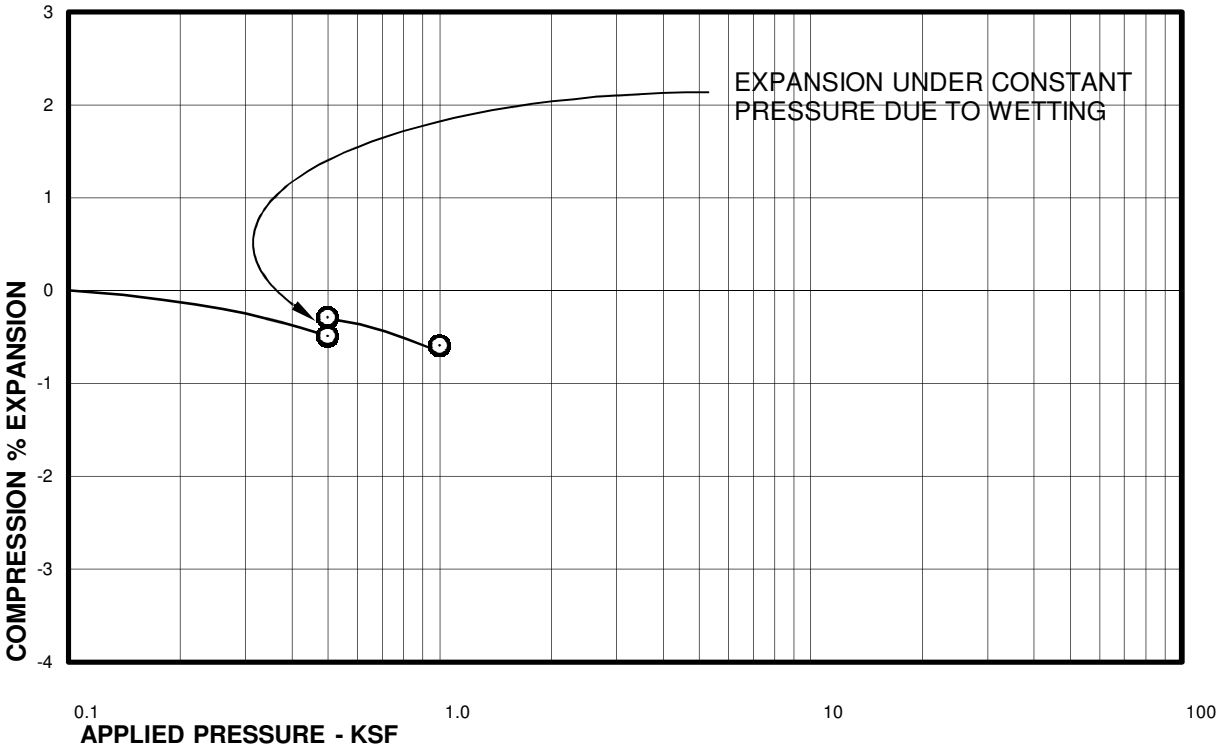
FIG. B-18

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



Sample of CLAYSTONE
From TH-15 AT 19 FEET

DRY UNIT WEIGHT= 105 PCF
MOISTURE CONTENT= 21.4 %



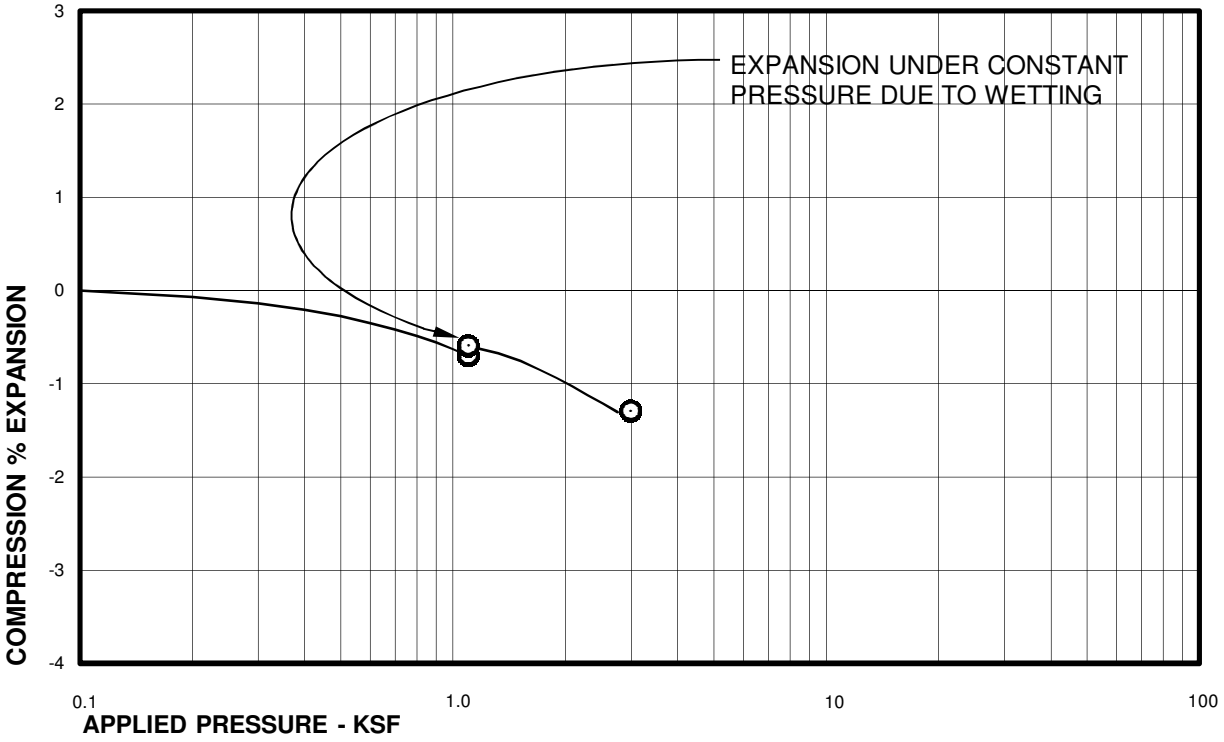
Sample of CLAY, SANDY (CL)
From TH-16 AT 4 FEET

DRY UNIT WEIGHT= 107 PCF
MOISTURE CONTENT= 9.9 %

Swell Consolidation Test Results

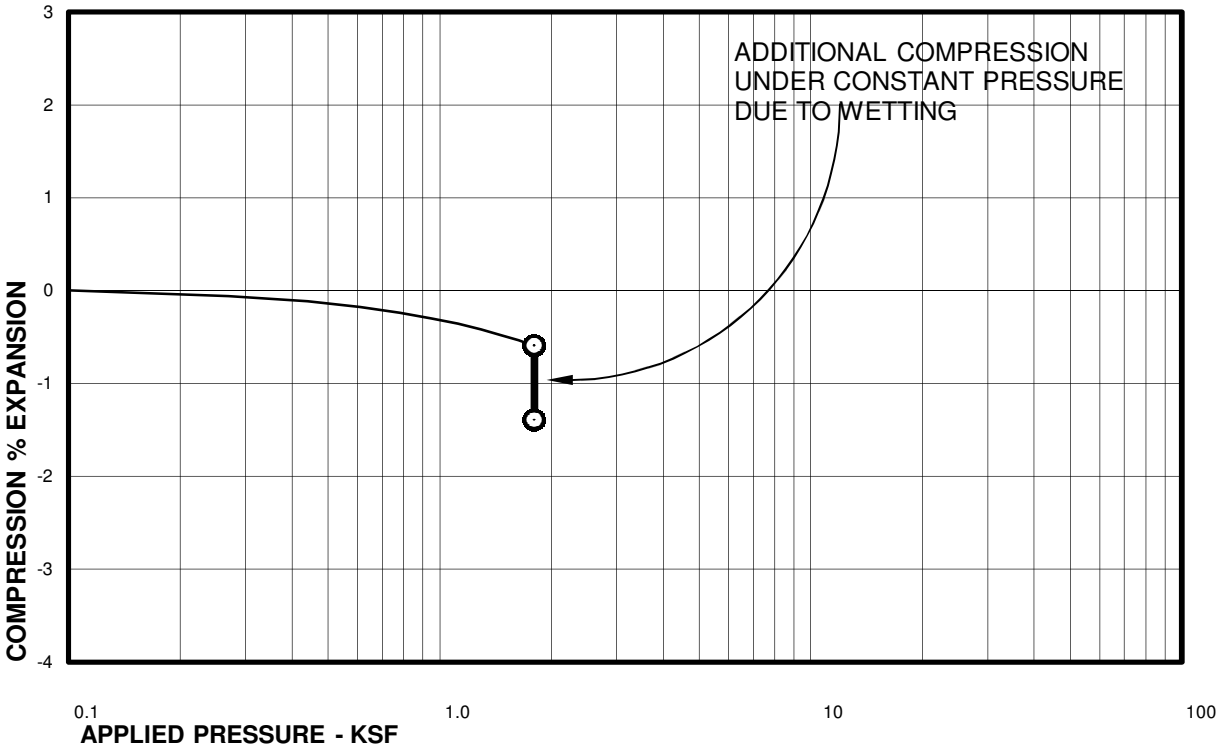
FIG. B-19

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= 118 PCF

From TH-16 AT 9 FEET MOISTURE CONTENT= 7.0 %



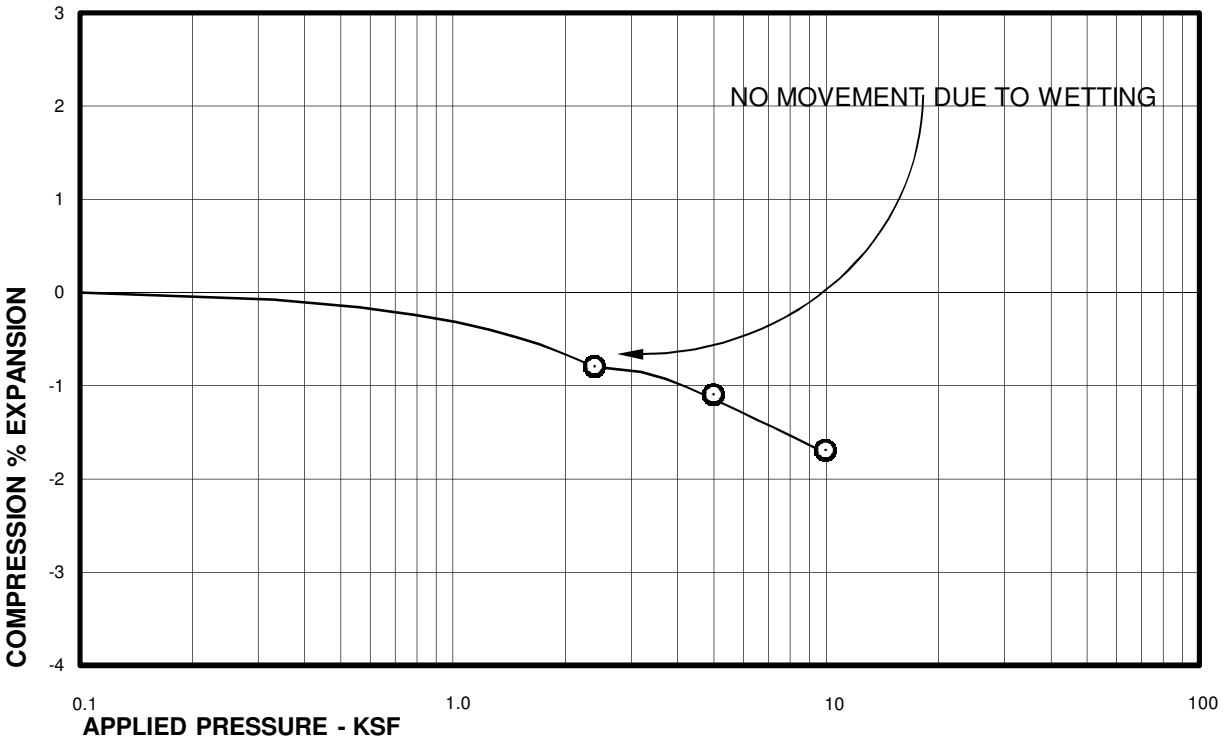
Sample of CLAY, SANDY (CL) DRY UNIT WEIGHT= PCF

From TH-16 AT 14 FEET MOISTURE CONTENT= 6.0 %

Swell Consolidation Test Results

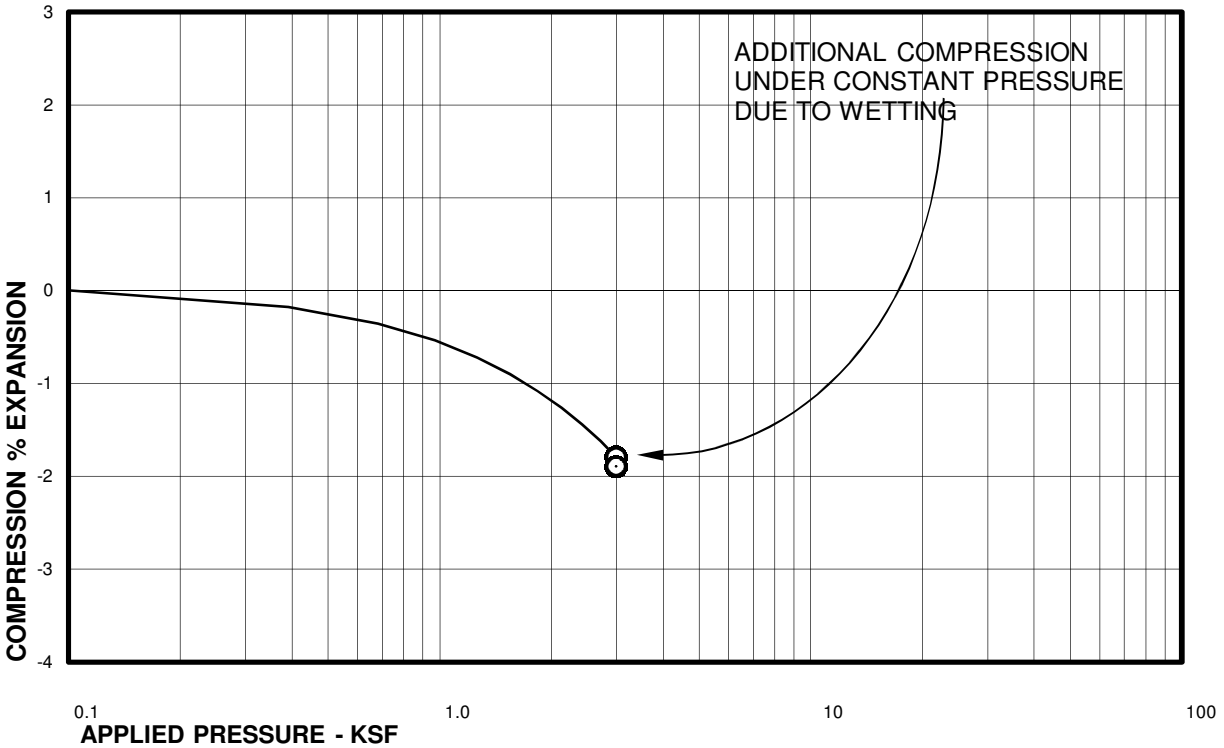
FIG. B-20

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



Sample of CLAY, SANDY (CL)
From TH-16 AT 19 FEET

DRY UNIT WEIGHT= 122 PCF
MOISTURE CONTENT= 7.8 %



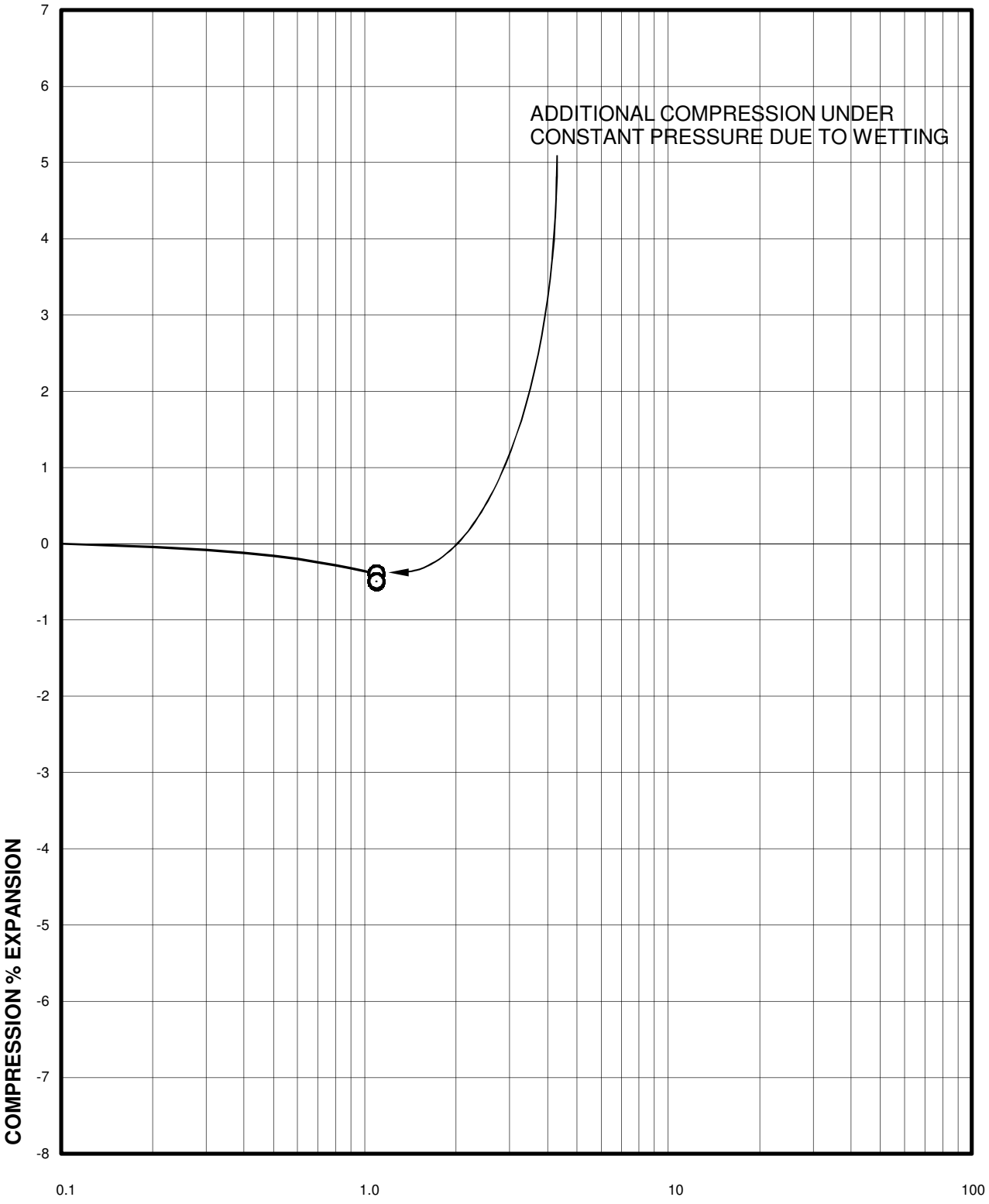
Sample of CLAY, SANDY (CL)
From TH-16 AT 24 FEET

DRY UNIT WEIGHT= 116 PCF
MOISTURE CONTENT= 11.6 %

Swell Consolidation Test Results

FIG. B-21

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



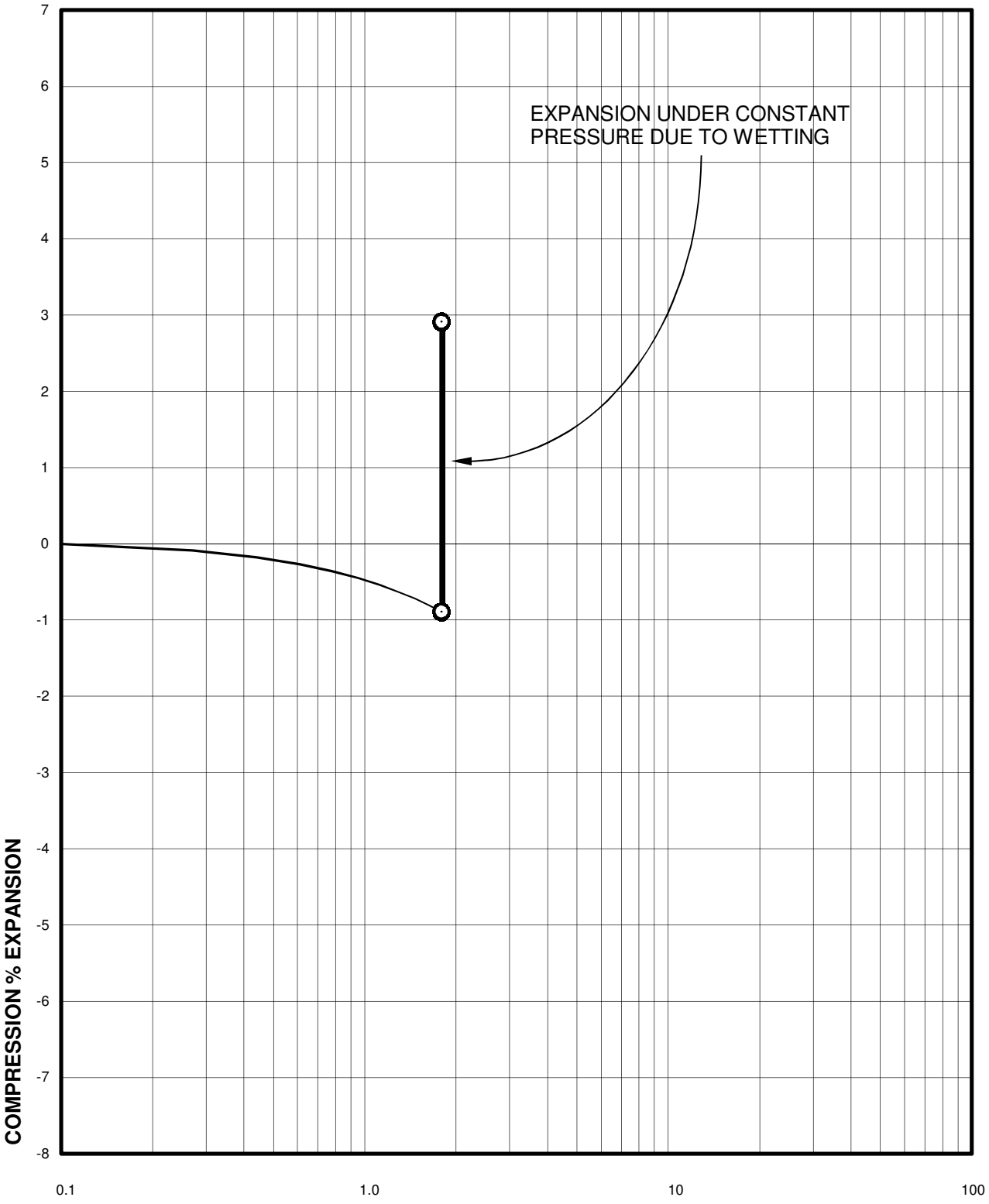
Sample of CLAY, SANDY (CL)
From TH-17 AT 9 FEET

DRY UNIT WEIGHT= 107 PCF
MOISTURE CONTENT= 7.1 %

Swell Consolidation Test Results

FIG. B-22

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



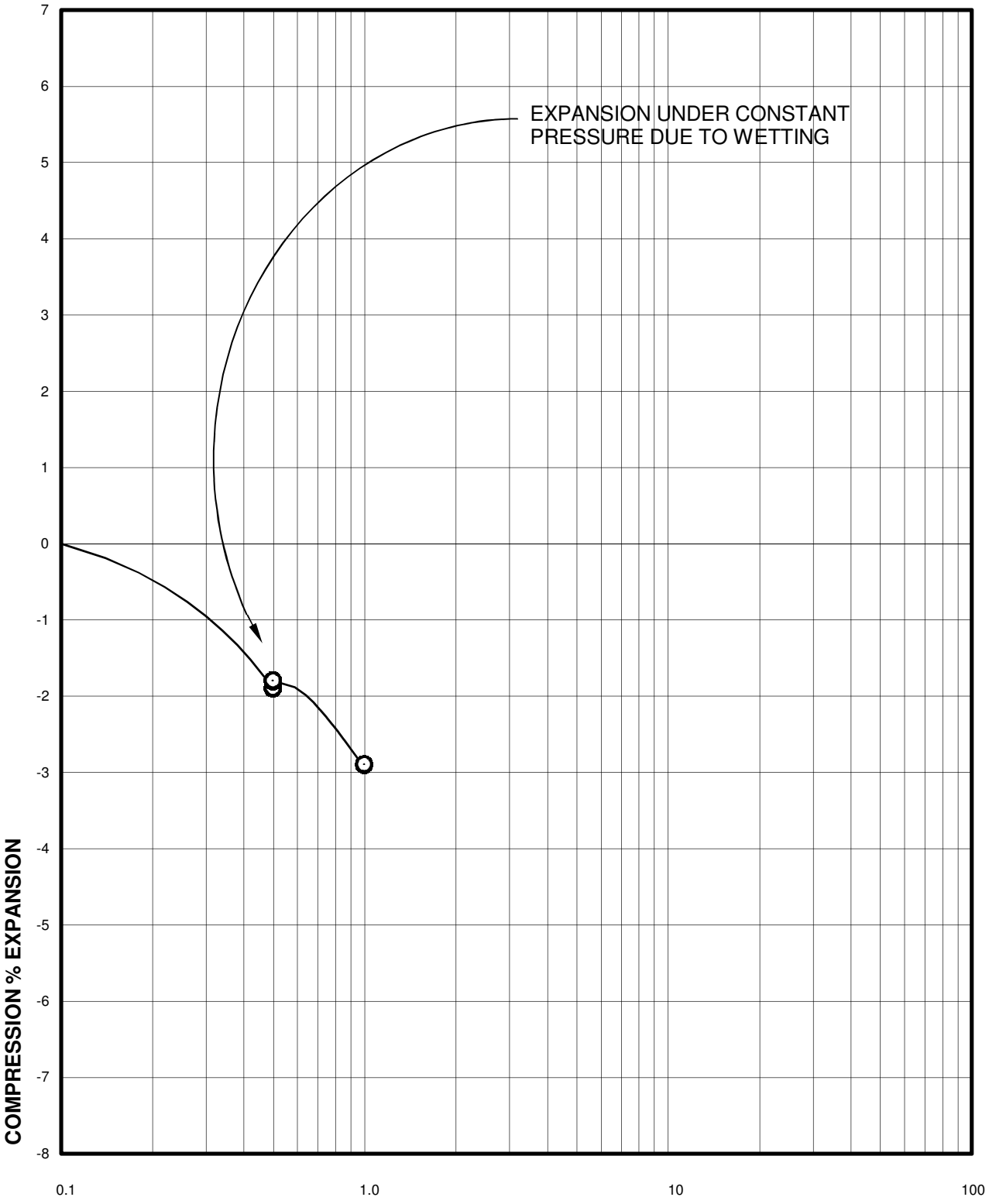
Sample of CLAY, SANDY (CL)
From TH-17 AT 14 FEET

DRY UNIT WEIGHT= 128 PCF
MOISTURE CONTENT= 11.1 %

Swell Consolidation Test Results

FIG. B-23

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



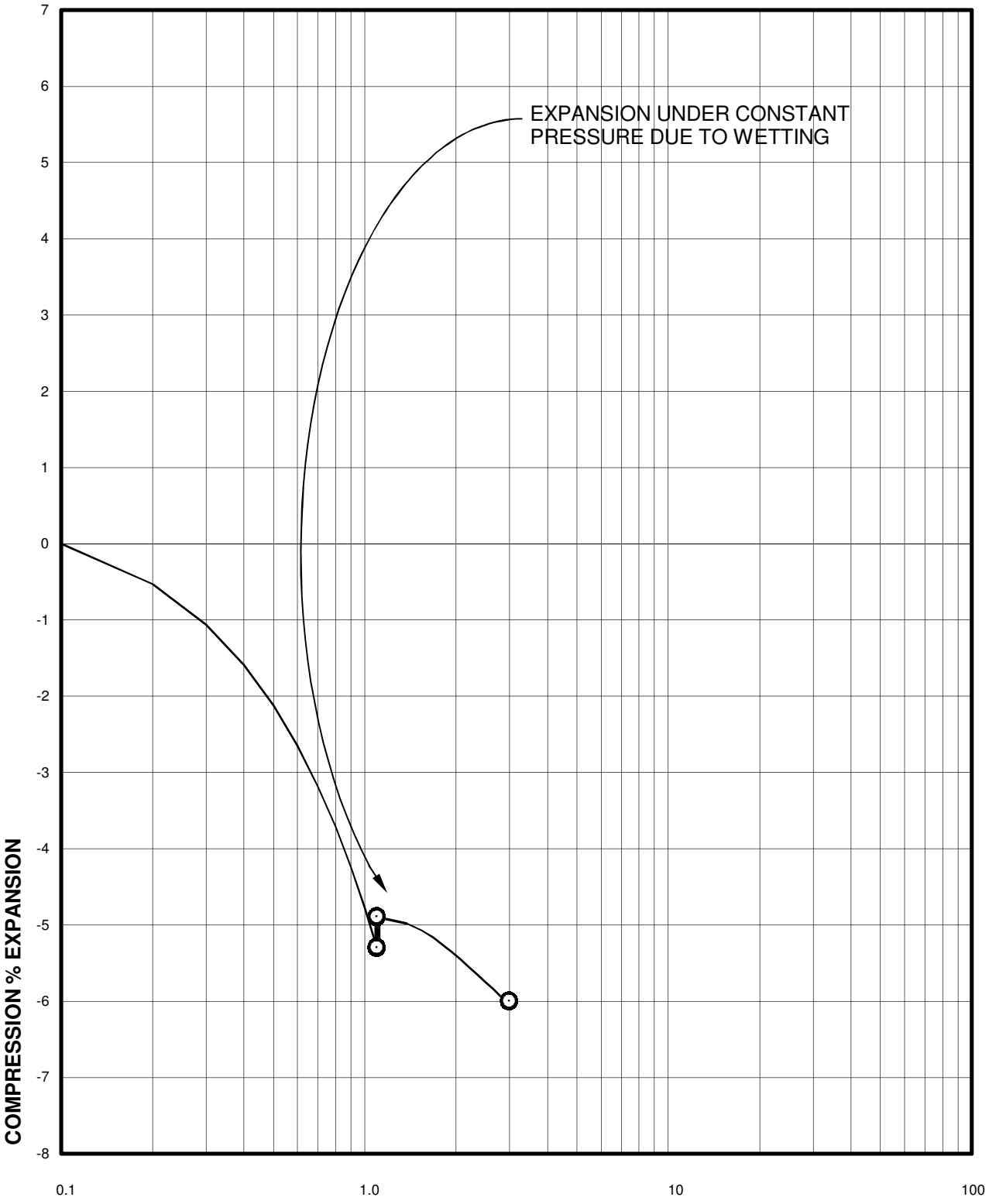
Sample of CLAY, SANDY (CL)
From TH-18 AT 4 FEET

DRY UNIT WEIGHT= 100 PCF
MOISTURE CONTENT= 22.0 %

Swell Consolidation Test Results

FIG. B-24

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



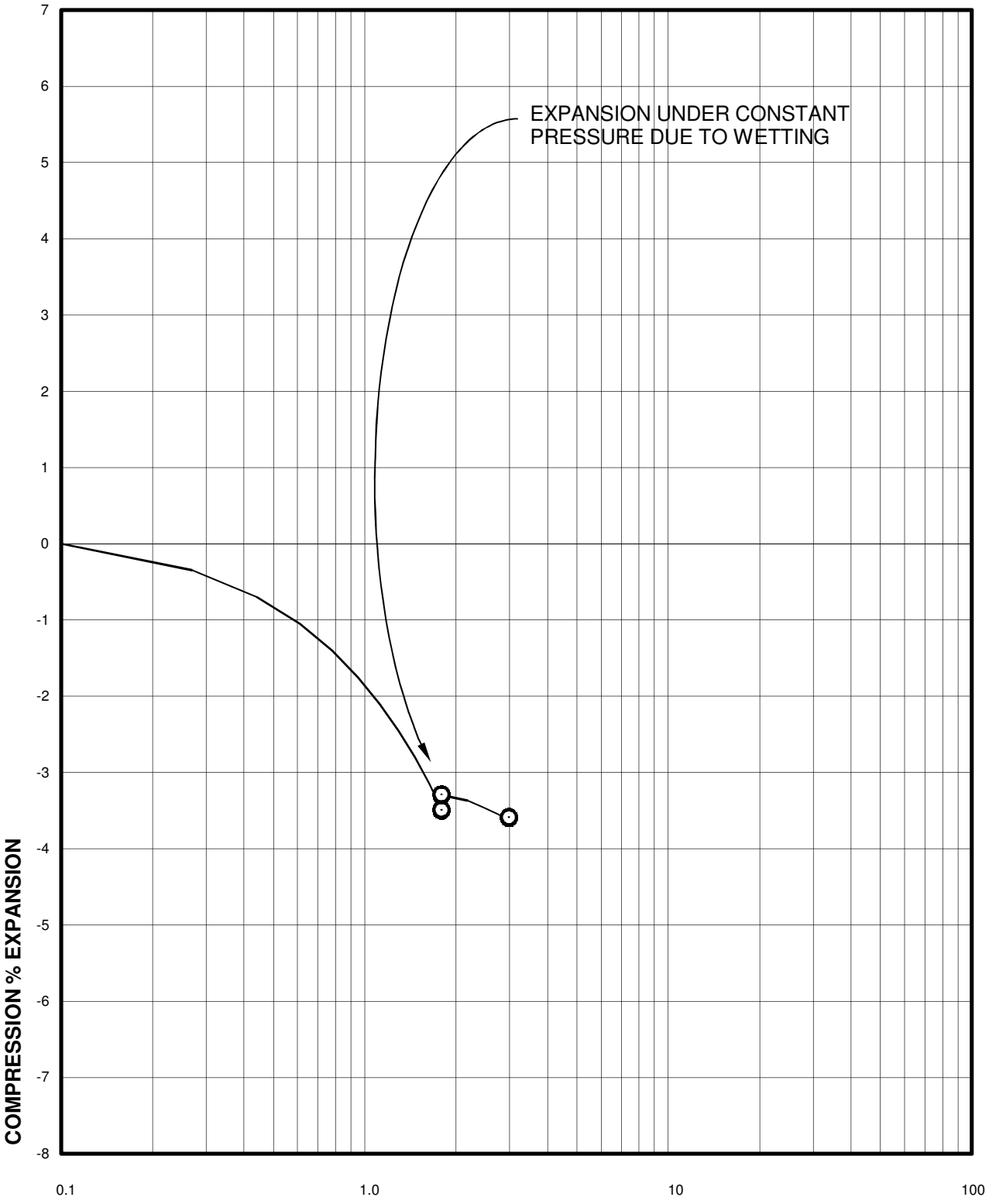
Sample of CLAY, SANDY (CL)
From TH-18 AT 9 FEET

DRY UNIT WEIGHT= 97 PCF
MOISTURE CONTENT= 25.9 %

Swell Consolidation Test Results

FIG. B-25

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



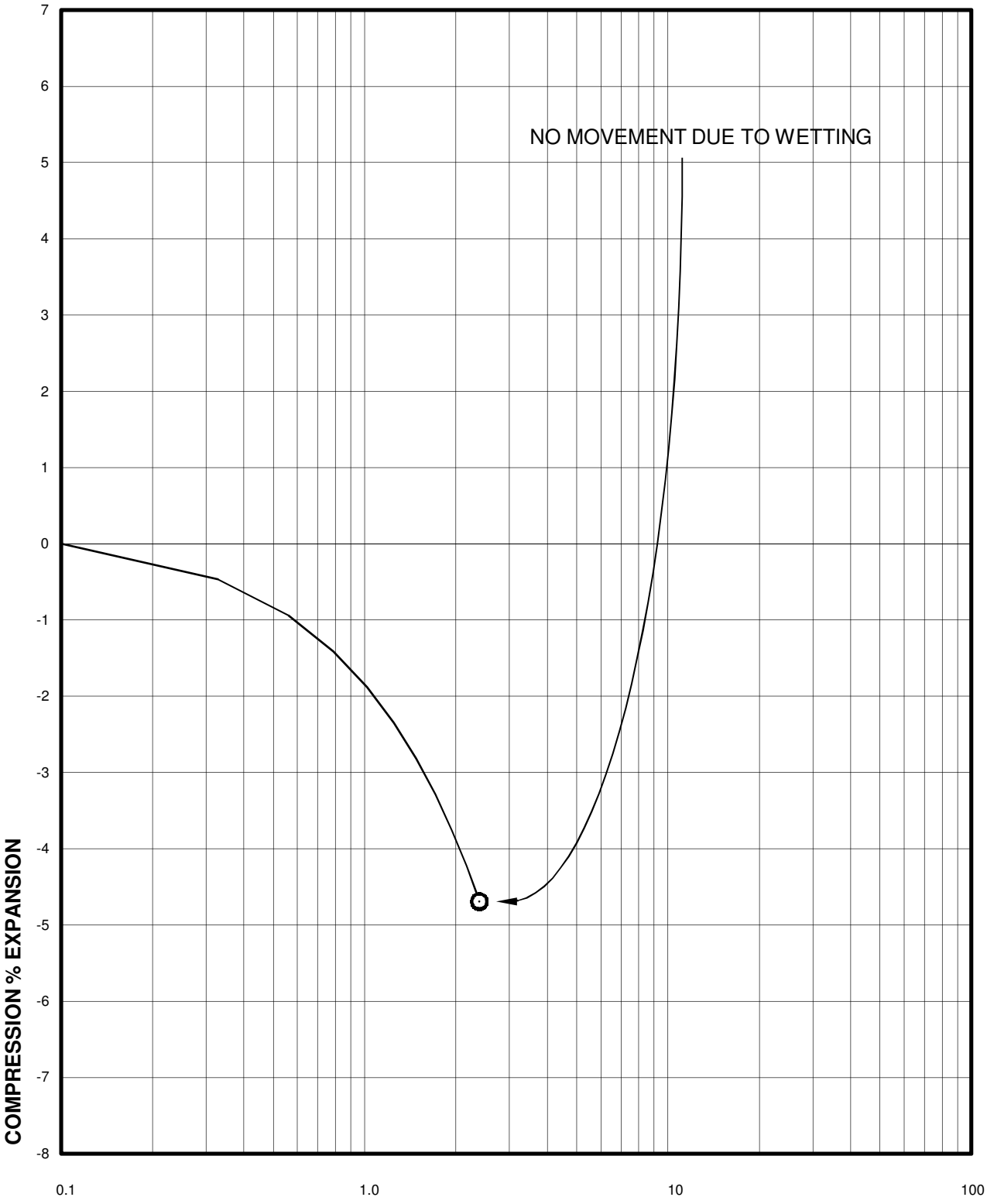
Sample of CLAY, SANDY (CL)
From TH-18 AT 14 FEET

DRY UNIT WEIGHT= 99 PCF
MOISTURE CONTENT= 25.9 %

Swell Consolidation Test Results

FIG. B-26

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



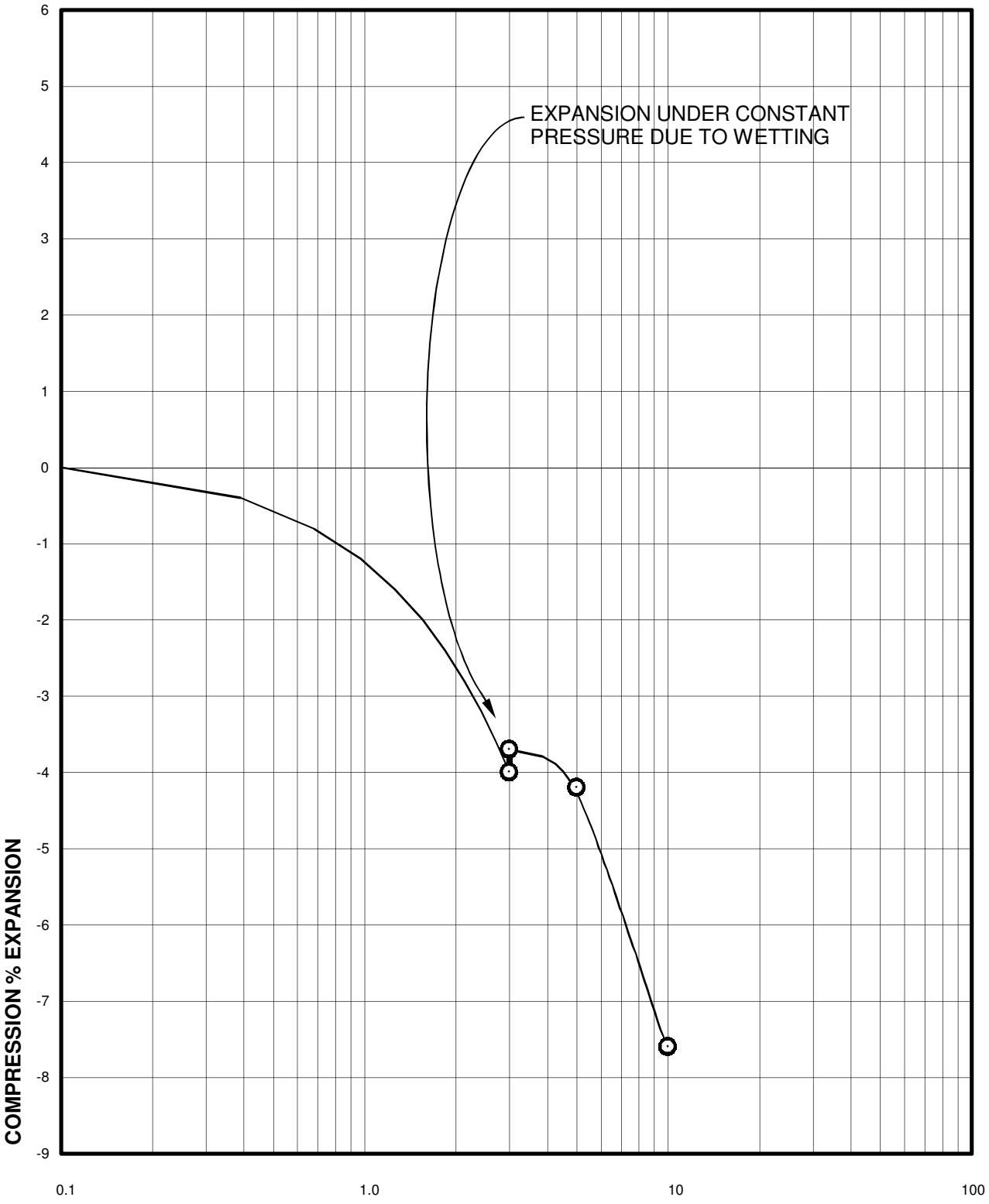
Sample of INTERLAYERED CLAY/SAND
From TH-18 AT 19 FEET

DRY UNIT WEIGHT= 104 PCF
MOISTURE CONTENT= 20.6 %

Swell Consolidation Test Results

FIG. B-27

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



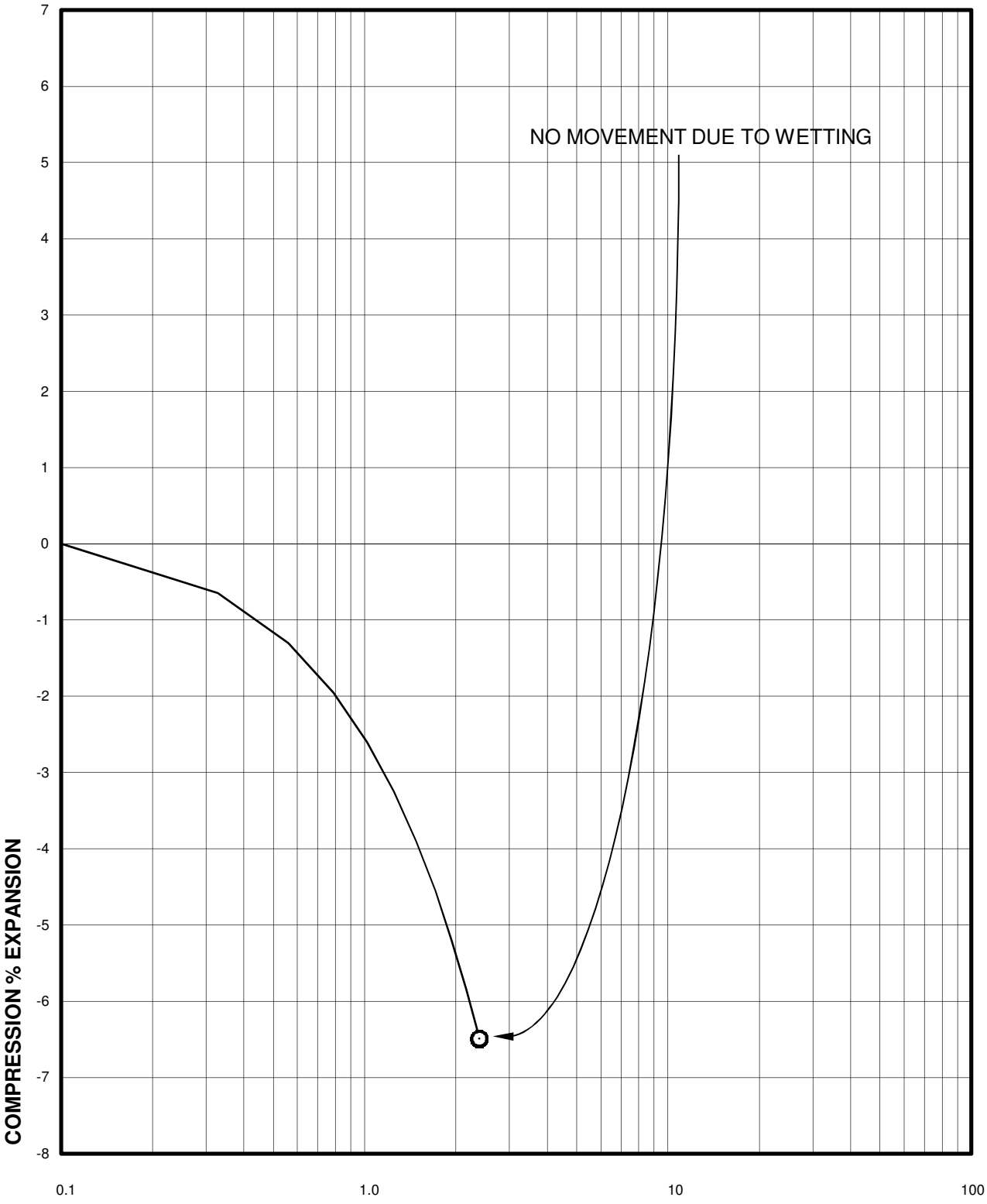
Sample of CLAY, SANDY (CL)
From TH-18 AT 24 FEET

DRY UNIT WEIGHT= 100 PCF
MOISTURE CONTENT= 25.4 %

Swell Consolidation Test Results

FIG. B-28

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



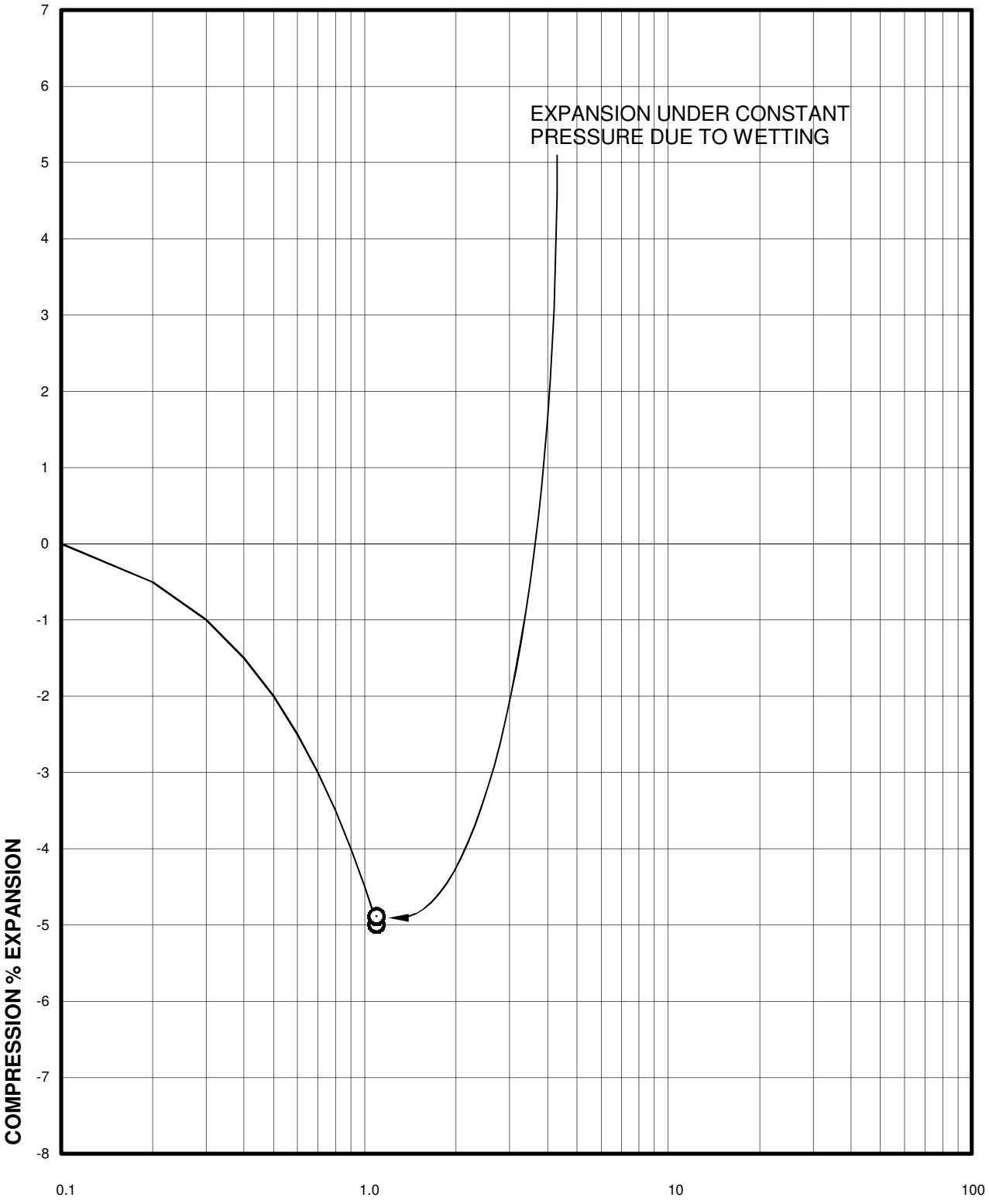
Sample of CLAY, SANDY (CL)
From TH-19 AT 19 FEET

DRY UNIT WEIGHT= 101 PCF
MOISTURE CONTENT= 23.7 %

Swell Consolidation Test Results

FIG. B-29

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



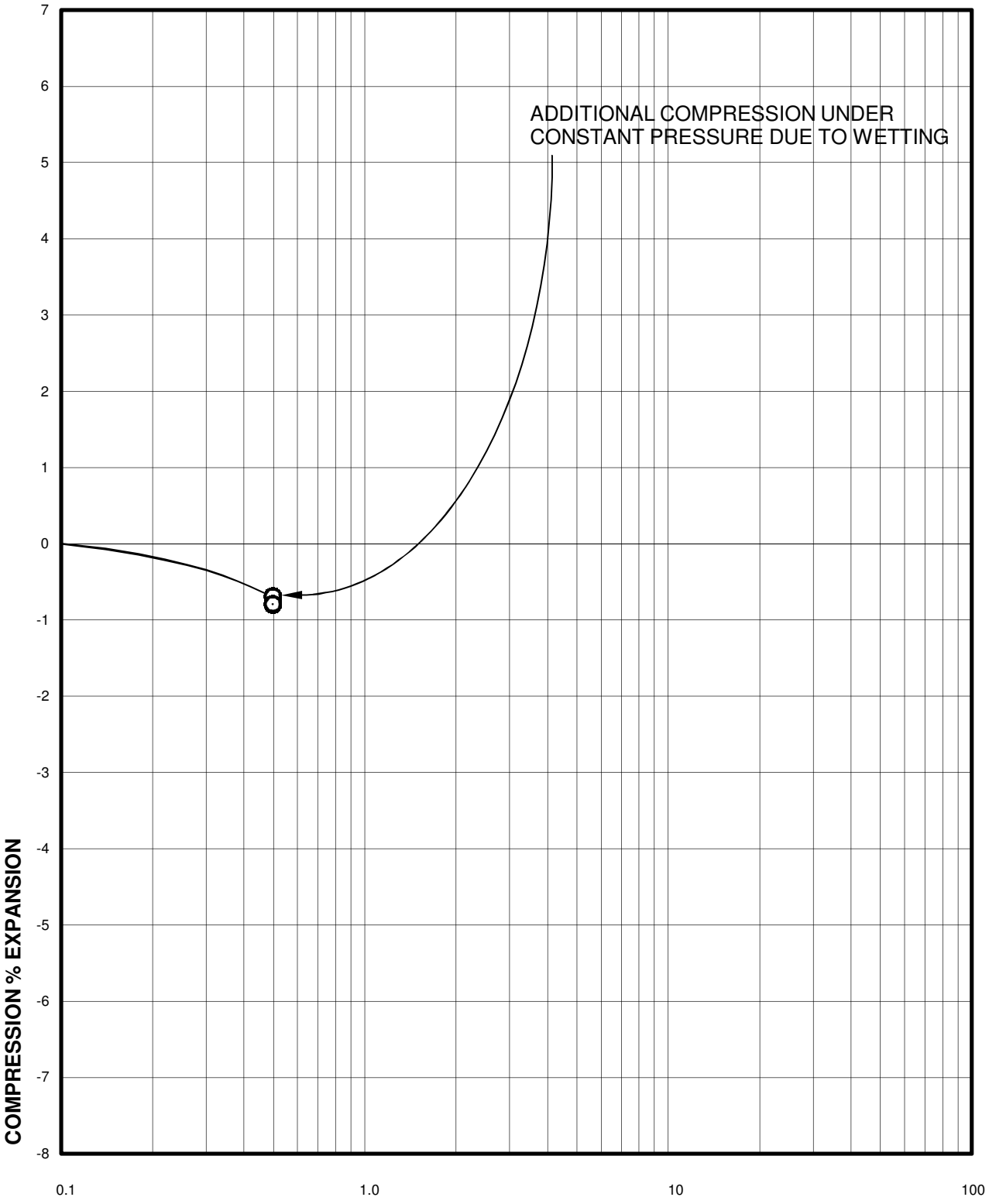
Sample of INTERLAYERED CLAY/SAND
From TH-20 AT 9 FEET

DRY UNIT WEIGHT= 96 PCF
MOISTURE CONTENT= 26.7 %

Swell Consolidation Test Results

FIG. B-30

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



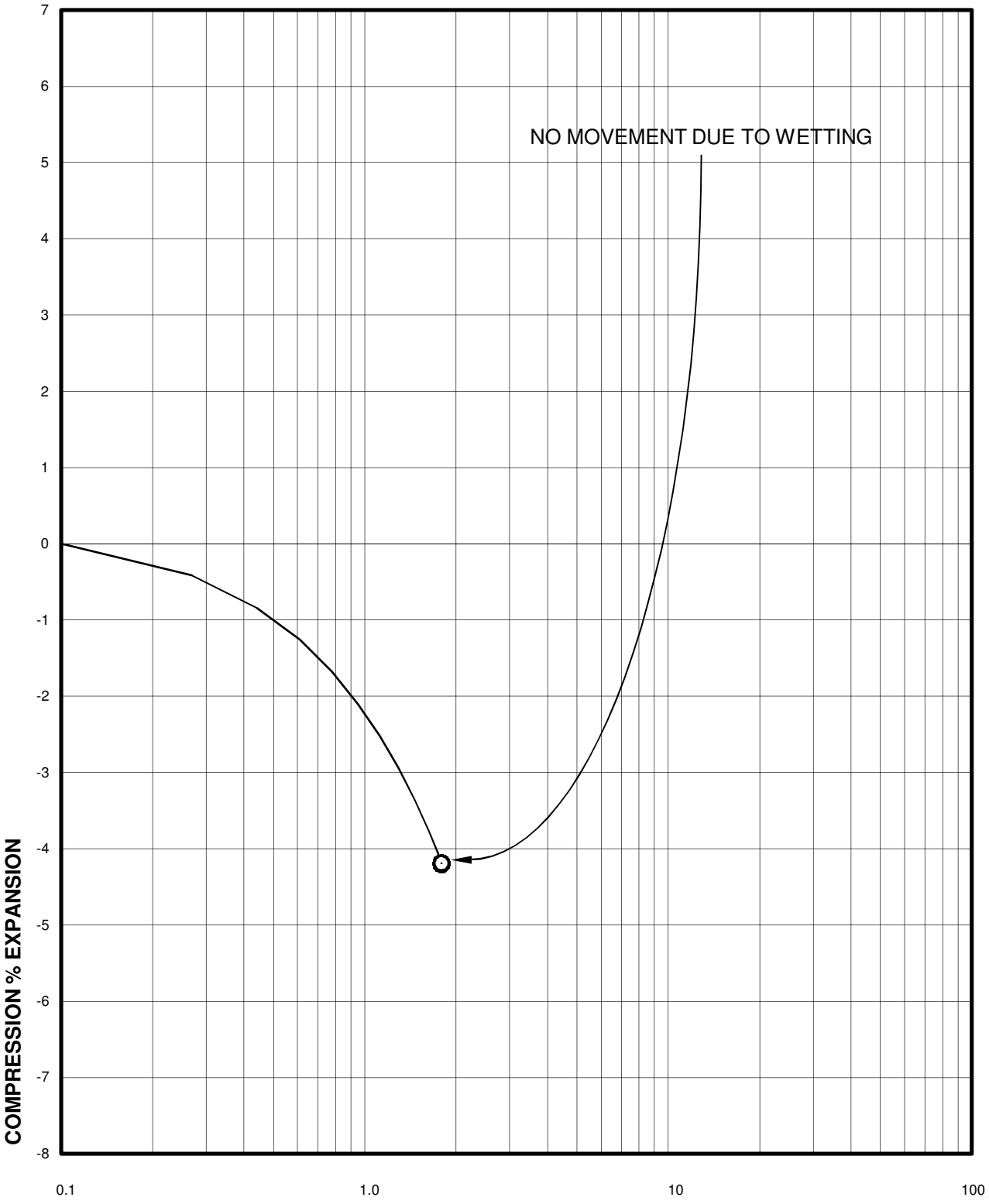
Sample of CLAY, SANDY (CL)
From TH-21 AT 4 FEET

DRY UNIT WEIGHT= 110 PCF
MOISTURE CONTENT= 13.8 %

Swell Consolidation Test Results

FIG. B-31

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



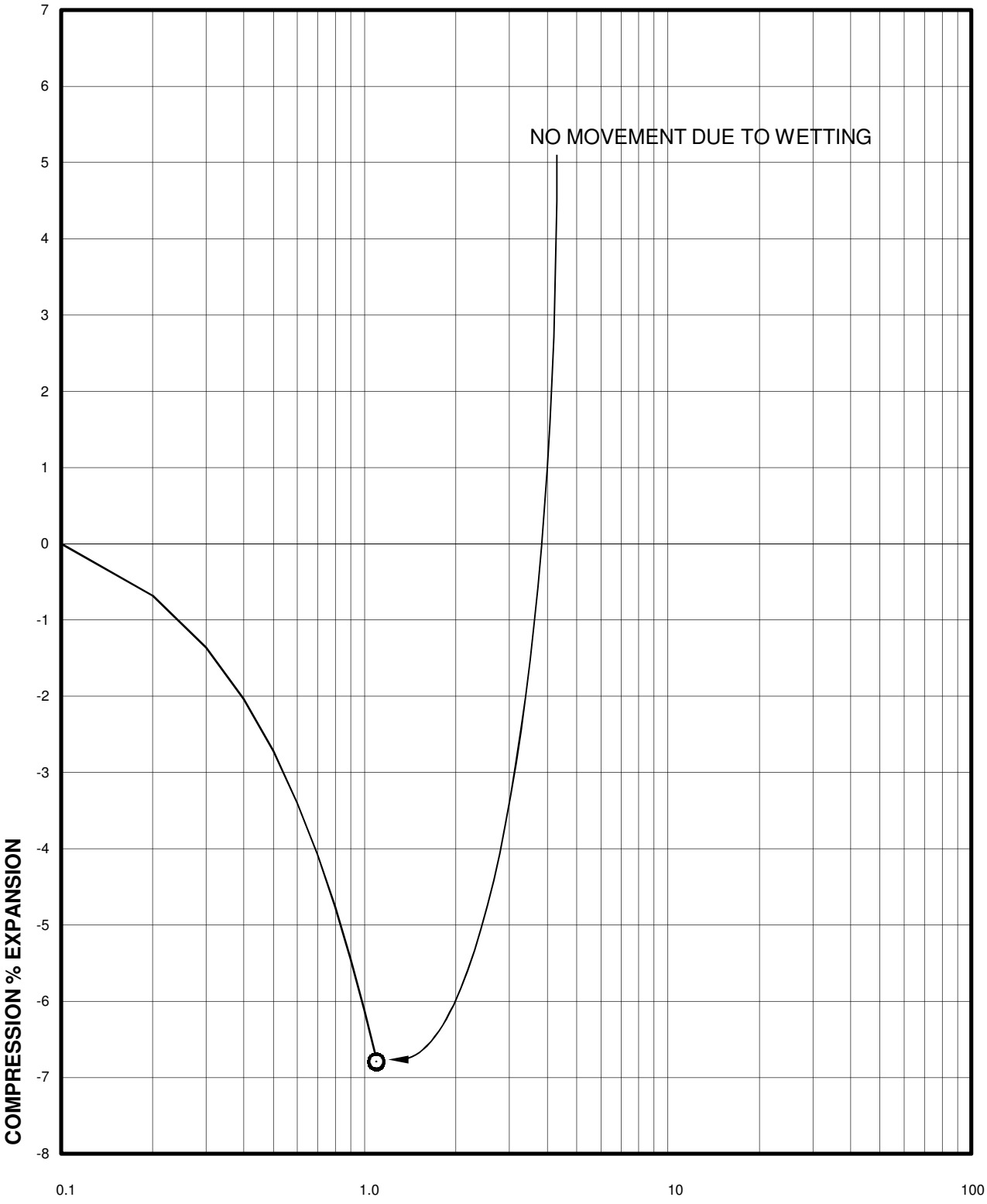
Sample of CLAY, SANDY (CL)
From TH-21 AT 14 FEET

DRY UNIT WEIGHT= 106 PCF
MOISTURE CONTENT= 20.4 %

Swell Consolidation Test Results

FIG. B-32

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm



Sample of CLAY, SANDY (CL)
From TH-22 AT 9 FEET

DRY UNIT WEIGHT= 96 PCF
MOISTURE CONTENT= 27.4 %

Swell Consolidation Test Results

FIG. B-33

OEO, LLC
ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115
S:\PROJECTS\48200\DN48284.000\115\2. Reports\R1\DN48284-115-R1-X1(SWELL).xlsm

TABLE B - I

SUMMARY OF LABORATORY TEST RESULTS

BORING	DEPTH (ft)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL TEST DATA				ATTERBERG LIMITS		UNCONFINED COMPRESSIVE STRENGTH (psf)	SOLUBLE SULFATE CONTENT (%)	PASSING NO. 200 SIEVE (%)	SOIL TYPE
				SWELL (%)	COMPRESSION (%)	APPLIED PRESSURE (psf)	SWELL PRESSURE (psf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)				
TH-1	4	18.6	106		0.1	500							CLAY, SANDY (CL)
TH-1	9	9.5	116	0.3		1,100							CLAY, SANDY (CL)
TH-1	14	9.3	117		1.9	1,800							CLAY, SANDY (CL)
TH-2	4	22.9	99		0.2	500							CLAY, SANDY (CL)
TH-2	9	5.8	97		4.6	1,100							SAND, SILTY (SM)
TH-2	14	7.1	102		1.6	1,800							SAND, SILTY (SM)
TH-2	19	18.5	102		0.7	2,400							CLAY, SANDY (CL)
TH-3	4	19.4	105	0.2		500							CLAY, SANDY (CL)
TH-3	9	10.2	116	0.7		1,100							CLAY, SANDY (CL)
TH-4	4	19.1	104	0.6		500							CLAY, SANDY (CL)
TH-4	14	7.3	125					24	10			22	GRAVEL, SILTY (GM)
TH-5	4	25.8	97		0.1	500					0.08		CLAY, SANDY (CL)
TH-5	19	23.4	103	0.0		2,400							SANDSTONE
TH-5	24	18.8	117	0.4		3,000							CLAYSTONE
TH-6	4	14.6	113					29	17			45	SAND, CLAYEY (SC)
TH-6	9	10.4	120	3.4		1,100							CLAY, SANDY (CL)
TH-7	4	18.8	96		0.1	500							CLAY, SANDY (CL)
TH-7	19	17.6	112	1.8		2,400							CLAYSTONE
TH-8	4	18.3	108	0.5		500							CLAY, SANDY (CL)
TH-8	14	20.7	104	0.7		1,800							CLAY, SANDY (CL)
TH-8	19	33.0	88	5.9		2,400							WEATHERED CLAYSTONE
TH-9	4	20.5	102	0.0		500							CLAY, SANDY (CL)
TH-9	9	13.1	117	0.1		1,100							GRAVEL, SANDY (GP)
TH-10	4	13.1	110		0.1	500							CLAY, SANDY (CL)
TH-10	9	8.5	108		1.2	1,100							CLAY, SANDY (CL)
TH-10	14	7.2	118		0.5	1,800							CLAY, SANDY (CL)
TH-10	19	15.4	112		0.2	2,400							CLAY, SANDY (CL)
TH-11	9	13.5	113		0.5	1,100							CLAY, SANDY (CL)
TH-11	24	14.3	116	0.3		3,000							CLAYSTONE
TH-12	4	22.3	103	0.7		500					0.03		CLAY, SANDY (CL)
TH-13	9	21.0	106		0.1	1,100							CLAY, SANDY (CL)
TH-14	4	15.0	107		0.1	500							CLAY, SANDY (CL)
TH-15	9	23.2	105							2,600			CLAY, SANDY (CL)
TH-15	14	16.3	118	0.0		1,800							CLAY, SANDY (CL)
TH-15	19	21.4	105	3.5		2,400							CLAYSTONE
TH-16	4	9.9	107	0.2		500	900						CLAY, SANDY (CL)
TH-16	9	7.0	118	0.1		1,100	1,500						CLAY, SANDY (CL)
TH-16	14	6.0			0.8	1,800							CLAY, SANDY (CL)
TH-16	19	7.8	122	0.0		2,400							CLAY, SANDY (CL)
TH-16	24	11.6	116		0.1	3,000							CLAY, SANDY (CL)
TH-17	9	7.1	107		0.1	1,100							CLAY, SANDY (CL)
TH-17	14	11.1	128	3.8		1,800							CLAY, SANDY (CL)
TH-18	4	22.0	100	0.1		500	650						CLAY, SANDY (CL)
TH-18	9	25.9	97	0.4		1,100	1,900						CLAY, SANDY (CL)
TH-18	14	25.9	99	0.2		1,800	2,800						CLAY, SANDY (CL)
TH-18	19	20.6	104	0.0		2,400							INTERLAYERED CLAY/SAND
TH-18	24	25.4	100	0.3		3,000	4,500						CLAY, SANDY (CL)
TH-19	19	23.7	101	0.0		2,400							CLAY, SANDY (CL)
TH-20	4	22.9	100					30	17			49	INTERLAYERED CLAY/SAND

TABLE B - I

SUMMARY OF LABORATORY TEST RESULTS

BORING	DEPTH (ft)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL TEST DATA				ATTERBERG LIMITS		UNCONFINED COMPRESSIVE STRENGTH (psf)	SOLUBLE SULFATE CONTENT (%)	PASSING NO. 200 SIEVE (%)	SOIL TYPE
				SWELL (%)	COMPRESSION (%)	APPLIED PRESSURE (psf)	SWELL PRESSURE (psf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)				
TH-20	9	26.7	96	0.1		1,100							INTERLAYERED CLAY/SAND
TH-21	4	13.8	110		0.1	500					0.36		CLAY, SANDY (CL)
TH-21	14	20.4	106	0.0		1,800							CLAY, SANDY (CL)
TH-22	4	23.8	101									47	SAND, CLAYEY (SC)
TH-22	9	27.4	96	0.0		1,100							CLAY, SANDY (CL)

APPENDIX C

GUIDELINE SITE GRADING AND SUB-EXCAVATION SPECIFICATIONS

GUIDELINE SITE GRADING AND SUB-EXCAVATION SPECIFICATIONS

Erie Assemblage
Erie, Colorado

1. DESCRIPTION

This item shall consist of the excavation, transportation, placement and compaction of materials from locations indicated on the plans, or staked by the Engineer, as necessary to achieve preliminary street and overlot elevations. These specifications shall also apply to compaction of excess cut materials that may be placed outside of the development boundaries.

2. GENERAL

The Soils Representative shall be the Owner's representative. The Soils Representative shall approve fill materials, method of placement, moisture contents and percent compaction, and shall give written approval of the completed fill.

3. CLEARING JOB SITE

The Contractor shall substantially remove debris, vegetation, organic matter, and other deleterious materials before excavation or fill placement is begun. The Contractor shall dispose of the cleared material to provide the Owner with a clean, neat appearing job site. Cleared material shall not be placed in areas to receive fill or where the material will support structures of any kind.

4. AREA TO BE FILLED

Debris, vegetation, organic matter, and other deleterious materials shall be substantially removed from the ground surface upon which fill is to be placed. The surface shall then be plowed or scarified until the surface is free from ruts, hummocks or other uneven features, which would prevent uniform compaction.

After the foundation for the fill has been cleared and scarified, it shall be disked or bladed until it is free from large clods, brought to the proper moisture content (0 to 4 percent above optimum moisture content for clays and within 2 percent of optimum moisture content for sands) and compacted to not less than 95 percent of maximum dry density as determined in accordance with ASTM D 698.

5. FILL MATERIALS

Fill soils shall be substantially free from debris, vegetation, organic matter, and other deleterious substances, and shall not contain rocks or lumps having a diameter greater than six (6) inches. Claystone bedrock should be broken down to three (3) inches or smaller in size. Fill materials shall be obtained from cut areas shown on the plans or staked in the field by the Engineer.

On-site materials classifying as CL, CH, SC, SM, SW, SP, GP, GC and GM are acceptable. Concrete, asphalt, organic matter and other deleterious materials or debris shall not be used as fill.

6. MOISTURE CONTENT

Fill material classifying as CH and CL shall be moisture conditioned to between 0 to 3 percent above optimum moisture content. Granular soils classifying as SC, SM, SW, SP, GP, GC and GM shall be moisture conditioned to within 2 percent of optimum moisture content as determined from Proctor compaction tests. Sufficient laboratory compaction tests shall be made to determine the optimum moisture content for the various soils encountered in borrow areas.

The Contractor may be required to add moisture to the excavation materials in the borrow area if, in the opinion of the Soils Representative, it is not possible to obtain uniform moisture content by adding water on the fill surface. The Contractor may be required to rake or disc the fill soils to provide uniform moisture content through the soils.

The application of water to embankment materials shall be made with any type of watering equipment approved by the Soils Representative, which will give the desired results. Water jets from the spreader shall not be directed at the embankment with such force that fill materials are washed out.

Should too much water be added to any part of the fill, such that the material is too wet to permit the desired compaction from being obtained, rolling and all work on that section of the fill shall be delayed until the material has been allowed to dry to the required moisture content. The Contractor will be permitted to rework wet material in an approved manner to hasten its drying.

7. COMPACTION OF FILL AREAS

Selected fill material shall be placed and mixed in evenly spread layers. After each fill layer has been placed, it shall be uniformly compacted to not less than the specified percentage of maximum density. Fill shall be compacted to at least 95 percent of the maximum density as determined in accordance with ASTM D 698. At the option of the Soils Representative, soils classifying as SW, GP, GC, or GM may be compacted to 95 percent of maximum density as determined in accordance with ASTM D 1557 or 70 percent relative density for cohesionless sand soils. Fill materials shall be placed such that the thickness of loose materials does not exceed 10 inches and the compacted lift thickness does not exceed 6 inches.

Compaction as specified above, shall be obtained by the use of sheepsfoot rollers, multiple-wheel pneumatic-tired rollers, or other equipment for soils classifying as CL, CH, or SC. Granular fill shall be compacted using vibratory equipment or other approved equipment. Compaction shall be accomplished while the fill material is at the specified moisture content. Compaction of each layer shall be continuous over the entire area. Compaction equipment shall make sufficient trips to ensure that the required density is obtained.

8. COMPACTION OF SLOPES

Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction operations shall be continued until slopes are stable, but not too dense for planting, and there is not appreciable amount of loose soils on the slopes. Compaction of slopes may be done progressively in increments of three to five feet (3' to 5') in height or after the fill is brought to its total height. Permanent fill slopes shall not exceed 4:1 (horizontal to vertical).

9. PLACEMENT OF FILL ON NATURAL SLOPES

Where natural slopes are steeper than 20 percent in grade and the placement of fill is required, benches shall be cut at the rate of one bench for each 5 feet in height (minimum of two benches). Benches shall be at least 10 feet in width. Larger bench widths may be required by the Engineer. Fill shall be placed on completed benches as outlined within this specification.

10. MOISTURE CONTENT AND DENSITY CRITERIA

Fill material shall be compacted to at least 95 percent of maximum ASTM D 698 (AASHTO T 99) dry density at 0 to 4 percent above optimum moisture content for clay fill and within 2 percent of optimum moisture content for sand fill. Additional criteria for acceptance are presented in DENSITY TESTS.

11. DENSITY TESTS

Field density tests shall be made by the Soils Engineer at locations and depths of his choosing. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density tests shall be taken in compacted material below the disturbed surface. When density tests indicate the density or moisture content of any layer of fill or portion thereof is below that required, the particular layer or portion shall be reworked until the required density or moisture content has been achieved.

The allowable ranges of moisture content and density given in MOISTURE CONTENT AND DENSITY CRITERIA are based on design considerations. The moisture shall be controlled by the Contractor so that moisture content of the compacted earth fill, as determined by tests performed by the Soils Engineer, shall be within the limits given. The Soils Engineer will inform the Contractor when the placement moisture is less than or exceeds the limits specified and the Contractor shall immediately make adjustments in procedures as necessary to maintain placement moisture content within the specified limits, to satisfy the following requirements.

A. Moisture

1. The average moisture content of material tested each day shall not be less than 1 percent over optimum moisture content.

2. Material represented by samples tested having moisture lower than 1 percent over optimum will be rejected. Such rejected materials shall be reworked until moisture equal to or greater than 1 percent above optimum is achieved.

B. Density

1. The average dry density of material tested each day shall not be less than 95 percent of standard Proctor maximum dry density (ASTM D 698).

2. No more than 10 percent of the material represented by the samples tested shall be at dry densities less than 95 percent of standard Proctor maximum dry density (ASTM D 698).

3. Material represented by samples tested having dry density less than 93 percent of standard Proctor maximum dry density (ASTM D 698) will be rejected. Such rejected materials shall be reworked until a dry density equal to or greater than 95 percent of standard Proctor maximum dry density (ASTM D 698) is obtained.

12. INSPECTION AND TESTING OF FILL

Inspection by the Soils Engineer shall be sufficient during the placement of fill and compaction operations so that they can declare the fill was placed in general conformance with specifications. All inspections necessary to test the placement of fill and observe compaction operations will be at the expense of the Owner.

13. SEASONAL LIMITS

No fill material shall be placed, spread or rolled while it is frozen, thawing, or during unfavorable weather conditions. When work is interrupted by heavy precipitation, fill operations shall not be resumed until the Soils Representative indicates that the moisture content and density of previously placed materials are as specified.

14. NOTICE REGARDING START OF GRADING

The Contractor shall submit notification to the Soils Representative and Owner advising them of the start of grading operations at least three (3) days in advance of the starting date. Notification shall also be submitted at least 3 days in advance of any resumption dates when grading operations have been stopped for any reason other than adverse weather conditions.

15. REPORTING OF FIELD DENSITY TESTS

Density tests made by the Soils Representative, as specified under "Density Tests" above, shall be submitted progressively to the Owner. Dry density, moisture content, and percentage compaction shall be reported for each test taken.

16. DECLARATION REGARDING COMPLETED FILL

The Soils Engineer shall provide a written declaration stating that the site was filled with acceptable materials, and was placed in general accordance with the specifications.

CTL | THOMPSON INCORPORATED

June 8, 2016

OEO, LLC
7353 South Alton Way, Suite A-100
Englewood, Colorado 80112

Attention: Corey Elliot

Subject: Addendum to Geologic and Preliminary Geotechnical Investigation
Erie Assemblage
Northeast of Baseline Road and 119th Street
Erie, Colorado
Project No. DN48,284-115

We performed a Geological and Preliminary Geotechnical Investigation for the Erie Assemblage project and presented results in a report dated May 10, 2016. We encountered very soft soils in the upper material of a few borings, but did not address the issues associated with the soft soils in our initial report. This letter presents our comments.

In three of our borings (TH-15, TH-19 and TH-22), the upper soils were very soft based on field penetration resistance tests. These borings are adjacent to the drainage (wetland) that traverses the site. Typically, soil samples are obtained by driving a sampler with blows of a 140-lb hammer falling 30 inches. In this case, the sampler advanced when the weight of the hammer was applied (without dropping hammer). Our boring logs in Appendix A have been modified to include the blow-count designation “Weight of Hammer” (WOH).

Stabilization of the very soft soils should be anticipated prior to placing fill. The stabilization may be achieved by placing 12 inches or more of recycled concrete or crushed rock with or without a), or placing 2 to 3 feet of fill to bridge over the soft soil before proper compaction of the fill can be achieved. Use of a geogrid material such as Tensar BX1100 covered by a layer of crushed rock can also be considered.

The very soft soils will settle when the weight of fill and other improvements is applied. Settlement will take some time to occur because water must drain out of the soils as they consolidate. This will likely require placement of additional fill to achieve design grades. If you desire, we can perform additional sampling and testing to provide an estimate of the amount of potential settlement and the time required for consolidation.. We recommend monitoring settlement to determine when the soft soils have consolidated to an acceptable level to allow construction of pavements and other improvements.

If you have questions regarding this letter, please call.

Very truly yours,

CTL | THOMPSON, INC.

Alexander C. Franceski, E.I.T.
Staff Engineer

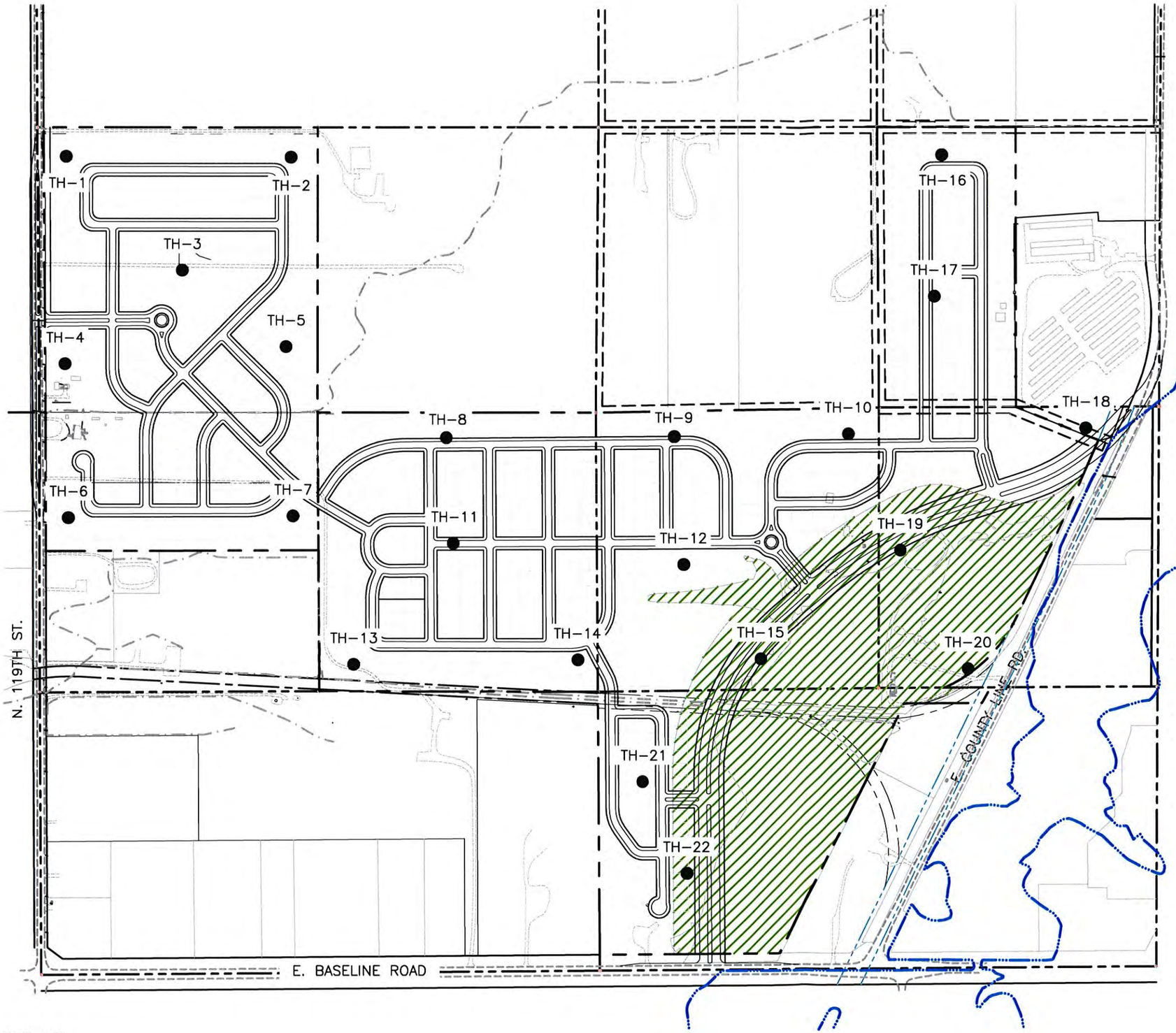
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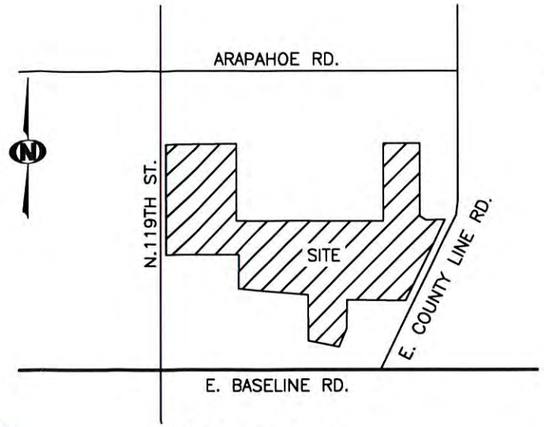


Ronald M. McOmber, P.E., D.GE
Chairman & CEO

ACF:RMM/ot
(2 copies)

Via email: coreye@e5xmanagement.com
mattc@remingtonhomes.net
bswain@kteng.com





VICINITY MAP
NOT TO SCALE

LEGEND:

TH−1 APPROXIMATE LOCATION OF EXPLORATORY BORING

ESTIMATED EXTENT OF VERY SOFT SOILS

0 250 500
SCALE: 1" = 500'

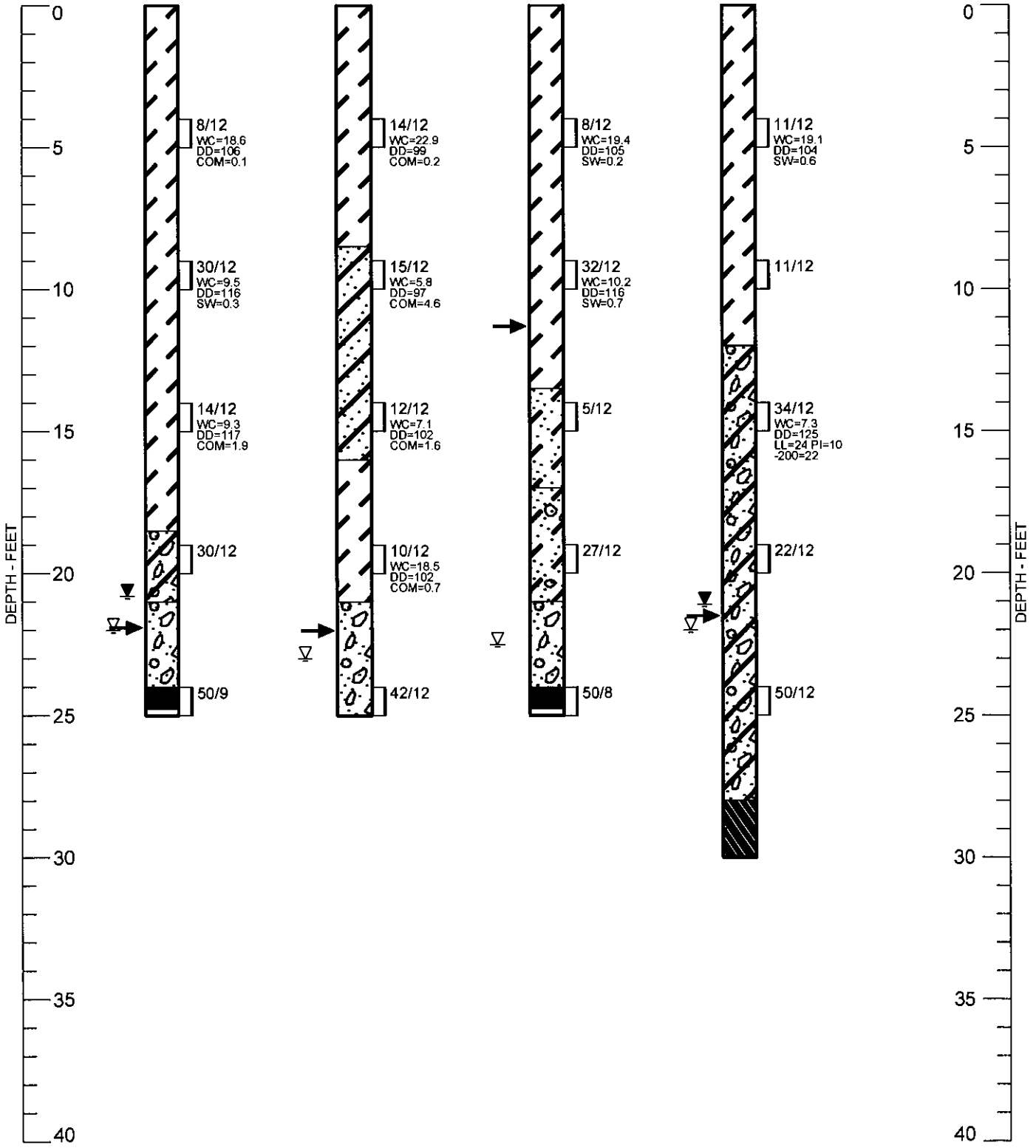
OEO, LLC
ERIE ASSEMBLAGE
Project No. DN48,284-115

Estimated Extent of Very Soft Soils

Fig. 1

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APPENDIX A
SUMMARY LOGS OF EXPLORATORY BORINGS

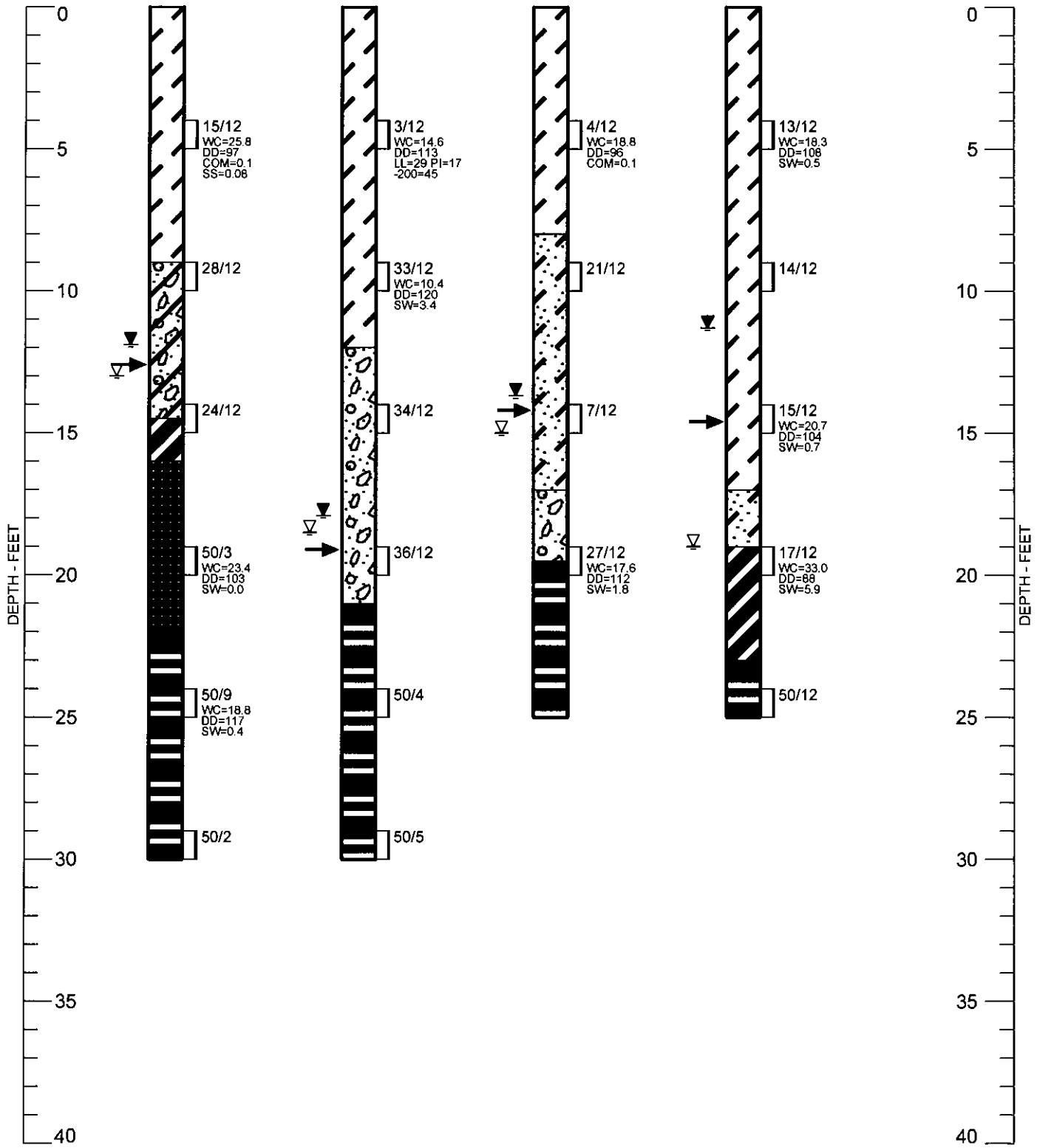


SUMMARY LOGS OF EXPLORATORYBORINGS

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PROJECT NO. DN48,284-115

FIG. A- 1

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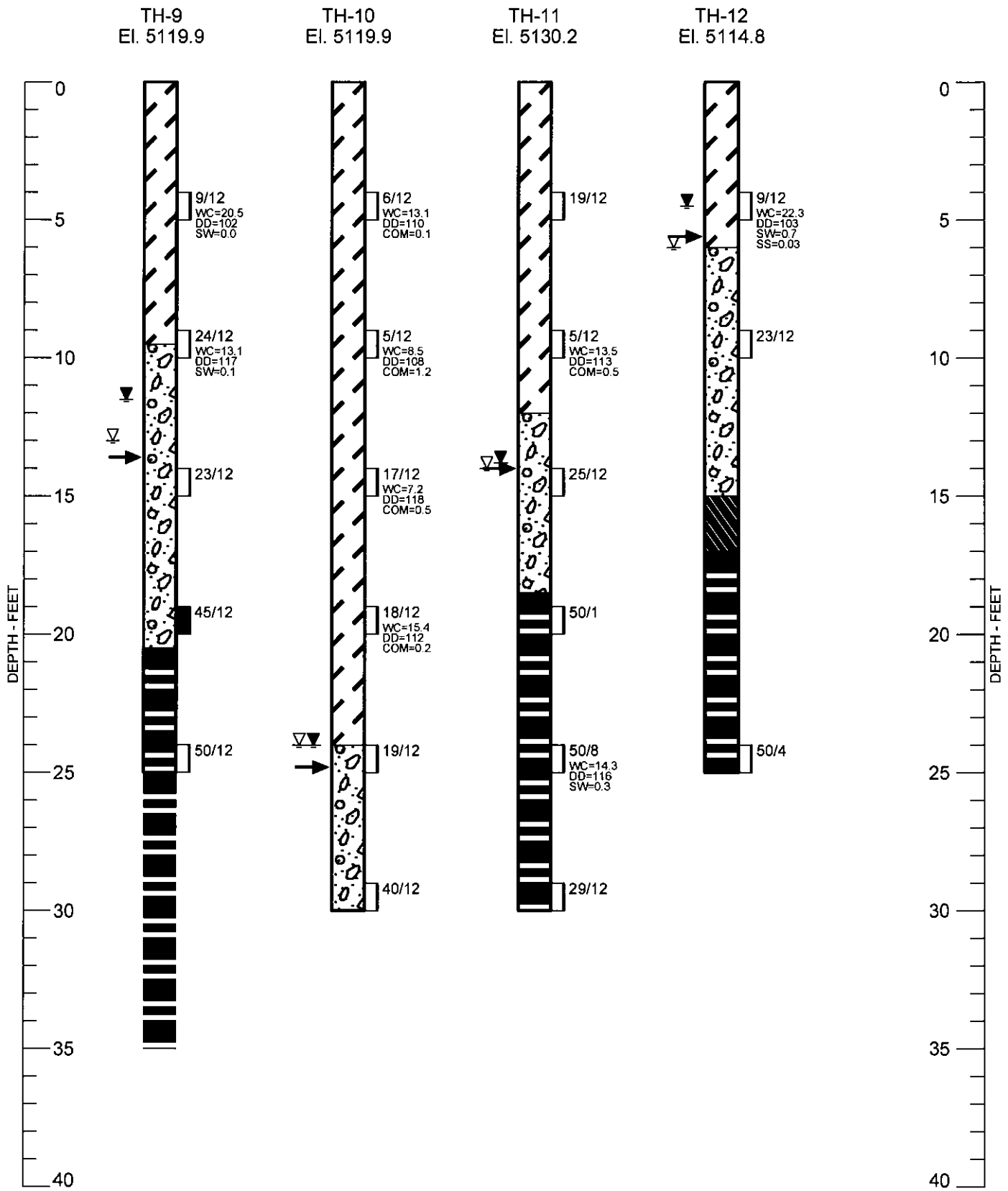


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SUMMARY LOGS OF EXPLORATORY BORINGS

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PROJECT NO. DN48,284-115

FIG. A- 2

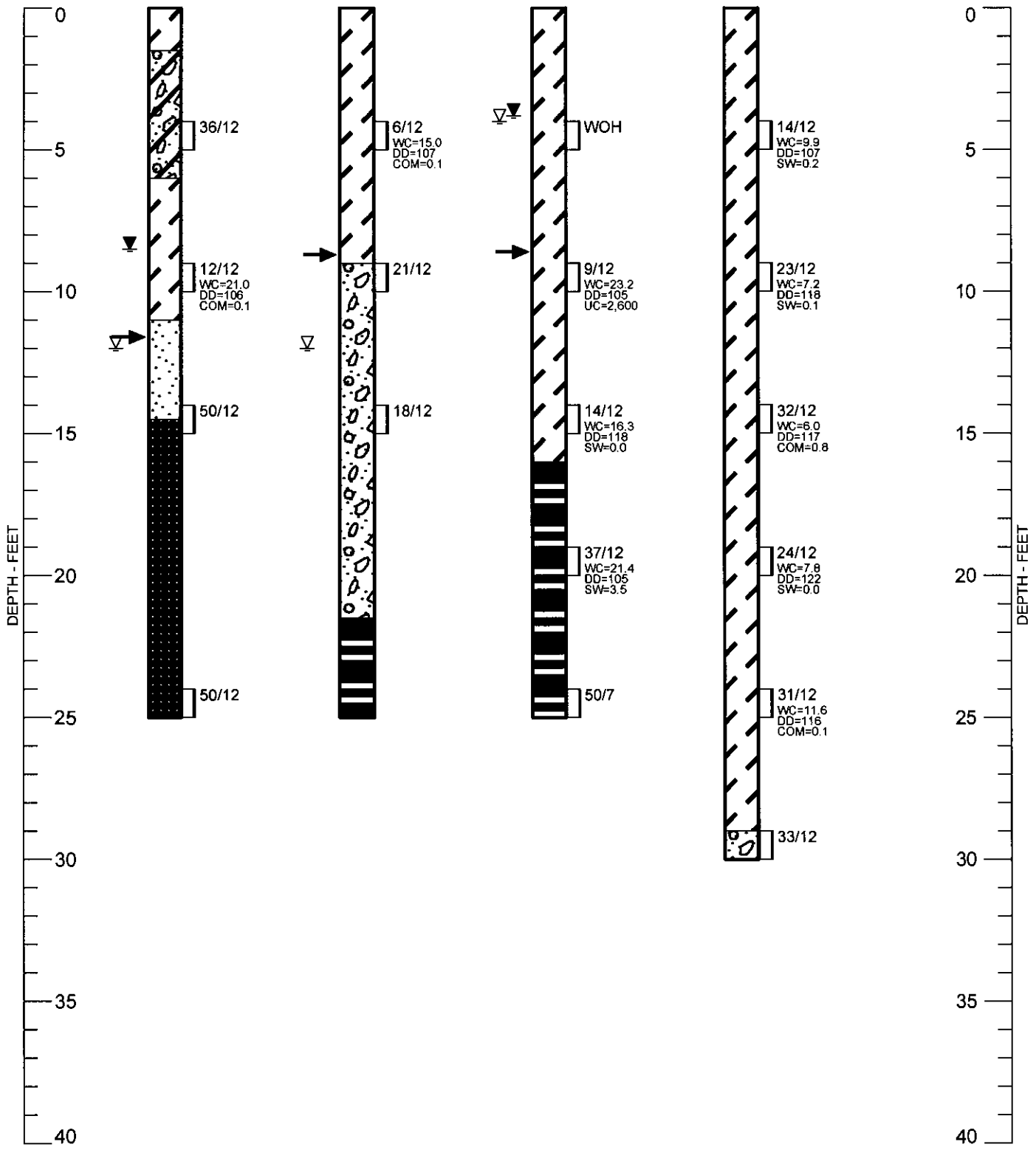


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SUMMARY LOGS OF EXPLORATORYBORINGS

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ERIE ASSEMBLAGE
PROJECT NO. DN48,284-115

FIG. A- 3

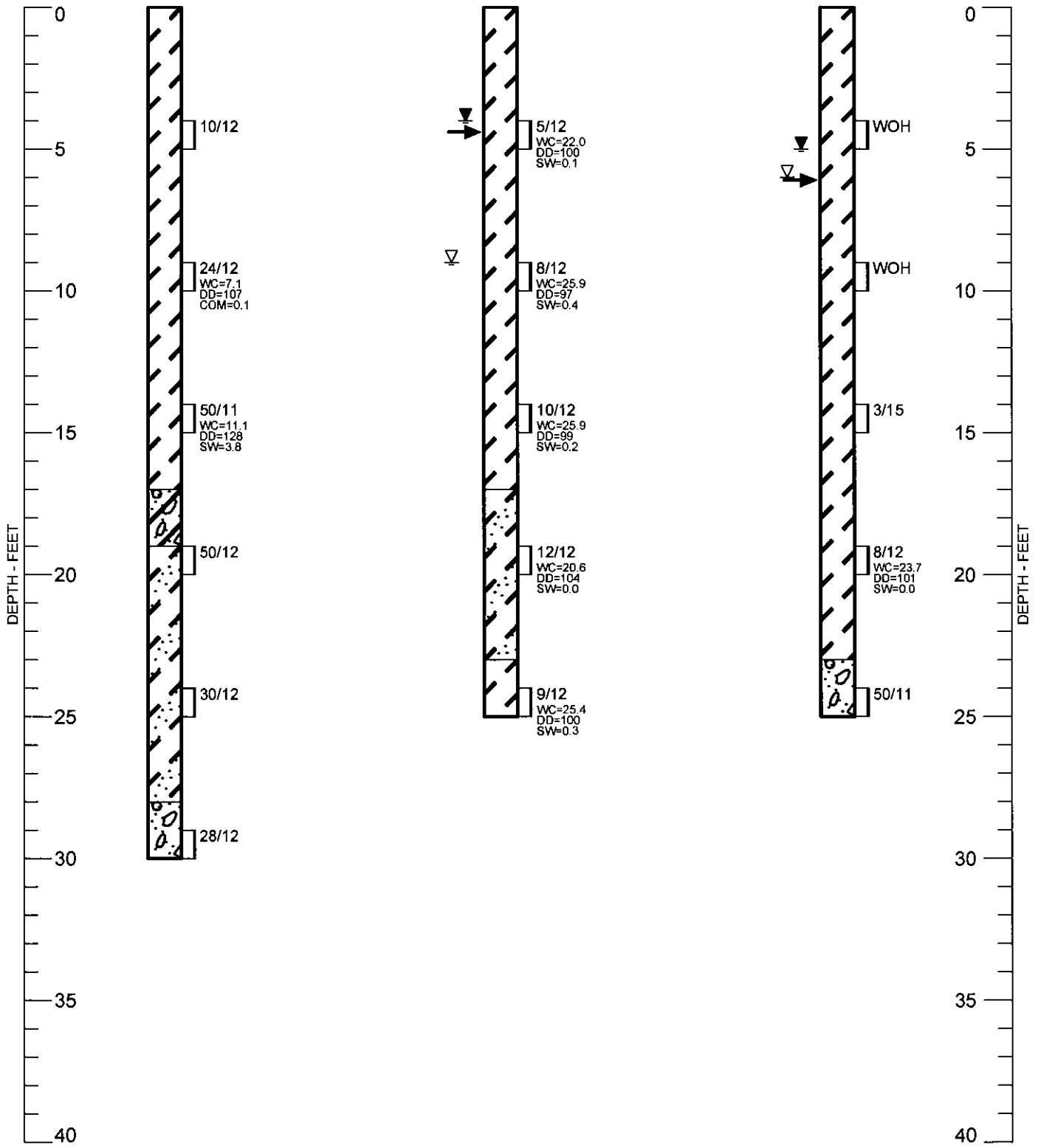


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SUMMARY LOGS OF EXPLORATORY BORINGS

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FIG. A- 4

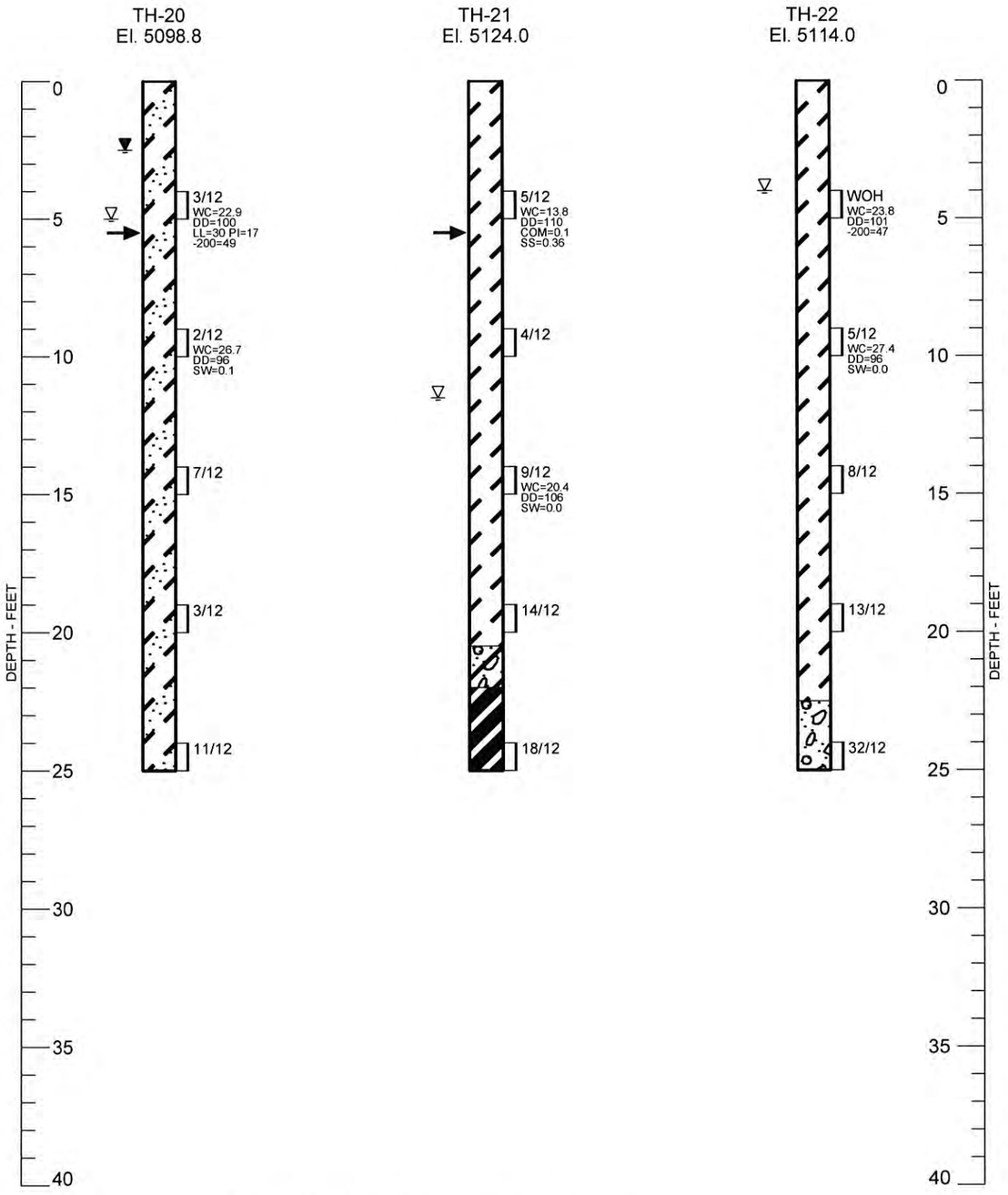


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SUMMARY LOGS OF EXPLORATORYBORINGS

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PROJECT NO. DN48,284-115

FIG. A- 5



SUMMARY LOGS OF EXPLORATORYBORINGS

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PROJECT NO. DN48,284-115

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LEGEND:

- CLAY, SANDY, SOFT TO VERY STIFF, DRY TO VERY MOIST, BROWN, TAN, WHITE, GRAY, RUST (CL).
- SAND, CLAYEY, LOOSE TO MEDIUM DENSE, SLIGHTLY MOIST TO WET, BROWN, GRAY, TAN (SC).
- SAND, SILTY, MEDIUM DENSE, SLIGHTLY MOIST TO WET, BROWN, GRAY (SM).
- GRAVEL, CLAYEY, MEDIUM DENSE TO DENSE, MOIST TO WET, BROWN, GRAY, RUST (GC).
- GRAVEL, SILTY, MEDIUM DENSE, DRY TO WET, BROWN, GRAY, RUST, WHITE, RED (GM).
- GRAVEL, SANDY, MEDIUM DENSE TO VERY DENSE, SLIGHTLY MOIST TO WET, BROWN, GRAY, WHITE (GP).
- INTERLAYERED CLAY/SAND, STIFF TO VERY STIFF, VERY LOOSE TO DENSE, DRY TO WET, BROWN, GRAY, RUST, BLACK, WHITE (CL OR SC).
- WEATHERED CLAYSTONE, MOIST, BROWN, RUST, GRAY.
- BEDROCK, CLAYSTONE, HARD, SLIGHTLY MOIST TO MOIST, BROWN, GRAY, RUST, WHITE.
- BEDROCK, SANDSTONE, HARD, MOIST, BROWN, TAN, GRAY.
- BEDROCK, INTERBEDDED CLAYSTONE/SANDSTONE, HARD, MOIST, BROWN, GRAY.
- WOH, SAMPLER ADVANCED BY WEIGHT OF HAMMER.
- DRIVE SAMPLE. THE SYMBOL 8/12 INDICATES 8 BLOWS OF AN AUTOMATIC 140-POUND HAMMER FALLING 30 INCHES WERE REQUIRED TO DRIVE A 2.5-INCH O.D. SAMPLER 12 INCHES.
- WATER LEVEL MEASURED AT TIME OF DRILLING.
- WATER LEVEL MEASURED AFTER DRILLING ON APRIL 15, 2016.
- INDICATES DEPTH OF CAVING AFTER DRILLING.

NOTES:

1. THE BORINGS WERE DRILLED ON APRIL 8 AND 12, 2016 USING 4-INCH DIAMETER, CONTINUOUS-FLIGHT SOLID-STEM AUGER AND A TRUCK-MOUNTED CME-45 DRILL RIG.
2. BORING LOCATIONS AND ELEVATIONS WERE DETERMINED BY A REPRESENTATIVE OF OUR FIRM REFERENCING THE TEMPORARY BENCHMARK SHOWN ON FIG. 1.
3. WC - INDICATES MOISTURE CONTENT (%).
   DD - INDICATES DRY DENSITY (pcf).
   SW - INDICATES SWELL WHEN WETTED UNDER APPLIED PRESSURE (%).
   COM - INDICATES COMPRESSION WHEN WETTED UNDER APPLIED PRESSURE (%).
   LL - INDICATES LIQUID LIMIT.
   PI - INDICATES PLASTICITY INDEX.
   -200 - INDICATES PASSING NO. 200 SIEVE (%).
   SS - INDICATES WATER-SOLUBLE SULFATE CONCENTRATION (%).
   UC - INDICATES UNCONFINED COMPRESSIVE STRENGTH (psf).
   pF - INDICATES SOIL SUCTION VALUE (pF).
4. THESE LOGS ARE SUBJECT TO THE EXPLANATIONS, LIMITATIONS AND CONCLUSIONS CONTAINED IN THIS REPORT.

FIG. A- 6

Ecological Resource Consultants, Inc.
5672 Juhls Drive ~ Boulder, CO ~ 80301 ~ (303) 679-4820

AQUATIC RESOURCE DELINEATION REPORT

FOR
ERIE SITE

MAY 11, 2016

Prepared By:
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Prepared For:
OEO, LLC
7353 S Alton Way, Suite A100
Centennial, CO 80112

ERC Project #1000-1601

EXECUTIVE SUMMARY

This report summarizes the delineation of aquatic resources completed by Ecological Resource Consultants, Inc. (ERC) for the Erie Site. ERC conducted a formal routine onsite delineation of aquatic resources within the 221 acre survey area located in unincorporated Boulder County, Colorado on April 4-8, 2016. A total of 28.34 acres of aquatic resources were identified and mapped within the survey area which include: 26.5 acres characterized as PEM/POW marsh habitat; 1.06 acres characterized as PEM wet meadow habitat; 0.76 acres (1,789 linear feet) characterized as PEM vegetated drainage habitat and 0.02 acres (87 linear feet) characterized as non-vegetated roadside ditch habitat.

The aquatic resource areas were delineated and mapped as A, B, C, D, E, F, G, H and I. Aquatic Resources A, B, C, E, F and G appear to contain a direct surface connection to downstream traditional navigable waters (TNWs) via Coal Creek which flows to Boulder Creek and St. Vrain Creek before joining the South Platte River approximately 20 miles northeast from the survey area. Aquatic Resources D, H and I are surrounded entirely by uplands and do not contain a direct surface connection to other waters of the US.

In addition, approximately 1,303 linear feet of man-made irrigation ditch, identified on the USGS topographic map as Goodhue Ditch, occurs within the survey area. The Goodhue Ditch appears to be historically excavated wholly in uplands for irrigation purposes and terminates in an upland agricultural field approximately 0.5 miles northeast from the survey area.

All areas that have been investigated in the field are mapped on the Aquatic Resource Delineation Map dated May 11, 2016 (**Appendix A**).

CONTENTS

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2.0 LOCATION 1
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4.2 AQUATIC RESOURCES 5
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APPENDIX A

Aquatic Resource Delineation Maps – Overview, Sheets 1-3

APPENDIX B

ERC Wetland Determination Data Forms

1.0 INTRODUCTION

This report summarizes the delineation of aquatic resources completed by Ecological Resource Consultants, Inc. (ERC) for the **Erie Site**. The purpose of this report is to provide a formal delineation of aquatic resources within the approximately 221 acre survey area established for this Site. This report facilitates efforts to document aquatic resource boundary determinations for verification and jurisdictional review by the US Army Corps of Engineers (USACE).

Report Prepared for:

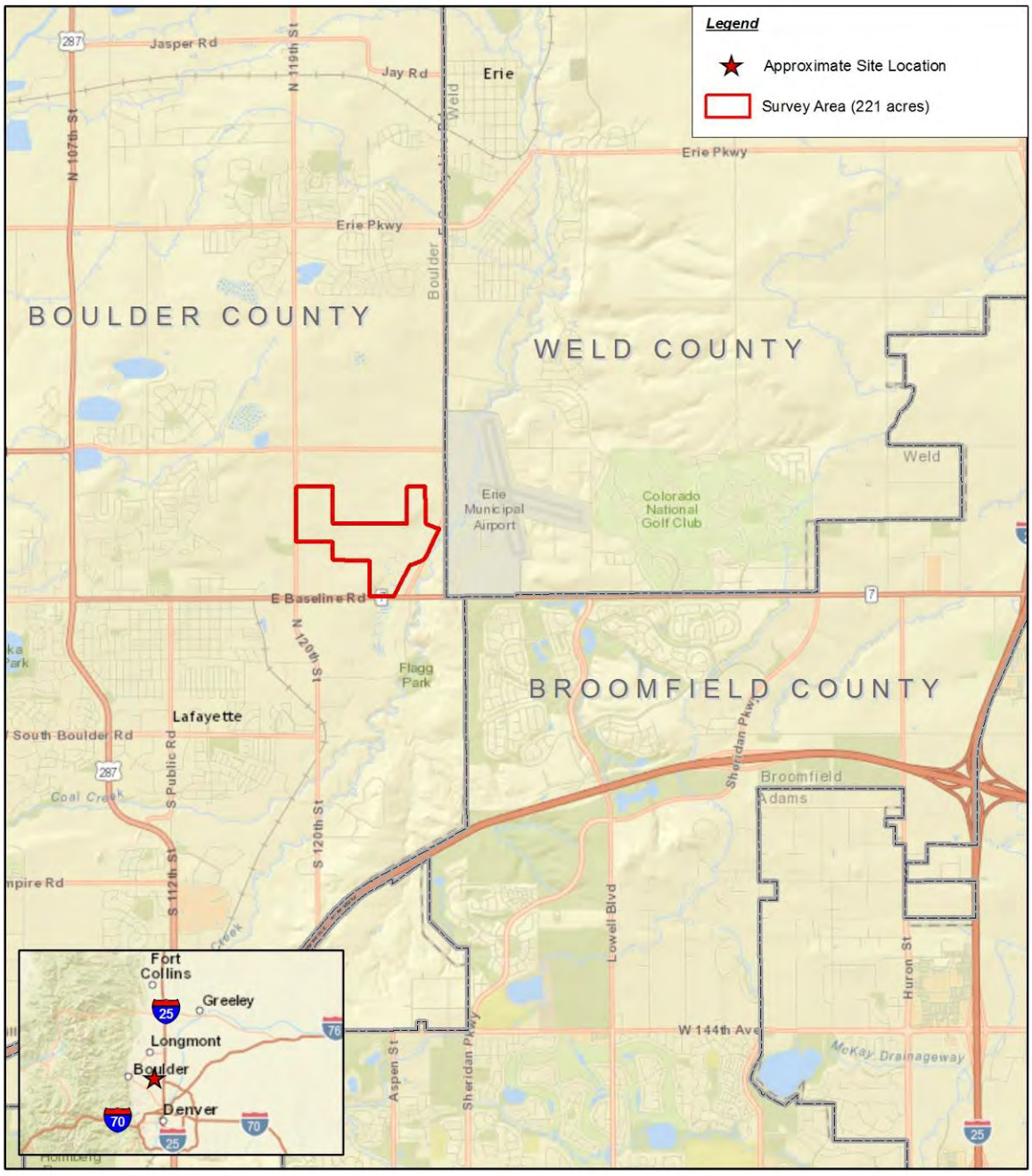
OEO, LLC

7353 S Alton Way, Suite A100

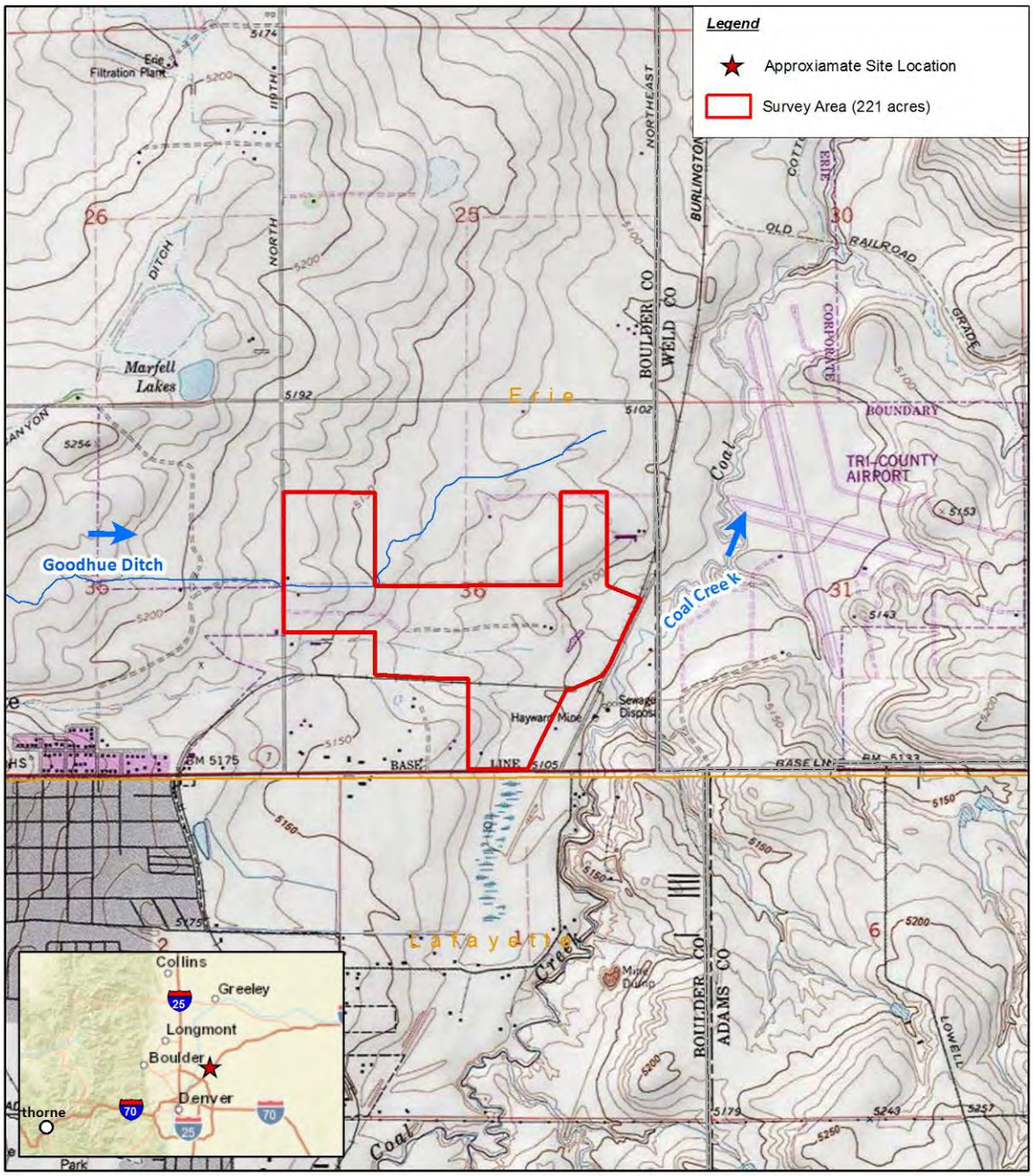
Centennial, CO 80112

2.0 LOCATION

The survey area is located at the northwest corner of East Baseline Road and East County Line Road in unincorporated Boulder County Colorado in the Coal Creek-Boulder Creek watershed (HUC 101900050604). More specifically, the survey area is located in **Section 36, Township 1 North, Range 69 West** in Boulder County (**latitude 40.005477° north, longitude -105.064096° west**). From Hwy 287, the survey area can be accessed by heading east for approximately 2.2 miles on Arapahoe Road, then south onto East County Line Road for 0.7 miles. The survey area is located on the west side of East County Line Road, and is accessible from an unpaved access road. The survey area comprises approximately 221 acres. Refer to **Figure 1** and **Figure 2** for a location map and US Geological Survey (USGS) topographic map of the survey area.



Prepared By: ERC *5672 Juhls Drive* *Boulder, CO 80301* *(303) 679-4820* *ERC #1000-1601*	**FIGURE 1.** **LOCATION MAP** **ERIE SITE** **BOULDER COUNTY, COLORADO**	0 0.5 1 Miles *Prepared For:* *OEO, LLC* *May 11, 2016*



Prepared By: ERC *5672 Juhls Drive* *Boulder, CO 80301* *(303) 679-4820* *ERC #1000-1601*	**FIGURE 2.** **USGS TOPOGRAPHIC MAP** **ERIE SITE** **BOULDER COUNTY, COLORADO**	0 0.25 0.5 Miles *Prepared For:* *OEO, LLC* *May 11, 2016*

3.0 METHODOLOGY

The aquatic resource delineation was conducted following the methodology enumerated in the *1987 Corps of Engineers Wetlands Delineation Manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0) (herein referred to as "Supplement") (Environmental Laboratory 1987, USACE 2010).* During the field inspection, dominant vegetation was recorded, representative hydrologic indicators were noted and soil samples were examined for hydric indicators. Delineation field work for the survey area was completed on April 4-8, 2016. The weather during the delineation was sunny and dry at approximately 70 degrees Fahrenheit. At the time of the field evaluation, the conditions observed within the survey area were typical for the region and sufficient indicators of vegetation, soils and hydrology were observed to make a wetland determination.

The USACE and the Environmental Protection Agency (USEPA) jointly define wetlands as: "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" [40 CFR 230.3(t)]. Three general environmental parameters define a wetland. These parameters must include the presence of hydrophytic vegetation, hydric soils, and wetland hydrology. Except under certain situations, evidence of a minimum of one positive wetland indicator from each of the above parameters must be identified in order to make a positive wetland determination.

In addition, waters of the US are also defined as areas that *"include essentially all surface waters such as rivers, streams and their tributaries, all wetlands adjacent to these waters, and all ponds, lakes and reservoirs".* The boundaries of some waters of the US (i.e., such as streams or lakes) are further defined by the ordinary high water mark (OHWM). The OHWM is characterized as "the line on the shores established by the fluctuations of water and indicated by physical characteristics such as: a clear natural line impressed on the bank, shelving, changes in the character of the soil, wetland vegetation, the presence of litter and debris, and other appropriate means that consider the characteristics of the surrounding areas" (USACE 2005). These definitions are the basis of this delineation method.

Areas that do not meet any one of the wetland parameters (hydrophytic vegetation, hydric soils and/or wetland hydrology) or non-vegetated stream channel/open water (OHWM) were classified as a non-wetland (upland) and mapped as such.

Any area determined to be potential waters of the US was delineated in the field with pink pin flags and ribbon identified with 'WETLAND BOUNDARY' printed on it and sequentially labeled alpha-numerically (i.e. A1, A2…).

Each wetland determination point was recorded using a hand-held Trimble GeoXH global positioning system (GPS) receiver. The resulting GPS data were post processed using GPS Pathfinder Office 5.3 software. Post processing differential correction provided an average horizontal mapping accuracy of +/- 2 feet. Post-processed GPS data were imported into ArcMap Geographic Information Systems (GIS) (Version 10.4) for spatial analysis and mapping. All aquatic resources delineated within the survey area are depicted on the Aquatic Resource Delineation Maps dated May 11, 2016 are provided as **Appendix A**. Wetland Determination data sheets are provided in **Appendix B**.

4.0 EXISTING CONDITIONS

4.1 LANDSCAPE SETTING

The survey area is situated within the Great Plains ecoregion (Bailey 1976) at an approximate elevation of 5,100 feet above mean sea level (AMSL). The vicinity of the survey area is comprised largely of agricultural lands intermixed with residential developments. The survey area is zoned by Boulder County as agricultural land. Land neighboring the survey area includes East Baseline Road to the south, East County Line Road to the east and agricultural land to the north and west.

The landscape within the survey area is predominantly characterized by the Cultivated Cropland ecological system (Comer et al. 2003). This non-natural system includes lands used for the production of annual crops where crop vegetation accounts for greater than 20 percent of the total vegetation and where the land is actively tilled. The southern and interior portion of the survey area is characterized as Western Great Plains Floodplain (Comer et al. 2003). This riparian system group is found in the floodplains of medium and large rivers of the western Great Plains and typically comprises a mix of wetland and upland habitats. Alluvial soils and periodic, intermediate flooding (every 5-25 years) typify this system.

4.2 AQUATIC RESOURCES

Delineated aquatic resources were classified according to physical and biological characteristics using the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin Classification System) (Cowardin et al. 1979). Within the survey area, habitat types were classified based on field evaluation. The wetland habitats within the survey that were classified using the Cowardin Classification System are summarized below in **Table 1**.

Table 1. Summary of Aquatic Resources Delineated within the Survey Area.

Aquatic Resource Name	ID	Classification		Acres	Linear Feet
		[1]Cowardin	Location (lat/long)		
A	A1	PEM/POW	40.005076°N, -105.060200°W	10.18	-
	A2	PEM/POW	40.005965°N, -105.057711°W	1.19	-
			Subtotal	11.37	
B	B1	Drainage Ditch	40.003547°N, -105.060547°W	0.33	881
	B2	Drainage Ditch	40.005141°N, -105.057676°W	0.43	908
			Subtotal	15.13	1,789
C	C	PEM/POW	40.002145°N, -105.061661°W	15.13	-
D	D	PEM	40.005821°N, -105.057443°W	0.02	-
E	E	PEM	40.004889°N, -105.059700°W	0.98	-
F	F	PEM	40.003609°N, -105.062313°W	0.04	-
G	G	Roadside Ditch	40.006525°N, -105.056541°W	0.02	87
H	H1	PEM	40.005963°N, -105.057359°W	0.002	
	H2	PEM	40.005835°N, -105.057783°W	0.01	
			Subtotal	0.01	
I	I	PEM	40.004364°N, -105.062107°W	0.01	-
TOTAL ONSITE				**28.34**	**1,876**

Notes:
[1] Habitat Type based on Cowardin et al. 1979.

A total of 28.34 acres of aquatic resources and 1,876 linear feet of drainage ditch/roadside ditch were delineated by ERC within the survey area. A description of the aquatic resource habitat types is provided as follows. Refer to **Table 2** for a list of vegetation identified within the survey area (Lichvar et al. 2014). The Aquatic Resource Delineation Maps dated May 11, 2016 are provided as **Appendix A**. Data sheets are provided in **Appendix B**.

AQUATIC RESOURCE A (11.37 ACRES)

Aquatic Resource A comprises a series of open water agricultural ponds (POW habitat) interspersed with PEM wetland situated on the northern portion of the survey area. The ponds are encircled by upland berms and are connected through culverts or pipes. Aquatic Resource A discharges to Aquatic Resource G which flows to a tributary of Coal Creek.

Overall, the vegetation community of Aquatic Resource A is dominated by a nearly monotypic stand of broad-leaf cat-tail (*Typha latifolia*). These areas contain a semi-permanently flooded water regime. Mixed herbaceous vegetation occurs along the seasonally flooded perimeter of the complex and includes three-square (*Schoenoplectus pungens*), reed canary grass (*Phalaris arundinacea*), fox-tail barley (*Hordeum jubatum*), American wild mint (*Mentha arvensis*) and/or sand spikerush (*Eleocharis montevidensis*). A smaller portion of Aquatic Resource A comprises deeper, permanently flooded habitat classified as POW. The dominant vegetation within the wetland areas consists of hydrophytic species (OBL-FAC).

Soils within the wetland areas are either clay or sandy clay textured meeting the criteria for the hydric soil indicator F3 (Depleted Matrix) and F8 (Redox Dark Surface). At the time of the delineation, primary wetland hydrology indicators of A3 (Saturation) were observed along the wetland/upland boundary in addition to secondary indicators of D3 (Geomorphic Position) and D5 (FAC-Neutral Test). The water table was present and observed at 18 inches. The wetland habitat within Aquatic Resource A meets the criteria for wetland based on the presence of hydrophytic vegetation, hydric soils and wetland hydrology.

Aquatic Resource A comprises a total of 11.37 acres within the survey area. Refer to **Photos 1-2** below for characteristics of Aquatic Resource A.



Photo 1. View west at PEM habitat of Aquatic Resource A dominated by a monotypic stand of broad-leaf cat-tail vegetation (depicted by blue line).



Photo 2. Aquatic Resource A. View west at mixed herbaceous PEM fringe wetland vegetation surrounding POW agricultural ponds. Approximate location of wetland data point DP-A1a.

AQUATIC RESOURCE B (0.76 ACRES, 1,789 LINEAR FEET)

Aquatic Resource B consists of a vegetated drainage swale dominated by PEM wetland habitat. The drainage appears to be man-made or historically modified for agricultural use and is not shown on the USGS topographic map of the area.

The drainage lacks a continuous defined bed, bank or OHWM through the eastern portion of Aquatic Resource B. The drainage appears to daylight from a groundwater seep within the western portion of Aquatic Resource B. Within the survey area, the drainage flows from southwest to northeast for approximately 1,789 feet to the confluence with Aquatic Resource A and finally to Aquatic Resource G before flowing offsite to a tributary of Coal Creek.

The drainage ranges from 10 to 30 feet in width and is generally vegetated by a monotypic stand of broad-leaf cat-tail within the upper (western) reach and other herbaceous species such as three-square, reed canary grass, fox-tail barley and spikerush in the lower (eastern) reach. The dominant vegetation within the wetland areas consists of hydrophytic species (OBL-FAC).

Soils within the wetland areas are either clay or sandy loam textured meeting the criteria for the hydric soil indicator A1 (Hydrogen Sulfide) and S1 (Sandy Mucky Mineral). At the time of the delineation, primary wetland hydrology indicators of A1 (Surface Water), A2 (High Water Table) and A3 (Saturation) were observed within Aquatic Resource B in addition to secondary indicators of D3 (Geomorphic Position) and D5 (FAC-Neutral Test). Surface water was observed flowing through the drainage at the time of the wetland delineation. The wetland habitat within Aquatic Resource B meets the criteria for wetland based on the presence of hydrophytic vegetation, hydric soils and wetland hydrology.

Aquatic Resource B comprises a total of 0.76 acres within the survey area. Refer to **Photos 3-4** below for characteristics of Aquatic Resource B.



Photo 3. View west at PEM vegetated drainage habitat of Aquatic Resource B. Approximate location of data points DP-B1a (wetland) and DP-B1b (upland).



Photo 4. View southwest at PEM drainage swale of Aquatic Resource B (depicted by blue line) near confluence with Aquatic Resource A.

AQUATIC RESOURCE C (15.13 ACRES)

Aquatic Resource C comprises an open water agricultural pond (POW habitat) interspersed with PEM wetland situated on the southern portion of the survey area. An upland berm forms the northern boundary of Aquatic Resource B. A culvert beneath the berm conveys flows from Aquatic Resource B to Aquatic Resource F and A. The southern portion of the survey area which adjoins Aquatic Resource C includes significantly disturbed agricultural land, currently used as horse pasture. Vegetation is essentially devoid around the perimeter of the pond from livestock use. The wetland boundary delineated in this area is largely based on indicators of hydric soil in addition to landscape position (i.e., toe of slope) thus represents the likely outermost wetland extent for this disturbed area.

Overall, the vegetation community of Aquatic Resource C is dominated by a nearly monotypic stand of broad-leaf cat-tail with a semi-permanently flooded water regime. Sparse patches of curly dock (*Rumex crispus*) occur within the dryer outer fringe areas. A smaller portion of Aquatic Resource C comprises deeper, permanently flooded habitat classified as POW. The dominant vegetation within the wetland areas consists of hydrophytic species (OBL-FAC).

Soils within the wetland areas are clay textured meeting the criteria for the hydric soil indicator F2 (Loamy Gleyed Matrix). At the time of the delineation, primary wetland hydrology indicators of A3 (Saturation) and A2 (High Water Table) were observed along the wetland/upland boundary in addition to secondary indicators of D3 (Geomorphic Position) and D5 (FAC-Neutral Test). The water table was present and observed at 6 inches. Several groundwater seeps were observed on the western side of Aquatic Resource C in addition to a PVC pipe which emerged from the northwest corner of the wetland and contained flowing water. The wetland habitat within Aquatic Resource C meets the criteria for wetland based on the presence of hydrophytic vegetation, hydric soils and wetland hydrology.

Aquatic Resource C comprises a total of 15.13 acres within the survey area. Refer to **Photos 5-6** below for characteristics of Aquatic Resource C.



Photo 5. View southwest at Aquatic Resource C – open water agricultural pond habitat (POW) interspersed with PEM broad-leaf cat-tail wetland.



Photo 6. View north at highly disturbed PEM fringe habitat of Aquatic Resource C dominated by curly dock vegetation. The wetland boundary (depicted by blue line) based on indicators of hydric soil and landscape position (i.e., toe of slope).

AQUATIC RESOURCE D (0.02 ACRES), AQUATIC RESOURCE H (0.01 ACRES)

Aquatic Resources D and H comprise three small, PEM, topographic depression wetlands located in the northeast portion of the survey area. The wetlands are located approximately 30 feet west from Aquatic Resource B; however no inlet or outlet were observed into or out from Aquatic Resource D or Aquatic Resource H.

The vegetation community of these wetlands is dominated by herbaceous species such as fox-tail barley and saltmarsh sandspurry (*Spergularia marina*). The dominant vegetation within the wetland areas consists of hydrophytic species (OBL-FAC).

Within Aquatic Resource D soils are clay textured meeting the criteria for the hydric soil indicator F3 (Depleted Matrix) and F8 (Redox Dark Surface). At the time of the delineation, primary wetland hydrology indicators of A3 (Saturation) and A2 (High Water Table) were observed throughout Aquatic Resource D in addition to secondary indicators of D3 (Geomorphic Position) and D5 (FAC-Neutral Test). The water table was present and observed at 8 inches. The primary source of hydrology for Aquatic Resource D is likely groundwater in combination with precipitation and seasonal snow melt. The wetland habitat within Aquatic Resource D meets the criteria for wetland based on the presence of hydrophytic vegetation, hydric soils and wetland hydrology.

Within Aquatic Resource H, soils are dark grey (10YR 4/2) and clay textured however distinct or prominent redox concentrations were not observed therefore the soils did not meet the criteria for any hydric soil indicators. At the time of the delineation, primary wetland hydrology indicator A3 (Saturation) was observed in addition to secondary indicators of D3 (Geomorphic Position) and D5 (FAC-Neutral Test). Aquatic Resource H is assumed wetland based on a dominance of hydrophytic vegetation (OBL) and wetland hydrology observed.

Aquatic Resource D comprises a total of 0.02 acres within the survey area. Aquatic Resource H comprises a total of 0.01 acres within the survey area. Refer to **Photos 7-8** below for characteristics of Aquatic Resource D and Aquatic Resource H.



Photo 7. View northeast of Aquatic Resource D (depicted by blue line). Dominant vegetation includes herbaceous species such as fox-tail barley and saltmarsh sandspurry.

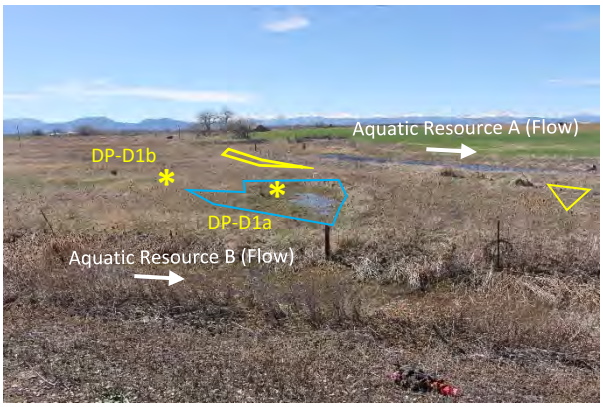


Photo 8. Overview west of Aquatic Resource D (depicted by blue line) and Aquatic Resource H (depicted by yellow line). Approximate location of data points DP-D1a (wetland) and DP-D1b (upland).

AQUATIC RESOURCE E (0.98 ACRES)

Aquatic Resource E consists of PEM wetland habitat situated on the east side of the survey area, between an upland berm (to the west) and agricultural land (to the east). Aquatic Resource E occurs within a topographic depression which slopes to the north toward Aquatic Resource A. A culvert beneath an upland berm conveys flows from Aquatic Resource E to Aquatic Resource A.

The vegetation community of Aquatic Resource E is dominated by herbaceous species such as fox-tail barley, saltmarsh sandspurry, three-square or reed canary grass. The dominant vegetation within the wetland areas consists of hydrophytic species (OBL-FAC).

Soils within the wetland areas are clay textured meeting the criteria for the hydric soil indicators A11 (Depleted Below Dark Surface), F6 (Redox Dark Surface) or F3 (Depleted Matrix). At the time of the delineation, primary wetland hydrology indicators of A3 (Saturation) or A1 (Surface Water) were observed along the wetland/upland boundary in addition to secondary indicators of D3 (Geomorphic Position) and D5 (FAC-Neutral Test). The water table was present and observed at 18 inches. The wetland habitat within Aquatic Resource E meets the criteria for wetland based on the presence of hydrophytic vegetation, hydric soils and wetland hydrology.

Aquatic Resource E comprises a total of 0.98 acres within the survey area. Refer to **Photos 9-10** below for characteristics of Aquatic Resource E.

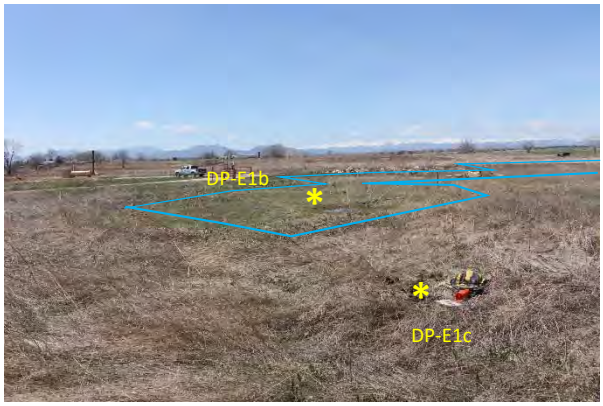


Photo 9. View southwest of Aquatic Resource E (depicted by blue line). This portion of the PEM wetland is dominated by herbaceous species such as fox-tail barley and saltmarsh sandspurry. Approximate location of data points DP-E1b (wetland) and DP-E1c (upland) shown above.



Photo 10. View north at along upland berm. Aquatic Resource E located right of the berm and Aquatic Resource A located left of berm. Approximate location of data point DP-E1a (wetland) shown above.

AQUATIC RESOURCE F (0.04 ACRES)

Aquatic Resource F consists of a small PEM wetland swale, located upslope from Aquatic Resource B. The wetland daylights from a groundwater seep and extends approximately 160 feet east to a culvert inlet which extends north to Aquatic Resource A. The wetland also contains a culvert outlet from Aquatic Resource C. No pipe or culvert connection was observed to Aquatic Resource B.

The wetland is approximately 15 feet wide and is generally vegetated by a monotypic stand of broad-leaf cat-tail. The dominant vegetation within the wetland areas consists of hydrophytic species (OBL-FAC).

Soils within the wetland are either clay or sandy loam textured meeting the criteria for the hydric soil indicator (A1) Hydrogen Sulfide and (S1) Sandy Mucky Mineral. At the time of the delineation, primary wetland hydrology indicators of (A1) Surface Water, (A2) High Water Table and A3 (Saturation) were observed within Aquatic Resource F in addition to secondary indicators of D3 (Geomorphic Position) and D5 (FAC-Neutral Test). Surface water was observed flowing through the drainage at the time of the wetland delineation. The wetland habitat within Aquatic Resource F meets the criteria for wetland based on the presence of hydrophytic vegetation, hydric soils and wetland hydrology.

Aquatic Resource F comprises a total of 0.04 acres within the survey area. Refer to **Photos 11-12** below for characteristics of Aquatic Resource F.

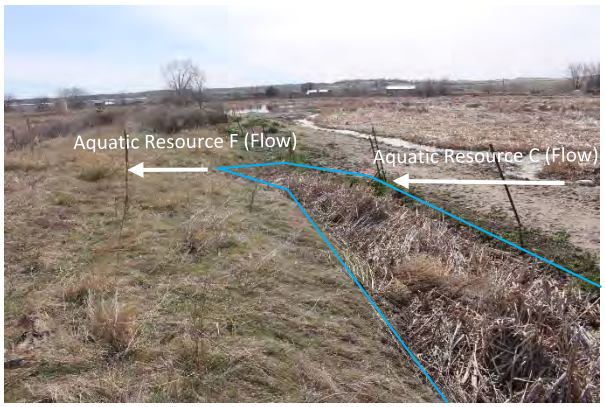


Photo 11. View east at PEM wetland swale habitat of Aquatic Resource F (depicted by blue line). The wetland extends north via culvert to Aquatic Resource A.



Photo 12. View north at larger (outer) culvert which extends north from Aquatic Resource F to Aquatic Resource A. The smaller (inner) culvert conveys flows from Aquatic Resource C (not shown) to Aquatic Resource A.

AQUATIC RESOURCE G (0.02 ACRES, 87 LINEAR FEET)

Aquatic Resource G consists of a non-vegetated roadside ditch, situated between an upland berm to the west and East County Line Road to the east. The ditch appears to be excavated from uplands to convey flows beneath East County Line Road. A culvert beneath the western berm delivers flows from Aquatic Resource A. Aquatic Resource G flows offsite to the east via culvert to a tributary of Coal Creek.

The ditch is approximately 5 feet wide, underlain by riprap and contains several riprap check structures across the channel bottom. Water was flowing through the ditch at the time of the wetland delineation. The roadside ditch contains a defined bed, bank and OHWM through Aquatic Resource G.

Aquatic Resource G comprises a total of 0.02 acres (87 linear feet) within the survey area. Refer to **Photos 13-14** below for characteristics of Aquatic Resource G.



Photo 13. View northeast at non-vegetated roadside ditch habitat of Aquatic Resource G. The ditch continues offsite (east) via culvert to a tributary of Coal Creek.



Photo 14. Aquatic Resource G. View south at culvert beneath E. County Line Rd.

AQUATIC RESOURCE I (0.01 ACRES)

Aquatic Resource I comprises a small, PEM groundwater seep wetland, located in the western portion of the survey area. The wetland is situated approximately 30 feet west (upslope) from Aquatic Resource A; however, no direct surface connection was observed from Aquatic Resource I to Aquatic Resource A.

The vegetation community of Aquatic Resource I is dominated entirely by three-square (OBL). Soils within the wetland are clay textured meeting the criteria for the hydric soil indicator F3 (Depleted Matrix) and F8 (Redox Dark Surface). At the time of the delineation, primary wetland hydrology indicators of A3 (Saturation) were observed throughout the wetland. The wetland habitat within Aquatic Resource I meets the criteria for wetland based on the presence of hydrophytic vegetation, hydric soils and wetland hydrology.

Aquatic Resource I comprises a total of 0.01 acres within the survey area. Refer to **Photos 15-16** below for characteristics of Aquatic Resource I.



Photo 15. View west at PEM groundwater seep wetland, Aquatic Resource I (depicted by blue line). Vegetation community is dominated by three-square (OBL).

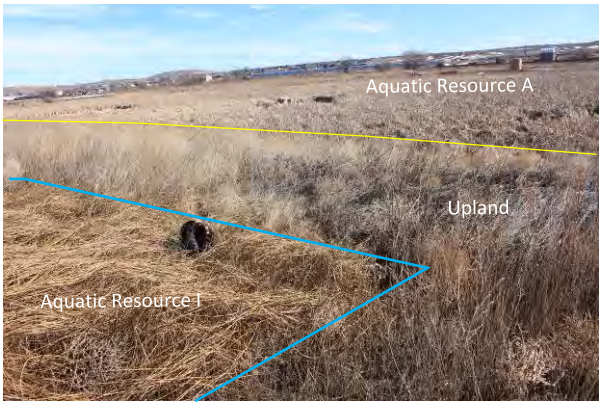


Photo 16. View northeast. Aquatic Resource I (depicted by blue line) is separated from Aquatic Resource A (depicted by yellow line) by upland hillside.

Table 2. Plant Species Found Within the Survey Area.

Scientific Name	Common Name	WIS*
Alnus incana	Speckled alder	FACW
Asclepias speciosa	Showy milkweed	FAC
Asclepias verticillata	Whorled milkweed	FACU
Bassia scoparia	Mexican-fireweed	FACU
Bromus inermis	Smooth brome	UPL
Bromus tectorum	Cheatgrass	NL
Cardaria draba	Whitetop	NL
Cirsium arvense	Canada thistle	FACU
Descurainia sophia	Tansy mustard	NL
Dipsacus fullonum	Fuller's teasel	FACU
Elaeagnus angustifolia	Russian olive	NL
Eleocharis montevidensis	Sand spikerush	FACW
Erigeron canadensis	Canadian horseweed	FACU
Glycyrrhiza lepidota	American licorice	FACU
Hordeum jubatum	Fox-tail barley	FACW
Juncus balticus	Baltic rush	FACW
Lepidium perfoliatum	Clasping pepperwort	FAC
Mentha arvensis	American wild mint	FACW
Myosurus minimus	Tiny mousetail	FACW
Pascopyrum smithii	Western wheatgrass	FACU
Phalaris arundinacea	Reed canary grass	FACW
Plantago major	Common plantain	NL
Populus deltoides	Eastern cottonwood	FAC
Ribes aureum	Golden currant	FACU
Rumex crispus	Curly dock	FAC
Salix exigua	Narrow-leaf willow	FACW
Salsola tragus	Prickly Russian thistle	FACU
Schoenoplectus pungens	Three-square	OBL
Sisymbrium altissimum	Tall hedge-mustard	FACU
Spergularia marina	Saltmarsh sandspurry	OBL
Typha latifolia	Broad-leaf cat-tail	OBL
Ulmus pumila	Siberian elm	UPL

* Wetland Indicator Status (WIS) – Great Plains Regions:
OBL = occurs in aquatic resources > 99% of time
FACW = occurs in aquatic resources 67-99% of time

Scientific Name	Common Name	WIS*
FAC	= occurs in aquatic resources 34-66% of time	
FACU	= occurs in aquatic resources 1-33% of time	
UPL	= occurs in uplands > 99% of time	
NI	= indicator status not known in this region	
NL	= indicator status not listed	

WIS Source: Lichvar, R.W., M. Butterwick, N.C. Melvin, and W.N. Kirchner. 2014. The National Wetland Plant List: 2014 Update of Wetland Ratings. Phytoneuron 2014-41: 1-42. http://www.phytoneuron.net/

4.3 UPLAND HABITAT

Upland habitat within the survey area consists primarily of agricultural land along the north and west sides, a horse pasture and farm on the southwest side, and upland grassland on the eastern portion of the survey area. Two vegetation communities are associated with upland habitats and include smooth brome *(Bromus inermis*) – western wheatgrass (*Pascopyrum smithi*) ruderal herbaceous vegetation throughout the eastern uplands/horse pasture areas and cultivated cropland across the northern and western portion of the survey area (NatureServe 2015). The vegetation communities characterized within the survey area are somewhat based on natural vegetation associations in the region (NatureServe 2015) however have been disturbed by historic and current land use practices thus represent somewhat degraded forms of these communities.

The cultivated cropland community is characterized as non-natural system which includes lands used for the production of annual crops where crop vegetation accounts for greater than 20 percent of the total vegetation and where the land is actively tilled.

The ruderal herbaceous vegetation community occurs widely through the Great Plains and has been commonly planted for pasture and hay fields (NatureServe 2015). Native species generally comprise less than 10% cover and include mixed-grass prairie grasses such as western-wheat grass and slender wild rye (*Elymus trachycaulus*). Other grasses and weedy species which dominate this community within the survey area include Mexican-fireweed (*Bassia scoparia*), smooth brome (*Bromus inermis*), cheatgrass (*Bromus tectorum*), tansy mustard (*Descurainia Sophia*), tall hedge-mustard (*Sisymbrium altissimum*) Canadian thistle (*Cirsium arvense*), eastern daisy fleabane (*Erigeron annuus*), horseweed (*Conyza canadensis*), Fuller's teasel (*Dipsacus fullonum*) and/or great mullein (*Verbascum thapsus*). The southern portion of the survey area is currently used for horse pasture and contains several farm buildings. The vegetation cover across this portion of the survey area is sparse, approximately 0% to 30% cover, and is also dominated by upland grasses and weeds. In general, the native species of this vegetation community are not conspicuous enough to identify the native plant association that could occupy the area (NatureServe 2015).

The majority of upland habitats across the survey area are dominated by FACU species with dry, light colored clay or sandy loam soils. Hydric soils, a dominance of hydrophytic vegetation, and/or wetland hydrology were not present in most upland habitats within the survey area. Some upland habitats were found to occur within

topographic micro-depressions containing vegetation communities dominated by FACW species such as fox-tail barley. Although dominated by hydrophytes, the overall species composition within these areas was generally intermixed with some degree of FACU-UPL grasses and weeds such as smooth brome, horseweed or thistle. Moreover, indicators of wetland hydrology and hydric soils were absent in these areas.

Refer to **Photos 17-18** below for characteristics of upland habitats identified within the survey area.



Photo 17. View north across ruderal upland vegetation community within eastern portion of the survey area dominated by smooth brome, Mexican fireweed, Canadian thistle and horseweed.



Photo 18. View north at upland cultivated cropland vegetation community within the northern portion of the survey area.

4.4 GOODHUE DITCH

Approximately 1,303 linear feet of man-made irrigation ditch, identified on the USGS topographic map as Goodhue Ditch, occurs within the survey area. The ditch diverts water from South Boulder Creek, just west of Marshall Reservoir flowing, east and south by way of excavated earthen channels, concrete-lined channels and underground pipes. The USGS topographic map shows the Goodhue Ditch splits within the City of Louisville; the southern branch lateral flows south to Coal Creek, then Stearns Lake before finally joining Rock Creek in the City of Broomfield, while the eastern branch flows to the City of Lafayette before terminating in an upland agricultural field approximately 0.5 miles east from survey area (40.014236°N, -105.057894°W). Within the survey area, the Goodhue Ditch is approximately 2-3 feet wide appears to be historically excavated wholly in uplands for irrigation purposes and terminates in an upland agricultural field therefore has been considered an upland ditch as part of this report. Refer to **Photos 19-20** below for characteristics of Goodhue Ditch within the survey area.



Photo 19. View west at Goodhue Ditch within the survey area. The 2 foot wide ditch was dry and surrounded by uplands at the time of the delineation.



Photo 20. View northeast at Goodhue Ditch as it leaves the survey area. The ditch terminates in an agricultural field approximately 0.5 miles to the northeast (offsite).

This report has been prepared by:

ECOLOGICAL RESOURCE CONSULTANTS, INC.

Diane Krzysztof, Ecologist (PWS # 2438)

(303) 679-4820 x106

Reviewed and approved by:

David J. Blauch, V.P., Senior Ecologist (PWS # 2130)

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APPENDIX A

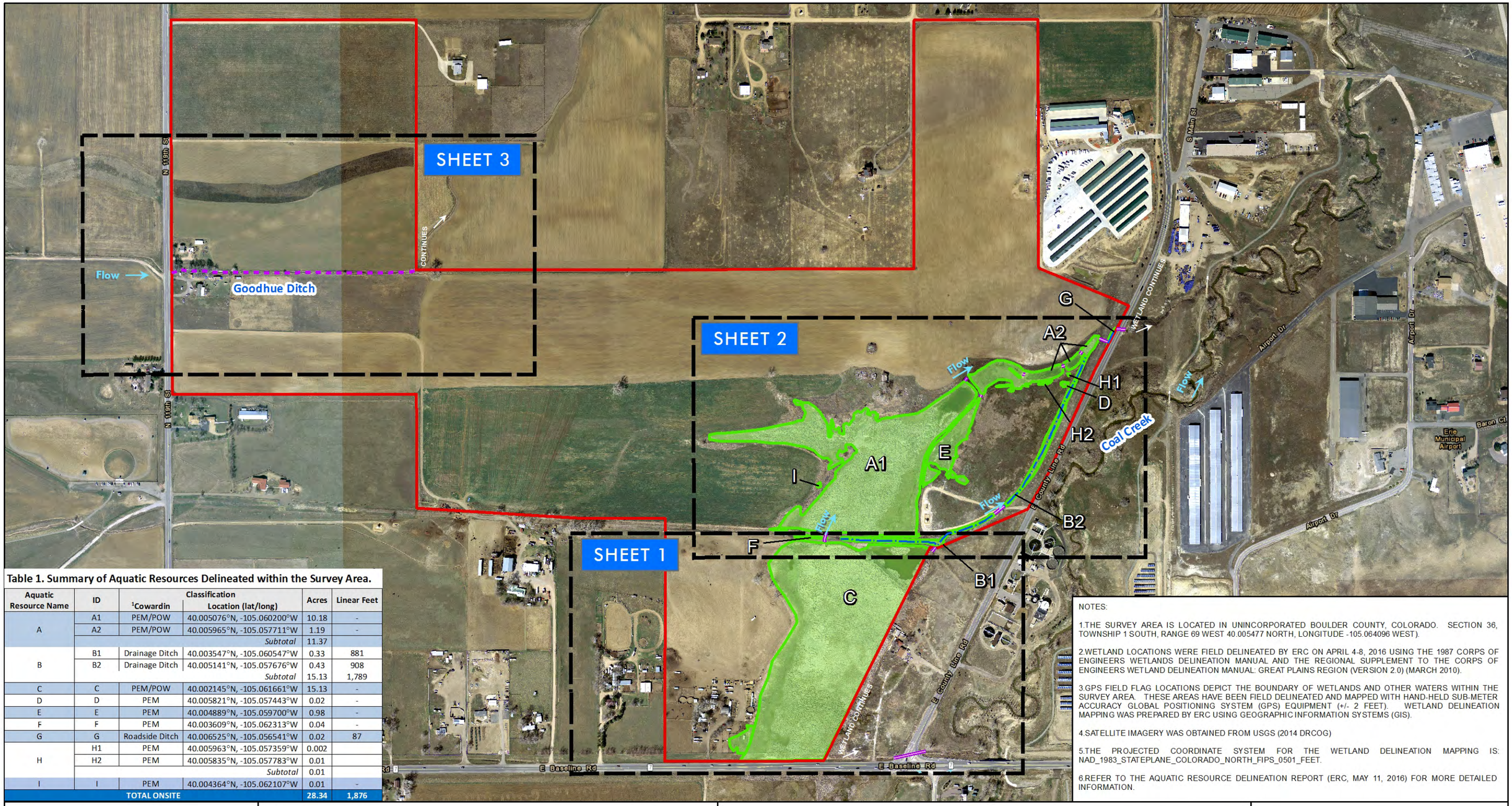


Table 1. Summary of Aquatic Resources Delineated within the Survey Area.

Aquatic Resource Name	ID	Classification [1]Cowardin	Classification Location (lat/long)	Acres	Linear Feet
A	A1	PEM/POW	40.005076°N, -105.060200°W	10.18	-
	A2	PEM/POW	40.005965°N, -105.057711°W	1.19	-
			Subtotal	11.37	
B	B1	Drainage Ditch	40.003547°N, -105.060547°W	0.33	881
	B2	Drainage Ditch	40.005141°N, -105.057676°W	0.43	908
			Subtotal	15.13	1,789
C	C	PEM/POW	40.002145°N, -105.061661°W	15.13	-
D	D	PEM	40.005821°N, -105.057443°W	0.02	-
E	E	PEM	40.004889°N, -105.059700°W	0.98	-
F	F	PEM	40.003609°N, -105.062313°W	0.04	-
G	G	Roadside Ditch	40.006525°N, -105.056541°W	0.02	87
H	H1	PEM	40.005963°N, -105.057359°W	0.002	
	H2	PEM	40.005835°N, -105.057783°W	0.01	
			Subtotal	0.01	
I	I	PEM	40.004364°N, -105.062107°W	0.01	-
TOTAL ONSITE				**28.34**	**1,876**

NOTES:

1.THE SURVEY AREA IS LOCATED IN UNINCORPORATED BOULDER COUNTY, COLORADO. SECTION 36, TOWNSHIP 1 SOUTH, RANGE 69 WEST 40.005477 NORTH, LONGITUDE -105.064096 WEST).

2.WETLAND LOCATIONS WERE FIELD DELINEATED BY ERC ON APRIL 4-8, 2016 USING THE 1987 CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL AND THE REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: GREAT PLAINS REGION (VERSION 2.0) (MARCH 2010).

3.GPS FIELD FLAG LOCATIONS DEPICT THE BOUNDARY OF WETLANDS AND OTHER WATERS WITHIN THE SURVEY AREA. THESE AREAS HAVE BEEN FIELD DELINEATED AND MAPPED WITH HAND-HELD SUB-METER ACCURACY GLOBAL POSITIONING SYSTEM (GPS) EQUIPMENT (+/- 2 FEET). WETLAND DELINEATION MAPPING WAS PREPARED BY ERC USING GEOGRAPHIC INFORMATION SYSTEMS (GIS).

4.SATELLITE IMAGERY WAS OBTAINED FROM USGS (2014 DRCOG)

5.THE PROJECTED COORDINATE SYSTEM FOR THE WETLAND DELINEATION MAPPING IS: NAD_1983_STATEPLANE_COLORADO_NORTH_FIPS_0501_FEET.

6.REFER TO THE AQUATIC RESOURCE DELINEATION REPORT (ERC, MAY 11, 2016) FOR MORE DETAILED INFORMATION.

Prepared By:

ERC

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Boulder, CO 80301
(303) 679-4820

ERC # 1000-1601

Legend

- A1 — Field Flag Location & ID
- DP-A1a — Data Point Location & ID
- Survey Area Boundary (221 acres)
- Upland Ditch

Delineated Aquatic Resource Boundary

- Waters of the US/Wetland
- Ditch
- Culvert

AQUATIC RESOURCE DELINEATION MAP - OVERVIEW

ERIE SITE
BOULDER COUNTY, COLORADO

Date: May 11, 2016

1 inch = 500 feet

0 — 500 — 1,000 Feet

NOTES:

1.THE SURVEY AREA IS LOCATED IN UNINCORPORATED BOULDER COUNTY, COLORADO. SECTION 36, TOWNSHIP 1 SOUTH, RANGE 69 WEST 40.005477 NORTH, LONGITUDE -105.064096 WEST).

2.WETLAND LOCATIONS WERE FIELD DELINEATED BY ERC ON APRIL 4-8, 2016 USING THE 1987 CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL AND THE REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: GREAT PLAINS REGION (VERSION 2.0) (MARCH 2010).

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4.SATELLITE IMAGERY WAS OBTAINED FROM USGS (2014 DRCOG)

5.THE PROJECTED COORDINATE SYSTEM FOR THE WETLAND DELINEATION MAPPING IS: NAD_1983_STATEPLANE_COLORADO_NORTH_FIPS_0501_FEET.

6.REFER TO THE AQUATIC RESOURCE DELINEATION REPORT (ERC, MAY 11, 2016) FOR MORE DETAILED INFORMATION.

F

SHEET 2

B1

C

Disturbed - Non Vegetated
(Included as part of Aquatic Resource C acreage)

WETLAND CONTINUES

WETLAND CONTINUES

E County Line Rd

E County Line Rd

E Baseline Rd

E Baseline Rd

E Baseline Rd

12399

12429

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ERC # 1000-1601

Legend

- Field Flag Location & ID
- Data Point Location & ID
- Survey Area Boundary (221 acres)
- Upland Ditch

Delineated Aquatic Resource Boundary

- Waters of the US/Wetland
- Ditch
- Culvert

AQUATIC RESOURCE DELINEATION MAP - SHEET 1

ERIE SITE
BOULDER COUNTY, COLORADO

Date: May 11, 2016

0 150 300 Feet

NOTES:

1.THE SURVEY AREA IS LOCATED IN UNINCORPORATED BOULDER COUNTY, COLORADO. SECTION 36, TOWNSHIP 1 SOUTH, RANGE 69 WEST 40.005477 NORTH, LONGITUDE -105.064096 WEST).

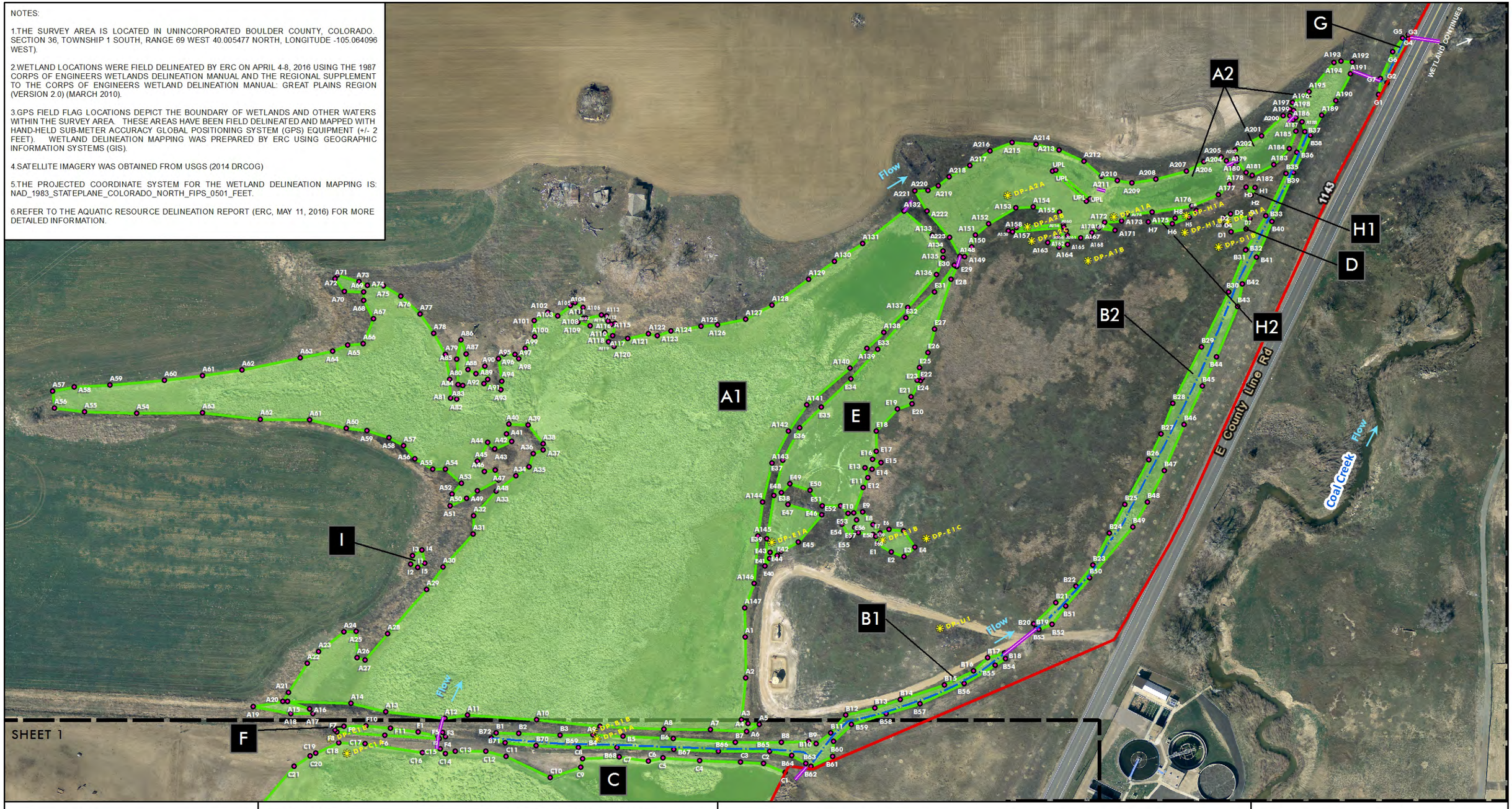
2.WETLAND LOCATIONS WERE FIELD DELINEATED BY ERC ON APRIL 4-8, 2016 USING THE 1987 CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL AND THE REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: GREAT PLAINS REGION (VERSION 2.0) (MARCH 2010).

3.GPS FIELD FLAG LOCATIONS DEPICT THE BOUNDARY OF WETLANDS AND OTHER WATERS WITHIN THE SURVEY AREA. THESE AREAS HAVE BEEN FIELD DELINEATED AND MAPPED WITH HAND-HELD SUB-METER ACCURACY GLOBAL POSITIONING SYSTEM (GPS) EQUIPMENT (+/- 2 FEET). WETLAND DELINEATION MAPPING WAS PREPARED BY ERC USING GEOGRAPHIC INFORMATION SYSTEMS (GIS).

4.SATELLITE IMAGERY WAS OBTAINED FROM USGS (2014 DRCOG)

5.THE PROJECTED COORDINATE SYSTEM FOR THE WETLAND DELINEATION MAPPING IS: NAD_1983_STATEPLANE_COLORADO_NORTH_FIPS_0501_FEET.

6.REFER TO THE AQUATIC RESOURCE DELINEATION REPORT (ERC, MAY 11, 2016) FOR MORE DETAILED INFORMATION.



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Legend

- A1 — Field Flag Location & ID
- DP-A1a — Data Point Location & ID
- Survey Area Boundary (221 acres)
- Upland Ditch

Delineated Aquatic Resource Boundary

- Waters of the US/Wetland
- Ditch
- Culvert

AQUATIC RESOURCE DELINEATION MAP - SHEET 2

ERIE SITE
BOUNDARY COUNTY, COLORADO

Date: May 11, 2016

0 150 300 Feet

NOTES:

1.THE SURVEY AREA IS LOCATED IN UNINCORPORATED BOULDER COUNTY, COLORADO. SECTION 36, TOWNSHIP 1 SOUTH, RANGE 69 WEST 40.005477 NORTH, LONGITUDE -105.064096 WEST).

2.WETLAND LOCATIONS WERE FIELD DELINEATED BY ERC ON APRIL 4-8, 2016 USING THE 1987 CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL AND THE REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: GREAT PLAINS REGION (VERSION 2.0) (MARCH 2010).

3.GPS FIELD FLAG LOCATIONS DEPICT THE BOUNDARY OF WETLANDS AND OTHER WATERS WITHIN THE SURVEY AREA. THESE AREAS HAVE BEEN FIELD DELINEATED AND MAPPED WITH HAND-HELD SUB-METER ACCURACY GLOBAL POSITIONING SYSTEM (GPS) EQUIPMENT (+/- 2 FEET). WETLAND DELINEATION MAPPING WAS PREPARED BY ERC USING GEOGRAPHIC INFORMATION SYSTEMS (GIS).

4.SATELLITE IMAGERY WAS OBTAINED FROM USGS (2014 DRCOG)

5.THE PROJECTED COORDINATE SYSTEM FOR THE WETLAND DELINEATION MAPPING IS: NAD_1983_STATEPLANE_COLORADO_NORTH_FIPS_0501_FEET.

6.REFER TO THE AQUATIC RESOURCE DELINEATION REPORT (ERC, MAY 11, 2016) FOR MORE DETAILED INFORMATION.



Prepared By:

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ERC # 1000-1601

Legend

- A1 — Field Flag Location & ID
- DP-A1a — Data Point Location & ID
- Survey Area Boundary (221 acres)
- Upland Ditch

Delineated Aquatic Resource Boundary

- Waters of the US/Wetland
- Ditch
- Culvert

AQUATIC RESOURCE DELINEATION MAP - SHEET 3

ERIE SITE
BOULDER COUNTY, COLORADO

Date: May 11, 2016

N

0 150 300 Feet

APPENDIX B

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/6/16

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-A1a

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Pond fringe Local relief (concave, convex, none): None Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0058495392° N Long: -105.058135576° W Datum: NAD83

Soil Map Unit Name: AoB-Ascalon-Otero complex, 0 to 3 percent slopes NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:
Data point located along southern fringe of agricultural pond. Paired with upland data point DP-A1b.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Schoenoplectus pungens	75	Yes	OBL
2. Spergularia marina	10	No	OBL
3. Eleocharis montevidensis	10	No	FACW
4. Descurainia sophia	3	No	NL
5. Dipsacus fullonum	1	No	FACU
6. Cirsium arvense	1	No	FACU
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✓ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:
PEM vegetation community is dominated by three-square intermixed with hydrophytic forbs and upland weeds. Meets the dominance test for hydrophytic vegetation.

SOIL

Sampling Point: DP-A1a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/1	70	10YR 4/4	30	C	M	Clay	Distinct redox concentrations
12-20	10YR 4/1	50	10YR 4/4	50	C	M	Sandy clay	Distinct redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

Dark gray soils with large, distinct redox concentrations. Meets the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ✓ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ✓ No ___ Depth (inches): 18"

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0"

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface soil saturation observed during the site visit. Meets the criteria for hydrology.
Surface water is present in the nearby pond.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/6/16

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-A1b

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Agricultural field Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0056588485° N Long: -105.058285932° W Datum: NAD83

Soil Map Unit Name: AoB-Ascalon-Otero complex, 0 to 3 percent slopes NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

Data point located in upland agricultural field. While this plot does have a vegetation community dominated by hydrophytes, its lacks positive indicators for hydric soils and wetland hydrology. Paired with wetland data point DP-A1a.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	
Herb Stratum (Plot size: _____)			
1. Hordeum jubatum	80	Yes	FACW
2. Erigeron canadensis	10	No	FACU
3. Rumex crispus	10	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✓ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

Microtopographic depression in upland agricultural field dominated by fox-tail barley. Although this community meets the dominance test for hydrophytic vegetation, indicators of hydric soils and wetland hydrology are absent. Underlain by dense clay soils, this mesic vegetation community is typical of microtopographic depressions within the upland agricultural field.

SOIL

Sampling Point: DP-A1b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-4	10YR 3/2	100					Clay	
4-12	10YR 4/4	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

Bright, dry soil with no hydric soil indicators. Does not meet the criteria for hydric soil.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators of hydrology observed. Does not meet the criteria for wetland hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/6/16

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-A2a

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none): None Slope (%):

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0059463059° N Long: -105.058739917° W Datum: NAD83

Soil Map Unit Name: AoB-Ascalon-Otero complex, 0 to 3 percent slopes NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

This sample plot represents the wetland site conditions for this portion of Aquatic Resource A. Data points DP-A2a (wetland), DP-A2b (wetland) and DP-A2c (upland) represent paired data points along a transect within Aquatic Resource A.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Hordeum jubatum	75	Yes	FACW
2. Spergularia marina	20	Yes	OBL
3. Erigeron canadensis	5	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✓ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

PEM vegetation community is dominated by fox-tail barley intermixed with sandspurry. Meets the dominance test for hydrophytic vegetation.

SOIL

Sampling Point: DP-A2a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 2/1	80	5YR 3/3	20	C	M	Clay	Prominent redox concentrations
18-20	10YR 4/1	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

Dark soils with large, prominent redox concentrations. Meets the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ✓ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ✓ No ___ Depth (inches): 18"

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0"

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface soil saturation observed during the site visit. Meets the criteria for hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/7/16

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-A2b

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Excavated swale Local relief (concave, convex, none): Convex Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0058081443° N Long: -105.058627948° W Datum: NAD83

Soil Map Unit Name: AoB-Ascalon-Otero complex, 0 to 3 percent slopes NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

Data point located within excavated PEM swale of Aquatic Resource A. Wetland vegetation, hydric soil indicators, and wetland hydrology present. Data points DP-A2a (wetland), DP-A2b (wetland) and DP-A2c (upland) represent paired data points along a transect within Aquatic Resource A.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Spergularia marina	65	Yes	OBL
2. Erigeron canadensis	20	Yes	FACU
3. Hordeum jubatum	10	No	FACW
4. Rumex crispus	5	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	65	x 1 =	65
FACW species	10	x 2 =	20
FAC species	5	x 3 =	15
FACU species	20	x 4 =	80
UPL species	0	x 5 =	0
Column Totals:	100 (A)		180 (B)

Prevalence Index = B/A = 1.80

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

✓ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

PEM vegetation community is dominated by sandspurry with horseweed around the perimeter. Prevalence index is < 3.0 with hydric soils and wetland hydrology present therefore data point meets the criteria for hydrophytic vegetation.

SOIL

Sampling Point: DP-A2b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	100					Clay	
4-12	10YR 3/2	95	10YR 5/6	5	C	M	Clay	Prominent redox concentrations
12-18	10YR 3/2	80	10YR 3/1	20	C	M	Clay	Faint redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

Dark soils with small, prominent redox concentrations at 12". Meets the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ✓ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ✓ No ___ Depth (inches): 18"

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0"

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface soil saturation observed during the site visit. Meets the criteria for hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/7/16

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-A2c

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Agricultural field Local relief (concave, convex, none): None Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0057466768° N Long: -105.058605178° W Datum: NAD83

Soil Map Unit Name: AoB-Ascalon-Otero complex, 0 to 3 percent slopes NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

Data point located in upland agricultural field. While this plot does have a vegetation community dominated by hydrophytes, its lacks positive indicators for hydric soils and wetland hydrology. Paired with wetland data points DP-A2a (wetland) and DP-A2b (wetland).

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Hordeum jubatum	80	Yes	FACW
2. Rumex crispus	15	No	FAC
3. Erigeron canadensis	5	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✓ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

Microtopographic depression in upland agricultural field dominated by fox-tail barley. Although this community meets the dominance test for hydrophytic vegetation, indicators of hydric soils and wetland hydrology are absent. Underlain by dense clay soils, this mesic vegetation community is typical of microtopographic depressions within the upland agricultural field.

SOIL

Sampling Point: DP-A2c

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-12	10YR 3/2	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

Bright, dry soil with no hydric soil indicators. Does not meet the criteria for hydric soil.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators of hydrology observed. Does not meet the criteria for wetland hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/8/16

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-B1a

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Ditch Local relief (concave, convex, none): Convex Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0035753474° N Long: -105.061096263° W Datum: NAD83

Soil Map Unit Name: Lv-Loveland soils NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:
The sample plot is located within PEM wetland habitat within the bottom of a drainage ditch. Wetland data point paired with DP-B1b (upland).

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Typha latifolia	50	Yes	OBL
2. Schoenoplectus pungens	40	Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 10%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✓ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:
PEM habitat dominated by cat-tail and three-square. Meets the dominance test for hydrophytic vegetation.

SOIL

Sampling Point: DP-B1a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-12	2.5YR 2.5/0	100					Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ✓ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ✓ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

Black, inundated soils with hydrogen sulfide odor. Some small cobbles present. Meets the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ✓ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ✓ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 2"

Water Table Present? Yes ✓ No ___ Depth (inches): 0"

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0"

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Drainage feature inundated to a depth of approximately 2" during Site visit. Meets the criteria for hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/8/16

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-B1b

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Berm Local relief (concave, convex, none): Concave Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0036126833° N Long: -105.061114731° W Datum: NAD83

Soil Map Unit Name: Lv-Loveland soils NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

Data point located on upland berm. This plot lacks any indicators of wetland vegetation, hydric soil and/or wetland hydrology. Paired with data point DP-B1a (wetland).

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Pascopyrum smithii	65	Yes	FACU
2. Erigeron canadensis	10	No	FACU
3. Cirsium arvense	10	No	FACU
4. Rumex crispus	5	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 10%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

Upland berm dominated by grasses and weeds. Does not meet the criteria for hydrophytic vegetation.

SOIL

Sampling Point: DP-B1b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0"								Restrictive Layer

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: Cobble

Depth (inches): 0"

Hydric Soil Present? Yes _____ No ✓

Remarks:

Restrictive cobble layer along upland berm. Does not meet the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Dry upland berm. No indicators of hydrology observed. Does not meet the criteria for wetland hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/8/16

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-C1a

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Wetland fringe Local relief (concave, convex, none): Convex Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0035166639° N Long: -105.062520793° W Datum: NAD83

Soil Map Unit Name: Lv-Loveland soils NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Yes Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

The sample plot is located within PEM wetland habitat along the northern fringe of an agricultural pond. Vegetation is significantly disturbed from livestock trampling therefore wetland boundary determination is assumed based on indicators of hydric soils and landscape position. Wetland data point paired with DP-C1b (upland).

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Rumex crispus	15	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	15 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 85%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✓ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

Sparse PEM habitat along pond fringe dominated by curly dock. Meets the dominance test for hydrophytic vegetation.

SOIL

Sampling Point: DP-C1a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	N 4/	100					Clay	
8-12	N 3/	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ✓ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ **No** _____

Remarks:

Bluish black, gleyed soils. Meets the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ✓ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ✓ No ___ Depth (inches): 6"

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0"

Wetland Hydrology Present? Yes ✓ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Soils are saturated to the surface with groundwater at 6". Meets the criteria for hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/8/16

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-C1b

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Berm Local relief (concave, convex, none): Concave Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0035813561° N Long: -105.062613339° W Datum: NAD83

Soil Map Unit Name: Lv-Loveland soils NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Yes Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

Upland data point paired with DP-C1a (wetland). Vegetation on this portion of the property is significantly disturbed from livestock trampling therefore wetland boundary determination was assumed based on indicators of hydric soils and landscape position.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	0 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 100%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

Upland berm is non-vegetated due to livestock trampling. Assumed to be non-wetland based on lack of hydric soil indicators, landscape position and no wetland hydrology.

SOIL

Sampling Point: DP-C1b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-12	10YR 3/4	100					Sandy clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

Bright, dry compacted soil. Does not meet the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators of hydrology observed. Does not meet the criteria for wetland hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/6/16

Applicant/Owner: KT Engineering State: Colorado Sampling Point: DP-D1a

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Convex Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0058272435° N Long: -105.057488546° W Datum: NAD83

Soil Map Unit Name: AoB-Ascalon-Otero complex, 0 to 3 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

PEM wetland data point located within small, (historically excavated) topographic depression, situated between the open water ponds of Wetland A (north) and Wetland B-ditch (east). Paired with upland data point DP-D1b.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Hordeum jubatum	90	Yes	FACW
2. Spergularia marina	5	No	OBL
3. Rumex crispus	1	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	96 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 4%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✓ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

PEM vegetation community is dominated by three-square intermixed with hydrophytic forbs and upland weeds. Meets the dominance test for hydrophytic vegetation.

SOIL

Sampling Point: DP-D1a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 5/1	80	5YR 3/3 & 3/2	20	C	M	Clay	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ✓ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

Dark gray soils with large, prominent redox concentrations. Meets the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ✓ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ✓ No ___ Depth (inches): 8"

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0"

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface soil saturation and high water table observed during the site visit. Meets the criteria for wetland hydrology.
Surface water is present approximately 3 feet northeast.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/6/16

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-D1b

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Agricultural field Local relief (concave, convex, none): None Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0057148317° N Long: -105.057539468° W Datum: NAD83

Soil Map Unit Name: AoB-Ascalon-Otero complex, 0 to 3 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

Upland data point paired with DP-D1a (wetland). Data point located in upland agricultural field. This plot lacks wetland vegetation, hydric soil indicators, and wetland hydrology.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Hordeum jubatum	75	Yes	FACW
2. Bromus inermis	20	Yes	UPL
3. Erigeron canadensis	5	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

Herbaceous vegetation community dominated by fox-tail barley and smooth brome. Does not meet the dominance test for hydrophytic vegetation, indicators of hydric soils and wetland hydrology are absent therefore prevalence test was not completed.

SOIL

Sampling Point: DP-D1b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	100					Clay	
4-12	10YR 4/4	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

Bright, dry soil with no hydric soil indicators. Does not meet the criteria for hydric soil.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Soils are moist, but not saturated. Drainage patterns (i.e., seasonal overland flow) observed on the ground surface likely from the adjacent ditch. No primary indicators of wetland hydrology observed. Does not meet the criteria for wetland hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/7/16

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-E1a

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Convex Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0044325819° N Long: -105.060095349° W Datum: NAD83

Soil Map Unit Name: AoB-Ascalon-Otero complex, 0 to 3 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

The sample plot is located in a depression or swale along eastern side of a berm. Wetland data point paired with DP-E1b (wetland) and DP-E1c (upland).

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Schoenoplectus pungens	80	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 20%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✓ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

PEM habitat dominated by three-square. Meets the dominance test for hydrophytic vegetation.

SOIL

Sampling Point: DP-E1a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	100					Clay	
4-12	10YR 3/1	20	10YR 4/3	80	C	M	Clay	Distinct redox concentrations
12-18	10YR 5/1	75	10YR 5/6	20	C	M	Clay	Prominent redox concentrations
			10YR 7/1	5	C	M	Clay	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ✓ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ✓ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

Very dark gray soils with distinct or prominent redox concentrations from 4-18". Meets the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ✓ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 2"

Water Table Present? Yes ✓ No ___ Depth (inches): 18"

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0"

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface water observed approximately 2" deep during Site visit. Meets the criteria for hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/7/16

Applicant/Owner: KT Engineering State: Colorado Sampling Point: DP-E1b

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Agricultural field Local relief (concave, convex, none): Convex Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0044404043° N Long: -105.059463754° W Datum: NAD83

Soil Map Unit Name: AoB-Ascalon-Otero complex, 0 to 3 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

This sample plot represents the PEMC wetland habitat type of Aquatic Resource E. Wetland vegetation, hydric soil indicators, and wetland hydrology present. Data points DP-E1a (wetland), DP-E1c (upland) represent paired data points within Aquatic Resource E.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Hordeum jubatum	95	Yes	FACW
2. Rumex crispus	5	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✓ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

PEM vegetation community is dominated by fox-tail barley. Data point meets the criteria for hydrophytic vegetation.

SOIL

Sampling Point: DP-E1b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	100					Clay	
4-18	10YR 4/1	80	10YR 5/6	20	C	M	Clay	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ✓ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

Dark gray soils with small, prominent redox concentrations below 4". Meets the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ✓ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ✓ No ___ Depth (inches): 18"

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0"

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface soil saturation observed during the site visit. Meets the criteria for hydrology.
Surface water inundation is present approximately 15' to the northeast in center of the wetland pocket.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/7/16

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-E1c

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Agricultural field Local relief (concave, convex, none): None Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0044450421° N Long: -105.059214821° W Datum: NAD83

Soil Map Unit Name: AoB-Ascalon-Otero complex, 0 to 3 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

Data point located in upland agricultural field. This plot lacks wetland vegetation, hydric soil indicators, and wetland hydrology. Paired with data points DP-E1a (wetland) and DP-E1b (wetland).

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Bassia scoparia	40	Yes	FACU
2. Bromus tectorum	30	Yes	NL
3. Cirsium arvense	20	Yes	FACU
4. Rumex crispus	10	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

Upland agricultural field dominated by herbaceous grasses and weeds. Does not meet the criteria for hydrophytic vegetation.

SOIL

Sampling Point: DP-E1c

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/2	100					Clay	
3-12	10YR 3/2	90	10YR 4/3	10	D	M	Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

No hydric soil indicators observed. Does not meet the criteria for hydric soil.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators of hydrology observed. Does not meet the criteria for wetland hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/7/16

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-H1a

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Swale Local relief (concave, convex, none): Convex Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0058532639° N Long: -105.057723054° W Datum: NAD83

Soil Map Unit Name: AoB-Ascalon-Otero complex, 0 to 3 percent slopes NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

Data point located within PEM swale, immediately adjacent to an upland berm. No hydric soil indicators observed at this data point location; however dominant vegetation is obligate with wetland hydrology observed. Sample area assumed to be wetland based on presence of hydrophytic vegetation wetland hydrology. Wetland data point paired with DP-H1b (upland).

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Spergularia marina	85	Yes	OBL
2. Rumex crispus	5	No	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 10%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✓ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

PEM vegetation community is dominated by sandspurry. Data point meets the criteria for hydrophytic vegetation.

SOIL

Sampling Point: DP-H1a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-20	10YR 4/2	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

Dark gray soils with no redox concentrations observed. Does not meet the criteria for any hydric soil indicators.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ✓ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ✓ No _____ Depth (inches): 0"

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Surface soil saturation observed during the site visit. Meets the criteria for hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/8/16

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-H1b

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Agricultural field Local relief (concave, convex, none): None Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0057804636° N Long: -105.057732896° W Datum: NAD83

Soil Map Unit Name: AoB-Ascalon-Otero complex, 0 to 3 percent slopes NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

Upland data point paired with DP-H1a (wetland). Data point located within upland agricultural field. This sample plot lacks any indicators of wetland vegetation, hydric soil and/or wetland hydrology.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Pascopyrum smithii	100	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

Upland herbaceous community is dominated by western wheatgrass Data point does not meet the criteria for hydrophytic vegetation.

SOIL

Sampling Point: DP-H1b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-12	10YR 4/2	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

Dark clay soils with no redox observed. Does not meet the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators of hydrology observed. Does not meet the criteria for wetland hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Site City/County: Unincorporated Boulder County Sampling Date: 4/8/16

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-U1

Investigator(s): D. Krzysztof Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Agricultural field Local relief (concave, convex, none): None Slope (%): _____

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.0040524009° N Long: -105.059139871° W Datum: NAD83

Soil Map Unit Name: AoB-Ascalon-Otero complex, 0 to 3 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

Data point located in upland agricultural field approximately 200 feet east of oil and gas extraction wells. A prairie dog colony occupies this portion of the site. This plot lacks wetland vegetation, hydric soil indicators, and wetland hydrology.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. Ribes aureum	30	Yes	FACU
2.			
3.			
4.			
5.			
	30 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Rumex crispus	75	Yes	FAC
2. Cirsium arvense	10	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	85 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 15%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC−): 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	75	x 3 =	225
FACU species	38	x 4 =	152
UPL species	0	x 5 =	0
Column Totals:	113 (A)		377 (B)

Prevalence Index = B/A = 3.34

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

Upland agricultural field dominated by an overstory of golden currant with curly dock understory. Does not meet the criteria for hydrophytic vegetation.

SOIL

Sampling Point: DP-U1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-12	10YR 3/3	100					Clay	10YR 3/1 streaks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

Brown, dry soil with no hydric soil indicators observed. Does not meet the criteria for hydric soil.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No indicators of hydrology observed. Does not meet the criteria for wetland hydrology.

Ecological Resource Consultants, Inc.
5672 Juhls Drive ~ Boulder, CO ~ 80301 ~ (303) 679-4820

Screening Report
for
Federal and State Listed Threatened and Endangered Species

Erie Site
Boulder County, Colorado

May 11, 2016

Prepared for:
OEO, LLC
7353 S Alton Way, Suite A100
Centennial, CO 80112

ERC Project #1000-1601

Screening Report
for
Federal and State Listed Threatened and Endangered Species

Erie Site
Boulder County, Colorado

May 11, 2016

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FIGURE 1 – VICINITY MAP
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FIGURE 3 – VEGETATION COMMUNITY MAP

1.0 INTRODUCTION

Ecological Resource Consultants, Inc. (ERC) has prepared this report at the request of the property owner OEO, LLC. The approximately 221 acre property referred to as Erie Site is located in unincorporated Boulder County, Colorado (Site). The Site is under consideration for potential future development which will likely alter a majority of the current Site landscape, therefore this report has been prepared to identify potential federal and state listed threatened and endangered species and/or habitat that could exist on or immediately surrounding the Site. In addition, this report provides a cursory screening of general wildlife use characteristics and existing vegetation community types.

This report has been prepared in accordance with the Migratory Bird Treaty Act (MBTA), Endangered Species Act (ESA) and Colorado Parks and Wildlife (CPW) Colorado Statute Title 33.

2.0 GENERAL SITE DESCRIPTION

The Site is generally located at the northwest corner of East Baseline Road and East County Line Road in Section 36, Township 1 north, Range 69 west, near the city of Lafayette in unincorporated Boulder County, Colorado (**latitude 40.005477° north, longitude -105.064096° west**). The Site is bound by East Baseline Road to the south, East County Line Road to the east, and vacant agricultural land to the north and west (refer to **Figures 1 and 2**).

The Site comprises approximately 221 acres and has an average elevation of 5,100 feet above mean sea level. Topography on the Site slopes downward to the east/northeast. The Site is generally undeveloped and consists primarily of agricultural land along the north and west sides, a large cattail wetland through the center of the Site, a horse pasture and farm on the southwest side, and upland grassland on the eastern portion of the Site. A natural gas extraction well is located on the eastern portion of the Site. An active prairie dog colony occurs on the eastern portion of the Site, generally along East County Line Road.

Review of the USGS topographic map depicts Goodhue Ditch extends from west to east approximately 1,300 feet across the northeastern corner of the Site. The ditch continues northeast for approximately 4,500 feet outside of the Site, terminating in an agricultural field.

Three vegetation communities occur within the Site and are comprised of broad-leaf cat-tail (*Typha latifolia*) western herbaceous vegetation along the central drainage, smooth brome *(Bromus inermis*) – western wheatgrass (*Pascopyrum smithi*) ruderal herbaceous vegetation throughout the eastern uplands (NatureServe 2015) and cultivated cropland across the northern and western portion of the Site. The vegetation communities characterized on the Site are somewhat based on natural vegetation associations in the region (NatureServe 2015) however those on the Site have been disturbed by historic and current land use practices thus represent somewhat degraded forms of these communities.

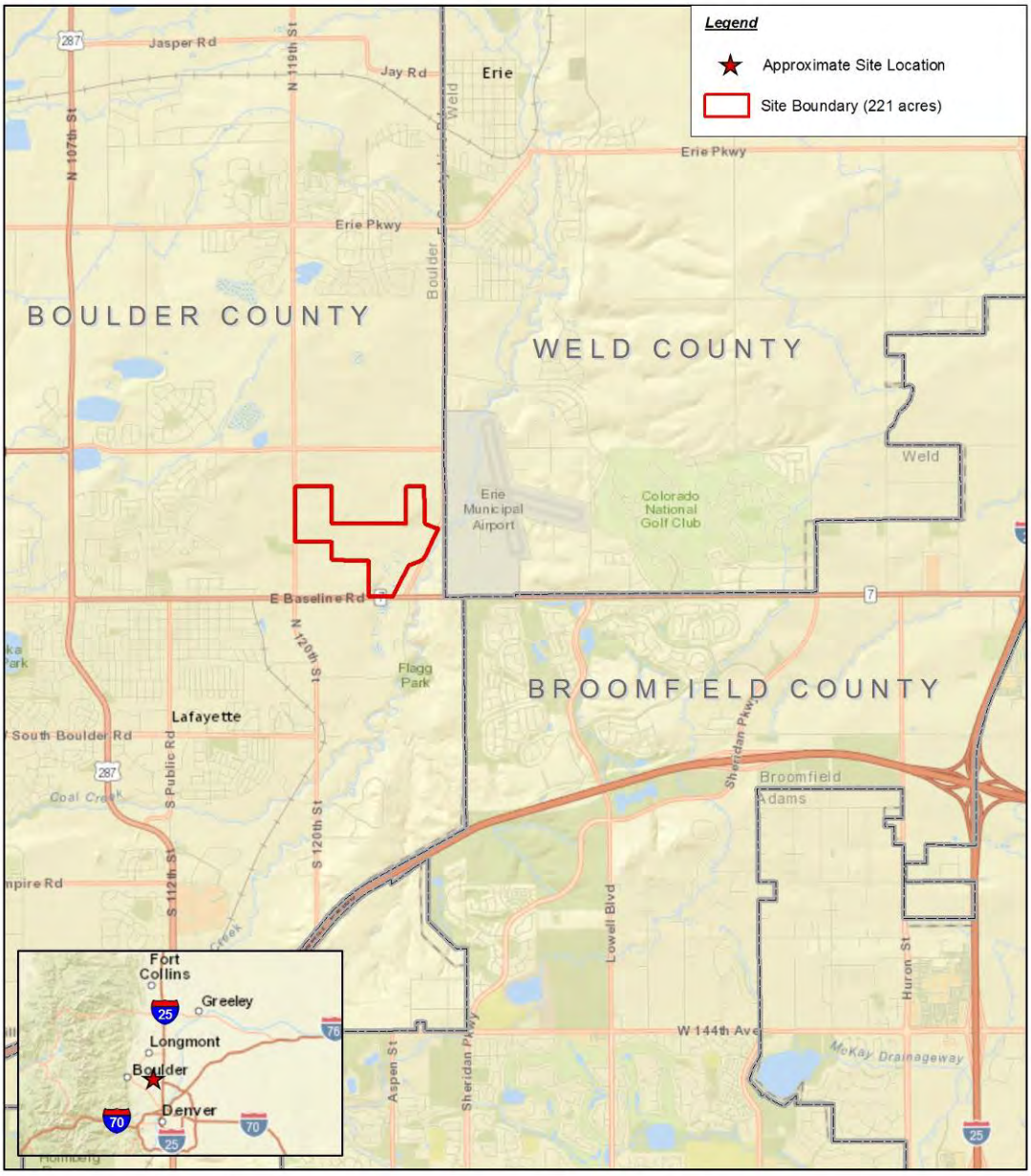
The cultivated cropland community is characterized as non-natural system which includes lands used for the production of annual crops where crop vegetation accounts for greater than 20 percent of the total vegetation and where the land is actively tilled. Two eastern cottonwood (*Populus deltoides*) trees are present within the center of the cultivated cropland community. Additionally, several mature overstory trees are present near an existing residence on the far eastern portion of the Site and along the southeastern Site boundary, within the cultivated cropland vegetation community.

The ruderal herbaceous vegetation community occurs widely through the Great Plains and has been commonly planted for pasture and hay fields (NatureServe 2015). Native species generally comprise less than 10% cover and include mixed-grass prairie grasses such as western-wheat grass and slender wild rye (*Elymus trachycaulus*). Within the Site, other grasses and weedy species which co-dominate this community include Mexican-fireweed (*Bassia scoparia*), smooth brome (*Bromus inermis*), cheatgrass (*Bromus tectorum*), tansy mustard (*Descurainia Sophia*), tall hedge-mustard (*Sisymbrium altissimum*) Canadian thistle (*Cirsium arvense*), eastern daisy fleabane (*Erigeron annuus*), horseweed (*Conyza canadensis*), Fuller's teasel (*Dipsacus fullonum*) and/or great mullein (*Verbascum thapsus*). Although not a dominant component of the vegetation community, several pockets of golden currant (*Ribes aureum*) occur throughout the ruderal herbaceous vegetation community.

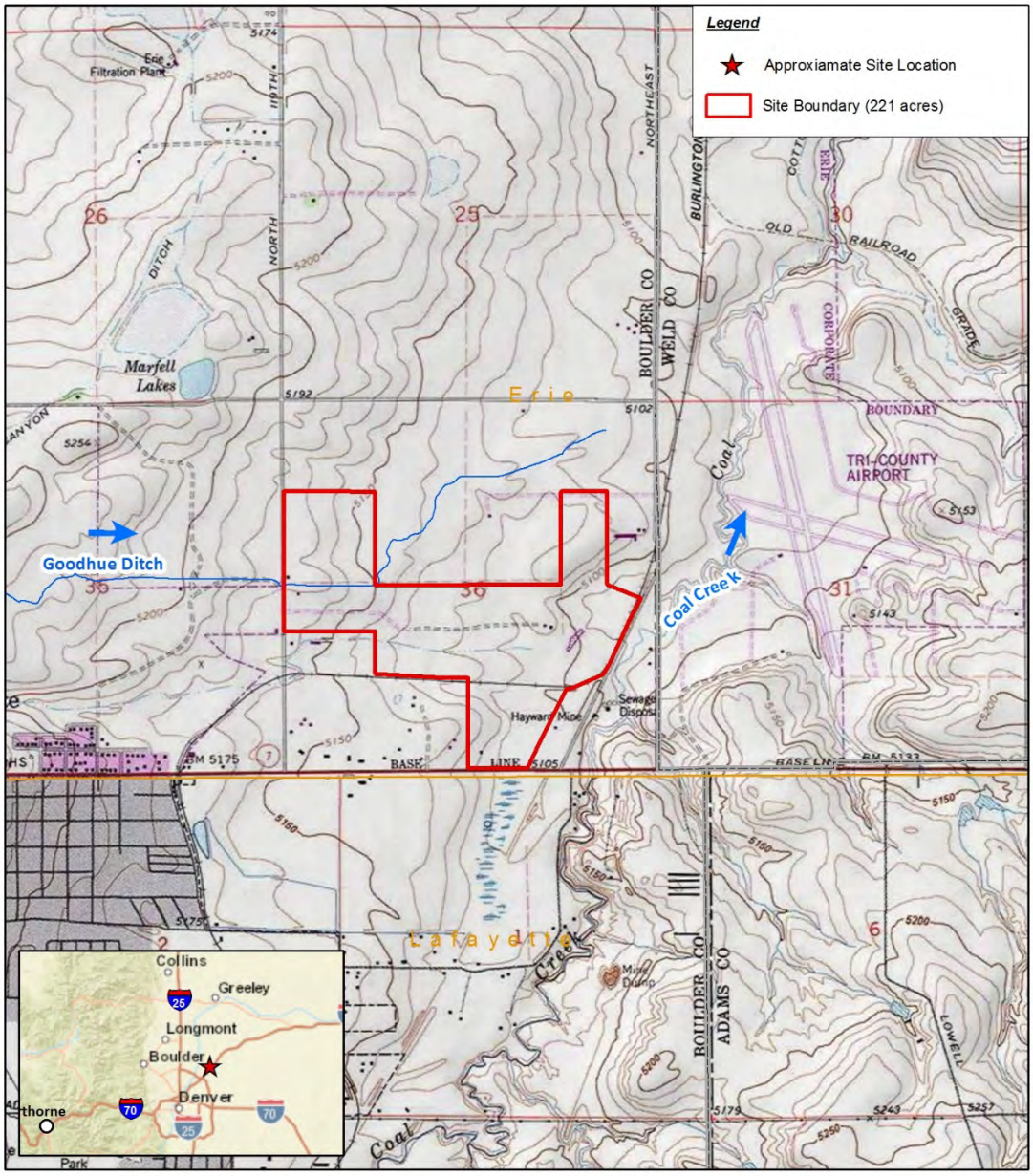
The southern portion of the Site is currently a horse pasture and contains several farm buildings. The vegetation cover across this portion of the Site is sparse, approximately 0% to 30% cover, and is also dominated by upland grasses and weeds. In general, the native species of this vegetation community are not conspicuous enough to identify the native plant association that could occupy the Site (NatureServe 2015). Several mature overstory trees are present near the existing farm buildings within the horse pasture community.

The broad-leaf cat-tail association is widespread across Colorado and the Great Plains occurring near streams, rivers, and ponds. The soil is flooded or saturated for at least part of the growing season (NatureServe 2015). The dominant species, broad-leaf cat-tail, occurs in dense, monotypic stands. Within the Site, mixed herbaceous vegetation occurs along the seasonally flooded perimeter of this vegetation community and includes species such as three-square (*Schoenoplectus pungens*), reed canary grass (*Phalaris arundinacea*), fox-tail barley (*Hordeum jubatum*), American wild mint (*Mentha arvensis*) and/or sand spikerush (*Eleocharis montevidensis*). A smaller portion of this vegetation community comprises deeper, permanently flooded open water habitat.

Refer to **Photos 1-4** below for typical characteristics within the Site. The overall existing Site conditions are depicted on the aerial photograph (DRGOG 2014) provided as **Figure 3**.



Prepared By: ERC *5672 Juhls Drive* *Boulder, CO 80301* *(303) 679-4820* *ERC #1000-1601*	**FIGURE 1.** **LOCATION MAP** **ERIE SITE** **BOULDER COUNTY, COLORADO**	0 0.5 1 Miles *Prepared For:* *OEO, LLC* *May 11, 2016*



Prepared By: ERC *5672 Juhls Drive* *Boulder, CO 80301* *(303) 679-4820* *ERC #1000-1601*	**FIGURE 2.** **USGS TOPOGRAPHIC MAP** **ERIE SITE** **BOULDER COUNTY, COLORADO**	0 0.25 0.5 Miles *Prepared For:* *OEO, LLC* *May 11, 2016*



Photo 1. View west at central portion of western herbaceous vegetation association dominated by a nearly monotypic stand of broad-leaf cat-tail vegetation.



Photo 2. Example of open water habitat which occurs within the broad-leaf cat-tail western herbaceous vegetation community.



Photo 3. Example of significantly disturbed horse pasture within the ruderal herbaceous vegetation community on the southern portion of the Site. Overall herbaceous vegetation cover ranges from 0-30%.



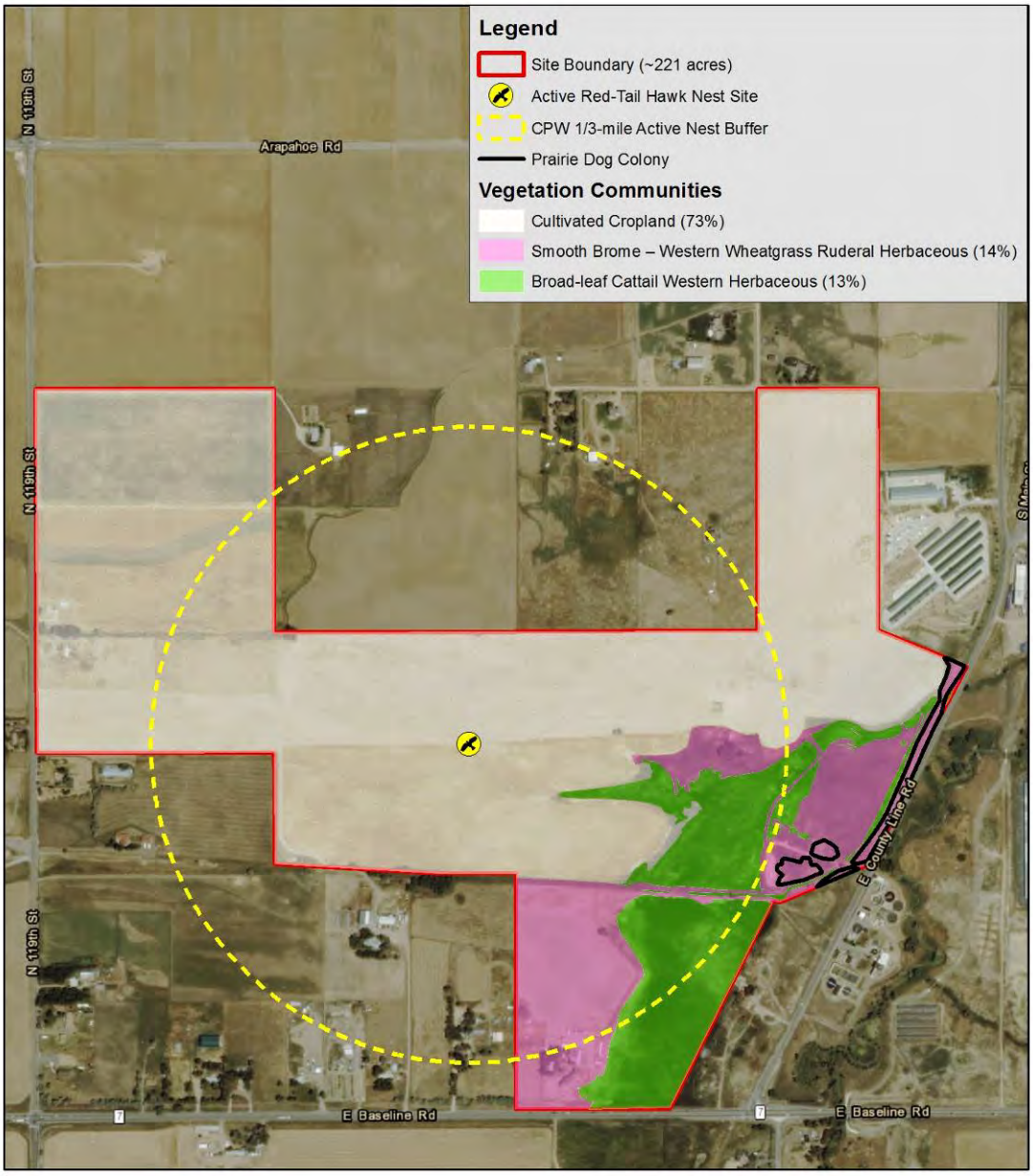
Photo 4. View north at cultivated cropland vegetation community within the northern portion of the Site.



Photo 5. Large eastern cottonwood tree within the cultivated cropland vegetation community.



Photo 6. View southwest of the broad-leaf cat-tail western herbaceous vegetation community within the Site. The berm (shown left) is occupied by an active prairie dog colony.



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ERC #1000-1601

FIGURE 3.
VEGETATION COMMUNITIES

ERIE SITE
BOULDER COUNTY, COLORADO

Prepared For:
OEO, LLC

May 11, 2016

3.0 SCREENING METHODOLOGY

ERC conducted a literature review as part of initial data collection for preparation of this report. Among others, ERC reviewed the available literature sources including; CPW information and the US Fish and Wildlife Service (USFWS) Federal Register.

A field inspection was subsequently conducted on April 4-8, 2016 to identify and document the presence of natural vegetation communities, general wildlife use and potential for threatened and endangered species/habitat. Upon review of all available resources, including literature and field inspections, ERC provides the following determination for the Site.

4.0 GENERAL WILDLIFE HABITAT (NON-REGULATED)

Wildlife utilizes the general landscape in a multitude of ways and uses a variety of habitats as areas of permanent inhabitance, seasonal inhabitance, breeding grounds, migratory routes, for foraging purposes, or as a temporary shelter. Potential wildlife habitat includes agricultural land, ruderal uplands and herbaceous wetland communities.

Historic and current land use associated with agricultural practices have restricted the development of any significant natural vegetation communities across much of the Site, which limits the overall quality of potential wildlife habitat. The predominant habitat type which occupies 73% of the Site is characterized as cultivated cropland. This habitat type which is dominated by non-native or weedy species is not typically considered of high ecological value to wildlife; however, agricultural lands can have beneficial values to certain wildlife species. These areas at a minimum are considered “open space” providing limited foraging and hunting grounds, refuge and limited areas for nesting (Kingery 1998). The agricultural land which is present across the Site has largely replaced the native shortgrass prairie habitat which would have been present in this region. The majority of the Site is occupied by rye crops and regularly plowed, or used as horse pasture therefore is devoid of any significant natural vegetation communities. Row crop agriculture, particularly large fields in monocultures of rye, generally provides suitable habitat for the least number and diversity of species (Blann 2006). Non-native species or ruderal native species which permeate the vegetation communities generally do not provide quality habitat for most wildlife. In general, agriculture practices have altered the structure, function, community composition, and habitat value of land within a majority of the Site. A limited number of mature eastern cottonwood (*Populus deltoides*) trees occur sporadically within the Site and around the immediate vicinity. Overstory canopy trees, situated in an agricultural landscape, can provide potential roosting and nesting habitat for visiting and residential raptors and smaller migratory birds. Wooden fence posts which encircle the perimeter of the Site can provide beneficial hunting perches and roost sites for raptors and larger perching birds around the open agriculture fields where few natural perches exist.

Although somewhat degraded and lacking in native biodiversity, the ruderal herbaceous vegetation community within the Site does provide a number of wildlife benefits within the larger agricultural landscape. Such lands often serve as a buffer between natural areas, providing food, cover, nesting and open-space habitat which allow movement and exchange of plant and animal populations. The upland ruderal herbaceous community also provides habitat for a large prairie dog colony across the eastern portion of the Site. Within the Site, significant limitations for wildlife use exist due to land use activities such as horse pasture, habitat fragmentation from roadways and fences and noise disturbances associated with the oil and gas operations and adjacent roadways. This community type occupies approximately 14% of the Site.

Wetlands can provide a variety of wildlife habitat features such as cover, forage or nesting habitat, and can act as a movement corridor for various small mammals, amphibians, birds and reptiles. The predominant wetland habitat type which occupies the central portion of the Site is emergent wetland dominated by a monotypic stand of broad-leaf cat-tail. Although somewhat limited in vegetative diversity, a number of wildlife values are associated with this wetland habitat type including food, nesting, brooding, cover and refuge for wildlife (Gucker 2008). The general structural characteristics of the marsh including a seasonal water source and emergent vegetation does create a relatively unique habitat in an otherwise arid and agricultural landscape. The central portions of the wetland are typically inundated seasonally which provides added wildlife benefits from habitat variety and deeper seasonal water for amphibians, birds and reptiles. Broad-leaf cat-tail is extremely important to common muskrats. It provides a major food source and important nesting habitats and materials. Waterfowl and other marsh birds throughout the region use broad-leaf cat-tail habitats extensively. In Colorado, broad-leaf cat-tail habitats are important nesting cover and habitat for soras, Virginia rails, blackbirds, and marsh wrens (Kingery 2008). Within the Site, some limitations for wildlife use exist due to the habitat fragmentation from roadways, upland berms, fences and restricted culverts; however, overall wetland habitat of the Site provides a variety of important wildlife habitat values. The herbaceous wetland vegetation community occupies approximately 13% of the Site.

Some local wildlife species that may use the habitats within the Site include coyote (*Canis latrans*), red fox (*Vulpes vulpes*), rabbit (*Lepus sp*.), cottontail (*Sylvilagus sp.*), raccoon (*Procyon lotor*), muskrat (*Ondatra zibethicus*), North American badger (*Taxidea taxus*), striped skunk (*Mephitis mephitis*), black-tailed prairie dog (*Cynomys ludovicianus*), northern pocket gopher (*Thomomys talpoides*), mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), western rattlesnake (*Crotalus viridis*), deer mouse (*Peromyscus maniculatus*), meadow vole (*Microtus pennsylvanicus*), barn owl (*Tyto alba*), hawks (*Buteo sp*.), osprey (*Pandion haliaetus*), Canada geese (*Branta canadensis*), red-winged blackbird (*Agelaius phoeniceus*), mourning dove (*Zenaida macroura*), killdeer (*Charadrius vociferus*), western meadowlark (*Sturnella neglecta*).

- Generally, there are features on the Site and the surrounding area that provide a variety of habitat components for waterfowl, local songbirds, raptors, amphibians, reptiles and small mammals; however, the majority of habitat on the Site (approximately 73%) comprises cultivated cropland which is highly degraded from a wildlife perspective by historic and current land use practices. In addition, the upland ruderal vegetation community which occupies approximately 14% of the Site is also highly degraded with regards to wildlife use and is limited in use by current land use activities, habitat fragmentation and noise disturbances. Any future land use changes to these upland habitats on the Site is likely to have minimal adverse effect to general wildlife in the local vicinity.

- Within the Site, the herbaceous wetland vegetation community occupies approximately 13% of the Site providing a variety of important wildlife habitat values. Any disturbance to this habitat type should be minimized to limit potential disturbance to local wildlife populations and regional habitat ranges.

5.0 MIGRATORY BIRD TREATY ACT

Migratory birds are protected under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 730-712). The MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase barter, or offer for sale, purchase, or barter any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations. In Colorado, all birds except for the

European starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*) and rock pigeon (*Columba livia*) are protected under the MBTA. A total of 523 migratory bird species are known to occur in the Mountain-Prairie Region (USFWS Region 6, Montana, Wyoming, Utah, North Dakota, South Dakota, Nebraska, Kansas and Colorado); 320 of the 523 migratory bird species are known to breed in USFWS Region 6.

Migratory birds likely exist within the Site. The limited trees located within the open agricultural land and pockets of shrubs within the ruderal vegetation community provide potential habitat for migratory birds. Several migratory birds were directly observed on the Site during the field evaluation including western meadowlark, red-winged blackbird, killdeer, common grackle (*Quiscalus quiscula*), black-billed magpie (*Pica hudsonia*) and mourning dove. Such birds are protected under the MBTA, and killing or possession of these birds (or their parts and nests) is prohibited under the MBTA. The migratory birds observed likely utilize the Site primarily for foraging and limited seasonal nesting due to the routine agricultural activities, the few permanent trees and non-native herbaceous vegetation community on the Site.

- Based upon literature review and an onsite assessment of the Site, ERC has determined that some migratory birds likely utilize the Site. These birds are protected under the MBTA, and killing or possession of these birds is prohibited. Future land use changes that may occur on Site which remove the more permanent (non-crop) vegetation should first ensure that active nests are not disturbed. Generally, the active nesting season for most migratory birds in this region of Colorado occurs between April 1 and August 31.

Two raptor species were observed on the Site during the field evaluation including bald eagle (*Haliaeetus leucocephalus)* and red-tailed hawk (*Buteo jamaicensis*). The bald eagle appeared only to be foraging and no nest sites were noted. An active red-tailed hawk nest was observed in an eastern cottonwood tree within the central portion of the cultivated cropland community. Refer to **Figure 3** for a map showing the approximate location of this nest. At the time of the field evaluation, one female red-tailed hawk was observed tending the nest and one male red-tailed hawk was observed flying/foraging within the open agricultural land.

- Active raptor nest sites are regulated by the USFWS under the MBTA with local review from the CPW. The CPW has established recommended buffer zones and seasonal activity restrictions implemented by the USFWS for a variety of Colorado raptors, including the red-tailed hawk which was observed at the Site (CPW 2008). Red-tailed hawk recommendations area as follows:

    - *No surface occupancy (beyond that which historically occurred in the area) within 1/3 mile radius of active nests. Seasonal restriction to human encroachment within 1/3 mile radius of active nests from February 15 through July 15. Some members of this species have adapted to urbanization and may tolerate human habitation to within 200 yards of their nest. Development that encroaches on rural sites is likely to cause abandonment.*

    - The CPW (2008) recommendations are subject to negotiation on a case-by-case basis by the CPW and USFWS Ecological Services Field Office. In cases where nests occur next to sites within the 1/3 mile buffer zone, negotiations may allow the project to proceed within the recommended buffer. However, activities within 1/3 mile of the nest should be avoided between February 15 and July 15 (**Figure 3**). Specific CPW (2008) recommendations for activities around active red-tailed hawk nests should be adhered to until consultation with the CPW USFWS Ecological Services Office has occurred. No

consultation would be necessary for activities occurring outside of the 1/3 mile buffer. A clearance survey can be conducted prior to any land disturbance activity within 1/3 mile of the nest to verify the nest site is potentially active.

6.0 SPECIES PROTECTED UNDER THE ENDANGERED SPECIES ACT OF 1973

The ESA of 1973 was enacted by the United States to conserve endangered and threatened species and the ecosystems that they depend on. Under the ESA, species may be listed as either "endangered" or "threatened"; both designations are protected by law. The ESA is administered by the USFWS. The USFWS has developed project specific species lists, available online by request, identifying threatened, endangered, and proposed species, designated critical habitat, and candidate species protected under the ESA that may occur within the boundary of the proposed project and/or may be affected by the proposed project (USFWS 2016) (Tracking Number: 06E24000-2016-SLI-0346). The species list for the Site has identified a total of eight threatened or endangered species within the project area.

Species Not within Range of the Site

The following federally listed threatened and endangered species are identified to occur within Boulder County. However, these species are not known to exist within the specific vicinity of the Site and/or have specific habitat requirements (i.e., elevation range) that are not common in the vicinity of the Site.

Common Name	Scientific Name	Status
Mexican spotted owl	*Strix occidentalis lucida*	Federally Threatened

- The Site does not contain the specific habitat characteristics necessary to support the species listed above. The species are not likely to occur within the Site therefore any future land use changes would not likely adversely affect the continued existence or available habitat of the species.

Water Depletions Species

The USFWS under the ESA has determined that water depletions in the South Platte River Basin are considered an adverse effect to the listed species identified below. The Site is considered to be located within the South Platte River Basin.

Common Name	Scientific Name	Status
Least tern	*Sternula antillarium*	Federally Endangered
Pallid sturgeon	*Scaphirhycchus albus*	Federally Endangered
Piping plover	*Charadrius melodus*	Federally Threatened
Western prairie fringed orchid	*Platanthera praeclara*	Federally Threatened
Whooping crane	*Grus Americana*	Federally Endangered

Any water related project conducted in the Platte River Basin that has a federal nexus; such as federal funding or a federal permits (i.e., Clean Water Act (CWA) Section 404 Permit), is subject to ESA Section 7 Consultation with the USFWS. The consultation is a mandate for water depletion projects that may adversely affect threatened and endangered species that rely on the South Platte River.

- The Site does not contain the specific habitat characteristics necessary to support the species listed above. The species do not occur within the Site therefore any future land use change will not directly adversely affect the continued existence or available habitat of the species.

- Any future project which may be water related or determined to be a water depletion to the South Platte River Basin may potentially be considered an adverse effect to these species. Generally non-water dependent projects such as residential or commercial developments (which are supplied by municipal water) are not considered water depletions and is therefore not likely to adversely affect the continued existence or available habitat of these species. The specific details of a future project must be reviewed to determine water depletion status.

Species Potentially within Range of the Site

The following federally listed threatened and endangered species are identified to occur or historically occur within Boulder County (USFWS 2016). The Site is located within the potential known range for these species to occur. Further analysis was conducted to determine if the species or habitat has the potential to exist on the Site considering site-specific conditions and characteristics. A brief explanation is provided as to the species life cycle, habitat requirements and potential occurrence on the Site. The Site is not within designated critical habitat of any federally listed species.

Common Name	Scientific Name	Status
Colorado butterfly plant	*Gaura neomexicana var. coloradensis*	Federally Threatened
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	Federally Threatened
Ute Ladies'-tresses orchid	*Spiranthes diluvialis*	Federally Threatened

COLORADO BUTTERFLY PLANT (GAURA NEOMEXICANA VAR. COLORADENSIS)

The Colorado butterfly plant is listed as federally threatened under the ESA. This plant species is a short-lived, perennial herb endemic to moist soils in mesic or wet meadows of floodplain areas in southeastern Wyoming, north central Colorado, and extreme western Nebraska. This early to mid-seral stage species occurs primarily in habitats created and maintained by streams active within their floodplains, with vegetation that is relatively open and not overly dense or overgrown. The conversion of natural wet meadows and natural riparian corridors to agricultural land and urban development is the primary threat to the continued existence of the species (Federal Register 2000).

- The herbaceous marsh habitat on the Site does not exhibit typical habitat of the Colorado butterfly plant. The Site is not located within designated critical habitat for this species (Federal Register 2005). Wetland habitat on the Site is dominated by a monotypic stand of cattails which is not typical habitat conducive to the Colorado butterfly plant. Neither individuals nor potential habitat for the Colorado butterfly plant were observed on or immediately surrounding the Site. Any future land use changes on the Site is not likely to adversely affect the continued existence or potential habitat of this species.

PREBLE'S MEADOW JUMPING MOUSE (ZAPUS HUDSONIUS PREBLEI)

On May 13, 1998 the US Fish and Wildlife Service issued a final rule to list the Preble's meadow jumping mouse (PMJM) as a federally threatened species under the ESA. PMJM range extends from southwestern Wyoming through eastern Colorado generally below 7,600 feet. Armstrong et al. (1997) described typical PMJM habitats as "well-developed plains riparian vegetation with relatively undisturbed grassland and a water source in close proximity." Also noted was a preference for "dense herbaceous vegetation consisting of a variety of grasses, forbs and thick shrubs" (USFWS 1999). This species is known to regularly travel into adjacent uplands to feed and hibernate. The PMJM hibernates in an underground burrow from September to May. PMJM bears two to three litters per year, averaging five young per litter, in a grass-lined nest. In general, PMJM surveys are recommended for areas with suitable habitat in Boulder County

below 7,600 feet and within 300 feet of vegetated irrigation canals, ditches, and wetlands. Areas that are highly disturbed or modified (including landscaped lots and paved areas) or wetland areas dominated by cattails are excluded from this recommendation.

No populations of the PMJM are known to occur within the vicinity of the Site (UDFCD 2010). Further, the Site and immediate vicinity is not designated as Critical Mouse Habitat by the USFWS (CPW 2014). The nearest known PMJM population is over 11 miles from the Site, upstream on Coal Creek. The USFWS Mouse Block Clearance Map for the Denver Metro Area (USFWS 2010) which identifies areas exempt from further review for PMJM habitat, shows the Site does not occur within the Block Clearance Zone.

- No PMJM individuals were observed on or surrounding the Site. The herbaceous marsh habitat on the Site is dominated by dense cattail vegetation which is not typical habitat of the PMJM. Moreover, the adjacent uplands comprise disturbed agricultural communities, including regularly plowed cultivated cropland and horse pasture which is not considered suitable upland habitat for this species. Due to the limited quality of the emergent wetland and disturbed uplands, and the absence of any nearby known populations, it is highly unlikely that the PMJM exists within the Site. The USFWS also states that sites where wetlands are entirely composed of dense stands of cattails are exempt from trapping survey. Any future land use changes on the Site are not likely to adversely affect the continued existence or potential habitat of this species.

UTE LADIES'-TRESSES (SPIRANTHES DILUVIALIS)

The Ute ladies-tresses is listed as federally threatened under the ESA. The Ute ladies-tresses occurs in seasonally moist soils and wet meadows near springs, lakes, or perennial streams and their associated floodplains below 6,500 feet in elevation in certain areas of Utah, Colorado, Idaho, Wyoming, and Nevada. Typical sites include early successional riparian habitats such as point bars, sand bars, and low lying gravelly, sandy, or cobbly edges. They seem to require "permanent subirrigation", conditions where the water table is close to the surface, but they are not tolerant of permanent standing water. Typical habitat is open and sparsely vegetated, populations decline if trees and shrubs invade the habitat. They do not compete well with aggressive species such as reed canary grass or monocultures of cattails.

- The herbaceous marsh habitat on the Site is dominated by dense cattail vegetation which is not typical habitat conducive to the Ute ladies-tresses. No Ute ladies-tresses or suitable habitat was identified in the Site. Any future land use changes on the Site are not likely to adversely affect the continued existence or potential habitat of this species.

7.0 STATE THREATENED AND ENDANGERED SPECIES

Species identified as state threatened or endangered are protected by the CPW under Colorado Statute Title 33. State regulations prohibit "*any person to take, possess, transport, export, process, sell or offer for sale, or ship and for any common or contract carrier to knowingly transport or receive for shipment*" any species or subspecies listed as state endangered or threatened. The CPW also has identified State Species of Special Concern, which are species or subspecies of native wildlife that are currently vulnerable in their Colorado range and have the potential to become threatened or endangered (CPW 2010). Species of Special Concern are not protected under State regulations but the 'take' of individuals and disturbance of their habitat is strongly discouraged.

All state listed species were screened as potential inhabitants of the Site based on general habitat requirements and CPW Species Profiles (CPW 2016). ERC evaluated the species listed by CPW as

threatened or endangered that could potentially exist on the Site. All animal species listed above as threatened or endangered by the USFWS are also listed by the CPW as threatened or endangered, respectively, therefore were not duplicated below.

Species Not within Range of the Site

The following listed threatened and endangered species are identified to occur within the state (CPW 2016). However, these species are not known to exist within the specific vicinity of the Site and/or have specific habitat requirements (i.e., elevation range) that are not common in the vicinity of the Site (CPW 2016, USFWS 2016).

Common Name	Scientific Name	Status
Boreal toad	*Bufo boreas boreas*	State Endangered
Southwestern willow flycatcher	*Empidonax traillii extimus*	State Endangered
Lesser prairie-chicken	*Tympanuchus pallidicinctus*	State Threatened
Arkansas darter	*Etheostoma cragini*	State Threatened
Bonytail	*Gila elegans*	State Endangered
Razorback sucker	*Xyrauchen texanus*	State Endangered
Humpback chub	*Gila cypha*	State Threatened
Colorado pikeminnow	*Ptychocheilus lucius*	State Threatened
Greenback cutthroat trout	*Oncorhynchus clarki stomias*	State Threatened
Rio grande sucker	*Catostomus plebeius*	State Endangered
Lake chub	*Couesius plumbeus*	State Endangered
Plains minnow	*Hybognathus placitus*	State Endangered
Suckermouth minnow	*Phenacobius mirabilis*	State Endangered
Northern redbelly dace	*Phoxinus eos*	State Endangered
Southern redbelly dace	*Phoxinus erythrogaster*	State Endangered
Brassy minnow	*Hybognathus hankinsoni*	State Threatened
Common shiner	*Luxilus cornutus*	State Threatened
Gray wolf	*Canis lupus*	State Endangered
Black-footed ferret	*Mustela nigripes*	State Endangered
Grizzly bear	*Ursus arctos*	State Endangered
Lynx	*Lynx canadensis*	State Endangered
Wolverine	*Gulo gulo*	State Endangered
River otter	*Lontra canadensis*	State Threatened
Kit fox	*Vulpes macrotis*	State Endangered

- The Site does not contain the specific habitat characteristics necessary to support the species listed above. The species are not likely to occur within the Site and therefore, any future land use changes would not likely adversely affect the continued existence or available habitat of the species.

Species Potentially within Range of the Site

The following state listed threatened and endangered species are identified to occur or historically occur within Boulder County. The Site is located within the potential known range for these species. Further analysis was conducted to determine if the species or habitat has the potential to exist on the Site

considering site-specific conditions and characteristics. A brief explanation is provided as to the species life cycle, habitat requirements and potential occurrence on the Site.

Common Name	Scientific Name	Status
Burrowing owl	*Athene cunicularia*	State Threatened
Plains sharp-tailed grouse	*Tympanuchus phasianellus jamesii*	State Endangered

BURROWING OWL (ATHENE CUNICULARIA)

The burrowing owl (Owl) is listed as a state threatened species in Colorado. The Owl is small (length of 24 centimeters), long-legged, boldly spotted, and barred with brown and white. The Owl is a breeding species across the plains of eastern Colorado however rarely winters in the state. Nesting habitat is abandoned burrows, especially prairie dog colonies, located in grasslands, mountain parks, well-drained steppes, deserts, prairies and agricultural lands from late March through October. The Owl can usually be observed on low perches such as fence posts, dirt mounds or the ground. Clutch size of this Owl averages six to seven and incubation lasts up to 30 days. The owlets usually run and forage at 4 weeks and fly at 6 weeks. Primary threats to existence of this species are habitat loss due to intensive agriculture, habitat degradation and fragmentation due to control of burrowing mammals and predation by cats and dogs.

- The presence of a prairie dog colony (although active) and general characteristics on the eastern portion of the Site are considered potential Owl habitat. Any land use changes that disturb the prairie dog colony between March 1 and October 31 should ensure Owls are not adversely affected. Owl surveys can be conducted during this time frame in order to verify the presence/absence of the species.

PLAINS SHARP-TAILED GROUSE (TYMPANUCHUS PHASIANELLUS JAMESII)

The sharp-tailed grouse (Grouse) is listed as a state endangered species in Colorado. The Grouse is brown with white horizontal barring and a short, pointed tail. Known populations exist only in Douglas County, Colorado. Typical habitat includes rolling hills with scrub oak thickets and medium to tall grasslands for courtship and nesting. As an equivalent to sagebrush, Grouse use scrub oaks, serviceberries and willows. These brushy sites provide critical winter shelter and food sources.

- The cultivated cropland and ruderal herbaceous vegetation communities within the Site do not exhibit the typical habitat characteristics necessary to support this species. Neither individuals nor potential habitat for the Grouse were observed on or immediately surrounding the Site. Any future land use changes within the Site should not adversely affect the continued existence or potential habitat of this species.

8.0 SUMMARY

ERC has conducted this screening for general wildlife use and federal and state threatened and endangered species for the approximately 221acre Site. The following provides key items identified as part of this report:

1. Three vegetation communities occur within the Site and are comprised of broad-leaf cat-tail western herbaceous vegetation along the central portion of the Site, smooth brome – western wheatgrass

ruderal herbaceous vegetation throughout the eastern uplands (NatureServe 2015) and cultivated cropland across the northern and western portion of the Site. The vegetation communities characterized on the Site are somewhat based on natural vegetation associations in the region (NatureServe 2015) however those on the Site have been disturbed by historic and current land use practices thus represent somewhat degraded forms of these communities. Any future land use changes on the Site are not likely to adversely affect any significant natural vegetation communities.

2. Generally, there are features on the Site and the surrounding area that provide a variety of habitat components for waterfowl, local songbirds, raptors, amphibians, reptiles and small mammals; however, the majority of habitat on the Site (approximately 73%) comprises cultivated cropland which is highly degraded from a wildlife perspective by historic and current land use practices. In addition, the upland ruderal vegetation community which occupies approximately 14% of the Site is also highly degraded and is limited in wildlife use by current land use activities, habitat fragmentation and noise disturbances. Any future land use changes to these upland habitats on the Site is likely to have minimal adverse effect to general wildlife in the local vicinity.

3. The herbaceous wetland vegetation community occupies approximately 13% of the Site providing a variety of important wildlife habitat values. Any disturbance to this habitat type should be minimized to limit potential disturbance to local wildlife populations and regional habitat ranges.

4. Based upon literature review and an onsite assessment of the Site, ERC has determined that some migratory birds likely utilize the Site. These birds are protected under the MBTA, and killing or possession of these birds is prohibited. Future land use changes that may occur on Site which remove the more permanent (non-crop) vegetation should first ensure that active nests are not disturbed. Generally, the active nesting season for most migratory birds in this region of Colorado occurs between April 1 and August 31.

5. In addition, an active red-tailed hawk nest is present on the Site. Raptor nest sites are further protected by the CPW and USFWS. The CPW has established recommended buffer zones for the red-tailed hawk which includes seasonal restriction to human encroachment within 1/3 mile radius of active nests from February 15 through July 15. Consultation with the CPW and USFWS Ecological Services Office would be necessary if activities were to occur between February 15 and July 15 and were within 1/3 mile of the nest. No consultation would be required for activities outside of the 1/3 mile buffer. A clearance survey can be conducted prior to any land disturbance activity within 1/3 mile of the nest to verify the nest site is potentially active.

6. No federally listed threatened and endangered species and/or habitat protected under the ESA were identified on the Site. The vegetation communities and features within the Site were investigated as potential habitat for federally listed species. Potential threatened and endangered species habitat was found to lack one or more habitat components critical for the federally listed species likely to occur in the area. Furthermore, connectivity to known populations was limited due to geographic, hydrologic, and other habitat constraints. No other individuals or habitat for federally listed threatened and endangered species would likely be impacted by any future land use changes.

7. Any future project which may be water related or determined to be a water depletion to the South Platte River Basin may potentially be considered an adverse effect to water depletion species. Generally non-water dependent projects such as residential or commercial developments (which are

supplied by municipal water) are not considered water depletions and is therefore not likely to adversely affect the continued existence or available habitat of these species. The specific details of a future project must be reviewed to determine potential water depletion status.

8. Upon review of species identified as State endangered or threatened, protected by the CPW under Colorado Statute Title 33, only the western burrowing owl (*Athene cunicularia hypugaea*) was identified as potentially present on the Site. The burrowing owl is listed as a state threatened species. The prairie dog colony and general characteristics on the eastern portion of the Site exhibit characteristics of potential burrowing owl habitat. However, no owl individuals were observed on the Site during the field investigation. Any land use changes that disturb the prairie dog colony between March 1 and October 31 should ensure Owls are not adversely affected. Owl surveys can be conducted during this time frame in order to verify the presence/absence of the species. No other individuals or habitat for state listed threatened and endangered species would likely be impacted by any future land use changes.

This report has been prepared by:

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Reviewed and approved by:



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Native Tree & Vegetation Survey & Protection Plan

This information is included with the KT Engineering PDP exhibits, and is also included in the Landscape Documents.

Environmental Hazards Report

CTL | THOMPSON INCORPORATED

PHASE I ENVIRONMENTAL SITE ASSESSMENT
ERIE ASSEMBLAGE
PORTIONS OF SECTION 36
TOWNSHIP 1 NORTH, RANGE 69 WEST
BOULDER COUNTY, COLORADO

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April 13, 2016

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EXECUTIVE SUMMARY

This report presents the results of the Phase I Environmental Site Assessment (ESA) that was performed by CTL | Thompson, Inc. for the Erie Assemblage (Site). The Site is generally located northwest of the intersection of County Line Road and Baseline Road in Erie, Colorado.

The Phase I ESA was conducted in general conformance with the methods and procedures described in the American Society for Testing and Materials (ASTM) E 1527-13, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.

The Site and adjacent area appear to have remained in residential and agricultural or rangeland use since at least the late 1930s. There were several structures on-site present in 1939/1940 and an additional structure was present in 1968. The Site also contains two abandoned/unoccupied residences and the remnants of a third residence or other structure.

Oil and gas development began in the early 1990s with a total of four oil/gas well drilled, with two currently remaining in operation.

We did find evidence of recognized environmental conditions in connection with the Site:

- The presence of two active and two abandoned oil and gas wells.
- The possibility for asbestos in the abandoned residences.
- Dump areas containing tanks and drums near the abandoned residences.
- A suspect-asbestos pipe (approximately 6 feet in length), and possibly
- buried asbestos in the dump piles and/or areas where structures formerly existed.

This executive summary does not contain all the information that is found in the full report. The report should be read in its entirety to obtain a more complete understanding of the information provided and to aid in any decisions made or actions taken based on this information.

1.0 INTRODUCTION

This report was prepared by CTL | Thompson, Inc. (CTL) for OEO, LLC, and presents the results of the Phase I Environmental Site Assessment (ESA) for the Erie Assemblage. The Site totals approximately 183 acres and is located west of the town of Erie city limits, and generally north of Baseline Road and west of the Boulder/Weld County Line Road. The Phase I ESA was conducted in general accordance with CTL's Proposal Number DN15-0338 and subsequent authorization by Mr. Corey Elliott on February 26, 2016.

1.1 Purpose

The purpose of the Phase I ESA was to identify Recognized Environmental Conditions (REC), to the extent feasible, pursuant to the methods and procedures described in the American Society for Testing and Materials (ASTM) Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessments, E 1527-13.

An REC is defined as the presence or likely presence of hazardous substances or petroleum products on a Site under conditions that indicate an existing release, a past release, or a material threat of a release of hazardous substances or petroleum products into structures on the Site or into the ground, groundwater, or surface water of the Site. The term includes hazardous substances or petroleum products even under conditions in compliance with laws. The term is not intended to include de minimis conditions that generally do not present a material risk of harm to public health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.

ASTM Standard E1527-13 also has separate definitions for past conditions that would otherwise be considered an REC but have been addressed to the satisfaction of the applicable regulatory agencies and would either allow for generally unrestricted use of the Site (referred to as a Historic Recognized Environmental Condition, or HREC) or

for use of the Site with various restrictions (referred to as a Controlled Recognized Environmental Condition, or CREC).

1.2 Scope of Services

The scope of services for this assessment consisted of a records review, a Site reconnaissance, historical research, interviews, and documentation of findings in a report.

1.3 Limitations

This Phase I ESA was prepared in general accordance with ASTM Standard E 1527-13. There may be additional environmental issues present at the Site that are outside the scope of this practice that include, but are not limited to, the following:

- Asbestos-containing materials;
- Radon;
- Lead-based paint;
- Lead in drinking water;
- Mold and fungi;
- Industrial hygiene;
- Indoor air quality;
- Health & safety;
- Ecological resources;
- Biological or infectious agents and pathogens;
- Regulatory compliance;
- High voltage power lines; and,
- Mine subsidence.

CTL provided an opinion based upon the condition of the Site on the day it was observed and a review of existing and reasonably ascertainable regulatory records and historical information. Our scope did not include chemical testing of soil, groundwater, air, or building materials. The opinion, conclusions, and recommendations of this report are not intended to be used or relied upon by a third party to this Agreement. With the

written consent of our client, CTL may be available to contract with other parties to provide an opinion or conduct additional environmental assessment services. Due to latent conditions and other contingencies which may become evident in the future, the current assessment does not result in any guarantee the subject Site is free and clear of hazardous materials. Should additional surface, subsurface or chemical data become available, the conclusions and recommendations contained in this report shall not be considered valid unless the data is reviewed and the conclusions of this report are modified or approved in writing by our firm.

We believe that this investigation was conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the locality of the project. No warranty, express or implied, is made.

2.0 SITE DESCRIPTION AND LOCATION

2.1 Location and Description

The "Site" is generally located northwest of the intersection of Baseline Road and the Boulder/Weld County Line Road, within unincorporated Boulder County, Colorado. The Site consists of four parcels, all located in Section 36, Township 1 North, Range 69 West of the 6th Principal Meridian, totaling approximately 183.33 acres. The parcels, from west to east, are generally described as follows:

Parcel 1: The SW ¼ of the NW ¼ of Section 36, with exceptions, totaling approximately 39.90 acres.

Parcel 2: Part of the NW ¼ of the SW ¼ of Section 36, with exceptions, totaling approximately 9.66 acres.

Parcel 3: The NW ¼ of the SE ¼, the NE ¼ of the SW ¼, and the S ½ of the NW ¼ of the SW ¼, Section 36, with exceptions, totaling approximately 90.33 acres.

Parcel 4: The NE ¼ of the SE ¼, and the W ½ of the SE ¼ of the NE ¼, Section 36, less parcels sold and other exceptions, totaling approximately 43.44 acres.

The Site location and plan are shown on Figure 1 (Area Map) and Figure 2 (Site Plan).

2.2 General Description of Site and Improvements

The Site is vacant land partially plowed or row crop stubble. The Site consists of vacant land within a largely undeveloped area. There are two uninhibited structures in dilapidated condition located at the site. There are two oil and gas wells, access roads and associated equipment located on the Site. A photographic record of our Site reconnaissance is presented in Appendix A.

2.3 General Uses of Adjoining Properties

The Site is located in a generally rural area, with commercial uses to the east within the Town of Erie along County Line Road. The adjoining properties generally consist of farm properties, oil and gas features, and a self-storage facility to the east. Additional details regarding our observations of adjacent properties are presented in Section 7.4 of this report.

3.0 USER PROVIDED INFORMATION

Mr. Corey Elliott of OEO, LLC is the user/client contact. Mr. Elliott responded to our Environmental Questionnaire on March 31, 2016. He also provided owner contact information. Four contacts were provided: Ms. Sonya Lewis (10 acre parcel), Mr. Joseph Guetlein (43 acre parcel), Ms. Linda Millican (90 acre parcel) and Mr. Richard Schillawski (40 acre parcel). We sent questionnaires to these individuals on March 18, 2016. We received responses only from Mr. Guetlein and Mr. Schillawski, both completed on March 18, 2016. A summary of some of their responses is included below.

3.1 Environmental Liens/Title Records

An environmental lien is a charge, security, or encumbrance upon title to a property to secure the payment of a cost, damage, debt, obligation, or duty arising out of response actions, cleanup, or other remediation of hazardous material or petroleum products upon a property. Mr. Elliott, Mr. Guetlein and Mr. Schillawski were not aware of existing environmental liens on the Site.

CTL was provided title documents for review. We reviewed four title commitments prepared by First American Commitment Title Insurance Company, Numbers NCS-766894-CO (December 14, 2015), NCS-766895-CO (December 15, 2015), NCS-773940-1-CO (February 12, 2016), and NCS-766885 (December 10, 2015). We searched for obvious evidence of environmental liens which would be expected to be listed in Schedule B – Section 2, Exceptions. Our review did not discover environmental liens. We are not title experts and we assume that the client/user of this Phase I ESA is conducting current title work per typical due diligence on the part of a property buyer.

3.2 Activity and Use Limitations

Environmental AULs are legal or physical restrictions or limitations on the use of, or access to, a Site or facility to: 1) reduce or eliminate potential exposure to hazardous substances or petroleum products in the soil or groundwater on the property, or 2) prevent activities that could interfere with the effectiveness of a response action, in order to ensure maintenance of a condition of no significant risk to public health or the environment. These legal or physical restrictions may include engineering controls, institutional controls, or land use restrictions. Mr. Elliott, Mr. Guetlein and Mr. Schillawski were not aware of recorded environmental AULs related to the Site.

3.3 Specialized Knowledge

Mr. Elliott, Mr. Guetlein and Mr. Schillawski were not aware of specialized knowledge or experience related to previous environmental activities on the Site, additional to oil and gas production on the site and nearby properties. Mr. Schillawski also indicated the storage of pesticides, herbicides and gasoline on the “retained lot” building area, which is not subject to this ESA.

3.4 Valuation Reduction for Environmental Issues

Mr. Elliott was not aware of valuation reduction of the Site because of environmental issues.

3.5 Commonly Known or Reasonably Ascertainable Information

Mr. Elliott, Mr. Guetlein and Mr. Schillawski were not aware of commonly known or reasonably ascertainable information regarding environmental issues related to the Site, additional to issues which may or may not be related to oil and gas production.

3.6 Reason for Performing a Phase I ESA

Mr. Elliott requested a Phase I ESA prior to acquisition of the Site.

3.7 Previous Environmental Site Assessments

A Mine Subsidence Assessment was prepared for the Site by Western Environment and Ecology, Inc. (Project No. 701-001-01, report dated January 18, 2016). The report concluded that no mining occurred beneath the Erie Assemblage; mine subsidence is beyond the scope of this ESA. No additional environmental reports were provided to us.

4.0 RECORDS REVIEW

CTL reviewed existing sources listed in the **REFERENCES** section to assess the soils, geologic and hydrogeologic conditions of the general vicinity of the Site.

4.1 Physiography

The Site is located on predominantly flat to sloping terrain in the southeastern direction, as presented on the topographic area map (Figure 1). The elevation ranges from approximately 5090 to 5190 feet above mean sea level. The predominant surface water feature in the vicinity of the Site is the pond and drainage way in the southeastern corner that flow towards Coal Creek which is located within approximately 100 feet to the east of the Site, flowing generally north.

4.2 Geology and Soils

According to the January 2016 Mine Subsidence Assessment by Western Environment and Ecology, the soils generally consist of approximately five feet of sandy clay soil, underlain by sands and silts down to approximately 10 feet below ground surface (bgs). Beneath this are water saturated clays, sands and gravels ranging from approximately 10 to 20 feet in thickness. Beneath that layer are clays, silts, fine-grained sands and coals of the Cretaceous-age Laramie Formation.

4.3 Groundwater

It is our experience that the flow direction of shallow, unconfined groundwater is generally controlled by topography. Based on topography, we estimate the general direction of groundwater flow below the Site is to the east. Topographic data suggests areas up-gradient of the Site are generally to the west. Based on our concurrent geotechnical study of the Site (Project DN48,284-115, report not yet complete), groundwater was first encountered in our borings at depths of 15 to 20 feet.

Groundwater levels will likely fluctuate seasonally and may rise in response to precipitation and landscape irrigation.

4.4 Water Wells

Water wells are generally identified through the Colorado Division of Water Resources online water well permit database. There are four (4) records of water wells for the Site:

An application was filed in 1969 by James Meeks for a domestic or irrigation well for the southern residence along the western boundary. This was replaced by a new application submitted by Erleen Meeks in 1987.

James Meeks also submitted an application in 1971 for an area in the southeastern portion of the Site, again for domestic or irrigation use.

The fourth application is for the other residence along the western boundary, and was submitted by Richard Schillawski in 1969 for similar uses.

If a well is located during development and if it is no longer planned for use, it must be properly abandoned.

4.5 Oil/Gas Wells

Oil and gas wells are identified through the Colorado Oil and Gas Conservation Commission (COGCC) online database. The database indicates the presence of two active wells and two abandoned wells.

The Arapahoe MC #36-5 is an active well in the northwest 40 acres of the Site, and is operated by 8 North, LLC. It was drilled in 1993. There are no records of releases, but a 2015 inspection revealed that weeds needed to be better controlled.

The Donley #2-36 is an active well near the southeast corner of the Site, and is operated by Extraction Oil & Gas, LLC. A tank battery is also located here and is discussed in more detail in Section 7.0. The well was drilled in 1992. There are no records of releases, and a 2015 inspection revealed no violations.

The Donley MC #36-10 and #36-8 are abandoned locations in the central and northeast portions of the Site, respectively, that were drilled in 1994 by Gerrity Oil & Gas Corporation. The information is very limited and it is possible that these wells were simply abandoned shortly after drilling.

In our experience, there is generally no third party oversight and soil sampling when oil/gas wells are abandoned, as there is with, for example, regulated underground fuel tanks. The presence of both active and abandoned wells, along with the active storage and separation equipment, are an REC for the Site, in our opinion. This is based on our previous experience with oil/gas well sites.

4.6 Physical Setting Analysis of Migration of Hazardous/Petroleum Substances

A hypothetic spill of a hazardous or petroleum substance on the Site would be expected to migrate along the ground surface to the east. Off-Site surface spills on the adjoining parcels to the west appear to have the highest potential to migrate on-Site. Based on local topography, we estimate groundwater generally flows to the east. Sources of contamination to groundwater beneath the Site, if present, would most likely be located to the west.

5.0 HISTORICAL USE INFORMATION

5.1 Historical Aerial Photographs and Topographic Maps

Historical aerial photographs of the Site and surrounding area were reviewed for 1937, 1948, 1953, 1966, 1971, 1978, 1983, 1993, 1999, 2005 and 2015; copies of the

historic aerial photographs are presented in Appendix B. USGS topographic maps were reviewed for 1949, 1967, 1967 photo-revised 1971 and 1979. The Site is located on the Erie Quadrangle. An interpretation of the aerial photographs and maps is presented, as follows:

- 1937-1948: The Site and surrounding area are predominantly agricultural land. A farm complex is on the western boundary of the Site. A dirt road also extends from the west onto the Site, and accesses at least three separate structures/outbuildings through the central portion of the site. County Line Road forms a portion of the eastern boundary, and a railroad is present along the irregular southern boundary. Coal mines and rural residences are depicted on nearby properties.

- 1953-1966: Some of the centrally located structures along the dirt road through the Site are no longer present; however, the eastern-most building group has additional structures. By 1966, additional rural residences appear to the south along Baseline Road, and the beginnings of a wastewater treatment plant appear to the east along Coal Creek.

- 1971-1979: An additional farm residence is present on-Site along the western boundary. By 1978, an elongated building, possibly for storage or industrial use, is now present to the east along County Line Road.

- 1993-1999: Two oil and gas production facilities are now visible on the Site, in the northwest and southeast areas. This use is also now visible in the nearby area. By 1999 a self-storage facility is present on the adjacent property to the east. The wastewater treatment plant to the east is also expanding over the years.

- 2002-2015: The Site is generally unchanged. The self-storage facility to the east continually expands with additional buildings during this time period.

5.2 Sanborn Fire Insurance Maps

Sanborn fire insurance maps were a tool used by the fire insurance industry to evaluate property risk. The maps often show details of historic dwellings, commercial buildings, and factories, indicate property uses and addresses, and show locations of items such as wells, cisterns, and fuel storage tanks. Sanborn Fire Insurance Map coverage was not available for the Site and surrounding area.

5.3 Cultural Features Map

The 1938/41 cultural features map shows the Site with a rural residence along the western boundary and a second residence or other structure centrally located. The railroad is present along the southern boundary. Major roads generally corresponding with section lines are present. The Town of Erie is present within three miles to the north. This mapping generally conforms to the photographs from the 1930s and 1940s.

5.4 Historical City Directories

Due to the predominant use of the Site for agricultural use, historic city directories were not reviewed for the Site.

5.5 Assessor Records

We reviewed Boulder County Assessor online files for the Site. Records indicate the Site consists of four parcels. The assessor information is summarized below:

Table I
Summary of Assessor Records

Address	Owner	Improvements	Building Area	Year Built	Acreage
903 E County Line Rd	Lafayette 7 A General Partnership	None	N/A	N/A	Undetermined
1032 N 119th St	Millican Revocable Living Trust	None	N/A	N/A	90.33
1130 N 119th St	Sonya J Lewis	1 story ranch	3,079 ft^2	1968	9.66
1160 N 119th St	Richard Douglas Schillawski	1 story ranch/open cattle shed/farm utility building	1373/800/144 ft^2	1932/1940/1940	39.90

6.0 REGULATORY AGENCY RECORDS

Regulatory agency records were provided by GeoSearch. The report, dated March 7, 2016, is presented in Appendix C.

6.1 Summary of Findings

Table II presents a summary of select regulatory agency records findings provided by GeoSearch. The findings presented in Table II are those that were determined to be topographically up-gradient and in near proximity to the site to warrant further discussion. All findings in the regulatory database are presented in the GeoSearch report in Appendix C. The findings and their locations are listed by address along with a description of their distance and topographic location in relation to the site.

Table II
Summary of Select Regulatory Agency Findings

Findings	Distance and Estimated Topographic Location	Search Radius											
		1 Mile		½ Mile					¼ Mile				
		National Priority List (NPL)	RCRA CORRACTS	RCRA Treatment, Storage, Dis-	CERCLIS/NFRAP	Colorado Voluntary Cleanup List	Solid Waste	Leaking Underground Storage	Registered Tanks (UST/AST)	Institutional Controls/Engineering	Spills (ERNS)	RCRA Generator	Other
Noble Energy Battery Section 36-1N-69W	OnSite Southeast Area	Air Emission Permit – Search not Needed per ASTM This feature is a REC and is discussed in Section 7.0											
TriCounty Self Storage 1401 NE County Line Road	Adjacent East Downgradient								X				
Falcon Properties 1001 WCR1	Mismapped – actual location 2 miles		X					X	X			X	

Findings	Distance and Estimated Topographic Location	Search Radius											
		1 Mile		½ Mile					¼ Mile				
		National Priority List (NPL)	RCRA CORRACTS	RCRA Treatment, Storage, Dis-	CERCLIS/NFRAP	Colorado Voluntary Cleanup List	Solid Waste	Leaking Underground Storage	Registered Tanks (UST/AST)	Institutional Controls/Engineering	Spills (ERNS)	RCRA Generator	Other
Waste Connections 2780 South Main Street	0.04 miles east Downgradient								X				
Spill 750 East County Line Road	0.05 miles south Cross-gradient										X		
Erie Airport 395 Airport Drive	0.15 miles east Downgradient							X	X			X	
Aero Systems 2580 South Main Street	0.21 miles east Downgradient							X	X				
The Egg Factory Inc 12420 Arapahoe Rd	0.21 mile northwest Up-gradient								X				

It should be noted that in addition to the findings presented in Table II, the GeoSearch Report indicated 13 unmapped findings that are unaddressed but potentially in the vicinity of the site. One of the listings appears to be a redundant listing for the Noble Tank Battery listed in Table II. The other listings are mostly for historical solid waste dumps where the address information is very incomplete and the records are often very old and limited. Neither these nor the other remaining listings, which include LSTs and a Spill, could be assessed due to the lack of locational information.

6.1.1 Registered Tank (UST/AST) Facilities

This is a list of underground and aboveground storage tanks (USTs and ASTs) registered with the State of Colorado. There were four UST/AST facilities listed within 1/4 mile of the site.

- Tri-County Self Storage located adjacent to the east of the Site, has a listing for a 1,000-gallon liquefied petroleum gas AST.

- Waste Connections located at 2780 Main St is situated immediately to the east beyond Tri-County Self Storage. There is one closed listing for a 6,000-gallon diesel AST and one open listing for a 6,000-gallon diesel AST.

- The Erie Municipal Airport has three listings for closed USTs for jet fuel, aviation gas and unleaded gasoline. These tanks are discussed further in Section 6.1.2. There are also two listings for open ASTs at the airport, each are 12,000-gallons for jet fuel and aviation gas.

- Aero Systems located at 2580 S Main Street has listings for two diesel USTs and one gasoline UST. All listings are closed and discussed further in Section 6.1.2.

6.1.2 Leaking Storage Tanks (LST) Facilities

The Colorado Department of Labor and Employment (CDLE) regulates active and inactive LST findings which have been reported to the state. There were two LST findings listed within ½ mile of the site.

- The Erie Municipal Airport has a LST listing associated with three USTs that were removed from the property. In June 1997 the tanks were removed and approximately 300 gallons of free phase petroleum product was encountered beneath the tanks. After the free phase product was removed approximately 700 cubic yards of petroleum impacted soil was removed from the excavation stored onsite to be landfarmed prior to being replaced. Groundwater samples collected indicated that the groundwater had not been impacted. Regulatory closure status was issued in November 1999.

- Aero Systems has a LST listing associated with three USTs (2 diesel, 1 gasoline) removed from the property in 1991. After the tanks were removed, endpoint soil sampling was conducted and only toluene was detected at trace concentrations that were below action levels. Regulatory closure status was issued in May 1992.

Due to distance from the Site, down-gradient location and regulatory status we do not believe these listings present a REC to the Site.

6.1.3 RCRA Generators

RCRA generators are facilities which generate regulated hazardous wastes under the Resource Conservation and Recovery Act (RCRA). RCRA generator facilities are classified as Large Quantity, Small Quantity, or Conditionally Exempt Small Quantity Generators. There is one RCRA Generator listed within 1/4 mile of the site.

- Rocky Mountain Propellers located at the Erie Municipal Airport is a facility for commercial and industrial machinery repair/maintenance. It is listed as a small quantity generator with no records of violations, enforcements or corrective actions. This site is also located down-gradient of the subject Site. We do not believe this presents a REC to the Site.

6.1.4 Spills

The Colorado Department of Public Health and Environment's Division of Emergency Preparedness and Response maintains this listing of chemical spills and/or releases. There are two Spills findings listed within 1/4 mile of the site:

- Both listings are from the Lafayette Wastewater Treatment Plant. The first Spill was from March 2003 was a truck accidentally released approximately 3,000-gallon of digested sludge into Coal Creek. The second listing is from October 2012 when E. Coli levels were in exceedance of standards for several days before they could be adjusted to below effluent standards. These listings impacted Coal Creek which does not flow through the Site. We do not believe these incidents rise to the level of an REC.

6.2 Local Government Records

We have contacted the Boulder County Public Health Department in the past and they have directed us to the Boulder County Hazardous Waste Map. This map shows listings for hazardous waste sites, historic dumps, mines and mills. There were no listings for the Site. There is a coal mine located adjacent to the west; however, it does not extend to within Site boundaries.

We contacted the Lafayette Fire Department, via email on April 6, 2016 in regards to hazardous material spills on or adjacent to the Site. The Fire Department has not yet replied to our request. No information was available from the fire department as of the preparation of this document. If and when we do receive a response, and if it alters the conclusions of this report, we will provide an addendum in writing.

7.0 SITE RECONNAISSANCE

The following section discusses observations made during our Site reconnaissance.

7.1 Methodology and Limiting Conditions

Our Mr. Trevor J Truett conducted a Site visit on April 4, 2016. North 119th Street provided access to the Site. The majority of the Site was accessed by walking and driving. A photographic record of the Site reconnaissance is presented in Appendix A.

7.2 Description of Site Structures and Roads

The Site consists of vacant land. The majority of the Site is or was recently agricultural land that has been plowed. The remainder of the Site consisted of grasses and weeds. There are two dilapidated homes on the Site. Generally, North 119th Street and rural homes border the Site to the west, rural homes/farms and oil/gas facilities border the Site to the south, rural homes/farms border the Site to the north; and County Line Road, as well as a self-storage facility, border the Site to the east.

7.3 Site Observations

During our reconnaissance, we specifically looked for obvious evidence of the Site features listed in Table III. Table III lists features typically observed on the exterior

of structures. An “X” located within the table indicates that the feature was readily observable during our visit. Those features which were observed on the Site are discussed in further detail within the following subsection(s).

Table III
Exterior Site Features

X	Aboveground Storage Tanks		Stained Soil and/or Pavement
	Air Emissions Sources		Stockpiles of Soil or Debris
X	Cultivated Land/Crops		Stressed Vegetation
	Drains, Sumps, Pits	X	Surface Water, Streams, Ponds, Lagoons
	Hazardous Material Storage	X	Transformers (Potential PCB)
	High Power Transmission Lines		Underground Storage Tanks
X	Natural Gas Pipelines		Unidentified Piping Below Grade
	Odors	X	Unidentified Substance Containers
X	Petroleum Pipelines		Vehicle Maintenance Areas
	Physical Irregularities		Waste Water Discharge
	Placed Fill or Imported Soils		Waste Treatment Processes
	Railroad Lines	X	Wells (Agricultural, Water Supply)
	Septic Systems or Leach Fields		Wells (Monitoring)
X	Solid Waste or Disposal Areas	X	Wells (Oil or Natural Gas)

7.3.1 Cultivated Land/Crops

We observed the majority of the Site that is or was recently in agricultural use. The land was recently plowed. We spoke with Mr. Richard Schillawski who currently owns the northwest 40 acres of the Site. Mr. Schillawski stated that he grew wheat on his land, and had been farming it for approximately 20 years. He also stated that he did apply herbicides to the property, which came in a concentrated form which he diluted with water in a tank and sprayed. The use of pesticides and herbicides can sometimes present a potential concern for these chemicals to adversely impact the soil and ground water beneath the site. However, many of the modern chemicals used degrade quickly in the natural environment. The crops believed to have been grown on or near the site are likely adapted to harsh growing conditions and the widespread use of chemicals such as DDT for row crops was uncommon. We believe that normal application of agricultural chemicals is a de minimis environmental condition and not an REC. We do not believe that this represents an REC for the Site.

7.3.2 Gas Wells/Aboveground Storage Tanks/Petroleum Pipelines

We observed two active gas wells operating on the Site. These wells are located on the northwest and southeast portions of the Site. The well facility on the southeast portion of the Site also contained one 300-barrel capacity aboveground storage tank. We also observed evidence of petroleum pipelines associated with the wells. We believe the presence of these facilities on Site presents an REC for the Site.

7.3.3 Wells (Agricultural, Water Supply)

We observed the possible remnants of a water well associated with the dilapidated house on the southeast portion of the Site. We do not believe the potential existence of this well presents an REC for the Site; however, we do recommend that wells no longer in use be properly plugged and abandoned.

7.3.4 Surface Water, Streams, Ponds and Lagoons

We observed ponds of water associated with a wetlands area and ditch on the southeast portion of the Site. We did not observe an obvious sheen or odor associated with these features. We did observed a rusted drum in one of the ponds. We do not believe these features represent an REC for the Site.

7.3.5 Natural Gas Pipelines

We observed natural gas pipeline markers on the Site. Natural gas is not considered a persistent contaminant when released into the soil or air, therefore we do not believe the existence of this pipeline(s) represents a REC for the Site.

7.3.6 Solid Waste or Disposal Areas/Unidentified Substance Containers

We observed multiple piles/areas of solid waste, most of which was concentrated on the east or southeast portions of the Site. Most of the debris appeared to be inert waste (wood, metal, tires, etc.), however, in some areas we observed old tanks, drums, buckets and other unknown substance containers with the debris. Some of these piles did appear to be associated with former structures on this portion of the Site. We do believe that the presence of these unknown containers and debris presents evidence of a REC for the Site.

In addition, we observed a section of cementitious pipe laying on the ground on the west portion of the Site, approximately six feet in length. The approximate location of this pipe is depicted on Figure 2. This pipe may contain asbestos and we recommend that it be properly tested, removed and disposed of by a General Abatement Contractor, if necessary. We emphasize that asbestos is not typically included in the scope of a Phase I ESA, and this observation does not constitute a full asbestos survey of the Site.

7.3.7 Transformers (Potential PCB)

We observed at least one pole-mounted electrical transformer on the Site. We did not observe obvious signs of staining or leakage associated with this transformer. We do not believe that this transformer represents a REC for the Site.

7.4 Review of Adjacent Properties

General observations of properties adjacent to the Site were performed in conjunction with on-Site observations made on April 4, 2016. Developed property in the vicinity of the Site consists of transportation corridors, a self-storage facility, rural single-family residences and/or farm/equestrian properties, oil and/or gas facilities and farm/pasture land. Properties immediately adjacent to the Site are described below, based on outdoor observations from the Site or nearby public streets.

- North: The subject Site is generally bounded by rural single-family residences or farmland/pasture land with oil/gas exploration facilities.

- East: The subject Site is generally bounded by County Line Road and a self-storage facility.

- South: The subject Site is generally bounded by rural single-family residences, farm/pasture land, farm/equestrian properties and an active oil/gas exploration facility.

- West: The subject Site is generally bounded by North 119th Street, as well as rural single-family/equestrian residences with a rural-single-family residence and farm/open space land beyond.

Observation of adjacent properties did not reveal obvious visual indications of environmental concern, other than oil/gas exploration facilities. We did not observe other evidence of landfills, lagoons, pits, or other waste treatment or disposal operations; underground storage tanks, spills, releases, or discharge of hazardous material other than oil/gas exploration facilities.

8.0 INTERVIEWS

8.1 Owner, Site Manager and/or Occupants

Mr. Joseph Guetlein (43 acre parcel) and Mr. Richard Schillawski (40 acre parcel) responded to our questionnaires of March 18, 2016. Some of their responses were summarized in Section 3.0. Additional information concerning general Site usage is summarized below.

Mr. Schillawski has owned his parcel since 1996. Its current uses, and to the best of his knowledge the former uses, include agriculture and oil and gas production. Currently these crops include wheat and barley. Corn and hay may have been grown previously.

Mr. Guetlein has owned his parcel since 1987. Its current use, and to the best of his knowledge the former use, includes agriculture. Currently the crop grown is wheat. An abandoned house is also located on his parcel.

9.0 DEVIATIONS

9.1 Exceptions and Deletions

ASTM Standard E 1527-13 for Phase I Environmental Site Assessments, Section 8.3.2, states that "all obvious uses of the Site shall be identified from the present, back to the Site's obvious first developed use, or back to 1940, whichever is earlier." The term "developed use" includes agricultural uses (i.e., cultivated land/agricultural crops) and placement of fill. In our opinion, livestock rangeland is not a developed use.

The historical documentation for this assessment went back to 1937 on the basis of an aerial photograph which showed the property as predominantly agricultural land. We were not able to ascertain the date of first agricultural use, thus the historical documentation was not fully satisfied for the ASTM standard.

It is the opinion of CTL that obtaining earlier historical information would not be sufficiently useful, reasonably ascertainable, or change the likelihood for the presence of an REC on the Site.

9.2 Data Gaps

We did not receive a response from the Lafayette Fire Department; however, given the history of the Site, we do not believe that these are significant data gaps which would affect our ability to identify recognized environmental conditions associated with the Site.

10.0 FINDINGS AND OPINION

10.1 Summary of Site Historical Use

The Site appears to have remained in agricultural use. Although the occupied residences are not included in this transaction, the Site does contain two abandoned/unoccupied residences and the remnants of a third residence or other structure.

The Site is currently and was previously in agricultural use. The use of pesticides and herbicides can sometimes present a potential concern for these chemicals to adversely impact the soil and groundwater water beneath the Site. However, many of these chemicals used today degrade quickly in the natural environment. We did not observe evidence of the usage or storage of banned chemicals (e.g. DDT, Dieldrin) at the Site; we believe that normal application of agricultural chemicals at the Site is a *de minimis* environmental condition.

The Site has also been used for oil and gas well development. There are currently two wells and their associated equipment within the boundaries of the Site. Two additional wells existed but have since been abandoned.

10.2 Nearby Environmental Concerns

There were multiple mapped findings listed in the GeoSearch report. However, these listings, which include the Erie Airport and other tank installations, are generally to the east and hydraulically downgradient from the Site. As such we do not believe these nearby listings present a REC for the Site.

11.0 CONCLUSIONS AND RECOMMENDATIONS

We have performed a Phase I Environmental Site Assessment (ESA) in general conformance with the scope and limitations of ASTM Practice E 1527-13 of the Erie Assemblage, the Site for OEO, LLC. Any exceptions to, or deletions from, this practice are

described in Section 9.1 of this report. This assessment has revealed no evidence of recognized environmental conditions in connection with the property with the exception of the following:

- The possibility for asbestos in the abandoned residences.
- The two active and two abandoned oil and gas wells on the Site.
- The dump areas, containing tanks and drums, near the abandoned residences.
- The suspect-asbestos pipe (approximately 6 feet in length), and possibly buried asbestos in the dump piles and/or areas where structures formerly existed.

We recommend a Limited Phase II ESA to address these concerns.

12.0 QUALIFICATIONS

This Phase I ESA was supervised by, and the report reviewed by, Mr. Matthew Wardlow, a licensed Professional Engineer (P.E.) registered in the State of Colorado. Mr. Wardlow has performed or reviewed over 1,000 Phase I ESAs in the State of Colorado, and has been practicing within the local environmental consulting profession for at least 20 years. The resumes of the individuals conducting this Phase I ESA are included in Appendix D.

Mr. Wardlow declares that, to the best of his professional knowledge and belief, he meets the definition of an Environmental Professional as defined in §312.10 of 40 CFR 312. I have the specific qualifications based on education, training and experience to assess a property of the nature, history and setting of the subject Site. I have developed and performed all appropriate inquiries in general conformance with the standards and practices set forth in 40 CFR Part 312.

We believe that this ESA was conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the locality of the project. No warranty, express or implied, is made.

If we can be of further service in discussing the contents of this report, please call.

CTL | THOMPSON, INC.

Trevor M. Branch, E.I.T.
Staff Environmental Engineer

Reviewed by:

Matthew L. Wardlow, P.E.
Environmental Department Manager

TMB:MLW/ab

Via e-mail: coreye@e5xmanagement.com

REFERENCES

Colorado Division of Water Resources, online Water Well Permit Database, http://165.127.23.116/webSite/lttools/

Colorado Oil and Gas Conservation Commission, online Oil/Gas Well Permit Database, http://www.oil-gas.state.co.us

CTL User Questionnaire, Mr. Corey Elliott, OEO, LLC, March 31, 2016

CTL Owner Questionnaire, Mr. Joseph Guetlein, March 18, 2016

CTL Owner Questionnaire, Mr. Richard Schillawski, March 18, 2016

GeoSearch™ Report (Project DN48284-200, dated March 7, 2016)

GeoSearch™ Historical Aerials Package (Project DN48284-200, dated March 4, 2016), photographs from 1937, 1948, 1953, 1966, 1971, 1978, 1983, 1993 and 1999)

Google Earth Imagery, Satellite Photographs, 2002, 2005, 2010 and 2015

Mine Subsidence Assessment, Western Environment and Ecology, Inc., Project No. 701-001-01, report dated January 18, 2016

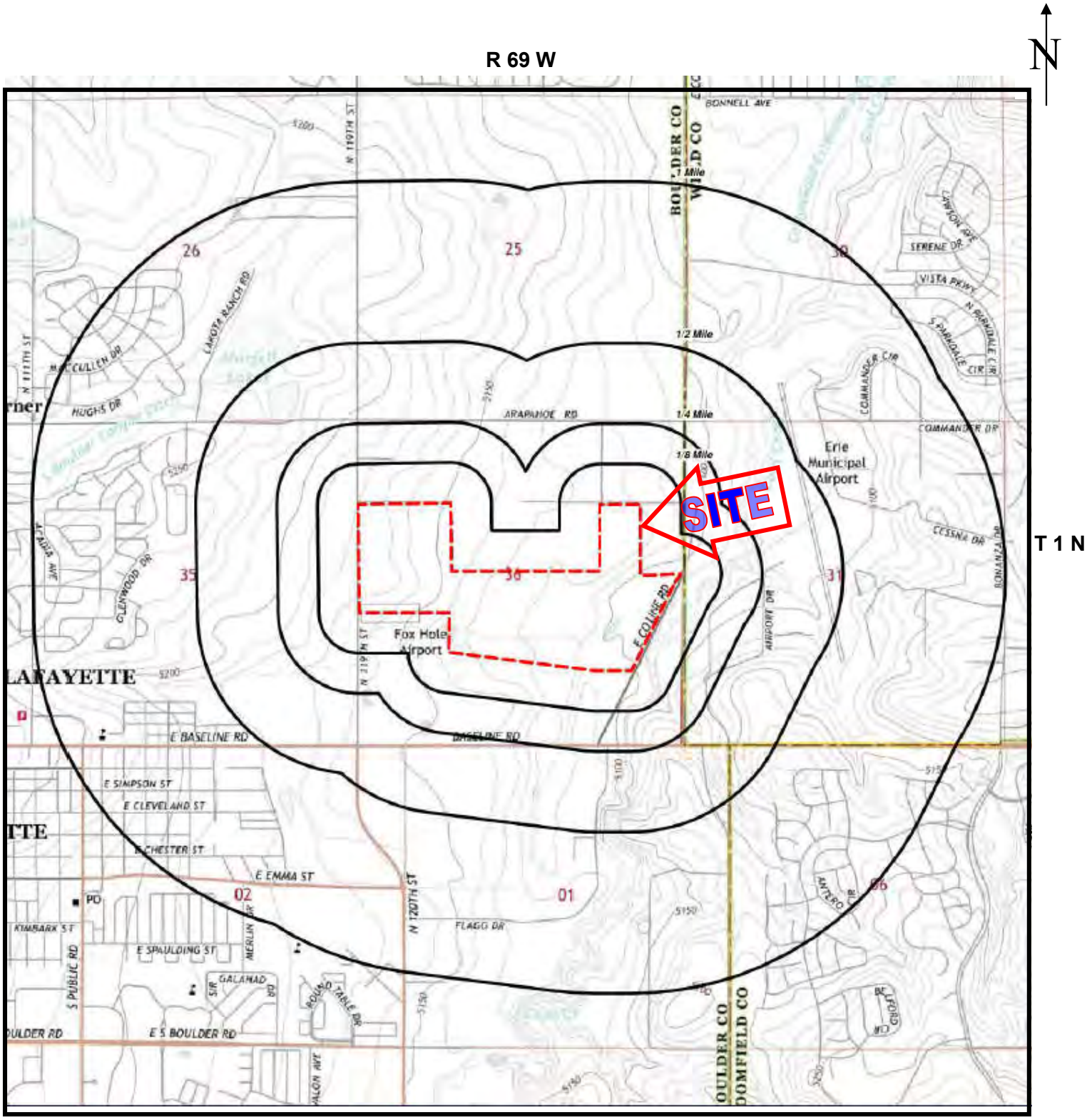
U.S. Geological Survey Topographic Map, Erie Quadrangle, Colorado (1951, 1967, and 1967 revised 1971, 1979 and 1994).

Title Commitment, First American Commitment Title Insurance Company, Number NCS-766894-CO (December 14, 2015).

Title Commitment, First American Commitment Title Insurance Company, Number NCS-766895-CO (December 15, 2015).

Title Commitment, First American Commitment Title Insurance Company, Number NCS-773940-1-CO (February 12, 2016).

Title Commitment, First American Commitment Title Insurance Company, Number NCS-766885 (December 10, 2015).

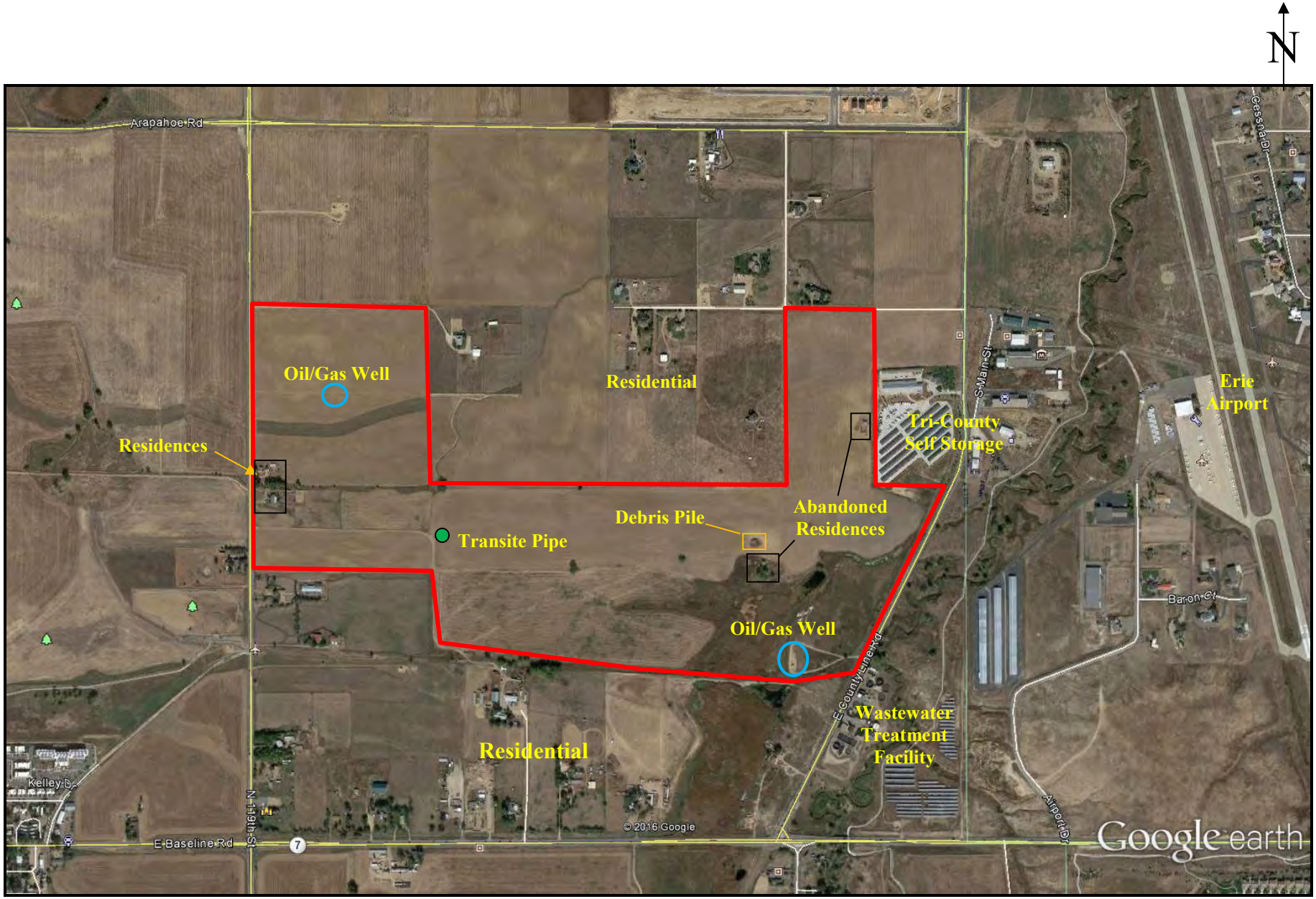


Scale: 1” ~ 2400’

Source:
U.S.G.S. Topographic Map
Erie Quadrangle
2013

OEO, LLC
ERIE ASSEMBLAGE
CTL PROJECT NO. DN48,284-200

Topographic Area Map
Fig. 1



CTL PROJECT NO. DN 48,284.000-200

Figure 2
Site Plan

APPENDIX A
SITE PHOTOGRAPHS



Description: Across southwest portion of Site
View Direction: East



Description: Across central portion of Site
View Direction: Northwest



Description: Across southeast portion of Site
View Direction: Southeast



Description: Pond with drum on southeast portion of Site
View Direction: South

SITE PHOTOGRAPHS

CTL | THOMPSON



Description: Across west portion of Site
View Direction: East



Description: Across northwest portion of Site
View Direction: North



Description: Across west portion of Site
View Direction: Southwest



Description: Across west portion of Site
View Direction: West

SITE PHOTOGRAPHS



Description: Dilapidated house and dump area
View Direction: Northeast



Description: Tank and farm dump area
View Direction: West



Description: Old farm equipment and dump area
View Direction: North



Description: Dilapidated house and dump area
View Direction: Northwest



Description: Dump area
View Direction: North



Description: Additional dilapidated house and dump area
View Direction: North



Description: Across northeast portion of Site
View Direction: North



Description: Across central portion of Site
View Direction: West



Description: Oil/gas well on southeast portion of Site
View Direction: North



Description: Petroleum product tank on southeast portion of Site
View Direction: South



Description: Oil/gas facility adjacent to south side of Site
View Direction: Southwest



Description: Oil/gas well on northwest portion of Site
View Direction: South

APPENDIX B
HISTORIC AERIAL PHOTOGRAPHS

Historical Aerials Package

http://www.geo-search.net/QuickMap/index.htm?DataID=Standard0000138168

Click on link above to access the map and satellite view of current property

Target Property:

Erie Assemblage
Baseline Road and 119th street
Erie, Boulder County, Colorado 80026

Prepared For:

CTL Thompson- Denver

Order #: 63746
Job #: 138168
Project #: DN48284-200
Date: 03/04/2016

TARGET PROPERTY SUMMARY

Erie Assemblage
Baseline Road and 119th street
Erie, Boulder County, Colorado 80026

USGS Quadrangle: ***Erie, CO***

Target Property Geometry: ***Area***

Target Property Longitude(s)/Latitude(s):
(-105.055990, 40.007566), (-105.058522, 40.003588), (-105.060668, 40.003588), (-105.069165, 40.004410), (-105.069122, 40.006185), (-105.074358, 40.006185), (-105.074444, 40.011050), (-105.069036, 40.011116), (-105.068994, 40.008059), (-105.060368, 40.008059), (-105.060368, 40.011050), (-105.058007, 40.011050), (-105.058007, 40.007862), (-105.055647, 40.007927), (-105.055990, 40.007566)

County/Parish Covered:
Boulder (CO), Broomfield (CO), Weld (CO)

Zipcode(s) Covered:
Broomfield CO: 80023
Erie CO: 80516
Lafayette CO: 80026

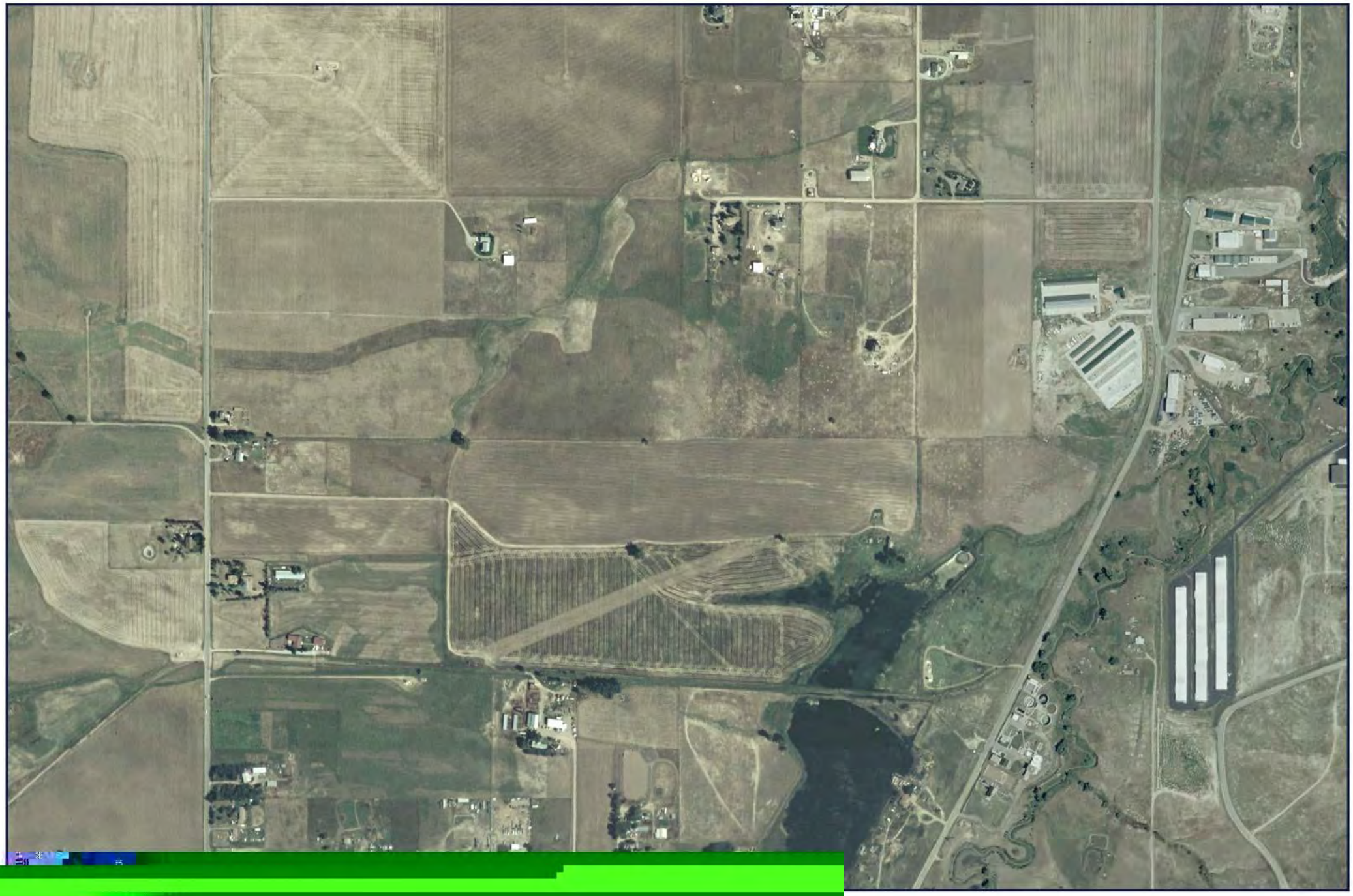
State(s) Covered:
CO

****Target property is located in Radon Zone 1.***
Zone 1 areas have a predicted average indoor radon screening level greater than 4 pCi/L (picocuries per liter).

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GeoSearch



GeoSearch



N
W E
S

JOB #: 138168 - 3/4/2016

SITE: ERIE ASSEMBLAGE
SOURCE: USGS
DATE: 10/04/1999
COUNTY: BOULDER, CO
SCALE: 1" = 700'

GeoSearch



N
W E
S

JOB #: 138168 - 3/4/2016

SITE: ERIE ASSEMBLAGE
SOURCE: USGS
DATE: 06/30/1993
COUNTY: BOULDER, CO
SCALE: 1" = 700'

GeoSearch



N
W E
S

JOB #: 138168 - 3/4/2016

SITE: ERIE ASSEMBLAGE
SOURCE: USGS
DATE: 10/05/1983
COUNTY: BOULDER, CO
SCALE: 1" = 700'

GeoSearch



N
W E
S

JOB #: 138168 - 3/4/2016

SITE: ERIE ASSEMBLAGE
SOURCE: USGS
DATE: 09/08/1978
COUNTY: BOULDER, CO
SCALE: 1" = 700'

GeoSearch



N
W E
S

JOB #: 138168 - 3/4/2016

SITE: ERIE ASSEMBLAGE
SOURCE: USGS
DATE: 08/06/1971
COUNTY: BOULDER, CO
SCALE: 1" = 700'

GeoSearch



N
W E
S

JOB #: 138168 - 3/4/2016

SITE: ERIE ASSEMBLAGE
SOURCE: USGS
DATE: 10/04/1966
COUNTY: BOULDER, CO
SCALE: 1" = 700'

GeoSearch



N
W E
S

JOB #: 138168 - 3/4/2016

SITE: ERIE ASSEMBLAGE
SOURCE: AMS
DATE: 09/10/1953
COUNTY: BOULDER, CO
SCALE: 1" = 700'

GeoSearch



N
W E
S

JOB #: 138168 - 3/4/2016

SITE: ERIE ASSEMBLAGE
SOURCE: USGS
DATE: 09/23/1948
COUNTY: BOULDER, CO
SCALE: 1" = 700'

GeoSearch



N
W E
S

JOB #: 138168 - 3/4/2016

SITE: ERIE ASSEMBLAGE
SOURCE: ASCS
DATE: 06/22/1937
COUNTY: BOULDER, CO
SCALE: 1" = 700'

GeoSearch

APPENDIX C
GEOSEARCH™ REPORT

GeoSearch
On time. On target. In touch.™

Radius Report

Satellite view

Target Property:

Erie Assemblage
Baseline Road and 119th street
Erie, Boulder County, Colorado 80026

Prepared For:

CTL Thompson- Denver

Order #: 63746
Job #: 138166
Project #: DN48284-200
Date: 03/07/2016

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Unlocatable Report . . . . . See Attachment

Zip Report . . . . . See Attachment

Disclaimer

This report was designed by GeoSearch to meet or exceed the records search requirements of the All Appropriate Inquiries Rule (40 CFR §312.26) and the current version of the ASTM International E1527, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process or, if applicable, the custom requirements requested by the entity that ordered this report. The records and databases of records used to compile this report were collected from various federal,state and local governmental entities. It is the goal of GeoSearch to meet or exceed the 40 CFR §312.26 and E1527 requirements for updating records by using the best available technology. GeoSearch contacts the appropriate governmental entities on a recurring basis. Depending on the frequency with which a record source or database of records is updated by the governmental entity, the data used to prepare this report may be updated monthly, quarterly, semi-annually, or annually.

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Target Property Summary

Target Property Information

Erie Assemblage
Baseline Road and 119th street
Erie, Colorado 80026

Coordinates
Area centroid (-105.06536, 40.0071584)
5,124 feet above sea level

USGS Quadrangle
Erie, CO

Geographic Coverage Information

County/Parish: Boulder (CO) , Broomfield (CO) , Weld (CO)
ZipCode(s):
Broomfield CO: 80023
Lafayette CO: 80026
Erie CO: 80516

Radon
* Target property is located in Radon Zone 1.
Zone 1 areas have a predicted average indoor radon screening level greater than 4 pCi/L (picocuries per liter).

Database Summary

FEDERAL LISTING

Standard Environmental Records

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
FEDERAL ENGINEERING INSTITUTIONAL CONTROL SITES	EC	0	0	TP/AP
LAND USE CONTROL INFORMATION SYSTEM	LUCIS	0	0	TP/AP
RCRA SITES WITH CONTROLS	RCRASC	0	0	TP/AP
EMERGENCY RESPONSE NOTIFICATION SYSTEM	ERNSCO	0	0	0.1250
NO LONGER REGULATED RCRA GENERATOR FACILITIES	NLRRCRAG	0	0	0.2500
RESOURCE CONSERVATION & RECOVERY ACT - GENERATOR FACILITIES	RCRAGR08	1	0	0.2500
RESOURCE CONSERVATION & RECOVERY ACT - NON-GENERATOR FACILITIES	RCRANGR08	2	0	0.2500
BROWNFIELDS MANAGEMENT SYSTEM	BF	0	0	0.5000
COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION & LIABILITY INFORMATION SYSTEM	CERCLIS	0	0	0.5000
NO FURTHER REMEDIAL ACTION PLANNED SITES	NFRAP	0	0	0.5000
NO LONGER REGULATED RCRA NON-CORRACTS TSD FACILITIES	NLRRCRAT	0	0	0.5000
RESOURCE CONSERVATION & RECOVERY ACT - NON-CORRACTS TREATMENT, STORAGE & DISPOSAL FACILITIES	RCRAT	0	0	0.5000
DELISTED NATIONAL PRIORITIES LIST	DNPL	0	0	1.0000
NATIONAL PRIORITIES LIST	NPL	0	0	1.0000
NO LONGER REGULATED RCRA CORRECTIVE ACTION FACILITIES	NLRRCRAC	1	0	1.0000
PROPOSED NATIONAL PRIORITIES LIST	PNPL	0	0	1.0000
RESOURCE CONSERVATION & RECOVERY ACT - CORRECTIVE ACTION FACILITIES	RCRAC	0	0	1.0000
RESOURCE CONSERVATION & RECOVERY ACT - SUBJECT TO CORRECTIVE ACTION FACILITIES	RCRASUBC	0	0	1.0000

SUB-TOTAL		4	0	

Additional Environmental Records

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
CERCLIS LIENS	SFLIENS	0	0	TP/AP
EPA DOCKET DATA	DOCKETS	0	0	TP/AP
MATERIAL LICENSING TRACKING SYSTEM	MLTS	0	0	TP/AP
TOXIC SUBSTANCE CONTROL ACT INVENTORY	TSCA	0	0	TP/AP
AEROMETRIC INFORMATION RETRIEVAL SYSTEM / AIR FACILITY SUBSYSTEM	AIRSAFS	1	1	0.1250
CLANDESTINE DRUG LABORATORY LOCATIONS	CDL	0	0	0.1250

Database Summary

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
HAZARDOUS MATERIALS INCIDENT REPORTING SYSTEM	HMIRSR08	0	0	0.1250
TOXICS RELEASE INVENTORY	TRI	1	0	0.1250
BIENNIAL REPORTING SYSTEM	BRS	0	0	0.2500
HISTORICAL GAS STATIONS	HISTPST	0	0	0.2500
OPEN DUMP INVENTORY	ODI	0	0	0.5000
DEPARTMENT OF DEFENSE SITES	DOD	0	0	1.0000
FORMERLY USED DEFENSE SITES	FUDS	0	0	1.0000
RECORD OF DECISION SYSTEM	RODS	0	0	1.0000
SUB-TOTAL		2	1	

Database Summary

STATE (CO) LISTING

Standard Environmental Records

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
ENVIRONMENTAL REAL COVENANTS LIST	COVENANTS	0	0	TP/AP
ABOVEGROUND STORAGE TANK FACILITIES	AST	5	0	0.2500
HAZARDOUS WASTE SITES- GENERATOR	HWSG	1	0	0.2500
UNDERGROUND STORAGE TANK FACILITIES	UST	3	0	0.2500
HISTORICAL SOLID WASTE LANDFILLS	HISTSWLF	2	8	0.5000
LEAKING STORAGE TANK FACILITIES	LST	3	0	0.5000
LEAKING UNDERGROUND STORAGE TANKS TRUST FUND SITES	LUSTTRUST	0	3	0.5000
SOLID WASTE FACILITIES	SWF	0	0	0.5000
VOLUNTARY CLEANUP AND REDEVELOPMENT PROGRAM SITES	VCRA	0	0	0.5000
HAZARDOUS WASTE SITES- CORRECTIVE ACTION	HWSCA	1	0	1.0000
SUPERFUND SITES	SF	0	0	1.0000

SUB-TOTAL		15	11	

Additional Environmental Records

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
ASBESTOS ABATEMENT AND DEMOLITION PROJECTS	ASBESTOS	0	0	TP/AP
URANIUM MILL TAILINGS SITES	UMTS	0	0	TP/AP
AIR POLLUTION CONTROL DIVISION PERMITTED FACILITIES	APCDP	1	0	0.1250
CLANDESTINE DRUG LABORATORY LOCATIONS	CDL	0	0	0.1250
DRY CLEANING FACILITIES	CLEANERS	0	0	0.1250
SPILLS LISTING	SPILLS	2	1	0.1250
HAZARDOUS WASTE SITES- TREATMENT, STORAGE & DISPOSAL	HWSTSD	0	0	0.5000
METHANE GAS STUDY SITES	METHANESITES	0	0	0.5000

SUB-TOTAL		3	1	

Database Summary

LOCAL LISTING

Additional Environmental Records

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
WELD COUNTY SOLID WASTE FACILITIES	WCSWF	0	0	0.5000
SUB-TOTAL		0	0	

TRIBAL LISTING

Standard Environmental Records

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
UNDERGROUND STORAGE TANKS ON TRIBAL LANDS	USTR08	0	0	0.2500
LEAKING UNDERGROUND STORAGE TANKS ON TRIBAL LANDS	LUSTR08	0	0	0.5000
OPEN DUMP INVENTORY ON TRIBAL LANDS	ODINDIAN	0	0	0.5000
SUB-TOTAL		0	0	

Additional Environmental Records

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
INDIAN RESERVATIONS	INDIANRES	0	0	1.0000
SUB-TOTAL		0	0	

TOTAL		24	13	

Database Radius Summary

FEDERAL LISTING

*Standard environmental records are displayed in **bold**.*

Acronym	Search Radius (miles)	TP/AP (0 - 0.02)	1/8 Mile (> TP/AP)	1/4 Mile (> 1/8)	1/2 Mile (> 1/4)	1 Mile (> 1/2)	> 1 Mile	Total
DOCKETS	0.0200	0	NS	NS	NS	NS	NS	0
EC	**0.0200**	**0**	**NS**	**NS**	**NS**	**NS**	**NS**	**0**
LUCIS	**0.0200**	**0**	**NS**	**NS**	**NS**	**NS**	**NS**	**0**
MLTS	0.0200	0	NS	NS	NS	NS	NS	0
RCRASC	**0.0200**	**0**	**NS**	**NS**	**NS**	**NS**	**NS**	**0**
SFLIENS	0.0200	0	NS	NS	NS	NS	NS	0
TSCA	0.0200	0	NS	NS	NS	NS	NS	0
AIRSAFS	0.1250	1	0	NS	NS	NS	NS	1
CDL	0.1250	0	0	NS	NS	NS	NS	0
ERNSCO	**0.1250**	**0**	**0**	**NS**	**NS**	**NS**	**NS**	**0**
HMIRSR08	0.1250	0	0	NS	NS	NS	NS	0
TRI	0.1250	1	0	NS	NS	NS	NS	1
BRS	0.2500	0	0	0	NS	NS	NS	0
HISTPST	0.2500	0	0	0	NS	NS	NS	0
NLRRCRAG	**0.2500**	**0**	**0**	**0**	**NS**	**NS**	**NS**	**0**
RCRAGR08	**0.2500**	**0**	**0**	**1**	**NS**	**NS**	**NS**	**1**
RCRANGR08	**0.2500**	**1**	**0**	**1**	**NS**	**NS**	**NS**	**2**
BF	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
CERCLIS	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
NFRAP	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
NLRRCRAT	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
ODI	0.5000	0	0	0	0	NS	NS	0
RCRAT	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
DNPL	**1.0000**	**0**	**0**	**0**	**0**	**0**	**NS**	**0**
DOD	1.0000	0	0	0	0	0	NS	0
FUDS	1.0000	0	0	0	0	0	NS	0
NLRRCRAC	**1.0000**	**1**	**0**	**0**	**0**	**0**	**NS**	**1**
NPL	**1.0000**	**0**	**0**	**0**	**0**	**0**	**NS**	**0**
PNPL	**1.0000**	**0**	**0**	**0**	**0**	**0**	**NS**	**0**
RCRAC	**1.0000**	**0**	**0**	**0**	**0**	**0**	**NS**	**0**
RCRASUBC	**1.0000**	**0**	**0**	**0**	**0**	**0**	**NS**	**0**
RODS	1.0000	0	0	0	0	0	NS	0

SUB-TOTAL		4	0	2	0	0	0	6

Database Radius Summary

STATE (CO) LISTING

*Standard environmental records are displayed in **bold**.*

Acronym	Search Radius (miles)	TP/AP (0 - 0.02)	1/8 Mile (> TP/AP)	1/4 Mile (> 1/8)	1/2 Mile (> 1/4)	1 Mile (> 1/2)	> 1 Mile	Total
ASBESTOS	0.0200	0	NS	NS	NS	NS	NS	0
COVENANTS	**0.0200**	**0**	**NS**	**NS**	**NS**	**NS**	**NS**	**0**
UMTS	0.0200	0	NS	NS	NS	NS	NS	0
APCDP	0.1250	1	0	NS	NS	NS	NS	1
CDL	0.1250	0	0	NS	NS	NS	NS	0
CLEANERS	0.1250	0	0	NS	NS	NS	NS	0
SPILLS	0.1250	0	2	NS	NS	NS	NS	2
AST	**0.2500**	**1**	**2**	**2**	**NS**	**NS**	**NS**	**5**
HWSG	**0.2500**	**0**	**0**	**1**	**NS**	**NS**	**NS**	**1**
UST	**0.2500**	**0**	**0**	**3**	**NS**	**NS**	**NS**	**3**
HISTSWLF	**0.5000**	**0**	**0**	**1**	**1**	**NS**	**NS**	**2**
HWSTSD	0.5000	0	0	0	0	NS	NS	0
LST	**0.5000**	**1**	**0**	**2**	**0**	**NS**	**NS**	**3**
LUSTTRUST	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
METHANESITES	0.5000	0	0	0	0	NS	NS	0
SWF	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
VCRA	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
HWSCA	**1.0000**	**1**	**0**	**0**	**0**	**0**	**NS**	**1**
SF	**1.0000**	**0**	**0**	**0**	**0**	**0**	**NS**	**0**

SUB-TOTAL		4	4	9	1	0	0	18

Database Radius Summary

LOCAL LISTING

*Standard environmental records are displayed in **bold**.*

Acronym	Search Radius (miles)	TP/AP (0 - 0.02)	1/8 Mile (> TP/AP)	1/4 Mile (> 1/8)	1/2 Mile (> 1/4)	1 Mile (> 1/2)	> 1 Mile	Total
WCSWF	0.5000	0	0	0	0	NS	NS	0
SUB-TOTAL		0	0	0	0	0	0	0

Database Radius Summary

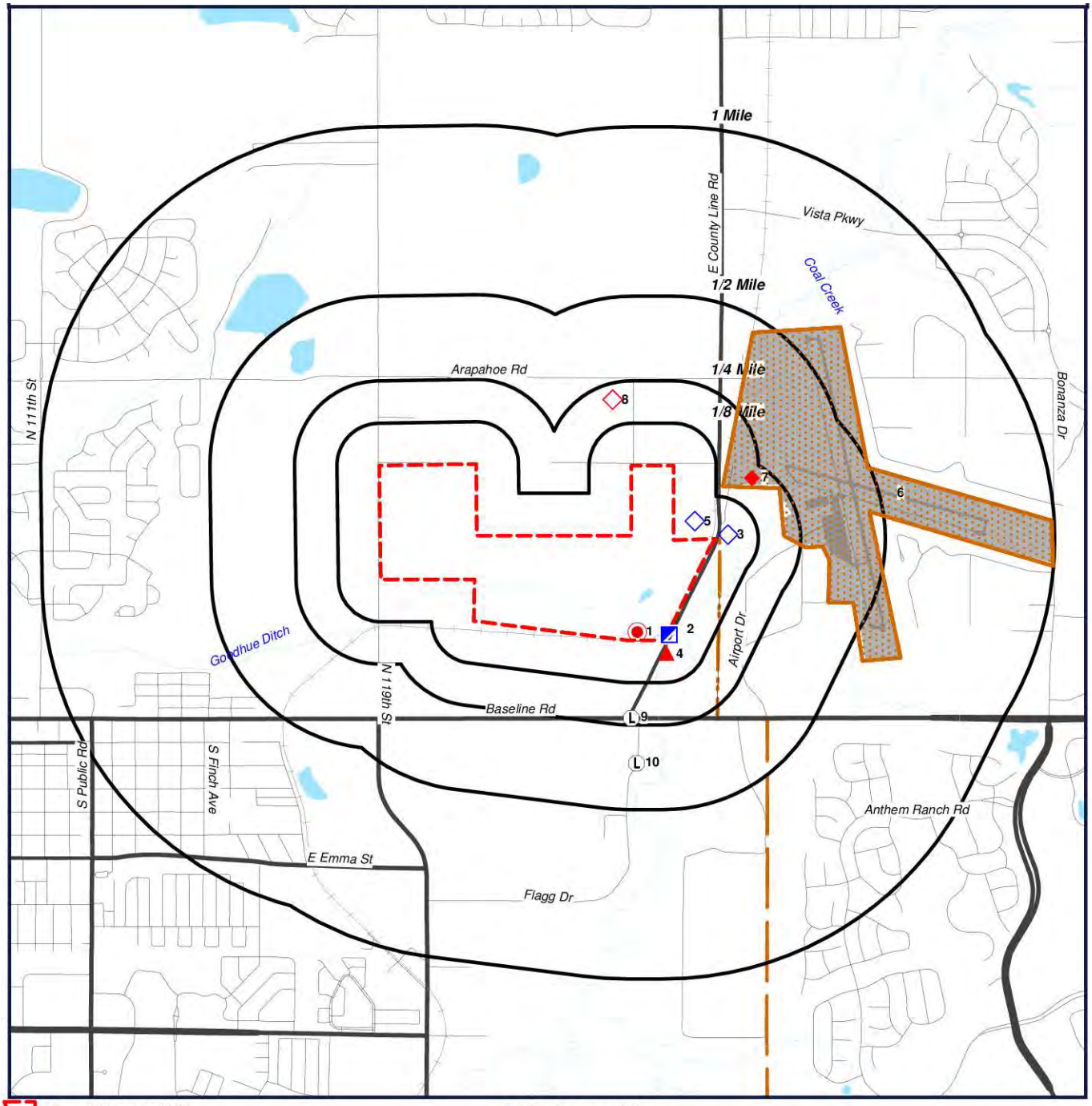
TRIBAL LISTING

*Standard environmental records are displayed in **bold**.*

Acronym	Search Radius (miles)	TP/AP (0 - 0.02)	1/8 Mile (> TP/AP)	1/4 Mile (> 1/8)	1/2 Mile (> 1/4)	1 Mile (> 1/2)	> 1 Mile	Total
USTR08	**0.2500**	**0**	**0**	**0**	**NS**	**NS**	**NS**	**0**
LUSTR08	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
ODINDIAN	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
INDIANRES	1.0000	0	0	0	0	0	NS	0
SUB-TOTAL		0	0	0	0	0	0	0
TOTAL		8	4	11	1	0	0	24

NOTES:
NS = NOT SEARCHED
TP/AP = TARGET PROPERTY/ADJACENT PROPERTY

Radius Map 1



Target Property (TP)
AIRSAFS
NLRRCRAC
AST
SPILLS
HWSG
LST
UST
RCRAGR08

AST
LST
UST
HISTSWLF

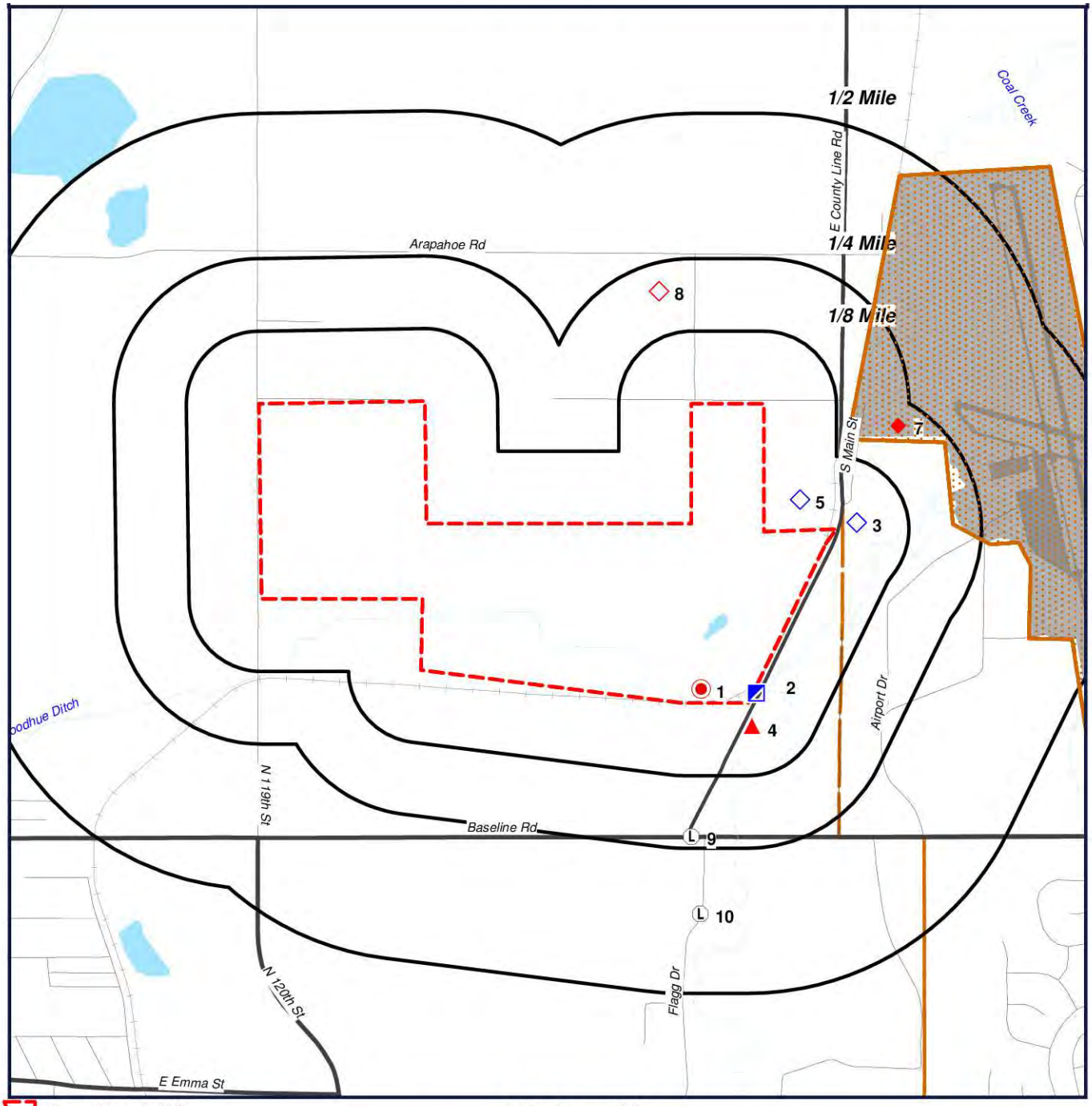
Erie Assemblage
Baseline Road and 119th street
Erie, Colorado
80026

N
W E
S

0' 1200' 2400' 3600'
SCALE: 1" = 2400'

Click here to access Satellite view

Radius Map 2



Target Property (TP)
AIRSAFS
NLRRCRAC
AST
SPILLS
HWSG
LST
UST
RCRAGR08

AST
LST
UST
HISTSWLF

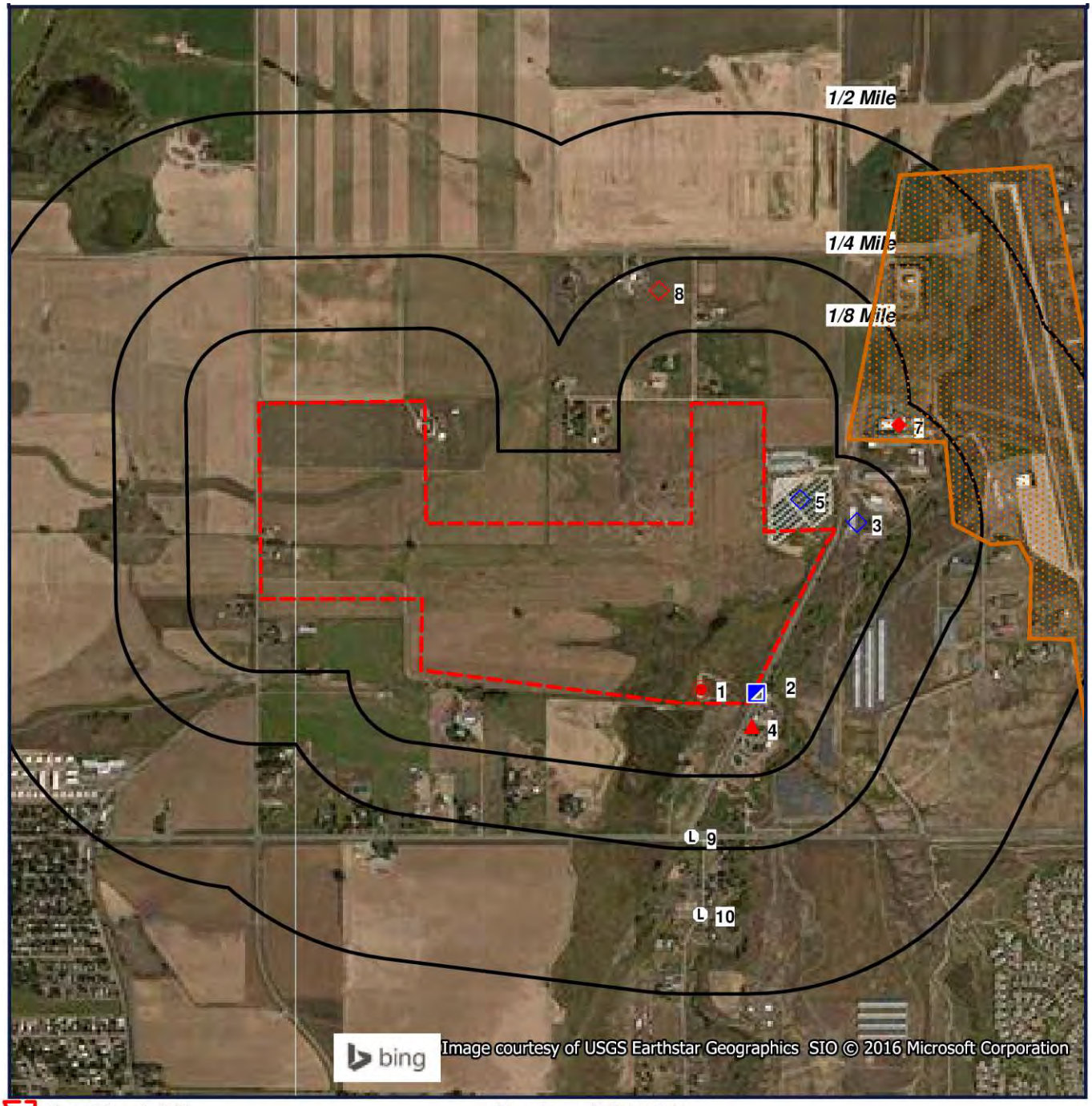
Erie Assemblage
Baseline Road and 119th street
Erie, Colorado
80026

N
W E
S

0' 700' 1400' 2100'
SCALE: 1" = 1400'

[Click here to access Satellite view]

Ortho Map



Target Property (TP)
AIRSAFS
NLRRCRAC
AST
SPILLS
HWSG
LST
UST
RCRAGR08

AST
LST
UST
HISTSWLF

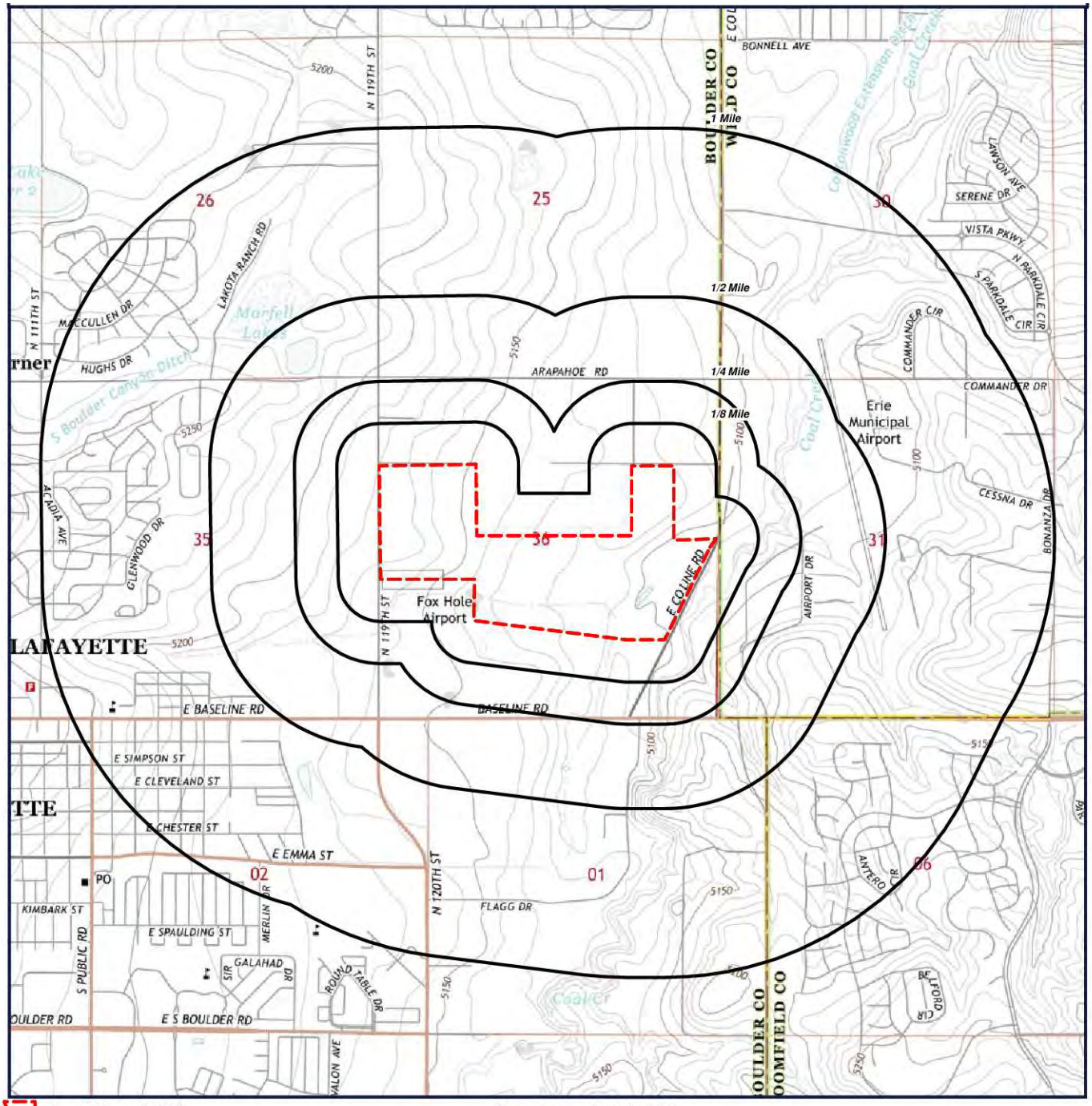
Quadrangle(s): Erie
Erie Assemblage
Baseline Road and 119th street
Erie, Colorado
80026

N
W E
S

0' 700' 1400' 2100'
SCALE: 1" = 1400'

Click here to access Satellite view

Topographic Map



Target Property (TP)

Quadrangle(s): Erie
Source: USGS, 08/02/2013
Erie Assemblage
Baseline Road and 119th street
Erie, Colorado
80026

N
W E
S

0' 1200' 2400' 3600'
SCALE: 1" = 2400'

[Click here to access Satellite view]

Located Sites Summary

*NOTE: Standard environmental records are displayed in **bold**.*

Map ID#	Database Name	Site ID#	Relative Elevation	Distance From Site	Site Name	Address	PAGE #
1	AIRSAFS	1077921	Lower (5,102 ft.)	0.001 mi. SW (5 ft.)	NOBLE ENERGY INC. BATTERY #11318900	NESE4 SEC36 T1N R69W, LAFAYETTE AREA, CO 80026	17
1	APCDP	013-1409	Lower (5,102 ft.)	0.001 mi. SW (5 ft.)	NOBLE ENERGY INC. BATTERY #11318900	NESE4 SEC36 T1N R69W, LAFAYETTE AREA, CO 80026	20
2	***HWSCA***	***COD007079627***	***Lower (5,100 ft.)***	***0.01 mi. SW (53 ft.)***	***CROCKETT & KELLY INC.***	***1001 WELD CNTY RD 1, ERIE, CO 80516***	***23***
2	***LST***	***13247LST***	***Lower (5,100 ft.)***	***0.01 mi. SW (53 ft.)***	***FALCON PROPERTIES***	***1001 WELD CR 1, ERIE, CO 80516***	***24***
2	***NLRRCRAC***	***COD007079627***	***Lower (5,100 ft.)***	***0.01 mi. SW (53 ft.)***	***CROCKETT & KELLY INC***	***1001 WELD CNTY RD 1, ERIE, CO 80516***	***25***
2	***RCRANGR08***	***COD007079627***	***Lower (5,100 ft.)***	***0.01 mi. SW (53 ft.)***	***CROCKETT & KELLY INC***	***1001 WELD CNTY RD 1, ERIE, CO 80516***	***28***
2	TRI	80516CRCKT1001W	Lower (5,100 ft.)	0.01 mi. SW (53 ft.)	CROCKETT & KELLY INC.	1001 WELD COUNTY RD. #1, ERIE, CO 80516	31
2	***AST***	***13247AST***	***Lower (5,100 ft.)***	***0.01 mi. SW (53 ft.)***	***FALCON PROPERTIES***	***1001 WELD CR 1, ERIE, CO 80516***	***32***
3	***AST***	***10093AST***	***Lower (5,092 ft.)***	***0.04 mi. NE (211 ft.)***	***WASTE CONNECTIONS***	***2780 S MAIN ST, ERIE, CO 80516***	***33***
4	SPILLS	2003-164	Lower (5,103 ft.)	0.05 mi. S (264 ft.)		750 E. COUNTY LINE RD.-RECLAIMATION, LAFAYETTE, CO	34
4	SPILLS	2012-0749	Lower (5,103 ft.)	0.05 mi. S (264 ft.)		750 E COUNTY LINE RD, AT THE WASTEW, LAFAYETTE, CO	35
5	***AST***	***19304AST***	***Lower (5,104 ft.)***	***0.06 mi. NW (317 ft.)***	***TRI COUNTY SELF STORAGE***	***1401 NE COUNTY LINE RD, ERIE, CO 80516***	***36***
6	***HWSG***	***COD981541535***	***Lower (5,095 ft.)***	***0.15 mi. E (792 ft.)***	***ROCKY MOUNTAIN PROPELLERS INC***	***TRICOUNTY AIRPORT, ERIE, CO 80516***	***37***
6	***LST***	***8024LST***	***Lower (5,095 ft.)***	***0.15 mi. E (792 ft.)***	***ERIE MUNICIPAL AIRPORT***	***395 AIRPORT DR, ERIE, CO 80516***	***38***
6	***UST***	***8024***	***Lower (5,095 ft.)***	***0.15 mi. E (792 ft.)***	***ERIE MUNICIPAL AIRPORT***	***395 AIRPORT DR, ERIE, CO 80516***	***39***
6	***RCRAGR08***	***COD981541535***	***Lower (5,095 ft.)***	***0.15 mi. E (792 ft.)***	***ROCKY MOUNTAIN PROPELLERS INC***	***ERIE MUNICIPAL AIRPORT, ERIE, CO 80516***	***40***
6	***AST***	***8024AST***	***Lower (5,095 ft.)***	***0.15 mi. E (792 ft.)***	***ERIE MUNICIPAL AIRPORT***	***395 AIRPORT DR, ERIE, CO 80516***	***43***
7	***UST***	***8746***	***Lower (5,096 ft.)***	***0.21 mi. NE (1109 ft.)***	***AERO SYSTEMS INC***	***2580 S MAIN ST, ERIE, CO 80516***	***44***
7	***RCRANGR08***	***COR000208488***	***Lower (5,096 ft.)***	***0.21 mi. NE (1109 ft.)***	***AERO SYSTEMS***	***2580 S MAIN, ERIE, CO 80516***	***45***
7	***LST***	***8746LST***	***Lower (5,096 ft.)***	***0.21 mi. NE (1109 ft.)***	***AERO SYSTEMS INC***	***2580 S MAIN ST, ERIE, CO 80516***	***47***
8	***UST***	***4298***	***Lower (5,122 ft.)***	***0.21 mi. NW (1109 ft.)***	***THE EGG FACTORY INC***	***12420 ARAPAHOE RD, LAFAYETTE, CO 80026***	***48***
8	***AST***	***4298AST***	***Lower (5,122 ft.)***	***0.21 mi. NW (1109 ft.)***	***THE EGG FACTORY INC***	***12420 ARAPAHOE RD, LAFAYETTE, CO 80026***	***49***
9	***HISTSWLF***	***00070-0000439***	***Lower (5,108 ft.)***	***0.23 mi. SW (1214 ft.)***	***ILLEGAL DUMP***	***HIGHWAY 7 AND COUNTY ROAD #1, LAFAYETTE, CO 80516***	***50***
10	***HISTSWLF***	***00070-0000438***	***Lower (5,114 ft.)***	***0.37 mi. S (1954 ft.)***	***HURST DUMP***	***FLAG DRIVE 3/10 MILE SOUTH OF BASEL, LAFAYETTE, CO 80026***	***51***

Elevation Summary

Elevations are collected from the USGS 3D Elevation Program 1/3 arc-second (approximately 10 meters) layer hosted at the NGTOC. .

Target Property Elevation: 5124 ft.

*NOTE: Standard environmental records are displayed in **bold**.*

EQUAL/HIGHER ELEVATION

No Records Found

LOWER ELEVATION

Map ID#	Database Name	Elevation	Site Name	Address	Page #
1	AIRSAFS	5,102 ft.	NOBLE ENERGY INC. BATTERY #11318900	NESE4 SEC36 T1N R69W, LAFAYETTE AREA, CO 80026	17
1	APCDP	5,102 ft.	NOBLE ENERGY INC. BATTERY #11318900	NESE4 SEC36 T1N R69W, LAFAYETTE AREA, CO 80026	20
2	***HWSCA***	***5,100 ft.***	***CROCKETT & KELLY INC.***	***1001 WELD CNTY RD 1, ERIE, CO 80516***	**23**
2	***LST***	***5,100 ft.***	***FALCON PROPERTIES***	***1001 WELD CR 1, ERIE, CO 80516***	**24**
2	***NLRRCRAC***	***5,100 ft.***	***CROCKETT & KELLY INC***	***1001 WELD CNTY RD 1, ERIE, CO 80516***	**25**
2	***RCRANGR08***	***5,100 ft.***	***CROCKETT & KELLY INC***	***1001 WELD CNTY RD 1, ERIE, CO 80516***	**28**
2	TRI	5,100 ft.	CROCKETT & KELLY INC.	1001 WELD COUNTY RD. #1, ERIE, CO 80516	31
2	***AST***	***5,100 ft.***	***FALCON PROPERTIES***	***1001 WELD CR 1, ERIE, CO 80516***	**32**
3	***AST***	***5,092 ft.***	***WASTE CONNECTIONS***	***2780 S MAIN ST, ERIE, CO 80516***	**33**
4	SPILLS	5,103 ft.		750 E. COUNTY LINE RD.- RECLAIMATION, LAFAYETTE, CO	34
4	SPILLS	5,103 ft.		750 E COUNTY LINE RD, AT THE WASTEW, LAFAYETTE, CO	35
5	***AST***	***5,104 ft.***	***TRI COUNTY SELF STORAGE***	***1401 NE COUNTY LINE RD, ERIE, CO 80516***	**36**
6	***HWSG***	***5,095 ft.***	***ROCKY MOUNTAIN PROPELLERS INC***	***TRICOUNTY AIRPORT, ERIE, CO 80516***	**37**
6	***LST***	***5,095 ft.***	***ERIE MUNICIPAL AIRPORT***	***395 AIRPORT DR, ERIE, CO 80516***	**38**
6	***UST***	***5,095 ft.***	***ERIE MUNICIPAL AIRPORT***	***395 AIRPORT DR, ERIE, CO 80516***	**39**
6	***RCRAGR08***	***5,095 ft.***	***ROCKY MOUNTAIN PROPELLERS INC***	***ERIE MUNICIPAL AIRPORT, ERIE, CO 80516***	**40**
6	***AST***	***5,095 ft.***	***ERIE MUNICIPAL AIRPORT***	***395 AIRPORT DR, ERIE, CO 80516***	**43**
7	***UST***	***5,096 ft.***	***AERO SYSTEMS INC***	***2580 S MAIN ST, ERIE, CO 80516***	**44**
7	***RCRANGR08***	***5,096 ft.***	***AERO SYSTEMS***	***2580 S MAIN, ERIE, CO 80516***	**45**
7	***LST***	***5,096 ft.***	***AERO SYSTEMS INC***	***2580 S MAIN ST, ERIE, CO 80516***	**47**
8	***UST***	***5,122 ft.***	***THE EGG FACTORY INC***	***12420 ARAPAHOE RD, LAFAYETTE, CO 80026***	**48**
8	***AST***	***5,122 ft.***	***THE EGG FACTORY INC***	***12420 ARAPAHOE RD, LAFAYETTE, CO 80026***	**49**
9	***HISTSWLF***	***5,108 ft.***	***ILLEGAL DUMP***	***HIGHWAY 7 AND COUNTY ROAD #1, LAFAYETTE, CO 80516***	**50**
10	***HISTSWLF***	***5,114 ft.***	***HURST DUMP***	***FLAG DRIVE 3/10 MILE SOUTH OF BASEL, LAFAYETTE, CO 80026***	**51**

MAP ID# 1

Distance from Property: 0.001 mi. (5 ft.) SW
Elevation: 5,102 ft. (Lower than TP)

SITE INFORMATION

UNIQUE ID: **1077921**
PLANT ID: **1077921**
NAME: **NOBLE ENERGY INC. BATTERY #11318900**
ADDRESS: **NESE4 SEC36 T1N R69W**
LAFAYETTE AREA, CO 80026
CLASSIFICATION: **POTENTIAL UNCONTROLLED EMISSIONS <100 TONS/YEAR**
OPERATION STATUS: **OPERATING**
STATE COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**
FACILITY TYPE: **PRIVATELY OWNED/OPERATED**
CURRENT HIGH PRIORITY VIOLATOR: **NOT REPORTED**
SIC DESCRIPTION: **ESTABLISHMENTS PRIMARILY ENGAGED IN PRODUCING LIQUID HYDROCARBONS FROM OIL AND GAS FIELD GASES.**

ENFORCEMENT ACTIONS

DATE ACHIEVED: **07/05/2012**
DATE RECORDED: **10/03/2012**
NATIONAL ACTION TYPE: **STATE CONDUCTED FCE/ON-SITE**
ALL AIR PROGRAM: **SIP SOURCE**
RESULTS OF STACK TEST AND TITLE V: **IN COMPLIANCE**
POLLUTANT: **NOT REPORTED**
ALL POLLUTION IN VIOLATION: **NOT REPORTED**
TYPE OF VIOLATION(S): **NOT REPORTED**
PENALTY AMOUNT: **0**

AIR PROGRAM

AIR PROGRAM STATUS: **OPERATING**
EPA COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**
POLLUTANT COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**
POLLUTANT: **VOLATILE ORGANIC COMPOUNDS**

HISTORICAL COMPLIANCE AIR PROGRAM LEVEL

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1204**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1401**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1201**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1402**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1102**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1301**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1203**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1403**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1302**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1104**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1304**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1101**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1303**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1202**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**

COMPLIANCE DATE (YYYQ): **1103**

HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

Back to Report Summary

MAP ID# 1

Distance from Property: 0.001 mi. (5 ft.) SW
Elevation: 5,102 ft. (Lower than TP)

SITE INFORMATION

SITE ID: **013-1409**

FACILITY NAME: **NOBLE ENERGY INC. BATTERY #11318900**

ADDRESS: **NESE4 SEC36 T1N R69W**
LAFAYETTE AREA, CO 80026

PERMIT NAME: **NOBLE ENERGY INC. BATTERY #11318900**

FACILITY CLASSIFICATION: **0**

AIR PROGRAM

AIR PROGRAM CLASSIFICATION: 'A'=Major, 'B'=Minor, 'SM'=Synthetic Minor, 'ND'=No Major Source Threshold Defined, 'C'=Unknown, 'BLANK'= BLANK FIELD

AIR PROGRAM CLASS: **MINOR**

ACID PRECIPITATION: **BLANK** APEN EXEMPT: **BLANK** CFC TRACKING: **BLANK**

CONDENSATE STORAGE TANK: **B** FESOP (NON-TITLE V): **BLANK** MACT (SEC. 63 NESHAPS): **BLANK**

NESHAP: **BLANK** NON FEDERALLY REPORTABLE SOURCE: **BLANK** FEDERAL NSPS: **BLANK**

STATE NSPS: **BLANK** NSR: **BLANK** PSD: **BLANK** SIP SOURCE UNDER FEDERAL JURISDICTION: **BLANK**

SIP SOURCE: **BLANK** TITLE V PERMITS: **BLANK** NATIVE AMERICAN: **BLANK**

PLANT AIR PROGRAM: **OZONE, AREA N2081**

PROPERTY AREA: **NOT REPORTED**

COMPLIANCE MONITORING SYSTEM: **NOT REPORTED**

DATE COMPLIANCE MONITORING SYSTEM: **08/04/10**

STANDARD INDUSTRIAL DESCRIPTION:

OIL AND GAS EXTRACTION - NATURAL GAS LIQUIDS

SITE CONTACT INFORMATION

CONTACT NAME: **TARYN WEINER**

CONTACT PHONE: **(303)228-4362**

SITE DESCRIPTION:**E&P CONDENSATE STORAGE TANK BATTERY**

COMMENTS:

NOT REPORTED

OWNER INFORMATION

OWNER CUSTOMER #: **7526294770**

OWNER NAME: **NOBLE ENERGY, INC.**

ADDRESS: **1625 BROADWAY**
NOT REPORTED, 08 80202

OWNER MAIL NAME: **BRIAN TAYLOR**

OWNER MAIL PHONE: **(720)587-2371**

SITE OWNER DESCRIPTION: **OGCC#67305 OIL & GAS EXTRACTIO**

SITE POLLUTANT INFORMATION

EFFECTIVE YEAR OF INVENTORY: **2015**

POLLUTANT NAME: **VOC - VOLATILE ORGANIC COMPOUNDS**

EMISSION DATA SUBMITTED YEAR: **2013**

POLLUTANT IS A HAZARDOUS AIR POLLUTANT UNDER COLORADO SECTION 25-7-109.3 C.R.S: **NO**

POLLUTANT IS A CRITERIA POLLUTANT: **YES**

POLLUTANT IS REPORTABLE AS EPCRA (SARA TITLE III) COMPOUND ONLY: **NO**

POLLUTANT IS A HAZARDOUS AIR POLLUTANT LISTED UNDER THE FEDERAL CAAA SECTION 112: **NO**

POLLUTANT IS A OZONE DEPLETING COMPOUND LISTED UNDER COLORADO AQCC REGULATION 15 SECTION II.11.: **NO**

ESTIMATED EMISSIONS: *(TONS PER YEAR):* **1.73990**
UNCONTROLLED ESTIMATED EMISSIONS: *(TONS PER YEAR):* **1.73990**
EMISSIONS LIMIT: *(TONS PER YEAR):* **0.00000**
ESTIMATED EMISSIONS WITH RULE EFFECTIVENESS: *(TONS PER YEAR)* **0.00000**

EFFECTIVE YEAR OF INVENTORY: **2014**
POLLUTANT NAME: **VOC - VOLATILE ORGANIC COMPOUNDS**
EMISSION DATA SUBMITTED YEAR: **2009**
POLLUTANT IS A HAZARDOUS AIR POLLUTANT UNDER COLORADO SECTION 25-7-109.3 C.R.S: **NO**
POLLUTANT IS A CRITERIA POLLUTANT: **YES**
POLLUTANT IS REPORTABLE AS EPCRA (SARA TITLE III) COMPOUND ONLY: **NO**
POLLUTANT IS A HAZARDOUS AIR POLLUTANT LISTED UNDER THE FEDERAL CAAA SECTION 112: **NO**
POLLUTANT IS A OZONE DEPLETING COMPOUND LISTED UNDER COLORADO AQCC REGULATION 15 SECTION II.11.: **NO**
ESTIMATED EMISSIONS: *(TONS PER YEAR):* **1.97280**
UNCONTROLLED ESTIMATED EMISSIONS: *(TONS PER YEAR):* **1.97280**
EMISSIONS LIMIT: *(TONS PER YEAR):* **0.00000**
ESTIMATED EMISSIONS WITH RULE EFFECTIVENESS: *(TONS PER YEAR)* **0.00000**

STACK

EFFECTIVE YEAR OF INVENTORY: **2015**
EMISSION DATA SUBMITTED YEAR: **2013**
EMISSION RELEASE POINT (STACK): **CONDENSATE TANK FLASH EMISSIONS**
STACK GAS FLOW RATE: *(CUBIC FEET PER MINUTE):* **9747.00000**
STACK GAS FLOW RATE (NEI COMPATIBLE): *(CUBIC FEET PER MINUTE):* **162.00000**
STACK HEIGHT: **20.00000**
STACK DIAMETER: **2.84000**
PLUME HEIGHT: **0.00000**
STACK TYPE DESCRIPTION:
A STACK WITH AN UNOBSTRUCTED OPENING DISCHARGING IN A VERTICAL DIRECTION

EFFECTIVE YEAR OF INVENTORY: **2014**
EMISSION DATA SUBMITTED YEAR: **2009**
EMISSION RELEASE POINT (STACK): **CONDENSATE TANK FLASH EMISSIONS**
STACK GAS FLOW RATE: *(CUBIC FEET PER MINUTE):* **9747.00000**
STACK GAS FLOW RATE (NEI COMPATIBLE): *(CUBIC FEET PER MINUTE):* **162.00000**
STACK HEIGHT: **20.00000**
STACK DIAMETER: **2.84000**
PLUME HEIGHT: **0.00000**
STACK TYPE DESCRIPTION:
A STACK WITH AN UNOBSTRUCTED OPENING DISCHARGING IN A VERTICAL DIRECTION

STACK POLLUTANT

EFFECTIVE YEAR OF INVENTORY: **2015**
POLLUTANT NAME: **VOC - VOLATILE ORGANIC COMPOUNDS**

EMISSION DATA SUBMITTED YEAR: **2013**

POLLUTANT IS A HAZARDOUS AIR POLLUTANT UNDER COLORADO SECTION 25-7-109.3 C.R.S: **NO**

POLLUTANT IS A CRITERIA POLLUTANT: **YES**

POLLUTANT IS REPORTABLE AS EPCRA (SARA TITLE III) COMPOUND ONLY: **NO**

POLLUTANT IS A HAZARDOUS AIR POLLUTANT LISTED UNDER THE FEDERAL CAAA SECTION 112: **NO**

POLLUTANT IS A OZONE DEPLETING COMPOUND LISTED UNDER COLORADO AQCC REGULATION 15 SECTION II.11.: **NO**

ESTIMATED EMISSIONS: *(TONS PER YEAR):*	UNCONTROLLED ESTIMATED EMISSIONS: *(TONS PER YEAR):*	EMISSIONS LIMIT: *(TONS PER YEAR):*
1.73990	**1.73990**	**0.00000**

ESTIMATED EMISSIONS WITH RULE EFFECTIVENESS: *(TONS PER YEAR)*

0.00000

EFFECTIVE YEAR OF INVENTORY: **2014**

POLLUTANT NAME: **VOC - VOLATILE ORGANIC COMPOUNDS**

EMISSION DATA SUBMITTED YEAR: **2009**

POLLUTANT IS A HAZARDOUS AIR POLLUTANT UNDER COLORADO SECTION 25-7-109.3 C.R.S: **NO**

POLLUTANT IS A CRITERIA POLLUTANT: **YES**

POLLUTANT IS REPORTABLE AS EPCRA (SARA TITLE III) COMPOUND ONLY: **NO**

POLLUTANT IS A HAZARDOUS AIR POLLUTANT LISTED UNDER THE FEDERAL CAAA SECTION 112: **NO**

POLLUTANT IS A OZONE DEPLETING COMPOUND LISTED UNDER COLORADO AQCC REGULATION 15 SECTION II.11.: **NO**

ESTIMATED EMISSIONS: *(TONS PER YEAR):*	UNCONTROLLED ESTIMATED EMISSIONS: *(TONS PER YEAR):*	EMISSIONS LIMIT: *(TONS PER YEAR):*
1.97280	**1.97280**	**0.00000**

ESTIMATED EMISSIONS WITH RULE EFFECTIVENESS: *(TONS PER YEAR)*

0.00000

UNIT COMMENT

-NO COMMENTS REPORTED

Back to Report Summary

MAP ID# 2

Distance from Property: 0.01 mi. (53 ft.) SW
Elevation: 5,100 ft. (Lower than TP)

SITE INFORMATION

EPA ID: **COD007079627**
SITE NAME: **CROCKETT & KELLY INC.**
SITE ADDRESS: **1001 WELD CNTY RD 1**
ERIE, CO 80516
SITE COUNTY: **WELD**
FACILITY TYPE: **CA**
STATUS: **ACTIVE**
LINKS: **http://www.epa.gov/cgi-bin/get1cReport.cgi?tool=echo&IDNumber=COD007079627**

Back to Report Summary

Leaking Storage Tank Facilities (LST)

MAP ID# 2

Distance from Property: 0.01 mi. (53 ft.) SW
Elevation: 5,100 ft. (Lower than TP)

FACILITY INFORMATION

UNIQUE ID: **13247LST**
FACILITY ID: **13247**
NAME: **FALCON PROPERTIES**
ADDRESS: **1001 WELD CR 1**
ERIE, CO 80516
SITE NAME: **FALCON PROPERTIES**
LOCATION: **1001 WELD CR 1, ERIE 80516**

LEAKING INFORMATION

EVENT ID:	STATUS:	RELEASE DATE:	ALTERNATE NAME:
1911	**CLOSED**	**10/21/1994**	**FALCON PROPERTIES**

COSTIS LINK: http://costis.cdle.state.co.us/event.asp?h_id=1911

Back to Report Summary

No Longer Regulated RCRA Corrective Action Facilities (NLRRCRAC)

MAP ID# 2

Distance from Property: 0.01 mi. (53 ft.) SW
Elevation: 5,100 ft. (Lower than TP)

FACILITY INFORMATION

EPA ID#: **COD007079627**
NAME: **CROCKETT & KELLY INC**
ADDRESS: **1001 WELD CNTY RD 1**
ERIE, CO 80516
CONTACT NAME: **DOYLE DUNGER**
CONTACT ADDRESS: **P O BOX 750**
ERIE CO 80516
CONTACT PHONE: **303-666-7788**
NON-NOTIFIER: **NOT A NON-NOTIFIER**
DATE RECEIVED BY AGENCY: **08/10/1993**
CERTIFICATION **- NO CERTIFICATION REPORTED -**
INDUSTRY CLASSIFICATION (NAICS) **- NO NAICS INFORMATION REPORTED -**

OWNER TYPE: **NOT REPORTED**
OWNER NAME: **NOT REPORTED**
OPERATOR TYPE: **NOT REPORTED**
OPERATOR NAME: **NOT REPORTED**

SITE HISTORY (INCLUDES GENERATORS AND NON-GENERATORS)
DATE RECEIVED BY AGENCY: **08/10/1993**
NAME: **CROCKETT & KELLY INC**
GENERATOR CLASSIFICATION: **NOT A GENERATOR**

CURRENT ACTIVITY INFORMATION

GENERATOR STATUS: **NOT A GENERATOR** LAST UPDATED DATE: **12/01/2004**
SUBJECT TO CORRECTIVE ACTION UNIVERSE: **YES**
TDSFs POTENTIALLY SUBJECT TO CORRECTIVE ACTION UNDER 3004 (u)/(v) UNIVERSE: **NO**
TDSFs ONLY SUBJECT TO CORRECTIVE ACTION UNDER DISCRETIONARY AUTHORITIES UNIVERSE: **NO**
NON TSDFs WHERE RCRA CORRECTIVE ACTION HAS BEEN IMPOSED UNIVERSE: **YES**
CORRECTIVE ACTION WORKLOAD UNIVERSE: **YES**

IMPORTER: **NO**
MIXED WASTE GENERATOR: **NO**
RECYCLER: **NO**
TRANSPORTER: **NO**
ONSITE BURNER EXEMPTION: **NO**
FURNACE EXEMPTION: **NO**
USED OIL REFINER: **NO**
USED OIL TRANSFER FACILITY: **NO**
UNDERGROUND INJECTION: **NO**
UNIVERSAL WASTE DESTINATION FACILITY: **NO**
TRANSFER FACILITY: **NO**
USED OIL FUEL BURNER: **NO**
USED OIL PROCESSOR: **NO**
USED OIL FUEL MARKETER TO BURNER: **NO**
SPECIFICATION USED OIL MARKETER: **NO**
USED OIL TRANSPORTER: **NO**

COMPLIANCE, MONITORING AND ENFORCEMENT INFORMATION

EVALUATIONS

02/10/2005	**FUI**	**FOLLOW-UP INSPECTION**
12/27/2004	**FUI**	**FOLLOW-UP INSPECTION**
05/14/2004	**FUI**	**FOLLOW-UP INSPECTION**
01/30/1998	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
10/22/1996	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
08/25/1995	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
07/13/1995	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
12/01/1994	**FCI**	**FOCUSED COMPLIANCE INSPECTION**

11/02/1994	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
10/06/1987	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
12/15/1986	**CEI**	**COMPLIANCE EVALUATION INSPECTION ON-SITE**
01/29/1985	**CEI**	**COMPLIANCE EVALUATION INSPECTION ON-SITE**

VIOLATIONS

01/29/1985	**262.A**	**GENERATORS - GENERAL**

ENFORCEMENTS

06/21/1985	**310**	**FINAL 3008(A) COMPLIANCE ORDER**

HAZARDOUS WASTE

F002	**THE FOLLOWING SPENT HALOGENATED SOLVENTS: TETRACHLOROETHYLENE, METHYLENE CHLORIDE,TRICHLOROETHYLENE, 1,1,1-TRICHLOROETHANE,CHLOROBENZENE, 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE, ORTHO-DICHLOROBENZENE, TRICHLOROFLUOROMETHANE, AND 1,1,2, TRICHLOROETHANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE HALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001,F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.**
U226	**ETHANE, 1,1,1-TRICHLORO-**
U226	**METHYL CHLOROFORM**

UNIVERSAL WASTE **- NO UNIVERSAL WASTE REPORTED -**

CORRECTIVE ACTION AREA (RELEASE)

AREA NAME:	AIR:	GROUNDWATER:	SOIL:	SURFACE WASTE:
ENTIRE FACILITY	**-----**	**Y**	**Y**	**-----**
GROUNDWATER	**-----**	**Y**	**-----**	**-----**
SOIL	**-----**	**-----**	**Y**	**-----**

CORRECTIVE ACTION EVENT

CA EVENT:	DATE:	EVENT DESCRIPTION:
CA999RM	**02/10/2005**	**CA PROCESS IS TERMINATED-REMEDIAL ACTIVITIES COMPLETE**
CA515	**02/07/2005**	**CORRECTIVE MEASURES REPORT RECEIVED**
CA550	**02/07/2005**	**REMEDY CONSTRUCTION**
CA814OM	**12/27/2004**	**OTHER WORKPLAN APPROVED**
CA811OM	**12/09/2004**	**OTHER WORKPLAN RECEIVED - OPERATION AND MAINTENANCE**
CA817OM	**12/09/2004**	**OTHER SUPPLEMENTAL INFORMATION RECEIVED**
CA100DC	**05/14/2004**	**RFI IMPOSITION-FOCUSED DATA COLLECTION REQ STAB EVAL**
CA006AC	**08/17/1999**	**TYPE OF UNIT - AREA OF CONCERN**
CA050PA	**08/17/1999**	**RFA COMPLETED-ASSESSMENT WAS A PA-PLUS**
CA155	**01/30/1998**	**INVESTIGATION SUPPLEMENTAL INFO REQ BY AGENCY**
CA155	**11/01/1996**	**INVESTIGATION SUPPLEMENTAL INFO REQ BY AGENCY**
CA650	**07/13/1995**	**STABILIZATION CONSTRUCTION COMPLETED**
CA075LO	**06/30/1995**	**CA PRIORITIZATION-LOW CA PRIORITY**
CA225NF	**06/30/1995**	**STABILIZATION MEASURES EVALUATION-NOT AMENABLE TO STABILIZATION (NOT FEASIBLE)**
CA725YE	**06/30/1995**	**HUMAN EXPOSURES CONTROLLED DETERMINATION-YES, APPLICABLE AS OF THIS DATE**
CA750YE	**06/30/1995**	**RELEASE TO GW CONTROLLED DETERMINATION-YES, APPLICABLE AS OF THIS DATE**

CA250	12/19/1994	CMS IMPOSITION
CA450	12/05/1994	CORRECTIVE MEASURES DESIGN APPROVED
CA200	11/04/1994	INVESTIGATION COMPLETE
CA006SM	06/01/1994	TYPE OF UNIT - SOLID WASTE MGMT UNIT
CA100	06/01/1994	INVESTIGATION IMPOSITION
CA0012	NOT REPORTED	CORRECTIVE ACTION UNIVERSE
CA0012	//	CORRECTIVE ACTION UNIVERSE
CA002Y	NOT REPORTED	REMEDIATION UNIVERSE
CA002Y	//	REMEDIATION UNIVERSE

Back to Report Summary

Resource Conservation & Recovery Act - Non-Generator Facilities (RCRANGR08)

MAP ID# 2

Distance from Property: 0.01 mi. (53 ft.) SW
Elevation: 5,100 ft. (Lower than TP)

FACILITY INFORMATION

EPA ID#: **COD007079627**
NAME: **CROCKETT & KELLY INC**
ADDRESS: **1001 WELD CNTY RD 1**
ERIE, CO 80516
CONTACT NAME: **DOYLE DUNGER**
CONTACT ADDRESS: **P O BOX 750**
ERIE CO 80516
CONTACT PHONE: **3036667788**
NON-NOTIFIER: **NOT A NON-NOTIFIER**
DATE RECEIVED BY AGENCY: **08/10/1993**

OWNER TYPE: **NOT REPORTED**
OWNER NAME: **NOT REPORTED**
OPERATOR TYPE: **NOT REPORTED**
OPERATOR NAME: **NOT REPORTED**

CERTIFICATION **- NO CERTIFICATION REPORTED -**

INDUSTRY CLASSIFICATION (NAICS) **- NO NAICS INFORMATION REPORTED -**

SITE HISTORY (INCLUDES GENERATORS AND NON-GENERATORS)

DATE RECEIVED BY AGENCY: **08/10/1993**
NAME: **CROCKETT & KELLY INC**
GENERATOR CLASSIFICATION: **NOT A GENERATOR**

CURRENT ACTIVITY INFORMATION

GENERATOR STATUS: **NOT A GENERATOR** LAST UPDATED DATE: **12/01/2004**
SUBJECT TO CORRECTIVE ACTION UNIVERSE: **NO**
TDSFs POTENTIALLY SUBJECT TO CORRECTIVE ACTION UNDER 3004 (u)/(v) UNIVERSE: **NO**
TDSFs ONLY SUBJECT TO CORRECTIVE ACTION UNDER DISCRETIONARY AUTHORITIES UNIVERSE: **NO**
NON TSDFs WHERE RCRA CORRECTIVE ACTION HAS BEEN IMPOSED UNIVERSE: **YES**
CORRECTIVE ACTION WORKLOAD UNIVERSE: **NO**

IMPORTER: **NO**
MIXED WASTE GENERATOR: **NO**
RECYCLER: **NO**
TRANSPORTER: **NO**
ONSITE BURNER EXEMPTION: **NO**
FURNACE EXEMPTION: **NO**
USED OIL REFINER: **NO**
USED OIL TRANSFER FACILITY: **NO**

UNDERGROUND INJECTION: **NO**
UNIVERSAL WASTE DESTINATION FACILITY: **NO**
TRANSFER FACILITY: **NO**
USED OIL FUEL BURNER: **NO**
USED OIL PROCESSOR: **NO**
USED OIL FUEL MARKETER TO BURNER: **NO**
SPECIFICATION USED OIL MARKETER: **NO**
USED OIL TRANSPORTER: **NO**

COMPLIANCE, MONITORING AND ENFORCEMENT INFORMATION

EVALUATIONS

02/10/2005	**FUI**	**FOLLOW-UP INSPECTION**
12/27/2004	**FUI**	**FOLLOW-UP INSPECTION**
05/14/2004	**FUI**	**FOLLOW-UP INSPECTION**
01/30/1998	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
10/22/1996	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
08/25/1995	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
07/13/1995	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
12/01/1994	**FCI**	**FOCUSED COMPLIANCE INSPECTION**

11/02/1994	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
10/06/1987	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
12/15/1986	**CEI**	**COMPLIANCE EVALUATION INSPECTION ON-SITE**
01/29/1985	**CEI**	**COMPLIANCE EVALUATION INSPECTION ON-SITE**

VIOLATIONS

01/29/1985	**262.A**	**GENERATORS - GENERAL**

ENFORCEMENTS

06/21/1985	**310**	**FINAL 3008(A) COMPLIANCE ORDER**

HAZARDOUS WASTE

F002	**THE FOLLOWING SPENT HALOGENATED SOLVENTS: TETRACHLOROETHYLENE, METHYLENE CHLORIDE,TRICHLOROETHYLENE, 1,1,1-TRICHLOROETHANE,CHLOROBENZENE, 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE, ORTHO-DICHLOROBENZENE, TRICHLOROFLUOROMETHANE, AND 1,1,2, TRICHLOROETHANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE HALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001,F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.**
U226	**ETHANE, 1,1,1-TRICHLORO-**
U226	**METHYL CHLOROFORM**

UNIVERSAL WASTE **- NO UNIVERSAL WASTE REPORTED -**

CORRECTIVE ACTION AREA (RELEASE)

AREA NAME:	AIR:	GROUNDWATER:	SOIL:	SURFACE WASTE:
ENTIRE FACILITY	**-----**	**Y**	**Y**	**-----**
GROUNDWATER	**-----**	**Y**	**-----**	**-----**
SOIL	**-----**	**-----**	**Y**	**-----**

CORRECTIVE ACTION EVENT

CA EVENT:	DATE:	EVENT DESCRIPTION:
CA999RM	**02/10/2005**	**CA PROCESS IS TERMINATED-REMEDIAL ACTIVITIES COMPLETE**
CA515	**02/07/2005**	**CORRECTIVE MEASURES REPORT RECEIVED**
CA550	**02/07/2005**	**REMEDY CONSTRUCTION**
CA814OM	**12/27/2004**	**OTHER WORKPLAN APPROVED**
CA811OM	**12/09/2004**	**OTHER WORKPLAN RECEIVED - OPERATION AND MAINTENANCE**
CA817OM	**12/09/2004**	**OTHER SUPPLEMENTAL INFORMATION RECEIVED**
CA100DC	**05/14/2004**	**RFI IMPOSITION-FOCUSED DATA COLLECTION REQ STAB EVAL**
CA006AC	**08/17/1999**	**TYPE OF UNIT - AREA OF CONCERN**
CA050PA	**08/17/1999**	**RFA COMPLETED-ASSESSMENT WAS A PA-PLUS**
CA155	**01/30/1998**	**INVESTIGATION SUPPLEMENTAL INFO REQ BY AGENCY**
CA155	**11/01/1996**	**INVESTIGATION SUPPLEMENTAL INFO REQ BY AGENCY**
CA650	**07/13/1995**	**STABILIZATION CONSTRUCTION COMPLETED**
CA075LO	**06/30/1995**	**CA PRIORITIZATION-LOW CA PRIORITY**
CA225NF	**06/30/1995**	**STABILIZATION MEASURES EVALUATION-NOT AMENABLE TO STABILIZATION (NOT FEASIBLE)**
CA725YE	**06/30/1995**	**HUMAN EXPOSURES CONTROLLED DETERMINATION-YES, APPLICABLE AS OF THIS DATE**
CA750YE	**06/30/1995**	**RELEASE TO GW CONTROLLED DETERMINATION-YES, APPLICABLE AS OF THIS DATE**

CA250	12/19/1994	CMS IMPOSITION
CA450	12/05/1994	CORRECTIVE MEASURES DESIGN APPROVED
CA200	11/04/1994	INVESTIGATION COMPLETE
CA006SM	06/01/1994	TYPE OF UNIT - SOLID WASTE MGMT UNIT
CA100	06/01/1994	INVESTIGATION IMPOSITION
CA0012	NOT REPORTED	CORRECTIVE ACTION UNIVERSE
CA0012	//	CORRECTIVE ACTION UNIVERSE
CA002Y	NOT REPORTED	REMEDIATION UNIVERSE
CA002Y	//	REMEDIATION UNIVERSE

Back to Report Summary

MAP ID# 2

Distance from Property: 0.01 mi. (53 ft.) SW
Elevation: 5,100 ft. (Lower than TP)

FACILITY INFORMATION

ID #: **80516CRCKT1001W**

OWNER NAME: **NA**

FACILITY NAME: **CROCKETT & KELLY INC.**

ADDRESS: **1001 WELD COUNTY RD. #1**
ERIE, CO 80516

COUNTY: **WELD**

CHEMICAL/S RELEASED

1,1,1-TRICHLOROETHANE

RELEASE INFORMATION

(Release amounts are reported in pounds)

REPORT YEAR	FUGITIVE AIR	STACK AIR	WATER RELEASE	CLASS I INJECTION WELLS	CLASS II - V INJECTION WELLS	RCRA C / OTHER LANDFILLS	LAND TREATMENT
1987	9360.00	0.00	0.00	0.00	0.00	0.00	0.00

Back to Report Summary

Aboveground Storage Tank Facilities (AST)

MAP ID# 2

Distance from Property: 0.01 mi. (53 ft.) SW
Elevation: 5,100 ft. (Lower than TP)

FACILITY INFORMATION

FACILITY ID: **13247**
NAME: **FALCON PROPERTIES**
ADDRESS: **1001 WELD CR 1**
ERIE, CO 80516
COSTIS LINK: http://costis.cdle.state.co.us/facility.asp?h_id=13247

OWNER INFORMATION

OWNER ID: **16477**
NAME: **FALCON PROPERTIES**
ADDRESS: **2240 WELD CR 5**
ERIE, CO 80516

TANK INFORMATION

TANK ID:	TANK TYPE:	TANK PRODUCT:	TANK CAPACITY:	TANK STATUS:	INSTALLATION DATE:
NR	**NOT REPORTED**	**NOT REPORTED**	**NOT REPORTED**	**NOT REPORTED**	**NOT REPORTED**

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Aboveground Storage Tank Facilities (AST)

MAP ID# 3

Distance from Property: 0.04 mi. (211 ft.) NE
Elevation: 5,092 ft. (Lower than TP)

FACILITY INFORMATION

FACILITY ID: **10093**
NAME: **WASTE CONNECTIONS**
ADDRESS: **2780 S MAIN ST**
ERIE, CO 80516
COSTIS LINK: http://costis.cdle.state.co.us/facility.asp?h_id=10093

OWNER INFORMATION

OWNER ID: **19126**
NAME: **WASTE CONNECTIONS**
ADDRESS: **5500 FRANKLIN**
DENVER, CO 80216

TANK INFORMATION

TANK ID:	TANK TYPE:	TANK PRODUCT:	TANK CAPACITY:	TANK STATUS:	INSTALLATION DATE:
27153	**ABOVEGROUND STORAGE TANK**	**4 - DIESEL**	**6000**	**CLOSED**	**NOT REPORTED**
27154	**ABOVEGROUND STORAGE TANK**	**4 - DIESEL**	**6000**	**OPEN**	**NOT REPORTED**

Back to Report Summary

MAP ID# 4

Distance from Property: 0.05 mi. (264 ft.) S
Elevation: 5,103 ft. (Lower than TP)

INCIDENT INFORMATION

CASE NUMBER: **2003-164** NRC NUMBER: **NOT REPORTED**

SPILL DATE: **03/31/03**

SPILL LOCATION: **750 E. COUNTY LINE RD.-RECLAIMATION PLANT**

SPILL CITY/STATE/ZIP: **LAFAYETTE, CO NOT REPORTED**

SPILL COUNTY: **BOULDER**

RESPONSIBLE PARTY

NAME: **LAFAYETTE WATER RECLAIMATION**

ADDRESS: **1290 S. PUBLIC RD.**
LAFAYETTE, CO 80026

COUNTY: **NOT REPORTED**

CONTACT: **MICK FORRESTER**

PHONE: **303-665-6034**

INCIDENT DETAILS

SOURCE: **FIXED FACILITY**

SOURCE TYPE: **SANITARY SEWER/LIFT STATION**

MEDIUM: **WATER**

WATERWAY: **COAL CREEK->BOULDER CREEK**

CAUSE: **ERROR OPERATOR**

MATERIAL TYPE: **SANITARY SEWER OVERFLOW**

MATERIAL DESCRIPTION:	MATERIAL QUANTITY:	WATER QUANTITY:
DIGESTED SLUDGE	**3000 GALLONS**	**500 G**

CAUSE INFORMATION:

A TRUCK UNLOADING DIGESTED SLUDGE HAD THE BOTTOM RELEASE VALVE STUCK OPEN, ALLOWING FOR MATERIAL TO RELEASE ONTO GROUND AND INTO COAL CREEK.

ACTION:

DIKES AND BURMS WERE CREATED TO ABATE FLOW OF SLUDGE TO COAL CREEK. A VAC TRUCK WILL ATTEMPT TO RECOVER RELEASED MATERIAL.

RESPONSE COMMENTS:

NOT REPORTED

COMMENTS:

DIGESTED SLUDGE IMPACTED THE 7B SEGMENT OF THE COAL CREEK. COAL CREEK EMPTIES TO BOULDER CREEK WHICH

Back to Report Summary

Spills Listing (SPILLS)

MAP ID# 4

Distance from Property: 0.05 mi. (264 ft.) S
Elevation: 5,103 ft. (Lower than TP)

INCIDENT INFORMATION

CASE NUMBER: **2012-0749** NRC NUMBER: **NOT REPORTED**

SPILL DATE: **10/24/12**

SPILL LOCATION: **750 E COUNTY LINE RD, AT THE WASTEWATER TREATMENT PLANT**

SPILL CITY/STATE/ZIP: **LAFAYETTE, CO NOT REPORTED**

SPILL COUNTY: **BOULDER**

RESPONSIBLE PARTY

NAME: **NOT REPORTED**

ADDRESS: **STREET NOT REPORTED**
CITY NOT REPORTED, CO

COUNTY: **NOT REPORTED**

CONTACT: **MICK FORRESTER**

PHONE: **303-665-5506**

INCIDENT DETAILS

SOURCE: **OTHER**

SOURCE TYPE: **WASTEWATER TREATMENT PLANT**

MEDIUM: **WATER**

WATERWAY: **COAL CREEK**

CAUSE: **OTHER**

MATERIAL TYPE: **PERMIT EXCEEDENCE**

MATERIAL DESCRIPTION:	MATERIAL QUANTITY:	WATER QUANTITY:
HIGH E. COLI READING	**1203 ORG/100 ML**	**NOT REPORTED**

CAUSE INFORMATION:

ROUTINE DAILY TEST OF E. COLI TAKEN ON 10/24/12 APPROX. 8:30 A.M. HAD TEST RESULTS COME BACK ON 10/25/12 SHOWING E COLI LEVEL AT 1203 ORGANISMS/100 ML. THEY ADJUSTED THE UV LEVELS AND REPEATED SAMPLES UNTIL BY 10/29/12 THEY HAD THE E COLI LEVELS WITHIN A

ACTION:

NOT REPORTED

RESPONSE COMMENTS:

NOT REPORTED

COMMENTS:

CALLER'S EMAIL: MICKF@CITYOFLAFAYETTE.COM

Back to Report Summary

Aboveground Storage Tank Facilities (AST)

MAP ID# 5

Distance from Property: 0.06 mi. (317 ft.) NW
Elevation: 5,104 ft. (Lower than TP)

FACILITY INFORMATION

FACILITY ID: **19304**
NAME: **TRI COUNTY SELF STORAGE**
ADDRESS: **1401 NE COUNTY LINE RD**
ERIE, CO 80516
COSTIS LINK: http://costis.cdle.state.co.us/facility.asp?h_id=19304

OWNER INFORMATION

OWNER ID: **22183**
NAME: **CHRIS MUHR**
ADDRESS: **1401 NE COUNTY LINE RD**
ERIE, CO 80516

TANK INFORMATION

TANK ID:	TANK TYPE:	TANK PRODUCT:	TANK CAPACITY:	TANK STATUS:	INSTALLATION DATE:
43927	**LIQUEFIED PETROLEUM GAS -LPG ABOVEGROUND**		**1000**	**NOT REPORTED**	**NOT REPORTED**

Back to Report Summary

MAP ID# 6

Distance from Property: 0.15 mi. (792 ft.) E
Elevation: 5,095 ft. (Lower than TP)

SITE INFORMATION

EPA ID: **COD981541535**
SITE NAME: **ROCKY MOUNTAIN PROPELLERS INC**
SITE ADDRESS: **TRICOUNTY AIRPORT**
ERIE, CO 80516
SITE COUNTY: **WELD**
FACILITY TYPE: **SQG**
STATUS: **ACTIVE**
LINKS: **http://www.epa.gov/cgi-bin/get1cReport.cgi?tool=echo&IDNumber=COD981541535**

Back to Report Summary

Leaking Storage Tank Facilities (LST)

MAP ID# 6

Distance from Property: 0.15 mi. (792 ft.) E
Elevation: 5,095 ft. (Lower than TP)

FACILITY INFORMATION

UNIQUE ID: **8024LST**
FACILITY ID: **8024**
NAME: **ERIE MUNICIPAL AIRPORT**
ADDRESS: **395 AIRPORT DR**
ERIE, CO 80516
SITE NAME: **ERIE MUNICIPAL AIRPORT**
LOCATION: **395 AIRPORT DR, ERIE 80516**

LEAKING INFORMATION

EVENT ID:	STATUS:	RELEASE DATE:	ALTERNATE NAME:
11568	**CLOSED**	**12/15/2011 14:45**	**ERIE MUNICIPAL AIRPORT**
COSTIS LINK:	http://costis.cdle.state.co.us/event.asp?h_id=11568		
7563	**CLOSED**	**7/22/1999**	**TRI COUNTY AIRPORT**
COSTIS LINK:	http://costis.cdle.state.co.us/event.asp?h_id=7563		
2546	**CLOSED**	**6/11/1997**	**ERIE TRI-COUNTY AIRPORT**
COSTIS LINK:	http://costis.cdle.state.co.us/event.asp?h_id=2546		

Back to Report Summary

Underground Storage Tank Facilities (UST)

MAP ID# 6

Distance from Property: 0.15 mi. (792 ft.) E
Elevation: 5,095 ft. (Lower than TP)

FACILITY INFORMATION

FACILITY ID: **8024**
NAME: **ERIE MUNICIPAL AIRPORT**
ADDRESS: **395 AIRPORT DR**
ERIE, CO 80516
COSTIS LINK: http://costis.cdle.state.co.us/facility.asp?h_id=8024

OWNER INFORMATION

OWNER ID: **7753**
NAME: **TOWN OF ERIE**
ADDRESS: **PO BOX 750**
ERIE, CO 80516

TANK INFORMATION

TANK ID:	TANK TYPE:	TANK PRODUCT:	TANK CAPACITY:	TANK STATUS:	INSTALLATION DATE:
20954	**UNDERGROUND STORAGE TANK**	**JETFUEL**	**3000**	**CLOSED**	**NOT REPORTED**
20955	**UNDERGROUND STORAGE TANK**	**AV GAS**	**8000**	**CLOSED**	**NOT REPORTED**
20956	**UNDERGROUND STORAGE TANK**	**1 - UNLEADED REGULAR (RUL)**	**3000**	**CLOSED**	**NOT REPORTED**

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Resource Conservation & Recovery Act - Generator Facilities (RCRAGR08)

MAP ID# 6

Distance from Property: 0.15 mi. (792 ft.) E
Elevation: 5,095 ft. (Lower than TP)

FACILITY INFORMATION

EPA ID#: **COD981541535**
NAME: **ROCKY MOUNTAIN PROPELLERS INC**
ADDRESS: **ERIE MUNICIPAL AIRPORT**
ERIE, CO 80516

OWNER TYPE: **PRIVATE**
OWNER NAME: **ROCK, ROBERT**
OPERATOR TYPE: **PRIVATE**
OPERATOR NAME: **ROCKY MOUNTAIN PROPELLERS INC**

CONTACT NAME: **DAVE HAMPEL**
CONTACT ADDRESS: **2865 AIRPORT DR**
ERIE CO 80516
CONTACT PHONE: **3036657905**
NON-NOTIFIER: **NOT A NON-NOTIFIER**
DATE RECEIVED BY AGENCY: **09/16/2009**

CERTIFICATION

CERTIFICATION NAME:	CERTIFICATION TITLE:	CERTIFICATION SIGNED DATE:
DAVE HAMPEL	**ENV MGR**	**08/31/2009**
DAVE HAMPEL	**ENV MGR**	**09/10/2003**

INDUSTRY CLASSIFICATION (NAICS)

81131 - COMMERCIAL AND INDUSTRIAL MACHINERY AND EQUIPMENT (EXCEPT AUTOMOTIVE AND ELECTRONIC) REPAIR AND MAINTENANCE

SITE HISTORY (INCLUDES GENERATORS AND NON-GENERATORS)

DATE RECEIVED BY AGENCY: **09/16/2009**
NAME: **ROCKY MOUNTAIN PROPELLERS INC**
GENERATOR CLASSIFICATION: **SMALL QUANTITY GENERATOR**

DATE RECEIVED BY AGENCY: **10/02/2003**
NAME: **ROCKY MOUNTAIN PROPELLERS INC**
GENERATOR CLASSIFICATION: **SMALL QUANTITY GENERATOR**

DATE RECEIVED BY AGENCY: **10/17/2001**
NAME: **ROCKY MOUNTAIN PROPELLERS INC**
GENERATOR CLASSIFICATION: **SMALL QUANTITY GENERATOR**

DATE RECEIVED BY AGENCY: **11/13/1998**
NAME: **ROCKY MOUNTAIN PROPELLERS INC**
GENERATOR CLASSIFICATION: **SMALL QUANTITY GENERATOR**

CURRENT ACTIVITY INFORMATION

GENERATOR STATUS: **SMALL QUANTITY GENERATOR** LAST UPDATED DATE: **09/17/2009**
SUBJECT TO CORRECTIVE ACTION UNIVERSE: **NO**
TDSFs POTENTIALLY SUBJECT TO CORRECTIVE ACTION UNDER 3004 (u)/(v) UNIVERSE: **NO**
TDSFs ONLY SUBJECT TO CORRECTIVE ACTION UNDER DISCRETIONARY AUTHORITIES UNIVERSE: **NO**
NON TSDFs WHERE RCRA CORRECTIVE ACTION HAS BEEN IMPOSED UNIVERSE: **NO**
CORRECTIVE ACTION WORKLOAD UNIVERSE: **NO**

IMPORTER: **NO**
MIXED WASTE GENERATOR: **NO**
RECYCLER: **NO**
TRANSPORTER: **NO**
UNDERGROUND INJECTION: **NO**
UNIVERSAL WASTE DESTINATION FACILITY: **NO**
TRANSFER FACILITY: **NO**
USED OIL FUEL BURNER: **NO**

ONSITE BURNER EXEMPTION: **NO**
FURNACE EXEMPTION: **NO**
USED OIL REFINER: **NO**
USED OIL TRANSFER FACILITY: **NO**
USED OIL PROCESSOR: **NO**
USED OIL FUEL MARKETER TO BURNER: **NO**
SPECIFICATION USED OIL MARKETER: **NO**
USED OIL TRANSPORTER: **NO**

COMPLIANCE, MONITORING AND ENFORCEMENT INFORMATION

EVALUATIONS

06/10/2015	**FSD**	**FACILITY SELF DISCLOSURE**
05/15/2014	**FSD**	**FACILITY SELF DISCLOSURE**
06/24/2013	**FSD**	**FACILITY SELF DISCLOSURE**
06/21/2012	**FSD**	**FACILITY SELF DISCLOSURE**
01/06/2012	**CEI**	**COMPLIANCE EVALUATION INSPECTION ON-SITE**
07/07/2011	**FSD**	**FACILITY SELF DISCLOSURE**
07/19/2010	**FSD**	**FACILITY SELF DISCLOSURE**
07/22/2009	**FSD**	**FACILITY SELF DISCLOSURE**
07/14/2008	**FSD**	**FACILITY SELF DISCLOSURE**
02/15/2001	**CEI**	**COMPLIANCE EVALUATION INSPECTION ON-SITE**
03/28/1991	**CEI**	**COMPLIANCE EVALUATION INSPECTION ON-SITE**

VIOLATIONS **- NO VIOLATIONS REPORTED -**

ENFORCEMENTS **- NO ENFORCEMENTS REPORTED -**

HAZARDOUS WASTE

D000

D001 **IGNITABLE WASTE**

F002 **THE FOLLOWING SPENT HALOGENATED SOLVENTS: TETRACHLOROETHYLENE, METHYLENE CHLORIDE,TRICHLOROETHYLENE, 1,1,1-TRICHLOROETHANE,CHLOROBENZENE, 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE, ORTHO-DICHLOROBENZENE, TRICHLOROFLUOROMETHANE, AND 1,1,2, TRICHLOROETHANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE HALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001,F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.**

F004 **THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: CRESOLS, CRESYLIC ACID, AND NITROBENZENE; AND THE STILL BOTTOMS FROM THE RECOVERY OF THESE SOLVENTS; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE NONHALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001,F002, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.**

UNIVERSAL WASTE

WASTE TYPE:	ACCUMULATED WASTE ON-SITE:	GENERATED WASTE ON-SITE:	SOURCE TYPE:
NOT REPORTED	**NO**	**NO**	**NOTIFICATION**
BATTERIES	**NO**	**NOT REPORTED**	**NOTIFICATION**
OTHER	**NO**	**NO**	**NOTIFICATION**
LAMPS	**NO**	**NOT REPORTED**	**NOTIFICATION**
MERCURY-CONTAINING DEVICES	**NO**	**NO**	**NOTIFICATION**
PESTICIDES	**NO**	**NOT REPORTED**	**NOTIFICATION**
MERCURY CONTAINING EQUIPMENT	**NO**	**NOT REPORTED**	**NOTIFICATION**

CORRECTIVE ACTION AREA **- NO CORRECTIVE ACTION AREA INFORMATION REPORTED -**

CORRECTIVE ACTION EVENT **- NO CORRECTIVE ACTION EVENT REPORTED -**

Back to Report Summary

Aboveground Storage Tank Facilities (AST)

MAP ID# 6

Distance from Property: 0.15 mi. (792 ft.) E
Elevation: 5,095 ft. (Lower than TP)

FACILITY INFORMATION

FACILITY ID: **8024**
NAME: **ERIE MUNICIPAL AIRPORT**
ADDRESS: **395 AIRPORT DR**
ERIE, CO 80516
COSTIS LINK: http://costis.cdle.state.co.us/facility.asp?h_id=8024

OWNER INFORMATION

OWNER ID: **7753**
NAME: **TOWN OF ERIE**
ADDRESS: **PO BOX 750**
ERIE, CO 80516

TANK INFORMATION

TANK ID:	TANK TYPE:	TANK PRODUCT:	TANK CAPACITY:	TANK STATUS:	INSTALLATION DATE:
42550	**ABOVEGROUND STORAGE TANK**	**JETFUEL**	**12000**	**OPEN**	**NOT REPORTED**
42551	**ABOVEGROUND STORAGE TANK**	**AV GAS**	**12000**	**OPEN**	**NOT REPORTED**
45976	**VEHICLE TANK METERS - TRUCK**	**AV GAS**	**0**	**OPEN**	**NOT REPORTED**
46093	**VEHICLE TANK METERS - TRUCK**	**JETFUEL**	**0**	**OPEN**	**NOT REPORTED**

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Underground Storage Tank Facilities (UST)

MAP ID# 7

Distance from Property: 0.21 mi. (1,109 ft.) NE
Elevation: 5,096 ft. (Lower than TP)

FACILITY INFORMATION

FACILITY ID: **8746**
NAME: **AERO SYSTEMS INC**
ADDRESS: **2580 S MAIN ST**
ERIE, CO 80516
COSTIS LINK: http://costis.cdle.state.co.us/facility.asp?h_id=8746

OWNER INFORMATION

OWNER ID: **116**
NAME: **AERO SYSTEMS INC**
ADDRESS: **2580 S MAIN ST**
ERIE, CO 80516

TANK INFORMATION

TANK ID:	TANK TYPE:	TANK PRODUCT:	TANK CAPACITY:	TANK STATUS:	INSTALLATION DATE:
22923	**UNDERGROUND STORAGE TANK**	**4 - DIESEL**	**999999999**	**CLOSED**	**NOT REPORTED**
22924	**UNDERGROUND STORAGE TANK**	**4 - DIESEL**	**999999999**	**CLOSED**	**NOT REPORTED**
22925	**UNDERGROUND STORAGE TANK**	**GASOLINE**	**999999999**	**CLOSED**	**NOT REPORTED**

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Resource Conservation & Recovery Act - Non-Generator Facilities (RCRANGR08)

MAP ID# 7

Distance from Property: 0.21 mi. (1,109 ft.) NE
Elevation: 5,096 ft. (Lower than TP)

FACILITY INFORMATION

EPA ID#: **COR000208488**
NAME: **AERO SYSTEMS**
ADDRESS: **2580 S MAIN**
ERIE, CO 80516
CONTACT NAME: **NOT REPORTED**
CONTACT ADDRESS: **NOT REPORTED**

CONTACT PHONE: **NOT REPORTED**
NON-NOTIFIER: **NON-NOTIFIER**
DATE RECEIVED BY AGENCY: **06/26/2013**
CERTIFICATION **- NO CERTIFICATION REPORTED -**
INDUSTRY CLASSIFICATION (NAICS) **- NO NAICS INFORMATION REPORTED -**
SITE HISTORY (INCLUDES GENERATORS AND NON-GENERATORS)
DATE RECEIVED BY AGENCY: **06/26/2013**
NAME: **AERO SYSTEMS**
GENERATOR CLASSIFICATION: **NOT A GENERATOR**
DATE RECEIVED BY AGENCY: **05/26/2004**
NAME: **AERO SYSTEMS**
GENERATOR CLASSIFICATION: **NOT A GENERATOR**

OWNER TYPE: **NOT REPORTED**
OWNER NAME: **NOT REPORTED**
OPERATOR TYPE: **NOT REPORTED**
OPERATOR NAME: **NOT REPORTED**

CURRENT ACTIVITY INFORMATION

GENERATOR STATUS: **NOT A GENERATOR** LAST UPDATED DATE: **06/28/2013**
SUBJECT TO CORRECTIVE ACTION UNIVERSE: **NO**
TDSFs POTENTIALLY SUBJECT TO CORRECTIVE ACTION UNDER 3004 (u)/(v) UNIVERSE: **NO**
TDSFs ONLY SUBJECT TO CORRECTIVE ACTION UNDER DISCRETIONARY AUTHORITIES UNIVERSE: **NO**
NON TSDFs WHERE RCRA CORRECTIVE ACTION HAS BEEN IMPOSED UNIVERSE: **NO**
CORRECTIVE ACTION WORKLOAD UNIVERSE: **NO**

IMPORTER: **NO**
MIXED WASTE GENERATOR: **NO**
RECYCLER: **NO**
TRANSPORTER: **NO**
ONSITE BURNER EXEMPTION: **NO**
FURNACE EXEMPTION: **NO**
USED OIL REFINER: **NO**
USED OIL TRANSFER FACILITY: **NO**

UNDERGROUND INJECTION: **NO**
UNIVERSAL WASTE DESTINATION FACILITY: **NO**
TRANSFER FACILITY: **NO**
USED OIL FUEL BURNER: **NO**
USED OIL PROCESSOR: **NO**
USED OIL FUEL MARKETER TO BURNER: **NO**
SPECIFICATION USED OIL MARKETER: **NO**
USED OIL TRANSPORTER: **NO**

COMPLIANCE, MONITORING AND ENFORCEMENT INFORMATION

EVALUATIONS

07/17/2013	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
06/26/2013	**CEI**	**COMPLIANCE EVALUATION INSPECTION ON-SITE**
05/26/2004	**CEI**	**COMPLIANCE EVALUATION INSPECTION ON-SITE**

VIOLATIONS

06/26/2013	**262.A**	**GENERATORS - GENERAL**

ENFORCEMENTS

06/26/2013 **175 COMPLIANCE ADVISORY**

HAZARDOUS WASTE

- NO HAZARDOUS WASTE INFORMATION REPORTED -

UNIVERSAL WASTE **- NO UNIVERSAL WASTE REPORTED -**

CORRECTIVE ACTION AREA **- NO CORRECTIVE ACTION AREA INFORMATION REPORTED -**

CORRECTIVE ACTION EVENT **- NO CORRECTIVE ACTION EVENT REPORTED -**

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Leaking Storage Tank Facilities (LST)

MAP ID# 7

Distance from Property: 0.21 mi. (1,109 ft.) NE
Elevation: 5,096 ft. (Lower than TP)

FACILITY INFORMATION

UNIQUE ID: **8746LST**
FACILITY ID: **8746**
NAME: **AERO SYSTEMS INC**
ADDRESS: **2580 S MAIN ST**
ERIE, CO 80516
SITE NAME: **AERO SYSTEMS INC**
LOCATION: **2580 S MAIN ST, ERIE 80516**

LEAKING INFORMATION

EVENT ID:	STATUS:	RELEASE DATE:	ALTERNATE NAME:
2062	**CLOSED**	**2/24/1992**	**AERO SYSTEMS INC**

COSTIS LINK: http://costis.cdle.state.co.us/event.asp?h_id=2062

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Underground Storage Tank Facilities (UST)

MAP ID# 8

Distance from Property: 0.21 mi. (1,109 ft.) NW
Elevation: 5,122 ft. (Lower than TP)

FACILITY INFORMATION

FACILITY ID: **4298**
NAME: **THE EGG FACTORY INC**
ADDRESS: **12420 ARAPAHOE RD**
LAFAYETTE, CO 80026
COSTIS LINK: http://costis.cdle.state.co.us/facility.asp?h_id=4298

OWNER INFORMATION

OWNER ID: **NOT REPORTED**
NAME: **EGG FACTORY INC**
ADDRESS: **12420 ARAPAHOE RD**
LAFAYETTE, CO 80026

TANK INFORMATION

TANK ID:	TANK TYPE:	TANK PRODUCT:	TANK CAPACITY:	TANK STATUS:	INSTALLATION DATE:
NR	**UNDERGROUND STORAGE TANK**	**DIESEL**	**560**	**PERMANENTLY CLOSED**	**04-MAY-84**

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Aboveground Storage Tank Facilities (AST)

MAP ID# 8

Distance from Property: 0.21 mi. (1,109 ft.) NW
Elevation: 5,122 ft. (Lower than TP)

FACILITY INFORMATION

FACILITY ID: **4298**
NAME: **THE EGG FACTORY INC**
ADDRESS: **12420 ARAPAHOE RD**
LAFAYETTE, CO 80026
COSTIS LINK: http://costis.cdle.state.co.us/facility.asp?h_id=4298

OWNER INFORMATION

OWNER ID: **5187**
NAME: **EGG FACTORY INC**
ADDRESS: **12420 ARAPAHOE RD**
LAFAYETTE, CO 80026

TANK INFORMATION

TANK ID:	TANK TYPE:	TANK PRODUCT:	TANK CAPACITY:	TANK STATUS:	INSTALLATION DATE:
NR	**NOT REPORTED**	**NOT REPORTED**	**NOT REPORTED**	**NOT REPORTED**	**NOT REPORTED**

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MAP ID# 9

Distance from Property: 0.23 mi. (1,214 ft.) SW
Elevation: 5,108 ft. (Lower than TP)

SITE INFORMATION

UNIQUE ID: **00070-0000439**
NAME: **ILLEGAL DUMP**
ADDRESS: **HIGHWAY 7 AND COUNTY ROAD #1**
LAFAYETTE, CO
DIRECTIONS: **NOT REPORTED**
COUNTY: **BOULDER**

SITE DETAILS

AGENCY SOURCE: **NOT REPORTED**
DETAIL1:
TRS-
DETAIL2:
NO OTHER DETAILS AVAILABLE

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MAP ID# 10

Distance from Property: 0.37 mi. (1,954 ft.) S
Elevation: 5,114 ft. (Lower than TP)

SITE INFORMATION

UNIQUE ID: **00070-0000438**
NAME: **HURST DUMP**
ADDRESS: **FLAG DRIVE 3/10 MILE SOUTH OF BASELINE ROAD**
LAFAYETTE, CO
DIRECTIONS: **NOT REPORTED**
COUNTY: **BOULDER**

SITE DETAILS

AGENCY SOURCE: **NOT REPORTED**
DETAIL1:
TRS-
DETAIL2:
NO OTHER DETAILS AVAILABLE

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Unlocated Sites Summary

This list contains sites that could not be mapped due to limited or incomplete address information.

Database Name	Site ID#	Site Name	Address	City/State/Zip/County
AIRSAFS	1020323	NOBLE ENERGY INC. BATTERY #11302600	NW SW SEC 36 T1N R69W	LAFAYETTE AREA 80026 Boulder
HISTSWLF	00070-0002198	AL CARTON DUMP	UNKNOWN	ERIE 80516 Weld
HISTSWLF	00070-0000396	COLORADO LANDFILL	NO ADDRESS REPORTED	ERIE 80516 Weld
HISTSWLF	00070-0002200	HORST/DEAMIN	UNKNOWN	ERIE 80516 Weld
HISTSWLF	00070-0001043	LAFAYETTE 21MS. & 2 ME	UNKNOWN	LAFAYETTE 80026 Boulder
HISTSWLF	00070-0000440	LAFAYETTE DUMP	NO ADDRESS REPORTED	LAFAYETTE 80026 Boulder
HISTSWLF	00070-0000397	LANDFILL SYSTEMS, INC.	NO ADDRESS REPORTED	ERIE 80516 Weld
HISTSWLF	00070-0002201	NEWHAUSER DUMP	UNKNOWN	ERIE 80516 Weld
HISTSWLF	00070-0002197	OLD ERIE LANDFILL	UNKNOWN	ERIE 80516 Weld
LUSTTRUST	00023-0000048	ERIE	ERIE	ERIE 80000
LUSTTRUST	00023-0000265	ERIE #1	ERIE #1	ERIE 80000
LUSTTRUST	00023-0000049	LAFAYETTE #1	LAFAYETTE #1	LAFAYETTE, CO 80000 BOULDER
SPILLS	CO93-063		1/4M E. OF 119TH ST. & 1/2M N HWY 7	LAFAYETTE

DOCKETS EPA Docket Data

VERSION DATE: 12/22/05

The United States Environmental Protection Agency Docket data lists Civil Case Defendants, filing dates as far back as 1971, laws broken including section, violations that occurred, pollutants involved, penalties assessed and superfund awards by facility and location. Please refer to ICIS database as source of current data.

EC Federal Engineering Institutional Control Sites

VERSION DATE: 08/03/15

This database includes site locations where Engineering and/or Institutional Controls have been identified as part of a selected remedy for the site as defined by United States Environmental Protection Agency official remedy decision documents. A site listing does not indicate that the institutional and engineering controls are currently in place nor will be in place once the remedy is complete; it only indicates that the decision to include either of them in the remedy is documented as of the completed date of the document. Institutional controls are actions, such as legal controls, that help minimize the potential for human exposure to contamination by ensuring appropriate land or resource use. Engineering controls include caps, barriers, or other device engineering to prevent access, exposure, or continued migration of contamination.

LUCIS Land Use Control Information System

VERSION DATE: 09/01/06

The LUCIS database is maintained by the U.S. Navy and contains information for former Base Realignment and Closure (BRAC) properties across the United States.

MLTS Material Licensing Tracking System

VERSION DATE: 03/11/15

MLTS is a list of approximately 8,100 sites which have or use radioactive materials subject to the United States Nuclear Regulatory Commission (NRC) licensing requirements.

RCRASC RCRA Sites with Controls

VERSION DATE: 02/23/16

This list of Resource Conservation and Recovery Act sites with institutional controls in place is provided by the U.S. Environmental Protection Agency.

SFLIENS CERCLIS Liens

VERSION DATE: 06/08/12

A Federal CERCLA ("Superfund") lien can exist by operation of law at any site or property at which United States

Environmental Protection Agency has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties. This database contains those CERCLIS sites where the Lien on Property action is complete.

TSCA Toxic Substance Control Act Inventory

VERSION DATE: 12/31/06

The Toxic Substances Control Act (TSCA) was enacted in 1976 to ensure that chemicals manufactured, imported, processed, or distributed in commerce, or used or disposed of in the United States do not pose any unreasonable risks to human health or the environment. TSCA section 8(b) provides the United States Environmental Protection Agency authority to "compile, keep current, and publish a list of each chemical substance that is manufactured or processed in the United States." This TSCA Chemical Substance Inventory contains non-confidential information on the production amount of toxic chemicals from each manufacturer and importer site.

AIRSAFS Aerometric Information Retrieval System / Air Facility Subsystem

VERSION DATE: 10/20/14

The United States Environmental Protection Agency (EPA) modified the Aerometric Information Retrieval System (AIRS) to a database that exclusively tracks the compliance of stationary sources of air pollution with EPA regulations: the Air Facility Subsystem (AFS). Since this change in 2001, the management of the AIRS/AFS database was assigned to EPA's Office of Enforcement and Compliance Assurance.

CDL Clandestine Drug Laboratory Locations

VERSION DATE: 01/20/16

The U.S. Department of Justice ("the Department") provides this information as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments. The Department does not establish, implement, enforce, or certify compliance with clean-up or remediation standards for contaminated sites; the public should contact a state or local health department or environmental protection agency for that information.

ERNSCO Emergency Response Notification System

VERSION DATE: 02/21/16

This National Response Center database contains data on reported releases of oil, chemical, radiological, biological, and/or etiological discharges into the environment anywhere in the United States and its territories. The data comes from spill reports made to the U.S. Environmental Protection Agency, U.S. Coast Guard, the National Response Center and/or the U.S. Department of Transportation.

HMIRSR08 Hazardous Materials Incident Reporting System

VERSION DATE: 11/08/15

The HMIRS database contains unintentional hazardous materials release information reported to the U.S. Department of Transportation located in EPA Region 8. This region includes the following states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

TRI Toxics Release Inventory

VERSION DATE: 12/31/13

The Toxics Release Inventory, provided by the United States Environmental Protection Agency, includes data on toxic chemical releases and waste management activities from certain industries as well as federal and tribal facilities. This inventory contains information about the types and amounts of toxic chemicals that are released each year to the air, water, and land as well as information on the quantities of toxic chemicals sent to other facilities for further waste management.

BRS Biennial Reporting System

VERSION DATE: 12/31/11

The United States Environmental Protection Agency (EPA), in cooperation with the States, biennially collects information regarding the generation, management, and final disposition of hazardous wastes regulated under the Resource Conservation and Recovery Act of 1976 (RCRA), as amended. The Biennial Report captures detailed data on the generation of hazardous waste from large quantity generators and data on waste management practices from treatment, storage and disposal facilities. Currently, the EPA states that data collected between 1991 and 1997 was originally a part of the defunct Biennial Reporting System and is now incorporated into the RCRAInfo data system.

HISTPST Historical Gas Stations

VERSION DATE: NR

This historic directory of service stations is provided by the Cities Service Company. The directory includes Cities Service filling stations that were located throughout the United States in 1930.

NLRRCRAG No Longer Regulated RCRA Generator Facilities

VERSION DATE: 02/09/16

This database includes RCRA Generator facilities that are no longer regulated by the United States Environmental Protection Agency or do not meet other RCRA reporting requirements. This listing includes facilities that formerly generated hazardous waste.
Large Quantity Generators: Generate 1,000 kg or more of hazardous waste during any calendar month; or Generate more than 1 kg of acutely hazardous waste during any calendar month; or Generate more than 100 kg of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land

or water, or acutely hazardous waste during any calendar month; or Generate 1 kg or less of acutely hazardous waste during any calendar month, and accumulate more than 1kg of acutely hazardous waste at any time; or Generate 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulated more than 100 kg of that material at any time.
Small Quantity Generators: Generate more than 100 and less than 1000 kilograms of hazardous waste during any calendar month and accumulate less than 6000 kg of hazardous waste at any time; or Generate 100 kg or less of hazardous waste during any calendar month, and accumulate more than 1000 kg of hazardous waste at any time.
Conditionally Exempt Small Quantity Generators: Generate 100 kilograms or less of hazardous waste per calendar month, and accumulate 1000 kg or less of hazardous waste at any time; or Generate one kilogram or less of acutely hazardous waste per calendar month, and accumulate at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, or acutely hazardous waste; or Generate 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, or acutely hazardous waste during any calendar month, and accumulate at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste.

RCRAGR08 Resource Conservation & Recovery Act - Generator Facilities

VERSION DATE: 02/09/16

This database includes sites listed as generators of hazardous waste (large, small, and exempt) in the RCRAInfo system. The United States Environmental Protection Agency defines RCRAInfo as the comprehensive information system which provides access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS). This database includes sites located in EPA Region 8. This region includes the following states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.
Large Quantity Generators: Generate 1,000 kg or more of hazardous waste during any calendar month; or Generate more than 1 kg of acutely hazardous waste during any calendar month; or Generate more than 100 kg of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, or acutely hazardous waste during any calendar month; or Generate 1 kg or less of acutely hazardous waste during any calendar month, and accumulate more than 1kg of acutely hazardous waste at any time; or Generate 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulated more than 100 kg of that material at any time.
Small Quantity Generators: Generate more than 100 and less than 1000 kilograms of hazardous waste during any calendar month and accumulate less than 6000 kg of hazardous waste at any time; or Generate 100 kg or less of hazardous waste during any calendar month, and accumulate more than 1000 kg of hazardous waste at any time.
Conditionally Exempt Small Quantity Generators: Generate 100 kilograms or less of hazardous waste per calendar month, and accumulate 1000 kg or less of hazardous waste at any time; or Generate one kilogram or less of acutely hazardous waste per calendar month, and accumulate at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the

cleanup of a spill, into or on any land or water, or acutely hazardous waste; or Generate 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, or acutely hazardous waste during any calendar month, and accumulate at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste.

RCRANGR08 Resource Conservation & Recovery Act - Non-Generator Facilities

VERSION DATE: 02/09/16

This database identifies RCRAInfo system sites that only handle hazardous waste, such as transporters, without generating any amount hazardous waste. The United States Environmental Protection Agency defines RCRAInfo as the comprehensive information system which provides access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS). This database includes sites located in EPA Region 8. This region includes the following states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

BF Brownfields Management System

VERSION DATE: 01/28/16

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. The United States Environmental Protection Agency maintains this database to track activities in the various brown field grant programs including grantee assessment, site cleanup and site redevelopment. This database included tribal brownfield sites.

CERCLIS Comprehensive Environmental Response, Compensation & Liability Information System

VERSION DATE: 10/25/13

CERCLIS is the repository for site and non-site specific Superfund information in support of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). This United States Environmental Protection Agency database contains an extract of sites that have been investigated or are in the process of being investigated for potential environmental risk. In 2014, the Superfund Program implemented a new information system, the Superfund Enterprise Management System (SEMS). Efforts to migrate data to SEMS and to enhance data quality control are now in the final stages. The Program will continue to rely on the final CERCLIS data set (dated November 12, 2013, which reflects official end of Fiscal Year 2013 Program progress) for public reporting until a complete and accurate SEMS data set is available.

NFRAP No Further Remedial Action Planned Sites

VERSION DATE: 10/25/13

NFRAP sites may be sites where, following an initial investigation, no contamination was found, contamination was removed quickly without the need for the site to be placed on the National Priorities List, or the contamination was not serious enough to require Federal Superfund action.

NLRRCRAT No Longer Regulated RCRA Non-CORRACTS TSD Facilities

VERSION DATE: 02/09/16

This database includes RCRA Non-Corrective Action TSD facilities that are no longer regulated by the United States Environmental Protection Agency or do not meet other RCRA reporting requirements. This listing includes facilities that formerly treated, stored or disposed of hazardous waste.

ODI Open Dump Inventory

VERSION DATE: 06/01/85

The open dump inventory was published by the United States Environmental Protection Agency. An “open dump” is defined as a facility or site where solid waste is disposed of which is not a sanitary landfill which meets the criteria promulgated under section 4004 of the Solid Waste Disposal Act (42 U.S.C. 6944) and which is not a facility for disposal of hazardous waste. This inventory has not been updated since June 1985.

RCRAT Resource Conservation & Recovery Act - Non-CORRACTS Treatment, Storage & Disposal Facilities

VERSION DATE: 02/09/16

This database includes Non-Corrective Action sites listed as treatment, storage and/or disposal facilities of hazardous waste in the RCRAInfo system. The United States Environmental Protection Agency defines RCRAInfo as the comprehensive information system which provides access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS).

DNPL Delisted National Priorities List

VERSION DATE: 07/22/15

This database includes sites from the United States Environmental Protection Agency’s Final National Priorities List (NPL) where remedies have proven to be satisfactory or sites where the original analyses were inaccurate, and the site is no longer appropriate for inclusion on the NPL, and final publication in the Federal Register has occurred.

DOD Department of Defense Sites

VERSION DATE: 06/21/10

This information originates from the National Atlas of the United States Federal Lands data, which includes lands owned or administered by the Federal government. Army DOD, Army Corps of Engineers DOD, Air Force DOD,

Navy DOD and Marine DOD areas of 640 acres or more are included.

FUDS Formerly Used Defense Sites

VERSION DATE: 06/01/15

The Formerly Used Defense Sites (FUDS) inventory includes properties previously owned by or leased to the United States and under Secretary of Defense Jurisdiction, as well as Munitions Response Areas (MRAs). The remediation of these properties is the responsibility of the Department of Defense. This data is provided by the U.S. Army Corps of Engineers (USACE), the boundaries/polygon data are based on preliminary findings and not all properties currently have polygon data available. DISCLAIMER: This data represents the results of data collection/processing for a specific USACE activity and is in no way to be considered comprehensive or to be used in any legal or official capacity as presented on this site. While the USACE has made a reasonable effort to insure the accuracy of the maps and associated data, it should be explicitly noted that USACE makes no warranty, representation or guaranty, either expressed or implied, as to the content, sequence, accuracy, timeliness or completeness of any of the data provided herein. For additional information on Formerly Used Defense Sites please contact the USACE Public Affairs Office at (202) 528-4285.

NLRRCRAC No Longer Regulated RCRA Corrective Action Facilities

VERSION DATE: 02/09/16

This database includes RCRA Corrective Action facilities that are no longer regulated by the United States Environmental Protection Agency or do not meet other RCRA reporting requirements.

NPL National Priorities List

VERSION DATE: 12/15/15

This database includes United States Environmental Protection Agency (EPA) National Priorities List sites that fall under the EPA's Superfund program, established to fund the cleanup of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action.

PNPL Proposed National Priorities List

VERSION DATE: 07/22/15

This database contains sites proposed to be included on the National Priorities List (NPL) in the Federal Register. The United States Environmental Protection Agency investigates these sites to determine if they may present long-term threats to public health or the environment.

RCRAC Resource Conservation & Recovery Act - Corrective Action Facilities

VERSION DATE: 02/09/16

This database includes all hazardous waste sites with ongoing corrective action activity and where corrective action is statutorily required to be address but have not had corrective action imposed in the RCRAInfo system.

The Corrective Action Program requires owners or operators of RCRA facilities (or treatment, storage, and disposal facilities) to investigate and cleanup contamination in order to protect human health and the environment. The United States Environmental Protection Agency defines RCRAInfo as the comprehensive information system which provides access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS).

RCRASUBC Resource Conservation & Recovery Act - Subject to Corrective Action Facilities

VERSION DATE: 02/09/16

This database includes hazardous waste sites which are potentially subject to corrective action regardless of whether they have correction action underway, plus any sites showing a corrective action event of RFI or beyond in the RCRAInfo system. Sites conducting corrective action under analogous state authorities are also included. The United States Environmental Protection Agency defines RCRAInfo as the comprehensive information system which provides access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS).

RODS Record of Decision System

VERSION DATE: 07/01/13

These decision documents maintained by the United States Environmental Protection Agency describe the chosen remedy for NPL (Superfund) site remediation. They also include site history, site description, site characteristics, community participation, enforcement activities, past and present activities, contaminated media, the contaminants present, and scope and role of response action.

Environmental Records Definitions - STATE (CO)

ASBESTOS Asbestos Abatement and Demolition Projects

VERSION DATE: 06/25/15

The Colorado Department of Public Health and Environment's Air Pollution Control Division assists schools and businesses to comply with air pollution laws regulating asbestos and asbestos containing materials. The regulation that governs asbestos in Colorado is the Colorado Air Quality Control Commission s Regulation No. 8, Part B, "Emission Standards for Asbestos." Notification is required for all demolitions of all facilities and all asbestos abatement projects that exceed the trigger levels, whatever is the lesser quantity. The notification requirements apply to both friable and non-friable asbestos materials. This database contains those related projects since January 2008.

COVENANTS Environmental Real Covenants List

VERSION DATE: 08/15/15

Senate Bill 01-145 gave authority to the Colorado Department of Public Health and Environment to approve requests to restrict the future use of a property using an enforceable agreement called an environmental covenant. These covenants, which are recorded with the deed and run with the land, provide a mechanism to ensure that institutional controls that are part of environmental remediation projects are properly implemented and that engineered structures are protected and maintained, so that implemented remedies continue to be protective of human health and the environment for as long as any residual contamination remains a risk.

UMTS Uranium Mill Tailings Sites

VERSION DATE: 08/09/02

There were nine uranium mill tailings sites in Colorado designated for cleanup under the federal Uranium Mill Tailings Radiation Control Act. These nine sites, know commonly as UMTRA sites, were remediated jointly by the State of Colorado and the U.S. Department of Energy during the late 1980's and early 1990's. Mill tailings were removed from 8 of the mill sites and relocated in engineered disposal cells. A disposal cell is designed to encapsulate the material, reduce radon emanation, and prevent the movement of water through the material. At one site, Maybell, CO, the tailings were stabilized in-place at the mill site. After remediation of the tailings was completed, the State and DOE began to investigate the residual impacts to groundwater at the mill sites. The groundwater phase of the UMTRA program is on-going. This database was provided by the Colorado Department of Public Health and Environment.

APCDP Air Pollution Control Division Permitted Facilities

VERSION DATE: 12/23/15

The Stationary Sources Program, located within the Air Pollution Control Division of the Colorado Department of Public Health and Environment, evaluates and develops air permits for stationary sources in Colorado. The program inspects sources to determine compliance with air regulations and permit conditions, and maintains a computerized inventory of air pollution emissions throughout the state.

CDL Clandestine Drug Laboratory Locations

VERSION DATE: 01/13/16

This list of Methamphetamine lab seizures is provided by multiple sources: the North Metro Task Force, FACTS (Forensic Applications Consulting Technologies, Inc) and the Colorado Springs Police Department. The North Metro Task Force list of Methamphetamine labs were seized between 2001 and 2010. The North Metro area includes the following Cities and Counties of Colorado: Adams County, Broomfield, Brighton, Commerce City, Federal Heights, Northglenn, Thornton, and Westminster. According to Section 2 of Colorado Revised Statutes: "25-18.5-103. Discovery of an illegal drug laboratory - property owner - clean-up - liability. (1) (a) Upon notification from a peace officer that chemicals, equipment, or supplies indicative of an illegal drug laboratory are located on a property, or when an illegal drug laboratory used to manufacture methamphetamine is otherwise discovered and the property owner has received notice, the owner of any contaminated property shall meet the cleanup standards for property established by the board in section 25-18.5-102". The FACTS and Colorado Springs Police Department Methamphetamine labs were seized between 2001 and 2014.

CLEANERS Dry Cleaning Facilities

VERSION DATE: 12/23/15

This database contains dry cleaners which have obtained an air permit through the Air Pollution Control Division at the Colorado Department of Public Health and Environment.

SPILLS Spills Listing

VERSION DATE: 12/15/15

The Colorado Department of Public Health and Environment's Division of Emergency Preparedness and Response maintains this listing of chemical spills and/or releases.

AST Aboveground Storage Tank Facilities

VERSION DATE: 01/04/16

The Oil and Public Safety Division of the Colorado Department of Labor and Employment maintains this list of aboveground storage tank (AST) facilities. This AST database also includes other types of storage tank facilities such as liquefied petroleum gas (LPG), vehicle tank meters (VTM), and compressed natural gas facilities.

HWSG Hazardous Waste Sites- Generator

VERSION DATE: 06/30/03

The Resource Conservation and Recovery Act (RCRA) was enacted by congress in 1976, followed by the promulgation of implementing regulations in 1980. In 1984, the State was authorized by EPA to implement the RCRA program in Colorado on their behalf. This facility listing includes RCRA sites listed as generators of hazardous waste (Small Quantity Generators and Large Quantity Generators) and was provided by the Colorado Department of Public Health and Environment.

Small Quantity Generators (SQG) generate, in any calendar month, more than 100 kg (220 lbs.) but less than 1,000 kg (2,200 lbs.) of RCRA hazardous waste; and generate, in any calendar month, or accumulate at any time, no more than 1 kg (2.2 lbs.) of acute hazardous waste and no more than 100 kg (220 lbs.) of material from the cleanup of a spill of acute hazardous waste; and accumulate on-site no more than 6000 kg (13,200 lbs) of hazardous waste at any one time; or, the site is a Small Quantity Generator if the site met all other criteria for a Conditionally Exempt Small Quantity Generator, but accumulated, at any time, more than 1,000 kg (2,200 lbs.) of RCRA hazardous waste.
Large Quantity Generators (LQG) generate, in any calendar month, 1,000 kg (2,200 lbs.) or more of RCRA hazardous waste; or generate, in any calendar month, or accumulated at any time, more than 1 kg (2.2 lbs.) of RCRA acute hazardous waste; or generate, in any calendar month, or accumulated at any time, more than 100 kg (220 lbs.) of spill cleanup material contaminated with RCRA acute hazardous waste.

UST Underground Storage Tank Facilities

VERSION DATE: 01/04/16

The Oil and Public Safety Division of the Colorado Department of Labor and Employment maintains this list of underground storage tank facilities.

HISTSWLF Historical Solid Waste Landfills

VERSION DATE: NR

This historical solid waste landfills database contains data from the Hazardous Materials Waste Management Division (HMWMD) of the Colorado Department of Public Health and other various state and local agencies. In the early 1980s, the HMWMD conducted a survey of staff members and local agencies to compile this listing of sites that were known or thought to have waste issues. This Solid Waste Historical Data is not considered complete or verifiable and has not been maintained since the late 1980s. The HMWMD is not responsible and shall not be liable to the used for damages of any kind arising out of the use of this data or information.

HWSTSD Hazardous Waste Sites- Treatment, Storage & Disposal

VERSION DATE: 06/30/03

The Resource Conservation and Recovery Act (RCRA) was enacted by congress in 1976, followed by the promulgation of implementing regulations in 1980. In 1984, the State was authorized by EPA to implement the RCRA program in Colorado on their behalf. TSD facilities treat, store, dispose, or recycle hazardous waste on site in units and therefore are subject to RCRA permitting requirements. Historic TSDs are facilities that have completed closure and/or post-closure of the RCRA Subtitle C Regulated Unit(s) or the Treatment/Storage/Disposal Unit is no longer regulated. This database was provided by the Colorado Department of Public Health and Environment.

LST Leaking Storage Tank Facilities

VERSION DATE: 01/04/16

The Oil and Public Safety Division of the Colorado Department of Labor and Employment maintains this list of

leaking aboveground and underground storage tank facilities.

LUSTTRUST Leaking Underground Storage Tanks Trust Fund Sites

VERSION DATE: 01/01/00

Suspected tank leaks have been discovered at the sites included in this database, but the facility responsible for the leak has not been identified. The state's investigtion and search for responsible parties is paid for out of the state's Leaking Underground Storage Tank (LUST) Trust Fund. This database was provided by the Colorado Department of Labor & Employment, Division of Oil and Public Safety, State Fund Section and is no longer updated.

METHANESITES Methane Gas Study Sites

VERSION DATE: 01/01/81

This Investigation of Methane Gas Hazards report was prepared by the Denver Office of Emergency Preparedness in 1981. The purpose of this study was to assess the actual and potential generation, migration, explosive and related problems associated with specified landfills, and to identify existing and potential problems, suggested strategies to prevent, abate, and control such problems and recommend investigative and monitoring functions as may be deemed necessary. The Colorado Department of Health selected eight landfills as priorities due to population density and potential hazards to population and property.

SWF Solid Waste Facilities

VERSION DATE: 09/11/15

The Colorado Department of Public Health and Environment maintains this database of solid waste disposal facilities, transfer stations, recyclers, waste tire registrants, and waste grease registrants.

VCRA Voluntary Cleanup and Redevelopment Program Sites

VERSION DATE: 12/23/15

This site listing is provided by the Colorado Department of Public Health and Environment (CDPHE) and includes both voluntary cleanup and brownfield properties. The Voluntary Cleanup and Redevelopment program was created in 1994. The objective of the program is to facilitate the redevelopment and transfer of contaminated properties. Properties that sit untouched because of their real or perceived contamination can be rehabilitated using the CDPHE's Brownfields Program in conjunction with the Voluntary Cleanup Program. Cleanup decisions are based on existing standards and the proposed use of the property. The actual cleanup and verification is the owner's responsibility.

HWSCA Hazardous Waste Sites- Corrective Action

VERSION DATE: 06/30/03

The Resource Conservation and Recovery Act (RCRA) was enacted by congress in 1976, followed by the

promulgation of implementing regulations in 1980. In 1984, the Hazardous and Solid Waste Amendments (HSWA) were added to RCRA providing for corrective action at facilities subject to RCRA. That same year, the State was authorized by EPA to implement the RCRA program in Colorado on their behalf. Corrective action may be implemented as part of a RCRA Hazardous Waste Permit, an Order, or a Corrective Action Plan pursuant to the Colorado Hazardous Waste Regulations. Corrective action is the process by which regulated facilities investigate and remediate, as necessary, all contamination (soil, ground water, surface water, air) associated with their releases into the environment. Historic Corrective Action Sites are facilities that have completed the RCRA Subtitle C corrective Action process. This database was provided by the Colorado Department of Public Health and Environment.

SF Superfund Sites

VERSION DATE: 06/01/03

This listing contains active, deleted and proposed "Superfund" hazardous waste sites, as well as those sites identified through the Natural Resource Damages section of Superfund legislation and one Private Non-Superfund Cleanup site. A site qualifies for the National Priorities List (NPL or Superfund list) when the U.S. Environmental Protection Agency (EPA) determines there is a release or threatened release of hazardous substances that may endanger public health, welfare or the environment. In Colorado, the lead agency for Superfund remediation may be either the EPA or the Colorado Department of Public Health and Environment.

Environmental Records Definitions - LOCAL

WCSWF	Weld County Solid Waste Facilities
VERSION DATE: 01/04/16	

This listing of solid waste facilities is provided by the Weld County Public Health Department.

USTR08 Underground Storage Tanks On Tribal Lands

VERSION DATE: 04/01/15

This database, provided by the United States Environmental Protection Agency (EPA), contains underground storage tanks on Tribal lands located in EPA Region 8. This region includes the following states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

LUSTR08 Leaking Underground Storage Tanks On Tribal Lands

VERSION DATE: 04/01/15

This database, provided by the United States Environmental Protection Agency (EPA), contains leaking underground storage tanks on Tribal lands located in EPA Region 8. This region includes the following states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

ODINDIAN Open Dump Inventory on Tribal Lands

VERSION DATE: 11/08/06

This Indian Health Service database contains information about facilities and sites on tribal lands where solid waste is disposed of, which are not sanitary landfills or hazardous waste disposal facilities, and which meet the criteria promulgated under section 4004 of the Solid Waste Disposal Act (42 U.S.C. 6944).

INDIANRES Indian Reservations

VERSION DATE: 01/01/00

The Department of Interior and Bureau of Indian Affairs maintains this database that includes American Indian Reservations, off-reservation trust lands, public domain allotments, Alaska Native Regional Corporations and Recognized State Reservations.

APPENDIX D
RESUMES

CTL | THOMPSON INCORPORATED

Trevor Branch, E.I., Staff Engineer/Geologist

Office Location

Denver, Colorado

Years of Experience

5 Years

Education

B.S. Environmental Engineering
University of New Hampshire
Durham, NH 2010

Training & Certifications

40 Hour OSHA Training

Confined Space Training

Engineer-in Training

Professional Affiliations

National Groundwater Association (NGWA)

Colorado Environmental Management Society

Professional Summary

Mr. Branch joined CTL | Thompson in 2013 with over two years of previous experience providing environmental consulting throughout New York, New Jersey and Connecticut.

Currently, as a Staff Engineer/Geologist for CTL's Denver-based environmental consulting division, his responsibilities are providing Phase I and Phase II ESAs, assistance with Remedial Alternatives, Remediation Design, and preparation of Voluntary Cleanup Plans. Mr. Branch's experience includes underground storage tank removals, site characterization and remediation.

Project Experience

5th and Walnut Parking Garage, Auraria Higher Education Center, Denver, CO
Served as site geologist during subsurface investigation activities to determine the extent of PAH contamination previously encountered in test borings and pits. Oversight of drilling, logging and field screening of soils, lab analysis and groundwater flow determination were all conducted during the Phase II investigation. The findings of this investigation indicated that the site was not a source of contamination and was likely up gradient from an unidentified source. Later received No Action Determination from CDPHE

345 Santa Fe Drive, Denver, Colorado
Performed Phase I ESA, Phase II ESA and Voluntary Cleanup Application for former chromium plating shop. Fully characterized site and then oversaw excavation remediation. Received No Action Determination from CDPHE.

County Line Apartments, Centennial, CO
Performed Phase I ESA, Phase II ESA and Voluntary Cleanup Application for this new building construction, downgradient from chlorinated solvent plume. Fully characterized site, assisted Mr. Wardlow with Remedial Alternatives including design of vapor mitigation systems and verification sampling. Received No Action Determination from CDPHE.

Green Gables Development, Lakewood, CO
Performed a Phase II ESA including a groundwater survey. Delineated extent of chlorinated solvent plume from off-site up-gradient source. Prepared approved Voluntary Cleanup Plan for residences located above impacted area. Designed vapor mitigation system.

Metro Express Car Wash, Sheridan, CO
Reviewed previous environmental studies for site located with the River Point at Sheridan development located adjacent to historic landfills with documented presence of volatile organic vapors including methane. Conducted baseline air quality sampling prior to and during construction activities. Prepared Operation Maintenance and Monitoring Plan for active vapor mitigation system installed in on-site building.

Matthew L. Wardlow, P.E.

Environmental Department Manager

Office Location
Denver, Colorado

Years of Experience
20 Years

Professional Registration
Registered Professional Engineer: Colorado

Education
B.S. Engineering and Policy, Washington University, St. Louis, MO, 1993

Training & Certifications
40 Hour OSHA Training

Confined Space Training

Mold Remediation Technician

Training Principals of Forced Air Remediation

Asbestos Inspector
Air Monitoring Specialist
Designer

Professional Affiliations
American Society of Civil Engineers

American Society of Foundation Engineers

Colorado Environmental Management Society

Urban Land Institute

Mr. Wardlow has a variety of technical expertise in Phase I and II Environmental Site Assessments, CDPHE Voluntary Cleanup (VCP) applications, asbestos consultation, underground storage tank removals, site characterizations, and assessments under the National Environmental Policy Act. Mr. Wardlow reviews all environmental deliverables, making sure that the latest practices are followed. He has developed a reputation as a consistent and reliable consultant for his clients, which include the City & County of Denver, Auraria Campus and its colleges, and Boulder County. He encompasses a variety of project experience including brownfields, historical mine sites, medical facilities, and wastewater treatment plants.

Project Experience

Regency Athletic Complex at MSU Denver, Denver Colorado
2016 ACEC CO GRAND CONCEPTOR AWARD – Highest Engineering Honor
This former brownfield, located at the southern end of Auraria Campus, was the site of geotechnical and environmental issues from past industrial use. There was also the potential for settlement due to undocumented fill. Mr. Wardlow devised an idea using Deep Dynamic Compaction (DDC), which is a ground improvement technique that densifies the majority of soils and fills in-place by using a drop weight. CTL then provided on-site geotechnical and environmental inspection services, management of contaminants excavated, and also successfully entered the client into the State of Colorado Voluntary Cleanup Program. Measures were also taken to monitor air quality and vibrations from the impact. The solution was about 25% of the removal and replacement costs, and there has been no noticeable settlement.

Other Redevelopment/Voluntary Cleanup Projects:
Prepared Overall 2016 Auraria Campus Materials Management Plan
New Breckenridge Brewery – VCP – Remediation of Pesticides
Community College of Denver Confluence Building
Metro State Hotel and Hospitality Learning Center
Metro State Student Success Building
AHEC 5th Street Parking Garage – VCP – Coal Ash and Asbestos
Gold Hill Mesa - VCP - Subdivision Constructed on Mine Tailings
4th and Santa Fe – VCP Remediation of Chrome Plating Site
ConocoPhillips - Purchase/Redevelopment of 400-acre StorageTek

Other Major Projects and Clients
Denver Department of Environmental Health - 20+ P1 and P2 ESAs
CDOT - Over 30 Asbestos Surveys, Air Clearances of Buildings
Land Developers - Due Diligence Studies and SWMP Consultation
Urban Land Conservancy - P1 and P2 ESAs, IAQ Concerns
CU Boulder - Asbestos Consultant - Ketchum Hall, Hallett Hall
Homebuilders - Due Diligence, Mold and Moisture Consultation
Boulder County Risk Management - On-Call Industrial Hygienist
Boulder Valley School District - On-Call Asbestos Consultant
Regis University - P1 ESA of 7 Parcels of Campus

Ecological Resource Consultants, Inc.
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Technical Memorandum

Date: April 21, 2017

To: OEO, LLC-Corey Elliot

From: Dave Blauch

Re: **Erie Gateway South-CDOT ROW – NRCS Prime Farmland Evalua. on**

Ecological Resource Consultants, Inc. (ERC) completed an evaluation of Natural Resources Conservation Service (NRCS) soil types within the Erie Gateway South, CDOT Right of Way (ROW) project to determine if unique or prime farmland exists. The project area comprises approximately 2,487 feet of Hwy 7 ROW and extends approximately 100 feet from the edge of exis. ng pavement on the south side of Hwy 7 to the fences of rural residential properties to the north (refer to **Figure 1**). Results of the evalua on are summarized as follows.

Four (4) soil types are mapped by the NRCS within the project area (Refer to **Table 1**) (hps://web soilsurvey.sc.egov.usda.gov). All four soil types are classified as "*prime farmland if irrigated*." No soils within the project area are considered "*prime farmland*, *farmland of statewide importance*, *farmland of local importance*, or *unique farmland*" per NRCS policy and procedures on prime and unique farmlands, published in the "Federal Register," Vol. 43, No. 21, January 31, 1978. Although mapped as "*prime farmland if irrigated*", the majority of land within the project area is actually comprised of paved highway with only a small portion along the northern side of the highway comprised of maintained road shoulder, rural yards of residen al homes. Refer to **Figure 1** for a map showing NRCS soil types and photo examples of conditions within the project area.

Table 1. NRCS Web Soil Survey Results within Project Area.

Farmland Classification— Summary by Map Unit — Boulder County Area, Colorado (CO643)				
Map unit symbol	**Map unit name**	**Rang**	**Acres in AOI**	**Percent of AOI**
AcA	Ascalon sandy loam, 0 to 3 percent slopes	Prime farmland if irrigated	2.7	47.5%
AcC	Ascalon sandy loam, 3 to 5 percent slopes	Prime farmland if irrigated	1.2	20.9%
AoB	Ascalon-Otero complex, 0 to 3 percent slopes	Prime farmland if irrigated	0.5	8.4%
Lv	Loveland soils	Prime farmland if irrigated	1.3	23.1%
Totals for Area of Interest			**5.7**	**100.0%**

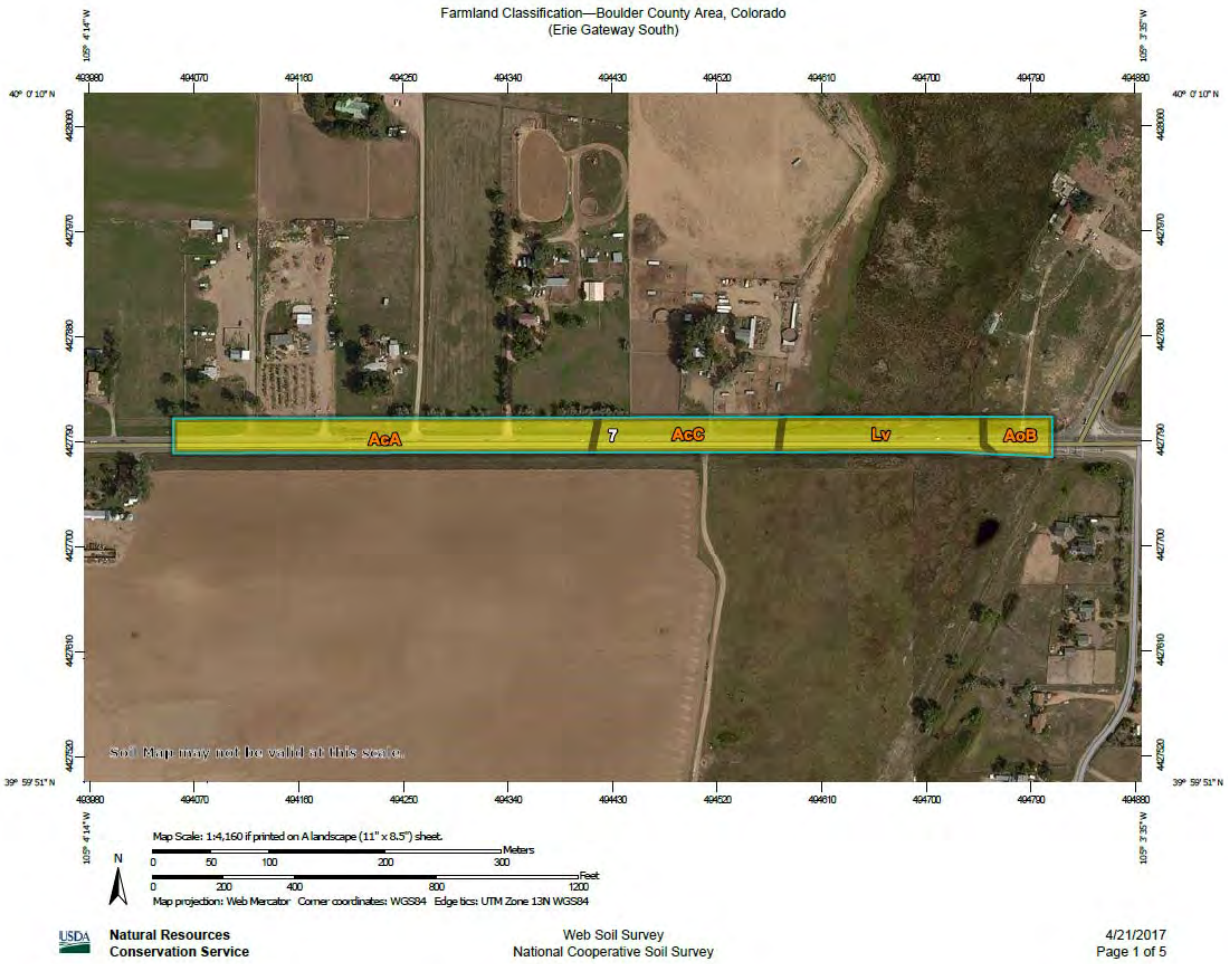






Photo examples of ground condion within the project area (depicted by red line).

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Colorado Department of Transportation

Environmental Clearances Information Summary

Erie Gateway South

Highway 7 Improvements

Boulder County, Colorado

April 7, 2017

Prepared for:

OEO, LLC
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ERC Project #1000-1701

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Colorado Department of Transportation

Environmental Clearances Information Summary

Erie Gateway South

Highway 7 Improvements

Boulder County, Colorado

April 7, 2017

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FIGURES

FIGURE 1 – USGS TOPOGRAPHIC MAP AND LOCATION MAP
FIGURE 2 – PHOTO POINT LOCATION MAP
FIGURE 3 – CDOT ROW IMPROVEMENT AREA
APPENDIX A - ERC Aquatic Resource Delineation Report

1.0 INTRODUCTION

Ecological Resource Consultants, Inc. (ERC) has prepared this report in compliance with the Colorado Department of Transportation (CDOT) Environmental Clearance Information Summary for the Erie Gateway South Highway 7 Improvement Project. The Environmental Clearance Information Summary is intended to inform project proponents about some of the more commonly encountered environmental permits/clearances that may apply to a project. This report is only intended as an initial screening to identify potential environmental conditions that may warrant further evaluation and/or permitting. This report specifically addresses environmental clearance information for wildlife resources, cultural resources, paleontological resources, wetland and stream impacts, and Clean Water Act (CWA) Section 404 permitting. This report is intended to satisfy the requirements of CDOT Environmental Clearances for projects taking place in a state highway right-of-way. These items are specifically outlined in *CDOT – Environmental Clearances Information Summary (May 2016).*

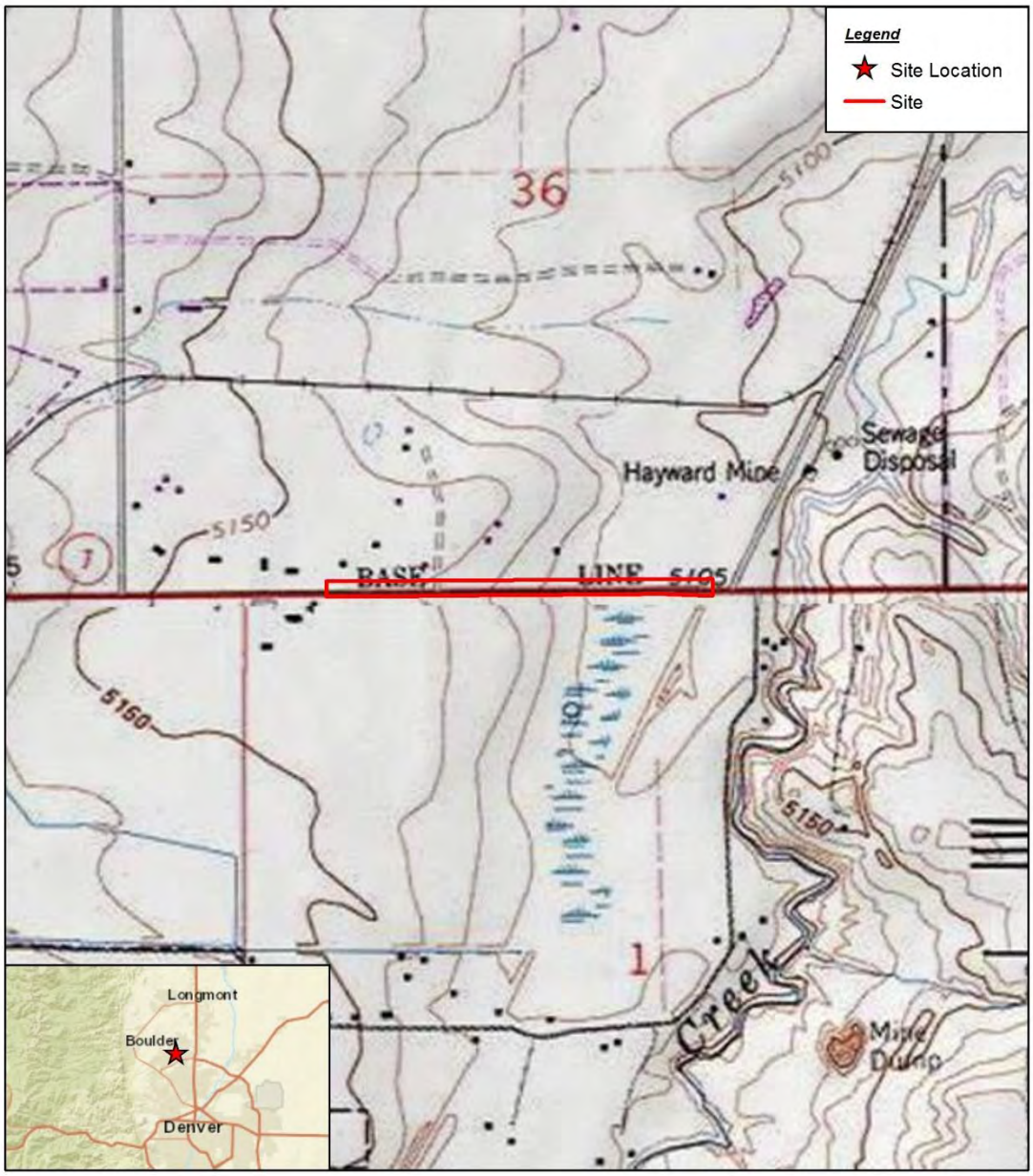
2.0 PROJECT DESCRIPTION

The proposed project (Project) intends to widen and improve a section of State Highway 7 (Hwy 7) to accommodate a roadway entrance to the proposed Erie Gateway South development. Improvements will generally occur along an approximately 2,487' section of the existing right-of-way (ROW) and easement through standard earthwork including grading, filling, culvert replacement, asphalt paving, erosion and sediment control, and seeding. Improvements are proposed to occur along the north side of Hwy 7 only, no earthwork or changes are proposed for the south side of Hwy 7 as part of the proposed project. Generally, all improvements will take place from the existing edge of asphalt on the south side of Hwy 7, and extend north approximately 100 feet including the vegetated roadside for the entire length of the Project.

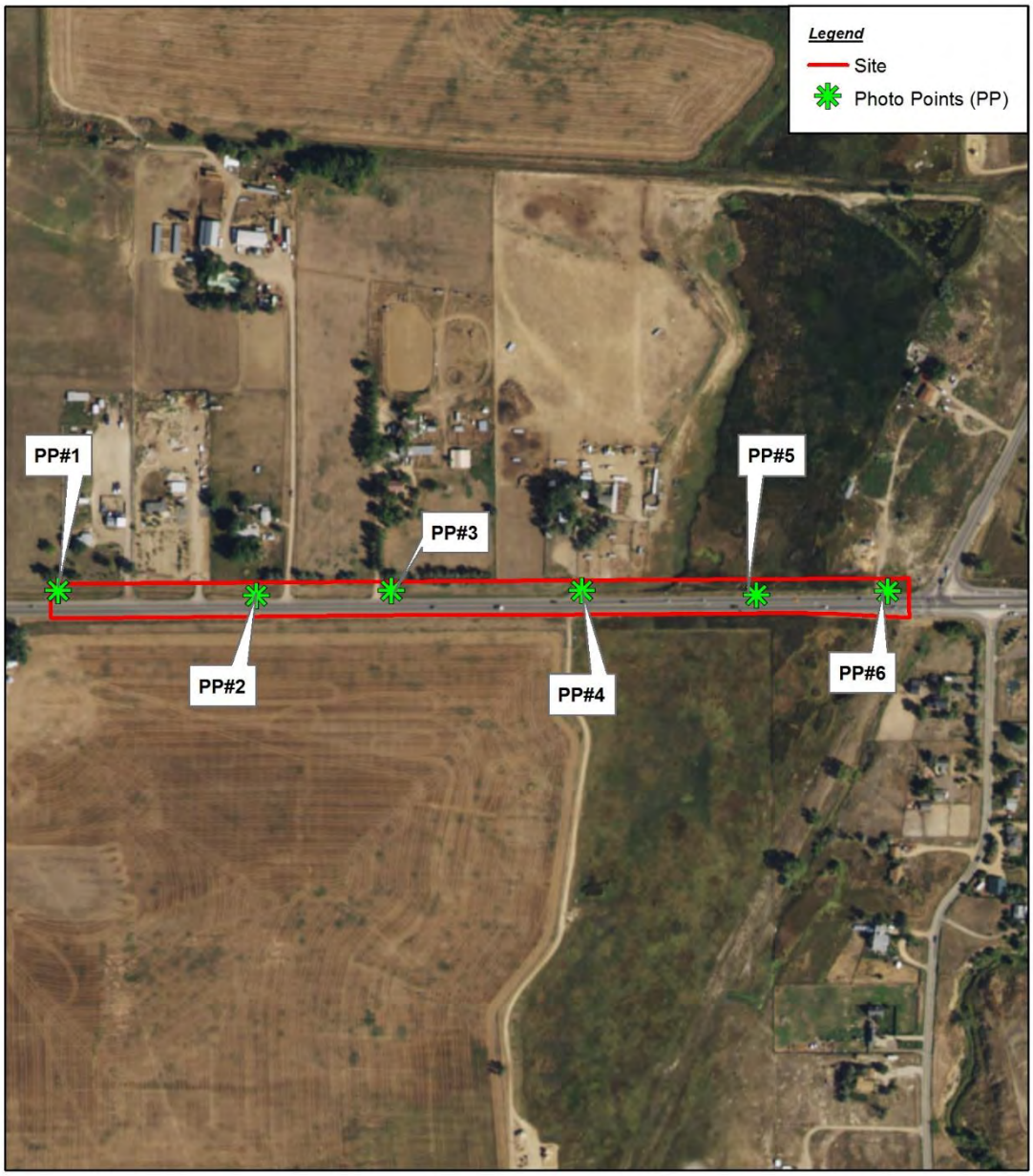
3.0 GENERAL SITE DESCRIPTION

The Project area (herein referred to as Site) is located along Hwy 7 immediately west of the intersection with East County Line Road, approximately four miles west of the intersection with Interstate 25 in Boulder County, Colorado. More specifically, the Site is located in **Section 36, Township 1 North, Range 69 West**, in Boulder County **(40.000248° north, -105.064151° west**). From the intersection of I-25 and Hwy 7, the Site can be accessed by heading west for approximately 4.2 miles on Hwy 7. The Site comprises the Hwy 7 ROW and extends approximately 100 feet from the edge of existing pavement on the south side of Hwy 7 to the fences of rural residential properties to the north. The Site is bordered predominantly by the rural yards of residential homes, pastures, and open lands to the north, and the mowed roadsides of Hwy 7 and open lands to the south. Refer to **Figure 1** for an overall location map and US Geological Survey (USGS) topographic map of the Site.

The Site comprises approximately 5.7 acres at an average elevation of 5,125 feet above mean sea level. The Site currently comprises the existing two-lane asphalt portion of Hwy 7 and vegetated roadside to the north. Vegetation within the Site is regularly mowed and maintained. Topography across the Site consists of a high point on the west side and generally slopes downward to the east. Refer to **Photos 1-6** below for typical characteristics within the Site. The photo point locations are depicted on **Figure 2**.



Prepared By: ERC *5672 Juhls Drive* *Boulder, CO 80301* *(303) 679-4820* *ERC #: 1000-1701*	**FIGURE 1.** **USGS TOPOGRAPHIC MAP** **ERIE GATEWAY SOUTH** **HIGHWAY 7 IMPROVEMENTS** **BOULDER COUNTY, COLORADO**	0 900 1,800 Feet *CDOT ENVIRONMENTAL CLEARANCE 2017*



Prepared By:
ERC
5672 Juhls Drive
Boulder, CO 80301
(303) 679-4820
ERC #: 1000-1701

FIGURE 2.
PHOTO POINT LOCATION MAP

ERIE GATEWAY SOUTH
HIGHWAY 7 IMPROVEMENTS
BOULDER COUNTY, COLORADO

0 400 800 Feet

CDOT ENVIRONMENTAL CLEARANCE 2017



Photo Point # 1. View east of the upland roadside and swale in the western most portion of the Site.



Photo Point # 2. View west of the upland roadside and swale in the western portion of the Site.



Photo Point # 3. View east along the upland roadside and swale in the central portion of the Site.



Photo Point # 4. View east at the roadside swale in the eastern portion of the Site. The culvert outlet and western boundary of Aquatic Resource Z (refer to Section 7.0) can be seen in this photo (depicted by blue line).



Photo Point # 5. View east at the mowed roadside adjacent to Aquatic Resource Z (refer to Section 7.0) within the Site (boundary depicted by the blue line).



Photo Point # 6. View east of the eastern most portion of Aquatic Resource Z (refer to Section 7.0), near the eastern boundary of the Site. (Approximate Site boundary depicted by red line)

FIGURE 3.

ERIE GATEWAY SOUTH

CDOT ROW IMPROVEMENTS AREA



N

100 0 50 100 200

SCALE: 1"= 100' HORIZ.

DATE: 03/07/2017

KT ENGINEERING
ENGINEERS • SURVEYORS
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ARVADA, CO 80002
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4.0 WILDLIFE RESOURCES

ERC conducted a literature review for wildlife resources as part of initial data collection for preparation of this report. Among others, ERC reviewed the available literature sources including; Colorado Parks and Wildlife (CPW) information and the US Fish and Wildlife Service (USFWS) Federal Register. A Field inspection was subsequently conducted on March 27, 2017 to identify and document the presence of natural vegetation communities, general wildlife use and potential for threatened and endangered species/habitat. In addition, ERC previously completed a threatened and endangered species screening for a larger site immediately adjacent to the north, in which a portion of the Site subject of this report was included. A report was issued dated May 11, 2016 (ERC 2016) which is referenced herein. Upon review of all available resources, including literature and field inspections, ERC provides the following determination for the Site.

Wildlife utilizes the general landscape in a multitude of ways and uses a variety of habitats as areas of permanent inhabitance, seasonal inhabitance, breeding grounds, migratory routes, for foraging purposes, or as temporary shelter. Potential wildlife habitat within the Site includes the herbaceous vegetated, mowed upland roadside/swale, and wetland areas dominated by cattails. Degraded or disturbed roadsides vegetated with grasses, weedy species, and/or ruderal herbaceous vegetation is not typically considered of high ecological value to wildlife but may have very limited benefits to certain wildlife species. Given that the Site is comprised of mowed roadsides, limited wetland habitat dominated by cattails, located within a heavily used highway ROW, and lacking tree/shrub cover and/or undisturbed herbaceous vegetative cover, the Site is considered undesirable habitat for most wildlife species.

Historic and current land use associated with the construction of Hwy 7, and ongoing disturbance associated with maintenance of the roadsides has restricted the development of any significant natural vegetation communities within the Site, which limits the overall quality of potential wildlife habitat. The roadsides appear to be regularly mowed which would imply that the Site is frequently disturbed limiting the overall wildlife habitat value. Hwy 7 is an active roadway that regularly experiences heavy traffic at higher rates of speed, making the Site an unwelcome environment for wildlife species. The vicinity of the Site does exhibit a limited amount of mature overstory canopy trees, midstory shrubs, dense herbaceous cover, and several water sources such as wetlands, ponds, and Coal Creek that can provide potential roosting and nesting habitat for visiting and residential raptors and smaller migratory birds. The surrounding open lands can provide a limited variety of wildlife habitat features such as cover, forage and nesting habitat, and acts as a movement corridor for various mammals, raptors, and migratory birds.

- Overall, habitat on Site is degraded and of lower ecological value from a wildlife perspective due to historic land disturbance, regular mowing of vegetation, and frequent traffic which severely limits potential wildlife use.

- No significant disturbance to wildlife is anticipated within the Site as a result of the Project. Specific clearances for general wildlife from CPW and/or USFWS is likely not warranted for the Project.

4.1 MIGRATORY BIRD TREATY ACT

Migratory birds are protected under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 730-712). The MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase barter, or offer for sale, purchase, or barter any migratory bird, or the parts, nests, or eggs of such a bird except under the

terms of a valid permit issued pursuant to Federal regulations. In Colorado, all birds except for the European starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*) and rock pigeon (*Columba livia*) are protected under the MBTA. A total of 523 migratory bird species are known to occur in the Mountain-Prairie Region (USFWS Region 6, Montana, Wyoming, Utah, North Dakota, South Dakota, Nebraska, Kansas and Colorado); 320 of the 523 migratory bird species are known to breed in USFWS Region 6.

- The fallow roadsides within the Site provides very limited potential for migratory bird use.
- During any construction activities associated with the improvements to Hwy 7 that occur within the Site which remove vegetation should first ensure that active nests are not disturbed. It is unlikely that migratory birds have or will establish nests within the regularly mowed roadside vegetation or dense monocultures of cattails.
- In addition, raptor nest sites are further protected by the CPW. The CPW has established recommended buffer zones and seasonal activity restrictions for a variety of Colorado raptors. While no active nests were observed, no potential habitat for nests exists (overstory canopy trees), and no CPW mapped buffer zones are located within the Site (CPW 2016). ERC 2016 did identify an active Red-Tail Hawk nest approximately 0.4 miles north of the Site. CPW recommends a 1/3 mile buffer around active Red-Tail Hawk nests, suggesting the Site is outside of this buffer zone. It is not anticipated that the Project would have any impact on this 2016 nest location which is outside of the CPW recommended buffer zone and given the existing traffic and activity within the Site. Prior to construction activities associated with the improvements to Hwy 7, a screening may be warranted to ensure that no active raptor nest sites have established within the vicinity of the Site.
- No significant disturbances to migratory birds are anticipated within the Site as a result of the Project.

4.2 SPECIES PROTECTED UNDER THE ENDANGERED SPECIES ACT OF 1973

The ESA of 1973 was enacted by the United States to conserve endangered and threatened species and the ecosystems that they depend on. Under the ESA, species may be listed as either "endangered" or "threatened"; both designations are protected by law. The ESA is administered by the USFWS. The USFWS has developed project specific species lists, available online by request, identifying threatened, endangered, and proposed species, designated critical habitat, and candidate species protected under the ESA that may occur within the boundary of the proposed project and/or may be affected by the proposed project (USFWS 2017) (Tracking Number: 06E24000-2017-SLI-0671). The species list for the Site has identified a total of eleven threatened or endangered species.

Species Not within Range of the Site

The following federally listed threatened and endangered species are identified to occur within Boulder County. However, these species are not known to exist within the specific vicinity of the Site and/or have specific habitat requirements (i.e., elevation range) that are not common in the vicinity of the Site.

Common Name	Scientific Name	Status
Canada Lynx	Lynx canadensis	Federally Threatened
Mexican Spotted Owl	*Strix occidentalis lucida*	Federally Threatened

- The Site does not contain the specific habitat characteristics necessary to support the species listed above. The species are not likely to occur within the Site therefore the construction activities

associated with the proposed project would not likely adversely affect the continued existence or available habitat of the species.

Species Potentially within Range of the Site

The following federally listed threatened and endangered species are identified to occur or historically occur within Boulder County (USFWS 2017). The Site is located within the potential known range for these species to occur. Further analysis was conducted to determine if the species or habitat has the potential to exist within the Site considering site-specific conditions and characteristics. A brief explanation is provided as to the species life cycle, habitat requirements and potential occurrence within the Site. The Site is not within designated critical habitat of any federally listed species.

Common Name	Scientific Name	Status
Colorado Butterfly Plant	*Gaura neomexicana var. coloradensis*	Federally Threatened
Greenback Cutthroat Trout	*Oncorhynchus clarki stomias*	Federally Threatened
Preble's Meadow Jumping Mouse	*Zapus hudsonius preblei*	Federally Threatened
Ute Ladies'-Tresses Orchid	*Spiranthes diluvialis*	Federally Threatened

The above federally threatened wildlife species (4) identified by the USFWS, listed in the project specific species list are believed to occur within Boulder County, therefore the Site was evaluated to determine if suitable habitat is present within the Site to support individuals or populations of these species. The following are the results:

Colorado Butterfly Plant - This plant species is a short-lived, perennial herb endemic to moist soils in mesic or wet meadows of floodplain areas in southeastern Wyoming, north central Colorado, and extreme western Nebraska. This early to mid-seral stage species occurs primarily in habitats created and maintained by streams active within their floodplains, with vegetation that is relatively open and not overly dense or overgrown. The conversion of natural wet meadows and natural riparian corridors to agricultural land and urban development is the primary threat to the continued existence of the species (Federal Register 2000).

- The specific characteristics of the Site do not exhibit typical habitat of the Colorado butterfly plant. The Site is not located within designated critical habitat for this species (USFWS 2017). Wetland habitat on the Site is dominated by a monotypic stand of cattails which is not typical habitat conducive to the Colorado butterfly plant. Neither individuals nor potential habitat for the Colorado butterfly plant were observed on or immediately surrounding the Site. The proposed project is not likely to adversely affect the continued existence or potential habitat of this species.

Greenback Cutthroat Trout – This species inhabits cold water streams and cold water lakes with adequate stream spawning habitat during spring. In general, trout require different habitat types for different life stages: juvenile (protective cover and low velocity flow, as in side channels and small tributaries); spawning (riffles with clean gravels); over-winter (deep water with low velocity flow and protective cover); and adult (juxtaposition of slow water areas for resting and fast water areas for feeding, with protective cover from boulders, logs, overhanging vegetation or undercut banks). Both water quality and quantity

are important. Greenbacks generally require clear, cold, well-oxygenated water (CPW 2016). The above characteristics are necessary to support individuals or populations of this species.

- No streams or lakes are located within the Site. Therefore, the proposed project is not likely to adversely affect the continued existence or potential habitat of this species.

Preble's Meadow Jumping Mouse - On May 13, 1998 the US Fish and Wildlife Service issued a final rule to list the Preble's meadow jumping mouse (PMJM) as a federally threatened species under the ESA. PMJM range extends from southwestern Wyoming through eastern Colorado generally below 7,600 feet. Armstrong et al. (1997) described typical PMJM habitats as "well-developed plains riparian vegetation with relatively undisturbed grassland and a water source in close proximity." Also noted was a preference for "dense herbaceous vegetation consisting of a variety of grasses, forbs and thick shrubs" (USFWS 1999). This species is known to regularly travel into adjacent uplands to feed and hibernate. The PMJM hibernates in an underground burrow from September to May. PMJM bears two to three litters per year, averaging five young per litter, in a grass-lined nest. In general, PMJM surveys are recommended for areas with suitable habitat in Boulder County below 7,600 feet and within 300 feet of vegetated irrigation canals, ditches, and wetlands. Areas that are highly disturbed or modified (including landscaped lots and paved areas) or wetland areas dominated by cattails are excluded from this recommendation.

No populations of the PMJM are known to occur within the vicinity of the Site (UDFCD 2010). Further, the Site and immediate vicinity is not designated as Critical Mouse Habitat by the USFWS (USFWS 2017). The USFWS Mouse Block Clearance Map for the Denver Metro Area (USFWS 2010) which identifies areas exempt from further review for PMJM habitat, shows the Site does not occur within the Block Clearance Zone.

- No PMJM individuals were observed on or surrounding the Site. The herbaceous wetland habitat on the Site is dominated by dense cattail vegetation which is not typical habitat of the PMJM. Moreover, the adjacent uplands comprise disturbed agricultural communities, including regularly plowed cultivated cropland and horse pasture which is not considered suitable upland habitat for this species. Due to the limited quality of the emergent wetland and disturbed uplands, and the absence of any nearby known populations, it is highly unlikely that the PMJM exists within the Site. The USFWS also states that sites where wetlands are entirely composed of dense stands of cattails are exempt from PMJM surveys. The proposed project is not likely to adversely affect the continued existence or potential habitat of this species.

Ute Ladies'-Tresses Orchid – This species occurs in seasonally moist soils and wet meadows near springs, lakes, or perennial streams and their associated floodplains below 6,500 feet in elevation in certain areas of Utah, Colorado, Idaho, Wyoming, and Nevada. Typical sites include early successional riparian habitats such as point bars, sand bars, and low lying gravelly, sandy, or cobbly edges. They seem to require "permanent subirrigation", conditions where the water table is close to the surface, but they are not tolerant of permanent standing water. Typical habitat is open and sparsely vegetated, populations decline if trees and shrubs invade the habitat. They do not compete well with aggressive species such as reed canary grass or monocultures of cattails.

- The herbaceous wetland habitat on the Site is dominated by dense cattail vegetation which is not typical habitat conducive to the Ute ladies-tresses. No Ute ladies-tresses or suitable habitat was

identified in the Site. The proposed project is not likely to adversely affect the continued existence or potential habitat of this species.

Water Depletions Species

The USFWS under the ESA has determined that water depletions in the South Platte River Basin are considered an adverse effect to the listed species identified below. The Site is considered to be located within the South Platte River Basin.

Common Name	Scientific Name	Status
Least Tern	*Sterna antillarum*	Federally Endangered
Piping Plover	*Charadrius melodus*	Federally Threatened
Whooping Crane	*Grus americana*	Federally Endangered
Pallid Sturgeon	*Scaphirhynchus albus*	Federally Endangered
Western Prairie Fringed Orchid	*Platanthera praeclara*	Federally Threatened

Any water related project conducted in the South Platte River Basin that has a federal nexus; such as federal funding or a federal permit (i.e., Clean Water Act (CWA) Section 404 Permit), is subject to ESA Section 7 Consultation with the USFWS. The consultation is a mandate for water depletion projects that may adversely affect threatened and endangered species that rely on the South Platte River.

- The Site does not contain the specific habitat characteristics necessary to support the species listed above; however, all species except the Pallid sturgeon and the Western Prairie Fringed Orchid are known to occur within Boulder County (USFWS 2017). The Project is not considered a potential water depletion to the South Platte River Basin. Therefore, the Project will not adversely affect the continued existence or available habitat of the species.

- No disturbance to Endangered Species Act Listed species/habitats are anticipated within the Site as a result of the Project. Specific clearances for ESA listed species from the USFWS is likely not warranted for the project.

4.3 STATE THREATENED AND ENDANGERED SPECIES

Species identified as state threatened or endangered are protected by the CPW under Colorado Statute Title 33. State regulations prohibit "*any person to take, possess, transport, export, process, sell or offer for sale, or ship and for any common or contract carrier to knowingly transport or receive for shipment*" any species or subspecies listed as state endangered or threatened. The CPW also has identified State Species of Special Concern, which are species or subspecies of native wildlife that are currently vulnerable in their Colorado range and have the potential to become threatened or endangered (CPW 2010). Species of Special Concern are not protected under State regulations but the 'take' of individuals and disturbance of their habitat is strongly discouraged.

All State listed species were screened as potential inhabitants of the Site based on general habitat requirements and CPW Species Profiles (CPW 2016b). ERC evaluated the species listed by CPW as threatened or endangered that could potentially exist within the Site. All species listed above as threatened or endangered by the USFWS are also listed by the CPW as threatened or endangered, respectively, therefore were not duplicated below.

Species Not within Range of the Site

The following listed threatened and endangered species are identified to occur within the State (CPW 2016b). However, these species are not known to exist within the specific vicinity of the Site and/or have specific habitat requirements (i.e., elevation range) that are not common in the vicinity of the Site (CPW 2016b and USFWS 2016).

Common Name	Scientific Name	Status
Boreal Toad	*Bufo boreas boreas*	State Endangered
Southwestern willow flycatcher	*Empidonax traillii extimus*	State Endangered
Lesser prairie-chicken	*Tympanuchus pallidicinctus*	State Threatened
Arkansas darter	*Etheostoma cragini*	State Threatened
Bonytail	*Gila elegans*	State Endangered
Razorback sucker	*Xyrauchen texanus*	State Endangered
Humpback chub	*Gila cypha*	State Threatened
Colorado pikeminnow	*Ptychocheilus Lucius*	State Threatened
Rio grande sucker	*Catostomus plebeius*	State Endangered
Lake chub	*Couesius plumbeus*	State Endangered
Plains minnow	*Hybognathus placitus*	State Endangered
Suckermouth minnow	*Phenacobius mirabilis*	State Endangered
Northern redbelly dace	*Phoxinus eos*	State Endangered
Southern redbelly dace	*Phoxinus erythrogaster*	State Endangered
Brassy minnow	*Hybognathus hankinsoni*	State Threatened
Common shiner	*Luxilus cornutus*	State Threatened
Gray wolf	*Canis lupus*	State Endangered
Grizzly bear	*Ursus arctos*	State Endangered
Wolverine	*Gulo gulo*	State Endangered
River otter	*Lontra Canadensis*	State Threatened
Kit fox	*Vulpes macrotis*	State Endangered
Black-footed Ferret	*Mustela nigripes*	State Endangered

- The Site does not contain the specific habitat characteristics necessary to support the species listed above. The species are not likely to occur within the Site and therefore, the proposed project would not likely adversely affect the continued existence or available habitat of the species.

Species potentially within Range of the Site

The following state listed threatened and endangered species are identified to occur or historically occur within Boulder County. The Site is located within the potential known range for these species. Further analysis was conducted to determine if the species or habitat has the potential to exist within the Site

considering site-specific conditions and characteristics. A brief explanation is provided as to the species life cycle, habitat requirements and potential occurrence on the Site.

Common Name	Scientific Name	Status
Burrowing owl	*Athene cunicularia*	State Threatened
Plains sharp-tailed grouse	*Tympanuchus phasianellus jamesii*	State Endangered

Burrowing Owl - The Owl is small (length of 24 centimeters), long-legged, boldly spotted, and barred with brown and white. The Owl is a breeding species across the plains of eastern Colorado however rarely winters in the state. Nesting habitat is abandoned burrows, especially prairie dog colonies, located in grasslands, mountain parks, well-drained steppes, deserts, prairies and agricultural lands from late March through October. The Owl can usually be observed on low perches such as fence posts, dirt mounds or the ground. Clutch size of this Owl averages six to seven and incubation lasts up to 30 days. The owlets usually run and forage at 4 weeks and fly at 6 weeks. Primary threats to existence of this species are habitat loss due to intensive agriculture, habitat degradation and fragmentation due to control of burrowing mammals and predation by cats and dogs.

- The vicinity of the Site contains an active prairie dog colony, generally located to the northwest of the intersection of Hwy 7 and East County Line Road, just outside of the northeast Site boundary. Given that this prairie dog colony is active and located outside the Site boundary, and no disturbances are proposed outside the Site boundary as part of the Project, it is unlikely that the Project will adversely affect the continued existence or potential habitat of this species.

Plains Sharp-Tailed Grouse - The Grouse is brown with white horizontal barring and a short, pointed tail. Known populations exist only in Douglas County, Colorado. Typical habitat includes rolling hills with scrub oak thickets and medium to tall grasslands for courtship and nesting. As an equivalent to sagebrush, Grouse use scrub oaks, serviceberries and willows. These brushy sites provide critical winter shelter and food sources.

- The mowed herbaceous vegetated roadsides, herbaceous wetland habitat dominated by cattails, and agricultural land within the Site do not exhibit the typical habitat characteristics necessary to support this species. Neither individuals nor potential habitat for the grouse were observed on or immediately surrounding the Site. The Project is not anticipated to adversely affect the continued existence or potential habitat of this species.

- No disturbance to State listed threatened and endangered species/habitats are anticipated within the Site as a result of the Project. Specific clearances for state listed endangered species from CPW is likely not warranted for the project.

5.0 CULTURAL RESOURCES

A cultural resource inventory was completed by A & B Cultural Consultants, LLC (A&B) for the larger Erie Gateway South property, which specifically included the Site subject of this report. The cultural resource inventory (A&B 2017) specifically involved a file search, literature review, and an intensive cultural resources field survey of portions of the larger 225-acre property which specifically included the Site. The National Register of Historic Places (NRHP), and The Colorado Historical Society Office of Archaeology and

Historic Preservation (CHS - OAHP) Colorado Inventory of Cultural Resources were reviewed to identify any listed or eligible historic properties on or within the vicinity of the property.

Summary of A&B 2017 Findings Specific to the Site

- The Site is not located within or directly adjacent to a historic district or cultural site.
- No buildings or structures are currently or have been previously located within the Site.
- The records review by A&B indicated that the eastern portion of the Site had been subject to previous cultural resource inventories that did not identify any resources within the Site.
- The A&B records review did identify four resources that were partially or completely within the larger 225 acre property to the north but are not located within the Site. These resources are the Burlington Northern Railroad (**5BL.374**) (**Eligible**), Goodhue No.1 Ditch (**5BL.2731**) (**Potentially Eligible**), Burt House/Schillawski Residence (**5BL.9249**) (**Not Eligible**), and the Haywood Mine (**5BL.10332**) (**Not Eligible**). These sites are located within the vicinity of the Site, but are well outside the Site and no disturbance is proposed to occur near any of these resources as part of the Project.
- A&B 2017 did not identify any listed or eligible historic or cultural resources within the Site.

6.0 PALEONTOLOGICAL RESOURCES

ERC completed a fossil locality file search through the University of Colorado Museum, Boulder, and the Denver Museum of Nature and Science to ascertain if paleontological resources have been previously identified in or near the Site. Through personal communication between ERC and the appropriate individuals at each museum, it was determined that none of the museum databases had fossil locality records on or within the vicinity of the Site (Personal Communication 2017). If fossils are encountered during the Project, all work in the Site shall be halted and the CDOT Regional Permitting Office and Region Planning and Environmental Manager shall be contacted immediately.

- No Paleontological Resources are known to occur in the vicinity of the Site.

7.0 AQUATIC RESOURCE DELINEATION

ERC conducted a formal routine onsite delineation of aquatic resources on March 27, 2017 to identify potential wetlands and/or waters of the US located within the Site. A complete Aquatic Resource Delineation Report is provided in **Appendix A**. The aquatic resource delineation was conducted following the methodology enumerated in the *1987 Corps of Engineers Wetlands Delineation Manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0) (herein referred to as "Supplement") (Environmental Laboratory 1987, USACE 2010)* in order to identify all potential aquatic resources that may be considered jurisdictional under Section 404 of the Clean Water Act. The aquatic resource delineation field work identified 0.646 acres of PEM wetland habitat within the Site, mapped as Aquatic Resource Z1 and Z2.

Aquatic Resources Z1 and Z2 comprise approximately 0.646 acres within the Site and consists of Palustrine emergent (PEM) wetland marsh habitat dominated by broadleaf cattail (*Typha latifolia*) with sparse patches of curly dock (*Rumex crispus*) and baltic rush (*Juncus balticus*) in the outer fringe areas. Hydrology within Aquatic Resource Z appears to be predominantly supported by groundwater and localized runoff.

Aquatic Resource Z1 is connected via culvert under an existing driveway to Aquatic Resource Z2. Aquatic Resource Z1 and Z2 appear to contain a direct surface connection to downstream traditional navigable waters (TNWs) via culvert underneath of East County Line Road, which drains to Coal Creek, and ultimately the South Platte River approximately 20 miles northeast of the Site. Therefore, Aquatic Resource Z1 and Z2 are likely considered jurisdictional waters of the US and regulated under Section 404 of the Clean Water Act.

- The Site does contain aquatic resources that are likely considered potential jurisdictional waters of the US.

8.0 CWA SECTION 404 PERMITTING

The Site has been identified to contain potentially jurisdictional waters of the US regulated under Section 404 of the Clean Water Act. A formal aquatic resource delineation report has been completed in accordance with US Army Corps of Engineers Denver Regulatory Office guidelines and is included in **Appendix A.** An impact analysis will be required that compares the final Project disturbance limits to the aquatic resource delineation boundaries in order to determine the total extent of impacts to potential waters of the US. Once impacts to potential waters of the US are quantified, the Project will likely require authorization under Section 404 of the Clean Water Act from the USACE Denver Regulatory Office.

- Project impacts to identified potential waters of the US may require authorization under Section 404 of the Clean Water Act.

9.0 UPLAND HABITAT

Upland habitat within the Site comprises a regularly mowed roadside with a continuous upland swale exhibiting entirely herbaceous vegetation at approximately 100% ground cover dominated by smooth brome (*Bromus inermis*), western wheatgrass (*Pascopyrum smithii*), English plantain (*Plantago lanceolata*) and common dandelion (*Taraxacum offcionale*) intermixed with non-dominant weedy and/or ruderal herbaceous species. No trees or shrub species are located within the Site. Soils were dry, loamy, and dark colored and no indicators of hydrology were present within the upland swale or adjacent areas at the time of the delineation. The upland swale appears to convey storm flows from Hwy 7 and surrounding upslope areas. Overall, topography across the Site consists of a highpoint on the west end of the Site, gradually sloping downward to the east - northeast. The upland swale is generally more deeply incised at the western portion of the Site and becomes less pronounced moving east. The edge of asphalt of Hwy 7 generally abuts vegetated roadside, very little gravel shoulder exists. The upland swale contains 5 culverts underneath of driveways to rural residential properties to the north of the Site. The culvert inlets and outlets were generally vegetated and/or partially filled with debris, indicating no signs of regular flow.

10.0 SUMMARY

ERC has prepared this report in compliance with the CDOT Environmental Clearance Information Summary for the Erie Gateway South Highway 7 Improvement Project. This report is only intended as an initial screening to identify potential environmental conditions that may warrant further evaluation and/or permitting. The following provides a summary of findings specific to the Project and Site and regulatory compliance.

1. No significant disturbance to wildlife subject to Colorado Parks and Wildlife regulations is anticipated within the Site as a result of the Project.

2. No significant disturbance to migratory birds subject to the Migratory Bird Treaty Act are anticipated within the Site as a result of the Project. Prior to any vegetation removal a screening for potential active nests may be warranted.

3. No disturbance to Endangered Species Act Listed species/habitats are anticipated within the Site as a result of the Project.

4. No disturbance to State listed threatened and endangered species/habitats are anticipated within the Site as a result of the Project.

5. A Cultural Resource Survey (A&B 2017) was completed for the Site and concluded that there are no cultural resources or historic properties within the Site that are listed under the National Register of Historic Places (NRHP), and/or The Colorado Historical Society Office of Archaeology and Historic Preservation (CHS - OAHP) Colorado Inventory of Cultural Resources. No disturbance to cultural resources or historic properties are anticipated within the Site as a result of the Project.

6. No Paleontological Resources are known to occur on the Site or within the vicinity of the Site.

7. Aquatic resources have been identified within the Site that are potentially considered jurisdictional waters of the US regulated under Section 404 of the Clean Water Act. A formal aquatic resource delineation has been completed. Any Project disturbances to these areas will require review and potential authorization from the US Army Corps of Engineers Denver Regulatory Office. An impact analysis will be required to determine the Project specific extent of disturbance.

This report has been prepared by:

ECOLOGICAL RESOURCE CONSULTANTS, INC.

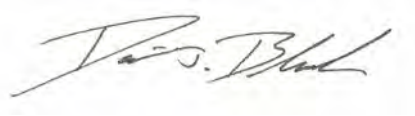


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APPENDIX A

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AQUATIC RESOURCE DELINEATION REPORT

FOR

ERIE GATEWAY SOUTH – HWY 7

BOULDER COUNTY, COLORADO

APRIL 7, 2017

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ERC Project #1000-1701

EXECUTIVE SUMMARY

This report summarizes the delineation of aquatic resources completed by Ecological Resource Consultants, Inc. (ERC) for the **Erie Gateway South – Hwy 7 Property**. ERC conducted a formal routine onsite delineation of aquatic resources within the approximately 5.7 acre survey area located in Boulder County, Colorado on March 27, 2017. A total of 0.646 acre of aquatic resources were identified and mapped within the survey area which include 0.646 acre characterized as PEM wetland habitat. In addition, ERC delineated the south side of Hwy 7 which is located outside of the survey area, but due to its close proximity to the survey area and the presence of wetland habitat was mapped for purposes of alternative planning. Approximately 0.767 acres of PEM wetland habitat was identified paralleling the survey area boundary on the south side of Hwy 7.

The aquatic resource areas were delineated and mapped as Aquatic Resources Y, Z1, and Z2. Aquatic Resource Y drains to Aquatic Resource Z2 via culvert under Hwy 7. Aquatic Resource Z1 and Z2 drain to a culvert under East County Line Road which outlets to downstream waters, Coal Creek, approximately 600 feet east of the survey area. Per USGS mapping, Coal Creek flows to Boulder Creek, St. Vrain Creek, and ultimately to the South Platte River, approximately 20 miles northeast of the survey area.

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2.0 LOCATION 1
3.0 METHODOLOGY 4
4.0 EXISTING CONDITIONS 5
4.1 LANDSCAPE SETTING 5
4.2 AQUATIC RESOURCES 5
4.3 UPLAND HABITAT 8
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Aquatic Resource Delineation Maps – Overview and Sheet 1

APPENDIX B

ERC Wetland Determination Data Forms

1.0 INTRODUCTION

This report summarizes the delineation of aquatic resources completed by Ecological Resource Consultants, Inc. (ERC) for the **Erie Gateway South – Hwy 7 Property**. The purpose of this report is to provide a formal delineation of aquatic resources within the approximately 5.7 acre survey area. This report facilitates efforts to document aquatic resource boundary determinations for verification and jurisdictional review (as needed) by the US Army Corps of Engineers (USACE).

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2.0 LOCATION

The survey area is located along Hwy 7 approximately four miles west of the intersection with Interstate 25 in Boulder County, Colorado in the Coal Creek – Boulder Creek watershed (HUC 101900050604). More specifically, the survey area is located in **Section 36, Township 1 North, Range 69 West**, in Boulder County **(40.000248° north, -105.064151° west**). From the intersection of I-25 and Hwy 7, the survey area can be accessed by heading west for approximately 4.2 miles on Hwy 7 to the intersection with East County Line Road. The survey area begins immediately west of the intersection and comprises the Hwy 7 right-of-way (ROW) extending approximately 100 feet from the edge of existing pavement on the south side of Hwy 7 to the fences of rural residential properties to the north. The survey area is bordered predominantly by the rural yards of residential homes, pastures, and open lands to the north, and the mowed roadsides of Hwy 7 and open lands to the south. Refer to **Figure 1 and Figure 2** for a location map and US Geological Survey (USGS) topographic map of the survey area.



Prepared By: ERC 5672 Jucla Drive Boulder, CO 80301 (303) 679-1820 ERC #: 1050-1701	**FIGURE 1.** **LOCATION MAP** **ERIE GATEWAY SOUTH** **HIGHWAY 7 IMPROVEMENTS** **BOULDER COUNTY, COLORADO**	0 2,000 4,000 Feet



Prepared By:
ERC
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ERC #: 1050-1701

FIGURE 2.
USGS TOPOGRAPHIC MAP

ERIE GATEWAY SOUTH
HIGHWAY 7 IMPROVEMENTS
BOULDER COUNTY, COLORADO

3.0 METHODOLOGY

The aquatic resource delineation was conducted following the methodology enumerated in the *1987 Corps of Engineers Wetlands Delineation Manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0) (herein referred to as "Supplement") (Environmental Laboratory 1987, USACE 2010).* During the field inspection, dominant vegetation was recorded, representative hydrologic indicators were noted and soil samples were examined for hydric indicators. Delineation field work for the survey area was completed on March 27, 2017. The weather during the delineation was cloudy at approximately 55 degrees Fahrenheit. At the time of the field evaluation, most vegetation growth was dormant persistent and/or beginning to emerge for the 2017 growing season. The conditions observed within the survey area were typical for the region and sufficient indicators of vegetation, soils and hydrology were observed to make a wetland determination. The following definitions provided the basis of this aquatic resource delineation.

The USACE and the Environmental Protection Agency (USEPA) jointly define wetlands as: "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" [40 CFR 230.3(t)]. Three general environmental parameters define a wetland. These parameters must include the presence of hydrophytic vegetation, hydric soils, and wetland hydrology. Except under certain situations, evidence of a minimum of one positive wetland indicator from each of the above parameters must be identified in order to make a positive wetland determination.

In addition, waters of the US are also defined as areas that *"include essentially all surface waters such as rivers, streams and their tributaries, all wetlands adjacent to these waters, and all ponds, lakes and reservoirs".* The boundaries of some waters of the US (i.e., such as streams or lakes) are further defined by the ordinary high water mark (OHWM). The OHWM is characterized as "the line on the shores established by the fluctuations of water and indicated by physical characteristics such as: a clear natural line impressed on the bank, shelving, changes in the character of the soil, wetland vegetation, the presence of litter and debris, and other appropriate means that consider the characteristics of the surrounding areas" (USACE 2005).

Areas that do not meet any one of the wetland parameters (hydrophytic vegetation, hydric soils and/or wetland hydrology) or non-vegetated stream channel/open water (OHWM) were classified as a non-wetland (upland) and mapped as such.

Any area determined to be potential waters of the US was delineated in the field with pink pin flags and ribbon identified with 'WETLAND BOUNDARY' printed on it and sequentially labeled alpha-numerically (i.e. A1, A2…).

Each wetland determination point was recorded using a hand-held Trimble GeoXH global positioning system (GPS) receiver. The resulting GPS data were post processed using GPS Pathfinder Office 5.85 software. Post processing differential correction provided an average horizontal mapping accuracy of +/- 2 feet. Post-processed GPS data were imported into ArcMap Geographic Information Systems (GIS) (Version 10.5) for spatial analysis and mapping. All aquatic resources delineated by ERC are depicted on

the Aquatic Resource Delineation Maps dated April 7, 2017 and provided as **Appendix A**. Wetland Determination data sheets are provided in **Appendix B**.

4.0 EXISTING CONDITIONS

4.1 LANDSCAPE SETTING

The survey area is situated within the Great Plains ecoregion (Bailey 1976) at an approximate elevation of 5,125 feet above mean sea level (AMSL). The vicinity of the survey area is comprised largely of agricultural land intermixed with rural residential development. Land neighboring the survey area includes agricultural land and wetland habitat to the south, and wetland habitat, agricultural land, and rural residential development to the north.

The landscape within the survey area is predominantly characterized by the Upland Grassland and Ruderal Herbaceous vegetation community and a small percentage of the survey area in the eastern portion is characterized as Western Great Plains Floodplain (Comer et al. 2003). The Western Great Plains Floodplain encompasses the aquatic resource habitat in the eastern portion of the survey area and adjacent area to the south, mapped as Aquatic Resources Y, Z1, and Z2. The majority of the survey area encompasses an upland mowed roadside swale and adjacent upland areas vegetated with grasses and ruderal herbaceous species. No trees or shrubs are located within the survey area. Topography across the survey area generally slopes to the east – northeast.

4.2 AQUATIC RESOURCES

A total of 0.646 acre of aquatic resources were delineated by ERC within the survey area (Onsite) and a total of 0.767 acre were delineated outside the survey area to the south (Offsite). Delineated aquatic resources were classified according to physical and biological characteristics using the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin Classification System) (Cowardin et al. 1979). Wetland habitat types were classified based on field evaluation and are summarized below in *Table 1. Summary of Aquatic Resources Delineated by ERC.*

A description of the aquatic resource habitat types is provided as follows. Refer to **Table 2** for a list of vegetation identified by the delineation (Lichvar et al. 2016). The Aquatic Resource Delineation Map dated April 7, 2017 is provided as **Appendix A.** Wetland Determination data sheets are provided in **Appendix B.**

Table 1. Summary of Aquatic Resources Delineated by ERC.

Aquatic Resource Name	ID	[1]Cowardin Classification	CENTROID Location (lat/long)	Onsite Acres	Offsite Acres
Y*	Y	PEM	40.000112°N, -105.062637°W	0	0.762
Z	Z1	PEM	40.000400°N, -105.062458°W	0.630	0
Z	Z2	PEM	40.000376°N, -105.062458°W	0.016	0.004
			TOTALS	**0.646**	**0.767**

Notes:
[1] Habitat Type based on Cowardin et al. 1979.
*Located outside the survey area to the south

AQUATIC RESOURCE Y (0.762 ACRE)

Aquatic Resource Y comprises PEM wetland marsh habitat with an outer fringe that can be described as a wet meadow habitat that extends south from Hwy 7. Aquatic Resource Y is located outside of the survey area to the south but parallels the southern survey area boundary for approximately 900 feet. Aquatic Resource Y has been included in this delineation report for purposes of alternative project planning. Hydrology within Aquatic Resource Y appears to be supported predominantly by groundwater and localized runoff. Aquatic Resource Y drains to a culvert near the northeastern boundary that flows to Aquatic Resource Z2, which flows to a culvert underneath of East County Line Road to the east which drains to Coal Creek, and ultimately to the South Platte River, approximately 20 miles northeast of the survey area.

Overall the vegetation community of Aquatic Resource Y is dominated by a nearly monotypic stand of broadleaf cattail (*Typha latifolia*). Species such as Baltic rush (*Juncus balticus*), curly dock (*Rumex crispus),* and reed canary grass (*Phalaris arundinacea*) are present on the outer fringe areas of the delineated portion. Outside of the delineated portion to the south, a wet meadow habitat exists dominated by a variety of grasses, sedges, and rushes. These areas contain a semi-permanently flooded water regime. The dominant species within the delineated portion consists of species designated as OBL.

Soils within Aquatic Resource Y are silty clay loam textured meeting the criteria for hydric soil indicator F3 (Depleted Matrix). At the time of the delineation, primary wetland hydrology indicators of A2 (High Water Table), A3 (Saturation), and C3 (Oxidized Rhizospheres Along Living Roots) were observed within Aquatic Resource Y, in addition to secondary hydrology indicators of D2 (Geomorphic position), and D5 (FAC-neutral test). The wetland habitat within Aquatic Resource Y meets the criteria for wetland based on the presence of hydrophytic vegetation, hydric soils, and wetland hydrology. Aquatic Resource Y comprises a total of 0.762 acre located outside the survey area to the south. Refer to **Photos 1-2** below for characteristics of Aquatic Resource Y.



Photo 1. View east of PEM wetland habitat typical of Aquatic Resource Y near the western boundary. Data points DP-Y1a (wetland) and DP-Y1b (upland) shown above. The wetland boundary begins at a culvert outlet underneath a farm access road at the left of the photo. (boundary depicted by blue line)



Photo 2. View west at the easternmost portion of Aquatic Resource Y. The culvert connection to Aquatic Resource Z2 is shown at the bottom right of the photo.

AQUATIC RESOURCES Z1 (0.63 ACRE) and Z2 (0.02 ACRE)

Aquatic Resource Z1 and Z2 comprise PEM wetland marsh habitat that extends outside the survey area to the north and is bordered on the south by Hwy 7. Hydrology within Aquatic Resources Z1 and Z2 appears to be supported predominantly by groundwater and localized runoff. Aquatic Resource Z1 flows to a culvert under an existing driveway to Aquatic Resource Z2, which flows to a culvert under East County Line Road to the east that drains to Coal Creek, and ultimately to the South Platte River approximately 20 miles northeast of the survey area.

Overall, the vegetation community of Aquatic Resource Z1 is dominated by a nearly monotypic stand of broadleaf cattail. The outer fringe of Z1 and Aquatic Resource Z2 exhibit species such as reed canary grass, curly dock, and Baltic rush. The wetland areas contain a semi-permanently flooded water regime. The dominant species within the wetland areas consists of species designated as FACW-OBL.

Soils within Aquatic Resources Z1 and Z2 are loam textured meeting the criteria for hydric soil indicator F3 (Depleted Matrix). At the time of delineation, primary wetland hydrology indicators of A1 (Surface Water), A2 (High Water Table), A3 (Saturation), and C3 (Oxidized Rhizospheres Along Living Roots) were observed within Aquatic Resources Z1 and Z2, in addition to secondary hydrology indicators of D2 (Geomorphic position), and D5 (FAC-neutral test). The wetland habitat within Aquatic Resources Z1 and Z2 meets the criteria for wetland based on the presence of hydrophytic vegetation, hydric soils, and wetland hydrology. Aquatic Resources Z1 and Z2 comprise a total of 0.646 acres within the survey area. Refer to **Photos 3-4** below for characteristics of Aquatic Resources Z1 and Z2.

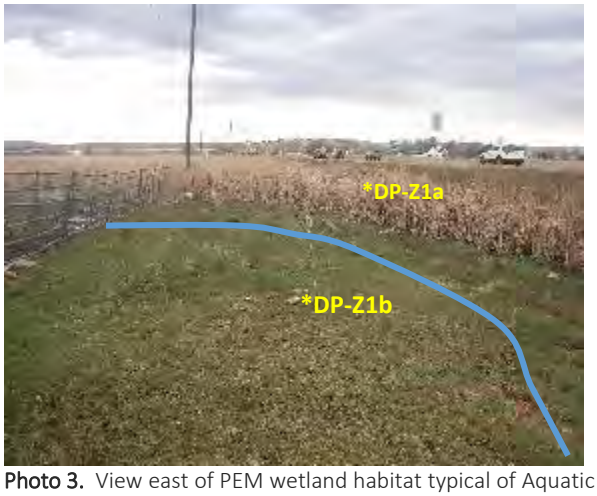


Photo 3. View east of PEM wetland habitat typical of Aquatic Resource Z1 near the western boundary (wetland boundary depicted by blue line). Data points DP-Z1a (wetland) and DP-Z1b (upland) are shown above.



Photo 4. View west at the easternmost portion of Aquatic Resource Z2 (boundary depicted by blue line). The culvert connecting Aquatic Resource Z1 and Z2 to Coal Creek is visible in the foreground of this photo.

4.3 UPLAND HABITAT

Upland habitat within the survey area consists primarily of herbaceous vegetated, mowed upland roadsides and an upland swale. According to the USGS GAP Analysis land cover data set two primary vegetation communities are associated with the survey area and include: Upland Grassland and Ruderal Herbaceous vegetation and the Western Great Plains Floodplain vegetation (Comer et al. 2003). The Western Great Plains Floodplain vegetation comprises a small portion of the survey area which comprises the wetland habitats of Aquatic Resources Y, Z1, and Z2 described above. A summary description of the Upland Grassland and Ruderal Herbaceous vegetation community which is predominant within the survey area and adjacent area to the south is provided as follows.

The Upland Grassland and Ruderal Herbaceous vegetation community encompasses all the upland habitats within the survey area. The uplands within the central and western portions of the survey area comprise regularly mowed upland roadsides exhibiting a continuous upland swale dominated by smooth brome (*Bromus inermis*), western wheatgrass (*Pascopyrum smithii*), English plantain (*Plantago lanceolata*), and common dandelion (*Taraxacum officinale*) intermixed with non-dominant grasses and ruderal herbaceous species. The upland swale contains 5 culverts under driveways to rural residential properties to the north of the survey area. Topography across the survey area generally slopes east-northeast and the upland swale is generally more deeply incised at the western portion of the Site and becomes less pronounced moving east. The inlets/outlets to the culverts are fully vegetated and/or partially filled with debris indicating no signs of regular flow. Vegetative cover across the upland areas generally comprises approximately 100% cover. No tree or shrub species are present within the survey area. The adjacent uplands on the south side of Hwy 7 outside the survey area generally exhibit the same characteristics described above.

The upland habitats across the survey area and adjacent area to the south are dominated by FAC-UPL species with dry, dark colored, gravelly loam soils. In general, the Upland Grassland and Ruderal

Herbaceous vegetation habitat across the survey area and adjacent areas did not meet the criteria for wetland based on lack of all three required parameters including hydrophytic vegetation, hydric soils, and/or wetland hydrology. Refer to **Photos 5-10** below for characteristics of upland habitat identified within the survey area.



Photo 5. View east at the upland roadsides and swale in the westernmost portion of the survey area.



Photo 6. View east at the upland swale and culvert crossing that is partially filled with debris within the western portion of the survey area.



Photo 7. View east at the vegetated upland swale and mowed roadsides characteristic of the central portion of the survey area.



Photo 8. View east at the mowed roadsides and swale with a culvert inlet under a driveway in the eastern portion of the survey area. The western boundary of Aquatic Resource Z begins at the outlet of this culvert. Approximate location of upland data point DP-U1 shown above.



Photo 9. View west at a fallow area on the south side of Hwy 7 outside the survey area. The approximate survey area boundary is depicted in red and Aquatic Resource Y boundary is depicted in blue. Upland data point DP-U3 shown above.



Photo 10. View east at the vegetated upland swale and culvert inlet partially filled with debris outside the survey area to the south. The western boundary of Aquatic Resource Y begins at the outlet of the culvert. Approximate location of upland data point DP-U2 shown above.

Table 2. Plant Species Found Within the Survey Area.

Scientific Name	Common Name	WIS*
Bromus inermis	Smooth brome	UPL
Juncus balticus	Baltic Rush	FACW
Lactuca serriola	Prickly Lettuce	FAC
Lemna minor	Common Duckweed	OBL
Pascopyrum smithii	Western-Wheat Grass	FACU
Plantago lanceolata	English Plantain	FAC
Rumex crispus	Curly Dock	FAC
Taraxacum officinale	Common dandelion	FACU
Typha latifolia	Broad-Leaf Cat-Tail	OBL

* Wetland Indicator Status (WIS) – Great Plains Regions:

OBL	= occurs in aquatic resources > 99% of time
FACW	= occurs in aquatic resources 67-99% of time
FAC	= occurs in aquatic resources 34-66% of time
FACU	= occurs in aquatic resources 1-33% of time
UPL	= occurs in uplands > 99% of time

WIS Source: Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List*: 2016 wetland ratings. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X http://www.phytoneuron.net/

This report has been prepared by:

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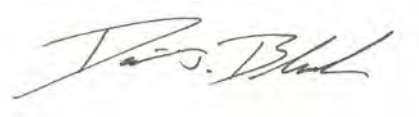


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5.0 REFERENCES

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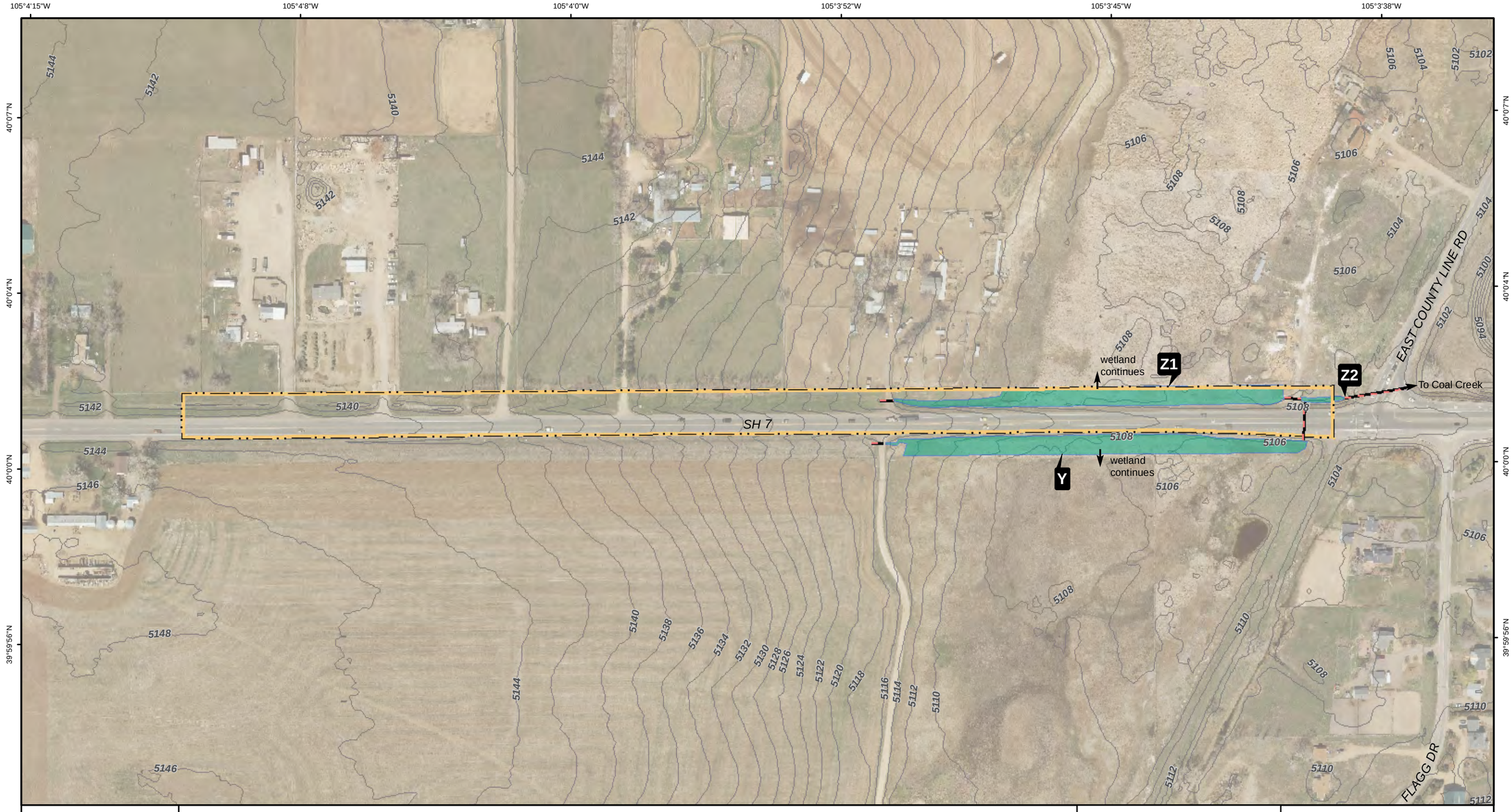
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APPENDIX A



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ERC # 1000-1701

ERC Survey Area Boundary: 5.66 AC

Aquatic Resource Boundary

Culvert

2' elevation contour (existing)

Aquatic Resource	ID	[1]Cowardin Classification	Location (lat/long)	Onsite Acres	Offsite Acres
Z	Z1	PEM	40.000400°N, 105.062458°W	0.630	0
Z	Z2	PEM	40.000376°N, 105.060890°W	0.016	0.004
Y	Y	PEM	40.000112°N, 105.062637°W	0	0.762
TOTALS				**0.646**	**0.767**

AQUATIC RESOURCE DELINEATION MAP

ERIE GATEWAY SOUTH – HIGHWAY 7 IMPROVEMENTS (OVERVIEW)

BOULDER COUNTY, COLORADO

DATE: APRIL 7, 2017

1 inch = 200 feet

0 200 400

Feet

105°3'52"W 105°3'45"W 105°3'37"W

40°0'4"N 40°0'0"N

Z1 Z2 Y

wetland continues

wetland continues

Z1 START Z2 DP-Z1B DP-Z1A DP-U1 DP-U2 DP-Y1A DP-Y1B DP-U3 Y25 END

SH 7(BASELINE RD)

EAST COUNTY LINE RD()

To Coal Creek

Prepared By:

ERC

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Boulder, CO 80301
(303) 679-4820

ERC # 1000-1701

- ERC Survey Area Boundary: 5.66 AC
- Aquatic Resource Boundary
- Data Point
- Field Flag Point
- Culvert

Aquatic Resource	ID	[1]Cowardin Classification	Location (lat/long)	Onsite Acres	Offsite Acres
Z	Z1	PEM	40.000400°N, 105.062458°W	0.630	0
Z	Z2	PEM	40.000376°N, 105.060890°W	0.016	0.004
Y	Y	PEM	40.000112°N, 105.062637°W	0	0.762
TOTALS				0.646	0.767

Sheet 1 extent

NORTH

AQUATIC RESOURCE DELINEATION MAP

ERIE GATEWAY SOUTH – HIGHWAY 7 IMPROVEMENTS (SHEET 1 OF 1)

BOUNDER COUNTY, COLORADO

DATE: APRIL 7, 2017

1 inch = 80 feet

0 80 160

Feet

APPENDIX B

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Gateway South - Hwy 7 City/County: Boulder County Sampling Date: 3/27/17

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-U1

Investigator(s): K. Medash Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Footslope Local relief (concave, convex, none): Concave Slope (%): 2-4%

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.000360° N Long: -105.064370° W Datum: NAD83

Soil Map Unit Name: AcC - Ascalon snady loam, 3 to 5 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

Upland located in a vegetated roadside swale in the eastern portion of the survey area. Located at upslope end of culvert inlet that flows to Aquatic Resource Z.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Bromus inermis	70	Yes	UPL
2. Taraxacum officinale	20	Yes	FACU
3. Plantago lanceolata	10	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

Vegetation appears to regularly mowed and was starting to emerge for the 2017 growing season at the time of the delineation. Does not meet the criteria for hydrophytic vegetation.

SOIL

Sampling Point: DP-U1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-8	10YR 3/2	100					Silt loam	
8-20	10YR 3/2	100					Clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

Soils were dry and loamy with little gravel, lower portion had higher clay content. Does not meet the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Data point located in an upland drainage swale that was fully vegetated and showed no signs of hydrology and/or regular flow. Does not meet the criteria for wetland hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Gateway South - Hwy 7 City/County: Boulder County Sampling Date: 3/27/17

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-U2

Investigator(s): K. Medash Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope (%): 2-4%

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.000171° N Long: -105.064528° W Datum: NAD83

Soil Map Unit Name: AcC - Ascalon sandy loam, 3 to 5 percent slopes NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:
Upland located in a mowed roadside swale, upslope of the culvert inlet that flows to Aquatic Resource Y.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Bromus inermis	90	Yes	UPL
2. Rumex crispus	10	No	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:
Vegetation is a monoculture of smooth brome with few sporadic patches of curly dock. Does not meet the criteria for hydrophytic vegetation.

SOIL

Sampling Point: DP-U2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/2	100					Gravelly loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: Coarse Fragments

Depth (inches): 12"+

Hydric Soil Present? Yes _____ No ✓

Remarks:

Soils were gravelly with rock fragment refusal at 12" likely due to close proximity to Hwy 7 ROW. Does not meet the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Data point located in a upland vegetated swale with no indicators of wetland hydrology or regular flow. Does not meet the criteria for wetland hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Gateway South - Hwy 7 City/County: Boulder County Sampling Date: 3/27/17

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-U3

Investigator(s): K. Medash Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Toeslope Local relief (concave, convex, none): Convex Slope (%): 2-4%

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.000106° N Long: -105.060954° W Datum: NAD83

Soil Map Unit Name: Lv - Loveland soils NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:
Upland located in an unmowed fallow roadside area adjacent to the eastern boundary of Aquatic Resource Y.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Bromus inermis	60	Yes	UPL
2. Pascopyrum smithii	20	Yes	FACU
3. Latuca serriola	15	No	FAC
4. Rumex crispus	5	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:
Vegetation community is representative of the fallow areas around the eastern boundary of Aquatic Resource Y. Does not meet the criteria for hydrophytic vegetation.

SOIL

Sampling Point: DP-U3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-10	10YR 3/2	100					Gravelly loam	
10-20	10YR 3/3	100					Clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

Soils had significant amount in gravel in upper portion likely due to close proximity to Hwy 7 ROW. Does not meet the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Data point located upslope at slightly higher elevation than Aquatic Resource Y. No hydrology indicators observed. Does not meet the criteria for wetland hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Gateway South - Hwy 7 City/County: Boulder County Sampling Date: 3/27/17

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-Y1a

Investigator(s): K. Medash Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 2-3%

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.000148° N Long: -105.064101° W Datum: NAD83

Soil Map Unit Name: AcC - Ascalon sandy loam, 3 to 5 percent slopes NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

PEM wetland comprising cattail marsh and wet meadow habitat directly off the south side of Hwy 7, bordered by agricultural land. Data point taken near the western wetland boundary. Aquatic Resource Y drains to a culvert under Hwy 7, which flows to Aquatic Resource Z, which flows to Coal Creek and ultimately the South Platte River approximately 20 miles northeast of the survey area. Pair with upland data point DP-Y1b.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Typha latifolia	60	Yes	OBL
2. Juncus balticus	40	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

Vegetation community was a nearly monotypic stand of cattails throughout much of the resource; however, there was a significant dryer outer fringe exhibiting species of grasses, sedges, and rushes, mainly outside the delineated portion to the south. Meets the criteria for hydrophytic vegetation.

SOIL

Sampling Point: DP-Y1a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-20	2.5Y 3/1	75	7.5YR 4/4	25	C	PL, M	Silty clay loam	Prominent concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

Soils were loamy and mucky throughout the profile. Meets the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ✓ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ✓ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ✓ No ___ Depth (inches): 4

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Soil saturation observed throughout most of the delineated resource. Surface water observed downslope of data point location (east) within monocultures of cattails. Culvert observed draining the wetland at the eastern end that flows to Aquatic Resource Z, Coal Creek, and ultimately the South Platte River. Meets the criteria for wetland hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Gateway South - Hwy 7 City/County: Boulder County Sampling Date: 3/27/17

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-Y1b

Investigator(s): K. Medash Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%): 2-3%

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.000087° N Long: -105.064208° W Datum: NAD83

Soil Map Unit Name: AcC - Ascalon sandy loam, 3 to 5 percent slopes NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:
Upland located in a roadside unmowed fallow area adjacent to Aquatic Resource Y. Pair with wetland data point DP-Y1a.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Pascopyrum smithii	50	Yes	FACU
2. Bromus inermis	20	Yes	UPL
3. Lactuca serriola	20	Yes	FAC
4. Rumex crispus	10	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:
Vegetation community is typical of the unmowed fallow upland areas around the perimeter of Aquatic Resource Y. Does not meet the criteria for hydrophytic vegetation.

SOIL

Sampling Point: DP-Y1b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-10	10YR 3/3	100					Clay loam	
10-20	10YR 3/2	100					Silty clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

Soils had high clay content and were relatively uniform in color throughout the profile. Does not meet the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology indicators observed. Data point located upslope at higher elevation than adjacent Aquatic Resource Y. Does not meet the criteria for wetland hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Gateway South - Hwy 7 City/County: Boulder County Sampling Date: 3/27/17

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-Z1a

Investigator(s): K. Medash Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Toeslope Local relief (concave, convex, none): Concave Slope (%): 1-2

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.000392° N Long: -105.063241° W Datum: NAD83

Soil Map Unit Name: Lv - Loveland soils NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

PEM Wetland marsh habitat situated in a natural depression directly off the north side of Hwy 7, wetland extends outside survey area to the north. Appears to drain via culvert to Coal Creek approximately 600 feet east of the survey area, and ultimately to the South Platte River. Pair with upland data point DP-Z1b.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Typha latifolia	90	Yes	OBL
2. Lemna minor	5	No	OBL
3. Juncus balticus	5	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

Vegetation community is a nearly monotypic stand of broadleaf cattail throughout the entire resource. Areas of surface water contained aquatic species of common duckweed. Dryer outer fringe contained curly dock and baltic rush. Meets the criteria for hydrophytic vegetation.

SOIL

Sampling Point: DP-Z1a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-20	2.5 Y 3/1	75	7.5 YR 4/4	25	C	PL, M	Loam	Prominent concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

Soils were loamy and mucky throughout the profile. Some areas of Manganese concentrations also visible. Meets the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ✓ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ✓ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 1

Water Table Present? Yes ✓ No ___ Depth (inches): 2

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Hydrology within the wetland appears to be predominantly supported by groundwater. Data point taken near outer fringe, deeper surface water was observed within the wetland to the east. Meets the criteria for wetland hydrology.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Erie Gateway South - Hwy 7 City/County: Boulder County Sampling Date: 3/27/17

Applicant/Owner: OEO, LLC State: Colorado Sampling Point: DP-Z1b

Investigator(s): K. Medash Section, Township, Range: S36, T1N, R69W

Landform (hillslope, terrace, etc.): Footslope Local relief (concave, convex, none): Convex Slope (%): 2-3

Subregion (LRR): Western Great Plains (LRR G) Lat: 40.000426° N Long: -105.063404° W Datum: NAD83

Soil Map Unit Name: Lv - Loveland soils NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

Upland located in a mowed roadside adjacent to horse pasture and a large PEM wetland complex. Hydric soils likely present due to close proximity to wetland. Data point located in a convex landscape position at a higher elevation than the wetland and is dominated by upland vegetation. Pair with wetland data point DP-Z1b.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Bromus inermis	40	Yes	UPL
2. Taraxacum officinale	30	Yes	FACU
3. Plantago lanceolata	20	Yes	FAC
4. Rumex crispus	10	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC–): 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✓

Remarks:

Vegetation community is representative of the mowed vegetation adjacent to wetland complex, likely why FAC species are present. Does not meet the criteria for hydrophytic vegetation.

SOIL

Sampling Point: DP-Z1b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 4/1	80	7.5YR 4/6	20	C	M	Clay loam	Prominent concentrations
10-20	10YR 5/1	80	7.5YR 4/6	20	C	M	Clay loam	Prominent concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR F**)
- ___ 1 cm Muck (A9) (**LRR F, G, H**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 2.5 cm Mucky Peat or Peat (S2) (**LRR G, H**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR F**)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ High Plains Depressions (F16) (**MLRA 72 & 73 of LRR H**)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR I, J**)
- ___ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ___ Dark Surface (S7) (**LRR G**)
- ___ High Plains Depressions (F16) (**LRR H outside of MLRA 72 & 73**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

Hydric soils likely present due to close proximity to a large wetland complex. Meets the criteria for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Dry-Season Water Table (C2)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where not tilled**)
- ___ Presence of Reduced Iron (C4)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Oxidized Rhizospheres on Living Roots (C3) (**where tilled**)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)
- ___ Frost-Heave Hummocks (D7) (**LRR F**)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ___ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology indicators observed at the data point location. Data point is located upslope of the wetland boundary in a convex landscape position with mowed upland vegetation. Does not meet the criteria for wetland hydrology.

CTL | THOMPSON INCORPORATED

PHASE I ENVIRONMENTAL SITE ASSESSMENT
ERIE ASSEMBLAGE – MCDONALD PROPERTY
12329 BASELINE ROAD
BOULDER COUNTY, COLORADO

Prepared for:

OEO, LLC
7353 South Alton Way
Suite A-100
Centennial, Colorado 80112

Attention: Corey Elliott

Project No. DN48,284-200

May 31, 2016

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EXECUTIVE SUMMARY

This report presents the results of the Phase I Environmental Site Assessment (ESA) that was performed by CTL | Thompson, Inc. for the Erie Assemblage – McDonald Property (Site). The Site is generally located northwest of the intersection of County Line Road and Baseline Road in Boulder County, Colorado.

The Phase I ESA was conducted in general conformance with the methods and procedures described in the American Society for Testing and Materials (ASTM) E 1527-13, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.

The Site and adjacent area appear to have remained in residential and agricultural or rangeland use since potentially the late 1800s to early 1900s. Mining activity was apparent in the area in the early 1900s. In an aerial photograph from 1937, there was a home with potential outbuildings visible on the Site. Oil and gas development began in the area in the the early 1990s.

We did find evidence of recognized environmental condition in connection with the Site:

- The presence of one active oil/gas well/facility on or adjacent to the northeast portion of the Site.

In addition, we observed at least two sections of cementitious pipe buried (in use for drainage) on or adjacent to the northeast portion of the Site. This pipe may contain asbestos and we recommend, if it will be disturbed during redevelopment, that it be properly tested, removed and disposed of by a General Abatement Contractor. We emphasize that asbestos is not typically included in the scope of a Phase I ESA, and this observation does not constitute a full asbestos survey of the Site. We do not believe

that the existence of this pipe rises to the level of an REC, but rather represents a business environmental risk or concern.

This executive summary does not contain all the information that is found in the full report. The report should be read in its entirety to obtain a more complete understanding of the information provided and to aid in any decisions made or actions taken based on this information.

1.0 INTRODUCTION

This report was prepared by CTL | Thompson, Inc. (CTL) for OEO, LLC, and presents the results of the Phase I Environmental Site Assessment (ESA) for the Erie Assemblage – McDonald Property. The Site totals approximately 33 acres and is located generally north of Baseline Road and west of the Boulder/Weld County Line Road. The Phase I ESA was conducted in general accordance with CTL's Proposal Number DN15-0338 and subsequent authorization by Mr. Matt Janke on April 5, 2016.

1.1 Purpose

The purpose of the Phase I ESA was to identify Recognized Environmental Conditions (REC), to the extent feasible, pursuant to the methods and procedures described in the American Society for Testing and Materials (ASTM) Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessments, E 1527-13.

An REC is defined as the presence or likely presence of hazardous substances or petroleum products on a Site under conditions that indicate an existing release, a past release, or a material threat of a release of hazardous substances or petroleum products into structures on the Site or into the ground, groundwater, or surface water of the Site. The term includes hazardous substances or petroleum products even under conditions in compliance with laws. The term is not intended to include de minimis conditions that generally do not present a material risk of harm to public health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.

ASTM Standard E1527-13 also has separate definitions for past conditions that would otherwise be considered an REC but have been addressed to the satisfaction of the applicable regulatory agencies and would either allow for generally unrestricted use of the Site (referred to as a Historic Recognized Environmental Condition, or HREC) or

for use of the Site with various restrictions (referred to as a Controlled Recognized Environmental Condition, or CREC).

1.2 Scope of Services

The scope of services for this assessment consisted of a records review, a Site reconnaissance, historical research, interviews, and documentation of findings in a report.

1.3 Limitations

This Phase I ESA was prepared in general accordance with ASTM Standard E 1527-13. There may be additional environmental issues present at the Site that are outside the scope of this practice that include, but are not limited to, the following:

- Asbestos-containing materials;
- Radon;
- Lead-based paint;
- Lead in drinking water;
- Mold and fungi;
- Industrial hygiene;
- Indoor air quality;
- Health & safety;
- Ecological resources;
- Biological or infectious agents and pathogens;
- Regulatory compliance;
- High voltage power lines; and,
- Mine subsidence.

CTL provided an opinion based upon the condition of the Site on the day it was observed and a review of existing and reasonably ascertainable regulatory records and historical information. Our scope did not include chemical testing of soil, groundwater, air, or building materials. The opinion, conclusions, and recommendations of this report are not intended to be used or relied upon by a third party to this Agreement. With the

written consent of our client, CTL may be available to contract with other parties to provide an opinion or conduct additional environmental assessment services. Due to latent conditions and other contingencies which may become evident in the future, the current assessment does not result in any guarantee the subject Site is free and clear of hazardous materials. Should additional surface, subsurface or chemical data become available, the conclusions and recommendations contained in this report shall not be considered valid unless the data is reviewed and the conclusions of this report are modified or approved in writing by our firm.

We believe that this investigation was conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the locality of the project. No warranty, express or implied, is made.

2.0 SITE DESCRIPTION AND LOCATION

2.1 Location and Description

The "Site" is generally located northwest of the intersection of Baseline Road and the Boulder/Weld County Line Road, within unincorporated Boulder County, Colorado. The Site consists of one parcel located in the South ½ of the Southeast ¼ of Section 36, Township 1 North, Range 69 West of the 6th Principal Meridian, totaling approximately 33 acres. The Site location and plan are shown on Figure 1 (Area Map) and Figure 2 (Site Plan).

2.2 General Description of Site and Improvements

The Site is an equestrian related property with associated animal shelters, pens and corrals. There is one house, a barn, a horse arena observation structure, outbuildings, and multiple trailers. There is one oil and gas well with associated equipment lo-

cated on or adjacent to the northeast portion of the Site. A photographic record of our Site reconnaissance is presented in Appendix A.

2.3 General Uses of Adjoining Properties

The Site is located in a generally rural area. The adjoining properties generally consist of transportation corridors, vacant land, farm properties and oil/gas facilities. Additional details regarding our observations of adjacent properties are presented in Section 7.4 of this report.

3.0 USER PROVIDED INFORMATION

Mr. Corey Elliott of OEO, LLC (OEO) is the user/client contact. Mr. Elliott responded to our environmental questionnaire on April 19, 2016. Mr. Elliot informed us that the current owner representative for the property is Mr. Bryce McDonald. We made multiple attempts to contact Mr. McDonald, but as of the writing of this report, we have not received a response. The responses of Mr. Elliot are summarized in the following section.

3.1 Environmental Liens/Title Records

An environmental lien is a charge, security, or encumbrance upon title to a property to secure the payment of a cost, damage, debt, obligation, or duty arising out of response actions, cleanup, or other remediation of hazardous material or petroleum products upon a property. Mr. Elliott was not aware of existing environmental liens on the Site.

CTL was provided title documents for review. We reviewed the title commitment prepared by First American Commitment Title Insurance Company, Numbers NCS-773939-CO (March 29, 2016). We searched for obvious evidence of environmental liens which would be expected to be listed in Schedule B – Section 2, Exceptions. Our

review did not discover obvious environmental liens. We are not title experts and we assume that the client/user of this Phase I ESA is conducting current title work per typical due diligence on the part of a property buyer.

3.2 Activity and Use Limitations

Environmental AULs are legal or physical restrictions or limitations on the use of, or access to, a Site or facility to: 1) reduce or eliminate potential exposure to hazardous substances or petroleum products in the soil or groundwater on the property, or 2) prevent activities that could interfere with the effectiveness of a response action, in order to ensure maintenance of a condition of no significant risk to public health or the environment. These legal or physical restrictions may include engineering controls, institutional controls, or land use restrictions. Mr. Elliott was not aware of recorded environmental AULs related to the Site.

3.3 Specialized Knowledge

Mr. Elliott was not aware of specialized knowledge or experience related to previous environmental activities on the Site.

3.4 Valuation Reduction for Environmental Issues

Mr. Elliott was not aware of valuation reduction of the Site because of environmental issues.

3.5 Commonly Known or Reasonably Ascertainable Information

Mr. Elliott was not aware of commonly known or reasonably ascertainable information regarding environmental issues related to the Site.

3.6 Reason for Performing a Phase I ESA

Mr. Elliott requested a Phase I ESA prior to acquisition of the Site.

3.7 Previous Environmental Site Assessments

Mr. Elliot was not aware of previous environmental assessments of the Site.

4.0 RECORDS REVIEW

CTL reviewed existing sources listed in the **REFERENCES** section to assess the soils, geologic and hydrogeologic conditions of the general vicinity of the Site.

4.1 Physiography

The Site is located on predominantly flat terrain, as presented on the topographic area map (Figure 1). The elevation is approximately 5120 feet above mean sea level. The predominant surface water feature in the vicinity of the Site is Coal Creek which is located within approximately 500 feet from the most eastern point of the Site, flowing generally north.

4.2 Geology and Soils

According to our concurrent geotechnical study of the Site (Project DN48,284-115), the soils generally consist of clay, sandy material underlain by silty/sandy gravel and weathered claystone bedrock. This report should be consulted for more detailed information.

4.3 Groundwater

It is our experience that the flow direction of shallow, unconfined groundwater is generally controlled by topography. Based on topography, we estimate the general direction of groundwater flow below the Site is to the east. Topographic data suggests areas up-gradient of the Site are generally to the west. Based on our concurrent geotechnical study of the Site (Project DN48,284-115), groundwater was first encountered in our borings at depths of 4 to 12 feet. Groundwater levels will likely fluctuate seasonally and may rise in response to precipitation and landscape irrigation.

4.4 Water Wells

Water wells are generally identified through the Colorado Division of Water Resources online water well permit database. There are at least 3 records of water wells for the Site. All three are registered for domestic use. If a well is located during development and if it is no longer planned for use, it must be properly abandoned.

4.5 Oil/Gas Wells

Oil and gas wells are identified through the Colorado Oil and Gas Conservation Commission (COGCC) online database. The database indicates the presence of one active well adjacent to the northeast portion of the Site.

The Donley #2-36 is an active well near the northeast corner of the Site, and is operated by Extraction Oil & Gas, LLC. A tank battery is also located here and is discussed in more detail in Section 7.0. The well was drilled in 1992. There are no records of releases, and a 2015 inspection revealed no violations.

In our experience, there is generally no third party oversight and soil sampling for oil/gas exploration, as there is with, for example, regulated underground fuel tanks. The presence of an active well, along with the active storage and separation equipment, are

an REC for the Site, in our opinion. This is based on our previous experience with oil/gas well sites.

4.6 Physical Setting Analysis of Migration of Hazardous/Petroleum Substances

A hypothetic spill of a hazardous or petroleum substance on the Site would be expected to migrate along the ground surface to the east. Off-Site surface spills on the adjoining parcels to the west appear to have the highest potential to migrate on-Site. Based on local topography, we estimate groundwater generally flows to the east. Sources of contamination to groundwater beneath the Site, if present, would most likely be located to the west.

5.0 HISTORICAL USE INFORMATION

5.1 Historical Aerial Photographs and Topographic Maps

Historical aerial photographs of the Site and surrounding area were reviewed for 1937, 1948, 1953, 1966, 1971, 1978, 1983, 1993, 1999, 2005, 2010, 2015 and 2016; a copy of the 2015 photograph is presented in Appendix B. USGS topographic maps were reviewed for 1904, 1950, 1967, 1971 and 1979. An interpretation of the aerial photographs and maps is presented, as follows:

- 1904: The Site appears as predominantly vacant land. A railroad line is depicted on the north portion of the Site with two spurs, one north, the south, on the northeast Site corner. Baseline Road is shown bordering the south side of the Site. The Gladstone Mine is depicted to west of the Site. County Line Road (Boulder/Weld) is depicted to the east of the Site. A rural home or farmstead is potentially depicted on the Site.

- 1937-1953: A rural home/farmstead is now visible on the southwest portion of the Site, with one or more potential outbuildings. Additional rural homes/farmsteads are visible to the north, east and southeast.

- 1966-1971: The Site remains generally unchanged. Additional rural homes/equestrian properties are visible to the west. The water treatment plant to the east, on the opposite side of County Line Road, is now visible.

- 1978-1983: The Site appears to be generally unchanged. The south railroad spur on the northeast site corner is less visible. A rural home is now visible on the adjacent property to the east. Buildings associated with the Erie Municipal Airport are now visible to the east.

- 1993-1999: The Site is generally unchanged. The oil/gas facility adjacent to/on the northeast corner of the Site is now visible.

- 2005: Additional outbuildings/trailers or sheds are visible on the Site. The Site appears to be equestrian in nature. The surrounding area remains generally unchanged.

- 2010-2016: Additional outbuildings/trailers or sheds are once again visible on the Site. The surrounding area remains generally unchanged. The Site appears generally as it does today.

5.2 Sanborn Fire Insurance Maps

Sanborn fire insurance maps were a tool used by the fire insurance industry to evaluate property risk. The maps often show details of historic dwellings, commercial buildings, and factories, indicate property uses and addresses, and show locations of items such as wells, cisterns, and fuel storage tanks. Sanborn Fire Insurance Map coverage was not available for the Site and surrounding area.

5.3 Cultural Features Map

The 1938/41 cultural features map shows the Site with a rural residence located on the southwest corner of the Site. The railroad is present on the northern portion of the Site. Major roads generally corresponding with section lines are present. The Town of Erie is present within four miles to the north. This mapping generally conforms to the photographs from the 1930s and 1940s.

5.4 Historical City Directories

Due to the predominant use of the Site for residential/agricultural use, historic city directories were not reviewed for the Site.

5.5 Assessor Records

We reviewed Boulder County Assessor online files for the Site. Records indicate the Site is owned by Linn S. McDonald. Records indicate that the Site contains one house built in 1879, totaling approximately 2,136 square feet. Records also indicate that the Site contains one farm utility building, one equipment shed, and one open cattle shed.

6.0 REGULATORY AGENCY RECORDS

Regulatory agency records were provided by GeoSearch™. The report, dated April 15, 2016, is presented in Appendix C.

6.1 Summary of Findings

Table I presents a summary of select regulatory agency records findings provided by GeoSearch™. The findings presented in Table I are those that were determined to be topographically up-gradient and in near proximity to the Site to warrant further discussion. All findings in the regulatory database are presented in the GeoSearch™ report in Appendix C. The findings and their locations are listed by address along with a description of their distance and topographic location in relation to the Site.

Table I
Summary of Select Regulatory Agency Findings

Findings	Distance and Estimated Topographic Location	Search Radius												
		1 Mile		½ Mile					¼ Mile					
		National Priority List (NPL)	RCRA CORRACTS	RCRA Treatment, Storage, Dis-	CERCLIS/NFRAP	Colorado Voluntary Cleanup List	Solid Waste	Leaking Underground Storage	Registered Tanks (UST/AST)	Institutional Controls/Engineering	Spills (ERNS)	RCRA Generator	Other
12329 Baseline Road	On-Site										X		
Noble Energy Battery Section 36-1N-69W	Adjacent North	Air Emission Permit – Search not Needed per ASTM. This feature is a REC and is discussed in Section 7.0											
Colo. Hwy 7 & County Line Rd.-NE Corner	500 feet east Down-gradient										X		
Falcon Properties/Crockett & Kelly Inc. 1001 WCR1	Mismapped – actual location 2 miles north		X					X	X			X	
Waste Water Plant 750 East County Line Road	Adjacent, northeast Down-gradient										X		
Erie Municipal Airport 395 Airport Drive	0.55 miles northeast Down-gradient							X	X				

It should be noted that in addition to the findings presented in Table I, the GeoSearch™ Report indicated 14 unmapped findings that are unaddressed but potentially in the vicinity of the Site. Two of the listings appear to be related to oil/gas facility air emission permits. The other listings are mostly for historical solid waste dumps where the address information is very incomplete and the records are often very old and limited. Neither these nor the other remaining listings, which include LSTs and a Spill, could be assessed due to the lack of locational information.

6.1.1 Leaking Storage Tanks (LST) Facilities

The Colorado Department of Labor and Employment (CDLE) regulates active and inactive LST findings which have been reported to the state. There was one LST finding listed within ½ mile of the Site.

- The Erie Municipal Airport has a LST listing associated with three Underground Storage Tanks (USTs) that were removed from the property. In June 1997 the tanks were removed and approximately 300 gallons of free phase petroleum product was encountered beneath the tanks. After the free phase product was removed approximately 700 cubic yards of petroleum impacted soil were removed from the excavation and stored onsite to be landfarmed prior to being replaced. Groundwater samples collected indicated that the groundwater had not been impacted. Regulatory closure status was issued in November 1999.

Due to distance from the Site, down-gradient location and regulatory status we do not believe this listing presents a REC for the Site.

6.1.2 Spills

The Colorado Department of Public Health and Environment's Division of Emergency Preparedness and Response maintains this listing of chemical spills and/or releases. There were five Spills findings listed within 1/4 mile of the site:

- The first listing is associated with the Site. In March of 2009 someone reported that water contaminated with manure was draining out of a horse corral on the Site and entering the adjacent wetland area. It is noted that Boulder County Public Health was looking into issuing a citation. No other information is provided. Due to the non-hazardous nature of this listing, we do not believe that it represents a REC for the Site.

- Three of the listings are from the Lafayette Wastewater Treatment Plant. The first Spill, from March 2003 was a truck which accidentally released approximately 3,000 gallons of digested sludge into Coal Creek. The second listing is from June of 2004 when a valve was left open on a lift station overnight which resulted in a release of approximately 10,000 gallons of bio-solids (sludge), which eventually entered Coal Creek. The third event occurred in October 2012 when E. Coli levels were in exceedance of

standards for several days before they could be adjusted to below effluent standards. These listings impacted Coal Creek which does not flow through the Site. We do not believe these incidents rise to the level of an REC for the Site.

- The fifth and final Spill listing is related to a release of approximately 50 gallons of diesel fuel at the northeast corner of Highway 7 (Baseline Road) and County Line Road in March of 2004. According to the listing, Custom Environmental was dispatched to the scene to contain and cleanup the material. Due to the given location information of this event, we do not believe it represents a REC for the Site.

6.2 Local Government Records

We have contacted the Boulder County Public Health Department in the past and they have directed us to the Boulder County Hazardous Waste Map. This map shows listings for hazardous waste sites, historic dumps, mines and mills. There were no listings for the Site. There is a coal mine (Haywood) located adjacent to the northeast; however, it does not appear to extend to within Site boundaries. There is also an illegal dump site depicted on the adjacent parcel to the east.

We contacted the Lafayette Fire Department, via email on April 13, 2018 in regards to hazardous material spills on or adjacent to the Site. The Fire Department responded on April 13, 2016 and stated that there have been no responses related to the Site in the last 34 years. A copy of their response is presented in Appendix D.

7.0 SITE RECONNAISSANCE

The following section discusses observations made during our Site reconnaissance.

7.1 Methodology and Limiting Conditions

Our Mr. Trevor Truett and Mr. Trevor Branch conducted a Site visit on May 13, 2016. Baseline Road provided access to the Site. The majority of the Site was accessed by walking. A photographic record of the Site reconnaissance is presented in Appendix A. We note that we did not observe the interior of the on-Site house, as well as the interior of at least one of the on-Site outbuildings. This was due to accessibility and/or issues involving the current tenant of the property.

7.2 Description of Site Structures and Roads

The Site contains one residence, a barn, at least one shed, an arena observation structure, as well as multiple animal shelters, pins, corrals and trailers. There are no roads on the Site. The Site appears to be associated with an equestrian related business.

7.3 Site Observations

During our reconnaissance, we specifically looked for obvious evidence of the Site features listed in Tables II and III. Table II lists features typically observed on the exterior of structures and Table III lists features typically observed inside of Site structures. An “X” located within the table indicates that the feature was readily observable during our visit. Those features which were observed on the Site are discussed in further detail within the following subsection(s).

Table II
Exterior Site Features

X	Aboveground Storage Tanks		Stained Soil and/or Pavement
	Air Emissions Sources	X	Stockpiles of Soil or Debris
	Cultivated Land/Crops		Stressed Vegetation
	Drains, Sumps, Pits	X	Surface Water, Streams, Ponds, Lagoons
	Hazardous Material Storage	X	Transformers (Potential PCB)
	High Power Transmission Lines		Underground Storage Tanks
	Natural Gas Pipelines		Unidentified Piping Below Grade
	Odors	X	Unidentified Substance Containers
	Petroleum Pipelines		Vehicle Maintenance Areas
	Physical Irregularities		Waste Water Discharge
	Placed Fill or Imported Soils		Waste Treatment Processes
X	Railroad Lines	X	Wells (Agricultural, Water Supply)
X	Septic Systems or Leach Fields		Wells (Monitoring)
	Solid Waste or Disposal Areas	X	Wells (Oil or Natural Gas)

Table III
Interior Site Features

	Boilers	X	Hazardous Material Storage
	Chemical Mixing/Use Areas		Heating and Cooling Systems
	Drains or Sumps		Hydraulic Lifts
	Elevators		Incineration Areas
	Emergency Generators		Odors
	Equipment Maintenance Areas		Staining or Corrosion
	Exhaust Hoods and Ducting		Unidentified Substance Containers

7.3.1 Stockpiles of Soil or Debris

We observed one or more pile/area containing what appeared to be refuse. This pile/area generally appeared to contain wood, metal, plastic and empty plastic containers (assumed). We also observed a refrigerator. We do not believe that this represents a REC for the Site; however, these materials should be disposed of properly.

7.3.2 Gas Wells/Aboveground Storage Tanks/Petroleum Pipelines

We observed one active gas well adjacent to the northeast portion of the Site. This well facility contained one 300-barrel capacity aboveground storage tank, which

may be located on the Site. We also observed evidence of petroleum pipelines associated with the well. We believe the presence of this facility on or adjacent to the Site presents an REC for the Site.

7.3.3 Wells (Agricultural, Water Supply)/Septic Systems or Leach Fields

We observed evidence of a potential water well or septic tank on the Site to the north of the residence in the form of a concrete access lid. We do not believe the potential existence of these features present an REC for the Site; however, we do recommend that septic systems/water wells no longer in use be properly abandoned.

7.3.4 Surface Water, Streams, Ponds and Lagoons

The eastern portion of the Site appears to be inundated with water, as we observed a significant amount of aquatically related plant and animal life. There is a pond on the northeast portion of the Site. We did not observe an obvious sheen or odor associated with these features. We do not believe these features represent a REC for the Site.

7.3.5 Railroad Lines

We observed an out of service railroad line on and/or adjacent to the north portion of the Site. We believe that this railroad line was likely associated with the mining activity in the area. We do not believe that the existence of this railroad line represents a REC for the Site; however, the possibility of slag (heavy metals) sometimes used as railroad line ballast and creosote, used as preservative for railroad ties, may be a disposal concern if this area will be disturbed during development.

7.3.6 Hazardous Material Storage/Unidentified Substance Containers

Inside of the barn, we observed multiple quart or less containers of paint, lubricants, oil, solvents and other typical household chemicals. We also observed at least six or more five-gallon or less containers of gasoline, two compressed gas cylinders and multiple one-gallon or more containers of paint, cleaners, oil and equestrian related products. We do not believe that the existence of these materials constitutes a REC for the Site.

In the outdoor areas we observed multiple 20-gallon propane cylinders and one 100-gallon or less propane cylinder. We also observed multiple one-gallon containers of engine coolant. In addition, there are multiple 55-gallon barrels scattered around the property, most of which appeared to be empty, potentially used for trash collection, or other equestrian/livestock related activities

In addition, we observed at least two sections of cementitious pipe buried (in use for drainage) on or adjacent to the northeast portion of the Site. This pipe may contain asbestos and we recommend, if it will be disturbed during redevelopment, that it be properly tested, removed and disposed of by a General Abatement Contractor. We emphasize that asbestos is not typically included in the scope of a Phase I ESA, and this observation does not constitute a full asbestos survey of the Site. We do not believe that the existence of this pipe rises to the level of an REC, but rather represents a business environmental risk or concern.

7.3.7 Transformers (Potential PCB)

We observed at least one pole-mounted electrical transformer on the Site. We did not observe obvious signs of staining or leakage associated with this transformer. We do not believe that this transformer represents a REC for the Site.

7.4 Review of Adjacent Properties

General observations of properties adjacent to the Site were performed in conjunction with on-Site observations made on May 13, 2016. Developed property in the vicinity of the Site consists of transportation corridors, vacant land, rural single-family residences and/or farm/equestrian properties, oil and/or gas facilities and farm/pasture land. Properties immediately adjacent to the Site are described below, based on outdoor observations from the Site or nearby public streets.

- North: The subject Site is generally bounded by vacant/farm or pasture land.
- East: The subject Site is generally bounded by one or more rural residential properties with Countyline Road beyond.
- South: The subject Site is generally bounded by Baseline Road with vacant/farm or pasture land, containing an oil/gas facility and rural single-family residences beyond.
- West: The subject Site is generally bounded by one or more rural residences/farm properties.

Observation of adjacent properties did not reveal obvious visual indications of environmental concern, other than oil/gas exploration facilities. We did not observe other evidence of landfills, lagoons, pits, or other waste treatment or disposal operations; underground storage tanks, spills, releases, or discharge of hazardous material other than oil/gas exploration facilities.

8.0 INTERVIEWS

8.1 Owner, Site Manager and/or Occupants

As previously mentioned, we did not receive a response from Mr. Bryce McDonald, the owner representative of the Site. If/when we do receive a response, and if it alters the conclusions of this report, we will provide an addendum.

9.0 DEVIATIONS

9.1 Exceptions and Deletions

ASTM Standard E 1527-13 for Phase I Environmental Site Assessments, Section 8.3.2, states that "all obvious uses of the Site shall be identified from the present, back to the Site's obvious first developed use, or back to 1940, whichever is earlier." The term "developed use" includes agricultural uses (i.e., cultivated land/agricultural crops) and placement of fill. In our opinion, livestock rangeland is not a developed use.

The historical documentation for this assessment went back to 1904 on the basis of a historical USGS topographical map, which showed one potential structure (home) on the Site. An aerial photograph from 1937 showed a home with potential outbuildings on the Site. Assessor's records indicate that the home was constructed in 1879. We were not able to ascertain the date of first developed use, thus the historical documentation was not fully satisfied for the ASTM standard.

It is the opinion of CTL that obtaining earlier historical information would not be sufficiently useful, reasonably ascertainable, or change the likelihood for the presence of an REC on the Site.

9.2 Data Gaps

We did not receive a response from the owner representative of the property. We do believe that this is a notable data gap; however, given the apparent nature of the Site, we do not believe that it prevents the publication of this report.

10.0 FINDINGS AND OPINION

10.1 Summary of Site Historical Use

The Site appears to have remained in residential/equestrian/agricultural use since potentially the late 1800s or early 1900s. Based on our understanding of the types of crops that are typically grown in Colorado, it is our belief that significant contamination from normal pesticides and herbicide application is unlikely. Application of pesticides and herbicides is more prevalent on fruits and vegetables, and less prevalent on field crops such as alfalfa, hay, and feed corn that are common in Colorado. Normal application of pesticides and herbicides is also subject to dilution and breakdown that occurs over time, due to sunlight and aeration in the upper portion of topsoil. As such, we do not believe that previous agricultural use at the Site presents a REC.

10.2 Nearby Environmental Concerns

There were multiple mapped findings listed in the GeoSearch™ report. However, these listings, which include the Erie Airport, the nearby waste water treatment plant, as well as other spills or releases, including a manure concern related to the Site itself, are generally not considered a REC because of their nature and/or are generally to the east and hydraulically downgradient from the Site. As such we do not believe these listings represent a REC for the Site.

11.0 CONCLUSIONS AND RECOMMENDATIONS

We have performed a Phase I Environmental Site Assessment (ESA) in general conformance with the scope and limitations of ASTM Practice E 1527-13 of the McDonald Property of the Erie Assemblage, the Site, for OEO, LLC. Any exceptions to, or deletions from, this practice are described in Section 9.1 of this report. This assessment has revealed no evidence of recognized environmental conditions in connection with the property with the exception of the following:

- One active oil/gas well/facility on or adjacent to the northeast portion of the Site.

We recommend a Limited Phase II ESA to address this concern.

In addition, we observed at least two sections of cementitious pipe buried (in use for drainage) on or adjacent to the northeast portion of the Site. This pipe may contain asbestos and we recommend, if it will be disturbed during redevelopment, that it be properly tested, removed and disposed of by a General Abatement Contractor. We emphasize that asbestos is not typically included in the scope of a Phase I ESA, and this observation does not constitute a full asbestos survey of the Site. We do not believe that the existence of this pipe rises to the level of an REC, but rather represents a business environmental risk or concern.

12.0 QUALIFICATIONS

This Phase I ESA was supervised by, and the report reviewed by, Mr. Matthew Wardlow, a licensed Professional Engineer (P.E.) registered in the State of Colorado. Mr. Wardlow has performed or reviewed over 1,000 Phase I ESAs in the State of Colorado, and has been practicing within the local environmental consulting profession for at least 20 years. The resumes of the individuals conducting this Phase I ESA are included in Appendix E.

Mr. Wardlow declares that, to the best of his professional knowledge and belief, he meets the definition of an Environmental Professional as defined in §312.10 of 40 CFR 312. I have the specific qualifications based on education, training and experience to assess a property of the nature, history and setting of the subject Site. I have developed and performed all appropriate inquiries in general conformance with the standards and practices set forth in 40 CFR Part 312.

We believe that this ESA was conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions in the locality of the project. No warranty, express or implied, is made.

If we can be of further service in discussing the contents of this report, please call.

CTL | THOMPSON, INC.

Trevor J Truett
Staff Environmental Scientist

Reviewed by:

Matthew L. Wardlow, P.E.
Environmental Department Manager

TJT:MLW/ot

Via e-mail: coreye@e5xmanagement.com

REFERENCES

Colorado Division of Water Resources, online Water Well Permit Database, http://165.127.23.116/webSite/lttools/

Colorado Oil and Gas Conservation Commission, online Oil/Gas Well Permit Database, http://www.oil-gas.state.co.us

CTL User Questionnaire, Mr. Corey Elliott, OEO, LLC, April 19, 2016

GeoSearch™ Report (Project DN48284-200-R2, dated April 15, 2016)

GeoSearch™ Historical Aerials Package (Project DN48284-200, dated March 4, 2016), photographs from 1937, 1948, 1953, 1966, 1971, 1978, 1983, 1993 and 1999)

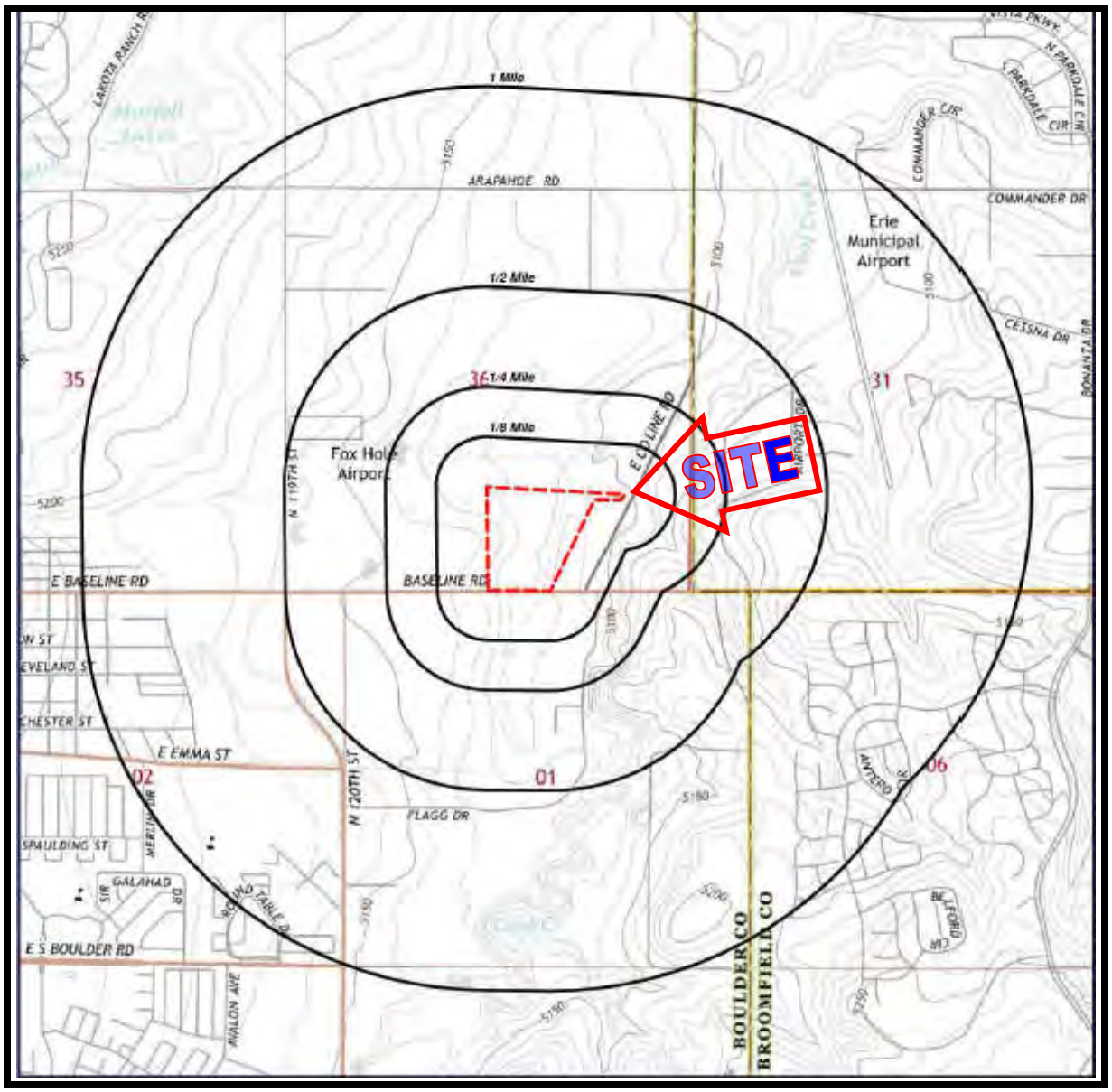
Google Earth Imagery, Satellite Photographs, 2005, 2010, 2015 and 2016.

U.S. Geological Survey Topographic Maps, Erie Quadrangle, Colorado (1904, 1950, 1967, 1971 and 1979).

Title Commitment, First American Commitment Title Insurance Company, Number NCS-773939-CO (March 29, 2016).

R 69 W

T 1 N



1" ~ 2,000'

Source:
U.S.G.S. Topographic Map
Lafayette Quadrangle, Colorado
2013



ERIE ASSEMBLAGE – MCDONALD PROPERTY
PHASE I ESA
DN48,284.000-200-R2

FIGURE 2

APPENDIX A
SITE PHOTOGRAPHS



Description: Across Site
View Direction: South



Description: Across Site
View Direction: Southwest



Description: Area south of Site
View Direction: South



Description: Across Site
View Direction: Northeast

SITE PHOTOGRAPHS

CTL | THOMPSON

Erie Assemblage – McDonald Property
May 13, 2016

CTL Project No. DN48,284-200-R2



Description: Across south portion of Site
View Direction: East



Description: On-Site residence
View Direction: West



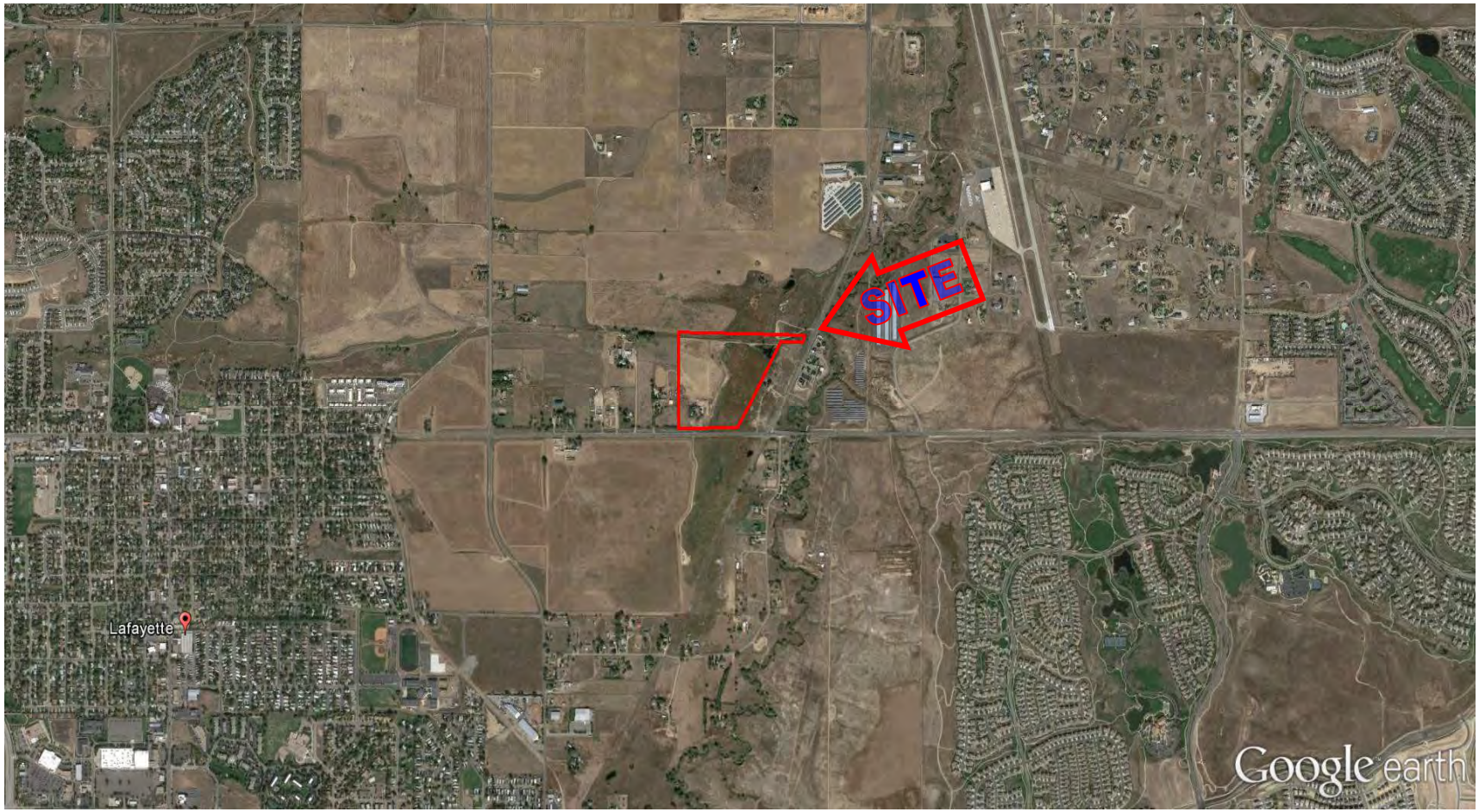
Description: Across north portion of Site
View Direction: West



Description: Across east portion of the Site
View Direction: East

SITE PHOTOGRAPHS

APPENDIX B
AERIAL PHOTOGRAPH



CTL | T PROJECT NO. DN48,824-200-R2

2015 AERIAL PHOTOGRAPH
Approximate Site Location

APPENDIX C
GEOSEARCH™ REPORT

GeoSearch
On time. On target. In touch.™

Radius Report

Satellite view

Target Property:

Erie Assemblage
12329 E Baseline Rd
Lafayette, Boulder County, Colorado 80026

Prepared For:

CTL Thompson- Denver

Order #: 65664
Job #: 142539
Project #: DN48284-200-R2
Date: 04/15/2016

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Unlocatable Report . . . . . See Attachment

Zip Report . . . . . See Attachment

Disclaimer

This report was designed by GeoSearch to meet or exceed the records search requirements of the All Appropriate Inquiries Rule (40 CFR §312.26) and the current version of the ASTM International E1527, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process or, if applicable, the custom requirements requested by the entity that ordered this report. The records and databases of records used to compile this report were collected from various federal,state and local governmental entities. It is the goal of GeoSearch to meet or exceed the 40 CFR §312.26 and E1527 requirements for updating records by using the best available technology. GeoSearch contacts the appropriate governmental entities on a recurring basis. Depending on the frequency with which a record source or database of records is updated by the governmental entity, the data used to prepare this report may be updated monthly, quarterly, semi-annually, or annually.

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Target Property Summary

Target Property Information

Erie Assemblage
12329 E Baseline Rd
Lafayette, Colorado 80026

Coordinates
Area centroid (-105.06292, 40.0022972)
5,112 feet above sea level

USGS Quadrangle
Erie, CO

Geographic Coverage Information

County/Parish: Boulder (CO) , Broomfield (CO) , Weld (CO)
ZipCode(s):
Broomfield CO: 80023
Lafayette CO: 80026
Erie CO: 80516

Radon
* Target property is located in Radon Zone 1.
Zone 1 areas have a predicted average indoor radon screening level greater than 4 pCi/L (picocuries per liter).

Database Summary

FEDERAL LISTING

Standard Environmental Records

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
FEDERAL ENGINEERING INSTITUTIONAL CONTROL SITES	EC	0	0	TP/AP
LAND USE CONTROL INFORMATION SYSTEM	LUCIS	0	0	TP/AP
RCRA SITES WITH CONTROLS	RCRASC	0	0	TP/AP
EMERGENCY RESPONSE NOTIFICATION SYSTEM	ERNSCO	0	0	0.1250
NO LONGER REGULATED RCRA GENERATOR FACILITIES	NLRRCRAG	0	0	0.2500
RESOURCE CONSERVATION & RECOVERY ACT - GENERATOR FACILITIES	RCRAGR08	0	0	0.2500
RESOURCE CONSERVATION & RECOVERY ACT - NON-GENERATOR FACILITIES	RCRANGR08	1	0	0.2500
BROWNFIELDS MANAGEMENT SYSTEM	BF	0	0	0.5000
NO LONGER REGULATED RCRA NON-CORRACTS TSD FACILITIES	NLRRCRAT	0	0	0.5000
RESOURCE CONSERVATION & RECOVERY ACT - NON-CORRACTS TREATMENT, STORAGE & DISPOSAL FACILITIES	RCRAT	0	0	0.5000
SUPERFUND ENTERPRISE MANAGEMENT SYSTEM	SEMS	0	0	0.5000
SUPERFUND ENTERPRISE MANAGEMENT SYSTEM ARCHIVED SITE INVENTORY	SEMSARCH	0	0	0.5000
DELISTED NATIONAL PRIORITIES LIST	DNPL	0	0	1.0000
NATIONAL PRIORITIES LIST	NPL	0	0	1.0000
NO LONGER REGULATED RCRA CORRECTIVE ACTION FACILITIES	NLRRCRAC	1	0	1.0000
PROPOSED NATIONAL PRIORITIES LIST	PNPL	0	0	1.0000
RESOURCE CONSERVATION & RECOVERY ACT - CORRECTIVE ACTION FACILITIES	RCRAC	0	0	1.0000
RESOURCE CONSERVATION & RECOVERY ACT - SUBJECT TO CORRECTIVE ACTION FACILITIES	RCRASUBC	0	0	1.0000
SUB-TOTAL		2	0	

Additional Environmental Records

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
CERCLIS LIENS	SFLIENS	0	0	TP/AP
EPA DOCKET DATA	DOCKETS	0	0	TP/AP
MATERIAL LICENSING TRACKING SYSTEM	MLTS	0	0	TP/AP
TOXIC SUBSTANCE CONTROL ACT INVENTORY	TSCA	0	0	TP/AP
AEROMETRIC INFORMATION RETRIEVAL SYSTEM / AIR FACILITY SUBSYSTEM	AIRSAFS	1	2	0.1250
CLANDESTINE DRUG LABORATORY LOCATIONS	CDL	0	0	0.1250

Database Summary

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
HAZARDOUS MATERIALS INCIDENT REPORTING SYSTEM	HMIRSR08	0	0	0.1250
TOXICS RELEASE INVENTORY	TRI	1	0	0.1250
BIENNIAL REPORTING SYSTEM	BRS	0	0	0.2500
HISTORICAL GAS STATIONS	HISTPST	0	0	0.2500
OPEN DUMP INVENTORY	ODI	0	0	0.5000
DEPARTMENT OF DEFENSE SITES	DOD	0	0	1.0000
FORMERLY USED DEFENSE SITES	FUDS	0	0	1.0000
RECORD OF DECISION SYSTEM	RODS	0	0	1.0000
SUB-TOTAL		2	2	

Database Summary

STATE (CO) LISTING

Standard Environmental Records

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
ENVIRONMENTAL REAL COVENANTS LIST	COVENANTS	0	0	TP/AP
ABOVEGROUND STORAGE TANK FACILITIES	AST	1	0	0.2500
HAZARDOUS WASTE SITES- GENERATOR	HWSG	0	0	0.2500
UNDERGROUND STORAGE TANK FACILITIES	UST	0	0	0.2500
HISTORICAL SOLID WASTE LANDFILLS	HISTSWLF	2	8	0.5000
LEAKING STORAGE TANK FACILITIES	LST	2	0	0.5000
LEAKING UNDERGROUND STORAGE TANKS TRUST FUND SITES	LUSTTRUST	0	3	0.5000
SOLID WASTE FACILITIES	SWF	0	0	0.5000
VOLUNTARY CLEANUP AND REDEVELOPMENT PROGRAM SITES	VCRA	0	0	0.5000
HAZARDOUS WASTE SITES- CORRECTIVE ACTION	HWSCA	1	0	1.0000
SUPERFUND SITES	SF	0	0	1.0000

SUB-TOTAL		6	11	

Additional Environmental Records

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
ASBESTOS ABATEMENT AND DEMOLITION PROJECTS	ASBESTOS	0	0	TP/AP
URANIUM MILL TAILINGS SITES	UMTS	0	0	TP/AP
AIR POLLUTION CONTROL DIVISION PERMITTED FACILITIES	APCDP	1	0	0.1250
CLANDESTINE DRUG LABORATORY LOCATIONS	CDL	0	0	0.1250
DRY CLEANING FACILITIES	CLEANERS	0	0	0.1250
SPILLS LISTING	SPILLS	5	1	0.1250
HAZARDOUS WASTE SITES- TREATMENT, STORAGE & DISPOSAL	HWSTSD	0	0	0.5000
METHANE GAS STUDY SITES	METHANESITES	0	0	0.5000

SUB-TOTAL		6	1	

Database Summary

LOCAL LISTING

Additional Environmental Records

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
WELD COUNTY SOLID WASTE FACILITIES	WCSWF	0	0	0.5000
SUB-TOTAL		0	0	

TRIBAL LISTING

Standard Environmental Records

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
UNDERGROUND STORAGE TANKS ON TRIBAL LANDS	USTR08	0	0	0.2500
LEAKING UNDERGROUND STORAGE TANKS ON TRIBAL LANDS	LUSTR08	0	0	0.5000
OPEN DUMP INVENTORY ON TRIBAL LANDS	ODINDIAN	0	0	0.5000
SUB-TOTAL		0	0	

Additional Environmental Records

Database	Acronym	Locatable	Unlocatable	Search Radius (miles)
INDIAN RESERVATIONS	INDIANRES	0	0	1.0000
SUB-TOTAL		0	0	

TOTAL		16	14	

Database Radius Summary

FEDERAL LISTING

*Standard environmental records are displayed in **bold**.*

Acronym	Search Radius (miles)	TP/AP (0 - 0.02)	1/8 Mile (> TP/AP)	1/4 Mile (> 1/8)	1/2 Mile (> 1/4)	1 Mile (> 1/2)	> 1 Mile	Total
DOCKETS	0.0200	0	NS	NS	NS	NS	NS	0
EC	**0.0200**	**0**	**NS**	**NS**	**NS**	**NS**	**NS**	**0**
LUCIS	**0.0200**	**0**	**NS**	**NS**	**NS**	**NS**	**NS**	**0**
MLTS	0.0200	0	NS	NS	NS	NS	NS	0
RCRASC	**0.0200**	**0**	**NS**	**NS**	**NS**	**NS**	**NS**	**0**
SFLIENS	0.0200	0	NS	NS	NS	NS	NS	0
TSCA	0.0200	0	NS	NS	NS	NS	NS	0
AIRSAFS	0.1250	1	0	NS	NS	NS	NS	1
CDL	0.1250	0	0	NS	NS	NS	NS	0
ERNSCO	**0.1250**	**0**	**0**	**NS**	**NS**	**NS**	**NS**	**0**
HMIRSR08	0.1250	0	0	NS	NS	NS	NS	0
TRI	0.1250	0	1	NS	NS	NS	NS	1
BRS	0.2500	0	0	0	NS	NS	NS	0
HISTPST	0.2500	0	0	0	NS	NS	NS	0
NLRRCRAG	**0.2500**	**0**	**0**	**0**	**NS**	**NS**	**NS**	**0**
RCRAGR08	**0.2500**	**0**	**0**	**0**	**NS**	**NS**	**NS**	**0**
RCRANGR08	**0.2500**	**0**	**1**	**0**	**NS**	**NS**	**NS**	**1**
BF	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
NLRRCRAT	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
ODI	0.5000	0	0	0	0	NS	NS	0
RCRAT	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
SEMS	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
SEMSARCH	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
DNPL	**1.0000**	**0**	**0**	**0**	**0**	**0**	**NS**	**0**
DOD	1.0000	0	0	0	0	0	NS	0
FUDS	1.0000	0	0	0	0	0	NS	0
NLRRCRAC	**1.0000**	**0**	**1**	**0**	**0**	**0**	**NS**	**1**
NPL	**1.0000**	**0**	**0**	**0**	**0**	**0**	**NS**	**0**
PNPL	**1.0000**	**0**	**0**	**0**	**0**	**0**	**NS**	**0**
RCRAC	**1.0000**	**0**	**0**	**0**	**0**	**0**	**NS**	**0**
RCRASUBC	**1.0000**	**0**	**0**	**0**	**0**	**0**	**NS**	**0**
RODS	1.0000	0	0	0	0	0	NS	0

SUB-TOTAL		1	3	0	0	0	0	4

Database Radius Summary

STATE (CO) LISTING

*Standard environmental records are displayed in **bold**.*

Acronym	Search Radius (miles)	TP/AP (0 - 0.02)	1/8 Mile (> TP/AP)	1/4 Mile (> 1/8)	1/2 Mile (> 1/4)	1 Mile (> 1/2)	> 1 Mile	Total
ASBESTOS	0.0200	0	NS	NS	NS	NS	NS	0
COVENANTS	**0.0200**	**0**	**NS**	**NS**	**NS**	**NS**	**NS**	**0**
UMTS	0.0200	0	NS	NS	NS	NS	NS	0
APCDP	0.1250	1	0	NS	NS	NS	NS	1
CDL	0.1250	0	0	NS	NS	NS	NS	0
CLEANERS	0.1250	0	0	NS	NS	NS	NS	0
SPILLS	0.1250	1	4	NS	NS	NS	NS	5
AST	**0.2500**	**0**	**1**	**0**	**NS**	**NS**	**NS**	**1**
HWSG	**0.2500**	**0**	**0**	**0**	**NS**	**NS**	**NS**	**0**
UST	**0.2500**	**0**	**0**	**0**	**NS**	**NS**	**NS**	**0**
HISTSWLF	**0.5000**	**0**	**1**	**1**	**0**	**NS**	**NS**	**2**
HWSTSD	0.5000	0	0	0	0	NS	NS	0
LST	**0.5000**	**0**	**1**	**0**	**1**	**NS**	**NS**	**2**
LUSTTRUST	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
METHANESITES	0.5000	0	0	0	0	NS	NS	0
SWF	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
VCRA	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
HWSCA	**1.0000**	**0**	**1**	**0**	**0**	**0**	**NS**	**1**
SF	**1.0000**	**0**	**0**	**0**	**0**	**0**	**NS**	**0**

SUB-TOTAL		2	8	1	1	0	0	12

Database Radius Summary

LOCAL LISTING

*Standard environmental records are displayed in **bold**.*

Acronym	Search Radius (miles)	TP/AP (0 - 0.02)	1/8 Mile (> TP/AP)	1/4 Mile (> 1/8)	1/2 Mile (> 1/4)	1 Mile (> 1/2)	> 1 Mile	Total
WCSWF	0.5000	0	0	0	0	NS	NS	0
SUB-TOTAL		0	0	0	0	0	0	0

Database Radius Summary

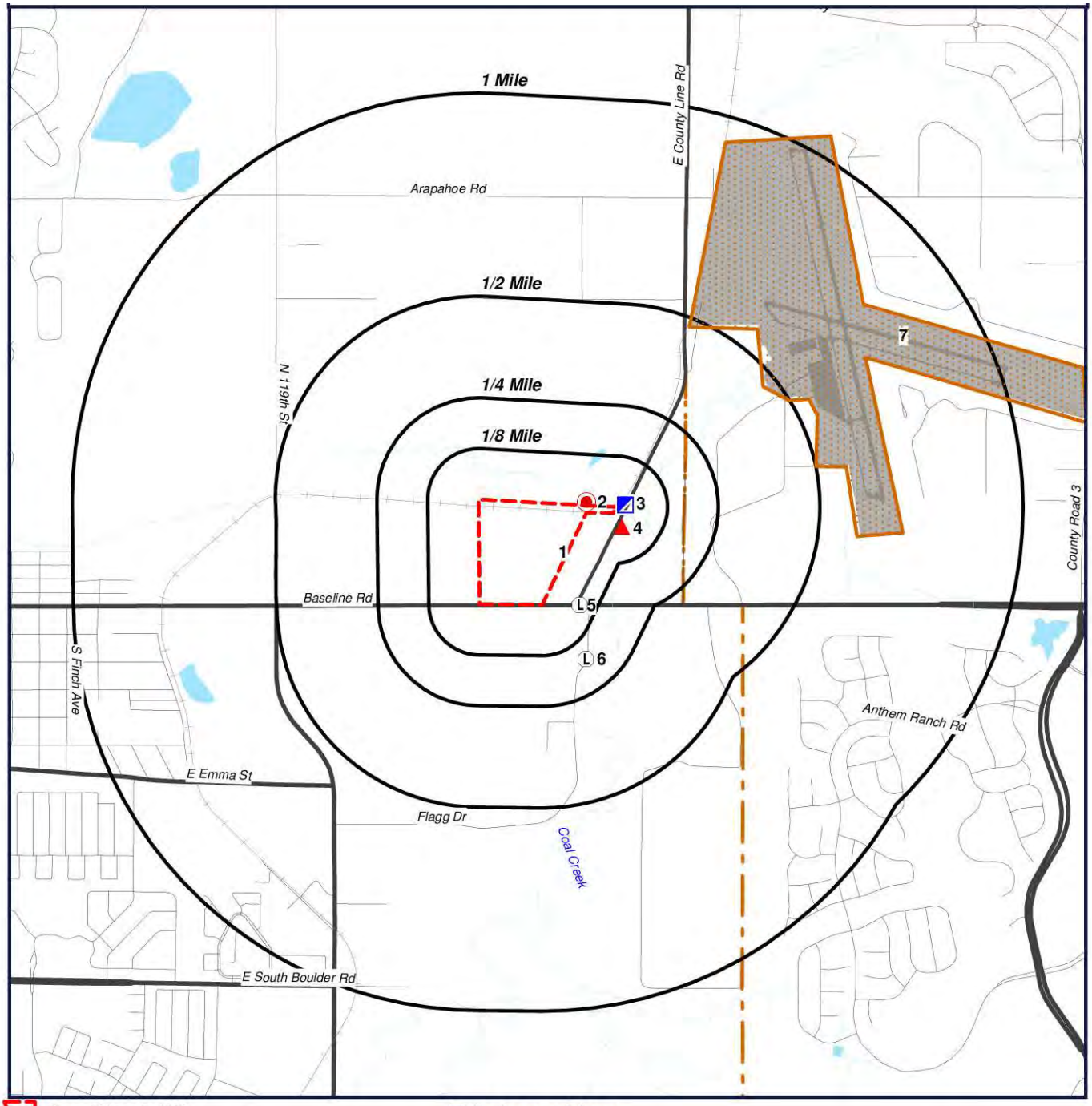
TRIBAL LISTING

*Standard environmental records are displayed in **bold**.*

Acronym	Search Radius (miles)	TP/AP (0 - 0.02)	1/8 Mile (> TP/AP)	1/4 Mile (> 1/8)	1/2 Mile (> 1/4)	1 Mile (> 1/2)	> 1 Mile	Total
USTR08	**0.2500**	**0**	**0**	**0**	**NS**	**NS**	**NS**	**0**
LUSTR08	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
ODINDIAN	**0.5000**	**0**	**0**	**0**	**0**	**NS**	**NS**	**0**
INDIANRES	1.0000	0	0	0	0	0	NS	0
SUB-TOTAL		0	0	0	0	0	0	0
TOTAL		3	11	1	1	0	0	16

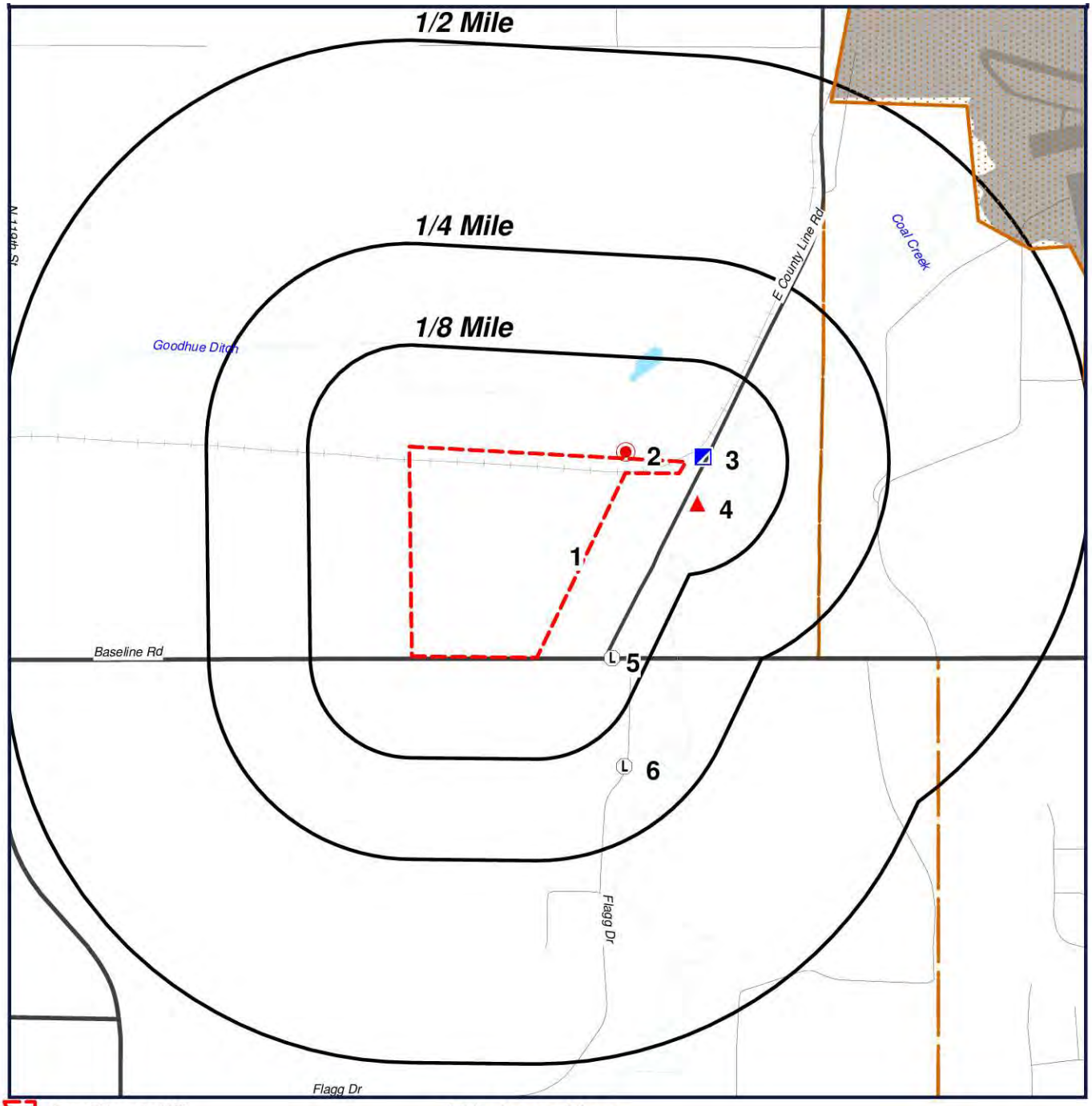
NOTES:
NS = NOT SEARCHED
TP/AP = TARGET PROPERTY/ADJACENT PROPERTY

Radius Map 1



Click here to access Satellite view

Radius Map 2



Target Property (TP)
AIRSAFS
NLRRCRAC
SPILLS
HISTSWLF
LST

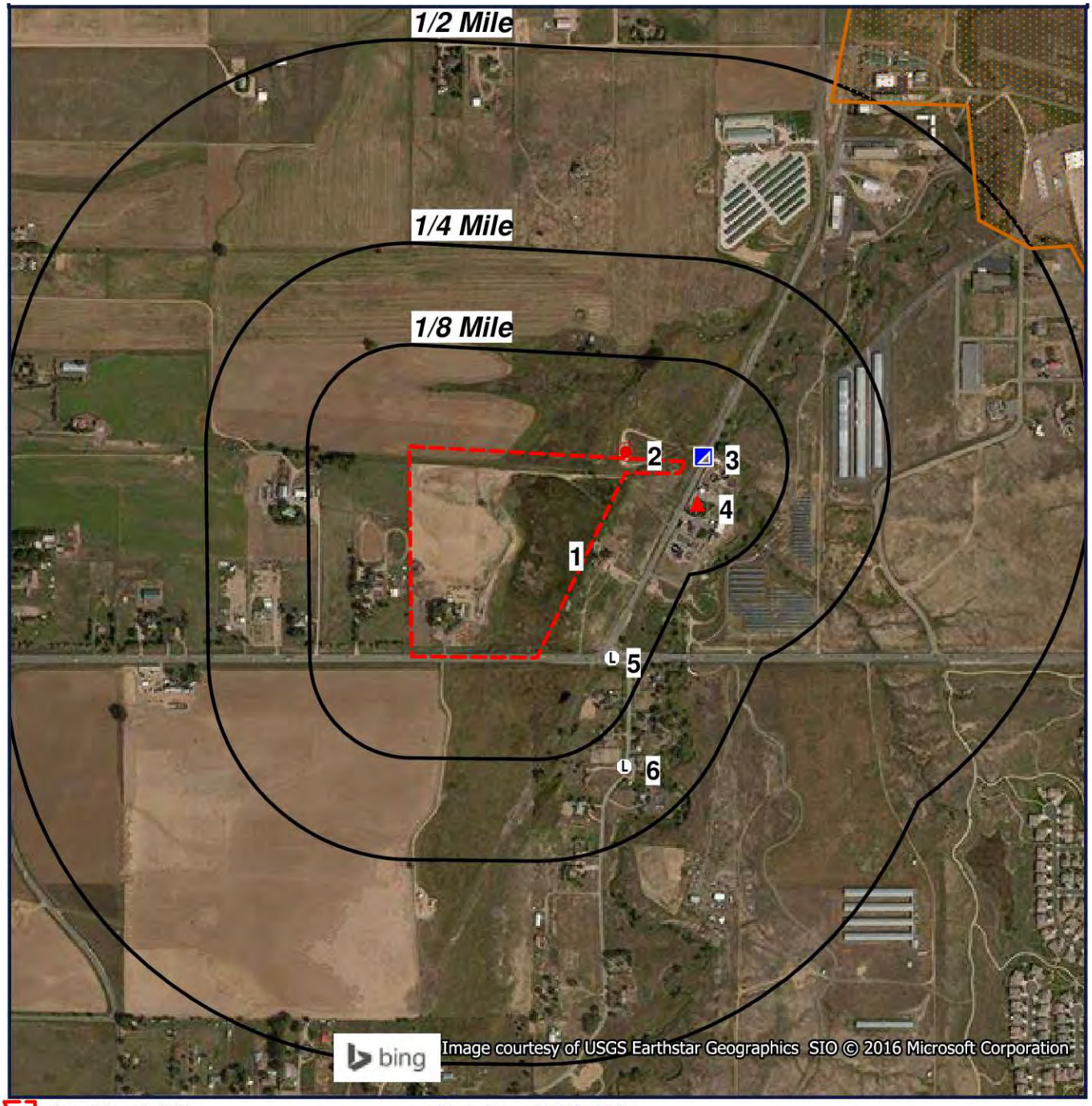
Erie Assemblage
12329 E Baseline Rd
Lafayette, Colorado
80026

N
W E
S

0' 500' 1000' 1500'
SCALE: 1" = 1000'

[Click here to access Satellite view]

Ortho Map



Target Property (TP)
AIRSAFS
NLRRCRAC
SPILLS
HISTSWLF
LST

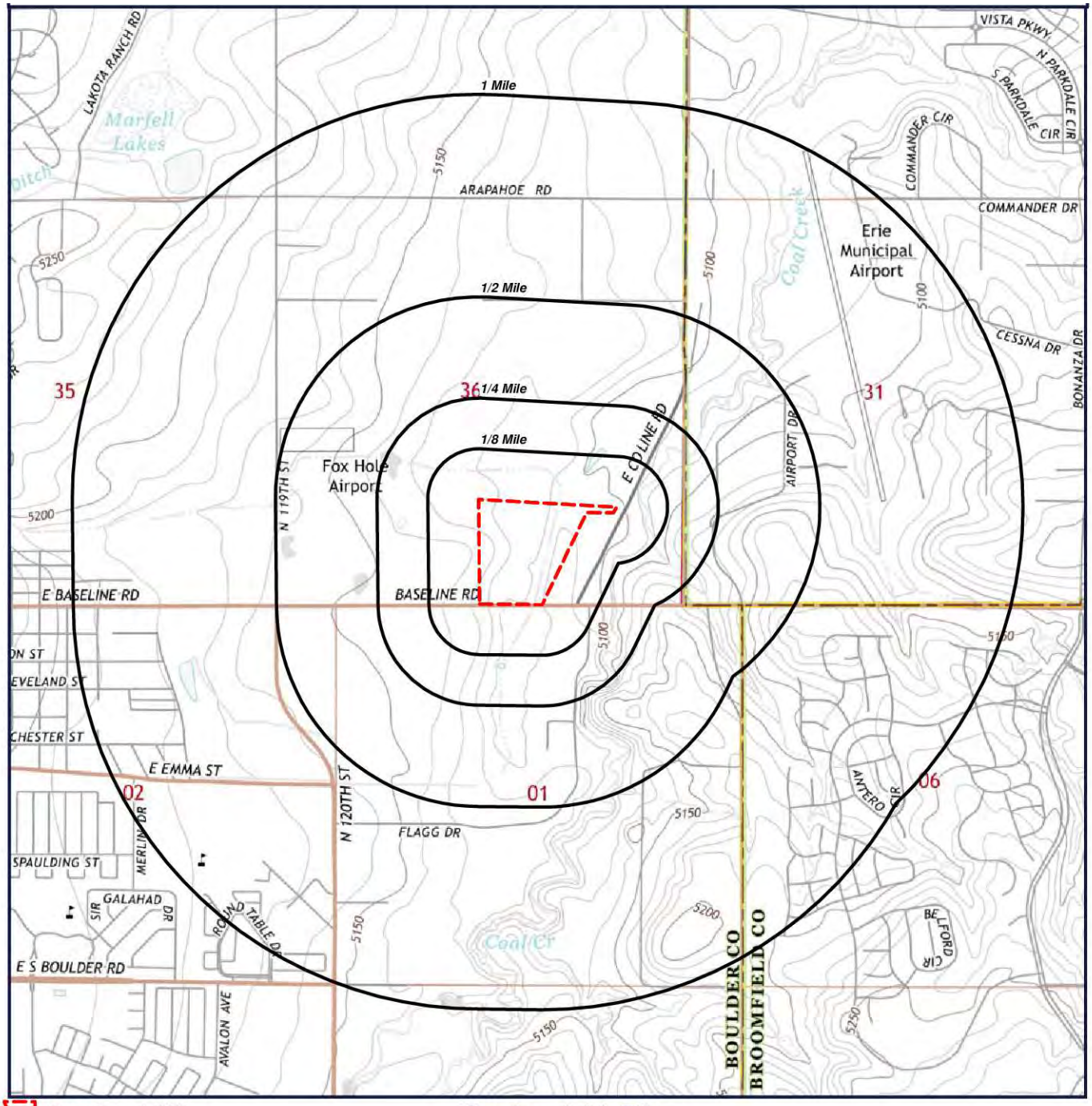
Quadrangle(s): Erie
Erie Assemblage
12329 E Baseline Rd
Lafayette, Colorado
80026

N
W E
S

0' 500' 1000' 1500'
SCALE: 1" = 1000'

Click here to access Satellite view

Topographic Map



Target Property (TP)

Quadrangle(s): Erie
Source: USGS, 08/02/2013
Erie Assemblage
12329 E Baseline Rd
Lafayette, Colorado
80026

N
W E
S

0' 1000' 2000' 3000'
SCALE: 1" = 2000'

[Click here to access Satellite view]

Located Sites Summary

*NOTE: Standard environmental records are displayed in **bold**.*

Map ID#	Database Name	Site ID#	Relative Elevation	Distance From Site	Site Name	Address	PAGE #
1	SPILLS	2009-0126	Lower (5,108 ft.)	TP		12329 BASELINE RD, MANURE IN THE CORRAL, DRAINING INTO THE WETLANDS TO THE SOUTH, BOULDER, CO	17
2	AIRSAFS	1077921	Lower (5,102 ft.)	0.01 mi. NE (53 ft.)	NOBLE ENERGY INC. BATTERY #11318900	NESE4 SEC36 T1N R69W, LAFAYETTE AREA, CO 80026	18
2	APCDP	013-1409	Lower (5,102 ft.)	0.01 mi. NE (53 ft.)	NOBLE ENERGY INC. BATTERY #11318900	NESE4 SEC36 T1N R69W, LAFAYETTE AREA, CO 80026	21
3	***HWSCA***	***COD007079627***	***Lower (5,100 ft.)***	***0.03 mi. NE (158 ft.)***	***CROCKETT & KELLY INC.***	***1001 WELD CNTY RD 1, ERIE, CO 80516***	***24***
3	***LST***	***13247LST***	***Lower (5,100 ft.)***	***0.03 mi. NE (158 ft.)***	***FALCON PROPERTIES***	***1001 WELD CR 1, ERIE, CO 80516***	***25***
3	***NLRRCRAC***	***COD007079627***	***Lower (5,100 ft.)***	***0.03 mi. NE (158 ft.)***	***CROCKETT & KELLY INC***	***1001 WELD CNTY RD 1, ERIE, CO 80516***	***26***
3	***RCRANGR08***	***COD007079627***	***Lower (5,100 ft.)***	***0.03 mi. NE (158 ft.)***	***CROCKETT & KELLY INC***	***1001 WELD CNTY RD 1, ERIE, CO 80516***	***29***
3	TRI	80516CRCKT1001W	Lower (5,100 ft.)	0.03 mi. NE (158 ft.)	CROCKETT & KELLY INC.	1001 WELD COUNTY RD. #1, ERIE, CO 80516	32
3	***AST***	***13247AST***	***Lower (5,100 ft.)***	***0.03 mi. NE (158 ft.)***	***FALCON PROPERTIES***	***1001 WELD CR 1, ERIE, CO 80516***	***33***
4	SPILLS	2012-0749	Lower (5,103 ft.)	0.05 mi. NE (264 ft.)		750 E COUNTY LINE RD, AT THE WASTEWATER TREATMENT PLANT, LAFAYETTE, CO	34
4	SPILLS	2004-421	Lower (5,103 ft.)	0.05 mi. NE (264 ft.)		HWY 7 & WELD COUNTY RD. 1 - WASTEWATER PLANT, LAFAYETTE, CO	35
4	SPILLS	2003-164	Lower (5,103 ft.)	0.05 mi. NE (264 ft.)		750 E. COUNTY LINE RD.- RECLAIMATION PLANT, LAFAYETTE, CO	36
5	SPILLS	2004-116	Lower (5,109 ft.)	0.08 mi. E (422 ft.)		COLO. HWY 7 & COUNTY LINE RD.- NE CORNER, LAFAYETTE, CO	37
5	***HISTSWLF***	***00070-0000439***	***Lower (5,109 ft.)***	***0.09 mi. E (475 ft.)***	***ILLEGAL DUMP***	***HIGHWAY 7 AND COUNTY ROAD #1, LAFAYETTE, CO 80516***	***38***
6	***HISTSWLF***	***00070-0000438***	***Higher (5,114 ft.)***	***0.18 mi. SE (950 ft.)***	***HURST DUMP***	***FLAG DRIVE 3/10 MILE SOUTH OF BASELINE ROAD, LAFAYETTE, CO 80026***	***39***
7	***LST***	***8024LST***	***Lower (5,095 ft.)***	***0.48 mi. NE (2534 ft.)***	***ERIE MUNICIPAL AIRPORT***	***395 AIRPORT DR, ERIE, CO 80516***	***40***

Elevation Summary

Elevations are collected from the USGS 3D Elevation Program 1/3 arc-second (approximately 10 meters) layer hosted at the NGTOC. .

Target Property Elevation: 5112 ft.

*NOTE: Standard environmental records are displayed in **bold**.*

EQUAL/HIGHER ELEVATION

Map ID#	Database Name	Elevation	Site Name	Address	Page #
6	***HISTSWLF***	***5,114 ft.***	***HURST DUMP***	***FLAG DRIVE 3/10 MILE SOUTH OF BASELINE ROAD, LAFAYETTE, CO 80026***	***39***

LOWER ELEVATION

Map ID#	Database Name	Elevation	Site Name	Address	Page #
1	SPILLS	5,108 ft.		12329 BASELINE RD, MANURE IN THE CORRAL, DRAINING INTO THE WETLANDS TO THE SOUTH, BOULDER, CO	17
2	AIRSAFS	5,102 ft.	NOBLE ENERGY INC. BATTERY #11318900	NESE4 SEC36 T1N R69W, LAFAYETTE AREA, CO 80026	18
2	APCDP	5,102 ft.	NOBLE ENERGY INC. BATTERY #11318900	NESE4 SEC36 T1N R69W, LAFAYETTE AREA, CO 80026	21
3	***HWSCA***	***5,100 ft.***	***CROCKETT & KELLY INC.***	***1001 WELD CNTY RD 1, ERIE, CO 80516***	***24***
3	***LST***	***5,100 ft.***	***FALCON PROPERTIES***	***1001 WELD CR 1, ERIE, CO 80516***	***25***
3	***NLRRCRAC***	***5,100 ft.***	***CROCKETT & KELLY INC***	***1001 WELD CNTY RD 1, ERIE, CO 80516***	***26***
3	***RCRANGR08***	***5,100 ft.***	***CROCKETT & KELLY INC***	***1001 WELD CNTY RD 1, ERIE, CO 80516***	***29***
3	TRI	5,100 ft.	CROCKETT & KELLY INC.	1001 WELD COUNTY RD. #1, ERIE, CO 80516	32
3	***AST***	***5,100 ft.***	***FALCON PROPERTIES***	***1001 WELD CR 1, ERIE, CO 80516***	***33***
4	SPILLS	5,103 ft.		750 E COUNTY LINE RD, AT THE WASTEWATER TREATMENT PLANT, LAFAYETTE, CO	34
4	SPILLS	5,103 ft.		HWY 7 & WELD COUNTY RD. 1 - WASTEWATER PLANT, LAFAYETTE, CO	35
4	SPILLS	5,103 ft.		750 E. COUNTY LINE RD.- RECLAIMATION PLANT, LAFAYETTE, CO	36
5	SPILLS	5,109 ft.		COLO. HWY 7 & COUNTY LINE RD.- NE CORNER, LAFAYETTE, CO	37
5	***HISTSWLF***	***5,109 ft.***	***ILLEGAL DUMP***	***HIGHWAY 7 AND COUNTY ROAD #1, LAFAYETTE, CO 80516***	***38***
7	***LST***	***5,095 ft.***	***ERIE MUNICIPAL AIRPORT***	***395 AIRPORT DR, ERIE, CO 80516***	***40***

Spills Listing (SPILLS)

MAP ID# 1

Distance from Property: 0 mi. (0 ft.) X
Elevation: 5,108 ft. (Lower than TP)

INCIDENT INFORMATION

CASE NUMBER: **2009-0126** NRC NUMBER: **NOT REPORTED**

SPILL DATE: **03/18/09**

SPILL LOCATION: **12329 BASELINE RD, MANURE IN THE CORRAL, DRAINING INTO THE WETLANDS TO THE SOUTHEAST, PICTURES WILL**

SPILL CITY/STATE/ZIP: **BOULDER, CO NOT REPORTED**

SPILL COUNTY: **BOULDER**

RESPONSIBLE PARTY

NAME: **TRI-COUNTY ARENAS**

ADDRESS: **12329 BASELINE RD**
BOULDER, CO

COUNTY: **BOULDER**

CONTACT: **NOT REPORTED**

PHONE: **303-926-5454**

INCIDENT DETAILS

SOURCE: **OTHER**

SOURCE TYPE: **HORSE CORRAL**

MEDIUM: **WATER AND LAND**

WATERWAY: **WETLANDS**

CAUSE: **NATURAL PHENOMENON**

MATERIAL TYPE: **OTHER**

MATERIAL DESCRIPTION:	MATERIAL QUANTITY:	WATER QUANTITY:
MANURE	**1 UNKNOWN**	**1 U**

CAUSE INFORMATION:

MANURE IN THE HORSE CORRAL AT THIS STABLE IS DRAINING INTO THE ADJACENT WETLANDS, PICTURES ATTACHED TO E-MAIL

ACTION:

BOULDER COUNTY PH IS CHECKING TO SEE IF THEY HAVE ANY WAY TO ISSUE A CITATION.

RESPONSE COMMENTS:

NOT REPORTED

COMMENTS:

NOT REPORTED

Back to Report Summary

MAP ID# 2

Distance from Property: 0.01 mi. (53 ft.) NE
Elevation: 5,102 ft. (Lower than TP)

SITE INFORMATION

UNIQUE ID: **1077921**
PLANT ID: **1077921**
NAME: **NOBLE ENERGY INC. BATTERY #11318900**
ADDRESS: **NESE4 SEC36 T1N R69W**
LAFAYETTE AREA, CO 80026
CLASSIFICATION: **POTENTIAL UNCONTROLLED EMISSIONS <100 TONS/YEAR**
OPERATION STATUS: **OPERATING**
STATE COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**
FACILITY TYPE: **PRIVATELY OWNED/OPERATED**
CURRENT HIGH PRIORITY VIOLATOR: **NOT REPORTED**
SIC DESCRIPTION: **ESTABLISHMENTS PRIMARILY ENGAGED IN PRODUCING LIQUID HYDROCARBONS FROM OIL AND GAS FIELD GASES.**

ENFORCEMENT ACTIONS

DATE ACHIEVED: **07/05/2012**
DATE RECORDED: **10/03/2012**
NATIONAL ACTION TYPE: **STATE CONDUCTED FCE/ON-SITE**
ALL AIR PROGRAM: **SIP SOURCE**
RESULTS OF STACK TEST AND TITLE V: **IN COMPLIANCE**
POLLUTANT: **NOT REPORTED**
ALL POLLUTION IN VIOLATION: **NOT REPORTED**
TYPE OF VIOLATION(S): **NOT REPORTED**
PENALTY AMOUNT: **0**

AIR PROGRAM

AIR PROGRAM STATUS: **OPERATING**
EPA COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**
POLLUTANT COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**
POLLUTANT: **VOLATILE ORGANIC COMPOUNDS**

HISTORICAL COMPLIANCE AIR PROGRAM LEVEL

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1204**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1401**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1201**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1402**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1102**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1301**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1203**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1403**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1302**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1104**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1304**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1101**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1303**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**
COMPLIANCE DATE (YYYQ): **1202**
HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

AIR PROGRAM: **SIP SOURCE**

COMPLIANCE DATE (YYYQ): **1103**

HISTORICAL COMPLIANCE STATUS: **IN COMPLIANCE WITH PROCEDURAL REQUIREMENTS**

Back to Report Summary

MAP ID# 2

Distance from Property: 0.01 mi. (53 ft.) NE
Elevation: 5,102 ft. (Lower than TP)

SITE INFORMATION

SITE ID: **013-1409**

FACILITY NAME: **NOBLE ENERGY INC. BATTERY #11318900**

ADDRESS: **NESE4 SEC36 T1N R69W**
LAFAYETTE AREA, CO 80026

PERMIT NAME: **NOBLE ENERGY INC. BATTERY #11318900**

FACILITY CLASSIFICATION: **0**

AIR PROGRAM

AIR PROGRAM CLASSIFICATION: 'A'=Major, 'B'=Minor, 'SM'=Synthetic Minor, 'ND'=No Major Source Threshold Defined, 'C'=Unknown, 'BLANK'= BLANK FIELD

AIR PROGRAM CLASS: **MINOR**

ACID PRECIPITATION: **BLANK** APEN EXEMPT: **BLANK** CFC TRACKING: **BLANK**

CONDENSATE STORAGE TANK: **B** FESOP (NON-TITLE V): **BLANK** MACT (SEC. 63 NESHAPS): **BLANK**

NESHAP: **BLANK** NON FEDERALLY REPORTABLE SOURCE: **BLANK** FEDERAL NSPS: **BLANK**

STATE NSPS: **BLANK** NSR: **BLANK** PSD: **BLANK** SIP SOURCE UNDER FEDERAL JURISDICTION: **BLANK**

SIP SOURCE: **BLANK** TITLE V PERMITS: **BLANK** NATIVE AMERICAN: **BLANK**

PLANT AIR PROGRAM: **OZONE, AREA N2081**

PROPERTY AREA: **NOT REPORTED**

COMPLIANCE MONITORING SYSTEM: **NOT REPORTED**

DATE COMPLIANCE MONITORING SYSTEM: **08/04/10**

STANDARD INDUSTRIAL DESCRIPTION:

OIL AND GAS EXTRACTION - NATURAL GAS LIQUIDS

SITE CONTACT INFORMATION

CONTACT NAME: **TARYN WEINER**

CONTACT PHONE: **(303)228-4362**

SITE DESCRIPTION:**E&P CONDENSATE STORAGE TANK BATTERY**

COMMENTS:

NOT REPORTED

OWNER INFORMATION

OWNER CUSTOMER #: **7526294770**

OWNER NAME: **NOBLE ENERGY, INC.**

ADDRESS: **1625 BROADWAY**
NOT REPORTED, 08 80202

OWNER MAIL NAME: **BRIAN TAYLOR**

OWNER MAIL PHONE: **(720)587-2371**

SITE OWNER DESCRIPTION: **OGCC#67305 OIL & GAS EXTRACTIO**

SITE POLLUTANT INFORMATION

EFFECTIVE YEAR OF INVENTORY: **2015**

POLLUTANT NAME: **VOC - VOLATILE ORGANIC COMPOUNDS**

EMISSION DATA SUBMITTED YEAR: **2013**

POLLUTANT IS A HAZARDOUS AIR POLLUTANT UNDER COLORADO SECTION 25-7-109.3 C.R.S: **NO**

POLLUTANT IS A CRITERIA POLLUTANT: **YES**

POLLUTANT IS REPORTABLE AS EPCRA (SARA TITLE III) COMPOUND ONLY: **NO**

POLLUTANT IS A HAZARDOUS AIR POLLUTANT LISTED UNDER THE FEDERAL CAAA SECTION 112: **NO**

POLLUTANT IS A OZONE DEPLETING COMPOUND LISTED UNDER COLORADO AQCC REGULATION 15 SECTION II.11.: **NO**

ESTIMATED EMISSIONS: *(TONS PER YEAR):* **1.73990**
UNCONTROLLED ESTIMATED EMISSIONS: *(TONS PER YEAR):* **1.73990**
EMISSIONS LIMIT: *(TONS PER YEAR):* **0.00000**
ESTIMATED EMISSIONS WITH RULE EFFECTIVENESS: *(TONS PER YEAR)* **0.00000**

EFFECTIVE YEAR OF INVENTORY: **2014**
POLLUTANT NAME: **VOC - VOLATILE ORGANIC COMPOUNDS**
EMISSION DATA SUBMITTED YEAR: **2009**
POLLUTANT IS A HAZARDOUS AIR POLLUTANT UNDER COLORADO SECTION 25-7-109.3 C.R.S: **NO**
POLLUTANT IS A CRITERIA POLLUTANT: **YES**
POLLUTANT IS REPORTABLE AS EPCRA (SARA TITLE III) COMPOUND ONLY: **NO**
POLLUTANT IS A HAZARDOUS AIR POLLUTANT LISTED UNDER THE FEDERAL CAAA SECTION 112: **NO**
POLLUTANT IS A OZONE DEPLETING COMPOUND LISTED UNDER COLORADO AQCC REGULATION 15 SECTION II.11.: **NO**
ESTIMATED EMISSIONS: *(TONS PER YEAR):* **1.97280**
UNCONTROLLED ESTIMATED EMISSIONS: *(TONS PER YEAR):* **1.97280**
EMISSIONS LIMIT: *(TONS PER YEAR):* **0.00000**
ESTIMATED EMISSIONS WITH RULE EFFECTIVENESS: *(TONS PER YEAR)* **0.00000**

STACK

EFFECTIVE YEAR OF INVENTORY: **2015**
EMISSION DATA SUBMITTED YEAR: **2013**
EMISSION RELEASE POINT (STACK): **CONDENSATE TANK FLASH EMISSIONS**
STACK GAS FLOW RATE: *(CUBIC FEET PER MINUTE):* **9747.00000**
STACK GAS FLOW RATE (NEI COMPATIBLE): *(CUBIC FEET PER MINUTE):* **162.00000**
STACK HEIGHT: **20.00000**
STACK DIAMETER: **2.84000**
PLUME HEIGHT: **0.00000**
STACK TYPE DESCRIPTION:
A STACK WITH AN UNOBSTRUCTED OPENING DISCHARGING IN A VERTICAL DIRECTION

EFFECTIVE YEAR OF INVENTORY: **2014**
EMISSION DATA SUBMITTED YEAR: **2009**
EMISSION RELEASE POINT (STACK): **CONDENSATE TANK FLASH EMISSIONS**
STACK GAS FLOW RATE: *(CUBIC FEET PER MINUTE):* **9747.00000**
STACK GAS FLOW RATE (NEI COMPATIBLE): *(CUBIC FEET PER MINUTE):* **162.00000**
STACK HEIGHT: **20.00000**
STACK DIAMETER: **2.84000**
PLUME HEIGHT: **0.00000**
STACK TYPE DESCRIPTION:
A STACK WITH AN UNOBSTRUCTED OPENING DISCHARGING IN A VERTICAL DIRECTION

STACK POLLUTANT

EFFECTIVE YEAR OF INVENTORY: **2015**
POLLUTANT NAME: **VOC - VOLATILE ORGANIC COMPOUNDS**

EMISSION DATA SUBMITTED YEAR: **2013**

POLLUTANT IS A HAZARDOUS AIR POLLUTANT UNDER COLORADO SECTION 25-7-109.3 C.R.S: **NO**

POLLUTANT IS A CRITERIA POLLUTANT: **YES**

POLLUTANT IS REPORTABLE AS EPCRA (SARA TITLE III) COMPOUND ONLY: **NO**

POLLUTANT IS A HAZARDOUS AIR POLLUTANT LISTED UNDER THE FEDERAL CAAA SECTION 112: **NO**

POLLUTANT IS A OZONE DEPLETING COMPOUND LISTED UNDER COLORADO AQCC REGULATION 15 SECTION II.11.: **NO**

ESTIMATED EMISSIONS: *(TONS PER YEAR):*	UNCONTROLLED ESTIMATED EMISSIONS: *(TONS PER YEAR):*	EMISSIONS LIMIT: *(TONS PER YEAR):*
1.73990	**1.73990**	**0.00000**

ESTIMATED EMISSIONS WITH RULE EFFECTIVENESS: *(TONS PER YEAR)*

0.00000

EFFECTIVE YEAR OF INVENTORY: **2014**

POLLUTANT NAME: **VOC - VOLATILE ORGANIC COMPOUNDS**

EMISSION DATA SUBMITTED YEAR: **2009**

POLLUTANT IS A HAZARDOUS AIR POLLUTANT UNDER COLORADO SECTION 25-7-109.3 C.R.S: **NO**

POLLUTANT IS A CRITERIA POLLUTANT: **YES**

POLLUTANT IS REPORTABLE AS EPCRA (SARA TITLE III) COMPOUND ONLY: **NO**

POLLUTANT IS A HAZARDOUS AIR POLLUTANT LISTED UNDER THE FEDERAL CAAA SECTION 112: **NO**

POLLUTANT IS A OZONE DEPLETING COMPOUND LISTED UNDER COLORADO AQCC REGULATION 15 SECTION II.11.: **NO**

ESTIMATED EMISSIONS: *(TONS PER YEAR):*	UNCONTROLLED ESTIMATED EMISSIONS: *(TONS PER YEAR):*	EMISSIONS LIMIT: *(TONS PER YEAR):*
1.97280	**1.97280**	**0.00000**

ESTIMATED EMISSIONS WITH RULE EFFECTIVENESS: *(TONS PER YEAR)*

0.00000

UNIT COMMENT

-NO COMMENTS REPORTED

Back to Report Summary

MAP ID# 3

Distance from Property: 0.03 mi. (158 ft.) NE
Elevation: 5,100 ft. (Lower than TP)

SITE INFORMATION

EPA ID: **COD007079627**
SITE NAME: **CROCKETT & KELLY INC.**
SITE ADDRESS: **1001 WELD CNTY RD 1**
ERIE, CO 80516
SITE COUNTY: **WELD**
FACILITY TYPE: **CA**
STATUS: **ACTIVE**
LINKS: **http://www.epa.gov/cgi-bin/get1cReport.cgi?tool=echo&IDNumber=COD007079627**

Back to Report Summary

Leaking Storage Tank Facilities (LST)

MAP ID# 3

Distance from Property: 0.03 mi. (158 ft.) NE
Elevation: 5,100 ft. (Lower than TP)

FACILITY INFORMATION

UNIQUE ID: **13247LST**
FACILITY ID: **13247**
NAME: **FALCON PROPERTIES**
ADDRESS: **1001 WELD CR 1**
ERIE, CO 80516
SITE NAME: **FALCON PROPERTIES**
LOCATION: **1001 WELD CR 1, ERIE 80516**

LEAKING INFORMATION

EVENT ID:	STATUS:	RELEASE DATE:	ALTERNATE NAME:
1911	**CLOSED**	**10/21/1994**	**FALCON PROPERTIES**

COSTIS LINK: http://costis.cdle.state.co.us/event.asp?h_id=1911

Back to Report Summary

No Longer Regulated RCRA Corrective Action Facilities (NLRRCRAC)

MAP ID# 3

Distance from Property: 0.03 mi. (158 ft.) NE
Elevation: 5,100 ft. (Lower than TP)

FACILITY INFORMATION

EPA ID#: **COD007079627**
NAME: **CROCKETT & KELLY INC**
ADDRESS: **1001 WELD CNTY RD 1**
ERIE, CO 80516
CONTACT NAME: **DOYLE DUNGER**
CONTACT ADDRESS: **P O BOX 750**
ERIE CO 80516
CONTACT PHONE: **303-666-7788**
NON-NOTIFIER: **NOT A NON-NOTIFIER**
DATE RECEIVED BY AGENCY: **08/10/1993**
CERTIFICATION **- NO CERTIFICATION REPORTED -**
INDUSTRY CLASSIFICATION (NAICS) **- NO NAICS INFORMATION REPORTED -**

OWNER TYPE: **NOT REPORTED**
OWNER NAME: **NOT REPORTED**
OPERATOR TYPE: **NOT REPORTED**
OPERATOR NAME: **NOT REPORTED**

SITE HISTORY (INCLUDES GENERATORS AND NON-GENERATORS)
DATE RECEIVED BY AGENCY: **08/10/1993**
NAME: **CROCKETT & KELLY INC**
GENERATOR CLASSIFICATION: **NOT A GENERATOR**

CURRENT ACTIVITY INFORMATION

GENERATOR STATUS: **NOT A GENERATOR** LAST UPDATED DATE: **12/01/2004**
SUBJECT TO CORRECTIVE ACTION UNIVERSE: **YES**
TDSFs POTENTIALLY SUBJECT TO CORRECTIVE ACTION UNDER 3004 (u)/(v) UNIVERSE: **NO**
TDSFs ONLY SUBJECT TO CORRECTIVE ACTION UNDER DISCRETIONARY AUTHORITIES UNIVERSE: **NO**
NON TSDFs WHERE RCRA CORRECTIVE ACTION HAS BEEN IMPOSED UNIVERSE: **YES**
CORRECTIVE ACTION WORKLOAD UNIVERSE: **YES**

IMPORTER: **NO**
MIXED WASTE GENERATOR: **NO**
RECYCLER: **NO**
TRANSPORTER: **NO**
ONSITE BURNER EXEMPTION: **NO**
FURNACE EXEMPTION: **NO**
USED OIL REFINER: **NO**
USED OIL TRANSFER FACILITY: **NO**
UNDERGROUND INJECTION: **NO**
UNIVERSAL WASTE DESTINATION FACILITY: **NO**
TRANSFER FACILITY: **NO**
USED OIL FUEL BURNER: **NO**
USED OIL PROCESSOR: **NO**
USED OIL FUEL MARKETER TO BURNER: **NO**
SPECIFICATION USED OIL MARKETER: **NO**
USED OIL TRANSPORTER: **NO**

COMPLIANCE, MONITORING AND ENFORCEMENT INFORMATION

EVALUATIONS

02/10/2005	**FUI**	**FOLLOW-UP INSPECTION**
12/27/2004	**FUI**	**FOLLOW-UP INSPECTION**
05/14/2004	**FUI**	**FOLLOW-UP INSPECTION**
01/30/1998	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
10/22/1996	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
08/25/1995	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
07/13/1995	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
12/01/1994	**FCI**	**FOCUSED COMPLIANCE INSPECTION**

11/02/1994	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
10/06/1987	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
12/15/1986	**CEI**	**COMPLIANCE EVALUATION INSPECTION ON-SITE**
01/29/1985	**CEI**	**COMPLIANCE EVALUATION INSPECTION ON-SITE**

VIOLATIONS

01/29/1985	**262.A**	**GENERATORS - GENERAL**

ENFORCEMENTS

06/21/1985	**310**	**FINAL 3008(A) COMPLIANCE ORDER**

HAZARDOUS WASTE

F002	**THE FOLLOWING SPENT HALOGENATED SOLVENTS: TETRACHLOROETHYLENE, METHYLENE CHLORIDE,TRICHLOROETHYLENE, 1,1,1-TRICHLOROETHANE,CHLOROBENZENE, 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE, ORTHO-DICHLOROBENZENE, TRICHLOROFLUOROMETHANE, AND 1,1,2, TRICHLOROETHANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE HALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001,F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.**
U226	**ETHANE, 1,1,1-TRICHLORO-**
U226	**METHYL CHLOROFORM**

UNIVERSAL WASTE **- NO UNIVERSAL WASTE REPORTED -**

CORRECTIVE ACTION AREA (RELEASE)

AREA NAME:	AIR:	GROUNDWATER:	SOIL:	SURFACE WASTE:
ENTIRE FACILITY	**-----**	**Y**	**Y**	**-----**
GROUNDWATER	**-----**	**Y**	**-----**	**-----**
SOIL	**-----**	**-----**	**Y**	**-----**

CORRECTIVE ACTION EVENT

CA EVENT:	DATE:	EVENT DESCRIPTION:
CA999RM	**02/10/2005**	**CA PROCESS IS TERMINATED-REMEDIAL ACTIVITIES COMPLETE**
CA515	**02/07/2005**	**CORRECTIVE MEASURES REPORT RECEIVED**
CA550	**02/07/2005**	**REMEDY CONSTRUCTION**
CA814OM	**12/27/2004**	**OTHER WORKPLAN APPROVED**
CA811OM	**12/09/2004**	**OTHER WORKPLAN RECEIVED - OPERATION AND MAINTENANCE**
CA817OM	**12/09/2004**	**OTHER SUPPLEMENTAL INFORMATION RECEIVED**
CA100DC	**05/14/2004**	**RFI IMPOSITION-FOCUSED DATA COLLECTION REQ STAB EVAL**
CA006AC	**08/17/1999**	**TYPE OF UNIT - AREA OF CONCERN**
CA050PA	**08/17/1999**	**RFA COMPLETED-ASSESSMENT WAS A PA-PLUS**
CA155	**01/30/1998**	**INVESTIGATION SUPPLEMENTAL INFO REQ BY AGENCY**
CA155	**11/01/1996**	**INVESTIGATION SUPPLEMENTAL INFO REQ BY AGENCY**
CA650	**07/13/1995**	**STABILIZATION CONSTRUCTION COMPLETED**
CA075LO	**06/30/1995**	**CA PRIORITIZATION-LOW CA PRIORITY**
CA225NF	**06/30/1995**	**STABILIZATION MEASURES EVALUATION-NOT AMENABLE TO STABILIZATION (NOT FEASIBLE)**
CA725YE	**06/30/1995**	**HUMAN EXPOSURES CONTROLLED DETERMINATION-YES, APPLICABLE AS OF THIS DATE**
CA750YE	**06/30/1995**	**RELEASE TO GW CONTROLLED DETERMINATION-YES, APPLICABLE AS OF THIS DATE**

CA250	12/19/1994	CMS IMPOSITION
CA450	12/05/1994	CORRECTIVE MEASURES DESIGN APPROVED
CA200	11/04/1994	INVESTIGATION COMPLETE
CA006SM	06/01/1994	TYPE OF UNIT - SOLID WASTE MGMT UNIT
CA100	06/01/1994	INVESTIGATION IMPOSITION
CA0012	NOT REPORTED	CORRECTIVE ACTION UNIVERSE
CA0012	//	CORRECTIVE ACTION UNIVERSE
CA002Y	NOT REPORTED	REMEDIATION UNIVERSE
CA002Y	//	REMEDIATION UNIVERSE

Back to Report Summary

Resource Conservation & Recovery Act - Non-Generator Facilities (RCRANGR08)

MAP ID# 3

Distance from Property: 0.03 mi. (158 ft.) NE
Elevation: 5,100 ft. (Lower than TP)

FACILITY INFORMATION

EPA ID#: **COD007079627**
NAME: **CROCKETT & KELLY INC**
ADDRESS: **1001 WELD CNTY RD 1**
ERIE, CO 80516
CONTACT NAME: **DOYLE DUNGER**
CONTACT ADDRESS: **P O BOX 750**
ERIE CO 80516
CONTACT PHONE: **3036667788**
NON-NOTIFIER: **NOT A NON-NOTIFIER**
DATE RECEIVED BY AGENCY: **08/10/1993**

OWNER TYPE: **NOT REPORTED**
OWNER NAME: **NOT REPORTED**
OPERATOR TYPE: **NOT REPORTED**
OPERATOR NAME: **NOT REPORTED**

CERTIFICATION **- NO CERTIFICATION REPORTED -**
INDUSTRY CLASSIFICATION (NAICS) **- NO NAICS INFORMATION REPORTED -**
SITE HISTORY (INCLUDES GENERATORS AND NON-GENERATORS)
DATE RECEIVED BY AGENCY: **08/10/1993**
NAME: **CROCKETT & KELLY INC**
GENERATOR CLASSIFICATION: **NOT A GENERATOR**

CURRENT ACTIVITY INFORMATION

GENERATOR STATUS: **NOT A GENERATOR** LAST UPDATED DATE: **12/01/2004**
SUBJECT TO CORRECTIVE ACTION UNIVERSE: **NO**
TDSFs POTENTIALLY SUBJECT TO CORRECTIVE ACTION UNDER 3004 (u)/(v) UNIVERSE: **NO**
TDSFs ONLY SUBJECT TO CORRECTIVE ACTION UNDER DISCRETIONARY AUTHORITIES UNIVERSE: **NO**
NON TSDFs WHERE RCRA CORRECTIVE ACTION HAS BEEN IMPOSED UNIVERSE: **YES**
CORRECTIVE ACTION WORKLOAD UNIVERSE: **NO**

IMPORTER: **NO**
MIXED WASTE GENERATOR: **NO**
RECYCLER: **NO**
TRANSPORTER: **NO**
ONSITE BURNER EXEMPTION: **NO**
FURNACE EXEMPTION: **NO**
USED OIL REFINER: **NO**
USED OIL TRANSFER FACILITY: **NO**

UNDERGROUND INJECTION: **NO**
UNIVERSAL WASTE DESTINATION FACILITY: **NO**
TRANSFER FACILITY: **NO**
USED OIL FUEL BURNER: **NO**
USED OIL PROCESSOR: **NO**
USED OIL FUEL MARKETER TO BURNER: **NO**
SPECIFICATION USED OIL MARKETER: **NO**
USED OIL TRANSPORTER: **NO**

COMPLIANCE, MONITORING AND ENFORCEMENT INFORMATION

EVALUATIONS

02/10/2005	**FUI**	**FOLLOW-UP INSPECTION**
12/27/2004	**FUI**	**FOLLOW-UP INSPECTION**
05/14/2004	**FUI**	**FOLLOW-UP INSPECTION**
01/30/1998	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
10/22/1996	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
08/25/1995	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
07/13/1995	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
12/01/1994	**FCI**	**FOCUSED COMPLIANCE INSPECTION**

11/02/1994	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
10/06/1987	**FCI**	**FOCUSED COMPLIANCE INSPECTION**
12/15/1986	**CEI**	**COMPLIANCE EVALUATION INSPECTION ON-SITE**
01/29/1985	**CEI**	**COMPLIANCE EVALUATION INSPECTION ON-SITE**

VIOLATIONS

01/29/1985	**262.A**	**GENERATORS - GENERAL**

ENFORCEMENTS

06/21/1985	**310**	**FINAL 3008(A) COMPLIANCE ORDER**

HAZARDOUS WASTE

F002	**THE FOLLOWING SPENT HALOGENATED SOLVENTS: TETRACHLOROETHYLENE, METHYLENE CHLORIDE,TRICHLOROETHYLENE, 1,1,1-TRICHLOROETHANE,CHLOROBENZENE, 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE, ORTHO-DICHLOROBENZENE, TRICHLOROFLUOROMETHANE, AND 1,1,2, TRICHLOROETHANE; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THE ABOVE HALOGENATED SOLVENTS OR THOSE SOLVENTS LISTED IN F001,F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.**
U226	**ETHANE, 1,1,1-TRICHLORO-**
U226	**METHYL CHLOROFORM**

UNIVERSAL WASTE **- NO UNIVERSAL WASTE REPORTED -**

CORRECTIVE ACTION AREA (RELEASE)

AREA NAME:	AIR:	GROUNDWATER:	SOIL:	SURFACE WASTE:
ENTIRE FACILITY	**-----**	**Y**	**Y**	**-----**
GROUNDWATER	**-----**	**Y**	**-----**	**-----**
SOIL	**-----**	**-----**	**Y**	**-----**

CORRECTIVE ACTION EVENT

CA EVENT:	DATE:	EVENT DESCRIPTION:
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CA155	**11/01/1996**	**INVESTIGATION SUPPLEMENTAL INFO REQ BY AGENCY**
CA650	**07/13/1995**	**STABILIZATION CONSTRUCTION COMPLETED**
CA075LO	**06/30/1995**	**CA PRIORITIZATION-LOW CA PRIORITY**
CA225NF	**06/30/1995**	**STABILIZATION MEASURES EVALUATION-NOT AMENABLE TO STABILIZATION (NOT FEASIBLE)**
CA725YE	**06/30/1995**	**HUMAN EXPOSURES CONTROLLED DETERMINATION-YES, APPLICABLE AS OF THIS DATE**
CA750YE	**06/30/1995**	**RELEASE TO GW CONTROLLED DETERMINATION-YES, APPLICABLE AS OF THIS DATE**

CA250	12/19/1994	CMS IMPOSITION
CA450	12/05/1994	CORRECTIVE MEASURES DESIGN APPROVED
CA200	11/04/1994	INVESTIGATION COMPLETE
CA006SM	06/01/1994	TYPE OF UNIT - SOLID WASTE MGMT UNIT
CA100	06/01/1994	INVESTIGATION IMPOSITION
CA0012	NOT REPORTED	CORRECTIVE ACTION UNIVERSE
CA0012	//	CORRECTIVE ACTION UNIVERSE
CA002Y	NOT REPORTED	REMEDIATION UNIVERSE
CA002Y	//	REMEDIATION UNIVERSE

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MAP ID# 3

Distance from Property: 0.03 mi. (158 ft.) NE
Elevation: 5,100 ft. (Lower than TP)

FACILITY INFORMATION

ID #: **80516CRCKT1001W**

OWNER NAME: **NA**

FACILITY NAME: **CROCKETT & KELLY INC.**

ADDRESS: **1001 WELD COUNTY RD. #1**
ERIE, CO 80516

COUNTY: **WELD**

CHEMICAL/S RELEASED

1,1,1-TRICHLOROETHANE

RELEASE INFORMATION

(Release amounts are reported in pounds)

REPORT YEAR	FUGITIVE AIR	STACK AIR	WATER RELEASE	CLASS I INJECTION WELLS	CLASS II - V INJECTION WELLS	RCRA C / OTHER LANDFILLS	LAND TREATMENT
1987	9360.00	0.00	0.00	0.00	0.00	0.00	0.00

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Aboveground Storage Tank Facilities (AST)

MAP ID# 3

Distance from Property: 0.03 mi. (158 ft.) NE
Elevation: 5,100 ft. (Lower than TP)

FACILITY INFORMATION

FACILITY ID: **13247**
NAME: **FALCON PROPERTIES**
ADDRESS: **1001 WELD CR 1**
ERIE, CO 80516
COSTIS LINK: http://costis.cdle.state.co.us/facility.asp?h_id=13247

OWNER INFORMATION

OWNER ID: **16477**
NAME: **FALCON PROPERTIES**
ADDRESS: **2240 WELD CR 5**
ERIE, CO 80516

TANK INFORMATION

TANK ID:	TANK TYPE:	TANK PRODUCT:	TANK CAPACITY:	TANK STATUS:	INSTALLATION DATE:
NR	**NOT REPORTED**	**NOT REPORTED**	**NOT REPORTED**	**NOT REPORTED**	**NOT REPORTED**

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Spills Listing (SPILLS)

MAP ID# 4

Distance from Property: 0.05 mi. (264 ft.) NE
Elevation: 5,103 ft. (Lower than TP)

INCIDENT INFORMATION

CASE NUMBER: **2012-0749** NRC NUMBER: **NOT REPORTED**

SPILL DATE: **10/24/12**

SPILL LOCATION: **750 E COUNTY LINE RD, AT THE WASTEWATER TREATMENT PLANT**

SPILL CITY/STATE/ZIP: **LAFAYETTE, CO NOT REPORTED**

SPILL COUNTY: **BOULDER**

RESPONSIBLE PARTY

NAME: **NOT REPORTED**

ADDRESS: **STREET NOT REPORTED**
CITY NOT REPORTED, CO

COUNTY: **NOT REPORTED**

CONTACT: **MICK FORRESTER**

PHONE: **303-665-5506**

INCIDENT DETAILS

SOURCE: **OTHER**

SOURCE TYPE: **WASTEWATER TREATMENT PLANT**

MEDIUM: **WATER**

WATERWAY: **COAL CREEK**

CAUSE: **OTHER**

MATERIAL TYPE: **PERMIT EXCEEDENCE**

MATERIAL DESCRIPTION:	MATERIAL QUANTITY:	WATER QUANTITY:
HIGH E. COLI READING	**1203 ORG/100 ML**	**NOT REPORTED**

CAUSE INFORMATION:

ROUTINE DAILY TEST OF E. COLI TAKEN ON 10/24/12 APPROX. 8:30 A.M. HAD TEST RESULTS COME BACK ON 10/25/12 SHOWING E COLI LEVEL AT 1203 ORGANISMS/100 ML. THEY ADJUSTED THE UV LEVELS AND REPEATED SAMPLES UNTIL BY 10/29/12 THEY HAD THE E COLI LEVELS WITHIN A

ACTION:

NOT REPORTED

RESPONSE COMMENTS:

NOT REPORTED

COMMENTS:

CALLER'S EMAIL: MICKF@CITYOFLAFAYETTE.COM

Back to Report Summary

MAP ID# 4

Distance from Property: 0.05 mi. (264 ft.) NE
Elevation: 5,103 ft. (Lower than TP)

INCIDENT INFORMATION

CASE NUMBER: **2004-421** NRC NUMBER: **NOT REPORTED**

SPILL DATE: **06/30/04**

SPILL LOCATION: **HWY 7 & WELD COUNTY RD. 1 - WASTEWATER PLANT**

SPILL CITY/STATE/ZIP: **LAFAYETTE, CO NOT REPORTED**

SPILL COUNTY: **BOULDER**

RESPONSIBLE PARTY

NAME: **CITY OF LAFAYETTE WASTEWATER**

ADDRESS: **STREET NOT REPORTED**
LAFAYETTE, CO

COUNTY: **NOT REPORTED**

CONTACT: **MICK FORRESTER**

PHONE: **303-665-6034**

INCIDENT DETAILS

SOURCE: **FIXED FACILITY**

SOURCE TYPE: **SANITARY SEWER/LIFT STATION**

MEDIUM: **WATER**

WATERWAY: **COAL CREEK**

CAUSE: **ERROR OPERATOR**

MATERIAL TYPE: **SANITARY SEWER OVERFLOW**

MATERIAL DESCRIPTION:	MATERIAL QUANTITY:	WATER QUANTITY:
BIOSOLIDS - SLUDGE	**10000 GALLONS**	**10000 G**

CAUSE INFORMATION:

AN OPERATOR LEFT A VALVE OPEN OVERNIGHT THAT ALLOWED FOR THE PUMPING OF SLUDGE INTO THE DIGESTOR AND EVENTUALLY INOT COAL CREEK.

ACTION:

VALVE WAS SHUT OFF AND A VAC TRUCK IS ATTEMPTING TO RECOVER RELEASED MATERIAL.

RESPONSE COMMENTS:

NOT REPORTED

COMMENTS:

ITS UNKNOWN IF ANY DOWNSTREAM USER INTAKES ARE ON COAL CREEK.

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MAP ID# 4

Distance from Property: 0.05 mi. (264 ft.) NE
Elevation: 5,103 ft. (Lower than TP)

INCIDENT INFORMATION

CASE NUMBER: **2003-164** NRC NUMBER: **NOT REPORTED**

SPILL DATE: **03/31/03**

SPILL LOCATION: **750 E. COUNTY LINE RD.-RECLAIMATION PLANT**

SPILL CITY/STATE/ZIP: **LAFAYETTE, CO NOT REPORTED**

SPILL COUNTY: **BOULDER**

RESPONSIBLE PARTY

NAME: **LAFAYETTE WATER RECLAIMATION**

ADDRESS: **1290 S. PUBLIC RD.**
LAFAYETTE, CO 80026

COUNTY: **NOT REPORTED**

CONTACT: **MICK FORRESTER**

PHONE: **303-665-6034**

INCIDENT DETAILS

SOURCE: **FIXED FACILITY**

SOURCE TYPE: **SANITARY SEWER/LIFT STATION**

MEDIUM: **WATER**

WATERWAY: **COAL CREEK->BOULDER CREEK**

CAUSE: **ERROR OPERATOR**

MATERIAL TYPE: **SANITARY SEWER OVERFLOW**

MATERIAL DESCRIPTION:	MATERIAL QUANTITY:	WATER QUANTITY:
DIGESTED SLUDGE	**3000 GALLONS**	**500 G**

CAUSE INFORMATION:

A TRUCK UNLOADING DIGESTED SLUDGE HAD THE BOTTOM RELEASE VALVE STUCK OPEN, ALLOWING FOR MATERIAL TO RELEASE ONTO GROUND AND INTO COAL CREEK.

ACTION:

DIKES AND BURMS WERE CREATED TO ABATE FLOW OF SLUDGE TO COAL CREEK. A VAC TRUCK WILL ATTEMPT TO RECOVER RELEASED MATERIAL.

RESPONSE COMMENTS:

NOT REPORTED

COMMENTS:

DIGESTED SLUDGE IMPACTED THE 7B SEGMENT OF THE COAL CREEK. COAL CREEK EMPTIES TO BOULDER CREEK WHICH

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MAP ID# 5

Distance from Property: 0.08 mi. (422 ft.) E
Elevation: 5,109 ft. (Lower than TP)

INCIDENT INFORMATION

CASE NUMBER: **2004-116** NRC NUMBER: **NOT REPORTED**
SPILL DATE: **03/01/04**
SPILL LOCATION: **COLO. HWY 7 & COUNTY LINE RD.- NE CORNER**
SPILL CITY/STATE/ZIP: **LAFAYETTE, CO NOT REPORTED**
SPILL COUNTY: **BOULDER**

RESPONSIBLE PARTY

NAME: **DEQUASIE TRUCKING**
ADDRESS: **608 E. DOUNSE**
LAFAYETTE, CO
COUNTY: **NOT REPORTED**
CONTACT: **JOHN DEQUASIE**
PHONE: **303-719-2297**

INCIDENT DETAILS

SOURCE: **HIGHWAY/ROADWAY**
SOURCE TYPE: **TRUCK/TRAILER**
MEDIUM: **WATER AND LAND**
WATERWAY: **WETLANDS-->COAL CREEK**
CAUSE: **TRANSPORTATION ACCIDENT**
MATERIAL TYPE: **OIL**

MATERIAL DESCRIPTION:	MATERIAL QUANTITY:	WATER QUANTITY:
DIESEL	**50 GALLONS**	**30 G**

CAUSE INFORMATION:
A TRUCK WAS EITHER TRYING TO AVOID A VEHICLE OR WAS RUN OFF THE ROAD, WHICH RESULTED IN A PUNCTURE TO A SADDLE TANK ALLOWING FOR RELESE OF DIESEL FUEL. RELEASED DIESEL IMPACTED SHOULDER OF HIGHWAY.
ACTION:
CUSTOM ENVIRONMENTAL HAS BEEN NOTIFIED FOR CLEANUP. LAFAYETTE FIRE DEPT. DID PUT BOOMS INTO WETLANDS TO CONTAIN RELEASED DIESEL. HOWEVER, BOOMS HAVE BECOME SATURATED AND FUEL IS MIGRATING.
RESPONSE COMMENTS:
NOT REPORTED
COMMENTS:
CUSTOM ENVIRONEMNTAL IS ON SCENE AND APPLYING MORE BOOMS TO PREVENT FURTHER MIGRATION OF FUEL IN WET

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Historical Solid Waste Landfills (HISTSWLF)

MAP ID# 5

Distance from Property: 0.09 mi. (475 ft.) E
Elevation: 5,109 ft. (Lower than TP)

SITE INFORMATION

UNIQUE ID: **00070-0000439**
NAME: **ILLEGAL DUMP**
ADDRESS: **HIGHWAY 7 AND COUNTY ROAD #1**
LAFAYETTE, CO
DIRECTIONS: **NOT REPORTED**
COUNTY: **BOULDER**

SITE DETAILS

AGENCY SOURCE: **NOT REPORTED**
DETAIL1:
TRS-
DETAIL2:
NO OTHER DETAILS AVAILABLE

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MAP ID# 6

Distance from Property: 0.18 mi. (950 ft.) SE
Elevation: 5,114 ft. (Higher than TP)

SITE INFORMATION

UNIQUE ID: **00070-0000438**
NAME: **HURST DUMP**
ADDRESS: **FLAG DRIVE 3/10 MILE SOUTH OF BASELINE ROAD**
LAFAYETTE, CO
DIRECTIONS: **NOT REPORTED**
COUNTY: **BOULDER**

SITE DETAILS

AGENCY SOURCE: **NOT REPORTED**
DETAIL1:
TRS-
DETAIL2:
NO OTHER DETAILS AVAILABLE

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Leaking Storage Tank Facilities (LST)

MAP ID# 7

Distance from Property: 0.48 mi. (2,534 ft.) NE
Elevation: 5,095 ft. (Lower than TP)

FACILITY INFORMATION

UNIQUE ID: **8024LST**
FACILITY ID: **8024**
NAME: **ERIE MUNICIPAL AIRPORT**
ADDRESS: **395 AIRPORT DR**
ERIE, CO 80516
SITE NAME: **ERIE MUNICIPAL AIRPORT**
LOCATION: **395 AIRPORT DR, ERIE 80516**

LEAKING INFORMATION

EVENT ID:	STATUS:	RELEASE DATE:	ALTERNATE NAME:
11568	**CLOSED**	**12/15/2011 14:45**	**ERIE MUNICIPAL AIRPORT**
COSTIS LINK:	http://costis.cdle.state.co.us/event.asp?h_id=11568		
7563	**CLOSED**	**7/22/1999**	**TRI COUNTY AIRPORT**
COSTIS LINK:	http://costis.cdle.state.co.us/event.asp?h_id=7563		
2546	**CLOSED**	**6/11/1997**	**ERIE TRI-COUNTY AIRPORT**
COSTIS LINK:	http://costis.cdle.state.co.us/event.asp?h_id=2546		

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Unlocated Sites Summary

This list contains sites that could not be mapped due to limited or incomplete address information.

Database Name	Site ID#	Site Name	Address	City/State/Zip/County
AIRSAFS	1020335	NOBLE ENERGY - BATTERY #11321400	SENE SEC1 T1S R69W	LAFAYETTE AREA 80026 Boulder
AIRSAFS	1020323	NOBLE ENERGY INC. BATTERY #11302600	NW SW SEC 36 T1N R69W	LAFAYETTE AREA 80026 Boulder
HISTSWLF	00070-0002198	AL CARTON DUMP	UNKNOWN	ERIE 80516 Weld
HISTSWLF	00070-0000396	COLORADO LANDFILL	NO ADDRESS REPORTED	ERIE 80516 Weld
HISTSWLF	00070-0002200	HORST/DEAMIN	UNKNOWN	ERIE 80516 Weld
HISTSWLF	00070-0001043	LAFAYETTE 21MS. & 2 ME	UNKNOWN	LAFAYETTE 80026 Boulder
HISTSWLF	00070-0000440	LAFAYETTE DUMP	NO ADDRESS REPORTED	LAFAYETTE 80026 Boulder
HISTSWLF	00070-0000397	LANDFILL SYSTEMS, INC.	NO ADDRESS REPORTED	ERIE 80516 Weld
HISTSWLF	00070-0002201	NEWHAUSER DUMP	UNKNOWN	ERIE 80516 Weld
HISTSWLF	00070-0002197	OLD ERIE LANDFILL	UNKNOWN	ERIE 80516 Weld
LUSTTRUST	00023-0000048	ERIE	ERIE	ERIE 80000
LUSTTRUST	00023-0000265	ERIE #1	ERIE #1	ERIE 80000
LUSTTRUST	00023-0000049	LAFAYETTE #1	LAFAYETTE #1	LAFAYETTE, CO 80000 BOULDER
SPILLS	CO90-029		WASTE TREATMENT FACILITY	LAFAYETTE

DOCKETS EPA Docket Data

VERSION DATE: 12/22/05

The United States Environmental Protection Agency Docket data lists Civil Case Defendants, filing dates as far back as 1971, laws broken including section, violations that occurred, pollutants involved, penalties assessed and superfund awards by facility and location. Please refer to ICIS database as source of current data.

EC Federal Engineering Institutional Control Sites

VERSION DATE: 08/03/15

This database includes site locations where Engineering and/or Institutional Controls have been identified as part of a selected remedy for the site as defined by United States Environmental Protection Agency official remedy decision documents. A site listing does not indicate that the institutional and engineering controls are currently in place nor will be in place once the remedy is complete; it only indicates that the decision to include either of them in the remedy is documented as of the completed date of the document. Institutional controls are actions, such as legal controls, that help minimize the potential for human exposure to contamination by ensuring appropriate land or resource use. Engineering controls include caps, barriers, or other device engineering to prevent access, exposure, or continued migration of contamination.

LUCIS Land Use Control Information System

VERSION DATE: 09/01/06

The LUCIS database is maintained by the U.S. Navy and contains information for former Base Realignment and Closure (BRAC) properties across the United States.

MLTS Material Licensing Tracking System

VERSION DATE: 02/12/16

MLTS is a list of approximately 8,100 sites which have or use radioactive materials subject to the United States Nuclear Regulatory Commission (NRC) licensing requirements.

RCRASC RCRA Sites with Controls

VERSION DATE: 02/23/16

This list of Resource Conservation and Recovery Act sites with institutional controls in place is provided by the U.S. Environmental Protection Agency.

SFLIENS CERCLIS Liens

VERSION DATE: 06/08/12

A Federal CERCLA ("Superfund") lien can exist by operation of law at any site or property at which United States

Environmental Protection Agency has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties. This database contains those CERCLIS sites where the Lien on Property action is complete.

TSCA Toxic Substance Control Act Inventory

VERSION DATE: 12/31/06

The Toxic Substances Control Act (TSCA) was enacted in 1976 to ensure that chemicals manufactured, imported, processed, or distributed in commerce, or used or disposed of in the United States do not pose any unreasonable risks to human health or the environment. TSCA section 8(b) provides the United States Environmental Protection Agency authority to "compile, keep current, and publish a list of each chemical substance that is manufactured or processed in the United States." This TSCA Chemical Substance Inventory contains non-confidential information on the production amount of toxic chemicals from each manufacturer and importer site.

AIRSAFS Aerometric Information Retrieval System / Air Facility Subsystem

VERSION DATE: 10/20/14

The United States Environmental Protection Agency (EPA) modified the Aerometric Information Retrieval System (AIRS) to a database that exclusively tracks the compliance of stationary sources of air pollution with EPA regulations: the Air Facility Subsystem (AFS). Since this change in 2001, the management of the AIRS/AFS database was assigned to EPA's Office of Enforcement and Compliance Assurance.

CDL Clandestine Drug Laboratory Locations

VERSION DATE: 01/20/16

The U.S. Department of Justice ("the Department") provides this information as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments. The Department does not establish, implement, enforce, or certify compliance with clean-up or remediation standards for contaminated sites; the public should contact a state or local health department or environmental protection agency for that information.

ERNSCO Emergency Response Notification System

VERSION DATE: 02/21/16

This National Response Center database contains data on reported releases of oil, chemical, radiological, biological, and/or etiological discharges into the environment anywhere in the United States and its territories. The data comes from spill reports made to the U.S. Environmental Protection Agency, U.S. Coast Guard, the National Response Center and/or the U.S. Department of Transportation.

HMIRSR08 Hazardous Materials Incident Reporting System

VERSION DATE: 11/08/15

The HMIRS database contains unintentional hazardous materials release information reported to the U.S. Department of Transportation located in EPA Region 8. This region includes the following states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

TRI Toxics Release Inventory

VERSION DATE: 12/31/14

The Toxics Release Inventory, provided by the United States Environmental Protection Agency, includes data on toxic chemical releases and waste management activities from certain industries as well as federal and tribal facilities. This inventory contains information about the types and amounts of toxic chemicals that are released each year to the air, water, and land as well as information on the quantities of toxic chemicals sent to other facilities for further waste management.

BRS Biennial Reporting System

VERSION DATE: 12/31/11

The United States Environmental Protection Agency (EPA), in cooperation with the States, biennially collects information regarding the generation, management, and final disposition of hazardous wastes regulated under the Resource Conservation and Recovery Act of 1976 (RCRA), as amended. The Biennial Report captures detailed data on the generation of hazardous waste from large quantity generators and data on waste management practices from treatment, storage and disposal facilities. Currently, the EPA states that data collected between 1991 and 1997 was originally a part of the defunct Biennial Reporting System and is now incorporated into the RCRAInfo data system.

HISTPST Historical Gas Stations

VERSION DATE: NR

This historic directory of service stations is provided by the Cities Service Company. The directory includes Cities Service filling stations that were located throughout the United States in 1930.

NLRRCRAG No Longer Regulated RCRA Generator Facilities

VERSION DATE: 02/09/16

This database includes RCRA Generator facilities that are no longer regulated by the United States Environmental Protection Agency or do not meet other RCRA reporting requirements. This listing includes facilities that formerly generated hazardous waste.
Large Quantity Generators: Generate 1,000 kg or more of hazardous waste during any calendar month; or Generate more than 1 kg of acutely hazardous waste during any calendar month; or Generate more than 100 kg of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land

or water, or acutely hazardous waste during any calendar month; or Generate 1 kg or less of acutely hazardous waste during any calendar month, and accumulate more than 1kg of acutely hazardous waste at any time; or Generate 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulated more than 100 kg of that material at any time.
Small Quantity Generators: Generate more than 100 and less than 1000 kilograms of hazardous waste during any calendar month and accumulate less than 6000 kg of hazardous waste at any time; or Generate 100 kg or less of hazardous waste during any calendar month, and accumulate more than 1000 kg of hazardous waste at any time.
Conditionally Exempt Small Quantity Generators: Generate 100 kilograms or less of hazardous waste per calendar month, and accumulate 1000 kg or less of hazardous waste at any time; or Generate one kilogram or less of acutely hazardous waste per calendar month, and accumulate at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, or acutely hazardous waste; or Generate 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, or acutely hazardous waste during any calendar month, and accumulate at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste.

RCRAGR08 Resource Conservation & Recovery Act - Generator Facilities

VERSION DATE: 02/09/16

This database includes sites listed as generators of hazardous waste (large, small, and exempt) in the RCRAInfo system. The United States Environmental Protection Agency defines RCRAInfo as the comprehensive information system which provides access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS). This database includes sites located in EPA Region 8. This region includes the following states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.
Large Quantity Generators: Generate 1,000 kg or more of hazardous waste during any calendar month; or Generate more than 1 kg of acutely hazardous waste during any calendar month; or Generate more than 100 kg of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, or acutely hazardous waste during any calendar month; or Generate 1 kg or less of acutely hazardous waste during any calendar month, and accumulate more than 1kg of acutely hazardous waste at any time; or Generate 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulated more than 100 kg of that material at any time.
Small Quantity Generators: Generate more than 100 and less than 1000 kilograms of hazardous waste during any calendar month and accumulate less than 6000 kg of hazardous waste at any time; or Generate 100 kg or less of hazardous waste during any calendar month, and accumulate more than 1000 kg of hazardous waste at any time.
Conditionally Exempt Small Quantity Generators: Generate 100 kilograms or less of hazardous waste per calendar month, and accumulate 1000 kg or less of hazardous waste at any time; or Generate one kilogram or less of acutely hazardous waste per calendar month, and accumulate at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the

cleanup of a spill, into or on any land or water, or acutely hazardous waste; or Generate 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, or acutely hazardous waste during any calendar month, and accumulate at any time: 1 kg or less of acutely hazardous waste; or 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste.

RCRANGR08 Resource Conservation & Recovery Act - Non-Generator Facilities

VERSION DATE: 02/09/16

This database identifies RCRAInfo system sites that only handle hazardous waste, such as transporters, without generating any amount hazardous waste. The United States Environmental Protection Agency defines RCRAInfo as the comprehensive information system which provides access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS). This database includes sites located in EPA Region 8. This region includes the following states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

BF Brownfields Management System

VERSION DATE: 01/28/16

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. The United States Environmental Protection Agency maintains this database to track activities in the various brown field grant programs including grantee assessment, site cleanup and site redevelopment. This database included tribal brownfield sites.

NLRRCRAT No Longer Regulated RCRA Non-CORRACTS TSD Facilities

VERSION DATE: 02/09/16

This database includes RCRA Non-Corrective Action TSD facilities that are no longer regulated by the United States Environmental Protection Agency or do not meet other RCRA reporting requirements. This listing includes facilities that formerly treated, stored or disposed of hazardous waste.

ODI Open Dump Inventory

VERSION DATE: 06/01/85

The open dump inventory was published by the United States Environmental Protection Agency. An “open dump” is defined as a facility or site where solid waste is disposed of which is not a sanitary landfill which meets the criteria promulgated under section 4004 of the Solid Waste Disposal Act (42 U.S.C. 6944) and which is not a facility for disposal of hazardous waste. This inventory has not been updated since June 1985.

RCRAT Resource Conservation & Recovery Act - Non-CORRACTS Treatment, Storage & Disposal Facilities

VERSION DATE: 02/09/16

This database includes Non-Corrective Action sites listed as treatment, storage and/or disposal facilities of hazardous waste in the RCRAInfo system. The United States Environmental Protection Agency defines RCRAInfo as the comprehensive information system which provides access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS).

SEMS Superfund Enterprise Management System

VERSION DATE: 01/11/16

The U.S. Environmental Protections Agency's (EPA) Office of Solid Waste and Emergency Response, Office of Superfund Remediation and Technology Innovation (OSRTI), has implemented The Superfund Enterprise Management System (SEMS), formerly known as CERCLIS (Comprehensive Environmental Response, Compensation and Liability Information System) to track and report on clean-up and enforcement activities taking place at Superfund sites. SEMS represents a joint development and ongoing collaboration between Superfund's Remedial, Removal, Federal Facilities, Enforcement and Emergency Response programs.

SEMSARCH Superfund Enterprise Management System Archived Site Inventory

VERSION DATE: 01/11/16

The Superfund Enterprise Management System Archive listing (SEMS-ARCHIVE) has replaced the CERCLIS NFRAP reporting system in 2015. This listing reflect sites that have been assessed and no further remediation is planned and is of no further interest under the Superfund program.

DNPL Delisted National Priorities List

VERSION DATE: 07/22/15

This database includes sites from the United States Environmental Protection Agency's Final National Priorities List (NPL) where remedies have proven to be satisfactory or sites where the original analyses were inaccurate, and the site is no longer appropriate for inclusion on the NPL, and final publication in the Federal Register has occurred.

DOD Department of Defense Sites

VERSION DATE: 06/21/10

This information originates from the National Atlas of the United States Federal Lands data, which includes lands owned or administered by the Federal government. Army DOD, Army Corps of Engineers DOD, Air Force DOD, Navy DOD and Marine DOD areas of 640 acres or more are included.

FUDS Formerly Used Defense Sites

VERSION DATE: 06/01/15

The Formerly Used Defense Sites (FUDS) inventory includes properties previously owned by or leased to the United States and under Secretary of Defense Jurisdiction, as well as Munitions Response Areas (MRAs). The remediation of these properties is the responsibility of the Department of Defense. This data is provided by the U.S. Army Corps of Engineers (USACE), the boundaries/polygon data are based on preliminary findings and not all properties currently have polygon data available. DISCLAIMER: This data represents the results of data collection/processing for a specific USACE activity and is in no way to be considered comprehensive or to be used in any legal or official capacity as presented on this site. While the USACE has made a reasonable effort to insure the accuracy of the maps and associated data, it should be explicitly noted that USACE makes no warranty, representation or guaranty, either expressed or implied, as to the content, sequence, accuracy, timeliness or completeness of any of the data provided herein. For additional information on Formerly Used Defense Sites please contact the USACE Public Affairs Office at (202) 528-4285.

NLRRCRAC No Longer Regulated RCRA Corrective Action Facilities

VERSION DATE: 02/09/16

This database includes RCRA Corrective Action facilities that are no longer regulated by the United States Environmental Protection Agency or do not meet other RCRA reporting requirements.

NPL National Priorities List

VERSION DATE: 12/15/15

This database includes United States Environmental Protection Agency (EPA) National Priorities List sites that fall under the EPA's Superfund program, established to fund the cleanup of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action.

PNPL Proposed National Priorities List

VERSION DATE: 07/22/15

This database contains sites proposed to be included on the National Priorities List (NPL) in the Federal Register. The United States Environmental Protection Agency investigates these sites to determine if they may present long-term threats to public health or the environment.

RCRAC Resource Conservation & Recovery Act - Corrective Action Facilities

VERSION DATE: 02/09/16

This database includes all hazardous waste sites with ongoing corrective action activity and where corrective action is statutorily required to be address but have not had corrective action imposed in the RCRAInfo system. The Corrective Action Program requires owners or operators of RCRA facilities (or treatment, storage, and disposal facilities) to investigate and cleanup contamination in order to protect human health and the

environment. The United States Environmental Protection Agency defines RCRAInfo as the comprehensive information system which provides access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS).

RCRASUBC Resource Conservation & Recovery Act - Subject to Corrective Action Facilities

VERSION DATE: 02/09/16

This database includes hazardous waste sites which are potentially subject to corrective action regardless of whether they have correction action underway, plus any sites showing a corrective action event of RFI or beyond in the RCRAInfo system. Sites conducting corrective action under analogous state authorities are also included. The United States Environmental Protection Agency defines RCRAInfo as the comprehensive information system which provides access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS) and the Biennial Reporting System (BRS).

RODS Record of Decision System

VERSION DATE: 07/01/13

These decision documents maintained by the United States Environmental Protection Agency describe the chosen remedy for NPL (Superfund) site remediation. They also include site history, site description, site characteristics, community participation, enforcement activities, past and present activities, contaminated media, the contaminants present, and scope and role of response action.

Environmental Records Definitions - STATE (CO)

ASBESTOS Asbestos Abatement and Demolition Projects

VERSION DATE: 01/12/16

The Colorado Department of Public Health and Environment's Air Pollution Control Division assists schools and businesses to comply with air pollution laws regulating asbestos and asbestos containing materials. The regulation that governs asbestos in Colorado is the Colorado Air Quality Control Commission s Regulation No. 8, Part B, "Emission Standards for Asbestos." Notification is required for all demolitions of all facilities and all asbestos abatement projects that exceed the trigger levels, whatever is the lesser quantity. The notification requirements apply to both friable and non-friable asbestos materials. This database contains those related projects since January 2008.

COVENANTS Environmental Real Covenants List

VERSION DATE: 08/25/15

Senate Bill 01-145 gave authority to the Colorado Department of Public Health and Environment to approve requests to restrict the future use of a property using an enforceable agreement called an environmental covenant. These covenants, which are recorded with the deed and run with the land, provide a mechanism to ensure that institutional controls that are part of environmental remediation projects are properly implemented and that engineered structures are protected and maintained, so that implemented remedies continue to be protective of human health and the environment for as long as any residual contamination remains a risk.

UMTS Uranium Mill Tailings Sites

VERSION DATE: 08/09/02

There were nine uranium mill tailings sites in Colorado designated for cleanup under the federal Uranium Mill Tailings Radiation Control Act. These nine sites, know commonly as UMTRA sites, were remediated jointly by the State of Colorado and the U.S. Department of Energy during the late 1980's and early 1990's. Mill tailings were removed from 8 of the mill sites and relocated in engineered disposal cells. A disposal cell is designed to encapsulate the material, reduce radon emanation, and prevent the movement of water through the material. At one site, Maybell, CO, the tailings were stabilized in-place at the mill site. After remediation of the tailings was completed, the State and DOE began to investigate the residual impacts to groundwater at the mill sites. The groundwater phase of the UMTRA program is on-going. This database was provided by the Colorado Department of Public Health and Environment.

APCDP Air Pollution Control Division Permitted Facilities

VERSION DATE: 02/01/16

The Stationary Sources Program, located within the Air Pollution Control Division of the Colorado Department of Public Health and Environment, evaluates and develops air permits for stationary sources in Colorado. The program inspects sources to determine compliance with air regulations and permit conditions, and maintains a computerized inventory of air pollution emissions throughout the state.

Environmental Records Definitions - STATE (CO)

CDL Clandestine Drug Laboratory Locations

VERSION DATE: 02/08/16

This list of Methamphetamine lab seizures is provided by multiple sources: the North Metro Task Force, FACTS (Forensic Applications Consulting Technologies, Inc) and the Colorado Springs Police Department. The North Metro Task Force list of Methamphetamine labs were seized between 2001 and 2010. The North Metro area includes the following Cities and Counties of Colorado: Adams County, Broomfield, Brighton, Commerce City, Federal Heights, Northglenn, Thornton, and Westminster. According to Section 2 of Colorado Revised Statutes: "25-18.5-103. Discovery of an illegal drug laboratory - property owner - clean-up - liability. (1) (a) Upon notification from a peace officer that chemicals, equipment, or supplies indicative of an illegal drug laboratory are located on a property, or when an illegal drug laboratory used to manufacture methamphetamine is otherwise discovered and the property owner has received notice, the owner of any contaminated property shall meet the cleanup standards for property established by the board in section 25-18.5-102". The FACTS and Colorado Springs Police Department Methamphetamine labs were seized between 2001 and 2014.

CLEANERS Dry Cleaning Facilities

VERSION DATE: 02/01/16

This database contains dry cleaners which have obtained an air permit through the Air Pollution Control Division at the Colorado Department of Public Health and Environment.

SPILLS Spills Listing

VERSION DATE: 01/31/16

The Colorado Department of Public Health and Environment's Division of Emergency Preparedness and Response maintains this listing of chemical spills and/or releases.

AST Aboveground Storage Tank Facilities

VERSION DATE: 01/04/16

The Oil and Public Safety Division of the Colorado Department of Labor and Employment maintains this list of aboveground storage tank (AST) facilities. This AST database also includes other types of storage tank facilities such as liquefied petroleum gas (LPG), vehicle tank meters (VTM), and compressed natural gas facilities.

HWSG Hazardous Waste Sites- Generator

VERSION DATE: 06/30/03

The Resource Conservation and Recovery Act (RCRA) was enacted by congress in 1976, followed by the promulgation of implementing regulations in 1980. In 1984, the State was authorized by EPA to implement the RCRA program in Colorado on their behalf. This facility listing includes RCRA sites listed as generators of hazardous waste (Small Quantity Generators and Large Quantity Generators) and was provided by the Colorado Department of Public Health and Environment.

Small Quantity Generators (SQG) generate, in any calendar month, more than 100 kg (220 lbs.) but less than 1,000 kg (2,200 lbs.) of RCRA hazardous waste; and generate, in any calendar month, or accumulate at any time, no more than 1 kg (2.2 lbs.) of acute hazardous waste and no more than 100 kg (220 lbs.) of material from the cleanup of a spill of acute hazardous waste; and accumulate on-site no more than 6000 kg (13,200 lbs) of hazardous waste at any one time; or, the site is a Small Quantity Generator if the site met all other criteria for a Conditionally Exempt Small Quantity Generator, but accumulated, at any time, more than 1,000 kg (2,200 lbs.) of RCRA hazardous waste.
Large Quantity Generators (LQG) generate, in any calendar month, 1,000 kg (2,200 lbs.) or more of RCRA hazardous waste; or generate, in any calendar month, or accumulated at any time, more than 1 kg (2.2 lbs.) of RCRA acute hazardous waste; or generate, in any calendar month, or accumulated at any time, more than 100 kg (220 lbs.) of spill cleanup material contaminated with RCRA acute hazardous waste.

UST Underground Storage Tank Facilities

VERSION DATE: 01/04/16

The Oil and Public Safety Division of the Colorado Department of Labor and Employment maintains this list of underground storage tank facilities.

HISTSWLF Historical Solid Waste Landfills

VERSION DATE: NR

This historical solid waste landfills database contains data from the Hazardous Materials Waste Management Division (HMWMD) of the Colorado Department of Public Health and other various state and local agencies. In the early 1980s, the HMWMD conducted a survey of staff members and local agencies to compile this listing of sites that were known or thought to have waste issues. This Solid Waste Historical Data is not considered complete or verifiable and has not been maintained since the late 1980s. The HMWMD is not responsible and shall not be liable to the used for damages of any kind arising out of the use of this data or information.

HWSTSD Hazardous Waste Sites- Treatment, Storage & Disposal

VERSION DATE: 06/30/03

The Resource Conservation and Recovery Act (RCRA) was enacted by congress in 1976, followed by the promulgation of implementing regulations in 1980. In 1984, the State was authorized by EPA to implement the RCRA program in Colorado on their behalf. TSD facilities treat, store, dispose, or recycle hazardous waste on site in units and therefore are subject to RCRA permitting requirements. Historic TSDs are facilities that have completed closure and/or post-closure of the RCRA Subtitle C Regulated Unit(s) or the Treatment/Storage/Disposal Unit is no longer regulated. This database was provided by the Colorado Department of Public Health and Environment.

LST Leaking Storage Tank Facilities

VERSION DATE: 01/04/16

The Oil and Public Safety Division of the Colorado Department of Labor and Employment maintains this list of

leaking aboveground and underground storage tank facilities.

LUSTTRUST Leaking Underground Storage Tanks Trust Fund Sites

VERSION DATE: 01/01/00

Suspected tank leaks have been discovered at the sites included in this database, but the facility responsible for the leak has not been identified. The state's investigtion and search for responsible parties is paid for out of the state's Leaking Underground Storage Tank (LUST) Trust Fund. This database was provided by the Colorado Department of Labor & Employment, Division of Oil and Public Safety, State Fund Section and is no longer updated.

METHANESITES Methane Gas Study Sites

VERSION DATE: 01/01/81

This Investigation of Methane Gas Hazards report was prepared by the Denver Office of Emergency Preparedness in 1981. The purpose of this study was to assess the actual and potential generation, migration, explosive and related problems associated with specified landfills, and to identify existing and potential problems, suggested strategies to prevent, abate, and control such problems and recommend investigative and monitoring functions as may be deemed necessary. The Colorado Department of Health selected eight landfills as priorities due to population density and potential hazards to population and property.

SWF Solid Waste Facilities

VERSION DATE: 01/19/16

The Colorado Department of Public Health and Environment maintains this database of solid waste disposal facilities, transfer stations, recyclers, waste tire registrants, and waste grease registrants.

VCRA Voluntary Cleanup and Redevelopment Program Sites

VERSION DATE: 02/03/16

This site listing is provided by the Colorado Department of Public Health and Environment (CDPHE) and includes both voluntary cleanup and brownfield properties. The Voluntary Cleanup and Redevelopment program was created in 1994. The objective of the program is to facilitate the redevelopment and transfer of contaminated properties. Properties that sit untouched because of their real or perceived contamination can be rehabilitated using the CDPHE's Brownfields Program in conjunction with the Voluntary Cleanup Program. Cleanup decisions are based on existing standards and the proposed use of the property. The actual cleanup and verification is the owner's responsibility.

HWSCA Hazardous Waste Sites- Corrective Action

VERSION DATE: 06/30/03

The Resource Conservation and Recovery Act (RCRA) was enacted by congress in 1976, followed by the

promulgation of implementing regulations in 1980. In 1984, the Hazardous and Solid Waste Amendments (HSWA) were added to RCRA providing for corrective action at facilities subject to RCRA. That same year, the State was authorized by EPA to implement the RCRA program in Colorado on their behalf. Corrective action may be implemented as part of a RCRA Hazardous Waste Permit, an Order, or a Corrective Action Plan pursuant to the Colorado Hazardous Waste Regulations. Corrective action is the process by which regulated facilities investigate and remediate, as necessary, all contamination (soil, ground water, surface water, air) associated with their releases into the environment. Historic Corrective Action Sites are facilities that have completed the RCRA Subtitle C corrective Action process. This database was provided by the Colorado Department of Public Health and Environment.

SF Superfund Sites

VERSION DATE: 06/01/03

This listing contains active, deleted and proposed "Superfund" hazardous waste sites, as well as those sites identified through the Natural Resource Damages section of Superfund legislation and one Private Non-Superfund Cleanup site. A site qualifies for the National Priorities List (NPL or Superfund list) when the U.S. Environmental Protection Agency (EPA) determines there is a release or threatened release of hazardous substances that may endanger public health, welfare or the environment. In Colorado, the lead agency for Superfund remediation may be either the EPA or the Colorado Department of Public Health and Environment.

WCSWF Weld County Solid Waste Facilities

VERSION DATE: 01/04/16

This listing of solid waste facilities is provided by the Weld County Public Health Department.

Environmental Records Definitions - TRIBAL

USTR08 Underground Storage Tanks On Tribal Lands

VERSION DATE: 04/01/15

This database, provided by the United States Environmental Protection Agency (EPA), contains underground storage tanks on Tribal lands located in EPA Region 8. This region includes the following states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

LUSTR08 Leaking Underground Storage Tanks On Tribal Lands

VERSION DATE: 04/01/15

This database, provided by the United States Environmental Protection Agency (EPA), contains leaking underground storage tanks on Tribal lands located in EPA Region 8. This region includes the following states: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming.

ODINDIAN Open Dump Inventory on Tribal Lands

VERSION DATE: 11/08/06

This Indian Health Service database contains information about facilities and sites on tribal lands where solid waste is disposed of, which are not sanitary landfills or hazardous waste disposal facilities, and which meet the criteria promulgated under section 4004 of the Solid Waste Disposal Act (42 U.S.C. 6944).

INDIANRES Indian Reservations

VERSION DATE: 01/01/00

The Department of Interior and Bureau of Indian Affairs maintains this database that includes American Indian Reservations, off-reservation trust lands, public domain allotments, Alaska Native Regional Corporations and Recognized State Reservations.

APPENDIX D
LOCAL GOVERNMENT RESPONSES

Thammarath, Olivia

From: Dave Friedel <davef@cityoflafayette.com>
Sent: Wednesday, April 13, 2016 3:25 PM
To: Truett, Trevor J.
Subject: RE: Records Request

Mr. Truett,

To my knowledge (34 years with local fire departments) I do not recall any type of Hazardous Materials incident on that property.

Any questions give me a call, 303-661-1200

Thanks,
Chief Friedel

From: Truett, Trevor J. [mailto:TTruett@CTLThompson.com]
Sent: Wednesday, April 13, 2016 3:07 PM
To: Dave Friedel; Norm Kellett; Peggy Jachimiak
Subject: Records Request

Dear Lafayette Fire Department,

I am performing a Phase I ESA on the property addressed as 12329 Baseline Road in Boulder County. It is located northwest of the intersection of County Line Road and Baseline Road. I would like to request information regarding hazardous materials spills or releases on or adjacent to the site. Please feel free to contact me if you have any questions.

Thank you

Trevor Truett
Environmental Staff Scientist
Phone (303) 825-0777
ttruett@ctlthompson.com

CTL | Thompson, Inc.
Denver Environmental Department
1971 West 12th Avenue
Denver, Colorado 80204
www.ctlt.com

APPENDIX E
RESUMES

Trevor J. Truett, Staff Scientist

Office Location

Denver, Colorado

Years of Experience

15 Years

Education

B.A. History,
University of Colorado,
1998

Training & Certifications

Asbestos Inspector (CABI)

Air Monitoring Specialist

40 Hour OSHA Training

Confined Space Training

Mr. Truett joined CTL | Thompson in 2000 as an Engineering Technician. He joined the Environmental Department in the fall of 2010 and currently serves as a Staff Scientist for commercial and municipal projects.

Mr. Truett has answered the bell with everything he has been asked to do, and now has certifications in the asbestos consulting arena. He is experienced in Phase I and II ESAs and demonstrates a quick grasp and surprising initiative. He has worked on a variety of projects including commercial retail properties, residential subdivisions, churches, industrial buildings, and municipal facilities. His previous experience in our Field Department is an asset in that he is familiar with contractor operations, particularly earthwork.

Project Experience

The Regency Athletic Complex at MSU, Auraria Campus, CO
Senior Technician and Asbestos Inspector providing oversight for excavation of a major Brownfield site. CTL was recently awarded the highest honor, the 2016 'Grand Conceptor Award' at the ACEC CO Engineering Excellence Awards for this project.

Metro State Center for Student Success, Auraria Campus, CO
Assisted with Phase I and II ESA and provided Asbestos Inspector oversight for excavation.

University of Wyoming, Law Building, Agricultural Buildings, Cheyenne, WY
Assisted lead inspector with record keeping, photos, and chains-of-custody for this wide-scale asbestos survey of the campus mechanical areas.

Stapleton, Filings 19 and 24, New Town Builders, Denver, CO
Assisted with Phase I ESA data gathering and photo research.

Metro State Hotel and Hospitality Learning Center, Auraria Campus, CO
Assisted with Phase I and II ESA provided Asbestos Inspector oversight for excavation.

CCD Confluence Building, Auraria Campus, CO
Installed monitoring wells and oversaw removal of TCE source area and then application of emulsion product to treat the groundwater.

1150 Oak Street, Lakewood, CO
Performed Phase II ESA on former greenhouse for pesticides, and area downgradient from nearby PCE and TCE groundwater plume.

Farrand Field, UC Boulder, CO
Provided excavation observation and compaction testing.

Matthew L. Wardlow, P.E.

Environmental Department Manager

Office Location
Denver, Colorado

Years of Experience
20 Years

Professional Registration
Registered Professional Engineer: Colorado

Education
B.S. Engineering and Policy, Washington University, St. Louis, MO, 1993

Training & Certifications
40 Hour OSHA Training

Confined Space Training

Mold Remediation Technician

Training Principals of Forced Air Remediation

Asbestos Inspector
Air Monitoring Specialist
Designer

Professional Affiliations
American Society of Civil Engineers

American Society of Foundation Engineers

Colorado Environmental Management Society

Urban Land Institute

Mr. Wardlow has a variety of technical expertise in Phase I and II Environmental Site Assessments, CDPHE Voluntary Cleanup (VCP) applications, asbestos consultation, underground storage tank removals, site characterizations, and assessments under the National Environmental Policy Act. Mr. Wardlow reviews all environmental deliverables, making sure that the latest practices are followed. He has developed a reputation as a consistent and reliable consultant for his clients, which include the City & County of Denver, Auraria Campus and its colleges, and Boulder County. He encompasses a variety of project experience including brownfields, historical mine sites, medical facilities, and wastewater treatment plants.

Project Experience

Regency Athletic Complex at MSU Denver, Denver Colorado
2016 ACEC CO GRAND CONCEPTOR AWARD – Highest Engineering Honor
This former brownfield, located at the southern end of Auraria Campus, was the site of geotechnical and environmental issues from past industrial use. There was also the potential for settlement due to undocumented fill. Mr. Wardlow devised an idea using Deep Dynamic Compaction (DDC), which is a ground improvement technique that densifies the majority of soils and fills in-place by using a drop weight. CTL then provided on-site geotechnical and environmental inspection services, management of contaminants excavated, and also successfully entered the client into the State of Colorado Voluntary Cleanup Program. Measures were also taken to monitor air quality and vibrations from the impact. The solution was about 25% of the removal and replacement costs, and there has been no noticeable settlement.

Other Redevelopment/Voluntary Cleanup Projects:
Prepared Overall 2016 Auraria Campus Materials Management Plan
New Breckenridge Brewery – VCP – Remediation of Pesticides
Community College of Denver Confluence Building
Metro State Hotel and Hospitality Learning Center
Metro State Student Success Building
AHEC 5th Street Parking Garage – VCP – Coal Ash and Asbestos
Gold Hill Mesa - VCP - Subdivision Constructed on Mine Tailings
4th and Santa Fe – VCP Remediation of Chrome Plating Site
ConocoPhillips - Purchase/Redevelopment of 400-acre StorageTek

Other Major Projects and Clients
Denver Department of Environmental Health - 20+ P1 and P2 ESAs
CDOT - Over 30 Asbestos Surveys, Air Clearances of Buildings
Land Developers - Due Diligence Studies and SWMP Consultation
Urban Land Conservancy - P1 and P2 ESAs, IAQ Concerns
CU Boulder - Asbestos Consultant - Ketchum Hall, Hallett Hall
Homebuilders - Due Diligence, Mold and Moisture Consultation
Boulder County Risk Management - On-Call Industrial Hygienist
Boulder Valley School District - On-Call Asbestos Consultant
Regis University - P1 ESA of 7 Parcels of Campus

MINE SUBSIDENCE ASSESSMENT

Erie Assemblage, 217.1018 Acres
Section 36 Township 1 North, Range 69 West,
Erie, Colorado



Prepared For:
E5X Management
7353 South Alton Way, Suite A-100
Englewood, Colorado 80112

WESTERN ENVIRONMENT AND ECOLOGY, INC.

2217 West Powers Avenue
Littleton, Colorado 80210
phone (303) 730-3452
fax (303) 730-3461
www.westernenvironment.com

MINE SUBSIDENCE ASSESSMENT

Erie Assemblage, 217.1018 Acres
Section 36 Township 1 North, Range 69 West,
Erie, Colorado

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E5X Management
7353 South Alton Way, Suite A-100
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Project Number 701-001-01

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1.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon the results of the following mine subsidence assessment of 217.1018 acres in Section 36, Township 1 North, Range 69 West, and referenced in this report as the Erie Assemblage, Western Environment and Ecology, Inc. (Western Environment) presents the following:

- There is no record of any mining occurring beneath the Erie Assemblage Property.

Using these conclusions, in general **No Mine Subsidence Related Development Restrictions** are required. However, Western Environment would recommend no building construction, without additional investigations potentially including drilling, occur within 200 feet of the limit of the Mitchell Mine, as shown on Figure 2, and within 175 feet of the limit of the Irvington Mine.

2.0 INTRODUCTION

Western Environment & Ecology, Inc. (Western Environment) was retained by Mr. Corey Elliot of E5X Management, to conduct a mine subsidence assessment of approximately 217.1018 acres in Section 36, Township 1 North, Range 69 West, Erie, Colorado. This site is referred to as the Erie Assemblage.

The purpose of this assessment is to evaluate the subsidence potential of the property and if the proposed PUD development is appropriate. No drilling was performed for this assessment. However, the results of several adjacent mine subsidence investigations performed by Western Environment personnel, were used in this evaluation.

Western Environment has completed subsidence investigations on several properties adjacent to the proposed Erie Assemblage Project. These investigations were presented in reports entitled: *Summary Report, Mine Subsidence Investigation Erie Commons Subdivision,* dated September 16, 2004*: Preliminary Mine Subsidence Investigation, Pratt Property*, dated September 19, 2014: and *Mine Subsidence Investigation, Vista Ridge Development,* dated March 1, 2001. Data acquired from these studies were utilized to evaluate the subsidence potential of the proposed Project. The results of the referenced assessments have been submitted to the Colorado Geological Survey (CGS) for review, and as such, are public information.

The conclusions and recommendations contained within this report are intended for use as an aid in planning and design. The information herein must be made available to the project geotechnical and structural engineers. Additionally, this report should accompany the site development plan when submitted to the Town of Erie. The Town will request that the Colorado Geological Survey review and comment on this subsidence investigation. Following these procedures will aid in assuring a more predictable and thus economic development process.

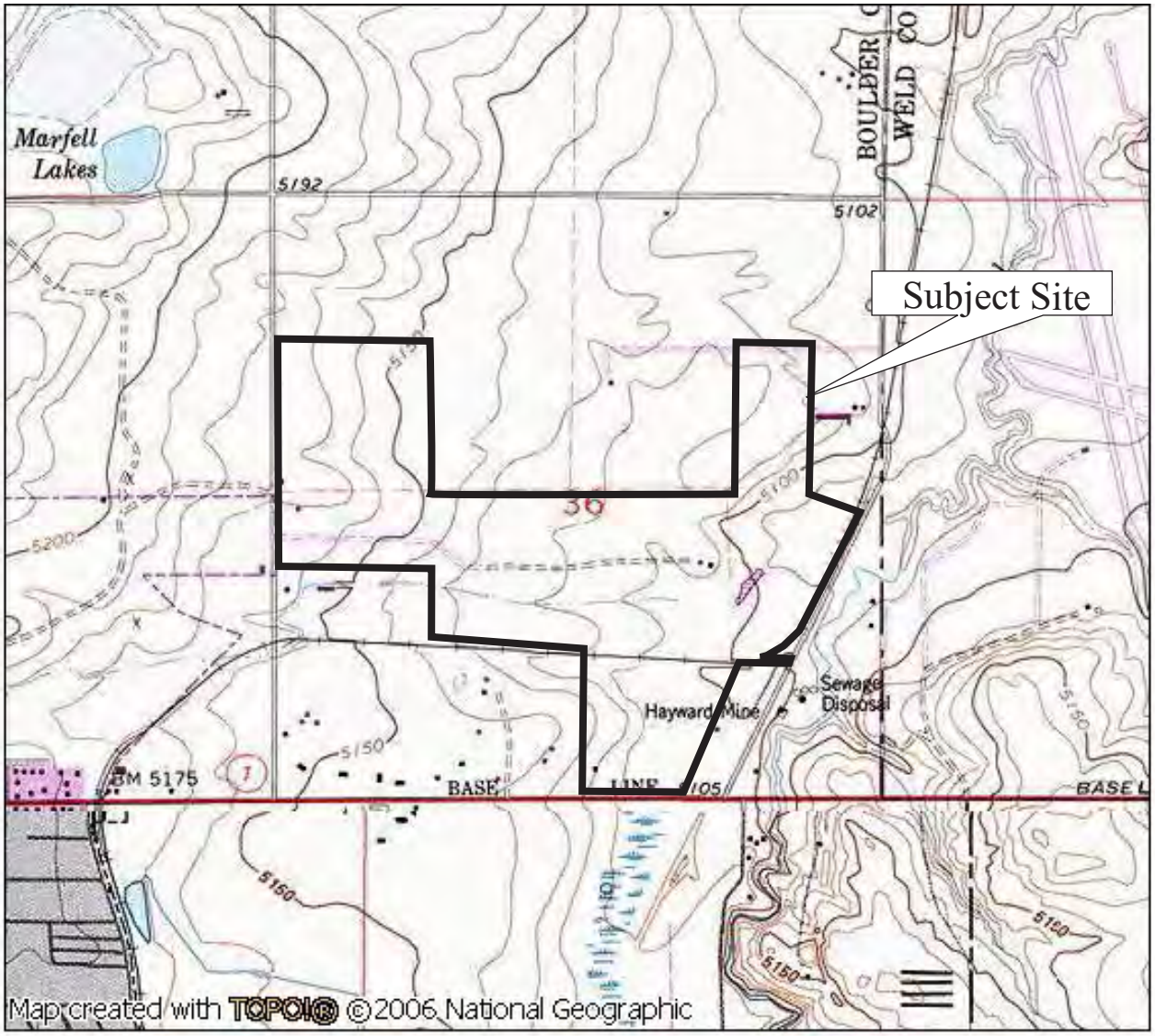
3.0 SITE CHARACTERISTICS

This mine subsidence investigation was conducted for 217.1018 acres in Section 36, Township 1 North, Range 69 West, Erie, Colorado (Figure 1). At the time of the assessment, the site was vacant agricultural property. Two farmsteads are located in the southwest portion of the project and three petroleum production facilities occur on the project. The property is located west of the Erie Air Park which is a combined general aviation airport, commercial and single family estate residential development. Agricultural property surround the site to the north and west. Residential estates are located to the south. The Lafayette sewage treatment plant and a mini storage facility occur to the southeast and northeast respectively of the project. The Erie Assemblage Project in located northwest of the intersection of Colorado State Highway 7 and County Line Road (Figure 2). The site is relative flat with an elevation of 5,125 (USGS Erie 7.5 Minute Quadrangle, 1979).

The abandoned coal mines that are located near the project are referenced in the files of the Colorado Geological Survey as the Mitchell, Simpson and Irvington. Additionally, the Excelsior and Gladstone shafts have production records on file with the CGS. However, research by Western Environment has determine that these shafts have been incorporated into the Simpson Mine. A detailed description of the mine is presented in Section 4.0.



View to west toward the Mitchell Mine, 119th Street in the foreground



NATIONAL GEOGRAPHIC

0.0 0.5 1.0 miles
0.0 0.5 1.0 1.5 km

TN MN
8½°
01/14/16

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Figure 1 - Project Location Map
Erie Assemblage Project
Section 36, Township 1 North, Range 69 West
Erie, Colorado



Approximate Scale in feet

0 1500

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Figure 2 - Mine Location Map
Erie Assemblage Project
Section 36, Township 1 North, Range 69 West
Erie, Colorado

4.0 COAL MINE DESCRIPTION

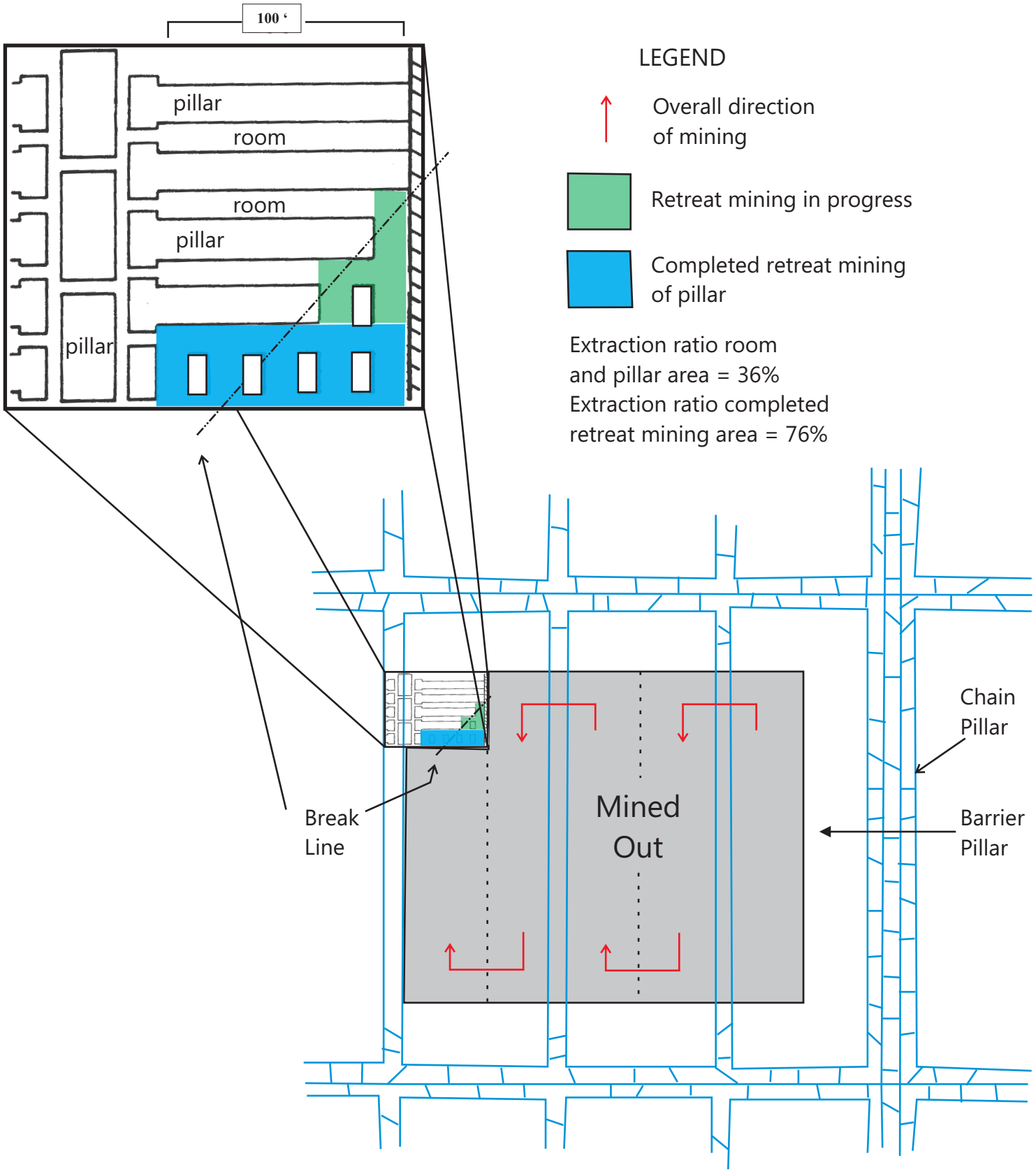
Several mines operated near the Erie Assemblage Project. Records maintained by the Colorado Division of Mines and the Colorado Geologic Survey show the Mitchell Mine began operation in 1893 and continued until 1920. Total production from the operation was placed at 1,295,229 tons. Entry to the mine was gained via a two compartment vertical shaft 222 feet deep, located approximately 1,200 feet southwest of the property. A single air shaft is located 250 feet north northwest of the "main" shaft. The Rocky Mountain Fuel Company was the last operator of record .

The Simpson Mine produced from 1889 to 1927. The total production was 4,125,693 tons making this operation one of the largest in the Boulder/Weld Coal Field. The main and air shafts, which are 240 feet in depth, are located approximately 4,500 feet southwest of the Erie Assemblage Project. This mine was also last operated by the Rocky Mountain Fuel Company.

Located to the southeast of the subject site is the Irvington Mine. It is also referenced as the Baker and Haywood Mine. Total production of 10,626 tons occurred between 1888 and 1909. No record of the depth of the main shaft is available. However, review of the adjacent Parkdale Mine map indicate that the depth to the mine varied from 250 feet in southern portions of Section 31 to 168 feet beneath Section 36. The Irvington Mine main shaft is located 750 southeast of the subject property.

All of these mines are classified as a modified room and pillar operation mine. The "pillar retreat" method was utilized during the operation. Haulage ways were ten feet wide and were separated by 30 foot wide "chain pillars". Rooms had approximate widths of fifteen feet and lengths of 100 feet. Western Environment has determined that coal extraction rates were approximately 70%.

Western Environment has researched the mining methods utilized in the Boulder/Weld mines. In the report entitled "A Study of Falls of Roof and Coal in Northern Colorado" Tomlinson (1933) describes the mining method used in five operating mines "*The room and pillar and panel methods of mining are employed. Pairs of room entries are advanced to a predetermined point, and rooms in sets of two to four are turned from one room entry or in some places from both entries. Room pillars are recovered immediately after the rooms have been advanced for the required distance, and a uniform break line maintained with each group of retreating pillars.*" This method of retreat mining is illustrated on Figure 3.



Literature Cited: Gray, Richard E. and Robert W. Bruhm, Coal Mine Subsidence - Eastern United States. Geological Society of America, Volume VI, 1984. And Tomlinson, H., "A Study of Falls of Roof and Coal In Northern Colorado", Dept. of Commerce, U.S. Bureau of Mines, Report of Investigations 3199, Jan., 1933.

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Figure 3 - Pillar Retreat Method for Coal Mining
Section 36, T1N, R69W
Erie, Colorado

5.0 REGIONAL GEOLOGY

5.1 Outcropping Units

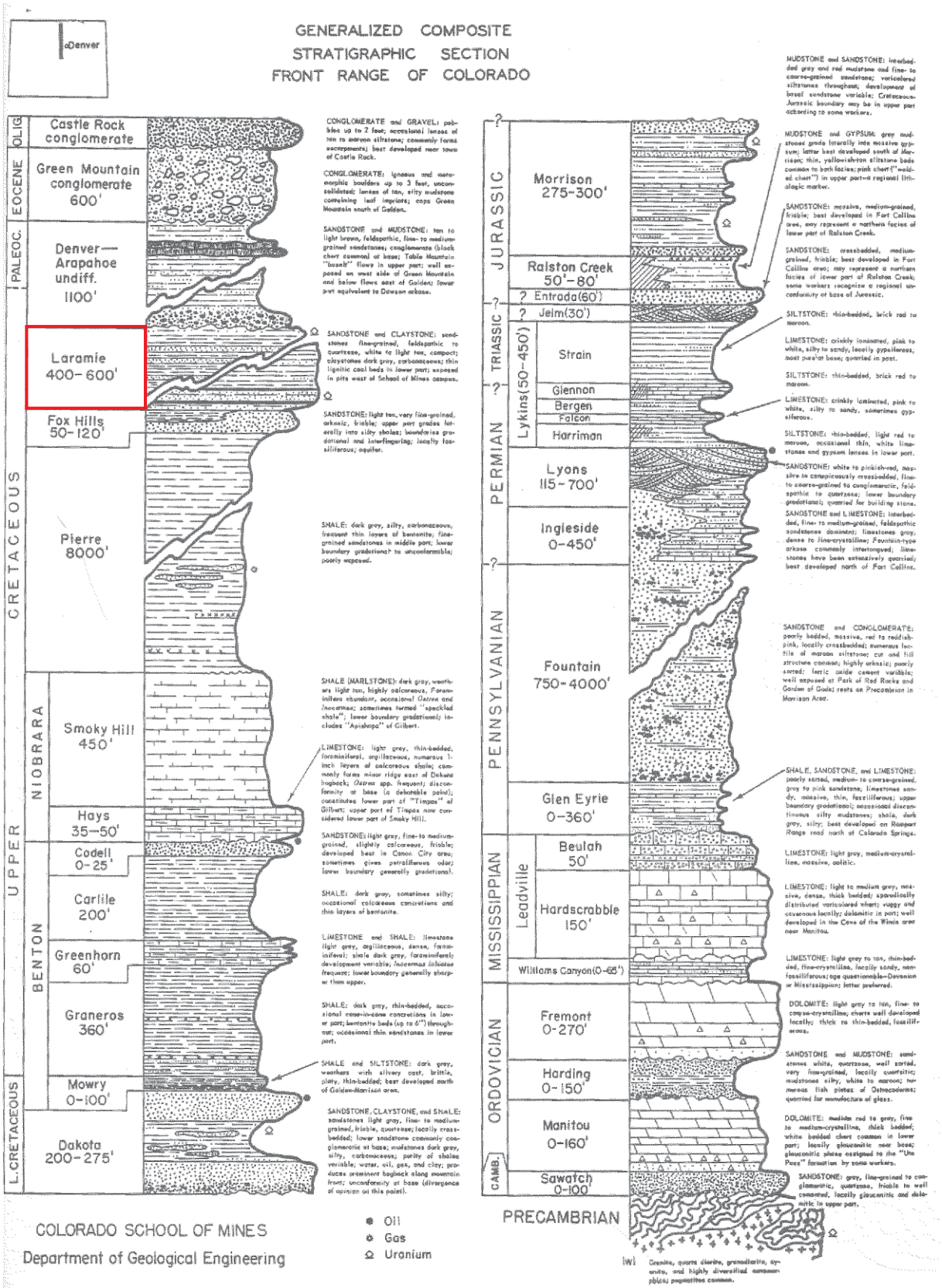
Outcropping units within and surrounding the Erie area are the Pierre Shale, the Fox Hills Sandstone, the Laramie Formation and Quaternary gravels and soils (Figure 4).

The Pierre Shale is a lead gray to brown and black shale of marine origin. Total thickness in the area is greater than 7,000 feet (Blair 1951), with the majority of the formation made up of shale. Near the top of the Pierre Shale it becomes increasingly sandy and contains beds of fine sandstones and siltstones as it grades into the Fox Hills Sandstone. This unit does not outcrop on the site but can be seen northeast of the project on the east side of the Town of Erie. The Fox Hills Sandstone is a massive to crossbedded sandstone. It was deposited in a beach and/or delta-front environment and comfortably overlies the Pierre Shale. The lower two-thirds of the formation is a fine to coarse grained, bluff colored sandstone which weathers to a light tan to tan color. The Fox Hills Sandstone contains numerous iron colored calcareous concretions, ranging in size from fractions of an inch to several feet. The upper one-third of the Fox Hills Sandstone is a fine to medium grained, light gray to pale yellow in color, crossbedded sandstone. The total thickness of the formation near this location is about 140 feet as measured in the NW 1/4 of Section 28, T1S, R70W. Thickness varies from 60 feet near Ralston Creek (Van Horn, 1957) to 250 feet near Baseline Reservoir.

The Laramie Formation, which directly underlies the site is predominantly a fresh water deltaic sequence, consisting of clays, sands, silts and coals (Figure 4). The lower portion is approximately 100 feet thick and is composed of sandstones, sandy shales, claystones, and coal beds. These coals have been economically mined in the past. The upper unit has a thickness of approximately 600 feet and is made up of mostly clay shales, very fine sandy shales, and lenticular beds of sandstone. The shales are largely carbonaceous and in places becomes lignitic. The Laramie Formation lies comfortably on the Fox Hills Sandstone.

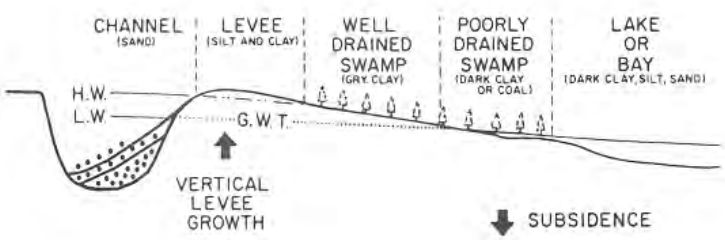
5.2 Structure

The subject property lies on the western edge of the Denver-Julesberg Basin against the Front Range Uplift. This basin contains up to 13,000 feet of sediments derived from the ancestral Rockies which laid to the west. Two kinds of faulting occur in this portion of the basin. A basement-controlled late Cretaceous Laramide faulting is the most prevalent and is the result of deformation

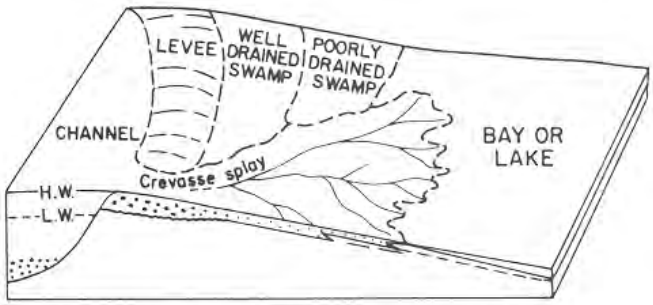


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Figure 4- Generalized Stratigraphic Section,
Section 36, T1N, R69W
Erie, Colorado

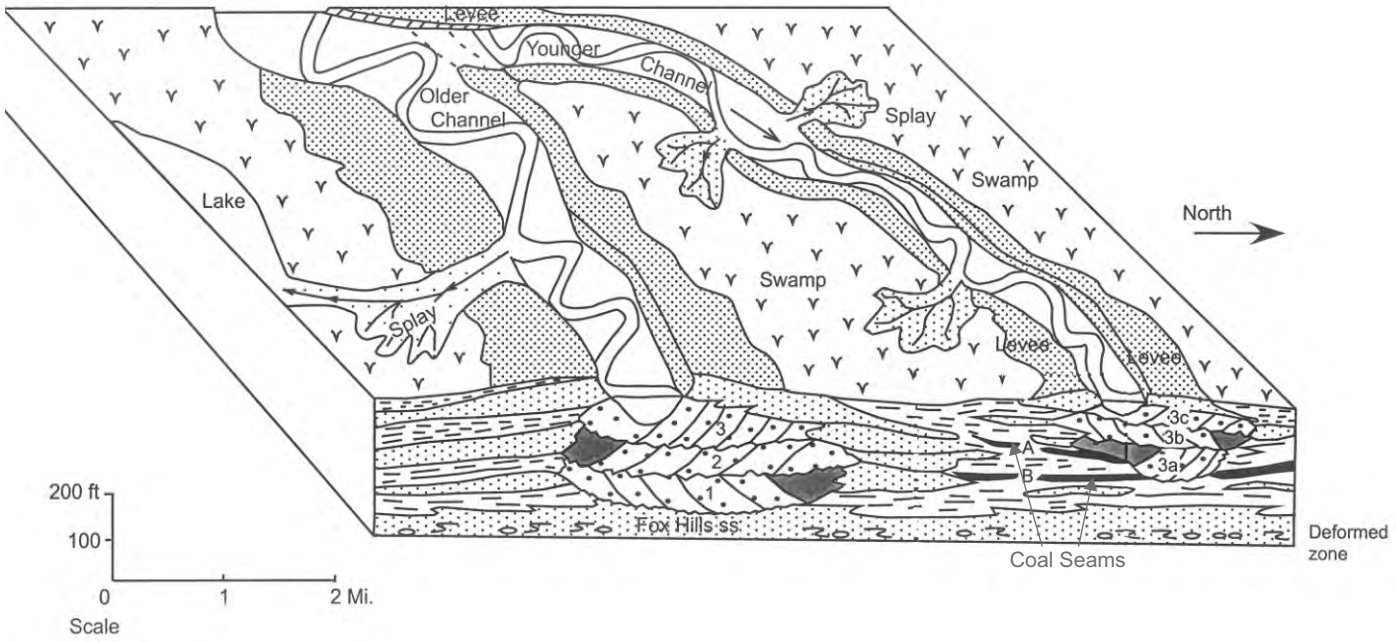


Channel and channel margin environments for lithologies in Laramie Formation.



LARAMIE ENVIRONMENTS OF DEPOSITION

Relationship of channel margin environments to crevasse splay deltas.



Figures from: A Guide to the uppermost Cretaceous stratigraphy, central Front Range Colorado, deltaic sedimentation, growth faulting and early Larimde vertical Movement
Weimer, R.J. 1973

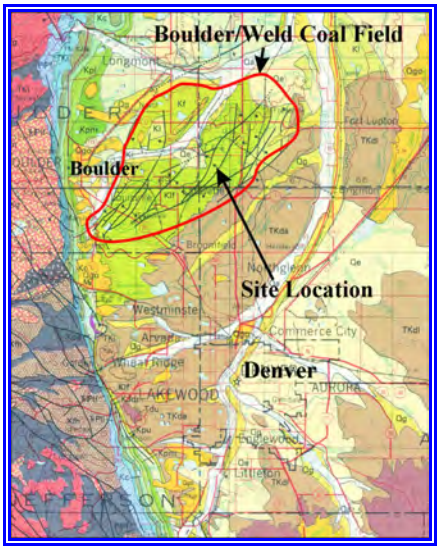
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Figure 5 - Generalized Stratigraphic Models of the Laramie Formation, Section 36, T1N, R69W Erie, Colorado

associated with uplift. The second basin has been described by Davis and Weimer (1976) as growth-faulting as a result of differential loading of the deltaic sequence at the time of deposition.

Growth faulting is the major structural feature seen in the area. A zone is present with dominant faults trending in a northeasterly direction. This system is ten miles wide and thirty miles long. These faults are high-angle, normal structures near the surface, but seismic work has shown that they tend to flatten and die out at depth. Work by Davis and Weimer (1976) shows that these listric normal faults do not continue below the Hygiene Member of the Pierre Shale. Antithetic faults resulting from tension then form horst and grabens. This effect had resulted in the increased thickness of sediments in the graben areas. The Fox Hills Sandstone has been reported to have a thickness near a growth fault of 484 feet (Spencer, 1961). The Laramie Formation also has increased thickness in these zones and this is believed to be the reason for the increased thickness of the coal seams in the Boulder-Weld coal field.

However, recently investigators have recognized low angle reverse faults in the Boulder-Weld area. Kittleson (The Origin of the Boulder-Weld Fault Zone, East of Boulder, Colorado: The Mountain Geologist, January 2009 Volume 46 Number1) describes the Longmont Detachment and identifies the Romero Fault as the footwall to the Detachment. These detachments are analogous to landslides, on a vastly larger scale, and occur in rocks exhibiting incomplete lithification.



Front Range geology, from Tweto, 1979

6.0 SITE GEOLOGY

Five distinct geologic units were encountered during drilling on adjacent projects, no drilling has been performed on the Erie Assemblage Project and variations to the following description are likely. The first and uppermost unit is a sandy clay soil approximately 5 feet thick. The next lower unit which has a gradational contact with the surficial soils, consists of light brown, medium to fine-grained sands and silts, possibly of aeolian origin. These sands and silts occur between 5 and 10 feet in depth and average approximately 5 to 8 feet thick. Their composition, like the surficial soils, are highly variable. Beneath the aeolian deposits, are water saturated clays, sands and gravels ranging from 10 to 20 feet in thickness.

The next unit encountered is the clays, silts, fine-grained sands and coals of the Cretaceous-age Laramie Formation. The contact between the Laramie Formation and the recent deposits occurred between 15 and 40 feet in depth. The first coal encountered was between 70 to 100 feet beneath the surface and averaged approximately 5 feet thick. The lower seam, which is likely correlative to the main seam for the Mitchell, Simpson and Irvington Mines, was penetrated between 170 to 220 feet on the Erie Commons property. This seam averaged approximately 6 feet thick beneath Erie Commons.

The lowest stratigraphically significant unit identified is the Laramie/ Fox Hills Formation. It's depth, in those holes which intersected the contact, ranged between 200 to 240 feet. This would indicated the Laramie/Fox Hill contact would be at approximately 240 feet beneath the Erie Project.. The upper Fox Hills Formation is characterized by light gray fine to very fine-grained quartzose sandstone.

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7.0 CLOSURE

The recommendations provided herein were developed from the information obtained from field exploration which reflect subsurface conditions only at the specific locations, at the particular times designated. Subsurface conditions at other locations and times may differ from conditions occurring at these locations. The nature and extent of any variations between the drill holes may not become evident until or during the course of construction. If variations then appear, it may be necessary to re-evaluate the recommendations of this report after performing on-site observations during the excavation period and noting the characteristics of any variations.

This report was prepared by a Professional Engineering Geologist, not a Geotechnical Engineer, and should not be construed as, or substituted for, engineering. This report is intended to inform geotechnical and structural engineers working on building design of the potential earth forces that could develop at the site, and to assist the client in determining whether to acquire and develop the site in question.

Our professional services have been performed, our findings, and our recommendations prepared in, accordance with generally accepted geological principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

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Cultural, Archaeological & Historic Report



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Project No.: 2017-0038

March 2017

ABSTRACT

A file search, literature review, and an intensive cultural resources survey of portions of the Study Area were performed in support of a project at the northwest corner of Baseline (State Highway 7) and East (E) County Line roads at the southern border of the Town of Erie, Boulder County, Colorado. The Study Area encompasses approximately 225 acres, which is located in portions of Section 36, Township 1 North, Range 69 West, 6th Principal Meridian. A&B Cultural Consultants, LLC performed a file search and literature review beginning on February 13, 2017. An intensive survey of the Study Area was conducted from February 20-22, 2017. The records review indicated that small portions the Study Area along SH 7 and E County Line Road had been subjected to previous cultural resources inventories that did not identify any sites within the Study Area. The file search also showed that four resources had been previously recorded that are partially or completely within the Study Area.

Reconnaissance and selective intensive surveys of portions of the Study Area were performed with the intent to evaluate the condition of any previously recorded sites within it; to ground truth any leads obtained through the archival research or the review of recent aerial photography of the area; and to perform an intensive pedestrian survey of a sample of the Study Area. Based on the review of the Assessorôs records and recent aerial photographs, four potential sites were identified within the Study Area that had not been previously recorded.

In its entirety, the Burlington Northern Railroad (**5BL.374**) has been determined to be eligible for the NRHP and the segments located within the Study Area retain sufficient integrity to support the eligibility. The Goodhue #1 Ditch (**5BL.2731**) was determined to be not eligible for the NRHP, but this determination was made in 1990 prior to the current standards and a re-evaluation of this would likely result in determination of eligible. The segments of both the ditch and its lateral located within the Study Area appear to retain sufficient integrity to support the eligibility. The Burt House, Schillawski Residence (**5BL.9249**) was recommend by previous recorders to be not eligible and the property and circumstances have not changed since that time to warrant a re-evaluation of this recommendation. The Haywood Mine (**5BL.10332**) was determined to be not eligible and the property and circumstances have not changed since that time to warrant a re-evaluation of this determination.

A farm complex at **12329 Baseline Road** is listed in the Assessorôs records as containing structures built in 1879, but the archival research and field survey failed to verify this date. Instead, it appears more likely the structures were first built sometime around 1932 and modified thereafter. An occupied rural residential property (**1130 N 119th Street**) contains atypical ranch-style house that was built in 1968. **Structure 1** is a dilapidated and abandoned residence located in the northeastern portion of the Study Area and **Structure 2** is part of an abandoned farm complex located in the east-central portion of the Study Area. Archival research on these four resources failed to yield any information to indicate that they were associated with any significant events or people, nor do any of them appear to have any architectural distinction. They are all recommended to not eligible for the NRHP.

Based on the sample intensive survey and other surveys in the surrounding area it can be concluded that there is very little likelihood of significant prehistoric deposits being located within the Study Area, with one slight exception; buried deposits along the western margins of the marsh in the southeastern portion of the Study Area cannot be completely ruled out.

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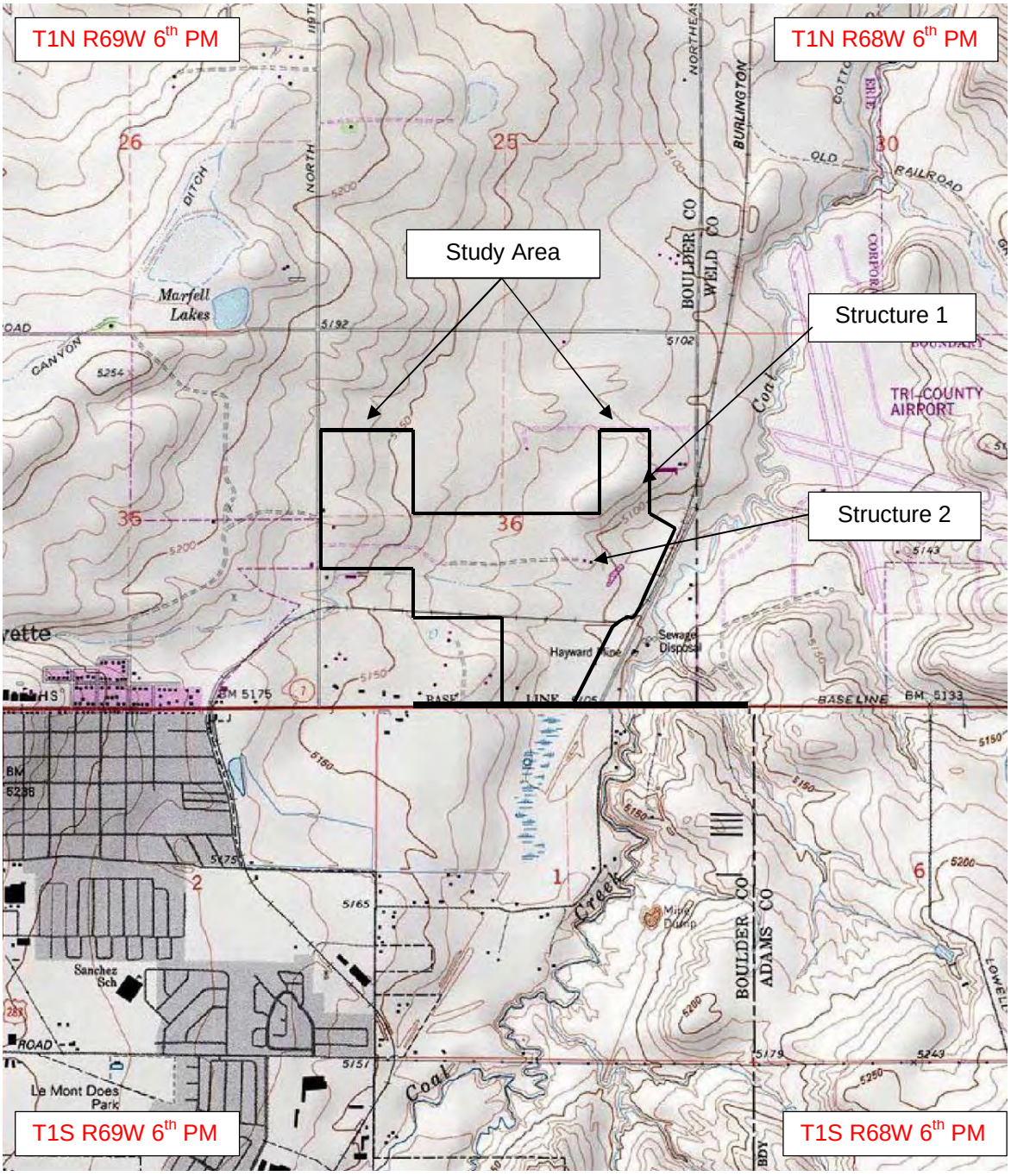
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The Town of Erie (Town), Boulder County, Colorado, is considering the application for a residential development project at the northwest corner of Baseline (State Highway [SH] 7) and East (E) County Line roads at the southern border of the Town. The proposed development would include approximately 75 acres of residential properties, approximately 40 acres of public open space, and approximately 31 acres of private open space/landscape buffer. The development will combine five distinct real estate parcels that were a part of annexation proceedings by the Town in 2016. These parcels are: 1160 N 119th Street, consisting of approximately 40 acres; 1130 N 119th Street, consisting of approximately 10 acres; 1132 N 119th Street, consisting of approximately 90 acres; 903 Baseline Road, consisting of approximately 33 acres; and 903 E County Line Road, consisting of approximately 43 acres. Three of these parcels have existing standing structures on them and the other two have abandoned structures on them. In addition to these real estate parcels, right-of-way along both side of Baseline Road extending from approximately 600 ft of E County Line Road to approximately 0.75 miles west of the section line was included in this inventory.

Ecological Resource Consultants, Inc. (ERC) has been retained by the developer to assist with environmental planning for the project. ERC in turn has retained A&B Cultural Consultants, LLC (A&B) to conduct a cultural resources overview investigation of the area of potential effects (APE; hereafter, the Study Area). The Study Area encompasses approximately 225 acres that are located in parts of the southeast quarter of Section 36, Township (T) 1 North (N), Range (R) 69 West (W), 6th Principal Meridian (P.M.) (Figure 1-1). The purpose of this cultural resources investigation is to identify based on existing information and a sample survey of the Study Area any districts, buildings, structures, sites, or objects that may be important in history or prehistory that are located within the Study Area.

A file search and literature review was performed on February 13, 2017 and an intensive survey of approximately 65 acres of the Study Area was conducted on February 20-22, 2017. Other sources of information were reviewed beginning on February 13, 2017 and continuing throughout the preparation of the report. The Project Principal Investigator is Robert J. Mutaw, Ph.D., who was assisted in the field by Anne Mutaw. Dr. Mutaw prepared the summary report.

This report describes the background, methods, and results of a cultural resources inventory of the Study Area. The report complies in form and content with guidelines issued by the Colorado Historical Society, Office of Archaeology and Historic Preservation (CHS-OAHP) (2007).



TN MN 9½°

A & B Cultural Consultants, LLC

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Scale 1:24,000

USGS 7. 5' Topographic Quadrangle Maps:

Erie, CO (1967; Photorevised 1979)

Figure 1-1. Study Area Location Map

Erie Gateway South, Boulder County, Colorado

Human use of an area, today and in the past, is conditioned to some extent by environmental parameters. The environment does not determine how and to what extent human groups will respond; rather, it provides opportunities for, and imposes constraints upon, human behavior, ameliorated to a greater or lesser extent by culture. To understand how human groups in an area adapted to the local situation, the regional environmental setting should be understood.

The Study Area is located in the South Platte River drainage system, within the Colorado Piedmont section of the Great Plains physiographic province (Fenneman 1931). Elevations range from 5,100 feet (ft.) at the southeastern corner to 5,180 ft. above mean sea level northwestern corner of the Study Area. The local topography is characterized as broadly rolling, with wide valleys separated by broad, gently rolling to flat, interstream divides (Figure 2-1). Coal Creek, immediately mile east of the Study Area, is the nearest natural, perennial water source. Coal Creek is a tributary of Boulder Creek, which is several miles north of the Study Area. The Boulder Creek system is a part of the South Platte drainage system.



Figure 2-1. Overview of central part of Study Area, looking west.

Climate in the area is typical of that on the Colorado Plains and is characterized by low humidity, sparse rainfall, moderate to high winds, abundant sunshine, and a wide range in daily temperatures.

Most of the study area itself has been in agricultural use for many years and it is surrounded by other agricultural properties or rural residential properties (Figure 2-2). In non-cultivated areas,

of the Study Area vegetation consists mainly of various mid and tall grasses and weeds, willows and few cottonwoods are found in moister area. The Study Area provides habitat for a variety of small mammals and birds and their predators, including raptors, coyotes, and raccoons.



Figure 2-2. Overview of central part of Study Area, looking northwest.

The principal soil in the Study Area is classified as Ascalon sandy loam, which consists of well-drained mixed alluvium and eolian materials (Figure 2-3). These soils are suitable for irrigated and dry land farming and cover approximately 80% of the Study Area. Two other soils are present in the southeastern portion of the Study Area in an area that appears to be an abandoned meander of Coal Creek. Calkins sandy loam is a deep, somewhat poorly drained grayish brown soil found on stream terraces and bottoms and formed in loamy alluvium. Loveland soils are deep, somewhat poorly drained, dark grayish brown, clay loam found on stream terraces and bottoms that formed in loamy alluvium (Moreland & Moreland 1975). The bedrock geology of the area generally dates to the Cretaceous Period and consists of sedimentary rocks that were formed in a large inland sea. A thick mantle of Pleistocene and Holocene eolian sand overlies the bedrock deposits and a small area of Broadway Alluvium is mapped in the extreme southeastern corner of the Study Area (Colton and Anderson 1978).



Figure 2-3. Ascalon soils in central part of Study Area, looking west.

Cycles of deposition and erosion, respectively, protect and destroy cultural resources. During the Quaternary period, degradational and aggradational episodes resulted in a series of terraces in the South Platte River Valley (Holliday 1987). These episodes left deposits known as the Pleistocene Verdos, Slocum, and Broadway alluvia and the Holocene Piney Creek and Post-Piney Creek alluvia in the valleys of drainages of the greater Denver area (Hunt 1954; Scott 1963). Away from the drainages Upper Pleistocene loess and eolian sand mantle the alluvial deposits (Montgomery 1984).

Sometime before the Illinoian glacial stage, which began about 200,000 years ago, the present drainage system in the South Platte Basin was generally established, and main valleys were essentially cut as deeply as they are today. By the beginning of the Wisconsin glacial stage, about 110,000 years ago, uplands in the Denver area had become deeply weathered and were covered with material that would become residuum. During the Wisconsin glacial stage, valleys in the South Platte Basin filled again with outwash material from the Front Range forming a terrace created by the Broadway alluvium that buried what was left of the pre-Wisconsin age terrace. This alluvium correlates with the gravel deposits near Dent, Colorado from which Clovis period fluted projectile points were recovered in association with mammoth remains (Hunt 1953, 1954: Scott 1963). A small area of this alluvium has been mapped in the extreme southeastern corner of the Study Area (Colton and Anderson 1978).

In some areas, a late Wisconsin age alluvium, which was derived from clays and silts from pre-Wisconsin soils that mantled the uplands, has been identified (Hunt 1954; Scott 1963). Scott (1963) has labelled this the ñpre-Piney Creek alluviumò (Gilmore 1991). While aggrading with these fills during the late Wisconsin or early Holocene, the flat surfaced valley bottoms became a source for sands and silts that were generally blown east, mantling the adjacent uplands of the major drainages with an eolian layer (Gilmore 1991; Hunt 1954; Scott 1963).

Hunt (1953) identified two Holocene alluviums in the Denver area, a later one with pottery artifacts and an earlier one without pottery, that have been named the post-Piney Creek and the Piney Creek alluviums, respectively (Hunt 1954; Scott 1963). Hunt (1954) first defined this alluvium using a type site located along Piney Creek, a tributary of Cherry Creek north of Parker. An archaeological site resting on top of the alluvium, with an age estimate from radiocarbon dating of 1,150 radiocarbon years Before Present (rybp), led Hunt to conclude that this alluvium was deposited no later than 800 A.D., and possibly considerably before the Christian Era. Scott (1963) confirmed this and projected an age of at least 2,800 years ago for the deposits based upon a similar alluvium found in Utah, which is similar to what Buckles (1980) concluded based on sediments from southeastern Colorado that he felt were 1,850 to 3,500 years old. Others (Madole and Rubin 1984) argue for even a much earlier age, placing the deposits in the Altithermal, or roughly 5,500 to 7,000 years ago, based on sediments from northern Colorado. Gilmore raises the issue that ñObviously, dating of this deposit needs to be refined if archaeologists continue to use it as a regional termò (Gilmore 1991:47). This alluvium does not appear to be present in the Study Area in the Study Area (Colton and Anderson 1978).

Another period of arroyo cutting followed the deposition of the Piney Creek alluvium that restored the streams to their previous and present levels (Hunt 1953, 1954), which was followed by the deposition of another alluvium along the major drainages, this one associated with pottery (Hunt 1953, 1954; Scott 1963). Referred to as ñProtohistoric and Historic alluviumò by Hunt (1954) and called the ñpost-Piney Creek alluviumò by Malde (1955), these deposits are coarser than the Piney Creek alluvium and found on the lowest terraces and floodplains. This alluvium is nowhere near as widespread in its occurrence as the Piney Creek alluvium and it is generally included within that geological mapping unit (Scott 1963). It may occur as a thin layer over the Piney Creek alluvium in some contexts and radiocarbon dated materials found in association place its formation to between 1,000 and 2,000 years ago (Gilmore 1991; Scott 1963). This alluvium does not appear to be present in the Study Area in the Study Area (Colton and Anderson 1978).

Humans have inhabited eastern Colorado for at least 12,000 years. The culture history of the region is described briefly, followed by a summary of previous investigations and known sites in or near the Study Area.

3.1 REGIONAL CULTURE HISTORY

3.1.1 Prehistoric Era

Humans have inhabited eastern Colorado for at least 12,000 years. This lengthy span of occupation in the Platte River Basin is segregated into chronologically ordered stages: Paleo-Indian (ca. 12,040-5700 B.C.), Archaic (ca. 5500 B.C.-A.D. 150), Late prehistoric (ca. A.D. 150-1540), and Protohistoric (ca. A.D. 1540-1860) (Chenault 1999). During this occupation, the indigenous populations pursued a general lifestyle of gathering and hunting. Evidence of their presence is reflected in concentrations of artifacts, mostly chipped stone, of different ages and found in a variety of environmental settings.

The eastern plains of Colorado, from the 1500s to the early 1700s, were occupied by the Apaches. The Utes, who lived mostly in the western half of Colorado, would occasionally travel onto the eastern plains for short-term expeditions. In the early 1700s, the Apache and Comanche groups engaged in conflicts with each other. The Comanche, with assistance from the Utes, were able to force the Apache into New Mexico by 1730. By the early 1800s, the Arapaho and the Cheyenne were occupying land along the South Platte and Arkansas Rivers. Ethnohistoric sources also indicate that groups of Lakotas hunted seasonally in the region (Clark 1999).

3.1.2 Historic Era

After the removal of the Arapaho and Cheyenne to reservations in Oklahoma, an expanse of unoccupied grassland was available for Europeans and Americans to claim. Euro-Americans traversed the area that would become Colorado as early as 1541, however, extensive settlement in Colorado did not occur until the mid-nineteenth century with the arrival of thousands of people seeking gold (Mehls 1984). One of the popular routes these pioneers followed was started by groups of Cherokee Indians traveling from northeastern Oklahoma to the goldfields of California in 1849 and 1850. After departing the Santa Fe Trail, this trail generally followed the route of the Trapperôs Trail and then streams such as the Jimmy Camp Creek until it reached Cherry Creek, which it followed until its confluence with the South Platte River in Denver (Whiteley 1999).

North of Denver, the trail generally followed the route of present-day US Highway 287, approximately 1.25 miles east of the Study Area, until it reached the future site of Laporte, subsequently entering the mountains and heading toward the Laramie plains. The path that the Native Americans took through the area was thereafter referred to as the Cherokee Trail, although it had long been a trail for fur trappers and traders. Upon their return to Oklahoma, the Cherokees attempted to organize an expedition to search further for gold. News of their discoveries reached a Georgian, William G. Russell, who would travel to Colorado and make the first significant gold discovery in 1858 (Watrous 1911). The Cherokee Trail was again popularized during the gold rush in Colorado that began in 1858 and during which thousands flocked to the Rocky Mountains with the hopes of striking it rich (Mehls 1984).

While many failed at mining, others stayed on to found towns and businesses that supplied the mining communities and developed early farming and ranching on the eastern plains (Mehls 1984). The success of these endeavors ultimately depended on the ability (or lack thereof) of the farmers to obtain water for their fields and animals. The Union Colony at Greeley marked the first attempt to irrigate large tracts of land. The colony was founded by Nathan C. Meeker, the agricultural editor of the New York Tribune, and his editor and publisher, Horace Greeley. The first irrigation of the higher or second bench lands along the Cache La Poudre River began with the Union Colony in 1870. When the Union Colony reaped a bounteous harvest from its irrigated land, other colonies soon followed, including the Agricultural Colony at Fort Collins and the Colorado Chicago Colony near Longmont (USDI Bureau of Reclamation 1937). Out of an agreement between Greeley and Fort Collins came the Colorado doctrine of prior appropriation for water rights, characterized by a ñfirst-in-time, first-in-rightò principle and a system of priorities of use, ideas that were later copied by other western states (Mehls 1984). These well-publicized irrigation ventures, together with Western boosterism, encouraged the rapid settlement of northern Colorado during the 1870s and 1880s. In turn, the new settlers initiated the development of even larger, more extensive irrigation projects (USDI Bureau of Reclamation 1949).

From the 1870s to 1910, the building of irrigation systems became a major industry in northeastern Colorado. The introduction of crops such as alfalfa, potatoes, and sugar beets, which required more intensive watering than products grown in earlier years, led to the development of irrigation systems by groups of farmers and large corporations. An elaborate system of canals and reservoirs, many of them jointly operated by several irrigation companies, successfully transformed the semiarid land of northeastern Colorado into some of the nation's most intensively cultivated farmland (Sherow et al. 1987; Ahlbrandt and Stieben 1987). World War I encouraged even further agricultural development in the area, as the country was called upon to supply food for other nations (Watrous 1911).

Irrigation in the Boulder Valley began as early as 1859 when the Lower Boulder Ditch (Boulder Creek section) was filed on October 1, 1859 for a fee of $25.00 (Dyni 1989). The Goodhue Ditch, which was originally called the South Boulder & Rock Creek Ditch, was built by Abner Goodhue with help from his neighbors sometime before 1873, the year the first water rights were appropriated. Dyni (1989) believes that it was completed in the 1860s and was the first ditch to divert water from South Boulder Creek. Originating along South Boulder Creek near Valmont, the ditch runs for twenty miles though southeastern Boulder County with the south branch terminating at the Stearns Dairy Farm (now Rock Creek Farm Open Space) and the north branch running through a portion of the Study Area and terminating to the northeast of it. The ditch was enlarged and extended in 1875 and 1885 and additional diversions and water rights were appropriated from Rock Creek and Coal Creek in 1875 and 1933 respectively. It is Priority Number 29, a relatively high position leaving it without water in some years, and it originally irrigated 5,425 acres. The ditch currently has about 400 users with a north branch running to Erie and a south branch to Broomfield and it is used to convey water to Wanaka Reservoir in Lafayette and Stearns Lake (also known as Goodhue Ditch Reservoir and Goodhue Reservoir #1) on Boulder County Open Space (Mobley-Tanaka and Gleichman 2001; Ditch Project 2014b; Colorado Division of Water Resources [CDWR] 2016). Segments of the north branch of the Goodhue #1 Ditch are present in the western portion of the Study Area, as well as segments of a lateral off of this ditch.

Ditch appropriations in the South Boulder Creek section for the Goodhue Ditch appear to date back to 1859, with several additional ones in the 1860s, 1870s, 1880s, 1890s, and 1900s with a total net amount of water right of approximately 386 cubic feet per second (cfs) (CDWR 2016).

Abner Goodhue and his wife Clara are considered to be locally significant early pioneers and farmers in the southeastern part of Boulder County. Abner, who was born in Canada in 1832, immigrated to Minnesota as a boy and then traveled the western US, worked with William F. ñBuffalo Billò Cody hunting buffalo for the railroads in the 1860s, and finally landed at the Rock Creek Stage Station around 1870. Lafayette and Mary Miller, who owned the station and surrounding farm, were interested in selling their property, as the stage business was dying with the coming of the railroads. Apparently, Goodhue was interested in developing the farm, as he bought the property in 1871 and must have immediately set to work on the ditch bearing his name. He added to his holdings through successful horse breeding and had over 1,400 acres by 1896. Abner died in 1912, and Clara and their three sons continued to run the farm and ditch company until the national ñfarm crisisò forced them into foreclosure in 1924 (Mobley-Tanaka and Gleichman 2001; Ditch Project 2014b).

Many of these early settlers also noticed outcroppings of coal in eastern Boulder and western Weld Counties, which eventually would be designated the Northern Coal Field, an area covering approximately 6,800 acres (Smith 1989). The larger and richer southern field eclipsed the reputation of the Northern Coal Field, even though the latter was where union men came first to organize the miners and Coloradoôs long coal strikes started in the northern field and spread southward (Smith 1989). Many of the towns in the areað such as Erie, Frederick, Lafayette, Louisville, Marshall, and Superiorð owe their existence to the development of the Northern Coal Field.

The Town of Erie was settled about 1867 by the Rev. Richard Van Valkenburg, a Methodist minister who named the town after his hometown in Erie, Pennsylvania (Boulder Daily Camera 2001). The town was incorporated in 1874. As the coal mining industry in the region grew, Erie attracted hundreds of miners, and at one time was the third-largest town in Weld County. The town was surrounded by coal mines. Coal mines in the vicinity of the Study Area included the Haywood/Irvington (called Hayward on the USGS Erie 1967 quadrangle map) to the southeast with a portion of the underground works extending under the extreme southeastern corner of the Study Area. This mine operated from 1899 to 1906 as the Haywood Mine and as the Irvington Mine from 1907 to 1908 and produced a total of 261,767 tons of sub-bituminous coal from a 6.5 ft to 12 ft thick seam (Pineda et al. 1986; Roberts et al. 2001; Turney and Murray-Williams 1983).

To the southeast of the Haywood Mine and sharing a contiguous area of undermining were the Baker (1887-1896), Blue Ribbon (1933), Parkdale (1907-1916), and Vaughn (1897-1906) mines. The Baker Shaft (new) was to the southeast of this complex and it operated from 1905 to 1909. The Caryl/Pallott/Storrs Mine, operating from 1898 to 1904, was located to the south of the Study Area. The Gladstone (1890-1915), the Mitchell/New Mitchell (1892-1920), and the Excelsior/Northern (1890-1913) were all located just to the west of the Study Area (Roberts et al. 2001; Turney and Murray-Williams 1983).

The earliest of these, the Baker Mine, was a slope mine just to the south of the Study Area that was owned by frontiersman named Jim Baker. Wagons from Missouri would load coal from this

mine and then delivery it to the stage stations along the Overland Stage route. In 1887, Daniel Davis was the superintendent and 9,120 tons of lignite coal was extracted from a 10 ft seam (Engles 1978). The Baker Land and Coal Company was incorporated on July 9, 1892 and through cash purchase and the issuance of stock acquired additional land in the area including the south half of the southeast quarter of Section 36, T1N, R69W, 6th P.M (includes portions of the Study Area). In 1898, they entered into a lease agreement with William A. Haywood who opened the shaft for the Haywood Mine. In 1902, the property was purchased in a foreclosure sale by Frank H. Jones. Later that year, the American Trust and Savings Bank and the Great Western Coal Mining Company (GWCMC) became the assignees of the lease and the lease with Haywood was cancelled. The property was sold next in 1905 to the Irvington Coal and Land Company, Frank H. Jones, Secretary for $250,000 in capital stock and the mine operated as the Irvington until closing in 1908 (Boulder County Clerk 2017; Roberts et al. 2001).

By late 1870, the Denver Pacific (DP) Railway had completed an extension line between Denver and Cheyenne, and the Kansas Pacific (KP) Railway Company (formerly the Union Pacific Railway Company, Eastern Division) completed construction of tracks from the Colorado-Kansas border to Denver. With the completion of these railroad lines, the region and rail network began to grow rapidly (Mehls 1984). The Colorado Central Railroad was completed from Golden, through Broomfield and Boulder counties, to Longmont in 1873 and after a number of ownership changes has been operated as the BNSF since 1995.

The Denver Western and Pacific Railway Company (DW&P) was formed in 1880. In 1881, the company began to construct six segments, including one between Erie and Burns Junction, which was located a short distance northwest of Broomfield (Ormes 1992; Wilkins 1974). At the outset, only the grade was constructed and no rails were placed on this segment. The Denver Marshall and Boulder Railway Company (DM&B), a subsidiary of the Union Pacific (UP), purchased the DW&P in 1885. The DM&B did not do any work on this segment (Ormes 1992). The Denver, Utah and Pacific (DU&P) purchased the DM&B from the UP in 1889, and by late August of that year had constructed a standard gauge rail on the DW&P grade between Burns Junction and Erie (Ormes 1992). The line was then leased to the Burlington and Missouri River (B&MR), a subsidiary of the Chicago, Burlington and Quincy (CB&Q), and train service commenced on September 1, 1889. The B&MR Railroad, an operation of the Chicago, Burlington, & Quincy CB&Q) Railroad, acquired this line from the Colorado Northern (CN) railroad in 1889. The CN had been built as a narrow-gauge line in 1883-1884 to service coal mines in the area. The B&MR was renamed the line the Lyons Branch. The Burlington Northern (BN) Railroad was created on March 2, 1970, through the merger of four railroads, including the CB&Q. A portion of this railroad runs along and within the eastern and southern portions of the Study Area.

Coal mining continued in the area until 1978 when the Eagle Mine, located about 3 miles east of Erie, closed (Town Historic Preservation Board 2009). Agriculture has continued uninterrupted in this region for over a century, until more recent development that is focused on residential and commercial uses.

3.2 PREVIOUS WORK

On February 13, 2017, A&B conducted an online search of the CHS-OAHP Colorado Inventory of Cultural Resources for Section 36, T1N, R69W, 6th P.M.. The results, as summarized in Tables 3-1 and 3-2, show that four surveys have been conducted in this section and seven resources recorded.

One of these surveys was a comprehensive survey of historic structures throughout Boulder County that apparently did not record any resources within the Study Area. The other three surveys were for highway improvement projects by the Colorado Department of Transportation (CDOT). Two of these surveys covered portions of the Study Area near the intersection of State Highway (SH) 7 and E County Line Road (BL.CH.NR36 and BL.CH.R1) and neither appears to have documented any sites within the Study Area. The last survey was for the US Highway 287 bypass project approximately one mile east of the Study Area in Lafayette (BL.CH.R2). This survey documented one site, the Goodhue #1 Ditch (**5BL.2731**) that extends into the Study Area.

In addition to this site, six other resources were previously recorded within Section 36, T1N, R67W, 6th P.M. and for which summary data are presented in Table 3-2. With the exception of one isolated prehistoric artifact (**5BL.2663**) all of these resources date from the historic era. These include two documentations of the Burlington Northern Railroad, two agricultural complexes, and a coal mine complex. Along with the Goodhue #1 Ditch, a segment of the railroad, one of the agricultural complexes and the mine complex are within the Study Area.

Table 3-1
PREVIOUS SURVEYS IN SECTION 36, T2N, R69W, 6TH P.M.

Report ID	Report Title	Author(S)	Institution	Completion Date
BL.SHF.R49	Unincorporated Boulder County Historic Sites Survey Report	McWilliams, Carl	Cultural Resource Historians	02/01/2003
BL.CH.NR36	**An Intensive Archaeological Resource Inventory of Proposed Intersection Improvements, State Highway 7 at East County Line Road, Boulder County, Colorado**	**Wolff, Greg**	**Colorado Department of Transportation**	**06/10/2008**
BL.CH.R1	**Cultural Resource Survey of a Bridge over Coal Creek, Boulder County**	**Angulski, Debra**	**Colorado Department of Transportation**	**07/20/1989**
BL.CH.R2	Survey Report, CDOH Project FC 287-3(50), Lafayette Bypass, Colorado Department of Highways	Pearce, Sally	Colorado Department of Transportation	02/20/1990

Notes: Surveys in bold cover parts of Study Area.

Table 3-2

PREVIOUSLY RECORDED SITES IN SECTION 36, T2N, R69W, 6TH P.M.

Site No.	Site Name or Type	Recording Date	Doc. ID	Site Type	Estimated Age	NRHP Eligibility*
5BL.374	**Burlington Northern Railroad**	**05/01/1981**	**MC.LG.R20 BL.LG.R99 MC.LG.R29 MC.R.R83 BL.LG.R113 BL.CH.R17**	**Track, Railroad Grade**	**1870-1879**	**Eligible - Officially**
5BL.374.7	Burlington Northern Railroad (Segment)	02/06/1990	---	Railroad	1878-1889	Not Eligible - Field
5BL.2663	Archaeological	06/21/1989	BL.CH.R1	Isolated Find - Mano	Prehistoric	Not Eligible - Field
5BL.2731	**Goodhue #1 Ditch**	**01/09/1990**	**BL.CH.R2**	**Ditch**	**1907**	**Not Eligible - Officially**
5BL.5761	Mcdonald Property	07/2008 11/11/1994	BL.LG.R183 BL.SHF.R49	Agricultural Complex	1880-1910	Not Eligible - Field
5BL.9249	**Burt House, Schillawski Residence**	**07/2008 06/27/2003**	**BL.LG.R183**	**Agricultural Complex**	**1928-1932**	**Not Eligible - Field**
5BL.10332	**Haywood Mine, Baker, Irvington**	**11/01/1986 1/1978**	**MC.CN.R1**	**Mine**	**1899**	**Not Eligible - Officially**

Notes: Sites in bold within Study Area; --- data not listed.

The purpose of these investigations is to identify historic properties within the Study Area. Historic properties are formally defined as objects, sites or districts that are listed in, or eligible for listing in the NRHP. Eligibility of any given recorded locality for listing in the NRHP, is assessed according to the criteria of evaluation described at 36 CFR 60.4:

> *The quality of significance in American history, architecture, archeology, engineering and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and*
>
> *(a) that are associated with events that have made a significant contribution to the broad patterns of our history; or*
>
> *(b) that are associated with the lives of persons significant in our past; or*
>
> *(c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or*
>
> *(d) that have yielded, or may be likely to yield, information important in prehistory or history.*

Integrity is the ñability of a property to convey its significanceò and ñto retain historic integrity a property will always possess several, and usually most, of the aspects.ò (Townsend et al. 1993: 17). Eligible sites are those that satisfy one or more of the aforementioned criteria and retain integrity. Non-eligible sites (including all isolated finds) are those that do not satisfy any of the evaluation criteria and/or lack integrity.

When evaluating segments of linear resources, such as railroad and ditches, the question is asked if the particular segment under study retains sufficient integrity to demonstrate its significance and thereby support the eligibility of the entire resource of which it is a part. If the particular segment lacks sufficient integrity, it is said to be unable to support the eligibility of the overall resource and is thereby considered not eligible for listing in the NRHP.

Archaeological sites are generally eligible under NRHP criterion d when they can produce data through analysis of artifacts and features found in an original context, i.e., *in situ*, that can be used in answering important research questions. Soils that formed in alluvial valleys yield evidence of the geomorphic and environmental settings and ages of archaeological deposits. These soils are formed in relation to patterns of alluvial sedimentation, and only on stable land surfaces (Holliday 1992; Ferring 1992). On the large-scale, stream channel migration, channel cut-off and meander-belt avulsion result in spatial variability in sedimentation. Variability in sedimentation resulting from meandering streams leads to matching patterns of soil development. In stable settings, soils have adequate time to develop, but in cases of rapid sedimentation, soil formation is inhibited. Sedimentation rates are slower farther from the channel often leading to soil profiles that are cumulative, with over-thickened A horizons. Sediments also grade upward from the floodplains to the levee facies matching the direction of the channel migration. These processes take hundreds to a few thousands of years and are significant to archaeological investigations (Ferring 1992).

Soils on higher terraces are generally older than those on lower terraces because they have had more time for pedogenesis to take place. A significant amount of time represented by a stratigraphic sequence may be taken up by pedogenesis in environments where sedimentation is episodic. In these contexts, archaeological materials in surface contexts may actually represent accumulations of artifacts over a long period of time and from multiple occupations (Holliday 1992).

Given the geomorphic parameters discussed above, there is a slight potential for Paleoindian sites associated with the Broadway alluvium equivalent (Montgomery 1984). However, potential exposures of the Broadway alluvium deposits within the Study Area are limited to the area in the southeastern corner of the Study Area.

Two primary activities were performed for this investigation: a file search and literature review and a reconnaissance survey. On February 13, 2017, A&B conducted an online search of the CHS-OAHP Colorado Inventory of Cultural Resources for Section 36, T1N, R67W, 6th P.M. Relevant literature pertaining to the area was reviewed for background information, as well as specific details concerning the Study Area during the ensuing period. Records reviewed included literature pertaining to the geology, soils, archaeology, and prehistory of the area; General Land Office (GLO) plat maps and field notes; Boulder County Assessorôs and Recorderôs records; historic aerial photographs and maps; and historic trails maps of the area.

An intensive cultural resources survey of approximately 65 acres (~29%) of the Study Area was conducted on February 20-22, 2017. The entire Study Area was first subject to inspection from the roadsides and a pedestrian investigation was then performed of selected areas. Readily indefinable resources such as standing structures and ditches, potential features identified through archival sources or aerial photographs, and areas that appeared to be geomorphologically suitable for the preservation of archaeological sites were the focus of the pedestrian investigations. Traditional archaeological survey methodology with two archaeologists walking parallel transects spaced no more than 15 m apart was employed to survey these areas. Visual examination of any resources encountered was conducted with photographic and global positioning system (GPS) documentation that identifies the location, nature, and integrity of the resource.

6.1 FILE SEARCH AND LITERATURE REVIEW

As discussed above in Section 3-2, the results of the file search showed that four surveys had been conducted in Section 36, T1N, R69W, 6th P.M. and seven resources were previously recorded within this section, four of which are within the Study Area. Two of these surveys, in bold in Table 3-1, were for highway projects at the intersection of the SH 7 and County Line Road and these are shown in blue in Figure 6-1. Neither of these surveys recorded any sites within the Study Area, although the survey for the Coal Creek bridge (BL.CH.R1) did record an isolated mano **(5BL.2663**) within the right-of-way to the east of the Study Area.

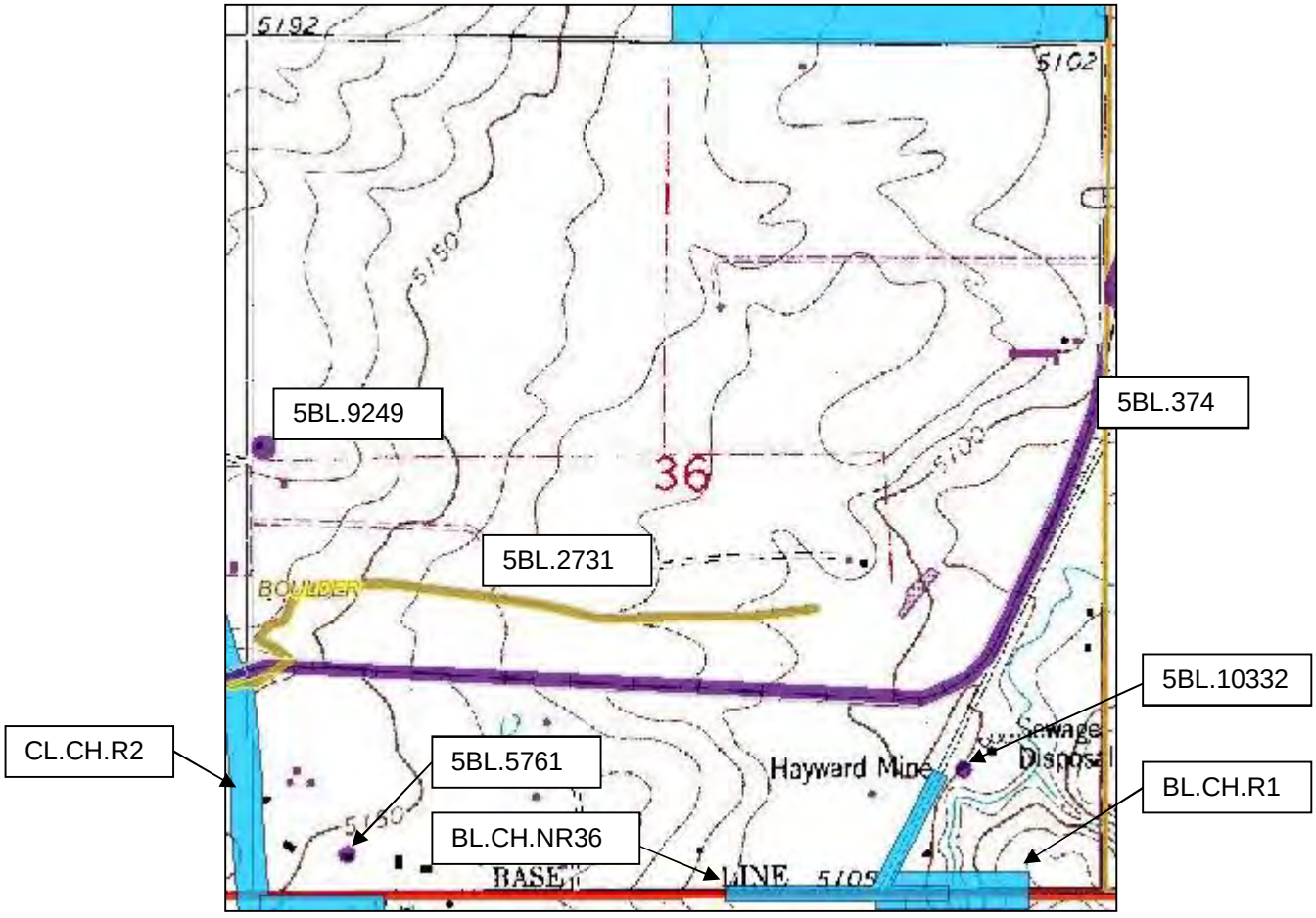


Figure 6-1. Excerpt from COMPASS database map showing Section 36.

Sites recorded in the Study Area are shown in purple and gold in Figure 6-1; isolated finds are not shown on this map. Site **5BL.2731** is highlighted in gold specifically because this location as recorded in the database does not appear to be accurate as will be discussed below, as well as the location for the Haywood Mine (**5BL.20332**).

A GLO plat map for T1N, R69W, 6th P.M. was reviewed and an excerpt of this map is shown in Figure 6-2 (GLO 1864a). This figure clearly depicts Coal Creek in relation to a ravine that joins it from the west through the center of the south half of the section along with other drainages that join it. It is also shows a trail that begins (ends?) in the northwest quarter of the southeast quarter

of the section and trends to the northwest with a branch to the north beginning in the southeast quarter of the northwest quarter of the section. The branch to the northwest is shown joining the ñStage Roadò in the northeast quarter of Section 27, T1N, R69W, 6th P.M. and the north trending branch exits the township near the northeast corner. These trails do not appear to correspond with any current transportation routes nor were any signs of them observed during the field survey. The GLO plat for the township to the south of the Study Area does not appear to show anything of concern (GLO 1864b). GLO patent records show that this section was granted to the State of Colorado by the United States as part of the Colorado Enabling Act that provided to the state two sections, 16 and 36, of every township to support education (GLO 2016).

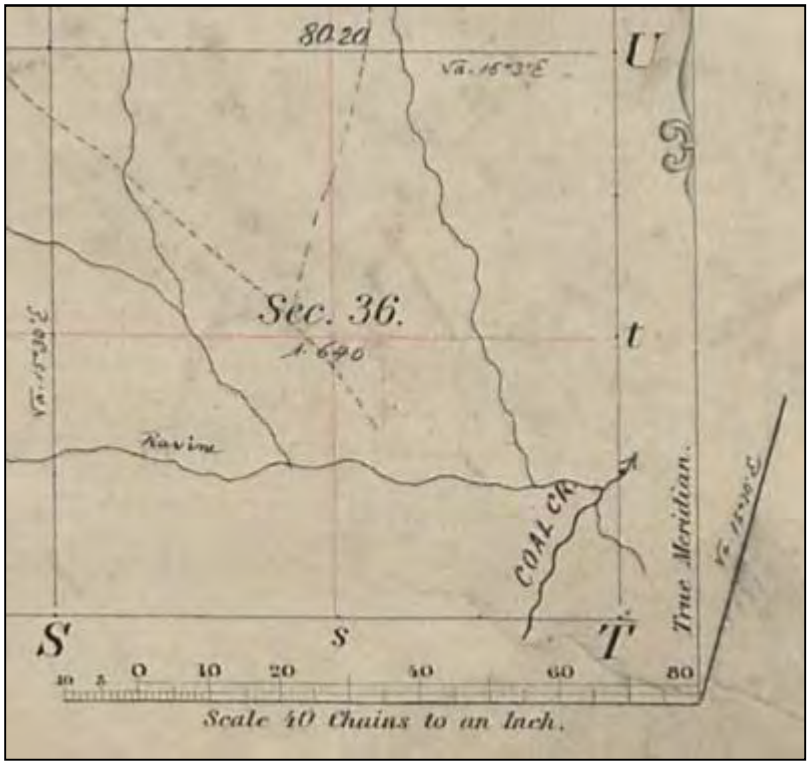


Figure 6-2. Excerpt from GLO Survey Plat, 1864.

Relevant historic trails maps include the one for the Greeley 1^{o} x 2^{o} Quadrangle (Scott and Shwayder 1993) and for the greater Denver area (Scott 1976). Excerpts from both of these maps are shown in Figure 6-3 and the match line corresponds to Baseline Road (SH 7). These maps show a north-south alignment of the Denver Western & Pacific Railroad (DW&P) running along the eastern border of the Study Area that does not directly correspond with the alignment of the Burlington Northern Railroad, which is shown in orange as part of the base map. A stop on the DW&P line named ñIrvingtonò and with the date 1905 is shown to the north of the Study Area. An area at the southeast corner of the Study Area is identified as ñCoal Parkò and is given the date of 1890. This area corresponds with the Baker Mine, which is part of the larger Baker-Haywood-Irvington mine complex.

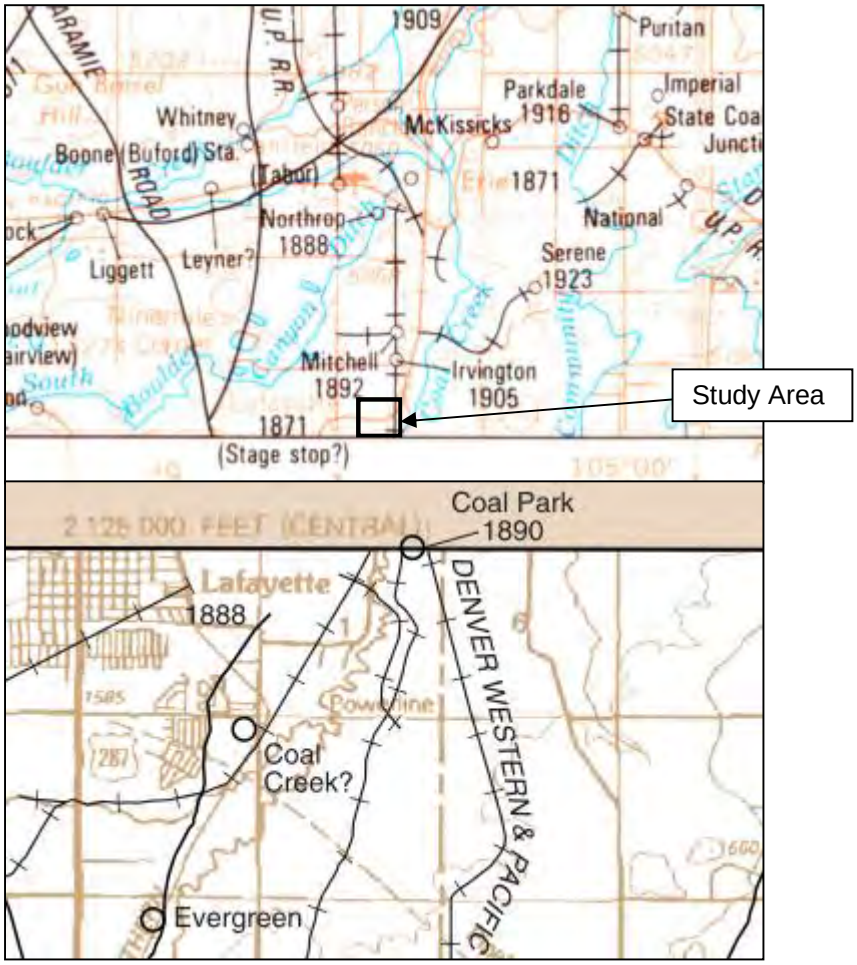


Figure 6-3. Excerpts from Historic Trails Maps.

The US Geological Survey (USGS) 15 minute quadrangle map for Niwot, Colorado includes the Study Area and surroundings to the north, east, and west (Figure 6-4). The map depicts two standing structures that appear to be within the Study Area and also appear to correspond with two abandoned structures located within the Study Area during the field reconnaissance and discussed further below As Structure 1 and Structure 2. This map also shows the alignment of the Burlington Northern Railroad in the appropriate location along with the spur to the Gladstone Mine that crosses along the southern border and through the southeastern corner of the Study Area. The apparently proper location of the Haywood Mine is shown but it is mislabeled as the ñHayward Mine.ò This map also shows a structure that appears to be to the west of the Study Area along Baseline road (SH 7) and does not appear to be any of the structures associated with the property within the Study Area located at 12329 Baseline Road, nor does it appear that any structures associated with this address are shown on this map.

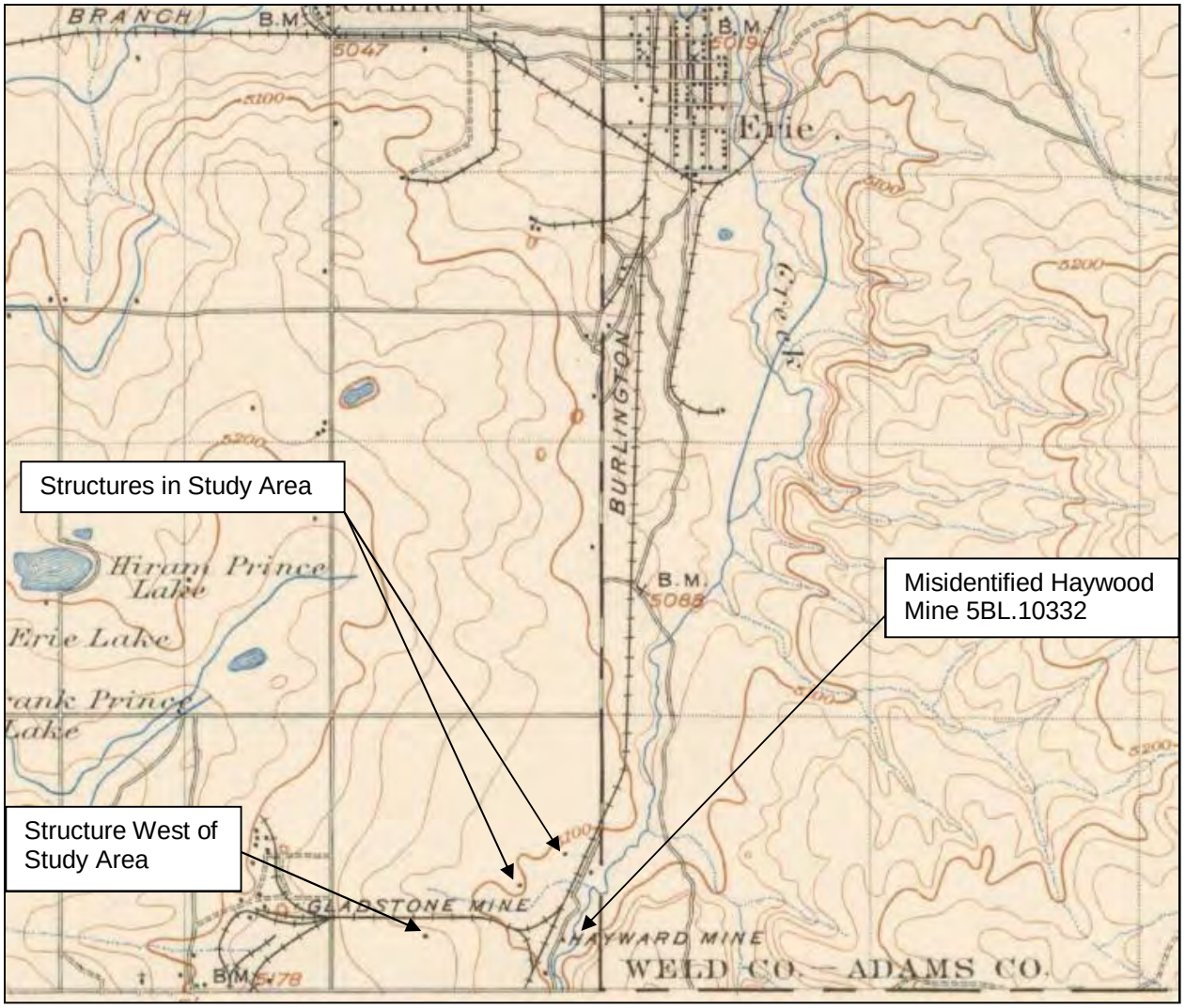


Figure 6-4. Excerpt from 1904 USGS Niwot, Colorado quadrangle map.

A map showing subsidence potential in abandoned coal mine areas in the Boulder-Weld Coal Field (Ivey and Hynes 1974) identifies the Haywood as the Irvington Mine and shows it in relation to the Baker and other mines (Figure 6-5). It appears to show much of the southeast corner of the section as being potentially undermined with a low risk for subsidence. It also appears to show portions of the Study Area in the northwest quarter and the northwest of the southwest quarter as having low and high risks for subsidence from mining at the Gladstone and Mitchell mines to the west of the Study Area.

A 1983 map showing the abandoned mines of Boulder County (Turney) shows the Irvington and Baker mines as not being connected to each other (Figure 6-6). This map appears to show the undermined area of the Irvington Mine extending to the northwest under E County Line Road and the railroad and possibly into the southeastern corner of the Study Area. It also shows the Gladstone and Mitchell mines extending into the west side of the Study Area, but not to the degree as shown in Figure 6-5.

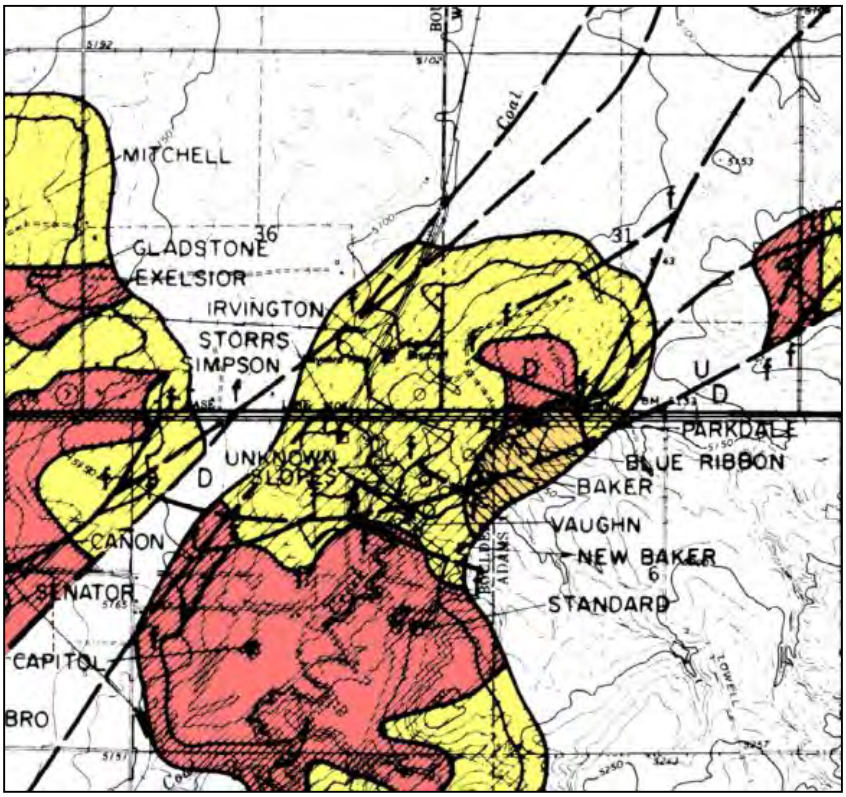


Figure 6-5. Excerpt from Ivey and Hynes 1974.

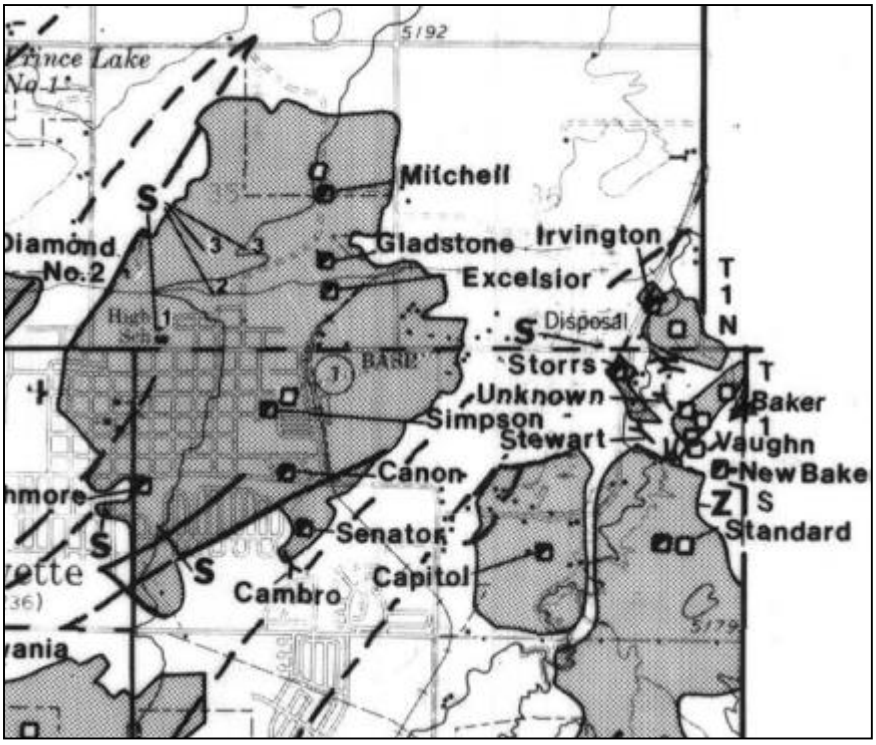


Figure 6-6. Excerpt from Truney 1983.

One additional map showing the extent of coal mine workings in the Boulder-Weld Coal Field (Roberts et al. 2001) has the Irvington, Baker and a few other mines as a contiguously undermined area (Figure 6-7). This map appears to depict minimal undermining from the Irvington Mine in the extreme southeastern corner of the Study Area and only a very small amount of undermining in the northwestern corner from Mitchell Mine. Based on this map, it does not appear that the southwestern portion of the Study Area was undermined by the Gladstone Mine. This map also incorrectly depicts Goodhue #1 Ditch as flowing directly in from the west through the Gladstone and Excelsior mines into the southwest quarter of the section and then branching to the north within the Study Area.

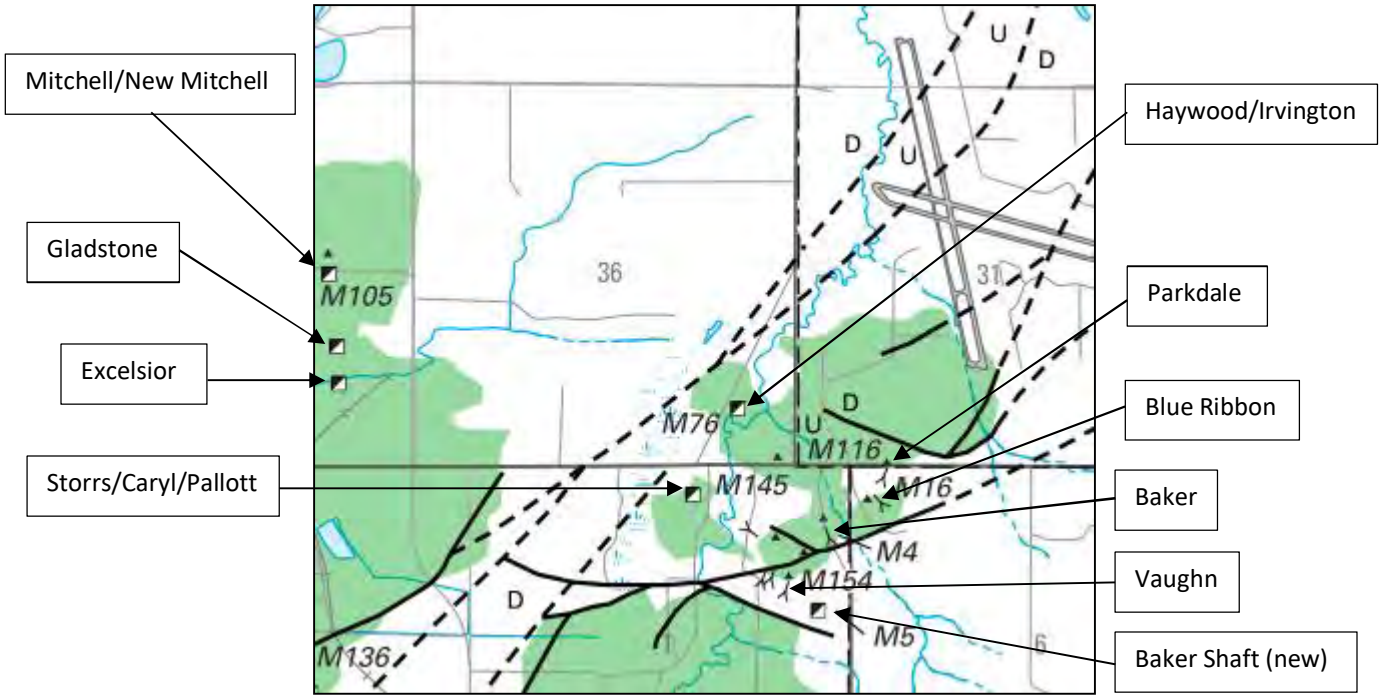


Figure 6-7. Excerpt from Roberts et al. 2001.

A map of Boulder County ditches and reservoirs (Boulder County 2011) appears to show the correct alignment of the Goodhue #1 Ditch relative to the Study Area (Figure 6-8).As shown, the ditch enters the Study Area from the west at the southwest corner of the northwest quarter of the section and then follows along the quarter section line to the quarter corner where there is a structure to divert water into field laterals. The ditch continues on the northeast to the northeast corner of the section. The alignment shown above in Figures 6-1 and 6-7 is actually that of a lateral that branches near US Highway 287 approximately one mile to the west of the Study Area It enters the property to the south of the northwestern portion of the Study Area and then turns into two field laterals or otherwise runs off down a natural drainage that runs through the center of the Study Area. According to the owner of the property in the northwest corner of the Study Area, for many years the water from the main part of the ditch terminated at his property as the water was no longer being used downstream and more water would flow through the lateral making it seem like it was the main channel (Personal communication between Richard Schillawski and the author, February 20, 2017).

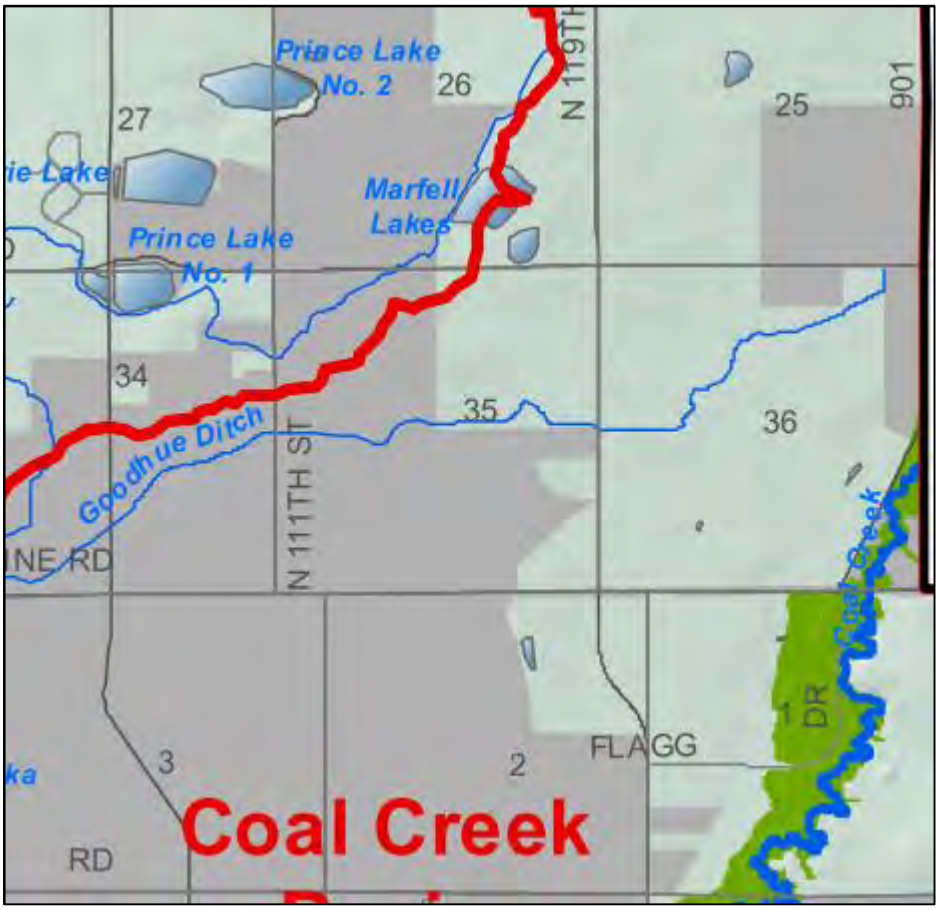


Figure 6-8. Excerpt from Boulder County 2011.

6.2 COUNTY ASSESSOR'S AND RECORDER'S RECORDS

Boulder County Assessorôs records were accessed to determine the ages of any standing structures on the Study Area properties and to initiate the research on past ownership (Boulder County Assessor 2017). These records indicated that standing structures are present on three of the subject properties. This information is summarized in Table 6-1.

Table 6-1. Standing structures within the study area.

Parcel Address	Type of Structure	Year Built
1160 N 119th Street (5BL.9249)	Residence Outbuilding Cattle shed	1932 1940 1940
1130 N 119th Street	Residence	1968
12329 Baseline Road	Residence Farm utility Equipment shed Cattle shed	1879 1879 1879 1879

To develop a specific historic context for all of the properties, the Boulder County Clerk and Recorderôs on-line records were searched and a chain of ownership was traced for each of the five parcels that comprise the Study Area (Boulder County Clerk 2017).

1160 N 119th Street

This property is the southwest quarter of the northwest quarter of Section 36, T1N, R69W, 6th P.M. and it includes approximately 40 acres. The chain of ownership is presented in Table 6-2.

Table 6-2. Chain of ownership for 1160 N 119th Street.

Date	Name(s)	Notes
2017	Schillawski, Richard D	
1995	Dorlch, Jack K and Elaine J	
1980	Burt, Ray W	O&G Lease
1938	Morrison, George	Ray Burtôs uncle
1923	Morrison, Hugh	
1893	Morrison, Alexander	State Patent; family from Scotland

1130 N 119th Street

This property is the north half of the north half of the northwest quarter of the southwest quarter of Section 36, T1N, R69W, 6th P.M. and it includes approximately 10 acres. The chain of ownership is presented in Table 6-3.

Table 6-3. Chain of ownership for 1130 N 119th Street.

Date	Name(s)	Notes
2017	Lewis, Sonja J	
1998	Meeks, James L and Erleen A	
1968	Meeks, James L and Erleen A	NW¼SW¼ + NE/¼SE¼ + N½NW¼SW¼
1934	Barrowman, William Jr	
1883	Barrowman, William	
1883	Thomas, William J	
1883	Schneider, Anna	State Patent

1032 N 119th Street

This property is the south half of the north half of the northwest quarter of the southwest quarter, the northeast quarter of the southwest quarter, and the northwest quarter of the southeast quarter of Section 36, T1N, R69W, 6th P.M. and it includes approximately 90 acres. The chain of ownership is presented in Table 6-4.

Table 6-4. Chain of ownership for 1032 N 119th Street.

Date	Name(s)	Notes
2017	Millican Revocable Living Trust	
2000	Millican, Lois V	
1981	Crane Homes	
1968	Meeks, James L and Erleen A	NW¼SW¼ + NW¼SE¼ + N½NW¼SW¼
1934	Barrowman, William Jr	
1907	Barrowman, William	State Patent NW¼SE¼
1883	Barrowman, William	
1883	Thomas, William J	
1883	Schneider, Anna	State Patent SW¼

903 E County Line Road

This property is the west half of the southeast quarter of the northeast quarter and part of the northeast quarter of the southeast quarter of Section 36, T1N, R69W, 6th P.M. and it includes approximately 43 acres. The chain of ownership is presented in Table 6-5.

Table 6-5. Chain of ownership for 903 E County Line Road.

Date	Name(s)	Notes
2017	Lafayette 7A General Partnership	
1981	Storey, Harold A	
1973	Storovich, Kenneth L	
1968	Arapahoe Building Company	
1966	May, Ralph E	NE¼ + NE¼/SE¼ w excl.
1960	Ilyin, Alexander and Marina	NE¼
1959	Ilyin, Gleb Alexander	NE¼
1921	Gouger, George E and Martha F	NE¼
1919	Benyon, Annie	NE¼
1888	Brown, Virginia and Spencer, Charles L	NE¼
1880	Sharratt, Charles	State Patent for NE¼
1918	Gouger, George E	NE¼SE¼
1891	Hurd, Annie	State Patent for NE¼SE¼

12329 Baseline Road

This property is most of the southwest quarter of the southeast quarter of Section 36, T1N, R69W, 6th P.M. and it includes approximately 33 acres. The chain of ownership is presented in Table 6-6.

Table 6-6. Chain of ownership for 12329 Baseline Road.

Date	Name(s)	Notes
2017	McDonald, Lynn S	
2009	McDonald, Richard	
1990	Powers, Clement R and Betty L	
1969	Tobey, Roger EA and Ann A	
1963	Cundall, Jennie	S½SE¼
1932	Cundall, Joseph, et al.	
1919	Irvington Land and Coal Company	
1905	American Trust Savings Bank	
1902	Great Western Coal Mining Company	
1899	Bartels, Gustav C and Baker Land and Coal Mining Company	Patent S½SE¼

6.3 FIELD SURVEY

Reconnaissance and selective intensive surveys of portions of the Study Area were performed on February 20-22, 2017. The intent of this survey was to field evaluate the condition of any previously recorded sites within the study area; to ground truth any leads obtained through the historic research or the review of recent aerial photography of the area; and to perform an intensive pedestrian survey of a sample of the Study Area.

6.3.1 Previously Recorded Sites

The file search identified four previously recorded sites that are located within, or partially within, the Study Area. These include segments of the abandoned Burlington Northern Railroad (**5BL.374**), segments of the Goodhue # 1 Ditch and Lateral Ditch (**5BL.2731**), the Burt House/ Schillawski Residence (**5BL.9247**), and the Haywood Mine (**5BL.10332**). Observations of these resources made during the field survey are described in the following along with evaluations of their significance.

5BL.374 – Burlington Northern Railroad

The location of this resource is clearly evidenced by a distinct berm that characterizes the alignment of this abandoned railroad (Figure 6-9). No tracks, railroad ties, or features were observed anywhere along the portions of this resource that were inspected within the Study Area. The primary alignment along the west side of E County Line Road is in fairly good condition with a very clear berm. The southern arm of the wye at the start of the branch to the Gladstone Mine has been heavily impacted by water erosion due to its location in a marshy area, and a few other areas along the alignment to the Gladstone Mine have been similarly impacted. The portion in the southwestern corner of the Study Area has been heavily impacted by farm equipment, while the portion immediately to the west is very clear and minimally impacted.

In its entirety, site **5BL.374** has been determined to be eligible for the NRHP and the SHPO has concurred with this determination. While these segments of the railroad within and along portions of the Study Area have variable integrity, it appears that on the whole these segments of this railroad retain sufficient integrity to support the eligibility of the overall resource that they are a part of and that has been determined to be eligible.

5BL.2731 – Goodhue #1 Ditch

The main channel of the Goodhue #1 Ditch enters the Study Area from the west at the southwest corner of the northwest quarter of the section and then follows along the quarter section line to the quarter corner where there is a structure to divert water into field laterals. The ditch continues on the northeast to the northeast corner of the section. A lateral that branches near US Highway 287 approximately one mile to the west of the Study Area enters into the property to the south of the northwestern portion of the Study Area and then turns into two field laterals or otherwise runs off down a natural drainage through the center of the Study Area. According to the owner of the property in the northwest corner of the Study Area, for many years the water from the main part of the ditch terminated at his property as the water was no longer being used downstream and more water would flow through the lateral making it seem like it was the main channel (Personal communication between Richard Schillawski and the author, February 20, 2017).



Figure 6-9. Railroad grade looking east, WWTP in background.



Figure 6-10. Goodhue # Ditch segment looking west near N 119th Street.

According to the OAHP database the Goodhue # 1 Ditch was determined to be not eligible for the NRHP and the SHPO concurred with this. However, this was in 1990, prior to the present system of managing and evaluating ditch segments and the current historic context for irrigation (Holleran 2005). It is also possible that this determination was meant to apply to the specific segments of the lateral that were in the APE for the US 287 Lafayette Bypass Project. Under todayôs standards, it is likely that the Goodhue #1 Ditch in its entirety would be considered eligible to the NRHP because of its association with early irrigated agriculture in Northeastern Colorado. It is also likely that both the ditch segment and lateral segment within the Study Area would be considered to retain sufficient integrity to support the eligibility of the entire resource of which they a part and that is recommended herein to be eligible.

5BL.9249 – Burt House/ Schillawski Residence (1160 N 119th Street)

This site consists of a residential structure and agricultural buildings located on 40 acres in the southwest quarter of the northwest quarter of Section 36, T1N, 69W, 6th P.M. (Figure 6-11). According to the Assessorôs records, the residence was built in 1932 and the outbuilding and cattle shed were built in 1940. Ray Burt and his wife Edith moved into this house shortly after it was constructed on property owned by his great uncle George Morrison. Burt worked at the Clayton Mine for 43 years and returned to farming his land after retiring in around 1963. Both Carol Beam, the initial recorder in 2003, and Cathleen Norman in 2008 recommended that this property did not have any local, state or national historical significance (Norman 2008). The SHPO has not been asked to concur with this evaluation.



Figure 6-11. Burt House/ Schillawski Residence looking northeast.

5BL.10332 – Haywood Mine/Baker/Irvington

The recorded location of this site corresponds solely with the location of the shaft as it is plotted on the USGS Erie, Colorado 1967/1979 quadrangle map (Figure 6-1) that mislabeled the Hayward Mine on that map. Both underground and surface aspects of this mine extended beyond the point shown on the map and into the southeastern corner of the Study Area, at least as shown on the coal mine maps of the area (Figures 6-5, 6-6, and 6-7). This portion of the Study Area was examined and no definitive signs of mining related artifacts or features were observed. Much of this area was occupied by the wye for the branch line to the Gladstone Mine and was disturbed by its construction and operation. This site has been determined to be not eligible for the NRHP and the SHPO has concurred with this determination.



Figure 6-12. Looking southeast toward Haywood Mine location at Study Area between railroad and E County Line Road.

6.3.2 Newly Identified Sites

Based on the review of the Assessorôs records and recent aerial photographs, four potential sites were identified within the Study Area that had not been previously recorded. These sites were assessed during the field survey and they include a farm complex, a rural residential property, and two abandoned residential structures. Observations of these resources made during the field survey are described in the following along with evaluations of their significance.

12329 Baseline

This property is a small farm complex consisting of a residence and three outbuildings situated on approximately 33 acres (Figure 6-13). The Assessorôs records (Table 6-1) lists the residence and three outbuildings as all being built in 1879. Only two of the outbuildings on the site, the utility building and cattle shed, appeared to be exceptionally old. The residence and equipment shed (barn) have either been extensively remodeled, or were not really built in 1879. There are other reasons to question this construction date. No buildings are shown here on the 1904 Niwot quadrangle map (Figure 6-4) , the patent for the south half of the southeast quarter of this section was not issued until 1899 (Table 6-6), and that patent was to a coal company whose mine was in the southeastern corner of the section. The size and form of the house is the result of several additions, and it is not clear which part was first to be built, or how early that may have been. The barn has been extensively remodeled as well and does not reflect an early construction date or any particular style. Only about half of the property is in agricultural use with the eastern portion being a marshy area. The agricultural portion of the property appears to be severely overgrazed with mainly barren earth present. Several pens, corrals and make-shift shelters are spread through the southern third of this area with the northern portion showing signs of cultivation.

This property was initially patented by Gustav Bartel and the Baker Land and Coal Mining Company in 1899 and stayed in the hands of this company and its successors until 1932. It was then purchased by the Cundall family who owned it until 1969 (Table 6-1). It is probable that the Cundalls were responsible for the initial and subsequent construction on this site.

The property does not appear to be associated with any particularly important contributions to the agricultural development in Northeastern Colorado; it does not appear to be associated with any important people in the history of the region; and it does not appear to be a particularly good example of any type, style, or period of construction. It is therefore recommended that this property would not meet the requirements for listing in the NRHP.



Figure 6-13. Looking northwest at residence (left) and northeast at barn (right).

1130 N 119th Street

This property is a small residential structure situated on approximately 10 acres. The Assessorôs records (Table 6-1) lists the residence as being built in 1968, which is on the cusp of being considered historic (50 years old or older is the generally accepted criterion) and is considered herein as if it were. The structure is a roughly rectangular, end-gabled, wood-frame ranch-style house with brick skirting and an end-gabled addition on the north and a shed-roofed addition on the rear. There are two small, wood-frame sheds also located on the property.

A state patent was issued for this property to Anna Schneider in 1883 and it was quickly sold twice that same year to end up in the hands of George Borrowman (Table 6-3), who does not appear to have built any structures at this particular site but may have built a structure on another piece of his property within the Study Area to the east of this site. Together this and the other property of Borrowmanôs were acquired in 1968 by James and Erleen Meeks who appear to have had this ranch house built at that time.

This property is border-line historic, having been built in 1968, it is not known to be associated with any significant events or people, and it is a mediocre example of a common style of residential construction from that era. It is therefore recommended that this property would not meet the requirements for listing in the NRHP.



Figure 6-14. Looking southeast at west and north façades.

Structure 1

This structure is an abandoned residence located in the northeastern portion of the Study Area (Figures 1-1 and 6-15). It is a rectangular, one-story, wood-frame, clipped-gable-roof structure that does not appear to be on any kind of foundation. It is clad in clapboard siding and shake shingles. Interior walls are finished with lath and plaster. There is a depression about twice the size of the structure immediately to the south of it. There is a scatter of historic artifacts of a general domestic nature within this depression and throughout the area surrounding the structure.

A state patent for the northeast quarter of this section was issued in 1880 to Charles Sharratt. He appears to have owned it for eight years before he sold it to Virginia Brown and Charles Spencer. They owned it until 1919 when it was sold to Anne Benyon, who then sold it to George and Martha Gouger in 1921. The Gougers remained owners until 1959 when they sold the property to Gleb Ilyin (Table 6-5). This structure appears to be shown on the 1904 Niwot quadrangle map (Figure 6-4) but is not shown on the 1967/1979 Erie quadrangle map (Figure 6-1). The owners of record in 1904 appear to be Virginia Brown and Charles Spencer, so it is probable that they were responsible for the construction of this house. The elements of architecture and construction observed on the building would appear to be consistent with a construction period between 1888 and 1904.

This property does not appear to be associated with any particularly important contributions to the historical development in Northeastern Colorado; it does not appear to be associated with any important people in the history of the region; it does not appear to be a particularly good example of any type, style, or period of construction; and it appears to lack sufficient integrity to convey its significance if it had any. It is therefore recommended that this property would not meet the requirements for listing in the NRHP.



Figure 6-15. Looking north-northeast at west and south façades.

Structure 2

This structure is part of an abandoned farm complex located in the east-central portion of the Study Area (Figures 1-1 and 6-16). The residential structure is the only structure still standing and it is an H-shaped, one-story, wood-frame, front-gable-roof structure that appears to be on a concrete foundation. It is clad in asphalt sheet material with a brick-like pattern and shake shingles. Interior walls are finished with lath and plaster. The house has the appearance of having been pieced together from three small rectangular minerôs cabins. There is a large concrete foundation to the northwest of the residence that filled with structural debris and other rubbish including a dump truck that has rolled to one side. This was likely a barn or other type of farm utility building. Another concrete foundation is located to the southeast of the residence that contains numerous bricks within and around it. This was likely a well house. A powerline is present that supplied power to the house from the main lines along E County Line Road to the east of this site. There is a scatter of historic artifacts of a general agricultural and domestic nature covering an area of approximately 3 acres surrounding the residence, particularly to the south and west of it. A single piece of sun-colored lavender glass, that indicates possible pre-1917 use of the site, was observed in the site area.

A state patent for the northeast quarter of this section was issued in 1907 to William Barrowman for the northwest quarter of the southeast quarter of this section. It then passed to his son William Jr. in 1934 who sold it to James and Erleen Meeks in 1968 (Table 6-4). A structure appears to be shown at this location on the 1904 Niwot quadrangle map (Figure 6-4) and it continues to be seen on the 1967 Erie quadrangle map along with a new structure shown by the photorevisions of 1979 (Figure 6-1). In a 1993 aerial photograph of the area available through GoogleEarth the property appears to be abandoned. It appears that William Barrowman was responsible for the construction of the residence, apparently before the date he was granted a patent for the land. The barn structure to the northeast appears to have been constructed between 1967 and 1979 by the Meeks family.

The property does not appear to be associated with any particularly important contributions to the agricultural development in Northeastern Colorado; it does not appear to be associated with any important people in the history of the region; it does not appear to be a particularly good example of any type, style, or period of construction; and it appears to lack sufficient integrity to convey its significance if it had any. It is therefore recommended that this property would not meet the requirements for listing in the NRHP.



Figure 6-16. Looking west at residence (left) and northwest at barn (right).

6.3.3 Archaeology

Based on the results of previous archaeological surveys in the vicinity and the general geomorphological characteristics of the Study Area, expectations for the presence of prehistoric archaeological materials were very low. Previous surveys in the general vicinity resulted in the discovery of few, if any prehistoric sites, and generally only documented occasional prehistoric isolated artifacts (Angulski 1989; Mutaw 2012, 2014; Phillips 1996; URS 2002). As discussed earlier in Sections Two and Four, the geomorphology of the Study Area is predominantly characterized by wind borne deposits that can be suitable for the preservation of archaeological sites, but if these surfaces are stable, it makes discovery of such deposits problematic. Sites have occasionally been found in areas with this type of setting on ridge crests and hill tops where they have been exposed by wind erosion and on stream terraces along water courses where exposed by water erosion. Also, the earlier review identified potential deposits of the Broadway alluvium, which has been associated with Paleoindian materials in some areas, in the extreme southeastern corner of the Study Area.

This area and several other areas meeting the above parameters were subjected to intensive pedestrian survey (Figure 6-17). These included areas throughout the Study Area and covered a total of approximately 65 acres. A single isolated piece of groundstone observed in the northeastern portion of the Study Area between the road and Structure 1 was the only prehistoric artifact discovered by this survey. The survey verified that most of the Study Area is covered with stable wind-borne deposits with signs of erosive activity. Terraces were also observed to be similarly intact and the southeastern portion of the Study Area has been impacted by mining, railroad construction, and other activities.



Figure 6-17. Example of a survey area along a terrace setting.

A file search, literature review, and an intensive cultural resources survey of portions of the Study Area were performed in support of an application for a residential development project at the northwest corner of Baseline (State Highway [SH] 7) and E County Line roads at the southern border of the Town of Erie, Boulder County, Colorado. The Study Area encompasses approximately 225 acres, which is located in portions of Section 36, Township 1 North, Range 69 West, 6th Principal Meridian. A&B Cultural Consultants, LLC (A&B) performed a file search and literature review beginning on February 13, 2017. An intensive survey of the Study Area was conducted from February 20-22, 2017 by A&B. The records review indicated that small portions the Study Area along SH 7 and E County Line Road had been subjected to previous cultural resources inventories that did not identify any sites within the Study Area. The file search also showed that four resources had been previously recorded that are partially or completely within the Study Area. These resources are the Burlington Northern Railroad (**5BL.374**), Goodhue #1 Ditch (**5BL.2731**), Burt House/Schillawski Residence (**5BL.9249**), and the Haywood Mine (**5BL.10332**).

Additional archival research identified maps showing the extent of the underground workings of the Haywood and other coal mines bordering the Study Area that showed some extension of these mines into the southeastern and western portions of it. Maps and aerial photographs were used to establish the correct alignment of the Goodhue # Ditch and a lateral ditch from it. Both of these enter separately into the western part of the Study Area. Boulder County Assessorôs records were reviewed and three properties were identified as having standing structures dating from 1879, 1942-1940, and 1968 (Boulder County Assessor 2017). Ownership information from the Boulder County Clerk and Recorderôs records was reviewed for chain of ownership and background information for the five parcels in the Study Area (Boulder County Clerk 2017). These records showed that all of these parcels entered private ownership as patents granted by the State of Colorado as is disbursed land within Section 36 that was granted to it by the United States as part of the Colorado enabling act.

Reconnaissance and selective intensive surveys of portions of the Study Area were performed with the intent to evaluate the condition of any previously recorded sites within the study area; to ground truth any leads obtained through the archival research or the review of recent aerial photography of the area; and to perform an intensive pedestrian survey of a sample of the Study Area. Based on the review of the Assessorôs records and recent aerial photographs, four potential sites were identified within the Study Area that had not been previously recorded. These sites were assessed during the field survey and they include a farm complex (**12329 Baseline Road**), a rural residential property (**1130 N 119th Street**), and two abandoned residential structures (**Structure 1** and **Structure 2**).

In its entirety, the Burlington Northern Railroad (**5BL.374**) has been determined to be eligible for the NRHP and the segments located within the Study Area retain sufficient integrity to support the eligibility of this resource. The Goodhue #1 Ditch (**5BL.2731**) was determined to be not eligible for the NRHP, but as explained above in Section 6.3.1, this determination was made in 1990 prior to the current standards and a re-evaluation of this would likely result in determination of eligible. The segments of both the ditch and its lateral located within the Study Area appear to retain sufficient integrity to support the eligibility of this resource. The Burt House, Schillawski Residence (**5BL.9249**) was recommend by previous recorders to be not eligible and the property and circumstances have not changed since that time to warrant a re-

evaluation of this recommendation. The Haywood Mine (**5BL.10332**) was determined to be not eligible and the property and circumstances have not changed since that time to warrant a re-evaluation of this determination.

A farm complex at **12329 Baseline Road** is listed in the Assessorôs records as containing structures built in 1879, but the archival research and field survey failed to verify this date. Instead, it appears more likely the structures were first built sometime around 1932 and modified thereafter. An occupied rural residential property (**1130 N 119th Street**) contains atypical ranch-style house that was built in 1968. Two abandoned residential structures were found with the Study Area. **Structure 1** is a dilapidated and abandoned residence located in the northeastern portion of the Study Area and **Structure 2** is part of an abandoned farm complex located in the east-central portion of the Study Area. Archival research on these four resources failed to yield any information to indicate that they were associated with any significant events or people, nor do any of them appear to have any architectural distinction. Therefore, it is recommended that they be considered not eligible for the NRHP.

Ridge crests, hill tops, and stream terraces within the study area were subjected to intensive pedestrian survey to assess the potential for the exposure of buried cultural deposits by wind and water erosion. The extreme southeastern corner of the Study Area was evaluated for any potential exposures of Broadway alluvium, which has been associated with Paleoindian materials in some areas. The survey verified that most of the Study Area is covered with stable wind-borne deposits with no signs of erosive activity. Terrace areas were also observed to be similarly intact. Based on this sample survey and other surveys in the surrounding area it can be concluded that there is very little likelihood of significant prehistoric deposits being located within the Study Area, with one slight exception; buried deposits along the western margins of the marsh in the southeastern portion of the Study Area cannot be completely ruled out.

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