LOT 1 - ERIE AIR PARK REPLAT D

LOCATED IN THE NORTHWEST QUARTER OF SECTION 31, TOWNSHIP 1 NORTH RANGE 68 WEST OF THE 6TH P.M.
TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO
AREA = 10.340 ACRES
SITE PLAN - SP-001595-2023

1 SITE CONTEXT MAP
SCALE: 1" = 200'

N

Z:\SiteWorks\Projects - Documents\2023 Projects\23126 Erie Air Park - Tract E-2\07-Drawings\07.0104-SIP Submittal\23126A-1-C2.dwg

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For Submittal

Lot 1
Erie Air Park Replat D

2800 Airport Drive
Erie, CO 80516

#	Date	Description
1	05/22/23	Initial Submittal
2	07/28/23	SIP Submittal

Project No: 23126A
By: JAS/DPA
File: 23126A-1

Site Context Map

Sheet
C-101

May 18, 2023

Mr. Chris LaRue
Town of Erie
645 Holbrook Street
P.O. Box 750
Erie, CO 80516

Reference: Letter of Authorization – Site Plan Review
Lot 1 – Erie Air Park Replat D
2800 Airport Drive – Erie, Colorado

Dear Chris:

The undersigned has hereby authorized Mr. Donald P, Ash to act as agent and/or make application to the Town of Erie for the above referenced property for the following applications:

- PUD Rezoning
- Minor Subdivision
- Site Plan Review

Sincerely,

David S. Nassar
Real Investments, LLC

[NOTARY BLOCK FOLLOWS]

ACKNOWLEDGEMENT

STATE OF COLORADO)
)ss.
COUNTY OF Weld)

The foregoing instrument was acknowledged before me this 18 day of May, 2023 by David S. Nassar, as manager of Real Investments, LLC.

(SEAL)

LAURIE HURD
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20214033179
MY COMMISSION EXPIRES 08/19/2025

NOTARY PUBLIC:

Sign: Laurie Hurd

Printed Name: Laurie Hurd

Commission Number: 20214033179

Commission Expiration: 8/19/25

COLORADO DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ACCESS PERMIT APPLICATION

Issuing authority application acceptance date:

Instructions: ***Please print or type***

- Contact the Colorado Department of Transportation (CDOT) or your local government to determine your issuing authority.
- Contact the issuing authority to determine what plans and other documents are required to be submitted with your application.
- Complete this form (some questions may not apply to you) and attach all necessary documents and Submit it to the issuing authority.
- Submit an application for each access affected.
- If you have any questions contact the issuing authority.
- For additional information see CDOT's Access Management website at **https://www.codot.gov/business/permits/accesspermits**

1) Property owner (Permittee)		2) Applicant or Agent for permittee (if different from property owner)	
Town of Erie			
Street address		Mailing address	
645 Holbrook Street, P.O. Box 750			
City, state & zip	Phone #	City, state & zip	Phone # (required)
Erie, CO 80516	**303.926.2870**		
E-mail address		E-mail address if available	

3) Address of property to be served by permit (required)

2800 Airport Drive

4) Legal description of property: If within jurisdictional limits of Municipality, city and/or County, which one?

county	subdivision	block	lot	section	township	range
Weld	**Erie Air Park Rep. D**	**1**	**Lot 1**	**31**	**1N**	**68W**

5) What State Highway are you requesting access from?

State Highway 7

6) What side of the highway? ■ N ☐ S ☐ E ☐ W

7) How many feet is the proposed access from the nearest mile post?

2600 feet (☐ N ☐ S ■ E ☐ W) from: **64**

How many feet is the proposed access from the nearest cross street?

0 feet (☐ N ☐ S ☐ E ☐ W) from: **Airport Drive**

8) What is the approximate date you intend to begin construction?

3/1/2024

9) Check here if you are requesting a:

☐ new access ☐ temporary access (duration anticipated:) ■ improvement to existing access

☐ change in access use ☐ removal of access ☐ relocation of an existing access (provide detail)

10) Provide existing property use

Airport/Residential/Business/Light Industrial

11) Do you have knowledge of any State Highway access permits serving this property, or adjacent properties in which you have a property interest?

■ no ☐ yes, if yes - what are the permit number(s) and provide copies: and/or, permit date:

12) Does the property owner own or have any interests in any adjacent property?

■ no ☐ yes, if yes - please describe:

13) Are there other existing or dedicated public streets, roads, highways or access easements bordering or within the property?

■ no ☐ yes, if yes - list them on your plans and indicate the proposed and existing access points.

14) If you are requesting agricultural field access - how many acres will the access serve?

No.

15) If you are requesting commercial or industrial access please indicate the types and number of businesses and provide the floor area square footage of each.

business/land use	square footage	business	square footage
Light Industrial	**137,500**		
Office	**34,375**		

16) If you are requesting residential developement access, what is the type (single family, apartment, townhouse) and number of units?

type	number of units	type	number of units

17) Provide the following vehicle count estimates for vehicles that will use the access. Leaving the property then returning is two counts.

Indicate if your counts are	# of passenger cars and light trucks at peak hour volumes	# of multi unit trucks at peak hour volumes
☐ peak hour volumes or ■ average daily volumes.	**1,885**	**20**
# of single unit vehicles in excess of 30 ft.	**# of farm vehicles (field equipment)**	**Total count of all vehicles**
20	**0**	**1,925**

18) Check with the issuing authority to determine which of the following documents are required to complete the review of your application.

a) Property map indicating other access, bordering roads and streets.
b) Highway and driveway plan profile.
c) Drainage plan showing impact to the highway right-of-way.
d) Map and letters detailing utility locations before and after development in and along the right-of-way.
e) Subdivision, zoning, or development plan.
f) Proposed access design.
g) Parcel and ownership maps including easements.
h) Traffic studies.
i) Proof of ownership.

1- It is the applicant's responsibility to contact appropriate agencies and obtain all environmental clearances that apply to their activities. Such clearances may include Corps of Engineers 404 Permits or Colorado Discharge Permit System permits, or ecological, archeological, historical or cultural resource clearances. The CDOT Environmental Clearances Information Summary presents contact information for agencies administering certain clearances, information about prohibited discharges, and may be obtained from Regional CDOT Utility/Special Use Permit offices or accessed via the CDOT Planning/Construction-Environmental-Guidance webpage: **https://www.codot.gov/programs/environmental/resources/guidance-standards/environmental-clearances-info-summary-august-2017/view**

2- All workers within the State Highway right of way shall comply with their employer's safety and health policies/procedures, and all applicable U.S. Occupational Safety and Health Administration (OSHA) regulations - including, but not limited to the applicable sections of 29 CFR Part 1910 - Occupational Safety and Health Standards and 29 CFR Part 1926 - Safety and Health Regulations for Construction.

Personal protective equipment (e.g. head protection, footwear, high visibility apparel, safety glasses, hearing protection, respirators, gloves, etc.) shall be worn as appropriate for the work being performed, and as specified in regulation. At a minimum, all workers in the State Highway right of way, except when in their vehicles, shall wear the following personal protective equipment: High visibility apparel as specified in the Traffic Control provisions of the documentation accompanying the Notice to Proceed related to this permit (at a minimum, ANSI/ISEA 107-1999, class 2); head protection that complies with the ANSI Z89.1-1997 standard; and at all construction sites or whenever there is danger of injury to feet, workers shall comply with OSHA's PPE requirements for foot protection per 29 CFR 1910.136, 1926.95, and 1926.96. If required, such footwear shall meet the requirements of ANSI Z41-1999.

Where any of the above-referenced ANSI standards have been revised, the most recent version of the standard shall apply.

3- The Permittee is responsible for complying with the Revised Guidelines that have been adopted by the Access Board under the American Disabilities Act (ADA). These guidelines define traversable slope requirements and prescribe the use of a defined pattern of truncated domes as detectable warnings at street crossings. The new Standards Plans and can be found on the Design and Construction Project Support web page at:
https://www.codot.gov/business/civilrights/ada/resources-engineers

If an access permit is issued to you, it will state the terms and conditions for its use. Any changes in the use of the permitted access not consistent with the terms and conditions listed on the permit may be considered a violation of the permit.

The applicant declares under penalty of perjury in the second degree, and any other applicable state or federal laws, that all information provided on this form and submitted attachments are to the best of their knowledge true and complete.

I understand receipt of an access permit does not constitute permission to start access construction work.

Applicant or Agent for Permittee signature	Print name	Date

If the applicant is not the owner of the property, we require this application also to be signed by the property owner or their legally authorized representative (or other acceptable written evidence). This signature shall constitute agreement with this application by all owners-of-interest unless stated in writing. If a permit is issued, the property owner, in most cases, will be listed as the permittee.

Property owner signature	Print name	Date

INSTRUCTIONS FOR COMPLETING APPLICATION FOR ACCESS PERMIT
(CDOT FORM NO. 137)
December 2018

To construct, relocate, close, or modify access(es) to a State Highway or when there are changes in use of such access point(s), an application for access permit must be submitted to the Colorado Department of Transportation (CDOT) or the local jurisdiction serving as the issuing authority for State Highway Access Permits. Contact the CDOT Regional Access Unit in which the subject property is located to determine where the application must be submitted. The following link will help you determine which CDOT Region office to contact:

https://www.codot.gov/business/permits/accesspermits/regional-offices.html

All applications are processed and access permits are issued in accordance to the requirements and procedures found in the most current version of the State Highway Access Code (Access Code). Code and the application form are also available from CDOT's web site at:

https://www.codot.gov/business/permits/accesspermits

Please complete all information requested accurately. Access permits granted based on applications found to contain false information may be revoked. An incomplete application will not be accepted. If additional information, plans and documents are required, attach them to the application. Keep a copy of your submittal for your records. Please note that only the original signed copy of the application will be accepted. Do not send or enclose any permit fee at this time. A permit fee will be collected if an access permit is issued. The following is a brief description of the information to be provided on each enumerated space on the application form (CDOT Form 137, 2010).

1. Property Owner (Permittee): Please provide the full name, mailing address and telephone number and the E-mail address (if available) of the legal property owner (owner of the surface rights). Please provide a telephone number where the Permittee can be reached during business hours (8:00 a.m. to 5:00 p.m.). Having a contract on the property is not a sufficient legal right to that property for purposes of this application. If the access is to be on or across an access easement, then a copy of the easement MUST accompany this application. If federal land is involved, provide the name of the relevant federal agency AND attach copy of federal authorization for property use.

2. Agent for permittee: If the applicant (person completing this application) is different than the property owner (Permittee), provide entity name (if applicable), the full name of the person serving as the Agent, mailing address, telephone number, and the E-mail address (if available). Please provide a telephone number where the Agent can be reached during business hours (8:00 a.m. to 5:00 p.m.). Joint applications such as owner/lessee may be submitted. Corporations must be licensed to do business in Colorado: All corporations serving as, or providing, an Agent as the applicant must be licensed to do business in Colorado.

3. Address of Property to be Served: Provide if property to be served has an official street address. If the access is a public road, note the name (or future name) of the road.

4. Legal Description of Property: Fill in this item to the extent it applies. This information is available at your local County Courthouse, or on your ownership deed(s). A copy of the deed may be required as part of this application in some situations. To determine applicability, check with the CDOT's Regional Access Manager or issuing authority staff.

5. State Highway: Provide the State Highway number from which the access is requested.

6. Highway Side: Mark the appropriate box to indicate what side of the highway the requested access is located.

7. Access Mile Point: Without complete information, we may not be able to locate the proposed access. To obtain the distance in feet, drive the length between the mile point and the proposed access, rounding the distance on the odometer to the nearest tenth of a mile; multiply the distance by 5,280 feet to obtain the number of feet from the mile point. Then enter the direction (i.e. north, south, east, west) from the mile point to the proposed access. Finally, enter the mile point number. It is helpful in rural or undeveloped areas if some flagging is tied to the right-of-way fence at the desired location of the access. Also, if there is a cross street or road close to the proposed access, note the distance in feet (using the same procedures noted above) from that cross street or road.

8. Access Construction Date: Fill in the date on which construction of the access is planned to begin.

9. Access Request: Mark items that apply. More than one item may be checked.

10. Existing property use: Describe how the property is currently being used. For example, common uses are Single Family Residential, Commercial or Agricultural.

11. Existing Access: Does the property have ***any other legal alternatives to reach a public road*** other than the access requested in this application? Note the access permit number(s) for any existing state highway access point(s) along with their issue date(s). If there are no existing access point(s), mark the "no" box.

12. Adjacent Property: Please mark the appropriate box. If the "yes" box is marked, provide a brief description of the property (location of the property in relation to the property for which this access application is being made).

13. Abutting Streets: If there are any other existing or proposed public roads or easements abutting the property, they should be shown on a map or plan attached to this application.

14. Agricultural Acres: Provide number of acres **to be served.**

15. Access Use: List the land uses and square footage of the site as it will be when it is fully developed. The planned land uses as they will be when the site is fully developed are used to project the amount of traffic that the site will generate, peak hour traffic levels and the type of vehicles that can be expected as a result of the planned land uses. There may be exceptional circumstances that would allow phased installation of access requirements. This is at the discretion of the CDOT Regional Access Unit or issuing authority staff.

16. Estimated Traffic Count: Provide a reasonable estimate of the traffic volume expected to use the access. Note the type of vehicles that will use the access along with the volume (number of vehicles in and out at either the peak hour or average daily rates) for each type of vehicle. A vehicle leaving the property and then returning counts as two trips. If 40 customers are expected to visit the business daily, there would be 80 trips in addition to the trips made by all employees and other visitors (such as delivery and trash removal vehicles). If the PDF on-line version of this application is being used, the fields for each type of vehicle will automatically be added together to populate the last field on the page.

17. Documents and Plans: The CDOT Regional Access Manager or issuing authority staff will determine which of these items must be provided to make the application complete. Incomplete applications will not be accepted. If an incomplete application is received via U.S. mail or through means other than in the hand of the Access Manager or issuing authority staff, it will not be processed. ***It is the responsibility of the applicant to verify with the CDOT Regional Access Manager or issuing authority staff whether the application is complete at the time of submission.***

Signature: Generally, if the applicant is not the property owner, then the property owner or a legally authorized representative must sign the application. With narrow exceptions, proof of the property owner's consent is required to be submitted with the application (proof may be a power of attorney or a similar consent instrument). The CDOT Regional Access Manager or issuing authority staff will determine if the exception provided in the Access Code (2.3 (3) (b)) is applicable.

If CDOT is the issuing authority for this application, direct your questions to the CDOT Regional Access Manager or the issuing authority staff serving the subject property.

https://www.codot.gov/business/permits/accesspermits/regional-offices.html

If the application is accepted, it will be reviewed by the CDOT Regional Access Manager or the issuing authority staff. If an Access Permit is issued, be sure to read all of the attached Terms and Conditions before signing and returning the Access Permit. The Terms and Conditions may require that additional information be provided prior to issuance of the Notice to Proceed.

The CDOT Regional Access Manager (or issuing authority staff) MUST be contacted prior to commencing work on any Access Permit project. ***A Notice to Proceed that authorizes the Permittee to begin access related construction MUST be issued prior to working on the access in the State Highway right-of-way.*** The Notice to Proceed may also have Terms and Conditions that must be fulfilled before work may begin on the permitted access.

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the built environment

July 31, 2023

Mr. Chris LaRue
Town of Erie
645 Holbrook Street
P.O. Box 750
Erie, CO 80516

Reference: Traffic Conformance Letter
Site Plan Review – SP-001598-2023
Lot 1 – Erie Air Park Replat D
2800 Airport Drive – Erie, Colorado
SiteWorks Project No. 23126

Dear Chris:

The following conformance letter has been prepared in response to the Town of Erie completeness review comments dated June 20, 2023, for the above referenced project.

The original Traffic Impact Analysis (TIS) was prepared by LSC Transportation Consultants, Inc. dated October 9, 2019. The report was included as part of the Minor Subdivision submittal for the site, which was approved by the Town in 2022.

We have reviewed the updated plans with LSC and have confirmed that there are no changes required to the original TIS. All of the traffic count reports, trip generation and level of service analysis have remained unchanged since the original report.

Should you have any questions or comments concerning this letter, kindly give us a call.

Sincerely,

Donald P. Ash, P.E.
Principal – SiteWorks

LSC TRANSPORTATION CONSULTANTS, INC.

1889 York Street
Denver, CO 80206
(303) 333-1105
FAX (303) 333-1107
E-mail: lsc@lscdenver.com

May 20, 2024

Mr. Don Ash
Site Work Studio
dash@siteworkstudio.com

Re: Erie Airpark Tract E-2
Traffic Impact Analysis
Erie, CO
LSC #230890

Dear Mr. Ash:

In response to your request, LSC Transportation Consultants, Inc. has prepared this updated traffic impact analysis for the proposed Erie Airpark Tract E-2 development to address Town comments. As shown on Figure 1, the site is located north of State Highway 7 on Airport Drive 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 weekday 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 the site's traffic impacts.

LAND USE AND ACCESS

The site is proposed to include about 137,500 square feet of light industrial use and about 34,375 square feet of office space. Access is proposed from a full movement access to Airport Drive as shown in the conceptual site plan in Figure 2.

ROADWAY AND TRAFFIC CONDITIONS

Area Roadways

The major roadways in the site's vicinity are shown on Figure 1 and are described below.

- **E. Baseline Road (SH 7)** is an east-west, two-lane state highway south of the site and is classified as a Non-Rural Principal Highway (NR-A) by CDOT. The intersection with Airport Drive is stop-sign controlled. The posted speed limit in the vicinity of the site is 55 mph.

- **Airport Drive** is a north-south, two-lane roadway providing access to E. Baseline Road (SH 7). The intersection with E. Baseline Road (SH 7) is stop-sign controlled.

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 counts are from the attached traffic counts conducted by Counter Measures in November, 2023.

2026 and 2044 Background Traffic

Figure 4 shows the estimated 2026 background traffic. The volumes to/from Airport Drive are assumed to grow at an annual rate of two percent. The through volumes on SH 7 were factored between the volumes in Figure 3 and 5.

Figure 5 shows the estimated 2044 background traffic. The volumes to/from Airport Drive are assumed to grow from the development of future Tract E-3. The through volumes on SH 7 are consistent with the 2044 total traffic from the *Parkdale North TIA* by LSC. Figure 9a from that TIA is attached for reference.

Existing, 2026, and 2044 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, 2026, and 2044 background levels of service using Synchro. Table 1 shows the level of service analysis results. The level of service reports are attached.

- **E. Baseline Road (SH 7)/Airport Drive:** All movements at this unsignalized intersection currently operate at LOS "D" or better during both morning and afternoon peak-hours with the exception of the southbound approach which operates at LOS "F" during the afternoon peak-hour. In 2026, the southbound approach is expected to operate at LOS "E" during the morning peak-hour and LOS "F" during the afternoon peak-hour with stop-sign control. The intersection is expected to be signalized by 2044 and is expected to operate at LOS "B" or better during both peak-hours.

TRIP GENERATION

Table 2 shows the estimated average weekday, morning peak-hour, and afternoon peak-hour trip generation for the proposed site based on the rates from *Trip Generation, 11th Edition, 2021* by the Institute of Transportation Engineers (ITE) for the proposed land use.

The proposed land use is projected to generate about 1,043 one-way vehicle-trips on the average weekday, with about half entering and half exiting 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 136 vehicles would enter and about 18 vehicles would exit the site. During the afternoon peak-hour, which generally occurs for one hour between 4:00 and 6:00 p.m., about 21 vehicles would enter and about 118 vehicles would exit.

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; the site's proposed land use; and the existing traffic counts.

TRIP ASSIGNMENT

Figure 7 shows the estimated site-generated traffic volumes based on the directional distribution percentages (from Figure 6) and the trip generation estimate (from Table 2).

2026 AND 2044 TOTAL TRAFFIC

Figure 8 shows the 2026 total traffic which is the sum of the 2026 background traffic volumes (from Figure 4) and the site-generated traffic volumes (from Figure 7). Figure 8 also shows the recommended 2026 lane geometry and traffic control.

Figure 9 shows the 2044 total traffic which is the sum of 2044 background traffic volumes (from Figure 5) and the site-generated traffic volumes (from Figure 7). Figure 9 also shows the recommended 2044 lane geometry and traffic control.

PROJECTED LEVELS OF SERVICE

The intersections in Figures 8 and 9 were analyzed to determine the 2026 and 2044 total levels of service. Table 1 shows the level of service analysis results. The level of service reports are attached.

- **E. Baseline Road (SH 7)/Airport Drive:** All movements at this unsignalized intersection are expected to operate at LOS "C" or better during both morning and afternoon peak-hours through 2044 with the exception of the southbound left-turn movement which is expected to operate at LOS "F" during both peak-hours with stop-sign control. As a signalized intersection it is expected to operate at LOS "C" or better during both peak-hours through 2044.

TRAFFIC SIGNAL WARRANT

The existing posted speed limit on E. Baseline Road (SH 7) is 55 mph so the reduced 70% factor is appropriate for use in this situation. A peak-hour warrant would require one hour of side road approach trips greater than 75 vehicles per hour (vph). A four-hour warrant would require four hours of side road approach trips greater than 60 vph. The afternoon peak-hour volume for only the southbound left-turn movement is expected to be about 84 vph in 2026 with full Tract E-2 buildout and 139 vph by 2044 with full buildout of Tract E-2 and E-3. The peak-hour warrant will be met in 2026. The 2026 and 2044 total traffic volumes are plotted on a four-

hour traffic signal warrant chart in Figure 10 which suggests the four-hour warrant could also be met over time.

CONCLUSIONS AND RECOMMENDATIONS

Trip Generation

1. The proposed land use is projected to generate about 1,043 one-way vehicle-trips on the average weekday, with about half entering and half exiting during a 24-hour period. During the morning peak-hour, about 136 vehicles would enter and about 18 vehicles would exit the site. During the afternoon peak-hour, about 21 vehicles would enter and about 118 vehicles would exit.

Projected Levels of Service

2. All movements at the E. Baseline Road (SH 7)/Airport Drive intersection are expected to operate at acceptable levels of service during both morning and afternoon peak-hours through 2044 with the exception of the southbound left-turn movement which is expected to operate at LOS "F" during both peak-hours with stop-sign control. As a signalized intersection it is expected to operate at LOS "C" or better during both peak-hours through 2044. This intersection is expected to meet a traffic signal warrant by 2026 with full build-out of Tract E-2.

Conclusions

3. The impact of the Erie Airpark Tract E-2 Park development can be accommodated by the existing roadway network with the following recommendations.

Recommendations

4. E. Baseline Road (SH 7) will likely need to be widened to four lanes by others prior to 2044.

5. A southbound right-turn lane is recommended approaching E. Baseline Road (SH 7) to prevent right-turning vehicles from being blocked by left-turning queued vehicles. It will also result in more efficient utilization of the acceleration lane on E. Baseline Road (SH 7).

6. The westbound right-turn lane and southbound to westbound right-turn acceleration lane are deficient in length and are currently striped on the existing shoulder. These two lanes should be lengthened and/or widened as appropriate. This will likely be coordinated through the CDOT access permit process.

7. Traffic signal control will likely be warranted by Tract E-2 buildout by 2026 - this will also likely be coordinated through the CDOT access permit process.

* * * * *

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May 18, 2023

Mr. Chris LaRue
Town of Erie
645 Holbrook Street
P.O. Box 750
Erie, CO 80516

Reference: Mineral Estate Notification – Site Plan Review
Lot 1 – Erie Air Park Replat D
2800 Airport Drive – Erie, Colorado
SiteWorks Project No. 23126

Dear Chris:

This letter has been prepared in accordance with your request to provide mineral estate notification for the above referenced project.

The sole mineral estate holder, Rocky Mountain Fuel Company, is no longer in operation. We have provided their contact information with this submittal, and they will be included in the Site Plan Review referral process. See the attached estate information and correspondence.

As a reminder, RM Fuel was notified in 2020 as part of the Minor Subdivision referral submittal. They responded that they are no longer in operation. Crestone Peak Resources, Inc. was also one of the referral agencies. There are no records showing that the mineral estate has been transferred or deeded to any other entity.

Prior discussions with RM Fuel have determined that the company still has ownership of the subsurface rights. There are no other surface right agreements or operating agreements in place.

Should you have any questions or comments concerning this letter, kindly give us a call.

Sincerely,

Donald P. Ash, P.E.
Principal – SiteWorks

Subsurface Mineral Rights – Last Known Contact Information:

The Rocky Mountain Fuel Company

8020 S County Road Rd 5 #200

Fort Collins, CO 80528

(970) 207-1157

Warranty deed recorded at Weld County Assessors on August 27, 1946 at Book 1186 Page 313. See attached deed.

The surface rights to the property were sold to George E. Gouger by The Rocky Mountain Fuel Company on August 27, 1946 per document recorded at Book 1186 Page 313. A copy of this deed has been attached to the submittal. The deed grants surface rights to the grantee, George E. Gouger. But the grantor, RM Fuel, reserved all surface and subsurface mineral rights to the property. There are no other surface right agreements or operating agreements in place. RM Fuel went bankrupt in 1944, but the assets that were not liquidated were maintained by other RM Fuel entities. Notice will be sent to the former RM Fuel office in Ft. Collins, but it appears that the office is permanently closed.

From: Warren Turner
To: Don Ash
Subject: Re: RM Fuel and Erie Air Park
Date: Friday, May 22, 2020 2:03:38 PM

Awesome. With oil at record lows and the current political climate, our guess was that those minerals would never develop.

> On May 22, 2020, at 2:00 PM, Don Ash <ash@scottcox.com> wrote:
>
> Ok. Great. Thanks for the info.
>
> We are subdividing one of the tracts.

From: Warren Turner <tpccolorado@gmail.com>
Sent: Friday, May 22, 2020 1:58:20 PM
To: Don Ash <ash@scottcox.com>
Subject: Re: RM Fuel and Erie Air Park

Don,

I just got off the phone with our broker. They believe Rocky Mountain Fuel still owns them and the contracts did not change the ownership of these minerals. Thanks,

Warren

> On May 21, 2020, at 10:46 AM, Don Ash <ash@scottcox.com> wrote:
>
> Hey Warren, this sounds good. Would there be a way for you to send me the contact person for this contract? I probably need to give them notice as well. It won't affect ownership or anything contractually between the two of you.
>
> Thanks,
>
> D
>
> **Donald P. Ash, P.E.**
> Chief Civil Engineer
> <image001.jpg>
> 1530 55th Street • Boulder, CO 80303
> W 303.444.3051 • F 303.444.3387 • C 303.918.7859
>
> <image002.png> <image003.png> <image004.png> <image005.png>

www.scottcox.com

From: Warren Turner <tpccolorado@gmail.com>
Sent: Thursday, May 21, 2020 10:14 AM
To: Don Ash <ash@scottcox.com>
Subject: Re: RM Fuel and Erie Air Park

Don,

Thanks for the response. There's some ambiguity as to ownership of those minerals do to an open ended contract. Thanks for reaching out. We have no comments or concerns.
Best regards,

Warren Turner

> On May 21, 2020, at 12:11 AM, Don Ash <ash@scottcox.com> wrote:
>
> I sent you a flash drive a while back with some documents pertaining to a subdivision at the Erie Air Park. RM Fuel was listed as the mineral estate holder. Your email response was forwarded to me by Staff.
>
> Have these assets been transferred to a different company? I can't seem to find any public records pertaining to any transfers. We are required to give the estate holders notice, but the proposed development does not affect your rights at all. So I'd like to figure out if there are any other notices required.
>
> Let me know if there is a different owner, or we can talk about the plans. 303.918.7859.

Thanks,

D

Donald P. Ash, P.E.
Chief Civil Engineer
<image001.jpg>

1530 55th Street • Boulder, CO 80303
W 303.444.3051 • F 303.444.3387 • C 303.918.7859

<image002.png>

<image003.png>

<image004.png>

<image005.png>

www.scottcox.com

Recorded at 9 00 o'clock A M. AUG 27 1946 BOOK 1186 PAGE 313

Reception No. 1047235 ANN SPOMER Recorder.

KNOW ALL MEN BY THESE PRESENTS, That THE ROCKY MOUNTAIN FUEL COMPANY

a corporation duly organized and existing under and by virtue of the laws of the State of ~~Colorado~~ Delaware

of the first part for the consideration of

Two Hundred Fifty and 00/100 ($250.00) Dollars

in hand paid, hereby sell and convey to GEORGE E. COUGER

of ~~the~~ Broomfield County of Boulder

and the State of Colorado the following real property, situate in the

County of Weld and State of Colorado, to-wit:

The SURFACE ONLY of the Northeast Quarter of the Southwest Quarter (NE¼SW¼) of Section Thirty-one (31), Township 1 North, Range 68 West, Weld County, Colorado, containing Forty (40) Acres, more or less.

The grantor reserves all minerals thereon and thereunder including, but not limited to coal, oil, and gas as well as the right of ingress and egress by the grantor, its successors in interest and assigns upon and across said lands for the purpose of prospecting for, mining, treating, processing, taking, and transporting any and all minerals and for the construction of plants, houses, buildings, offices, dumps, roads, power lines, pipe lines, and other structures incidental to such operations.

The second party, its successors and assigns as a part of the consideration of this deed, assigns and forever waives and releases any and all claim or claims it may have or acquire in the future arising out of any injury of for damages, as well as any right to enjoin the grantor, its successors in interest and assigns because of any injury or threatened injury caused or occasioned at any time by subsidence or other disturbances of the surface of the above described lands occasioned by any mining operations or activities incident thereto involving the minerals thereon or thereunder. It is definitely understood that the second party is not the owner of such minerals, and purchases subject to the right of the first party to enter upon said land and to remove said minerals and to do all other things incident to such mining operations.

with all its appurtenances, and warrant the title to the same, subject to all existing rights-of-way including railroads, public roads, ditches, power lines, telephone lines, etc.

The Grantee herein assumes and agrees to pay all taxes levied on the above described lands for the year 1946 and thereafter.

Signed, sealed and delivered this 1st day of August, A. D. 1946

ATTEST:

Mildred Lea
Secretary.

THE ROCKY MOUNTAIN FUEL COMPANY

By H. M. Jones
Vice-President.

DOCUMENTARY 50 CENTS 50

DOCUMENTARY 5 CENTS 5

STATE OF COLORADO,
City and County of Denver } ss.

The foregoing instrument was acknowledged before me this 1st day of August 1946, by H. M. Jones as Vice-President and Mildred Lea as Secretary of The Rocky Mountain Fuel Company, a corporation.

My notarial commission expires

Witness my hand and official seal.

ETHEL G. WELLS, Notary Public
City and County of Denver, Colorado
My commission expires Nov. 4, 1948

Ethel G. Wells
Notary Public.

No. 897C. WARRANTY DEED—Statutory Form (Corporation) —The Bradford-Robinson Ptg. Co., Mfrs. Robinson's Legal Blanks, Denver.

4506261 07/17/2019 01:26 PM
Total Pages: 1 Rec Fee: $13.00
Carly Koppes - Clerk and Recorder, Weld County, CO

AMENDED REQUEST FOR NOTIFICATION OF SURFACE DEVELOPMENT
(C.R.S. § 24-65.5-101 et seq.)

STATE OF COLORADO)
COUNTY OF WELD)

WHEREAS, by Request for Notification of Surface Development dated June 18, 2019, recorded June 19, 2019 at Reception No. 4498658 in the records of Weld County, Colorado,

Crestone Peak Resources Holdings LLC (CPR) is the Mineral Estate Owner (as defined in C.R.S. Section 24-65.5-102(5)) underlying the following described land located in Weld County, Colorado (the "**Subject Lands**"), to-wit:

Township 1 North, Range 68 West, 6th P.M.
Section 30: ALL

WHEREAS, there were certain errors or omissions in the original Request and the undersigned wishes to amend the Request to correct the errors and omissions;

NOW, THEREFORE, the undersigned does hereby amend the Request for Notification of Surface Development by replacing the original document.

Pursuant to C.R.S. Section 24-65.5-103(3), CPR hereby requests written notification of any and all Applications for Development (as such term is defined in C.R.S. Section 24-65.5-102(2)) and all other proposed surface development activities on the Subject Lands in accordance with the terms of Article 24-65.5, C.R.S. Such notices should be sent to the following address:

Crestone Peak Resources Holdings LLC
1801 California Street, Suite 2500
Denver, CO 80202
Attn: DJ Surface Land Department

Executed this 15th day of July 2019.

Crestone Peak Resources Holdings LLC

By: _____
Name: Shea Kauffman
Title: Director of Land & Business Development

STATE OF COLORADO)
)ss.
COUNTY OF DENVER)

The foregoing instrument was acknowledged before me this 15th day of July 2019, by Shea Kauffman, as Director of Land & Business Development of Crestone Peak Resources Holdings LLC, a Delaware limited liability company.

Witness my hand and official seal.

My Commission Expires: 4/18/21

LAURA L CUSTER
Notary Public
State of Colorado
Notary ID # 20124081516
My Commission Expires 04-18-2021

_____
Notary Public

4506262 07/17/2019 01:26 PM
Total Pages: 1 Rec Fee: $13.00
Carly Koppes - Clerk and Recorder, Weld County, CO

AMENDED REQUEST FOR NOTIFICATION OF SURFACE DEVELOPMENT
(C.R.S. § 24-65.5-101 et seq.)

STATE OF COLORADO)
COUNTY OF WELD)

WHEREAS, by Request for Notification of Surface Development dated June 18, 2019, recorded June 19, 2019 at Reception No. 4498659 in the records of Weld County, Colorado,

Crestone Peak Resources Holdings LLC (CPR) is the Mineral Estate Owner (as defined in C.R.S. Section 24-65.5-102(5)) underlying the following described land located in Weld County, Colorado (the "**Subject Lands**"), to-wit:

Township 1 North, Range 68 West, 6th P.M.
Section 31: ALL

WHEREAS, there were certain errors or omissions in the original Request and the undersigned wishes to amend the Request to correct the errors and omissions;

NOW, THEREFORE, the undersigned does hereby amend the Request for Notification of Surface Development by replacing the original document.

Pursuant to C.R.S. Section 24-65.5-103(3), CPR hereby requests written notification of any and all Applications for Development (as such term is defined in C.R.S. Section 24-65.5-102(2)) and all other proposed surface development activities on the Subject Lands in accordance with the terms of Article 24-65.5, C.R.S. Such notices should be sent to the following address:

Crestone Peak Resources Holdings LLC
1801 California Street, Suite 2500
Denver, CO 80202
Attn: DJ Surface Land Department

Executed this 15th day of July 2019.

Crestone Peak Resources Holdings LLC

By: _____
Name: Shea Kauffman
Title: Director of Land & Business Development

STATE OF COLORADO)
)ss.
COUNTY OF DENVER)

The foregoing instrument was acknowledged before me this 15th day of July 2019, by Shea Kauffman, as Director of Land & Business Development of Crestone Peak Resources Holdings LLC, a Delaware limited liability company.

Witness my hand and official seal.

My Commission Expires: 4/18/21

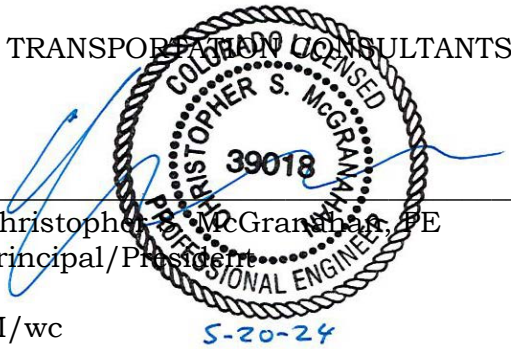
LAURA L CUSTER
Notary Public
State of Colorado
Notary ID # 20124081516
My Commission Expires 04-18-2021

_____
Notary Public

We trust our findings will assist you in gaining approval of the proposed Erie Airpark Tract E-2 development. Please contact me if you have any questions or need further assistance.

Sincerely,

LSC TRANSPORTATION CONSULTANTS, INC.



By_____
Christopher S. McGranahan, PE
Principal/President

CSM/wc

Enclosures: Tables 1 and 2
Figures 1 - 10
Traffic Count Reports
Figure 9 from *Parkdale North TIA* by LSC
Level of Service Definitions
Level of Service Reports

W:\LSC\Projects\2023\230890-ErieAirpark-TractE-2\Report\May-2024\ErieAirparkTract_E-2-052024.wpd

Table 1
Intersection Levels of Service Analysis
Erie Airpark Tract E-2
Erie, CO
LSC #230890; May, 2024

		Existing		2026 Background		2026 Total Traffic		2044 Background		2044 Total Traffic	
Intersection Location	Traffic Control	Level of Service AM	Level of Service PM	Level of Service AM	Level of Service PM	Level of Service AM	Level of Service PM	Level of Service AM	Level of Service PM	Level of Service AM	Level of Service PM
State Highway 7/Airport Drive	TWSC										
EB Left		B	A	B	A	B	B	--	--	--	--
SB Approach		D	F	E	F	--	--	--	--	--	--
SB Left		--	--	--	--	F	F	--	--	--	--
SB Right		--	--	--	--	C	C	--	--	--	--
Critical Movement Delay		30.1	77.1	37.9	168.4	95.9	>240	--	--	--	--
	Signalized										
EB Left		--	--	--	--	A	A	A	D	C	D
EB Through		--	--	--	--	A	A	A	A	A	A
WB Through		--	--	--	--	A	A	A	B	A	C
WB Right		--	--	--	--	A	A	A	A	A	A
SB Left		--	--	--	--	E	E	E	E	E	D
SB Right		--	--	--	--	E	E	E	E	E	D
Entire Intersection Delay (sec /veh)		--	--	--	--	7.4	12.8	6.1	15.0	7.7	22.8
Entire Intersection LOS		--	--	--	--	A	B	A	B	A	C

Table 2
ESTIMATED TRAFFIC GENERATION
Erie Airpark Tract E-2
Erie, CO
LSC #230890; May, 2024

			Trip Generation Rates [1]					Total Trips Generated				
			Average	AM Peak-Hour		PM Peak-Hour		Average	AM Peak-Hour		PM Peak-Hour	
Trip Generating Category	Quantity		Weekday	In	Out	In	Out	Weekday	In	Out	In	Out
CURRENTLY PROPOSED LAND USE												
Light Industrial [2]	137.500	KSF [3]	4.87	0.651	0.089	0.091	0.559	670	90	12	13	77
Office Space [4]	34.375	KSF [3]	10.84	1.338	0.182	0.245	1.195	373	46	6	8	41
							Total =	**1,043**	**136**	**18**	**21**	**118**

Notes:
(1) Source: *Trip Generation*, Institute of Transportation Engineers, 11th Edition, 2021
(2) ITE Land Use No. 110 - General Light Industrial
(3) KSF = 1,000 square feet
(4) ITE Land Use No. 710 - General Office Building

Figure 1

Vicinity Map

Erie Airpark Tract E-2 (LSC #230890)

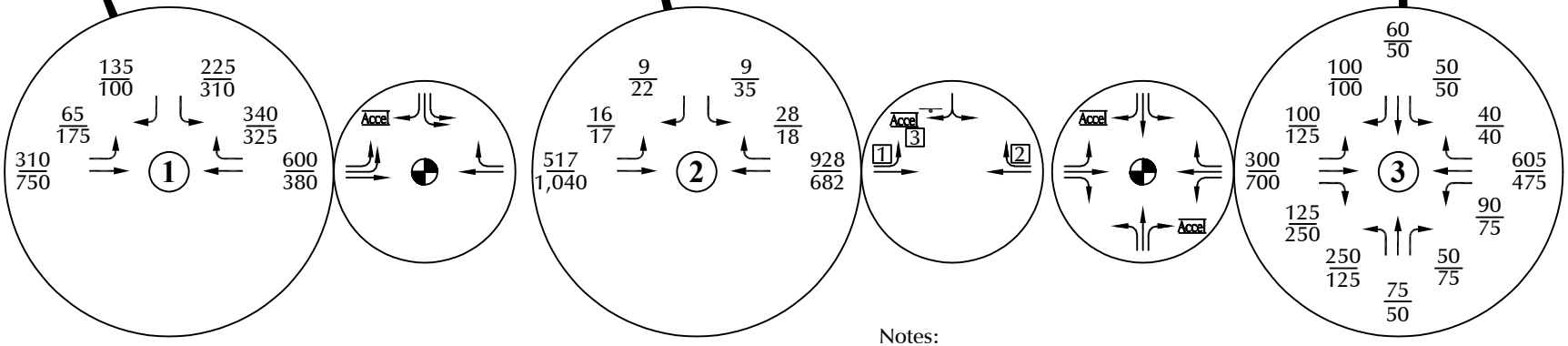
LSC TRANSPORTATION CONSULTANTS, INC.

Approximate Scale
Scale: NTS

Figure 2

Site Plan

Erie Airpark Tract E-2 (LSC #230890)



LEGEND:

⊦ = Stop Sign

SPEED LIMIT 25 = Speed Limit

26/35 = AM Peak Hour Traffic / PM Peak Hour Traffic

1,000 = Average Daily Traffic

Existing Auxiliary Lane Lengths

1 EB LT = 700 feet

2 WB RT = 100 feet - substandard

3 SB to WB Accel = 150 feet - substandard

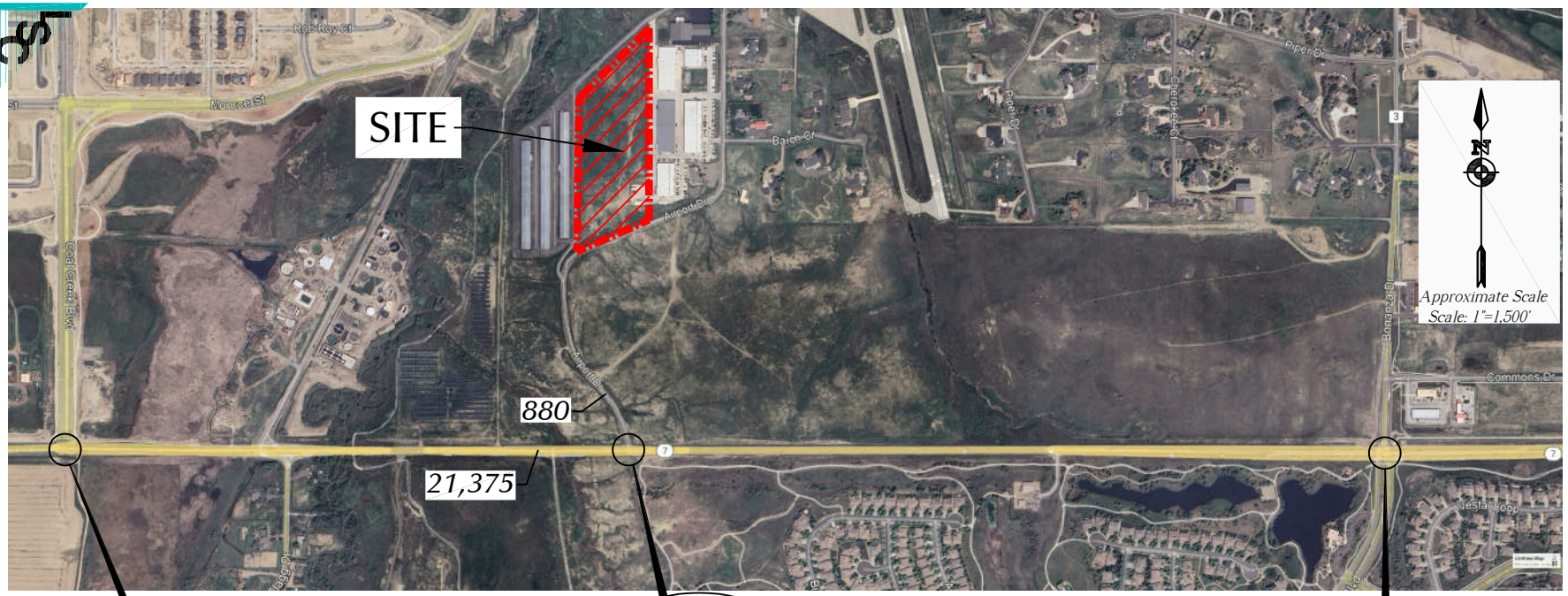
Notes:

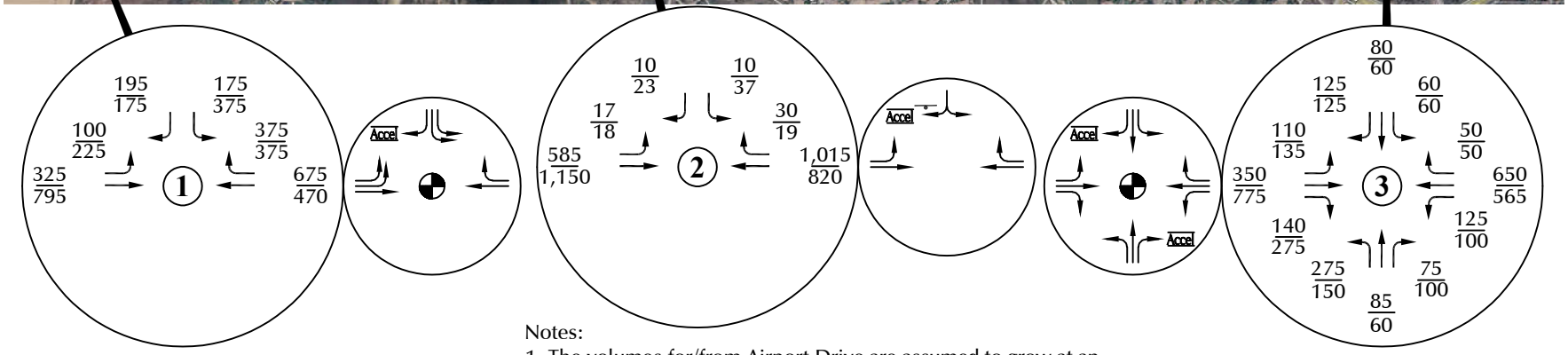
1. The daily volume on SH 7 is based on the attached CDOT Straight Line Diagram.
2. The peak hour volumes at #1 and #3 are estimated by LSC and were added to the analysis to show the effects on levels of service of these upstream traffic signals.

Figure 3

Existing Traffic, Lane Geometry and Traffic Control

Erie Airpark Tract E-2 (LSC #230890)





Notes:
1. The volumes for/from Airport Drive are assumed to grow at an annual rate of two percent. The through volumes on SH 7 were factored between the volumes in Figure 3 and 5.
2. The peak hours volumes at #1 and #3 are estimated by LSC and were added to the analysis to show the effects on levels of service of these upstream traffic signals.

LEGEND:

⊦ = Stop Sign

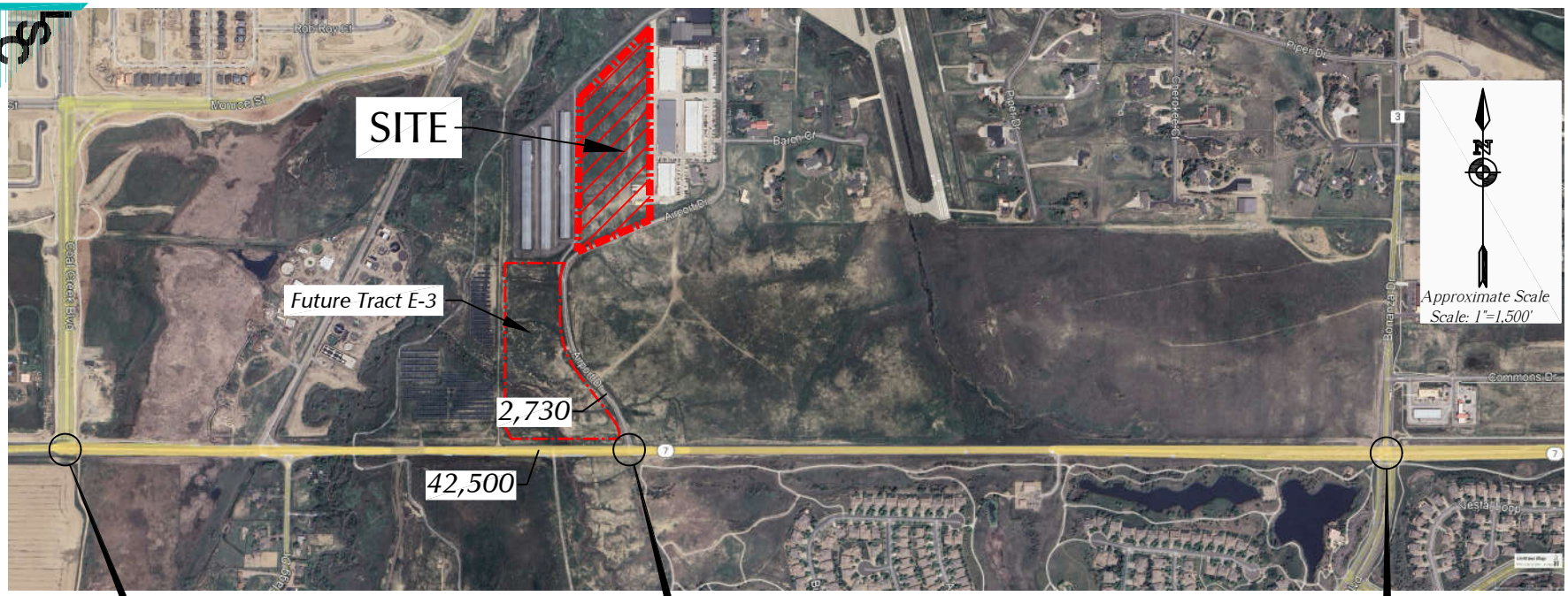
26/35 = AM Peak Hour Traffic / PM Peak Hour Traffic

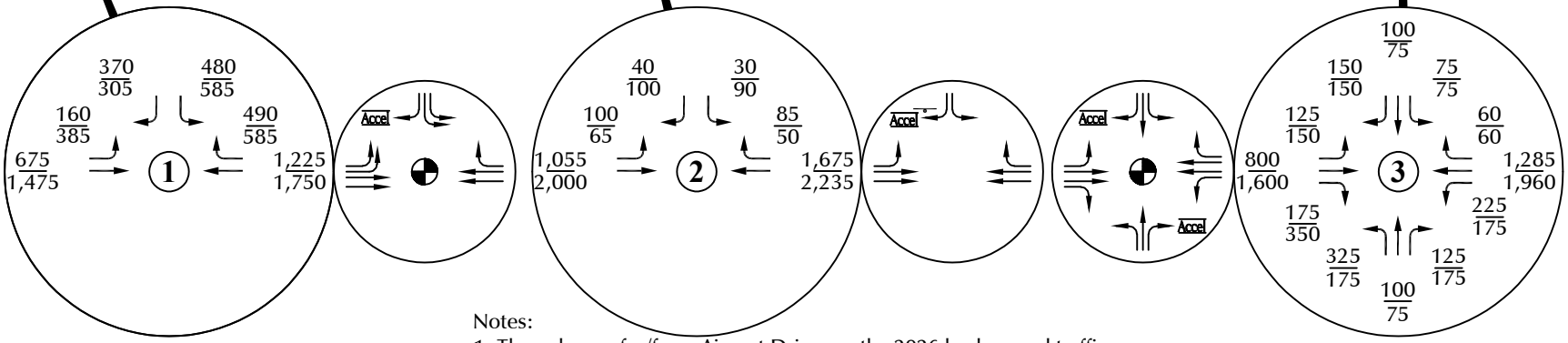
1,000 = Average Daily Traffic

Figure 4

Year 2026 Background Traffic, Lane Geometry and Traffic Control

Erie Airpark Tract E-2 (LSC #230890)





Notes:
1. The volumes for/from Airport Drive are the 2026 background traffic plus future trips from future Tract E-3. The through volumes on SH 7 are consistent with the 2043 total traffic from Parkdale North TIA by LSC. Figure 9 from that TIA is attached for reference.
2. The volumes at #1 and #3 were added to include the effects of those upstream traffic signals in the capacity analysis.

LEGEND:

⊦ = Stop Sign

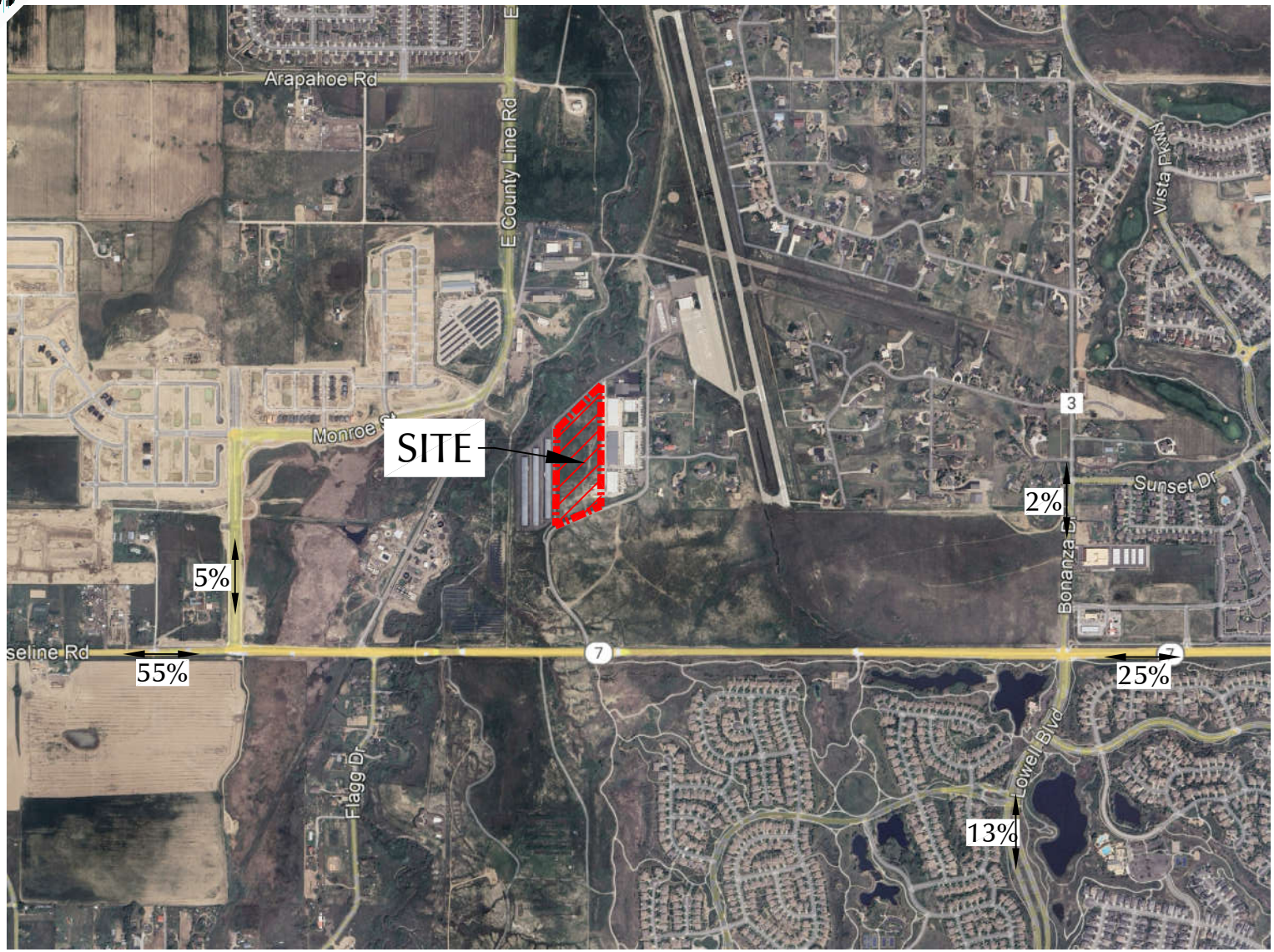
$\frac{26}{35}$ = $\frac{\text{AM Peak Hour Traffic}}{\text{PM Peak Hour Traffic}}$

1,000 = Average Daily Traffic

Figure 5

Year 2044 Background Traffic, Lane Geometry and Traffic Control

Erie Airpark Tract E-2 (LSC #230890)



N

Approximate Scale
Scale: 1"=1,500'

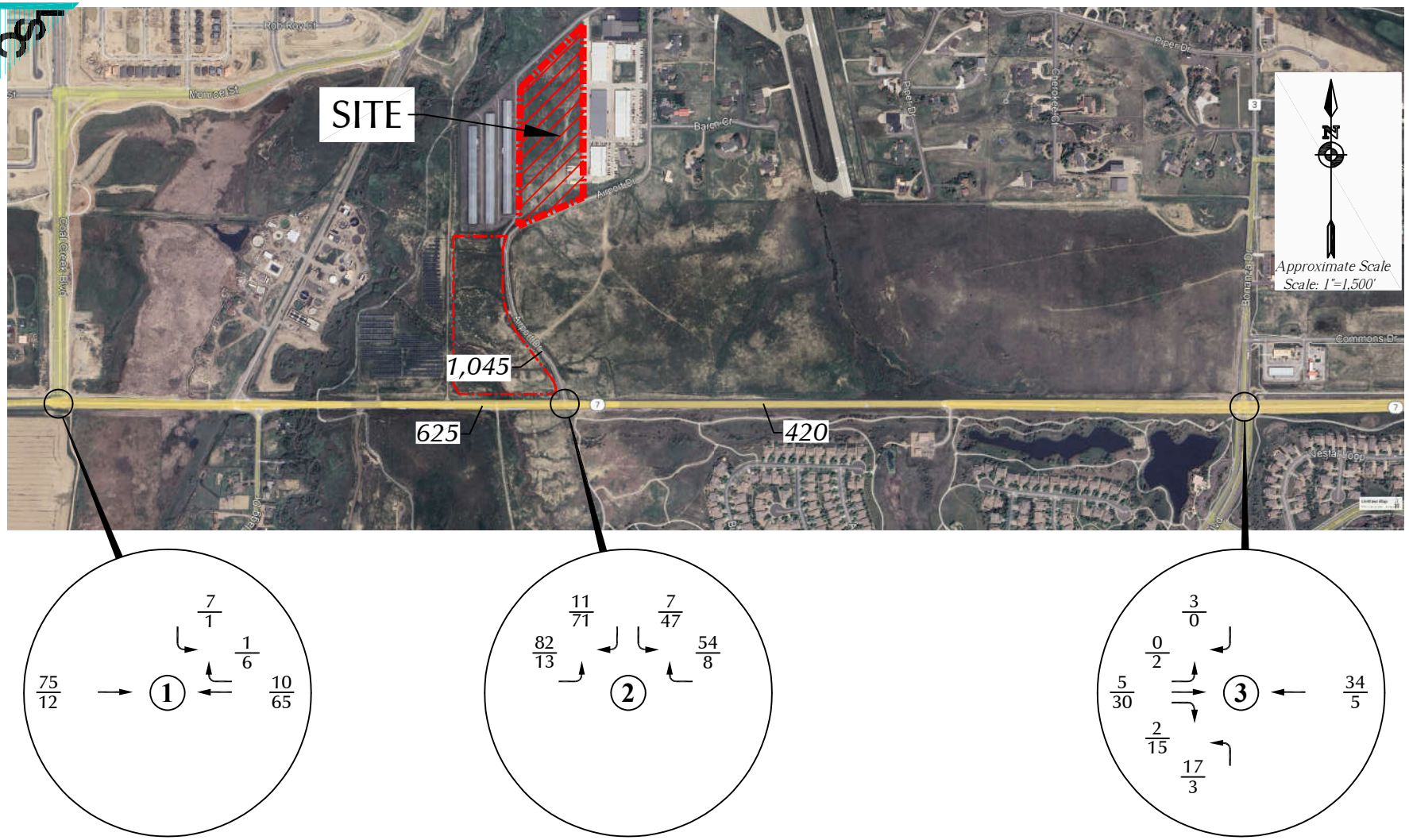
LEGEND:

65% = Percent Directional Distribution

Figure 6

Directional Distribution of Site-Generated Traffic

Erie Airpark Tract E-2 (LSC #230890)



LEGEND:

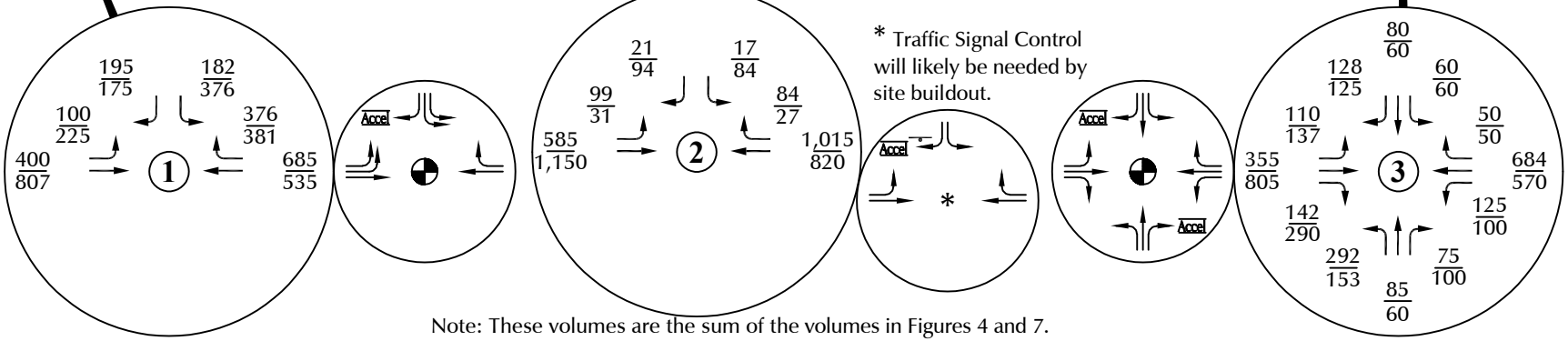
$\frac{26}{35}$ = $\frac{\text{AM Peak Hour Traffic}}{\text{PM Peak Hour Traffic}}$

1,000 = Average Daily Traffic

Figure 7

Assignment of Site-Generated Traffic

Erie Airpark Tract E-2 (LSC #230890)



Note: These volumes are the sum of the volumes in Figures 4 and 7.

Required Auxiliary Lanes Per CDOT Access Code:
EB LT = 484 feet (378' decel + 106' storage) = 222-foot transition taper - the existing lane exceeds this length.
WB RT = 378 feet + 222-foot transition taper - the existing lane will need to be extended.
SB to WB Accel = 738 feet + 222-foot transition taper - the existing lane will need to be extended.

Additional Turn Lane Recommendation on Airport Road Approaching SH 7:
SB RT = 100 feet + 100-foot transition taper.

LEGEND:

⊦ = Stop Sign

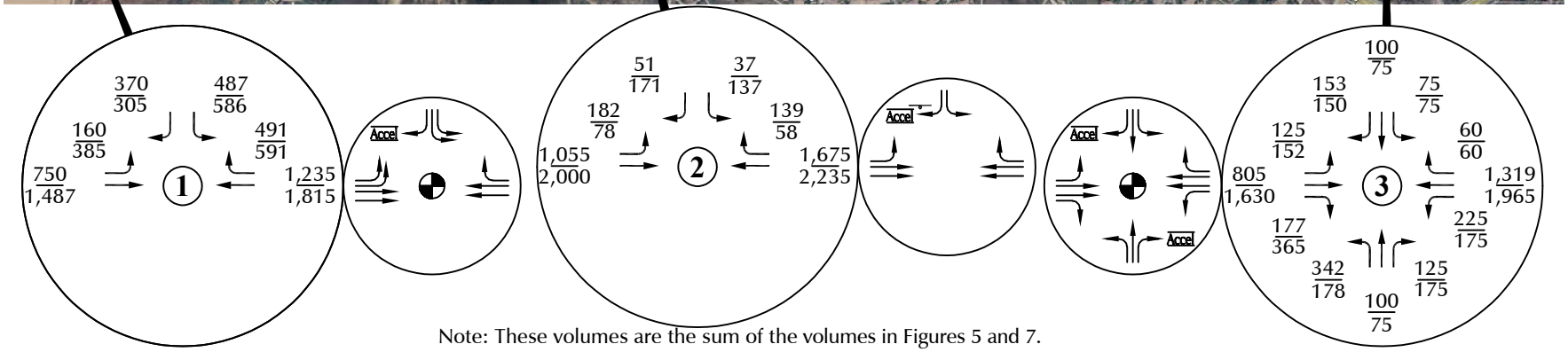
26/35 = AM Peak Hour Traffic / PM Peak Hour Traffic

1,000 = Average Daily Traffic

Figure 8

Year 2026 Total Traffic, Lane Geometry and Traffic Control

Erie Airpark Tract E-2 (LSC #230890)



Note: These volumes are the sum of the volumes in Figures 5 and 7.

Required Auxiliary Lanes Per CDOT Access Code:
EB LT = 560 feet (378' decel + 182' storage) = 222-foot transition taper - the existing lane exceeds this length.
WB RT = 378 feet + 222-foot transition taper - the existing lane will need to be extended.
SB to WB Accel = 738 feet + 222-foot transition taper - the existing lane will need to be extended.

Additional Turn Lane Recommendation on Airport Road Approaching SH 7:
SB RT = 100 feet + 100-foot transition taper.

LEGEND:

◓ = Traffic Signal

26/35 = AM Peak Hour Traffic / PM Peak Hour Traffic

1,000 = Average Daily Traffic

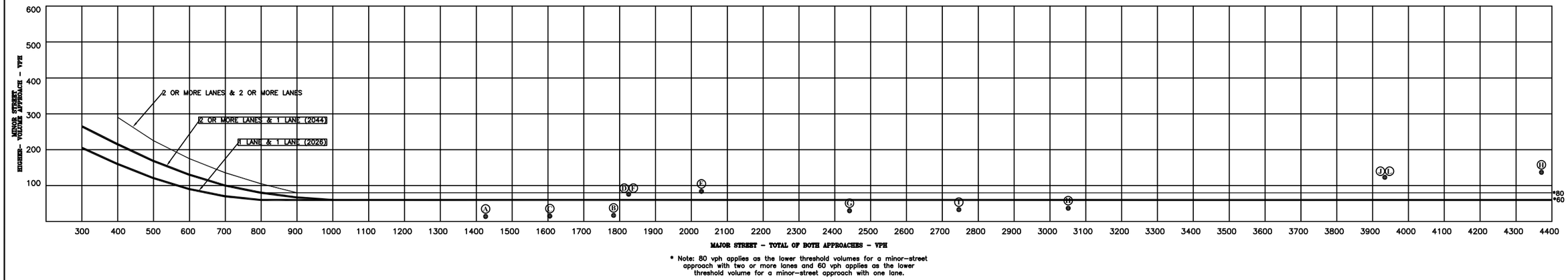
Figure 9

Year 2044 Total Traffic, Lane Geometry and Traffic Control

Erie Airpark Tract E-2 (LSC #230890)

Figure 4C-2. Warrant 2 Four-Hour Vehicular Volume (70% Factor)

(Community Less than 10,000 population or above 40 mph on Major Street)



2026 Total Traffic (from Figure 8)

Ⓐ Hour Before AM Peak Hour (80%) = (1426,14)
Ⓑ AM Peak Hour = (1783,17)
Ⓒ Hour After AM Peak Hour (90%) = (1605,15)
Ⓓ Hour Before PM Peak Hour (90%) = (1825,76)
Ⓔ PM Peak Hour = (2028,84)
Ⓕ Hour After PM Peak Hour (90%) = (1825,76)

2044 Total Traffic (from Figure 9)

Ⓐ Hour Before AM Peak Hour (80%) = (2441,30)
Ⓑ AM Peak Hour = (3051,37)
Ⓒ Hour After AM Peak Hour (90%) = (2746,33)
Ⓓ Hour Before PM Peak Hour (90%) = (3934,123)
Ⓔ PM Peak Hour = (4371,137)
Ⓕ Hour After PM Peak Hour (90%) = (3934,123)

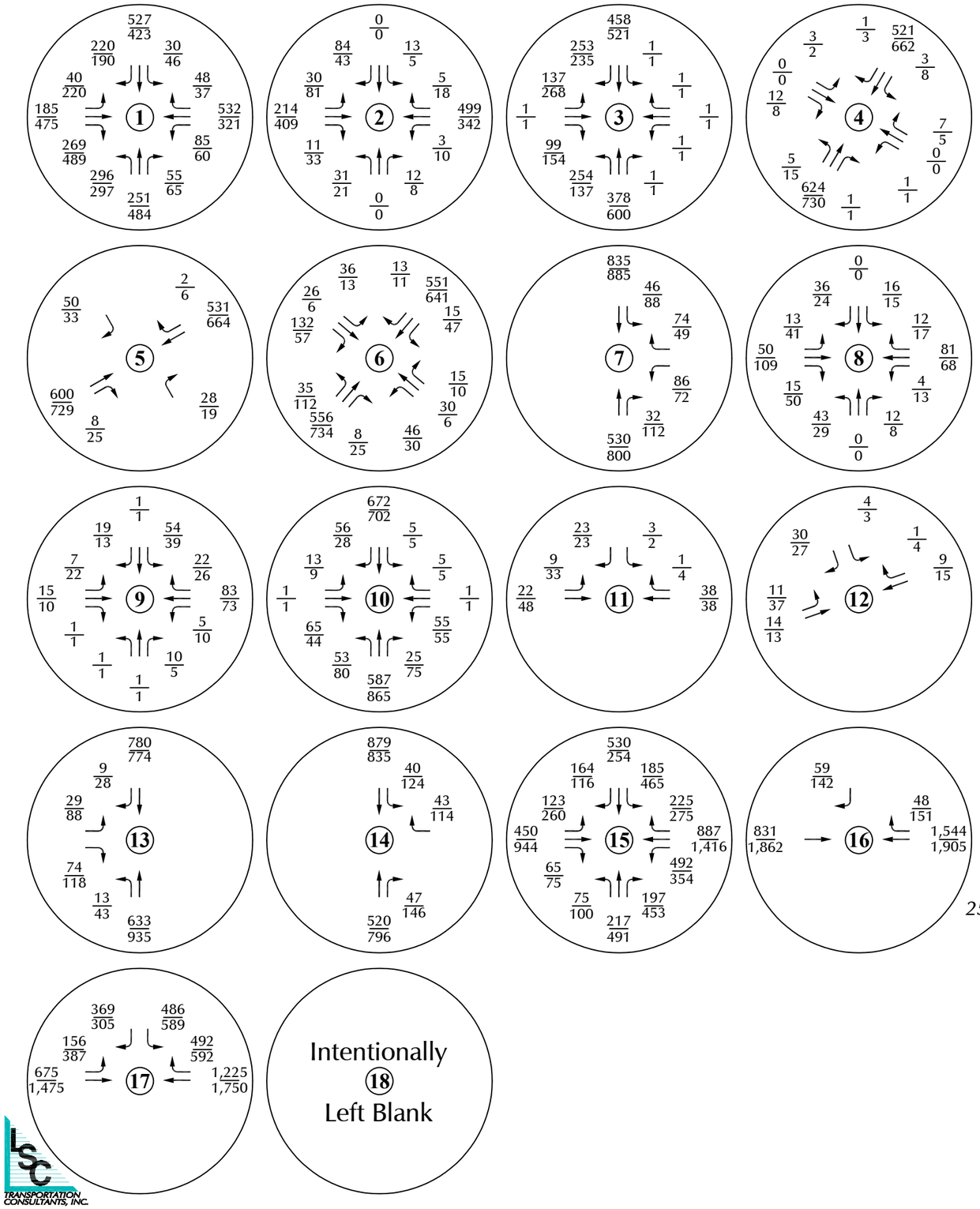
Note: This warrant will likely be met by 2026.

Figure 10

Warrant 2 - Four-Hour Vehicular Volume SH 7/Airport Drive

Erie Airpark Tract E-2 (LSC #230890)

LSC TRANSPORTATION CONSULTANTS, INC.



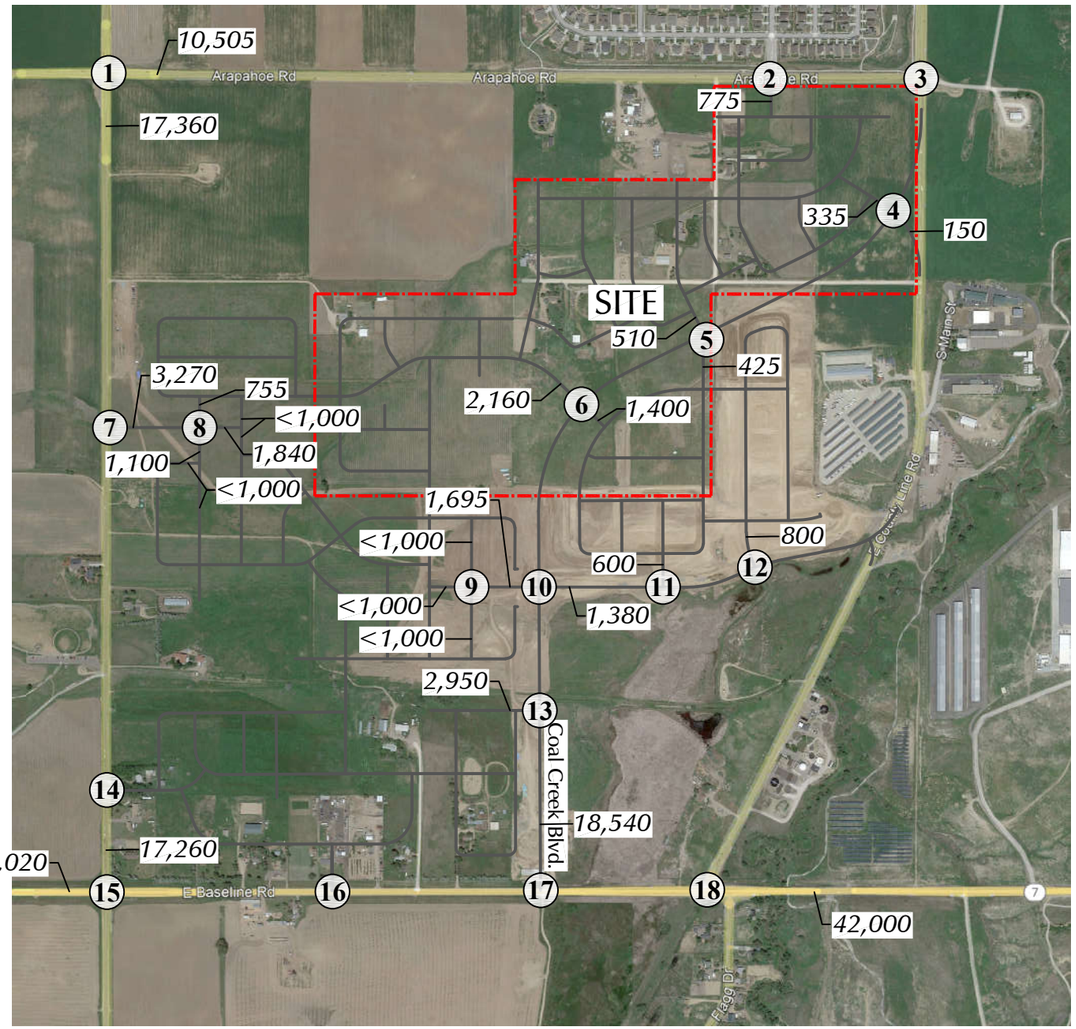
LEGEND:

$\frac{26}{35}$ = $\frac{\text{AM Peak Hour Traffic}}{\text{PM Peak Hour Traffic}}$

1,000 = Average Daily Traffic

N

Approximate Scale
Scale: 1"=1,000'



Note: These volumes are the sum of the volumes in Figures 5a and 7.

Figure 9a

Year 2043 Total Traffic

Parkdale North (LSC #221090)

LSC TRANSPORTATION CONSULTANTS, INC.

COUNTER MEASURES INC.

1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: AIRPORT DR
E/W STREET: HWY 7 (E. BASELINE RD)
CITY: ERIE
COUNTY: BOULDER

File Name : AIRPHWY7
Site Code : 00000011
Start Date : 11/2/2023
Page No : 1

Groups Printed- VEHICLES

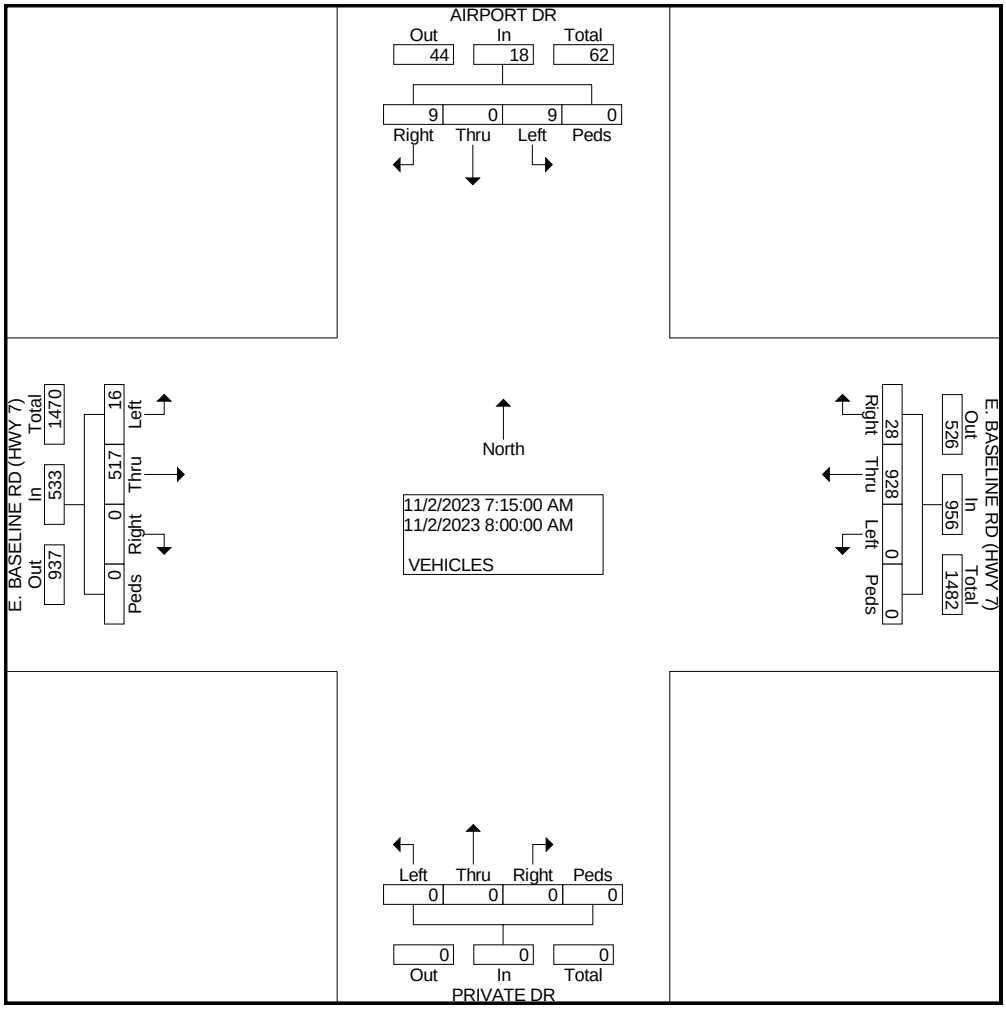
	AIRPORT DR Southbound				E. BASELINE RD (HWY 7) Westbound				PRIVATE DR Northbound				E. BASELINE RD (HWY 7) Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:30 AM	6	0	4	0	0	193	2	0	0	0	0	0	0	75	0	0	280
06:45 AM	1	0	1	0	0	183	1	0	0	0	0	0	2	83	0	0	271
Total	7	0	5	0	0	376	3	0	0	0	0	0	2	158	0	0	551
07:00 AM	0	0	2	0	1	174	5	0	1	0	0	0	8	107	0	0	298
07:15 AM	2	0	4	0	0	234	4	0	0	0	0	0	3	114	0	0	361
07:30 AM	1	0	2	0	0	278	9	0	0	0	0	0	0	106	0	0	396
07:45 AM	6	0	1	0	0	207	9	0	0	0	0	0	11	149	0	0	383
Total	9	0	9	0	1	893	27	0	1	0	0	0	22	476	0	0	1438
08:00 AM	0	0	2	0	0	209	6	0	0	0	0	0	2	148	0	0	367
08:15 AM	1	0	3	0	0	205	7	0	0	0	0	0	6	139	0	0	361
Total	1	0	5	0	0	414	13	0	0	0	0	0	8	287	0	0	728
04:00 PM	11	0	6	0	0	155	3	0	0	0	0	0	4	280	0	0	459
04:15 PM	2	1	7	0	0	200	8	0	0	0	0	0	6	236	0	0	460
04:30 PM	14	0	6	0	0	162	2	0	0	0	0	0	4	265	0	0	453
04:45 PM	8	0	3	0	0	165	5	0	0	0	0	0	3	259	0	0	443
Total	35	1	22	0	0	682	18	0	0	0	0	0	17	1040	0	0	1815
05:00 PM	18	0	9	0	0	157	1	0	0	0	0	0	4	249	0	0	438
05:15 PM	9	0	6	0	0	159	7	0	0	0	0	0	0	274	0	0	455
05:30 PM	8	0	10	0	0	166	2	1	0	0	0	0	6	272	0	0	465
05:45 PM	4	1	0	0	0	152	3	0	0	0	0	0	1	248	0	0	409
Total	39	1	25	0	0	634	13	1	0	0	0	0	11	1043	0	0	1767
Grand Total	91	2	66	0	1	2999	74	1	1	0	0	0	60	3004	0	0	6299
Apprch %	57.2	1.3	41.5	0.0	0.0	97.5	2.4	0.0	100.0	0.0	0.0	0.0	2.0	98.0	0.0	0.0	
Total %	1.4	0.0	1.0	0.0	0.0	47.6	1.2	0.0	0.0	0.0	0.0	0.0	1.0	47.7	0.0	0.0	

COUNTER MEASURES INC.
1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: AIRPORT DR
E/W STREET: HWY 7 (E. BASELINE RD)
CITY: ERIE
COUNTY: BOULDER

File Name : AIRPHWY7
Site Code : 00000011
Start Date : 11/2/2023
Page No : 2

	AIRPORT DR Southbound					E. BASELINE RD (HWY 7) Westbound					PRIVATE DR Northbound					E. BASELINE RD (HWY 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 08:15 AM - Peak 1 of 1																					
Intersection	07:15 AM																				
Volume	9	0	9	0	18	0	928	28	0	956	0	0	0	0	0	16	517	0	0	533	1507
Percent	50.0	0.0	50.0	0.0		0.0	97.1	2.9	0.0		0.0	0.0	0.0	0.0		3.0	97.0	0.0	0.0		
07:30 Volume	1	0	2	0	3	0	278	9	0	287	0	0	0	0	0	0	106	0	0	106	396
Peak Factor																					0.951
High Int.	07:45 AM					07:30 AM					6:15:00 AM					07:45 AM					
Volume	6	0	1	0	7	0	278	9	0	287	0	0	0	0	0	11	149	0	0	160	
Peak Factor					0.643					0.833										0.833	



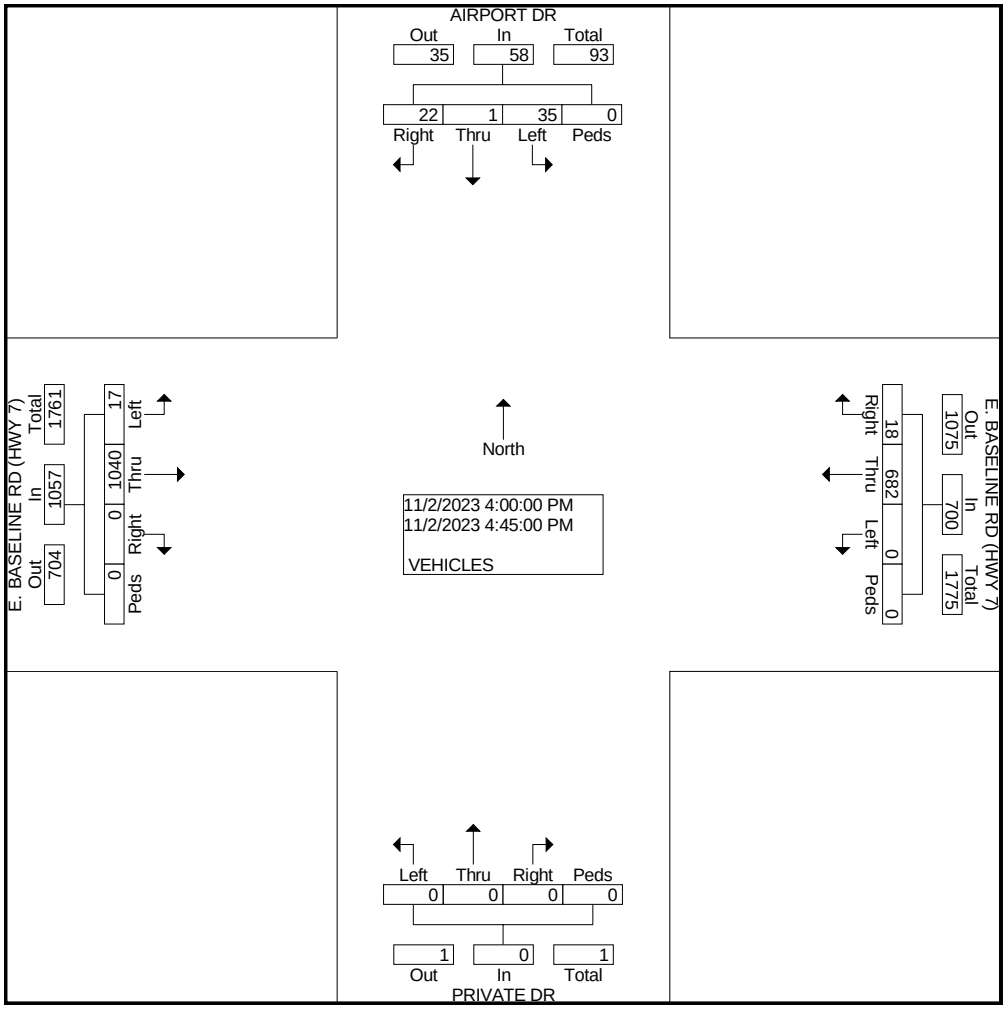
COUNTER MEASURES INC.

1889 YORK STREET
DENVER.COLORADO
303-333-7409

N/S STREET: AIRPORT DR
E/W STREET: HWY 7 (E. BASELINE RD)
CITY: ERIE
COUNTY: BOULDER

File Name : AIRPHWY7
Site Code : 00000011
Start Date : 11/2/2023
Page No : 3

	AIRPORT DR Southbound					E. BASELINE RD (HWY 7) Westbound					PRIVATE DR Northbound					E. BASELINE RD (HWY 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	04:00 PM																				
Volume	35	1	22	0	58	0	682	18	0	700	0	0	0	0	0	17	1040	0	0	1057	1815
Percent	60.3	1.7	37.9	0.0		0.0	97.4	2.6	0.0		0.0	0.0	0.0	0.0		1.6	98.4	0.0	0.0		
04:15 Volume	2	1	7	0	10	0	200	8	0	208	0	0	0	0	0	6	236	0	0	242	460
Peak Factor																					0.986
High Int.	04:30 PM					04:15 PM										04:00 PM					
Volume	14	0	6	0	20	0	200	8	0	208	0	0	0	0	0	4	280	0	0	284	
Peak Factor					0.725					0.841										0.930	



LOCATION: AIRPORT DR. N-O E. BASELINE RD (HWY 7)
CITY: ERIE
COUNTY: BOULDER
DIRECTION: NORTH/SOUTH

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 230714
Station ID: 230714

Start Time	07-Nov-23 Tue	NORTH	SOUTH							Total
12:00 AM		*	*							*
01:00		*	*							*
02:00		*	*							*
03:00		*	*							*
04:00		*	*							*
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		*	*							*
10:00		**28**	25							**53**
11:00		23	**27**							50
12:00 PM		**33**	33							**66**
01:00		32	28							60
02:00		27	24							51
03:00		26	37							63
04:00		22	34							56
05:00		15	**42**							57
06:00		16	16							32
07:00		12	26							38
08:00		4	11							15
09:00		1	4							5
10:00		2	3							5
11:00		1	2							3
Total		242	312							554
Percent		43.7%	56.3%							
AM Peak	-	10:00	11:00	-	-	-	-	-	-	10:00
Vol.	-	28	27	-	-	-	-	-	-	53
PM Peak	-	12:00	17:00	-	-	-	-	-	-	12:00
Vol.	-	33	42	-	-	-	-	-	-	66

LOCATION: AIRPORT DR. N-O E. BASELINE RD (HWY 7)
CITY: ERIE
COUNTY: BOULDER
DIRECTION: NORTH/SOUTH

COUNTER MEASURES INC.
1889 YORK STREET
DENVER,COLORADO 80206
303-333-7409

Site Code: 230714
Station ID: 230714

Start Time	08-Nov-23 Wed	NORTH	SOUTH							Total
12:00 AM		0	1							1
01:00		0	1							1
02:00		1	0							1
03:00		1	2							3
04:00		1	2							3
05:00		13	3							16
06:00		34	7							41
07:00		42	28							70
08:00		**44**	27							**71**
09:00		35	**33**							68
10:00		*	*							*
11:00		*	*							*
12:00 PM		*	*							*
01:00		*	*							*
02:00		*	*							*
03:00		*	*							*
04:00		*	*							*
05:00		*	*							*
06:00		*	*							*
07:00		*	*							*
08:00		*	*							*
09:00		*	*							*
10:00		*	*							*
11:00		*	*							*
Total		171	104							275
Percent		62.2%	37.8%							
AM Peak	-	08:00	09:00	-	-	-	-	-	-	08:00
Vol.	-	44	33	-	-	-	-	-	-	71
PM Peak	-	-	-	-	-	-	-	-	-	-
Vol.	-	-	-	-	-	-	-	-	-	-
Grand Total		413	416							829
Percent		49.8%	50.2%							
ADT		ADT 788		AADT 788						

LEVEL OF SERVICE DEFINITIONS

From *Highway Capacity Manual*, Transportation Research Board

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

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.

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	517	928	28	9	9
Future Vol, veh/h	16	517	928	28	9	9
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	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	17	562	1009	30	10	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1039	0	-	0	1605	1009
Stage 1	-	-	-	-	1009	-
Stage 2	-	-	-	-	596	-
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	669	-	-	-	116	292
Stage 1	-	-	-	-	352	-
Stage 2	-	-	-	-	550	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	669	-	-	-	113	292
Mov Cap-2 Maneuver	-	-	-	-	113	-
Stage 1	-	-	-	-	343	-
Stage 2	-	-	-	-	550	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	30.1
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	669	-	-	-	163
HCM Lane V/C Ratio	0.026	-	-	-	0.12
HCM Control Delay (s)	10.5	-	-	-	30.1
HCM Lane LOS	B	-	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	0.4

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	17	1040	682	18	35	22
Future Vol, veh/h	17	1040	682	18	35	22
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	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	18	1130	741	20	38	24

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	761	0	-	0	1907	741
Stage 1	-	-	-	-	741	-
Stage 2	-	-	-	-	1166	-
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	851	-	-	-	75	416
Stage 1	-	-	-	-	471	-
Stage 2	-	-	-	-	296	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	851	-	-	-	73	416
Mov Cap-2 Maneuver	-	-	-	-	73	-
Stage 1	-	-	-	-	461	-
Stage 2	-	-	-	-	296	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	77.1
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	851	-	-	-	107
HCM Lane V/C Ratio	0.022	-	-	-	0.579
HCM Control Delay (s)	9.3	-	-	-	77.1
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	2.8

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	17	585	1015	30	10	10
Future Vol, veh/h	17	585	1015	30	10	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	-	-	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	18	636	1103	33	11	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1136	0	-	0	1775	1103
Stage 1	-	-	-	-	1103	-
Stage 2	-	-	-	-	672	-
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	615	-	-	-	91	257
Stage 1	-	-	-	-	318	-
Stage 2	-	-	-	-	508	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	615	-	-	-	88	257
Mov Cap-2 Maneuver	-	-	-	-	88	-
Stage 1	-	-	-	-	309	-
Stage 2	-	-	-	-	508	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	37.9
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	615	-	-	-	131
HCM Lane V/C Ratio	0.03	-	-	-	0.166
HCM Control Delay (s)	11	-	-	-	37.9
HCM Lane LOS	B	-	-	-	E
HCM 95th %tile Q(veh)	0.1	-	-	-	0.6

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	18	1150	820	19	37	23
Future Vol, veh/h	18	1150	820	19	37	23
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	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	20	1250	891	21	40	25

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	912	0	-	0	2181	891
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	1290	-
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	747	-	-	-	51	341
Stage 1	-	-	-	-	401	-
Stage 2	-	-	-	-	258	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	747	-	-	-	50	341
Mov Cap-2 Maneuver	-	-	-	-	50	-
Stage 1	-	-	-	-	390	-
Stage 2	-	-	-	-	258	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	168.4
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	747	-	-	-	74
HCM Lane V/C Ratio	0.026	-	-	-	0.881
HCM Control Delay (s)	9.9	-	-	-	168.4
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	4.4

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	99	585	1015	84	17	21
Future Vol, veh/h	99	585	1015	84	17	21
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	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	108	636	1103	91	18	23

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1194	0	-	0	1955	1103
Stage 1	-	-	-	-	1103	-
Stage 2	-	-	-	-	852	-
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	585	-	-	-	70	257
Stage 1	-	-	-	-	318	-
Stage 2	-	-	-	-	418	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	585	-	-	-	57	257
Mov Cap-2 Maneuver	-	-	-	-	57	-
Stage 1	-	-	-	-	259	-
Stage 2	-	-	-	-	418	-

Approach	EB	WB	SB
HCM Control Delay, s	1.8	0	54.2
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	585	-	-	-	57	257
HCM Lane V/C Ratio	0.184	-	-	-	0.324	0.089
HCM Control Delay (s)	12.5	-	-	-	95.9	20.4
HCM Lane LOS	B	-	-	-	F	C
HCM 95th %tile Q(veh)	0.7	-	-	-	1.2	0.3

Intersection	
Int Delay, s/veh	24.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	31	1150	820	27	84	94
Future Vol, veh/h	31	1150	820	27	84	94
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	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	34	1250	891	29	91	102

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	920	0	-	0	2209	891
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	1318	-
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	742	-	-	-	~ 49	341
Stage 1	-	-	-	-	401	-
Stage 2	-	-	-	-	250	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	742	-	-	-	~ 47	341
Mov Cap-2 Maneuver	-	-	-	-	~ 47	-
Stage 1	-	-	-	-	383	-
Stage 2	-	-	-	-	250	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	$ 307.1
HCM LOS			F

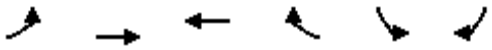
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	742	-	-	-	47	341
HCM Lane V/C Ratio	0.045	-	-	-	1.943	0.3
HCM Control Delay (s)	10.1	-	-	-	$ 628.3	20
HCM Lane LOS	B	-	-	-	F	C
HCM 95th %tile Q(veh)	0.1	-	-	-	9.2	1.2

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	99	585	1015	84	17	21
Future Volume (vph)	99	585	1015	84	17	21
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases	2			6		4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	15.0	95.0	80.0	80.0	25.0	25.0
Total Split (%)	12.5%	79.2%	66.7%	66.7%	20.8%	20.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	107.5	109.5	94.4	94.4	7.8	7.8
Actuated g/C Ratio	0.90	0.91	0.79	0.79	0.06	0.06
v/c Ratio	0.31	0.37	0.75	0.07	0.16	0.19
Control Delay	4.4	2.1	14.3	1.4	55.5	23.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.4	2.1	14.3	1.4	55.5	23.1
LOS	A	A	B	A	E	C
Approach Delay		2.5	13.3		37.3	
Approach LOS		A	B		D	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.75	
Intersection Signal Delay: 9.7	Intersection LOS: A
Intersection Capacity Utilization 74.7%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 2: SH 7 (Baseline Rd) & Airport Road



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	99	585	1015	84	17	21
Future Volume (veh/h)	99	585	1015	84	17	21
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
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	108	636	1103	91	18	23
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	376	1656	1503	1273	70	62
Arrive On Green	0.04	0.89	0.80	0.80	0.04	0.04
Sat Flow, veh/h	1781	1870	1870	1585	1781	1585
Grp Volume(v), veh/h	108	636	1103	91	18	23
Grp Sat Flow(s),veh/h/ln	1781	1870	1870	1585	1781	1585
Q Serve(g_s), s	1.1	7.1	33.9	1.4	1.2	1.7
Cycle Q Clear(g_c), s	1.1	7.1	33.9	1.4	1.2	1.7
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	376	1656	1503	1273	70	62
V/C Ratio(X)	0.29	0.38	0.73	0.07	0.26	0.37
Avail Cap(c_a), veh/h	453	1656	1503	1273	312	277
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	8.2	1.2	5.7	2.5	55.9	56.2
Incr Delay (d2), s/veh	0.4	0.7	3.2	0.1	1.9	3.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.3	8.2	0.3	0.6	1.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	8.6	1.9	8.9	2.6	57.8	59.8
LnGrp LOS	A	A	A	A	E	E
Approach Vol, veh/h		744	1194		41	
Approach Delay, s/veh		2.8	8.4		58.9	
Approach LOS		A	A		E	

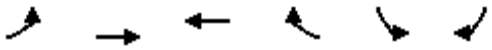
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		111.3		8.7	9.9	101.4
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		90.0		20.0	10.0	75.0
Max Q Clear Time (g_c+I1), s		9.1		3.7	3.1	35.9
Green Ext Time (p_c), s		4.0		0.1	0.1	10.8

Intersection Summary	
HCM 6th Ctrl Delay	7.4
HCM 6th LOS	A

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	31	1150	820	27	84	94
Future Volume (vph)	31	1150	820	27	84	94
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases	2			6		4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	15.0	95.0	80.0	80.0	25.0	25.0
Total Split (%)	12.5%	79.2%	66.7%	66.7%	20.8%	20.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	98.5	98.5	91.8	91.8	12.5	12.5
Actuated g/C Ratio	0.82	0.82	0.76	0.76	0.10	0.10
v/c Ratio	0.08	0.82	0.63	0.02	0.49	0.40
Control Delay	3.2	12.0	10.4	1.6	59.3	13.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.2	12.0	10.4	1.6	59.3	13.8
LOS	A	B	B	A	E	B
Approach Delay		11.7	10.1		35.2	
Approach LOS		B	B		D	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 13.0	Intersection LOS: B
Intersection Capacity Utilization 72.7%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 2: SH 7 (Baseline Rd) & Airport Road



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	31	1150	820	27	84	94
Future Volume (veh/h)	31	1150	820	27	84	94
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
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	34	1250	891	29	91	102
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	444	1560	1430	1212	162	144
Arrive On Green	0.03	0.83	0.76	0.76	0.09	0.09
Sat Flow, veh/h	1781	1870	1870	1585	1781	1585
Grp Volume(v), veh/h	34	1250	891	29	91	102
Grp Sat Flow(s),veh/h/ln	1781	1870	1870	1585	1781	1585
Q Serve(g_s), s	0.4	40.1	25.7	0.5	5.9	7.5
Cycle Q Clear(g_c), s	0.4	40.1	25.7	0.5	5.9	7.5
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	444	1560	1430	1212	162	144
V/C Ratio(X)	0.08	0.80	0.62	0.02	0.56	0.71
Avail Cap(c_a), veh/h	542	1560	1430	1212	312	277
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	5.6	5.0	6.4	3.4	52.3	53.0
Incr Delay (d2), s/veh	0.1	4.4	2.1	0.0	3.1	6.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	7.6	7.4	0.1	2.8	6.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	5.7	9.4	8.4	3.4	55.3	59.3
LnGrp LOS	A	A	A	A	E	E
Approach Vol, veh/h		1284	920		193	
Approach Delay, s/veh		9.3	8.3		57.4	
Approach LOS		A	A		E	

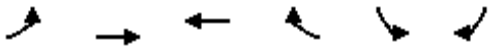
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		105.1		14.9	8.4	96.7
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		90.0		20.0	10.0	75.0
Max Q Clear Time (g_c+I1), s		42.1		9.5	2.4	27.7
Green Ext Time (p_c), s		14.9		0.4	0.0	7.0

Intersection Summary	
HCM 6th Ctrl Delay	12.8
HCM 6th LOS	B

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	100	1055	1675	85	30	40
Future Volume (vph)	100	1055	1675	85	30	40
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases	2			6		4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	20.0	95.0	75.0	75.0	25.0	25.0
Total Split (%)	16.7%	79.2%	62.5%	62.5%	20.8%	20.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	104.4	105.4	91.2	91.2	7.7	7.7
Actuated g/C Ratio	0.87	0.88	0.76	0.76	0.06	0.06
v/c Ratio	0.46	0.37	0.68	0.08	0.29	0.30
Control Delay	21.9	1.2	2.8	0.1	59.3	20.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.9	1.2	2.8	0.1	59.3	20.9
LOS	C	A	A	A	E	C
Approach Delay		3.0	2.7		37.6	
Approach LOS		A	A		D	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 42 (35%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.68	
Intersection Signal Delay: 3.6	Intersection LOS: A
Intersection Capacity Utilization 68.5%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 2: SH 7 (Baseline Rd) & Airport Road



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	100	1055	1675	85	30	40
Future Volume (veh/h)	100	1055	1675	85	30	40
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
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	109	1147	1821	92	33	43
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	267	3112	2820	1258	73	65
Arrive On Green	0.04	0.88	0.79	0.79	0.04	0.04
Sat Flow, veh/h	1781	3647	3647	1585	1781	1585
Grp Volume(v), veh/h	109	1147	1821	92	33	43
Grp Sat Flow(s),veh/h/ln	1781	1777	1777	1585	1781	1585
Q Serve(g_s), s	1.2	7.1	26.1	1.5	2.2	3.2
Cycle Q Clear(g_c), s	1.2	7.1	26.1	1.5	2.2	3.2
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	267	3112	2820	1258	73	65
V/C Ratio(X)	0.41	0.37	0.65	0.07	0.45	0.66
Avail Cap(c_a), veh/h	418	3112	2820	1258	297	264
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	7.6	1.4	5.3	2.7	56.2	56.7
Incr Delay (d2), s/veh	1.0	0.3	1.2	0.1	4.3	10.9
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	5.8	0.3	1.1	3.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	8.6	1.7	6.4	2.8	60.5	67.6
LnGrp LOS	A	A	A	A	E	E
Approach Vol, veh/h		1256	1913		76	
Approach Delay, s/veh		2.3	6.2		64.5	
Approach LOS		A	A		E	

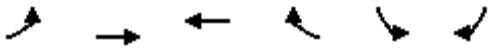
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		110.1		9.9	9.9	100.2
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		90.0		20.0	15.0	70.0
Max Q Clear Time (g_c+I1), s		9.1		5.2	3.2	28.1
Green Ext Time (p_c), s		9.3		0.1	0.2	19.7

Intersection Summary	
HCM 6th Ctrl Delay	6.1
HCM 6th LOS	A

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	100	2000	2235	50	90	100
Future Volume (vph)	100	2000	2235	50	90	100
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases	2			6		4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	12.0	90.0	78.0	78.0	30.0	30.0
Total Split (%)	10.0%	75.0%	65.0%	65.0%	25.0%	25.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	-1.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	4.0	3.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	98.0	98.0	84.2	84.2	13.0	14.0
Actuated g/C Ratio	0.82	0.82	0.70	0.70	0.11	0.12
v/c Ratio	0.57	0.75	0.98	0.05	0.51	0.40
Control Delay	24.5	9.0	21.6	4.7	59.2	15.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.5	9.0	21.6	4.7	59.2	15.5
LOS	C	A	C	A	E	B
Approach Delay		9.8	21.2		36.2	
Approach LOS		A	C		D	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.98	
Intersection Signal Delay: 16.6	Intersection LOS: B
Intersection Capacity Utilization 84.0%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 2: SH 7 (Baseline Rd) & Airport Road



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	100	2000	2235	50	90	100
Future Volume (veh/h)	100	2000	2235	50	90	100
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
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	109	2174	2429	54	98	109
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	159	2948	2656	1185	170	165
Arrive On Green	0.04	0.83	0.75	0.75	0.10	0.10
Sat Flow, veh/h	1781	3647	3647	1585	1781	1585
Grp Volume(v), veh/h	109	2174	2429	54	98	109
Grp Sat Flow(s),veh/h/ln	1781	1777	1777	1585	1781	1585
Q Serve(g_s), s	1.5	32.2	65.5	1.1	6.3	7.9
Cycle Q Clear(g_c), s	1.5	32.2	65.5	1.1	6.3	7.9
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	159	2948	2656	1185	170	165
V/C Ratio(X)	0.68	0.74	0.91	0.05	0.58	0.66
Avail Cap(c_a), veh/h	191	2948	2656	1185	386	357
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.5	4.5	12.1	4.0	51.9	51.7
Incr Delay (d2), s/veh	7.6	1.7	6.2	0.1	3.1	4.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	5.4	19.3	0.3	3.0	7.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	42.1	6.2	18.4	4.0	55.0	56.3
LnGrp LOS	D	A	B	A	E	E
Approach Vol, veh/h		2283	2483		207	
Approach Delay, s/veh		7.9	18.0		55.7	
Approach LOS		A	B		E	

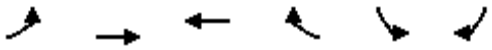
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		104.5		15.5	9.9	94.7
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		85.0		25.0	7.0	73.0
Max Q Clear Time (g_c+I1), s		34.2		9.9	3.5	67.5
Green Ext Time (p_c), s		28.4		0.5	0.1	5.1

Intersection Summary	
HCM 6th Ctrl Delay	15.0
HCM 6th LOS	B

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	182	1055	1675	139	37	51
Future Volume (vph)	182	1055	1675	139	37	51
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases	2			6		4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	20.0	95.0	75.0	75.0	25.0	25.0
Total Split (%)	16.7%	79.2%	62.5%	62.5%	20.8%	20.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	103.9	104.9	85.5	85.5	8.2	8.2
Actuated g/C Ratio	0.87	0.87	0.71	0.71	0.07	0.07
v/c Ratio	0.67	0.37	0.72	0.13	0.33	0.35
Control Delay	44.4	1.3	6.9	0.5	60.0	19.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.4	1.3	6.9	0.5	60.0	19.5
LOS	D	A	A	A	E	B
Approach Delay		7.6	6.4		36.6	
Approach LOS		A	A		D	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 42 (35%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 7.7	Intersection LOS: A
Intersection Capacity Utilization 73.1%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 2: SH 7 (Baseline Rd) & Airport Road



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	182	1055	1675	139	37	51
Future Volume (veh/h)	182	1055	1675	139	37	51
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
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	198	1147	1821	151	40	55
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	257	3079	2783	1242	89	79
Arrive On Green	0.04	0.87	0.78	0.78	0.05	0.05
Sat Flow, veh/h	1781	3647	3647	1585	1781	1585
Grp Volume(v), veh/h	198	1147	1821	151	40	55
Grp Sat Flow(s),veh/h/ln	1781	1777	1777	1585	1781	1585
Q Serve(g_s), s	2.4	7.6	27.3	2.7	2.6	4.1
Cycle Q Clear(g_c), s	2.4	7.6	27.3	2.7	2.6	4.1
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	257	3079	2783	1242	89	79
V/C Ratio(X)	0.77	0.37	0.65	0.12	0.45	0.69
Avail Cap(c_a), veh/h	406	3079	2783	1242	297	264
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.4	1.6	5.8	3.1	55.4	56.1
Incr Delay (d2), s/veh	4.8	0.3	1.2	0.2	3.5	10.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.8	0.5	6.5	0.6	1.3	3.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	24.2	1.9	7.0	3.3	58.9	66.3
LnGrp LOS	C	A	A	A	E	E
Approach Vol, veh/h		1345	1972		95	
Approach Delay, s/veh		5.2	6.7		63.2	
Approach LOS		A	A		E	

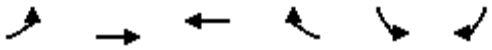
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		109.0		11.0	10.0	99.0
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		90.0		20.0	15.0	70.0
Max Q Clear Time (g_c+I1), s		9.6		6.1	4.4	29.3
Green Ext Time (p_c), s		9.3		0.2	0.4	19.8

Intersection Summary	
HCM 6th Ctrl Delay	7.7
HCM 6th LOS	A

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	78	2000	2235	58	137	171
Future Volume (vph)	78	2000	2235	58	137	171
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		4	
Permitted Phases	2			6		4
Detector Phase	5	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	12.0	90.0	78.0	78.0	30.0	30.0
Total Split (%)	10.0%	75.0%	65.0%	65.0%	25.0%	25.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	-1.0	-2.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	4.0	3.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	94.6	94.6	84.2	84.2	16.4	17.4
Actuated g/C Ratio	0.79	0.79	0.70	0.70	0.14	0.14
v/c Ratio	0.49	0.78	0.98	0.06	0.62	0.59
Control Delay	20.7	11.1	21.7	4.8	59.5	29.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.7	11.1	21.7	4.8	59.5	29.8
LOS	C	B	C	A	E	C
Approach Delay		11.5	21.3		43.0	
Approach LOS		B	C		D	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 100	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.98	
Intersection Signal Delay: 18.4	Intersection LOS: B
Intersection Capacity Utilization 79.9%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 2: SH 7 (Baseline Rd) & Airport Road



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	78	2000	2235	58	137	171
Future Volume (veh/h)	78	2000	2235	58	137	171
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
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	85	2174	2429	63	149	186
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	137	2775	2488	1110	257	242
Arrive On Green	0.04	0.78	0.70	0.70	0.14	0.15
Sat Flow, veh/h	1781	3647	3647	1585	1781	1585
Grp Volume(v), veh/h	85	2174	2429	63	149	186
Grp Sat Flow(s),veh/h/ln	1781	1777	1777	1585	1781	1585
Q Serve(g_s), s	1.5	41.4	77.7	1.5	9.4	13.5
Cycle Q Clear(g_c), s	1.5	41.4	77.7	1.5	9.4	13.5
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	137	2775	2488	1110	257	242
V/C Ratio(X)	0.62	0.78	0.98	0.06	0.58	0.77
Avail Cap(c_a), veh/h	171	2775	2488	1110	386	357
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.3	7.4	17.1	5.6	48.0	48.8
Incr Delay (d2), s/veh	4.5	2.3	13.3	0.1	2.1	5.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	10.1	27.6	0.4	4.4	11.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	38.9	9.7	30.3	5.7	50.0	54.7
LnGrp LOS	D	A	C	A	D	D
Approach Vol, veh/h		2259	2492		335	
Approach Delay, s/veh		10.8	29.7		52.6	
Approach LOS		B	C		D	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		98.7		21.3	9.7	89.0
Change Period (Y+Rc), s		5.0		5.0	5.0	5.0
Max Green Setting (Gmax), s		85.0		25.0	7.0	73.0
Max Q Clear Time (g_c+I1), s		43.4		15.5	3.5	79.7
Green Ext Time (p_c), s		25.4		0.8	0.0	0.0

Intersection Summary		
HCM 6th Ctrl Delay		22.8
HCM 6th LOS		C

PROJECT SHEET *BASE DESIGN STANDARDS*

Complete one Project Sheet for each project that includes Stormwater Quality Control Measures. Please email stormwater@erieco.gov with any questions. This document acceptance shall not be construed to relieve any requirement to conform to the Standards and Specifications not specifically addressed in this form. The engineering design and concept remains the responsibility of the professional engineer.

SITE INFORMATION

Project Name: Erie Village Fifth Filing Replat B			
Project Location: C.W. Bixler Boulevard and E. County Line Road			
Submitted Date: 10/08/2021		Submitted By:	
Applicant Email: mcoonce@porchfronthomes.com		Applicant Phone: 303.442.8453	
Applicant Organization: Porchfront Homes at Erie Village, LLC			
Acreage Disturbed: 19.79			
Existing Impervious: 2.0%		New Net Impervious: 75%	
Review Date:		Reviewed By:	
✓ Preparer	Requirements		
X	Design Details are included for all Control Measures (CM)		
X	List or include a description of any Source CMs (i.e. preventing pollutants from contacting stormwater) or other non-structural CMs: • S-1 Covering Outdoor Storage and Handling Areas • S-2 Spill Prevention, Containment and Control • S-5 Good Housekeeping • S-6 Preventative Maintenance • S-7 Vehicle Maintenance, Fueling and Storage • S-11 Street Sweeping and Cleaning • S-12 Storm Sewer System Cleaning		
X	Does project overlap multiple MS4 Jurisdictions?	Yes	No
N/A	If project overlaps jurisdictions, provide written agreement designating responsibility for CM requirements, review, inspections		

DESIGN STANDARDS

Design Standards may be used in combination, as necessary, to meet the requirements. Additional design methods may be considered if they comply with the MS4 Permit. Evaluation of suitability of Stormwater Quality Control Measures (CMs) is based on pollutant removal, flood attenuation and long-term maintenance. CMs must be designed in accordance with the most current version of USDCM vol. 3, Chapter 4 "Treatment BMPs" and the Town of Erie's Standards and Specifications. CMs must also meet the specific requirements for each Design Standard used. Design Standard requirements can be found on the MS4 general permit here: COR90000

1. Indicate below, which Design Standards will be used for the project, and
2. Complete a separate, corresponding Design Standards checklist for each CM (e.g., WQCV, etc.)

Design Standard	*# CMs*	*Location/Identifying information*
WQCV	1	Pond A – North of C. W. Bixler Boulevard
Pollutant Removal		
Runoff Reduction		
Regional WQCV Control Measure		
Regional WQCV Facility		

CHECKLIST WQCV Standard

WQCV STANDARD Criteria

Control measure(s) must be designed to provide treatment and/or infiltration of the Water Quality Capture Volume (WQCV) for 100% of the site.

Complete checklist if using the WQCV Standard to meet Design Standard requirements.

Project Name: Erie Village Fifth Filing Replat B		
Preparer	Requirements	
X	Control measure(s) provide treatment and/or infiltration of the WQCV for 100% of the site	
X	% of site treated: 100%	
X	CM type: Extended Detention Basin	CM ID/location: Pond A – North of C. W. Bixler Boulevard
X	See Drainage Report section: See Section IV.B.2	

If less than 100% of the site is treated, complete the following:

Preparer	Requirements	
N/A	% of site not treated by control measures (not to exceed 20% or 1 acre):	
	%	size (acres)
N/A	Provide explanation that the excluded area is impractical to treat:	
N/A	Provide explanation that another CM is not practicable for the untreated area:	

Endorsement
Attached to Policy No. OX25152287.1185881
Our Order No. 25152287
Issued By Old Republic National Title Insurance Company

The Company herey insures the insured against loss or damage arising from the effect of any instrument recorded in the public records affecting the title to the land or the lien of the insured mortgage subsequent to the effective date of the policy or of the date of the last previous search of said records, and prior to date of this endorsement, except:

QUIT CLAIM DEED RECORDED APRIL 2, 2019 AT RECEPTION NO. **4477982**.
EASEMENT DEED AND AGREEMENT RECORDED APRIL 24, 2019 AT RECEPTION NO. **4483705**.
STATEMENT OF AUTHORITY FOR REAL INVESTMENTS LLC RECORDED JUNE 14, 2019 AT RECEPTION NO. **4497571**.
NOTICE FOR REQUEST OF SURFACE DEVELOPMENT RECORDED JUNE 19, 2019 AT RECEPTION NO. **4498658** AND **4498659**, AMENDMENTS THERETO RECORDED JULY 17, 2019 AT RECEPTION NO. **4506261** AND **4506262**.

This endorsement does no afford coverage as to taxes, bonds or assessments, if any, except to the extent expressly stated.

Dated: NOVEMBER 07, 2019

This endorsement is issued as part of the Policy. Except as it expressly states, it does not (i) modify any of the terms and provisions of the Policy, (ii) modify any prior endorsements, (iii) extend the Date of Policy, or (iv) increase the Amount of Insurance. To the extent a provision of the Policy or a previous endorsement is inconsistent with an express provision of this endorsement, this endorsement controls. Otherwise, this endorsement is subject to all of the terms and provisions of the Policy and of any prior endorsements.

Old Republic National Title Insurance Company

By: LAND TITLE GUARANTEE COMPANY

By: 

Land Title
GUARANTEE COMPANY

State Documentary Fee
Date: March 27, 2019
$45.00

Warranty Deed

(Pursuant to 38-30-113 C.R.S.)

THIS DEED, made on **March 27th, 2019** by **SHERIDAN SCHOFIELD AND PEGGY J. SCHOFIELD** Grantor(s), of the County of **Douglas** and State of **Colorado** for the consideration of (**$450,000.00**) ***Four Hundred Fifty Thousand and 00/100*** dollars in hand paid, hereby sells and conveys to **DAVID S. NASSAR** Grantee(s), whose street address is **395 AIRPORT DRIVE, ERIE, CO 80516**, County of **Weld**, and State of **Colorado**, the following real property in the County of **Weld**, and State of Colorado, to wit:

TRACT E-2, ERIE AIR PARK TRACT E MINOR SUBDIVISION, COUNTY OF WELD, STATE OF COLORADO

also known by street and number as: **VACANT, ERIE, CO 80516**

with all its appurtenances and warrants the title to the same, subject to *general taxes for the year 2019 and those specific Exceptions described by reference to recorded documents as reflected in the Title Documents accepted by Grantee(s) in accordance with Record Title Matters (Section 8.2) of the Contract to Buy and Sell Real Estate relating to the above described real property; distribution utility easements, (including cable TV); those specifically described rights of third parties not shown by the public records of which Grantee(s) has actual knowledge and which were accepted by Grantee(s) in accordance with Off-Record Title Matters (Section 8.3) and Current Survey Review (Section 9) of the Contract to Buy and Sell Real Estate relating to the above described real property; inclusions of the Property within any special tax district; Any special assessment if the improvements were not installed as of the date of Buyer's signature on the Contract to Buy and Sell Real Estate, whether assessed prior to or after Closing; and other* ***NONE***

Sheridan Schofield
SHERIDAN SCHOFIELD

PEGGY J. SCHOFIELD

State of **Colorado**)
)ss.
County of **BOULDER**)

The foregoing instrument was acknowledged before me on this day of **March 27th, 2019** by **SHERIDAN SCHOFIELD AND PEGGY J. SCHOFIELD**

Witness my hand and official seal

My Commission expires: 5-24-19

Notary Public

JACQUELINE BECK
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 19914007156
My Commission Expires May 24, 2019

4477980 04/02/2019 08:10 AM
Total Pages: 1 Rec Fee: $13.00 Doc Fee: $45.00
Carly Koppes - Clerk and Recorder, Weld County, CO

When recorded return to: **DAVID S. NASSAR**
395 AIRPORT DRIVE, ERIE, CO 80516

4477982 04/02/2019 08:10 AM
Total Pages: 1 Rec Fee: $13.00
Carly Koppes - Clerk and Recorder, Weld County, CO

State Documentary Fee
Date: 03/27/2019
$0.00
No Doc Fee Required

Quit Claim Deed

(Pursuant to 38-30-116 C.R.S.)

THIS DEED, made on **March 27, 2019** by **DAVID S. NASSAR** Grantor(s) of the County of **BOULDER** and State of **COLORADO** for the consideration of ***** Ten Dollars and Other Good and Valuable Consideration ***** dollars in hand paid, hereby sells and quitclaims to **REAL INVESTMENTS LLC, A COLORADO LIMITED LIABILITY COMPANY** Grantee(s), as Entity whose street address is **395 AIRPORT DRIVE, ERIE, CO 80516** County of **Weld**, State of **Colorado**, the following real property in the County of **Weld** and State of **Colorado**, to wit:

TRACT E-2, ERIE AIR PARK TRACT E MINOR SUBDIVISION, COUNTY OF WELD, STATE OF COLORADO

also known by street and number as **VACANT, ERIE, CO 80516**
with all its appurtenances.

DAVID S. NASSAR

DAVID S. NASSAR

State of Colorado)
)ss
County of Boulder)

The foregoing instrument was acknowledged before me on this day of **March 27, 2019** by **DAVID S. NASSAR**

Notary Public
My Commission expires 5-24-19

JACQUELINE BECK
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 19914007156
My Commission Expires May 24, 2019

When recorded return to:
VACANT, ERIE, CO 80516

Land Title GUARANTEE COMPANY

Land Title Guarantee Company
Customer Distribution

PREVENT FRAUD - Please remember to call a member of our closing team when initiating a wire transfer or providing wiring instructions.

Order Number: **FCC25152287-10** Date: **03/29/2019**

Property Address: **VACANT, ERIE, CO 80516**

PLEASE CONTACT YOUR CLOSER OR CLOSER'S ASSISTANT FOR WIRE TRANSFER INSTRUCTIONS

For Closing Assistance	Closer's Assistant	For Title Assistance
Jackie Beck	Alaina Greenhouse	Ft. Collins Customer Care
2595 CANYON BLVD #340	2595 CANYON BLVD #340	772 WHALERS WAY #100
BOULDER, CO 80302	BOULDER, CO 80302	FORT COLLINS, CO 80525
(720) 406-2087 (Work)	(720) 406-2097 (Work)	(970) 282-3649 (Work)
(303) 393-4851 (Work Fax)	(303) 393-3976 (Work Fax)	(970) 282-3652 (Work Fax)
jbeck@ltgc.com	agreenhouse@ltgc.com	customercare@ltgc.com
Company License: CO44565	Contact License: CO545891	
	Company License: CO44565	

Buyer/Borrower
DAVID NASSAR
395 AIRPORT DRIVE
ERIE, CO 80516
david@marketwise.com
Delivered via: Electronic Mail

Seller/Owner
SHERIDAN SCHOFIELD AND PEGGY SCHOFIELD
44 BANTALA PLACE
CASTLE ROCK, CO 80108
(303) 663-3963 (Work)
jschofld@aol.com
Delivered via: Electronic Mail

Land Title Guarantee Company
Estimate of Title Fees

Order Number: **FCC25152287-10** Date: **03/29/2019**

Property Address: **VACANT, ERIE, CO 80516**

Parties: **DAVID S. NASSAR**

SHERIDAN SCHOFIELD AND PEGGY J. SCHOFIELD AND ERIE STORAGE, LLC, A COLORADO LIMITED LIABILITY COMPANY AS THEIR INTEREST MAY APPEAR

Visit Land Title's Website at **www.ltgc.com** for directions to any of our offices.

Estimate of Title insurance Fees	
"ALTA" Owner's Policy 06-17-06 Builder/Developer Rate	$706.00
Deletion of Standard Exception(s)	$100.00
Tax Certificate	$26.00
	Total $832.00

If Land Title Guarantee Company will be closing this transaction, the fees listed above will be collected at closing.

Thank you for your order!

Chain of Title Documents:

Weld county recorded 11/02/2001 under reception no. 2897454

Weld county recorded 01/27/1993 under reception no. 2319662

Plat Map(s):

Weld county recorded 03/22/2019 under reception no. 4475348

Weld county recorded 05/03/1978 under reception no. 1752380

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule A

Order Number: FCC25152287-10

Property Address:

VACANT, ERIE, CO 80516

1. **Effective Date:**

   03/21/2019 at 5:00 P.M.

2. **Policy to be Issued and Proposed Insured:**

   "ALTA" Owner's Policy 06-17-06 Builder/Developer Rate $450,000.00
   Proposed Insured:
   DAVID S. NASSAR

3. **The estate or interest in the land described or referred to in this Commitment and covered herein is:**

   A Fee Simple

4. **Title to the estate or interest covered herein is at the effective date hereof vested in:**

   SHERIDAN SCHOFIELD AND PEGGY J. SCHOFIELD AND ERIE STORAGE, LLC, A COLORADO LIMITED LIABILITY COMPANY AS THEIR INTEREST MAY APPEAR

5. **The Land referred to in this Commitment is described as follows:**

   TRACT E-2, ERIE AIR PARK TRACT E MINOR SUBDIVISION, COUNTY OF WELD, STATE OF COLORADO

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B-1

(Requirements)

Order Number: FCC25152287-10

The following are the requirements to be complied with:

Payment to or for the account of the grantors or mortgagors of the full consideration for the estate or interest to be insured.

Proper instrument(s) creating the estate or interest to be insured must be executed and duly filed for record, to-wit:

1. (THIS ITEM WAS INTENTIONALLY DELETED)
2. WARRANTY DEED FROM SHERIDAN SCHOFIELD AND PEGGY J. SCHOFIELD TO DAVID S. NASSAR CONVEYING SUBJECT PROPERTY.
3. PROVIDE LAND TITLE GUARANTEE COMPANY WITH A CURRENT IMPROVEMENT SURVEY PLAT OR AN ALTA SURVEY OF SUBJECT PROPERTY. UPON REVIEW, ADDITIONAL REQUIREMENTS AND/OR EXCEPTIONS MAY BE NECESSARY.

   LAND TITLE IS NOT RESPONSIBLE FOR ORDERING SAID IMPROVEMENT SURVEY PLAT OR AN ALTA SURVEY.

   SAID SURVEY MUST BE CERTIFIED TO LAND TITLE GUARANTEE COMPANY AND OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY.
4. (THIS ITEM WAS INTENTIONALLY DELETED)
5. GOOD AND SUFFICIENT DEED FROM ERIE STORAGE, LLC, TO DAVID S. NASSAR CONVEYING SUBJECT PROPERTY.
6. WRITTEN CONFIRMATION THAT THE INFORMATION CONTAINED IN STATEMENT OF AUTHORITY FOR ERIE STORAGE, LLC, A COLORADO LIMITED LIABILITY COMPANY RECORDED MARCH 30, 2006 AT RECEPTION NO. **3374676** IS CURRENT.

   NOTE: SAID INSTRUMENT DISCLOSES SAUNDERS BUCKSTEIN AS THE MEMBER AUTHORIZED TO EXECUTE INSTRUMENTS CONVEYING, ENCUMBERING OR OTHERWISE AFFECTING TITLE TO REAL PROPERTY ON BEHALF OF SAID ENTITY. IF THIS INFORMATION IS NOT ACCURATE, A CURRENT STATEMENT OF AUTHORITY MUST BE RECORDED.

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B-1

(Requirements)

Order Number: FCC25152287-10

The following are the requirements to be complied with:

NOTE: ITEMS 1-3 OF THE STANDARD EXCEPTIONS WILL BE DELETED UPON RECEIPT OF AN APPROVED SURVEY. MATTERS DISCLOSED BY SAID SURVEY MAY BE ADDED TO SCHEDULE B-2 HEREOF.

UPON THE APPROVAL OF THE COMPANY AND THE RECEIPT OF A NOTARIZED FINAL LIEN AFFIDAVIT, ITEM NO. 4 OF THE STANDARD EXCEPTIONS ON THE OWNER'S POLICY, WILL BE AMENDED AS FOLLOWS:

ITEM NO. 4 OF THE STANDARD EXCEPTIONS IS DELETED AS TO ANY LIENS OR FUTURE LIENS RESULTING FROM WORK OR MATERIAL FURNISHED AT THE SPECIFIC, DIRECT REQUEST, AND WITH THE ACTUAL KNOWLEDGE OF SHERIDAN SCHOFIELD AND PEGGY J. SCHOFIELD AND ERIE STORAGE, LLC, A COLORADO LIMITED LIABILITY COMPANY AS THEIR INTEREST MAY APPEAR.
OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY SHALL HAVE NO LIABILITY FOR ANY LIENS ARISING FROM WORK OR MATERIAL FURNISHED AT THE SPECIFIC, DIRECT REQUEST, AND WITH THE ACTUAL KNOWLEDGE OF DAVID S. NASSAR.

NOTE: ITEM 5 OF THE STANDARD EXCEPTIONS WILL BE DELETED IF LAND TITLE GUARANTEE COMPANY CONDUCTS THE CLOSING OF THE CONTEMPLATED TRANSACTION(S) AND RECORDS THE DOCUMENTS IN CONNECTION THEREWITH.

NOTE: UPON PROOF OF PAYMENT OF 2016 TAXES, ITEM 6 WILL BE AMENDED TO READ:

TAXES AND ASSESSMENTS FOR THE YEAR 2017 AND SUBSEQUENT YEARS.

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B-2

(Exceptions)

Order Number: FCC25152287-10

The policy or policies to be issued will contain exceptions to the following unless the same are disposed of to the satisfaction of the Company:

1. **Any facts, rights, interests, or claims thereof, not shown by the Public Records but that could be ascertained by an inspection of the Land or that may be asserted by persons in possession of the Land.**
2. **Easements, liens or encumbrances, or claims thereof, not shown by the Public Records.**
3. **Any encroachment, encumbrance, violation, variation, or adverse circumstance affecting the Title that would be disclosed by an accurate and complete land survey of the Land and not shown by the Public Records.**
4. **Any lien, or right to a lien, for services, labor or material heretofore or hereafter furnished, imposed by law and not shown by the Public Records.**
5. **Defects, liens, encumbrances, adverse claims or other matters, if any, created, first appearing in the public records or attaching subsequent to the effective date hereof but prior to the date of the proposed insured acquires of record for value the estate or interest or mortgage thereon covered by this Commitment.**
6. **(a) Taxes or assessments that are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the Public Records; (b) proceedings by a public agency that may result in taxes or assessments, or notices of such proceedings, whether or not shown by the records of such agency or by the Public Records.**
7. **(a) Unpatented mining claims; (b) reservations or exceptions in patents or in Acts authorizing the issuance thereof; (c) water rights, claims or title to water.**
8. ALL MINERALS ON AND UNDER THE SUBJECT PROPERTY, INCLUDING BUT NOT LIMITED TO COAL, OIL AND GAS AS WELL AS THE RIGHT OF INGRESS AND EGRESS UPON AND ACROSS SAID LANDS FOR THE PURPOSE OF PROSPECTING FOR, MINING, TREATING, PROCESSING, TAKING AND TRANSPORTING ANY AND ALL MINERALS AND FOR THE CONSTRUCTION OF PLANTS, HOUSES, BUILDINGS, OFFICES, DUMPS, ROADS, POWER LINES, PIPE LINES AND OTHER STRUCTURES INCIDENTAL TO SUCH OPERATIONS, AS RESERVED BY THE ROCKY MOUNTAIN FUEL COMPANY IN WARRANTY DEED RECORDED AUGUST 27, 1946 IN BOOK 1186 AT PAGE **313**, AND ANY INTEREST THEREIN OR RIGHTS THEREUNDER.
9. CONDITION THAT THE OWNER OF THE SUBJECT PROPERTY, HIS SUCCESSORS AND ASSIGNS, FOREVER WAIVES AND RELEASES ANY AND ALL CLAIM OR CLAIMS HE MIGHT HAVE OR ACQUIRE IN THE FUTURE ARISING OUT OF ANY INJURY FOR DAMAGES, AS WELL AS ANY RIGHT TO ENJOIN THE ROCKY MOUNTAIN FUEL COMPANY, ITS SUCCESSORS IN INTEREST AND ASSIGNS, BECAUSE OF ANY INJURY OR THREATENED INJURY CAUSED OR OCCASIONED AT ANY TIME BY SUBSIDENCE OR OTHER DISTURBANCES OF THE SURFACE OF THE SUBJECT PROPERTY OCCASIONED BY ANY MINING OPERATIONS OR ACTIVITIES INCIDENT THERETO INVOLVING THE MINERALS THEREON OR THEREUNDER, AS IMPOSED IN WARRANTY DEED FROM THE ROCKY MOUNTAIN FUEL COMPANY RECORDED AUGUST 27, 1946, IN BOOK 1186 AT PAGE **313**.
10. RIGHT OF WAY FOR ELECTRIC TRANSMISSION LINE PURPOSES AS CONTAINED IN INSTRUMENT RECORDED JULY 21, 1954 IN BOOK 1395 AT PAGE **571**.
11. RIGHT OF WAY EASEMENT AS GRANTED TO PUBLIC SERVICE COMPANY OF COLORADO IN INSTRUMENT RECORDED JULY 21, 1954, IN BOOK 1395 AT PAGE **573**.

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B-2

(Exceptions)

Order Number: FCC25152287-10

The policy or policies to be issued will contain exceptions to the following unless the same are disposed of to the satisfaction of the Company:

12. RIGHT OF WAY EASEMENT AS GRANTED TO THE MOUNTAIN STATES TELEPHONE AND TELEGRAPH COMPANY IN INSTRUMENT RECORDED APRIL 20, 1957, IN BOOK 1475 AT PAGE 553.
13. TERMS, CONDITIONS AND PROVISIONS OF EASEMENT RECORDED OCTOBER 31, 1961 IN BOOK 1598 AT PAGE 165.
14. TERMS, CONDITIONS AND PROVISIONS OF ANNEXATION AGREEMENT RECORDED DECEMBER 28, 1977 UNDER RECEPTION NO. 1739852.
15. TERMS, CONDITIONS AND PROVISIONS OF ERIE AIR PARK SUBDIVISION AGREEMENT RECORDED MAY 03, 1978 UNDER RECEPTION NO. 1752378.
16. TERMS, CONDITIONS AND PROVISIONS OF AVIATION EASEMENT AND AGREEMENT RECORDED MAY 11, 1978 UNDER RECEPTION NO. 1753139.
17. TERMS, CONDITIONS AND PROVISIONS OF EASEMENT FOR RUNWAY LIGHT INSTALLATION AND MAINTENANCE, DRAINAGE AND SNOW REMOVAL AGREEMENT RECORDED MAY 11, 1978 UNDER RECEPTION NO. 1753142.
18. TERMS, CONDITIONS AND PROVISIONS OF SOLAR EASEMENT AND AGREEMENT RECORDED MAY 11, 1978 UNDER RECEPTION NO. 1753143.
19. EASEMENTS, CONDITIONS, COVENANTS, RESTRICTIONS, RESERVATIONS AND NOTES ON THE PLAT OF ERIE AIR PARK SUBDIVISION RECORDED MAY 03, 1978 UNDER RECEPTION NO. 1752380.
20. THE EFFECT, IF ANY, OF LETTER RECORDED AUGUST 12, 1982 UNDER RECEPTION NO. 1900277.
21. TERMS, CONDITIONS AND PROVISIONS OF LEASE RECORDED SEPTEMBER 29, 1982 AT RECEPTION NO. 1905076.

    NOTE: EXTENSION OF THE ABOVE LEASE AS CLAIMED BY AFFIDAVIT OF PRODUCTION WAS RECORDED OCTOBER 12, 1984 UNDER RECEPTION NO. 1984915.
22. RESTRICTIVE COVENANTS, WHICH DO NOT CONTAIN A FORFEITURE OR REVERTER CLAUSE, AS CONTAINED IN INSTRUMENT RECORDED MAY 11, 1978, UNDER RECEPTION NO. 1753140 AND AS AMENDED IN INSTRUMENT RECORDED SEPTEMBER 30, 1993, UNDER RECEPTION NO. 2352630 IN BOOK 1404 AND AS AMENDED DECEMBER 27, 1993 AT RECEPTION NO. 2365912 AND AS AMENDED IN INSTRUMENT RECORDED DECEMBER 21, 1995, UNDER RECEPTION NO. 2468577 IN BOOK 1524 AND AMENDED OCTOBER 22, 2002 AT RECEPTION NO. 2998230
23. TERMS, CONDITIONS AND PROVISIONS OF AGREEMENT RECORDED APRIL 28, 1986 AT RECEPTION NO. 2051362.
24. TERMS, CONDITIONS AND PROVISIONS OF ASSESSMENT RECORDED NOVEMBER 21, 1990 AT RECEPTION NO. 2233799.
25. THE TERMS AND PROVISIONS OF ORDINANCE NOS. 409 AND 411, RECORDED FEBRUARY 4, 1991 UNDER RECEPTION NO. 2240420 AND FEBRUARY 25, 1991 UNDER RECEPTION NO. 2242128
26. TERMS, CONDITIONS AND PROVISIONS OF AGREEMENT RECORDED MARCH 05, 1991 AT RECEPTION NO. 2243072.

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B-2

(Exceptions)

Order Number: FCC25152287-10

The policy or policies to be issued will contain exceptions to the following unless the same are disposed of to the satisfaction of the Company:

27. ORDER OF INCLUSION FOR WELD COUNTY PORTION OF THE TOWN OF ERIE INTO THE NORTHERN COLORADO WATER CONSERVANCY DISTRICT RECORDED FEBRUARY 6, 1992 UNDER RECEPTION NO. **2277399**.
28. TERMS, AGREEMENTS, PROVISIONS, CONDITIONS AND OBLIGATIONS, AS CONTAINED IN AGREEMENT REGARDING INSTALLATION OF SANITARY SEWER LINES BY AND BETWEEN ERIE WATER AND SANITATION DISTRICT AND ROBERT LEE ROCK RECORDED AUGUST 13, 1992 UNDER RECEPTION NO. **2299958** IN BOOK 1347
29. RESTRICTIVE COVENANTS, WHICH DO NOT CONTAIN A FORFEITURE OR REVERTER CLAUSE, AS CONTAINED IN INSTRUMENT RECORDED DECEMBER 27, 1993, UNDER RECEPTION NO. **2365912**.
30. TERMS, CONDITIONS AND PROVISIONS OF ORDER RECORDED APRIL 18, 1995 AT RECEPTION NO. **2434694**.
31. TERMS, CONDITIONS AND PROVISIONS OF ORDER RECORDED APRIL 27, 1995 AT RECEPTION NO. **2435904**.
32. MATTERS AS SET FORTH ON SURVEY RECORDED JUNE 28, 2002 AT RECEPTION NO. **2969635**
33. TERMS, CONDITIONS AND PROVISIONS OF OPTION RECORDED MARCH 20, 2006 AT RECEPTION NO. **3371704**.
34. TERMS, CONDITIONS AND PROVISIONS OF TAXIWAY EASEMENT DEED AND AGREEMENT RECORDED DECEMBER 15, 2006 AT RECEPTION NO. **3442230**.
35. EXISTING LEASES OR TENANCIES, IF ANY
36. ANY LOSS OR DAMAGE WHICH THE PROPOSED INSUREDS MAY INCUR BY REASON OF THE FAILURE TO COMPLY WITH THE LAWS AND REGULATIONS OF ANY STATE, COUNTY OR OTHER AUTHORITY RELATING TO THE SUBDIVISION OF THE LAND TO BE INSURED.
37. ANY FACTS, RIGHTS, INTERESTS OR CLAIMS WHICH MAY EXIST OR ARISE BY REASON OF THE FOLLOWING FACTS SHOWN ON ALTA/NSPS LAND TITLE SURVEY CERTIFIED _____ PREPARED BY SCOTT, COX & ASSOCIATES, INC., JOB #17150A:
    A. STORM DRAINAGE LINES AND MANHOLES
    B. WATER LINE
    SAID DOCUMENT STORED AS OUR ESI _____
38. EASEMENTS, CONDITIONS, COVENANTS, RESTRICTIONS, RESERVATIONS AND NOTES ON THE PLAT OF ERIE AIR PARK TRACT E MINOR SUBDIVISION RECORDED MARCH 22, 2019 UNDER RECEPTION NO. **4475348**.

LAND TITLE GUARANTEE COMPANY
DISCLOSURE STATEMENTS

Note: Pursuant to CRS 10-11-122, notice is hereby given that:

(A) The Subject real property may be located in a special taxing district.

(B) A certificate of taxes due listing each taxing jurisdiction will be obtained from the county treasurer of the county in which the real property is located or that county treasurer's authorized agent unless the proposed insured provides written instructions to the contrary. (for an Owner's Policy of Title Insurance pertaining to a sale of residential real property).

(C) The information regarding special districts and the boundaries of such districts may be obtained from the Board of County Commissioners, the County Clerk and Recorder, or the County Assessor.

Note: Effective September 1, 1997, CRS 30-10-406 requires that all documents received for recording or filing in the clerk and recorder's office shall contain a top margin of at least one inch and a left, right and bottom margin of at least one half of an inch. The clerk and recorder may refuse to record or file any document that does not conform, except that, the requirement for the top margin shall not apply to documents using forms on which space is provided for recording or filing information at the top margin of the document.

Note: Colorado Division of Insurance Regulations 8-1-2 requires that "Every title entity shall be responsible for all matters which appear of record prior to the time of recording whenever the title entity conducts the closing and is responsible for recording or filing of legal documents resulting from the transaction which was closed". Provided that Land Title Guarantee Company conducts the closing of the insured transaction and is responsible for recording the legal documents from the transaction, exception number 5 will not appear on the Owner's Title Policy and the Lenders Policy when issued.

Note: Affirmative mechanic's lien protection for the Owner may be available (typically by deletion of Exception no. 4 of Schedule B, Section 2 of the Commitment from the Owner's Policy to be issued) upon compliance with the following conditions:

(A) The land described in Schedule A of this commitment must be a single family residence which includes a condominium or townhouse unit.

(B) No labor or materials have been furnished by mechanics or material-men for purposes of construction on the land described in Schedule A of this Commitment within the past 6 months.

(C) The Company must receive an appropriate affidavit indemnifying the Company against un-filed mechanic's and material-men's liens.

(D) The Company must receive payment of the appropriate premium.

(E) If there has been construction, improvements or major repairs undertaken on the property to be purchased within six months prior to the Date of Commitment, the requirements to obtain coverage for unrecorded liens will include: disclosure of certain construction information; financial information as to the seller, the builder and or the contractor; payment of the appropriate premium fully executed Indemnity Agreements satisfactory to the company, and, any additional requirements as may be necessary after an examination of the aforesaid information by the Company.

No coverage will be given under any circumstances for labor or material for which the insured has contracted for or agreed to pay.

Note: Pursuant to CRS 10-11-123, notice is hereby given:

This notice applies to owner's policy commitments disclosing that a mineral estate has been severed from the surface estate, in Schedule B-2.

(A) That there is recorded evidence that a mineral estate has been severed, leased, or otherwise conveyed from the surface estate and that there is substantial likelihood that a third party holds some or all interest in oil, gas, other minerals, or geothermal energy in the property; and

(B) That such mineral estate may include the right to enter and use the property without the surface owner's permission.

Note: Pursuant to CRS 10-1-128(6)(a), It is unlawful to knowingly provide false, incomplete, or misleading facts or information to an insurance company for the purpose of defrauding or attempting to defraud the company. Penalties may include imprisonment, fines, denial of insurance, and civil damages. Any insurance company or agent of an insurance company who knowingly provides false, incomplete, or misleading facts or information to a policyholder or claimant for the purpose of defrauding or attempting to defraud the policyholder or claimant with regard to a settlement or award payable from insurance proceeds shall be reported to the Colorado Division of Insurance within the Department of Regulatory Agencies.

Note: Pursuant to Colorado Division of Insurance Regulations 8-1-3, notice is hereby given of the availability of a closing protection letter for the lender, purchaser, lessee or seller in connection with this transaction.

JOINT NOTICE OF PRIVACY POLICY OF LAND TITLE GUARANTEE COMPANY, LAND TITLE GUARANTEE COMPANY OF SUMMIT COUNTY LAND TITLE INSURANCE CORPORATION AND OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY

This Statement is provided to you as a customer of Land Title Guarantee Company as agent for Land Title Insurance Corporation and Old Republic National Title Insurance Company.

We want you to know that we recognize and respect your privacy expectations and the requirements of federal and state privacy laws. Information security is one of our highest priorities. We recognize that maintaining your trust and confidence is the bedrock of our business. We maintain and regularly review internal and external safeguards against unauthorized access to non-public personal information ("Personal Information").

In the course of our business, we may collect Personal Information about you from:

- applications or other forms we receive from you, including communications sent through TMX, our web-based transaction management system;
- your transactions with, or from the services being performed by us, our affiliates, or others;
- a consumer reporting agency, if such information is provided to us in connection with your transaction;

  and
- The public records maintained by governmental entities that we either obtain directly from those entities, or from our affiliates and non-affiliates.

Our policies regarding the protection of the confidentiality and security of your Personal Information are as follows:

- We restrict access to all Personal Information about you to those employees who need to know that information in order to provide products and services to you.
- We maintain physical, electronic and procedural safeguards that comply with federal standards to protect your Personal Information from unauthorized access or intrusion.
- Employees who violate our strict policies and procedures regarding privacy are subject to disciplinary action.
- We regularly assess security standards and procedures to protect against unauthorized access to Personal Information.

WE DO NOT DISCLOSE ANY PERSONAL INFORMATION ABOUT YOU WITH ANYONE FOR ANY PURPOSE THAT IS NOT PERMITTED BY LAW.

Consistent with applicable privacy laws, there are some situations in which Personal Information may be disclosed. We may disclose your Personal Information when you direct or give us permission; when we are required by law to do so, for example, if we are served a subpoena; or when we suspect fraudulent or criminal activities. We also may disclose your Personal Information when otherwise permitted by applicable privacy laws such as, for example, when disclosure is needed to enforce our rights arising out of any agreement, transaction or relationship with you.

Our policy regarding dispute resolution is as follows: Any controversy or claim arising out of or relating to our privacy policy, or the breach thereof, shall be settled by arbitration in accordance with the rules of the American Arbitration Association, and judgment upon the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof.

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Commitment to Insure

ALTA Commitment - 2006 Rev.

OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY, a Minnesota corporation, (Company), for a valuable consideration, commits to issue its policy or policies of title insurance, as identified in Schedule A, in favor of the Proposed Insured named in Schedule A, as owner or mortgagee of the estate or interest in the land described or referred to in Schedule A, upon payment of the premiums and charges and compliance with the requirements; all subject to the provisions of Schedule A and B and to the Conditions of this Commitment.

This Commitment shall be effective only when the identity of the Proposed Insured and the amount of the policy or policies committed for have been inserted in Schedule A by the Company. All liability and obligation under this commitment shall cease and terminate six months after the Effective Date or when the policy or policies committed for shall issue, whichever first occurs, provided that the failure to issue such policy or policies is not the fault of the Company.

Conditions and Stipulations

1. The term "mortgage", when used herein, shall include deed of trust, trust deed, or other security instrument.
2. If the proposed Insured has or acquires actual knowledge of any defect, lien, encumbrance, adverse claim or other matter affecting the estate or interest or mortgage thereon covered by this Commitment other than those shown in Schedule B hereof, and shall fail to disclose such knowledge to Company in writing, the Company shall be relieved from liability for any loss or damage resulting from any act of reliance hereon to the extent the Company is prejudiced by failure to so disclose such knowledge. If the proposed Insured shall disclose such knowledge to the Company, or if the Company otherwise acquires actual knowledge of any such defect, lien, encumbrance, adverse claim or other matter, the Company at its option may amend Schedule B of this Commitment accordingly, but such amendment shall not relieve the Company from liability previously incurred pursuant to paragraph 3 of these Conditions and Stipulations.
3. Liability of the Company under this Commitment shall be only to the named proposed Insured and such parties included under the definition of Insured in the form of policy or policies committed for and only for actual loss incurred in reliance hereon in undertaking in good faith (a) to comply with the requirements hereof or (b) to eliminate exceptions shown in Schedule B, or (c) to acquire or create the estate or interest or mortgage thereon covered by this Commitment. In no event shall such liability exceed the amount stated in Schedule A for the policy or policies committed for and such liability is subject to the insuring provisions and the Conditions and Stipulations and the Exclusions from Coverage of the form of policy or policies committed for in favor of the proposed Insured which are hereby incorporated by reference and are made a part of this Commitment except as expressly modified herein.
4. This commitment is a contract to issue one or more title insurance policies and is not an abstract of title or a report of the condition of title. Any action or actions or rights of action that the proposed Insured may have or may bring against the Company arising out of the status of the title to the estate or interest or the status of the mortgage thereon covered by this Commitment must be based on and are subject to the provisions of this Commitment.
5. The policy to be issued contains an arbitration clause. All arbitrable matters when the Amount of Insurance is $2,000,000 or less shall be arbitrated at the option of either the Company or the Insured as the exclusive remedy of the parties. You may review a copy of the arbitration rules at www.alta.org.

Standard Exceptions

In addition to the matters contained in the Conditions and Stipulations and Exclusions from Coverage above referred to, this Commitment is also subject to the following:

1. Rights or claims of parties in possession not shown by the Public records.
2. Easements, or claims of easements, not shown by the Public Records.
3. Discrepancies, conflicts in boundary lines, shortage in area, encroachments, and any facts which a correct survey or inspection of the Land would disclose and which are not shown by the Public Records.
4. Any lien, or right to a lien, for services, labor or material theretofore or hereafter furnished, imposed by law and not shown by the Public Records.
5. Defects, liens, encumbrances, adverse claims or other matters, if any, created, first appearing in the Public Records or attaching subsequent to the effective date hereof but prior to the date the proposed insured acquires of record for value the estate or interest or mortgage thereon covered by this Commitment.

IN WITNESS WHEREOF, Old Republic National Title Insurance Company has caused its corporate name and seal to be affixed by its duly authorized officers on the date shown in Schedule A to be valid when countersigned by a validating officer or other authorized signatory.

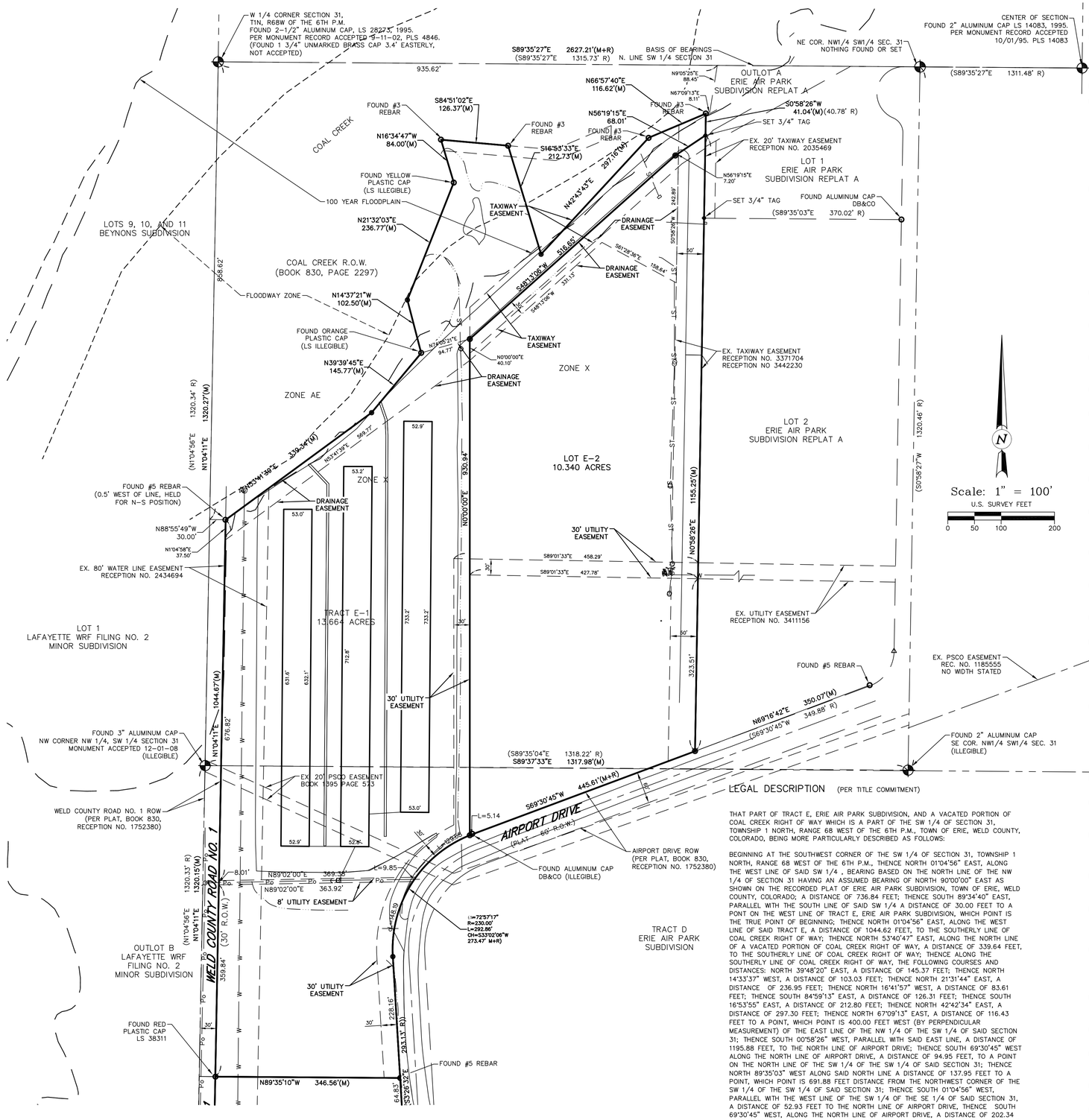
Issued by:
Land Title Guarantee Company
3033 East First Avenue Suite 600
Denver, Colorado 80206
303-321-1880

President

Old Republic National Title Insurance Company, a Stock Company
400 Second Avenue South
Minneapolis, Minnesota 55401
(612)371-1111

Mark Bilbrey, President

Rande Yeager, Secretary



TITLE COMMITMENT NOTES

THIS SURVEY DOES NOT CONSTITUTE A TITLE SEARCH BY SCOTT, COX & ASSOCIATES, INC. LAND TITLE GUARANTEE COMPANY ORDER NUMBER: FCC25152287-6 EFFECTIVE DATE 12/28/2018 AT 5:00 P.M. WAS SOLELY RELIED UPON FOR INFORMATION REGARDING EASEMENTS, RIGHTS-OF-WAY, AND ENCUMBRANCES OF RECORD IN THE PREPARATION OF THIS SURVEY.

THE FOLLOWING ITEMS ARE AS ENUMERATED IN SCHEDULE B-2 EXCEPTIONS. [SURVEYOR'S NOTES]

ITEMS 1-7 STANDARD EXCEPTIONS REFER TO TITLE COMMITMENT.

ITEM 8 ALL MINERALS ON AND UNDER THE SUBJECT PROPERTY, INCLUDING BUT NOT LIMITED TO COAL, OIL AND GAS AS WELL AS THE RIGHT OF INGRESS AND EGRESS UPON AND ACROSS SAID LANDS FOR THE PURPOSE OF PROSPECTING FOR, MINING, TREATING, PROCESSING, TAKING AND TRANSPORTING ANY AND ALL MINERALS AND FOR THE CONSTRUCTION OF PLANTS, HOUSES, BUILDINGS, OFFICES, DUMPS, ROADS, POWER LINES, PIPE LINES AND OTHER STRUCTURES INCIDENTAL TO SUCH OPERATIONS, AS RESERVED BY THE ROCKY MOUNTAIN FUEL COMPANY IN WARRANTY DEED RECORDED AUGUST 27, 1946 IN BOOK 1186 AT PAGE 313, AND ANY INTEREST THEREIN OR RIGHTS THEREUNDER. [AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE]

ITEM 9 CONDITION THAT THE OWNER OF THE SUBJECT PROPERTY, HIS SUCCESSORS AND ASSIGNS, FOREVER WAIVES AND RELEASES ANY AND ALL CLAIM OR CLAIMS HE MIGHT HAVE OR ACQUIRE IN THE FUTURE ARISING OUT OF ANY INJURY FOR DAMAGES, AS WELL AS ANY RIGHT TO ENJOIN THE ROCKY MOUNTAIN FUEL COMPANY, ITS SUCCESSORS IN INTEREST AND ASSIGNS, BECAUSE OF ANY INJURY OR THREATENED INJURY CAUSED OR OCCASIONED AT ANY TIME BY SUBSIDENCE OR OTHER DISTURBANCES OF THE SURFACE OF THE SUBJECT PROPERTY OCCASIONED BY ANY MINING OPERATIONS OR ACTIVITIES INCIDENT THERETO INVOLVING THE MINERALS THEREON OR THEREUNDER, AS IMPOSED IN WARRANTY DEED FROM THE ROCKY MOUNTAIN FUEL COMPANY RECORDED AUGUST 27, 1946, IN BOOK 1186 AT PAGE 313. [AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE]

ITEM 10 RIGHT OF WAY FOR ELECTRIC TRANSMISSION LINE PURPOSES AS CONTAINED IN INSTRUMENT RECORDED JULY 21, 1954 IN BOOK 1395 AT PAGE 571. [DOES NOT AFFECT THE PROPERTY]

ITEM 11 RIGHT OF WAY EASEMENT AS GRANTED TO PUBLIC SERVICE COMPANY OF COLORADO IN INSTRUMENT RECORDED JULY 21, 1954, IN BOOK 1395 AT PAGE 573. [AFFECTS PROPERTY AND IS SHOWN]

ITEM 12 RIGHT OF WAY EASEMENT AS GRANTED TO THE MOUNTAIN STATES TELEPHONE AND TELEGRAPH COMPANY IN INSTRUMENT RECORDED APRIL 20, 1957, IN BOOK 1475 AT PAGE 553. [AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE]

ITEM 13 TERMS, CONDITIONS AND PROVISIONS OF EASEMENT RECORDED OCTOBER 31, 1961 IN BOOK 1598 AT PAGE 165. [UNABLE TO READ]

ITEM 14 TERMS, CONDITIONS AND PROVISIONS OF ANNEXATION AGREEMENT RECORDED DECEMBER 28, 1977 UNDER RECEPTION NO. 1739852. [MAY INCLUDE A PORTION OF THE SITE]

ITEM 15 TERMS, CONDITIONS AND PROVISIONS OF ERIE AIR PARK SUBDIVISION AGREEMENT RECORDED MAY 03, 1978 UNDER RECEPTION NO. 1752378. [AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE]

ITEM 16 TERMS, CONDITIONS AND PROVISIONS OF AVIATION EASEMENT AND AGREEMENT RECORDED MAY 11, 1978 UNDER RECEPTION NO. 1753139. [AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE]

ITEM 17 TERMS, CONDITIONS AND PROVISIONS OF EASEMENT FOR RUNWAY LIGHT INSTALLATION AND MAINTENANCE, DRAINAGE AND SNOW REMOVAL AGREEMENT RECORDED MAY 11, 1978 UNDER RECEPTION NO. 1753142. [DOES NOT AFFECT THE PROPERTY]

ITEM 18 TERMS, CONDITIONS AND PROVISIONS OF SOLAR EASEMENT AND AGREEMENT RECORDED MAY 11, 1978 UNDER RECEPTION NO. 1753143.[AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE FOR COLLECTION OF SOLAR PANELS]

ITEM 19 EASEMENTS, CONDITIONS, COVENANTS, RESTRICTIONS, RESERVATIONS AND NOTES ON THE PLAT OF ERIE AIR PARK SUBDIVISION RECORDED MAY 03, 1978 UNDER RECEPTION NO. 1752380. [AFFECTS PROPERTY AND IS SHOWN]

ITEM 20 THE EFFECT, IF ANY, OF LETTER RECORDED AUGUST 12, 1982 UNDER RECEPTION NO. 1900277. [AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE]

ITEM 21 TERMS, CONDITIONS AND PROVISIONS OF LEASE RECORDED SEPTEMBER 29, 1982 AT RECEPTION NO. 1905076. [AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE]

NOTE: EXTENSION OF THE ABOVE LEASE AS CLAIMED BY AFFIDAVIT OF PRODUCTION WAS RECORDED OCTOBER 12, 1984 UNDER RECEPTION NO. 1984915. [AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE]

ITEM 22 RESTRICTIVE COVENANTS, WHICH DO NOT CONTAIN A FORFEITURE OR REVERTER CLAUSE, AS CONTAINED IN INSTRUMENT RECORDED MAY 11, 1978, UNDER RECEPTION NO. 1753140 AND AS AMENDED IN INSTRUMENT RECORDED SEPTEMBER 30, 1993, UNDER RECEPTION NO. 2352630 IN BOOK 1404 AND AS AMENDED DECEMBER 27, 1993 AT RECEPTION NO. 2365912 AND AS AMENDED IN INSTRUMENT RECORDED DECEMBER 21, 1995, UNDER RECEPTION NO. 2468577 IN BOOK 1524 AND AMENDED OCTOBER 22, 2002 AT RECEPTION NO. 2998230. [AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE]

ITEM 23 TERMS, CONDITIONS AND PROVISIONS OF AGREEMENT RECORDED APRIL 28, 1986 AT RECEPTION NO. 2051362. [DOES NOT AFFECT THE PROPERTY]

ITEM 24 TERMS, CONDITIONS AND PROVISIONS OF ASSESSMENT RECORDED NOVEMBER 21, 1990 AT RECEPTION NO. 2233799. [AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE]

ITEM 25 THE TERMS AND PROVISIONS OF ORDINANCE NOS. 409 AND 411, RECORDED FEBRUARY 4, 1991 UNDER RECEPTION NO. 2240420 AND FEBRUARY 25, 1991 UNDER RECEPTION NO. 2242128. [AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE]

ITEM 26 TERMS, CONDITIONS AND PROVISIONS OF AGREEMENT RECORDED MARCH 05, 1991 AT RECEPTION NO. 2243072. [AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE]

ITEM 27 ORDER OF INCLUSION FOR WELD COUNTY PORTION OF THE TOWN OF ERIE INTO THE NORTHERN COLORADO WATER CONSERVANCY DISTRICT RECORDED FEBRUARY 6, 1992 UNDER RECEPTION NO. 2277399. [AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE]

ITEM 28 TERMS, AGREEMENTS, PROVISIONS, CONDITIONS AND OBLIGATIONS, AS CONTAINED IN AGREEMENT REGARDING INSTALLATION OF SANITARY SEWER LINES BY AND BETWEEN ERIE WATER AND SANITATION DISTRICT AND ROBERT LEE ROCK RECORDED AUGUST 13, 1992 UNDER RECEPTION NO. 2299958 IN BOOK 1347. [DOES NOT AFFECT THE PROPERTY]

ITEM 29 RESTRICTIVE COVENANTS, WHICH DO NOT CONTAIN A FORFEITURE OR REVERTER CLAUSE, AS CONTAINED IN INSTRUMENT RECORDED DECEMBER 27, 1993, UNDER RECEPTION NO. 2365912. [AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE]

ITEM 30 TERMS, CONDITIONS AND PROVISIONS OF ORDER RECORDED APRIL 18, 1995 AT RECEPTION NO. 2434694. [DOES NOT AFFECT THE PROPERTY]

ITEM 31 TERMS, CONDITIONS AND PROVISIONS OF ORDER RECORDED APRIL 27, 1995 AT RECEPTION NO. 2435904. [AFFECTS PROPERTY AND IS SHOWN] JOHN NEEDS TO LOOK AT

ITEM 32 MATTERS AS SET FORTH ON SURVEY RECORDED JUNE 28, 2002 AT RECEPTION NO. 2969635. [AFFECTS PROPERTY AND IS SHOWN (GILLANS SURVEY)]

ITEM 33 TERMS, CONDITIONS AND PROVISIONS OF OPTION RECORDED MARCH 20, 2006 AT RECEPTION NO. 3371704. [AFFECTS PROPERTY AND IS SHOWN]

ITEM 34 TERMS, CONDITIONS AND PROVISIONS OF TAXIWAY EASEMENT DEED AND AGREEMENT RECORDED DECEMBER 15, 2006 AT RECEPTION NO. 3442230. [AFFECTS PROPERTY AND IS SHOWN]

ITEM 35 EXISTING LEASES OR TENANCIES, IF ANY. [AFFECTS THE PROPERTY BUT IS BLANKET IN NATURE]

LEGAL DESCRIPTION (PER TITLE COMMITMENT)

THAT PART OF TRACT E, ERIE AIR PARK SUBDIVISION, AND A VACATED PORTION OF COAL CREEK RIGHT OF WAY WHICH IS A PART OF THE SW 1/4 OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., TOWN OF ERIE, WELD COUNTY, COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF THE SW 1/4 OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M., THENCE NORTH 01°04'56" EAST, ALONG THE WEST LINE OF SAID SW 1/4 , BEARING BASED ON THE NORTH LINE OF THE NW 1/4 OF SECTION 31 HAVING AN ASSUMED BEARING OF NORTH 90°00'00" EAST AS SHOWN ON THE RECORDED PLAT OF ERIE AIR PARK SUBDIVISION, TOWN OF ERIE, WELD COUNTY, COLORADO; A DISTANCE OF 736.84 FEET; THENCE SOUTH 89°34'40" EAST, PARALLEL WITH THE SOUTH LINE OF SAID SW 1/4 A DISTANCE OF 30.00 FEET TO A PONT ON THE WEST LINE OF TRACT E, ERIE AIR PARK SUBDIVISION, WHICH POINT IS THE TRUE POINT OF BEGINNING; THENCE NORTH 01°04'56" EAST, ALONG THE WEST LINE OF SAID TRACT E, A DISTANCE OF 1044.62 FEET, TO THE SOUTHERLY LINE OF COAL CREEK RIGHT OF WAY; THENCE NORTH 53°40'47" EAST, ALONG THE NORTH LINE OF A VACATED PORTION OF COAL CREEK RIGHT OF WAY, A DISTANCE OF 339.64 FEET, TO THE SOUTHERLY LINE OF COAL CREEK RIGHT OF WAY; THENCE ALONG THE SOUTHERLY LINE OF COAL CREEK RIGHT OF WAY, THE FOLLOWING COURSES AND DISTANCES: NORTH 39°48'20" EAST, A DISTANCE OF 145.37 FEET; THENCE NORTH 14°33'37" WEST, A DISTANCE OF 103.03 FEET; THENCE NORTH 21°31'44" EAST, A DISTANCE OF 236.95 FEET; THENCE NORTH 16°41'57" WEST, A DISTANCE OF 83.61 FEET; THENCE SOUTH 84°59'13" EAST, A DISTANCE OF 126.31 FEET; THENCE SOUTH 16°53'55" EAST, A DISTANCE OF 212.80 FEET; THENCE NORTH 42°42'34" EAST, A DISTANCE OF 297.30 FEET; THENCE NORTH 67°09'13" EAST, A DISTANCE OF 116.43 FEET TO A POINT, WHICH POINT IS 400.00 FEET WEST (BY PERPENDICULAR MEASUREMENT) OF THE EAST LINE OF THE NW 1/4 OF THE SW 1/4 OF SAID SECTION 31; THENCE SOUTH 00°58'26" WEST, PARALLEL WITH SAID EAST LINE, A DISTANCE OF 1195.88 FEET, TO THE NORTH LINE OF AIRPORT DRIVE; THENCE SOUTH 69°30'45" WEST ALONG THE NORTH LINE OF AIRPORT DRIVE, A DISTANCE OF 94.95 FEET, TO A POINT ON THE NORTH LINE OF THE SW 1/4 OF THE SW 1/4 OF SAID SECTION 31; THENCE NORTH 89°35'03" WEST ALONG SAID NORTH LINE A DISTANCE OF 137.95 FEET TO A POINT, WHICH POINT IS 691.88 FEET DISTANCE FROM THE NORTHWEST CORNER OF THE SW 1/4 OF THE SW 1/4 OF SAID SECTION 31; THENCE SOUTH 01°04'56" WEST, PARALLEL WITH THE WEST LINE OF THE SW 1/4 OF THE SE 1/4 OF SAID SECTION 31, A DISTANCE OF 52.93 FEET TO THE NORTH LINE OF AIRPORT DRIVE, THENCE SOUTH 69°30'45" WEST, ALONG THE NORTH LINE OF AIRPORT DRIVE, A DISTANCE OF 202.34 FEET TO A POINT OF CURVATURE; THENCE CONTINUING ALONG THE WESTERLY LINE OF AIRPORT DRIVE AND ALONG A CURVE TO THE LEFT HAVING A RADIUS OF 230.00 FEET, A CENTRAL ANGLE OF 72°57'17", AN ARC DISTANCE OF 292.86 FEET, TO A POINT OF TANGENT; THENCE CONTINUING ALONG THE WESTERLY LINE OF AIRPORT DRIVE SOUTH 03°26'32" EAST, A DISTANCE OF 228.56 FEET; THENCE NORTH 89°34'40" WEST, PARALLEL WITH THE SOUTH LINE OF THE SW 1/4 OF THE SW 1/4 OF SAID SECTION 31, A DISTANCE OF 346.99 FEET TO THE TRUE POINT OF BEGINNING.

LEGEND

5475	EXISTING CONTOUR
	EXISTING SWALE
	PUBLIC LAND CORNER FOUND
	SET #5 REBAR WITH 1" RED PLASTIC CAP STAMPED SCOTT COX ASC PLS 24302 (P&C) (UNLESS NOTED)
	SET NAIL AND 3/4" BRASS TAG STAMPED PLS 24302 (NAIL&TAG) AS NOTED
	FOUND MONUMENT AS NOTED
E	EXISTING ELECTRIC METER
WV	EXISTING WATER VALVE
G	EXISTING GAS METER
W	EXISTING WATER METER
	CONTROL POINT
	EXISTING FIRE HYDRANT
X X X	EXISTING FENCE
W W W	EXISTING WATER W/FIRE HYDRANT
ST ST	EXISTING STORM SEWER W/MANHOLE
(R)	RECORD COURSE
(M)	MEASURED COURSE PER THIS SURVEY
(S54°08'29"W 0.08')	RECORD OR CALCULATED POSITION TO FOUND MONUMENT

SURVEY NOTES

1. THE BASIS OF BEARINGS IS THE WEST LINE OF THE SW 1/4 OF SECTION 31, T1N, R68W OF THE 6TH P.M. BETWEEN THE FOUND MONUMENTS SHOWN HEREON AND BEARS N01°04'56"E, PER THE PLAT.
2. BENCH MARK: NGS POINT AI5917 (LOCSUR), AN ALUMINUM DISK SET IN TOP OF CONCRETE MONUMENT LOCATED 122.4 FEET WEST-SOUTHWEST FROM THE CENTER OF RUNWAY 15-33 AT ERIE AIR PARK. ELEVATION =5117.77' NAVD88.
3. THE SIZE AND TYPE OF MONUMENTS FOUND ARE SHOWN HEREON.
4. NOTICE: ACCORDING TO COLORADO LAW, YOU MUST COMMENCE ANY LEGAL ACTION BASED ON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVERED SUCH DEFECT. IN NO EVENT, MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCED MORE THAN TEN YEARS FROM THE DATE OF THE CERTIFICATION SHOWN HEREON. CRS-13-80-105 (3)(a)
5. FLOOD PLAIN DESIGNATION OF THE SURVEYED PROPERTY PER LETTER OF MAP REVISION CASE NO.: 13-08-0247 EFFECTIVE DATE DECEMBER 28, 2012 IS ZONE X, BEING AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.
6. THE LOCATION OF THE ABOVE GROUND UTILITIES SHOWN HEREON ARE BASED ON THE FIELD SURVEY BY SCOTT, COX & ASSOCIATES, INC. THE LOCATIONS OF THE UNDERGROUND UTILITIES SHOWN HEREON ARE BASED ON SAID SURVEY AND INFORMATION PROVIDED BY UNCC, CITY OF BOULDER, XCEL AND QWEST MAPPING. SCOTT, COX & ASSOCIATES, INC. IS NOT RESPONSIBLE FOR UTILITY INFORMATION PROVIDED BY OTHERS. SCOTT, COX & ASSOCIATES, INC. RECOMMENDS THAT THE LOCATION OF THE UTILITIES BE FIELD VERIFIED PRIOR TO ANY DIGGING ON, OR ADJACENT TO THE SUBJECT PROPERTY.
7. PLATS AND LAND SURVEY PLATS DEPOSITED AT BOULDER LAND USE DEPARTMENT, REFERENCED OR USED FOR THIS SURVEY: ERIE AIR PARK SUBDIVISION REPLAT A, RECEPTION NO. 02302520; ERIE AIR PARK SUBDIVISION, RECEPTION NO. 1752380.
8. ALL ADJOINING STREETS ARE PUBLIC.
9. THERE IS OBSERVED EVIDENCE OF CURRENT EARTH MOVING WORK. THERE IS NO OBSERVED EVIDENCE OF BUILDING CONSTRUCTION OR BUILDING ADDITIONS. NO OBSERVED EVIDENCE OF RECENT STREET OR SIDEWALK CONSTRUCTION OR REPAIRS. NO OBSERVED EVIDENCE OF WETLAND AREAS AS DELINEATED BY APPROPRIATE AUTHORITIES. NO RECORD OF OFFSITE EASEMENTS OR SERVITUDES BENEFITING THE SURVEYED PROPERTY.

CERTIFICATION

TO: LAND TITLE GUARANTEE COMPANY; OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY; DAVID S. NASSAR; SHERIDAN SCHOFIELD AND PEGGY J. SCHOFIELD

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2016 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 1-5, 6a, 8, 11, AND 13 OF TABLE A THEREOF. THE FIELDWORK WAS COMPLETED ON JANUARY 25, 2018.

COLORADO REGISTERED A. JOHN BURI 24302 PROFESSIONAL LAND SURVEYOR

A. JOHN BURI, PLS 24302
FOR AND ON BEHALF OF
SCOTT, COX & ASSOCIATES, INC.

ALTA/NSPS LAND TITLE SURVEY
TRACT E-2 ERIE AIR PARK TRACT E MINOR SUBDIVISION
LOCATED IN THE SW 1/4 SEC. 31 T1N, R68W OF THE 6TH P.M.
TOWN OF ERIE
COUNTY OF BOULDER
STATE OF COLORADO
AIRPORT ROAD

SCOTT, COX & ASSOCIATES, INC.
consulting engineers • surveyors
1530 55th Street • Boulder, Colorado 80303
(303) 444 - 3051

Designed by AJB	Date	Scale	Drawing no.		Sheet
Drawn by JAS	10/11/19	1"=100'	17510C-1		1
Checked by AJB	Revision	Description		Date	Project no.
					17510C

Medium Bronze
SR:0.19 E:0.85 SRI:15

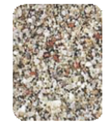
0.03 - MEDIUM BRONZE

Surrey Beige

0.01 - SURREY BEIGE

Sandstone

0.02 - SANDSTONE



Dakota Bronze

1.00 - DAKOTA BRONZE

5 **TYPICAL MATERIAL SCHEME BUILDING ELEVATION**
Not To Scale

NASSAR DEVELOPMENT

ERIE | david@nassardevelopment.com 303.775.8522

DENVER | zach@nassardevelopment.com 303.775.8522

Consultant

Issue/Revisions **Date** **No.**

Project Information

Erie Air Park - Tract E-2
LOT 1 - ERIE AIR PARK REPLAT D
ERIE, COLORADO 80516

Sheet Information

Sheet Title: MATERIALS

SIP RESUBMITTAL 2023.05.11

Sheet Number:

M.1

Nassar Project: 2019.11

5/12/2023 9:11:39 AM

GROUND
ENGINEERING

Preliminary Subsurface Exploration Program
Erie Air Park
Tract E, Lot E-2
Erie, Colorado

Prepared For:
Real Investments, LLC
c/o Nassar Development
3000 Airport Drive, Unit 203
Erie, CO 80516

Attention: Mr. David Nassar

Job Number: 19-0040 **November 29, 2018**

TABLE OF CONTENTS

PURPOSE AND SCOPE OF STUDY

This report presents the results of a preliminary geotechnical evaluation performed by GROUND Engineering Consultants, Inc. (GROUND) for the Real Investments, LLC in support of design of the proposed development of Erie Air Park Lot E-2 in Erie, Colorado. Our study was conducted in general accordance with GROUND's Proposal No. 1908-1591, dated August 27th, 2019

A field exploration program was conducted to obtain information on the subsurface conditions. Material samples obtained during the subsurface exploration were tested in the laboratory to provide data on the engineering characteristics of the on-site soils. The results of the field exploration and laboratory testing are presented herein.

This preliminary report has been prepared to summarize the data obtained and to present our findings and conclusions based on the proposed development/improvements and the subsurface conditions encountered. Preliminary design parameters and a discussion of engineering considerations related to the proposed improvements are included herein. This report should be understood and utilized in its entirety; specific sections of the text, drawings, graphs, tables, and other information contained within this report are intended to be understood in the context of the entire report. This includes the *Closure* section of the report which outlines important limitations on the information contained herein.

This report was prepared for design purposes of Real Investments, LLC based on our understanding of the proposed project at the time of preparation of this report. The data, conclusions, opinions, and preliminary geotechnical parameters provided herein should not be construed to be sufficient for other purposes, including the use by contractors, or any other parties for any reason not specifically related to the design of the project. Furthermore, the information provided in this report was based on the exploration and testing methods described below. Deviations between what was reported herein and the actual surface and/or subsurface conditions may exist, and in some cases those deviations may be significant. <u>The preliminary / initial information presented in this report is not sufficient for design. Additional, structure-specific subsurface exploration and site evaluation MUST be performed prior to final design and construction</u>.

PLANNED DEVELOPMENT

We understand that the subject development is currently in preliminary or feasibility stage of development. Provided information indicates that proposed construction may ultimately consist of five hangar structures with concrete pavement. Grading information was unavailable at the time of this report preparation. Based on the existing site topography, material cuts and fills up to approximately 3 feet may be necessary to facilitate construction. We assume structural loads likely will be light to moderate, typical of this type of construction. We assume no below grade levels are planned for construction. Additionally, we understand paved parking areas and drive lanes are also anticipated.

If the proposed development differs significantly from that described above, GROUND should be notified to re-evaluate the conclusions and parameters contained herein.

SITE CONDITIONS

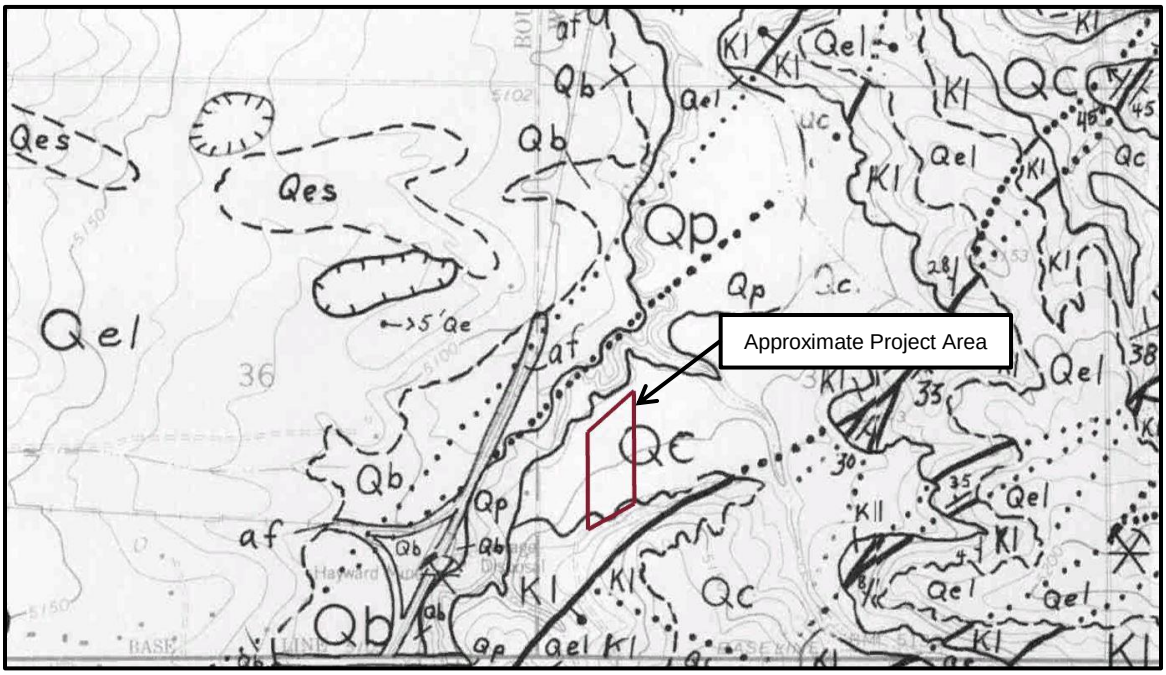
At the time of our subsurface exploration program, the site generally existed as an undeveloped lot. Construction debris and stockpiles of fill materials were observed at the time of drilling. No samples of these materials were sampled or tested as a part of this study. The site is bordered by a natural drainage to the north, commercial buildings to the east and west and Airport Drive to the south. The ground surface is generally flat with an overall slope down to the north at a slope of approximately 1 percent.

Man-made fill was observed to varying depths in most of test holes during the subsurface exploration program. The exact extents, limits, and composition of any man-made fill were not determined as part of the scope of work addressed by this study and should be expected to potentially exist at varying depths and locations across the site.

GEOLOGIC SETTING AND HAZARDS

Site Geology

Published geologic maps, e.g., Colton and Anderson (1977),[1] depict the project area as underlain by Upper Holocene and Upper Pleistocene Colluvium (**Qc)** and by the Upper Cretaceous Laramie Formation (**Kl**). Alluvial deposits are also mapped in the project area as well. A portion of the geologic map is reproduced below.



Colluvium, in the project area, generally consists of fine to coarse grained sands, clays, and silts similar to the bedrock materials from which they are derived. Cobble and boulder sized clasts of bedrock can be present as well.

Alluvium generally consist of fine to coarse sands and gravels with cobbles and boulders. Clay and silt lenses are present locally. The large cobbles and boulders present locally can be difficult to handle or process.

[1] Colton, R.B., and Anderson, L.W., 1977, *Preliminary geologic map of the Erie quadrangle, Boulder, Weld, and Adams Counties, Colorado*: U.S. Geological Survey, Miscellaneous Field Studies Map MF-882, scale 1:24,000

The Laramie Formation generally consists of interbedded sandstone, claystone, siltstone, shale, and coal. The claystones and shales are typically moderately to highly expansive and some sandstones, along with other well-cemented beds, of Denver Formation can be very hard and difficult to excavate. Additionally, the coal beds present in the Laramie Formation have been mined locally.

Geologic Hazards

Expansive Soils Swelling clayey soils and bedrock change volume in response to changes in moisture content that can occur seasonally, or in response to changes in land use, including development. Expansion potentials vary with moisture contents, density, and details of the clay chemistry and mineralogy. The swell potential in any particular area can vary markedly both laterally and vertically due to the complex interbedding of the site soil and bedrock materials. Moisture changes also occur erratically, resulting in conditions that cannot always be predicted.

The shallow earth materials underlying the site included silts and clays and the underlying bedrock includes claystones. The plasticity of the site soils ranged from moderately to highly plastic. Swell-consolidation testing indicated a very significant potential for heave at the site with swells up to 8.1 percent measured against surcharge pressures approximating overburden loads (see Table 1). Design-level geotechnical evaluations of individual building sites, roadways, and other movement sensitive structures should include an assessment of the presence of swelling materials in the foundation soils, so that appropriate, remedial design and construction can be implemented, as necessary.

Collapsible Soils Certain surficial deposits in the Denver metropolitan area, typically eolian (wind-blown), materials are known to be susceptible to local hydro-consolidation or “collapse.” Hydro-consolidation consists of a significant volume loss due to re-structuring of the constituent grains of the soil to a more compact arrangement upon wetting. Undocumented fills soils, like those present on site, also can be susceptible to “collapse.”

Significant consolidations were not measured in the swell-consolidation testing performed on site materials. However, given the presence of undocumented fill soils at the site, consolidations may be possible in site soils. Again, design-level geotechnical

evaluations for building design, roadway alignment, etc. should include an assessment of the possible presence of collapsible materials in the foundation soils, so that appropriate, remedial design and construction can be implemented, if necessary.

Radon Testing for the possible presence of radon gas prior to project development does not yield useful results regarding the potential accumulation of radon in completed structures. Radon accumulations typically are found in basements or other enclosed portions of buildings built in areas underlain at relatively shallow depths by granitic crystalline rock. The likelihood of encountering radon in concentrations exceeding applicable health standards on the subject site, underlain by relatively deep soils and sedimentary bedrock, is significantly lower.

Radon testing should be performed in each building on-site, after construction is completed. Proper ventilation usually is sufficient to mitigate potential radon accumulations. Building designs should accommodate such ventilation for all building areas.

Seismic Activity / Faulting Neither site reconnaissance nor review of available geologic maps indicated the trace of an active or potentially active fault traversing or immediately adjacent to the site. Therefore, the likelihood of surface fault rupture at the site is considered to be relatively low.

The closest extent of a documented active or potentially active fault to the site is the Rock Creek Fault, which is located approximately 8.2 miles to the southwest (Kirkham and Rogers, 1981[2]; Colorado Geological Survey, 2008[3]). This suspect fault has a cumulative length of approximately 2.5 miles, trends generally northeast, and is generally considered to be a high angle, listric, northwest dipping, reverse fault with late Cenozoic displacement. The risk of this fault giving rise to damaging, earthquake-induced ground motions at the site is considered to be relatively low give the magnitudes of previously recorded events in the project area and last known movements of the fault.

[2] Kirkham, R.M., and W. P. Rogers, 1981, *Earthquake Potential in Colorado, A Preliminary Evaluation*, Colorado Geological Survey, Bulletin 43.
[3] Colorado Geological Survey, 2008, *Preliminary Quaternary Fault and Fold Database, and Map Server*, http://geosurvey.state.co.us/Default.aspx?tabid=453.

Additionally, published geologic maps, such as Colton and Anderson (1977),[4] depict older faults within about 500 feet of the project site. These faults are only mapped as displacing older deposits and are not show as displacing younger, Quaternary deposits. Therefore, we consider the likelihood of surface fault rupture related to these faults to be low.

We consider the site to be likely to fall within the parameters of a Seismic Site Class D site, in accordance with 2015 IBC based on extrapolation of available data to depth. However, in the due to the relatively shallow nature of the bedrock, portions of the site may classify as Site Class C, but additionally information will be necessary. If a quantitative assessment of the classification is needed, shear wave velocity testing to 100+ feet or other surface testing methods will be required. A proposal for this work can be provided upon request. Compared with other regions of Colorado, recorded earthquake frequency in the project area is moderate.

Slope Stability and Erosion Colton and others (1975),[5] as well as larger scale geologic maps providing coverage of the site that were reviewed for this study, did not depict landslide deposits on or adjacent to the subject site.

The site is gently sloping, but nearly flat lying in terms of slope stability. During our preliminary reconnaissance of site area, no evidence was obviously noted of mass-wasting processes associated with steep slopes, such as landslides, slumps, or unusual soil creep. Therefore, the likelihood of project developments being affected by existing large scale, unanticipated slope instabilities is considered low.

Preliminarily, it is our opinion that un-retained, permanent slope cuts be less than 10 feet in height and maintain a maximum 3 : 1 (horizontal : vertical) slope angle or less with proper erosion control measures implemented. Steeper and/or taller slopes may be possible, but must be evaluated on a case-by-case basis. Proper surface drainage controls to reduce the potential for erosional slope damage need to be implemented in the grading design to control runoff, which may be increased due to proposed pavement

[4] Colton, R.B., and Anderson, L.W., 1977, *Preliminary geologic map of the Erie quadrangle, Boulder, Weld, and Adams Counties, Colorado*: U.S. Geological Survey, Miscellaneous Field Studies Map MF-882, scale 1:24,000

[5] Colton, R.B., J.A. Holligan, and L.W. Anderson, 1975, *Preliminary Map of Landslide Deposits, Denver 1° x 2° Quadrangle, Colorado*, U.S. Geological Survey, Miscellaneous Field Studies Map MF-705.

surfaces, structures, and landscape irrigation. Re-vegetation or other means of protection should be used on graded slopes.

Flooding The subject property abuts a reach of Coal Creek. The Flood Insurance Rate Map (FIRM) produced by for the area FEMA (2019),[6] depicts the northern portion of the project site as being within Zone AE, which indicates a special flood hazard area and significant risk of flooding. The southern portion of the site, however, is mapped as being within Zone X indicating a minimal risk of flooding. Therefore, portions of site do appear to be vulnerable to flooding. Therefore, the site and any planned grade changes should be evaluated by a civil engineer with regard to flood risk.

Wetland Potential No obvious indications of conditions similar to jurisdictional wetlands were apparent during GROUND's site reconnaissance. Additionally, according to the U.S. Fish and Wildlife Service,[7] the project site is not designated as a wetland area. However, areas associated with the Coal Creek to north of the site, are mapped as jurisdictional wetlands. Site development should adhere to all regulations concerning wetland protection. Explicit designation of wetlands was not included as part of the scope of this study.

Mining Activity and Mining Related Subsidence Review of U.S. Geological Survey geologic maps covering the site Roberts, Hynes, and Woodward (2001)[8] and Turney and Murray-Williams (1983)[9] and other available, published maps depicting areas of coal extraction, indicate past mining activities within greater project that are mapped as extending beneath the project site. However, no mineshafts, adits, or other structures are depicted as being on the subject parcel, but many such structures are shown within the greater project area.

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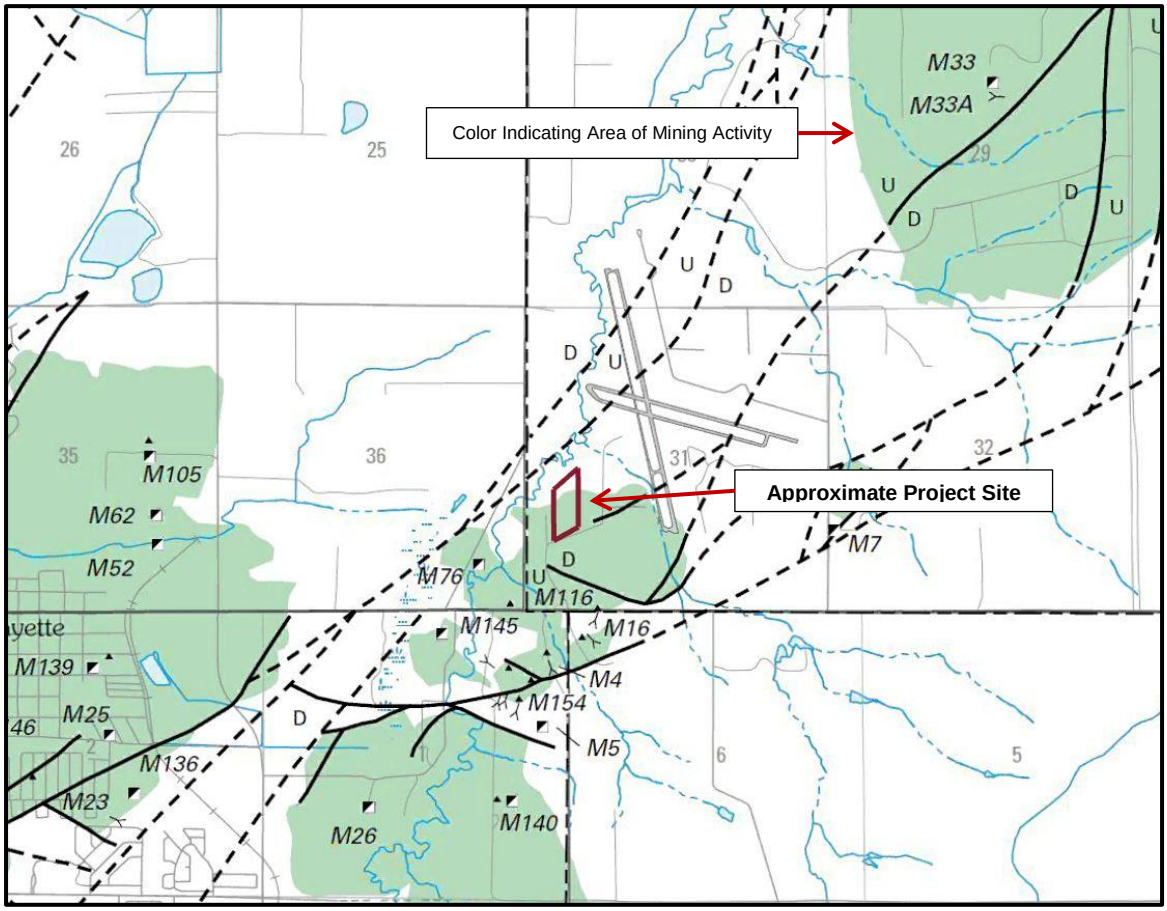
[6] Federal Emergency Management Administration, 2013, https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd accessed on 11/26/2019

[7] U.S. Fish and Wildlife Service, National Wetlands Inventory, , www.fws.gov/wetlands accessed on 11/26/2019

[8] Roberts, S.B., Hynes, J.L., and Woodward, C.L., 2001, *Maps Showing the Extent of Mining, Locations of Mine Shafts, Adits, Air Shafts, Bedrock Faults, and Thickness of Overburden Above Abandoned Coal Mines in the Boulder-Weld Coal Field, Boulder, Weld, and Adams Counties, Colorado.* U.S. Geological Survey, Geological Investigations Series Map I-2735.

[9] Turney, J.E., Murray-Williams L., 1983, *Colorado Front Range Inactive Coal Mine Data and Subsidence, Boulder County*, Colorado Geological Survey, Plate 3 of 12.

Nearby mines with workings are presented below in a summary table and are shown on a portion of the Robert, Hynes, and Woodward (2001) map reproduced below.



Mines and Mine Workings Near the Project Site[3]

Map ID	Name of Mine Working	Alternate / Previous Name	Years Active
M16	Blue Ribbon	-	1933
M76	Irvington	Haywood	1907-1908 1899-1906
M116	Parkdale	-	1907-1916
M154	Vaughn		1897-1906

Mine workings that are mapped within the project area are depicted as being 150 to 250 feet below existing grades. Coal and lignite were not observed in the fill however, based on our experience in the Erie area coal and/or lignite may be encountered during construction. No indications of mining structures (i.e., shafts, adits, etc.) were apparent on the site during the site reconnaissance, however.

Published geologic maps do not indicate formations underlying the site at shallow depths that include evaporite (salt, gypsum, etc.) deposits, limestones or other materials vulnerable to subsurface dissolution. Therefore, the likelihood of subsidence associated with such rock types or other hazards related to subsurface dissolution appears to be low.

INITIAL SUBSURFACE EXPLORATION

Subsurface exploration for the project was conducted on November 5th, 2019. A total of five (5) test holes were drilled using a truck-mounted drill rig advancing continuous flight auger. The test holes were advanced to depths of about 28 to 37 feet below existing grade within approximate areas planned for development. Test holes were advanced to their planned termination depths to evaluate the subsurface conditions as well as to retrieve samples for laboratory testing and analysis. A representative of GROUND directed the subsurface exploration, logged the test holes in the field, and prepared the samples for transport to our laboratory. The test holes were backfilled following data collection operations.

Samples of the subsurface materials were retrieved with a 2-inch I.D. 'California' liner sampler or a 1.375-inch I.D. standard split spoon sampler. The sampler was driven into the substrata with blows from a 140-pound hammer falling 30 inches, a procedure similar to the Standard Penetration Test described by ASTM Method D1586. Penetration resistance values, when properly evaluated, indicate the relative density or consistency of soils. Depth and elevations at which the samples were obtained and associated penetration resistance values are shown on the test hole logs.

The approximate locations of the test holes are shown on Figure 1. Logs of the test holes are presented on Figure 2 and Appendix A. Explanatory notes and a legend are provided on Figure 3.

LABORATORY TESTING

Samples retrieved from our test holes were examined and visually classified in the laboratory by the project engineer. Laboratory testing of soil and bedrock samples included standard property tests, such as natural moisture contents, dry unit weights, grain size analyses, and Atterberg limits. Swell-consolidation testing, water soluble sulfates, and corrosivity testing were performed on select samples as well. Laboratory tests were performed in general accordance with applicable ASTM protocols. Results of the laboratory testing program are summarized in Tables 1 and 2.

SUBSURFACE CONDITIONS

In general, the test holes penetrated a thin layer of topsoil[10], approximately 6 inches thick (greater or lesser thicknesses likely exist locally), underlain fill materials consisting of sandy clay with local gravel and claystone materials that extended to approximately up to approximately 11 feet below existing grades. These materials were underlain by sandy clay at depths ranging from approximately 1 to 11 feet below existing grades. Fat clay materials were encountered below the sandy clay or fill materials in test hole 1 to 3 and continued to depths of approximately 35 to 36 feet below existing grade. Siltstone/Claystone bedrock materials were encountered below the sandy clay materials in test holes 4 and 5 at depths of 5 and 14 feet below existing grades. These materials continued to the test hole termination depths of approximately 28 to 34 feet below

[10] 'Topsoil' as used herein is defined geotechnically. The materials so described may or may not be suitable for landscaping or as a growth medium for such plantings as may be proposed for the project.

existing grades. A layer of sand and gravel, approximately 1.5 feet in thickness, was observed locally in test hole 2 at a depth of approximately 35 feet below existing grades. The test holes extended to depths between 28 and 37 feet below existing grades.

It also should be noted that coarse gravel, cobbles and boulders are not well represented in samples obtained from small diameter test holes. At this site, therefore, it should be anticipated that gravel and cobbles, and possibly boulders, may be present in the fill and native soils, as well as comparably sized fragments of construction debris, even where not included in the general descriptions of the site soil types below.

Fill materials were predominantly sandy clay with some local gravel and claystone materials, were medium to highly plastic, fine grained with trace gravel, dry to moist, and red-brown to gray-brown to brown in color with iron staining.

Clay materials were sandy, medium plastic, fine grained, dry to slightly moist, hard, and gray-brown in color with iron staining and local caliche staining.

Fat Clay materials were, highly plastic, fine grained, slightly moist to wet, medium stiff to hard, and gray-brown in color with iron staining and local caliche staining.

Sand and Gravel materials were clayey and fine to coarse grained with gravel, medium plastic, wet, medium dense to dense, and gray brown in color.

Claystone Bedrock was slightly sandy, fine grained, dry to moist, moderately to highly plastic, medium hard to very hard and resistant, and gray-brown in color with iron staining.

Groundwater was encountered at depths ranging from approximately 27 to 33 feet below existing grade at the time of drilling. Groundwater was re-checked in test hole 2 approximately 1 hour after drilling operations and was measured at approximately 23 feet below existing grades. Other test holes were backfilled due to safety. Groundwater levels can be expected to fluctuate, however, in response to annual and longer-term cycles of precipitation, irrigation, surface drainage, land use, and the development of transient, perched water conditions.

Swell-Consolidation Testing suggested a potential for swell in the tested on-site materials. Swells ranging from approximately 1.5 up to 8.1 percent were measured upon wetting under various surcharge pressures (see Table 1).

PRELIMINARY GEOTECHNICAL CONSIDERATIONS ON DEVELOPMENT

As stated, specific grading information was unavailable at the time of this report preparation. Based on the existing topography of the site, material cuts and fills up to approximately 3 feet may be necessary to facilitate construction. We assume that the building will be lightly to moderately loaded.

Primary geotechnical considerations at the project site consist of variable depths of existing fill materials, a large potential for heave within existing site materials and variable depth to bedrock materials at the project site.

Groundwater was encountered at depths ranging from approximately 23 to 33 feet below existing grade at the time of drilling. Therefore, groundwater will likely not be a factor for shallow excavations, but may be a factor in for deep foundation elements

Presented below are preliminary considerations and parameters regarding geotechnical aspects of the proposed development. These considerations and parameters are provided to assist with preliminary project planning. **Additional, structure-specific studies must be performed prior to final design.**

ANTICIPATED FOUNDATION AND FLOOR SYSTEM *OPTIONS*

Deep Foundation/Structural Floor Systems For the least potential for movement (approximately ½ inch), it is GROUND's opinion that a deep foundation system consisting of straight-shaft drilled piers advanced into the underlying bedrock with a structural floor system be utilized. Additionally, building entryways and other attached building appurtenances should ideally be founded on piers the same as the main building structure, to reduce the potential of differential movement. It is anticipated that bedrock penetrations of approximately 20 to 25 feet and pier lengths ranging from approximately 45 feet to greater than 60 feet would satisfy geotechnical conditions for the proposed structure. The actual pier lengths, however, should be based on the design loads, etc., as determined by the structural engineer following site-specific geotechnical explorations.

Anticipated piers may be designed for allowable end bearing pressures of 25,000 to 30,000 psf and a skin friction of 1,875 to 2,250 psf for the portion of the pier penetrating competent bedrock.

Shallow Foundation/Slab-on-grade Floor Systems Alternatively, but not equal in performance, a shallow foundation and slab-on-grade floor system could be constructed on a fill prism of imported granular fill materials. Based on our exploration and limited analysis program, an over-excavation and re-placement of the existing site materials with non-expansive import materials to a depth of at least 15 feet below the existing grade may be necessary to support a shallow foundation and slab-on-grade floor system for the proposed construction. Please note that greater thicknesses of remedial earthwork may be required beneath footings/slabs following final geotechnical exploration and laboratory testing programs.

We anticipate that allowable bearing pressures where footings bear on imported non-expansive granular fill materials will range from 2,000 to 3,000 psf for associated settlements of about 1 inch. Similarly, slabs-on-grade bearing on 15 feet or more of imported non-expansive granular fill material could be designed based on an allowable subgrade vertical modulus (K) ranging from 100 to 200 pci.

Note that a combination of deep foundations with a reinforced slab on grade may be desirable from a cost standpoint assuming that the owner can accept the increased potential for slab movements. A risk assessment can be determined after final structure locations are identified and further subsurface exploration is completed

WATER-SOLUBLE SULFATES

The concentrations of water-soluble sulfates measured in a selected sample retrieved from the test holes was approximately 0.05 percent by weight (See Table 2). Such concentrations of soluble sulfates represent a negligible environment for sulfate attack on concrete exposed to these materials. Degrees of attack are based on the scale of 'negligible,' 'moderate,' 'severe' and 'very severe' as described in the “Design and Control of Concrete Mixtures,” published by the Portland Cement Association (PCA). The Colorado Department of Transportation (CDOT) utilizes a corresponding scale with 4 classes of severity of sulfate exposure (Class 0 to Class 3) as described in the published table below.

REQUIREMENTS TO PROTECT AGAINST DAMAGE TO CONCRETE BY SULFATE ATTACK FROM EXTERNAL SOURCES OF SULFATE

Severity of Sulfate Exposure	Water-Soluble Sulfate (SO_4) In Dry Soil *(%)*	Sulfate (SO_4) In Water *(ppm)*	Water Cementitious Ratio *(maximum)*	Cementitious Material Requirements
Class 0	0.00 to 0.10	0 to 150	0.45	Class 0
Class 1	0.11 to 0.20	151 to 1500	0.45	Class 1
Class 2	0.21 to 2.00	1501 to 10,000	0.45	Class 2
Class 3	2.01 or greater	10,001 or greater	0.40	Class 3

Based on this datum no use of a special, sulfate-resistant cement in project concrete appears necessary.

SOIL CORROSIVITY

Data were obtained to support an initial assessment of the potential for corrosion of ferrous metals in contact with earth materials at the site, based on the conditions at the time of GROUND's evaluation. The test results are summarized in Table 2.

Reduction-Oxidation testing in a selected sample indicated a negative potential: approximately -97 millivolts. Such low potentials typically create a more corrosive environment.

Sulfide Reactivity testing indicated a 'positive' result in the local soils. The presence of sulfides in the soils suggests a more corrosive environment.

Soil Resistivity In order to assess the "worst case" for mitigation planning, a sample of material retrieved from the test holes was tested for resistivity in the laboratory, after being saturated with water, rather than in the field. Resistivity also varies inversely with temperature. Therefore, the laboratory measurements were made at a controlled temperature. Measurement of electrical resistivity indicated a value of approximately 1,950 ohm-centimeters in the selected sample of site soils.

pH Where pH is less than 4.0, soil serves as an electrolyte; the pH range of about 6.5 to 7.5 indicates soil conditions that are optimum for sulfate reduction. In the pH range

above 8.5, soils are generally high in dissolved salts, yielding a low soil resistivity.[11] Testing of a selected sample of site soils indicated a pH value of about 8.8.

Corrosivity Assessment The American Water Works Association (AWWA) has developed a point system scale used to predict corrosivity. The scale is intended for protection of ductile iron pipe but is valuable for project steel selection. When the scale equals 10 points or higher, protective measures for ductile iron pipe are indicated. The AWWA scale is presented below. The soil characteristics refer to the conditions at and above pipe installation depth.

Table A.1 Soil-Test Evaluation

Soil Characteristic / Value	Points
Redox Potential	
< 0 (negative values)	5
0 to +50 mV	4
+50 to +100 mV	3½
> +100 mV	0
Sulfide Reactivity	
Positive	3½
Trace	2
Negative	0
Soil Resistivity	
<1,500 ohm-cm	10
1,500 to 1,800 ohm-cm	8
1,800 to 2,100 ohm-cm	5
2,100 to 2,500 ohm-cm	2
2,500 to 3,000 ohm-cm	1
>3,000 ohm-cm	0
pH	
0 to 2.0	5
2.0 to 4.0	3
4.0 to 6.5	0
6.5 to 7.5	0 *
7.5 to 8.5	0
>8.5	3
Moisture	
Poor drainage, continuously wet	2
Fair drainage, generally moist	1
Good drainage, generally dry	0

* If sulfides are present and low or negative redox-potential results (< 50 mV) are obtained, add three (3) points for this range.

[11] American Water Works Association ANSI/AWWA C105/A21.5-05 Standard.

We anticipate that drainage at the site after construction will be effective. Nevertheless, based on the preliminary values obtained for this study, the overburden soils and bedrock appear to comprise a corrosive environment for ferrous metals (16½).

If additional information is needed regarding soil corrosivity, then the American Water Works Association or a corrosion engineer should be contacted. It should be noted, however, that changes to the site conditions during construction, such as the import of other soils, or the intended or unintended introduction of off-site water, might alter corrosion potentials significantly.

PROJECT EARTHWORK

The following information is for private improvements; public roadways or utilities should be constructed in accordance with applicable municipal / agency standards.

General Considerations Site grading should be performed as early as possible in the construction sequence to allow settlement of fills and surcharged ground to be realized to the greatest extent prior to subsequent construction.

Prior to earthwork construction, concrete/asphalt, vegetation and other deleterious materials should be removed and disposed of off-site or stockpiled for reuse evaluation. Relic underground utilities should be abandoned in accordance with applicable regulations, removed as necessary, and properly capped.

Topsoil present on-site should not be incorporated into ordinary fills. Instead, topsoil should be stockpiled during initial grading operations for placement in areas to be landscaped or for other approved uses. As mentioned, the topsoil encountered was not tested for quality and may not be suitable for all landscaping purposes.

Existing Fill Soils Man-made fill was encountered during the exploration. Actual contents and composition of any man-made fill materials are not known; therefore, some of the excavated man-made fill materials (if encountered) may not be suitable for replacement as backfill. The geotechnical engineer should be retained during site excavations to observe the excavated fill materials and provide guidance for its suitability for reuse.

Use of Existing Native Soils Overburden soils that are free of trash, organic material, construction debris, and other deleterious materials are suitable, in general, for placement as compacted fill. Organic materials should not be incorporated into project fills.

Fragments of rock, cobbles, and inert construction debris (e.g., concrete or asphalt) larger than 3 inches in maximum dimension will require special handling and/or placement to be incorporated into project fills. In general, such materials should be placed as deeply as possible in the project fills. Existing asphalt or road base materials, if processed sufficiently, could potentially be used as grading materials. A geotechnical engineer should be consulted regarding appropriate parameters for usage of such materials on a case-by-case basis when such materials have been identified during earthwork. Standard parameters that likely will be generally applicable can be found in Section 203 of the current CDOT Standard Specifications for Road and Bridge Construction.

Imported Fill Materials If it is necessary to import material to the site, the imported soils should be free of organic material, and other deleterious materials. **Imported material should consist of soils that have less than 50 percent passing the No. 200 Sieve and should have a plasticity index of less than 15.** Representative samples of the materials proposed for import should be tested and approved by the geotechnical engineer prior to transport to the site.

Fill Platform Preparation Prior to filling, the top 8 to 12 inches of in-place materials on which fill soils will be placed should be scarified, moisture conditioned and properly compacted in accordance with the parameters below to provide a uniform base for fill placement. If over-excavation is to be performed, then these parameters for subgrade preparation are for the subgrade **below the bottom** of the specified over-excavation depth.

If surfaces to receive fill expose loose, wet, soft, or otherwise deleterious material, additional material should be excavated, or other measures taken to establish a firm platform for filling. The surfaces to receive fill must be effectively stable prior to placement of fill.

Fill Placement Fill materials should be thoroughly mixed to achieve a uniform moisture content, placed in uniform lifts not exceeding 8 inches in loose thickness, and properly compacted.

Soils that classify as GP, GW, GM, GC, SP, SW, SM, or SC in accordance with the USCS classification system (granular materials) should be compacted to 95 or more percent of the maximum modified Proctor dry density at moisture contents within 2 percent of optimum moisture content as determined by ASTM D1557.

Site Soils that classify as ML and CL, should be compacted to 95 percent of the maximum standard Proctor density at moisture contents from 1 percent below to 3 percent above the optimum moisture content as determined by ASTM D698. No fill materials should be placed, worked, rolled while they are frozen, thawing, or during poor/inclement weather conditions.

Site soils that classify as CH should be compacted to 95 percent of the maximum standard Proctor density at moisture contents from 1 percent above to 3 percent above the optimum moisture content as determined by ASTM D698 and should not be used as structural fill.

Care should be taken with regard to achieving and maintaining proper moisture contents during placement and compaction. Materials that are not properly moisture conditioned may exhibit significant pumping, rutting, and deflection at moisture contents near optimum and above. The contractor should be prepared to handle soils of this type, including the use of chemical stabilization, if necessary.

Compaction areas should be kept separate, and no lift should be covered by another until relative compaction and moisture content within the ranges are obtained.

Settlements Settlements will occur in filled ground, typically on the order of 1 to 2 percent of the fill depth. If fill placement is performed properly and is tightly controlled, in GROUND's experience the majority (on the order of 60 to 80 percent) of that settlement will typically take place during earthwork construction, provided the contractor achieves the compaction levels provided herein. The remaining potential settlements likely will take several months or longer to be realized, and may be exacerbated if these fills are subjected to changes in moisture content.

Cut and Filled Slopes Permanent site slopes supported by on-site soils up to 10 feet in height may be constructed no steeper than 3 (H) to 1 (V). In the event slopes greater than 10 feet in height are planned, a slope stability analysis should be performed. Minor raveling or surficial sloughing should be anticipated on slopes cut at this angle until vegetation is well re-established. Surface drainage should be designed to direct water away from slope faces.

Use of Squeegee Relatively uniformly graded fine gravel or coarse sand, i.e., "squeegee," or similar materials commonly are proposed for backfilling foundation excavations, utility trenches (excluding approved pipe bedding), and other areas where employing compaction equipment is difficult. In general, GROUND does not suggest this procedure for the following reasons:

Although commonly considered "self-compacting," uniformly graded granular materials require densification after placement, typically by vibration. The equipment to densify these materials is not available on many job-sites.

Even when properly densified, uniformly graded granular materials are permeable and allow water to reach and collect in the lower portions of the excavations backfilled with those materials. This leads to wetting of the underlying soils and resultant potential loss of bearing support as well as increased local heave or settlement.

Wherever possible, excavations should be backfilled with approved, on-site soils placed as properly compacted fill. Where this is not feasible, use of "Controlled Low Strength Material" (CLSM), i.e., a lean, sand-cement slurry ("flowable fill") or a similar material for backfilling should be considered.

Where "squeegee" or similar materials are proposed for use by the contractor, the design team should be notified by means of a Request for Information (RFI), so that the proposed use can be considered on a case-by-case basis. Where "squeegee" meets the project requirements for pipe bedding material, however, it is acceptable for that use.

EXCAVATION CONSIDERATIONS

Excavation Difficulty Test holes for the subsurface exploration were advanced to the depths indicated on the test hole logs by means of conventional, truck-mounted,

geotechnical drill equipment. We anticipate no significant excavation difficulties with heavy duty excavation equipment in good working condition.

Temporary un-shored excavation slopes for other areas up to 10 feet in height should be cut no steeper than 1.5 (H) to 1 (V) in the site soils in the absence of seepage. Some surficial sloughing may occur on slope faces cut at this angle. As stated, local conditions encountered during construction, such as loose, dry sand, or soft or wet materials, or seepage will require flatter slopes. Stockpiling of materials should not be permitted closer to the tops of temporary slopes than 5 feet or a distance equal to the depth of the excavation, whichever is greater.

Should site constraints prohibit the use of the provided slope angles, temporary shoring should be used. The shoring should be designed to resist the lateral earth pressure exerted by structure, traffic, equipment, and stockpiles. GROUND can provide shoring design upon request.

Groundwater was encountered at depths ranging from approximately 23 to 33 feet below existing grade at the time of drilling. Therefore, groundwater may be a significant factor in deep excavations and deep trench excavations. The contractor should be prepared to dewater excavations. If seepage or groundwater is encountered in project excavations, the geotechnical engineer should evaluate the conditions and provide additional parameters and considerations, as appropriate. Drilled pier excavations will encounter groundwater and very hard, resistant bedrock. The Contractor should be prepared to penetrate resistant bedrock and to install piers in the presence of groundwater.

Good surface drainage should be provided around temporary excavation slopes to direct surface runoff away from the slope faces. A properly designed swale should be provided at the top of the excavations. In no case should water be allowed to pond at the site. Slopes should be protected against erosion. Erosion along the slopes will result in sloughing and could lead to a slope failure. Any excavations in which personnel will be working must comply with all OSHA Standards and Regulations (CFR 29 Part 1926). The contractor's "responsible person" should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. GROUND has provided the information above solely as a service to the client, and is not assuming responsibility for construction site safety or the contractor's activities.

UTILITY PIPE INSTALLATION

Pipe Support The bearing capacity of the site soils appeared adequate, in general, for support of the proposed utility lines. The pipe + contents are less dense than the soils which will be displaced for installation. Therefore, GROUND anticipates no significant pipe settlements in these materials where properly bedded.

Excavation bottoms may expose soft, loose, or otherwise deleterious materials, including debris. Firm materials may be disturbed by the excavation process. All such unsuitable materials should be excavated and replaced with properly compacted fill. Areas allowed to pond water will require excavation and replacement with properly compacted fill. The contractor should take particular care to ensure adequate support near pipe joints which are less tolerant of extensional strains.

Trench Backfilling Settlement of compacted soil trench backfill materials will occur, even where all the backfill is placed and compacted correctly. Typical settlements are on the order of 1 to 2 percent of fill thickness. However, the need to compact to the lowest portion of the backfill must be balanced against the need to protect the pipe from damage from the compaction process. Some thickness of backfill may need to be placed at compaction levels lower than specified (or smaller compaction equipment used together with thinner lifts) to avoid damaging the pipe. Protecting the pipe in this manner can result in somewhat greater surface settlements. Therefore, although other alternatives may be available, the following options are presented for consideration:

Controlled Low Strength Material: Because of these limitations, the most conservative option consists of backfilling the entire depth of the trench (both bedding and common backfill zones) with “controlled low strength material” (CLSM), i.e., a lean, sand-cement slurry, “flowable fill,” or similar material along all trench alignment reaches with low tolerances for surface settlements.

If used, the CLSM used as pipe bedding and trench backfill should exhibit a 28-day unconfined compressive strength between 50 to 200 psi so that re-excavation is not unusually difficult.

Placement of the CLSM in several lifts or other measures likely will be necessary to avoid ‘floating’ the pipe. Measures also should be taken to maintain pipe alignment during CLSM placement.

Compacted Soil Backfilling For most projects, site-generated materials are utilized for backfilling. Where compacted soil backfilling is employed, using the site soils or similar materials as backfill, the risk of backfill settlements entailed in the selection of this higher risk alternative must be anticipated and accepted by the Client/Owner.

We anticipate that the on-site soils excavated from trenches will be suitable, in general, for use as common trench backfill within the above-described limitations. Backfill soils should be free of vegetation, organic debris and other deleterious materials. Fragments of rock, cobbles, and inert construction debris (e.g., concrete or asphalt) coarser than 3 inches in maximum dimension should not be incorporated into trench backfills.

Soils placed for compaction as trench backfill should be conditioned to a relatively uniform moisture content, placed and compacted in accordance with the *Project Earthwork* section of this report.

Pipe Bedding Pipe bedding materials, placement and compaction should meet the specifications of the pipe manufacturer and applicable municipal standards. Bedding should be brought up uniformly on both sides of the pipe to reduce differential loadings.

As discussed above, the use of CLSM or similar material in lieu of granular bedding and compacted soil backfill should be considered where the tolerance for surface settlement is low. (Placement of CLSM as bedding to at least 12 inches above the pipe can protect the pipe and assist construction of a well-compacted conventional backfill, although possibly at an increased cost relative to the use of conventional bedding.)

If a granular bedding material is specified, with regard to potential migration of fines into the pipe bedding, design and installation follow ASTM D2321. If the granular bedding does not meet filter criteria for the enclosing soils, then non-woven filter fabric (e.g., Mirafi® 140N, or the equivalent) should be placed around the bedding to reduce migration of fines into the bedding which can result in severe, local surface settlements. Where this protection is not provided, settlements can develop/continue several months or years after completion of the project. In addition, clay or concrete cut-off walls should be installed to interrupt the granular bedding section to reduce the rates and volumes of water transmitted along the sewer alignment which can contribute to migration of fines.

If granular bedding is specified, the contractor should anticipate that significant volumes of on-site soils may not be suitable for that use. Materials proposed for use as pipe

bedding should be tested by a geotechnical engineer for suitability prior to use. Imported materials should be tested and approved by a geotechnical engineer prior to transport to the site.

SURFACE DRAINAGE

The site soils are relatively stable with regard to moisture content – volume relationships at their existing moisture contents. Other than the anticipated, post-placement settlement of fills, post-construction soil movement will result primarily from the introduction of water into the soil underlying the proposed structure, hardscaping, and pavements. Based on the site surface and subsurface conditions encountered in this study, we do not anticipate a rise in the local water table sufficient to approach foundation or floor elevations. Therefore, wetting of the site soils likely will result from infiltrating surface waters (precipitation, irrigation, etc.), and water flowing along constructed pathways such as bedding in utility pipe trenches.

The following drainage measures should be incorporated as part of project design and during construction. The facility should be observed periodically to evaluate the surface drainage and identify areas where drainage is ineffective. Routine maintenance of site drainage should be undertaken throughout the design life of the project. If these measures are not implemented and maintained effectively, the movement estimates provided in this report could be exceeded.

1) Wetting or drying of the foundation excavations and underslab areas should be avoided during and after construction as well as throughout the improvements' design life. Permitting increases/variations in moisture to the adjacent or supporting soils may result in a decrease in bearing capacity and an increase in volume change of the underlying soils, and increased total and/or differential movements.

2) Positive surface drainage measures should be provided and maintained to reduce water infiltration into foundation soils.

   The ground surface surrounding the exterior of each building should be sloped to drain away from the foundation in all directions. A minimum slope of 12 inches in the first 10 feet should be incorporated in the areas not covered with pavement or concrete slabs, or a minimum 3 percent in the first 10 feet in the areas covered

with pavement or concrete slabs. Reducing the slopes to comply with ADA requirements may be necessary by other design professionals but may entail an increased potential for moisture infiltration and subsequent volume change of the underlying soils and resultant distress.

In no case should water be allowed to pond near or adjacent to foundation elements, hardscaping, utility trench alignments, etc.

3) Drainage should be established and maintained to direct water away from sidewalks and other hardscaping as well as utility trench alignments. Where the ground surface does not convey water away readily, additional post-construction movements and distress should be anticipated.

4) In GROUND's experience, it is common during construction that in areas of partially completed paving or hardscaping, bare soil behind curbs and gutters, and utility trenches, water is allowed to pond after rain or snow-melt events. Wetting of the subgrade can result in loss of subgrade support and increased settlements / increased heave. By the time final grading has been completed, significant volumes of water can already have entered the subgrade, leading to subsequent distress and failures. The contractor should maintain effective site drainage throughout construction so that water is directed into appropriate drainage structures.

5) On some sites, slopes may descend toward buildings locally. Such slopes can be created during grading even on comparatively flat sites. In such cases, even where the slopes as described above are implemented effectively, water may flow toward and beneath a structure or other site improvements with resultant additional, post-construction movements. Where the final site configuration includes graded or retained slopes descending toward the improvements, surface drainage swales and/or interceptor drains should be installed between the improvements and the slope.

Where irrigation is applied on or above slopes, drainage structures commonly are needed near the toe-of-slope to prevent on-going or recurrent wet conditions.

6) Roof downspouts and drains should discharge well beyond the perimeter of the structure foundations (minimum 10 feet) and backfill zones and be provided with positive conveyance off-site for collected waters.

7) Based on our experience with similar facilities, the project may include landscaping/watering near site improvements. Irrigation water – both that applied to landscaped areas and over-spray – is a significant cause of distress to improvements. To reduce the potential for such distress, vegetation requiring watering should be located 10 or more feet from building perimeters, flatwork, or other improvements. Irrigation sprinkler heads should be deployed so that applied water is not introduced near or into foundation/subgrade soils. Landscape irrigation should be limited to the minimum quantities necessary to sustain healthy plant growth.

8) Use of drip irrigation systems can be beneficial for reducing over-spray beyond planters. Drip irrigation can also be beneficial for reducing the amounts of water introduced to foundation/subgrade soils, but only if the total volumes of applied water are controlled with regard to limiting that introduction. Controlling rates of moisture increase beneath the foundations, floors, and other improvements should take higher priority than minimizing landscape plant losses.

   Where plantings are desired within 10 feet of a building, it is GROUND's opinion that the plants be placed in water-tight planters, constructed either in-ground or above-grade, to reduce moisture infiltration in the surrounding subgrade soils. Planters should be provided with positive drainage and landscape underdrains. As an alternative involving a limited increase in risk, the use of water-tight planters may be replaced by local shallow underdrains beneath the planter beds. Colorado Geological Survey – Special Publication 43 provides additional guidelines for landscaping and reducing the amount of water that infiltrates into the ground.

   GROUND understands many municipalities require landscaping within 10 feet of building perimeters. Provided that positive, effective surface drainage is initially implemented and maintained throughout the life of the facility and the Owner understands and accepts the risks associated with this requirement, vegetation

that requires little to no watering may be located within 10 feet of the building perimeter.

9) Inspections must be made by facility representatives to make sure that the landscape irrigation is functioning properly throughout operation and that excess moisture is not applied.

10) Plastic membranes should not be used to cover the ground surface adjacent to the building as soil moisture tends to increase beneath these membranes. Perforated "weed barrier" membranes that allow ready evaporation from the underlying soils may be used.

Cobbles or other materials that tend to act as baffles and restrict surface flow should not be used to cover the ground surface near the foundations.

11) Maintenance as described herein may include complete removal and replacement of site improvements in order to maintain effective surface drainage.

12) Detention ponds commonly are incorporated into drainage design. When a detention pond fills, the rate of release of the water is controlled and water is retained in the pond for a period of time. Where in-ground storm sewers direct surface water to the pond, the granular pipe bedding also can direct shallow groundwater or infiltrating surface water toward the pond. Thus, detention ponds can become locations of enhanced and concentrated infiltration into the subsurface, leading to wetting of foundation soils in the vicinity with consequent heave or settlement. Therefore, unless the pond is clearly down-gradient from the proposed buildings and other structures that would be adversely affected by wetting of the subgrade soils, including off-site improvements, the detention pond should be provided with an effective, low permeability liner. In addition, cut-off walls and/or drainage provisions should be provided for the bedding materials surrounding storm sewer lines flowing to the pond.

PRELIMINARY PAVEMENT SECTIONS

A pavement section is a layered system designed to distribute concentrated traffic loads to the subgrade. Performance of the pavement structure is directly related to the physical properties of the subgrade soils and traffic loadings. The standard care of

practice in pavement design describes the flexible pavement section as a “20-year” design pavement: however, most flexible pavements will not remain in satisfactory condition without routine maintenance and rehabilitation procedures performed throughout the life of the pavement.

We anticipate pavement sections for the internal drives and parking areas may consist of a full depth asphalt section ranging from approximately 5 to 7 inches of asphalt. Composite sections with equivalent structural sections can be provided in the final report. A minimum section of 6 inches of Portland cement concrete underlain by at least 6 inches of Class 6 aggregate base course may also be necessary. Heavy truck traffic and loading/unloading areas should ideally be designed as a reinforced slab and consist of at least 6 to 7 inches of concrete underlain by at least 6 inches of Class 6 aggregate base course. Additionally, composite sections consisting of asphalt over aggregate base course may be utilized.

Due to the swell potential observed in the site soils, typical subgrade preparation on the order of 12 inches will likely not be sufficient at the project site. Greater depth of over-excavation should be anticipated depending on the owners tolerances for movement. Greater depths of subgrade processing will further reduce potential pavement movements.

The collection and diversion of surface drainage away from paved areas is extremely important to satisfactory performance of the pavements. The subsurface and surface drainage systems should be carefully designed to ensure removal of the water from paved areas and subgrade soils. Allowing surface waters to pond on pavements will cause premature pavement deterioration. Where topography, site constraints, or other factors limit or preclude adequate surface drainage, pavements should be provided with edge drains to reduce loss of subgrade support. The long-term performance of the pavement also can be improved greatly by proper backfilling and compaction behind curbs, gutters, and sidewalks so that ponding is not permitted and water infiltration is reduced.

ADDITIONAL EXPLORATION REQUIREMENTS

The above data and information are based on a limited preliminary subsurface exploration only. Additional geotechnical studies must be performed to further evaluate

the site for building-specific foundation and floor system, retaining wall parameters, final site grading, and pavement sections.

CLOSURE

Geotechnical Review The author of this report or a GROUND principal should be retained to review project plans and specifications to evaluate whether they comply with the intent of the measures discussed in this report. The review should be requested in writing.

In addition, building-specific geotechnical exploration(s) must be completed for the project prior to final design and construction.

Materials Testing Real Investments, LLC should consider retaining a geotechnical engineer to perform materials testing during construction. The performance of such testing or lack thereof, however, in no way alleviates the burden of the contractor or subcontractor from constructing in a manner that conforms to applicable project documents and industry standards. The contractor or pertinent subcontractor is ultimately responsible for managing the quality of his work; furthermore, testing by the geotechnical engineer does not preclude the contractor from obtaining or providing whatever services that he deems necessary to complete the project in accordance with applicable documents.

Limitations This report has been prepared for Real Investments, LLC as it pertains to design of the proposed Erie Air Park Lot E-2 Development as described herein. It should not be assumed to contain sufficient information for other parties or other purposes. The Client has agreed to the terms, conditions, and liability limitations outlined in our proposal between the Real Investments, LLC and GROUND. Reliance upon our report is not granted to any other potential owner, contractor, or lender. Requests for third-party reliance should be directed to GROUND in writing; granting reliance by GROUND is not guaranteed.

In addition, GROUND has assumed that the final geotechnical subsurface exploration will be performed prior to construction. Changes in project plan development or schedule should be brought to the attention of the Geotechnical Engineer, in order that the preliminary geotechnical information may be re-evaluated and, as necessary, modified.

The preliminary geotechnical conclusions in this report were based on subsurface information from a limited number of exploration points, as shown in Figure 1, as well as the means and methods described herein. Subsurface conditions were interpolated between and extrapolated beyond these locations. It is not possible to guarantee the subsurface conditions are as indicated in this report. Actual conditions exposed during construction may differ from those encountered during site exploration. In addition, a contractor who obtains information from this report for development of his scope of work or cost estimates does so solely at his own risk and may find the geotechnical information in this report to be inadequate for his purposes or find the geotechnical conditions described herein to be at variance with his experience in the greater project area. The contractor should obtain the additional geotechnical information that is necessary to develop his workscope and cost estimates with sufficient precision. This includes, but is not limited to, information regarding excavation conditions, earth material usage, current depths to groundwater, etc. Because of the necessarily limited nature of the subsurface exploration performed for this study, the contractor should be allowed to evaluate the site using test pits or other means to obtain additional subsurface information to prepare his bid.

If during construction, surface, soil, bedrock, or groundwater conditions appear to be at variance with those described herein, a geotechnical engineer should be retained at once, so that our conclusions for this site may be re-evaluated in a timely manner and dependent aspects of project design can be modified, as necessary.

The materials present on-site are stable at their natural moisture content, but may change volume or lose bearing capacity or stability with changes in moisture content. Performance of the proposed structure and pavement will depend on implementation of the conclusions and information in this report and on proper maintenance after construction is completed. Because water is a significant cause of volume change in soils and rock, allowing moisture infiltration may result in movements, some of which will exceed estimates provided herein and should therefore be expected by the Owner.

ALL DEVELOPMENT CONTAINS INHERENT RISKS. It is important that ALL aspects of this report, as well as the estimated performance (and limitations with any such estimations) of proposed improvements are understood by Real Investments, LLC. Utilizing the geotechnical parameters and measures herein for planning, design, and/or construction constitutes understanding and acceptance of the conclusions with regard to

risk and other information provided herein, associated improvement performance, as well as the limitations inherent within such estimates. Ensuring correct interpretation of the contents of this report by others is not the responsibility of GROUND. If any information referred to herein is not well understood, it is imperative that owner contact the author or a GROUND principal immediately. We will be available to meet to discuss the risks and remedial approaches presented in this report, as well as other potential approaches, upon request.

Current applicable codes may contain criteria regarding performance of structures and/or site improvements which may differ from those provided herein. Our office should be contacted regarding any apparent disparity.

GROUND makes no warranties, either expressed or implied, as to the professional data, opinions or conclusions contained herein. Because of numerous considerations that are beyond GROUND's control, the economic or technical performance of the project cannot be guaranteed in any respect**.**

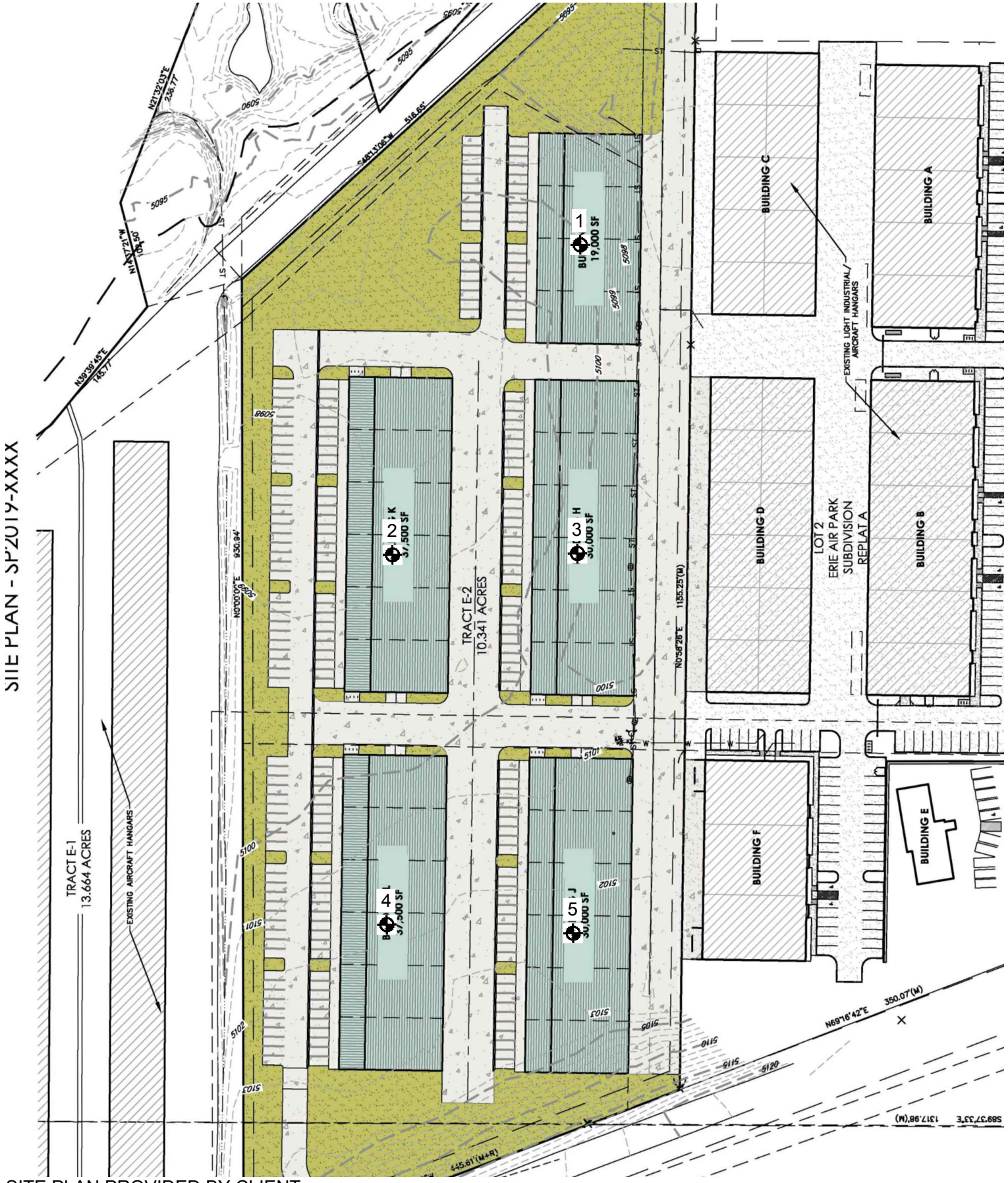
This document, together with the concepts and conclusions presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Re-use of, or improper reliance on this document without written authorization and adaption by GROUND Engineering Consultants, Inc., shall be without liability to GROUND Engineering Consultants, Inc.

GROUND appreciates the opportunity to complete this portion of the project and welcomes the opportunity to provide the Real Investments, LLC or the owner with a proposal for additional geotechnical exploration at the project site.

Sincerely,

GROUND Engineering Consultants, Inc.

Kelsey Van Bemmel, P.E. Reviewed by Joseph Zorack, P.E.



SITE PLAN PROVIDED BY CLIENT

1 ⊕ Indicates test hole number and approximate location.

(Not to Scale)

GROUND
ENGINEERING CONSULTANTS

LOCATION OF TEST HOLES

JOB NO.: 19-0040	FIGURE: 1
CADFILE NAME: 0040SITE.DWG	

GROUND ENGINEERING

LOGS OF THE TEST HOLES

CLIENT: Marketwise, LLC

JOB NO.: 19-0040

PROJECT NAME: Erie Air Park Lot E-2 Tract E: Prelim

PROJECT LOCATION: Erie, CO

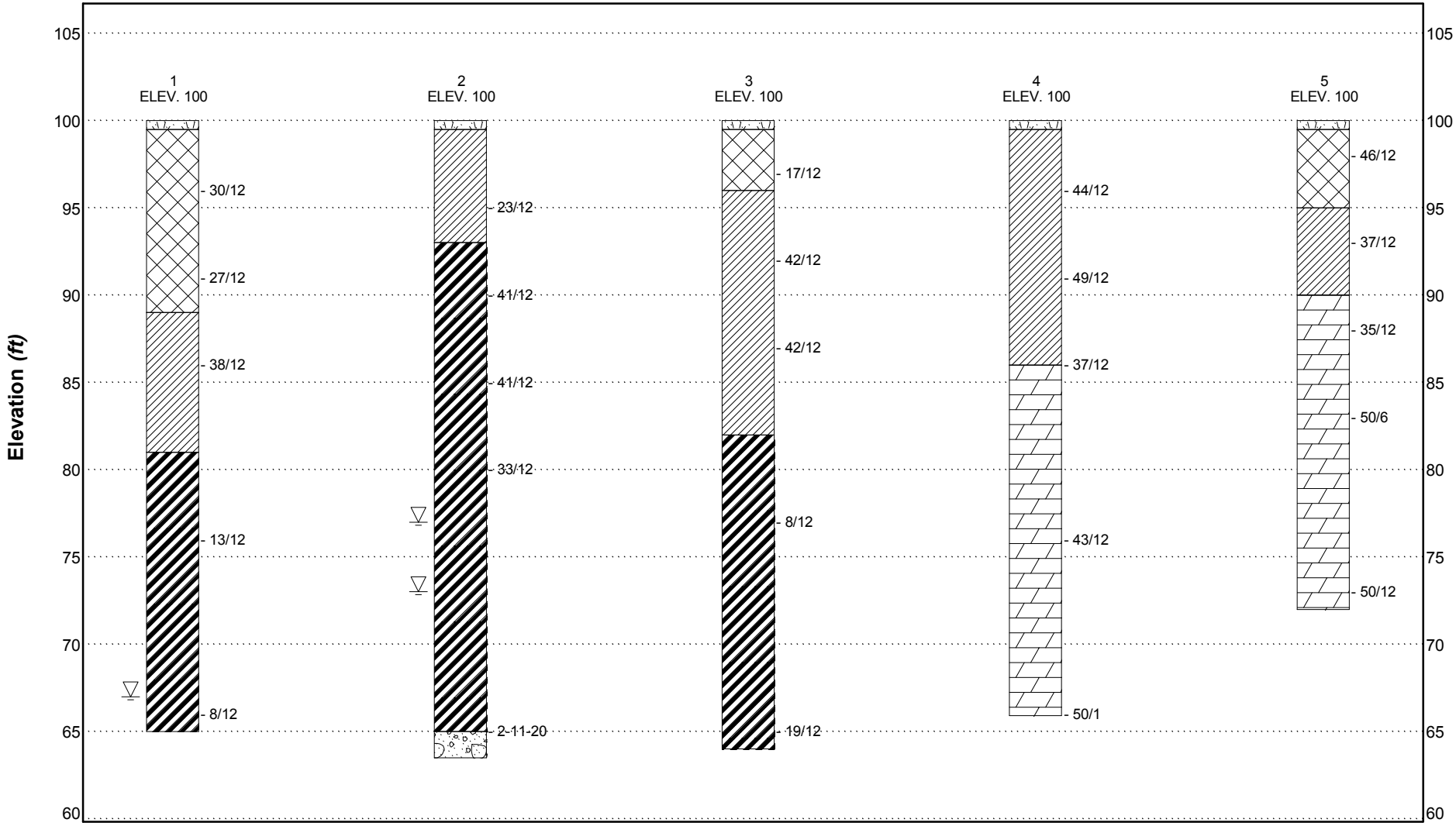


Figure #2

LEGEND AND NOTES

CLIENT: Marketwise, LLC **PROJECT NAME:** Erie Air Park Lot E-2 Tract E: Prelim

JOB NO.: 19-0040 **PROJECT LOCATION:** Erie, CO

MATERIAL SYMBOLS


TOPSOIL


FAT CLAY (CH)


FILL


LEAN CLAY


SAND AND GRAVEL


CLAYSTONE BEDROCK

NOTE: See Detailed Logs for Material descriptions.

SAMPLER SYMBOLS


Modified California Liner Sampler
23 / 12 Drive sample blow count indicates 23 blows of a 140 pound hammer falling 30 inches were required to drive the sampler 12 inches.


Standard Penetration Test Sampler
23 / 12 Drive sample blow count indicates 23 blows of a 140 pound hammer falling 30 inches were required to drive the sampler 12 inches.

NOTES

1. Test holes were drilled on 11/5/2019 with 4" solid stem auger.

2. Locations of the test holes were determined approximately by pacing from features shown on the site plan provided.

3. Elevations of the test holes were not measured and the logs of the test holes are drawn to depth. Nominal elevation of "100 feet" indicates existing ground level at the test hole at the time of drilling.

4. The test hole locations and elevations should be considered accurate only to the degree implied by the method used.

5. The lines between materials shown on the test hole logs represent the approximate boundaries between material types and the transitions may be gradual.

6. Groundwater level readings shown on the logs were made at the time and under the conditions indicated. Fluctuations in the water level may occur with time.

7. The material descriptions on these logs are for general classification purposes only. See full text of this report for descriptions of the site materials & related information.

8. All test holes were immediately backfilled upon completion of drilling, unless otherwise specified in this report.

ABBREVIATIONS

▽ Water Level at Time of Drilling, or as Shown

▼ Water Level at End of Drilling, or as Shown

▼ Water Level After 24 Hours, or as Shown

NV	No Value
NP	Non-Plastic

Figure #3

GROUND ENGINEERING

Client: Real Investments, LLC

Project No.: 19-0040

Erie Air Park
Lot E-2

TABLE 1: SUMMARY OF LABORATORY TEST RESULTS

Sample Location		Natural Moisture Content	Natural Dry Density	Gradation			Atterberg Limits		Swell/Collapse		Unconfined Compressive Strength		USCS Equivalent Classification	AASHTO Equivalent Classification (Group Index)	Sample Description
Test Hole No.	Depth (feet)	(%)	(pcf)	Gravel (%)	Sand (%)	Fines (%)	Liquid Limit	Plasticity Index	Volume Change (%)*	Surcharge (psf)	(psi)	(ksf)			
TH-1	4	10	118	-	-	64.5	30	21	3.4	500	-	-	s(CL)	A-6 (10)	Fill: sandy CLAY
TH-1	9	9.8	121.8	-	-	67.3	34	15	-	-	-	-	s(CL)	A-6 (8)	Fill: sandy CLAY
TH-2	10	14.3	118.7	-	-	91.9	54	27	7.1	1000	-	-	CH	A-7-6 (28)	FAT CLAY
TH-3	3	7.3	SD	-	-	49.7	NV	NP	-	-	-	-	SM	A-4 (0)	Fill: silty SAND
TH-3	8	10.3	124.2	-	-	82.8	50	28	6.9	1000	-	-	(CL)s	A-7-6 (24)	CLAY with sand
TH-4	4	11.1	120.5	-	-	77.2	47	20	7.2	500	-	-	(CL)s	A-7-6 (16)	CLAY with sand
TH-4	24	18	111.7	-	-	94.7	65	33	-	-	97.6	14.05	CH	A-7-5 (38)	Claystone Bedrock
TH-5	7	11.4	124.1	-	-	87.1	46	26	-	-	273	39.31	CL	A-7-6 (24)	CLAY
TH-5	12	17.8	107.6	-	-	77.6	60	30	8.1	1500	-	-	(CH)s	A-7-5 (25)	Clayestone Bedrock
TH-5	17	10.1	128.5	-	-	86.0	41	21	1.5	2000	-	-	CL	A-7-6 (18)	Claystone Bedrock

*Negative indicates collapse, SD = Sample disturbed, NV = No value, NP = Non-plastic

GROUND ENGINEERING

Client: Real Investments, LLC

Project No.: 19-0040

Erie Air Park

Lot E-2

TABLE 2: SUMMARY OF SOIL CORROSION TEST RESULTS

Sample Location		Water Soluble Sulfates *(%)*	pH	Redox Potential *(mV)*	Sulfide Reactivity*	Resistivity *(ohm-cm)*	USCS Equivalent Classification	AASHTO Equivalent Classification (Group Index)	Sample Description
Test Hole No.	Depth *(feet)*								
TH-3	2	0.05	8.8	-97.0	Positive	1,950	SM	A-4 (0)	Silty SAND

*Performed by eAnalytics Laboratory.

Appendix A
Detailed Drill Logs

GROUND ENGINEERING

TEST HOLE 1

CLIENT: Marketwise, LLC **PROJECT NAME:** Erie Air Park Lot E-2 Tract E: Prelim

JOB NO.: 19-0040 **PROJECT LOCATION:** Erie, CO

Elevation (ft)	Depth (ft)	Graphic Log	Material Descriptions and Drilling Notes	Sample Type	Blow Count	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Passing No. 200 Sieve	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	Swell/Consolidation (%) at Surcharge Pressure (psf)	Unconfined Compressive Strength (ksf)	USCS
100	0		**TOPSOIL**										
			FILL: Predominantly sandy clay with some local gravel and claystone materials, were medium to highly plastic, fine grained with trace gravel, dry to moist, and red-brown to gray-brown to brown in color with iron staining.										
95	5				30/12	10.0	118.0	65	30	21	3.4 @ 500		CL
90	10				27/12	9.8	121.8	67	34	15			CL
			CLAY: Sandy, medium plastic, fine grained, dry to slightly moist, hard, and gray-brown in color with iron staining and local caliche staining.										
85	15				38/12								
80	20		**FAT CLAY**: Highly plastic, fine grained, slightly moist to wet, medium stiff to hard, and gray-brown in color with iron staining an local caliche staining.										
75	25				13/12								
70	30												
			Groundwater encountered at 33 feet.										
65	35				8/12								

Bottom of borehole at Approx. 35 feet.

TEST HOLE 2

GROUND ENGINEERING

CLIENT: Marketwise, LLC **PROJECT NAME:** Erie Air Park Lot E-2 Tract E: Prelim

JOB NO.: 19-0040 **PROJECT LOCATION:** Erie, CO

Elevation (ft)	Depth (ft)	Graphic Log	Material Descriptions and Drilling Notes	Sample Type	Blow Count	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Passing No. 200 Sieve	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	Swell/Consolidation (%) at Surcharge Pressure (psf)	Unconfined Compressive Strength (ksf)	USCS
100	0		**TOPSOIL**										
			CLAY: Sandy, medium plastic, fine grained, dry to slightly moist, hard, and gray-brown in color with iron staining and local caliche staining.										
95	5				23/12								
			FAT CLAY: Highly plastic, fine grained, slightly moist to wet, medium stiff to hard, and gray-brown in color with iron staining an local caliche staining.										
90	10				41/12	14.3	118.7	92	54	27	7.1 @ 1000		CH
85	15				41/12								
80	20				33/12								
75	25		*Groundwater encountered at 27 feet 1 hour after drilling.*										
70	30		*Groundwater encountered at 27 feet.*										
65	35		**SAND and GRAVEL**: Clayey and fine to coarse grained with gravel, medium plastic, wet, medium dense to dense, and gray brown in color.		2-11-20								

Bottom of borehole at Approx. 37 feet.

GROUND ENGINEERING

TEST HOLE 3

CLIENT: Marketwise, LLC **PROJECT NAME:** Erie Air Park Lot E-2 Tract E: Prelim

JOB NO.: 19-0040 **PROJECT LOCATION:** Erie, CO

Elevation (ft)	Depth (ft)	Graphic Log	Material Descriptions and Drilling Notes	Sample Type	Blow Count	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Passing No. 200 Sieve	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	Swell/Consolidation (%) at Surcharge Pressure (psf)	Unconfined Compressive Strength (ksf)	USCS
100	0		**TOPSOIL**										
			FILL: Predominantly sandy clay with some local gravel and claystone materials, were medium to highly plastic, fine grained with trace gravel, dry to moist, and red-brown to gray-brown to brown in color with iron staining.										
					17/12	7.3	SD	50	NV	NP			SM
95	5		**CLAY**: Sandy, medium plastic, fine grained, dry to slightly moist, hard, and gray-brown in color with iron staining and local caliche staining.										
					42/12	10.3	124.2	83	50	28	6.9 @ 1000		CL
90	10												
					42/12								
85	15												
80	20		**FAT CLAY**: Highly plastic, fine grained, slightly moist to wet, medium stiff to hard, and gray-brown in color with iron staining an local caliche staining.										
					8/12								
75	25												
70	30												
65	35				19/12								

Bottom of borehole at Approx. 36 feet.

GROUND ENGINEERING

TEST HOLE 4

CLIENT: Marketwise, LLC

PROJECT NAME: Erie Air Park Lot E-2 Tract E: Prelim

JOB NO.: 19-0040

PROJECT LOCATION: Erie, CO

Elevation (ft)	Depth (ft)	Graphic Log	Material Descriptions and Drilling Notes	Sample Type	Blow Count	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Passing No. 200 Sieve	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	Swell/Consolidation (%) at Surcharge Pressure (psf)	Unconfined Compressive Strength (ksf)	USCS
100	0		**TOPSOIL**										
			CLAY: Sandy, medium plastic, fine grained, dry to slightly moist, hard, and gray-brown in color with iron staining and local caliche staining.										
95	5				44/12	11.1	120.5	77	47	20	7.2 @ 500		CL
90	10				49/12								
85	15		**CLAYSTONE BEDROCK**: Slightly sandy, fine grained, dry to moist, moderately to highly plastic, medium hard to very hard and resistant, and gray-brown in color with iron staining.		37/12								
80	20												
75	25				43/12	18.0	111.7	95	65	33		14.05	CH
70	30												
			Bottom of borehole at Approx. 34 feet.		50/1								

GROUND ENGINEERING

TEST HOLE 5

CLIENT: Marketwise, LLC

PROJECT NAME: Erie Air Park Lot E-2 Tract E: Prelim

JOB NO.: 19-0040

PROJECT LOCATION: Erie, CO

Elevation (ft)	Depth (ft)	Graphic Log	Material Descriptions and Drilling Notes	Sample Type	Blow Count	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Passing No. 200 Sieve	Atterberg Limits: Liquid Limit	Atterberg Limits: Plasticity Index	Swell/Consolidation (%) at Surcharge Pressure (psf)	Unconfined Compressive Strength (ksf)	USCS
100	0		**TOPSOIL**										
			FILL: Predominantly sandy clay with some local gravel and claystone materials, were medium to highly plastic, fine grained with trace gravel, dry to moist, and red-brown to gray-brown to brown in color with iron staining.										
					46/12								
95	5												
			CLAY: Sandy, medium plastic, fine grained, dry to slightly moist, hard, and gray-brown in color with iron staining and local caliche staining.										
					37/12	11.4	124.1	87	46	26		39.31	CL
90	10												
			CLAYSTONE BEDROCK: Slightly sandy, fine grained, dry to moist, moderately to highly plastic, medium hard to very hard and resistant, and gray-brown in color with iron staining.										
					35/12	17.8	107.6	78	60	30	8.1 @ 1500		CH
85	15												
					50/6	10.1	128.5	86	41	21	1.5 @ 2000		CL
80	20												
75	25				50/12								

Bottom of borehole at Approx. 28 feet.

PHASE III DRAINAGE REPORT

LOT 1 ERIE AIR PARK REPLAT D

Erie, Colorado

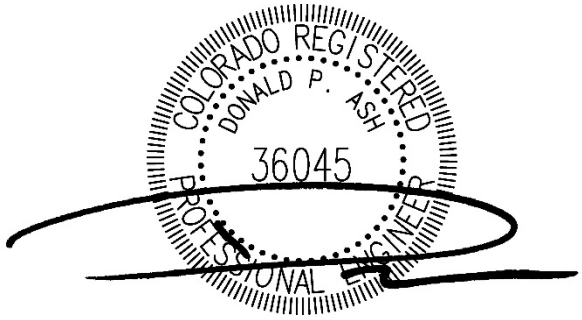
October 11, 2019
(Revised June 5, 2020)
(Revised January 8, 2021)
(Revised May 21, 2021)

Prepared for:

Nassar Development/
Real Investments, LLC

ENGINEER'S STATEMENT

I hereby certify that this **Phase III Drainage Report** for the design of the **Lot 1 Erie Air Park Replat D** 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.



_____

Donald P. Ash
Registered Professional Engineer
State of Colorado No. 36045

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

TABLE OF CONTENTS

I. GENERAL LOCATION AND DESCRIPTION

A. Location

1. This report is submitted as the Phase III Drainage Report of the existing and proposed conditions for Lot 1 Erie Air Park Replat D, located at the Erie Air Park, in the Town of Erie.
2. The site is located in the Southwest 1/4 of Section 31, Township 1 North, Range 68 West of the 6th Prime Meridian, in the Town of Erie, Weld County, State of Colorado.
3. Major Drainage Facilities – This site is located within the Town of Erie Outfall Systems Plan (OSP) prepared by Love & Associates, Inc dated 2007. Coal Creek is located directly north and west of the subject property.
4. The site is bounded by Coal Creek to the north, an existing light industrial development to the east, Airport Drive and an undeveloped property to the south and an existing aircraft hangar facility to the west. A Vicinity Map is included with this report.

B. Description of Property

1. The existing 10.340-acre site is currently undeveloped.
2. Existing ground cover consists of native grasses. There are numerous trees located along Airport Drive and the south side of the site. These trees were recently planted by the current owner concurrently with the recent development to the east.

   The majority of the site generally slopes to the north at an approximate slope of 2%. The eastern half of the lot drains east and north. The western half of the lot drains west and north. Existing drainage patterns are shown on the Drainage Plan that is included with this report.

   The United States Department of Agriculture (USGS) Natural Resources Conservation Service (NRCS) Soil Survey for the site identifies the existing site soils as Midway-Shingle Complex, Ulm Clay Loam and Colombo Clay Loam with a hydrologic soil group of C and D.

3. Coal Creek is located directly north of the subject property.
4. The project will consist of five (5) light industrial buildings, with associated driveway, parking and landscaping improvements.
5. There are no irrigation facilities located on or near the site.
6. The proposed land use will be light industrial. A Planned Unit Development (PUD) Zoning overlay will control the specific zoning on the subject property.
7. There are no wetland areas located on the property. Coal Creek is located directly north of the site and is not affected by the proposed improvements.

8. There is a drainage easement located along the north side of the property. This easement is for the conveyance of drainage from Tract E-1. There is also a 30' utility easement that runs through the center of the site. These existing easements will be unaffected by the proposed improvements.

II. DRAINAGE BASINS

A. Major Basin Description

1. Based on the FEMA Flood Insurance Rate Map (FIRM) - Map Number 08013C0443K dated August 15, 2019, portions of the site are located within Zone X (Shaded) areas of the 500-year floodplain. The rest of the site is located with Zone X.
2. There are no irrigation facilities located on or near the site.
3. There are no lakes or ponds which influence or may be influenced by the local drainage. There are no dams on or adjacent to the subject property. There is one (1) existing water quality pond located at the north west corner of the site, which provides water quality for Lot 1 Erie Air Park Replat D and Lot 2 Erie Air Park Replat A.
4. There are no irrigation ditches or facilities which will be affect by the proposed development.

B. Sub-Basin Description

1. For the purposes of this report, the existing site has been broken into two (2) historic sub-basins.

   Basin HA1 consists of the western half of the undeveloped site. Runoff within this basin is conveyed via overland flow towards the west and north, to the northwest corner of the site, and then east into the existing water quality pond. The proposed drainage Swale HA-1 located along the west and north property lines will direct water into the pond. The runoff is then released through a water quality release structure, where is it conveyed underneath of the existing taxiway and eventually discharges into Coal Creek.

   Basin HA2 consists of the eastern half of the undeveloped site. Runoff within this basin is conveyed via overland flow towards the east and north, to the northeast corner of the site, and then north into the existing water quality pond. The proposed drainage Swale HA-2 located along the east property line will direct water north into the pond. The runoff is then released through a water quality release structure, where is it conveyed underneath of the existing taxiway and eventually discharges into Coal Creek.

2. There are five (5) offsite drainage basins that affect the site.

Drainage from Basin OS1 consists of a portion of the undeveloped land south of the site known as Tract D, which is located south and east of Airport Drive, north of Baseline Road. This drainage is conveyed via overland flow and into the roadside drainage swale that is located along the east and south sides of Airport Drive. The offsite drainage is then conveyed north through a 24" corrugated metal pipe (CMP) culvert underneath of Airport Drive. The runoff is then conveyed through a drainage swale which is located along the east side of Tract E-1. The drainage is then conveyed underneath of the existing taxiway through another 24" CMP culvert, where it flows north and eventually discharges into Coal Creek.

Drainage from Basin OS2 consists of the northern portion of Airport Drive. This drainage is conveyed via overland flow and into the existing drainage swale that is located along the east side of Tract E-1. The drainage is then conveyed underneath of the existing taxiway through another 24" CMP culvert, where it flows north and eventually discharges into Coal Creek.

Drainage from Basin OS3 through OS5 consists of the northern portions of Airport Drive located adjacent to and directly south of the subject property. This drainage is conveyed via overland flow and into Basin A. Drainage is then conveyed north where it drains into the existing water quality pond.

Drainage from Basin C1 consists of the developed land east of the site, including a portion of Lot 2 Erie Air Park Subdivision Replat A. This drainage is conveyed via overland flow and into the offsite drainage system on Lot 2. The runoff is then conveyed through a 24" CMP storm sewer, underneath of the existing taxiway, and into the existing water quality pond. This pond was designed as part of the Lot 2 development and has been sized to accept the offsite drainage from this basin.

The roof drainage from Basin C1 has been collected in an existing storm sewer system, which is located along the east side of the site. PVC roof drains from Lot 2 Erie Air Park Subdivision Replat A is connected to this system, which is conveyed north and into the existing water quality pond.

Drainage from Basin B1 consists of the eastern portions of the developed land west of the site, including portions of Tract E-1 Erie Air Park Tract E Minor Subdivision. This basin includes the hangar buildings, apron and site improvements. This drainage is conveyed via overland flow into the drainage swale which is located on the east side of Tract E-1. The drainage is then conveyed underneath of the existing taxiway through the 24" CMP culvert, where it flows north and eventually discharges into Coal Creek.

The existing drainage patterns from this offsite basin will continue to drain through the subject property during developed conditions. This offsite runoff will be unaffected by the proposed development.

3. The runoff from the existing site is summarized in Table 1. Existing runoff calculations have been included in Appendix B.

III. DRAINAGE DESIGN CRITERIA

A. Development Criteria Reference and Constraints

1. There are no previous drainage master plans or drainage studies that influence or are influences by the proposed drainage facilities.
2. There is one (1) previous study that has been completed for the site. The "Final Drainage Report for the Erie Convair Hangar Complex" was prepared by Scott, Cox & Associates, Inc. (SCA Report) dated March 23, 2009 and contains the overall site drainage and water quality requirements for both Lot 2 Erie Air Park Replat A and the subject property.
3. The site drainage was generally constrained by the adjacent developments. Grading was constrained by the existing grades along the east and west property lines. The site was also constrained by the existing curb and gutter elevations along Boxelder Street, and the existing grades along the north property line.
4. There are no wetland areas located on the property. Coal Creek is located directly north of the site and is not affected by the proposed improvements.
5. The following reports, files and drawings form the basis of this report: 1) Town of Erie Unified Development Code (UDC); 2) Town of Erie Standards and Specifications for Design and Construction of Public Improvements (STANDARDS); and 3) Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual, Volumes 1-3 (USDCM). Relevant sections, as required, can be found in the Appendix located at the back of this report.
6. This drainage plan is in general conformance with the Town Standards and Specifications, the MHFD Storm Drainage Criteria Manual and the Outfall Systems Plan.

B. Hydrological Criteria

1. The design rainfall data used in this study was taken from the STANDARDS, Section 813.06 – Rainfall Intensity Duration Curves for the Town of Erie. One-hour rainfall depth was taken from Table 800-2 and used in conjunction with the intensity equation listed under Section 813.06.

As required in the STANDARDS, for all land uses, hydrologic information was developed for an initial storm return period of 5-years and major storm return period of 100-years. The criteria and methodology used in determining the storm runoff peaks and volumes were those outlined in the USDCM as directed by the STANDARDS.

2. Runoff calculations were obtained using the Rational Method as outlined in the Manual for basins having less than 130 acres.

Rational Formula is:

$$Q = CIA$$

Where: Q = Peak Discharge (cfs)
C = Runoff Coefficient (USDCM)
I = Rainfall Intensity (in/hr) (USDCM)
A = Drainage Basin Tributary Area (acres)

C. Hydraulic Criteria

1. The entire site drains north into the Coal Creek major drainageway. The major drainageway has the ability to handle the drainage from the subject property.
2. Storm sewer systems have been designed using the Autodesk Storm and Sanitary Sewer Analysis. Storm sewer plans, calculations and profiles have been included for the 5 and 100-year storm events. Storm sewer inlets have been designed using the MHFD street and inlet worksheets.
3. Water quality volumes, discharges and storage calculations are based on the USDCM Volume 2, Storage. Water quality facilities have been designed in accordance with the USDCM Volume 3, Best Management Practices. The UDFCD detention worksheets were used for calculations of the detention and water quality facilities.

D. Adaptions from Criteria

1. There are no adaptions or variances requested from the Criteria.

IV. DRAINAGE FACILITY DESIGN

A. General Concepts

1. The site is currently undeveloped.
2. Proposed swales and drainage facilities have been designed in order to convey existing drainage to the existing stormwater quality facility.

3. Future development of the subject property would likely consist of a series of storm inlets, which would be designed to conveyed developed runoff to the existing stormwater quality facility located on the north east corner of the site.
4. The existing drainage patterns from offsite basin will continue to drain through the subject property during developed conditions. This offsite runoff will be unaffected by the proposed development.
5. Proposed drainage patterns are shown on the Drainage Plan. Proposed runoff calculations for Basin A have also been enclosed in Appendix B. Proposed runoff from the site is shown in Table 1.
6. The proposed stormwater quality facilities have been designed in accordance with the previously referenced SCA Report.

B. Specific Details

1. The Drainage Plan shows the proposed Site Plan, on-site grading and overland flow directions. Under the proposed conditions, the site will be broken into two (2) sub-basins.

   Basin A-1 consists of the western half of the undeveloped site. Runoff within this basin is conveyed via overland flow towards the west and north, to the northwest corner of the site, and then east into the existing water quality pond. The proposed drainage Swale HA-1 located along the west and north property lines will direct existing drainage into the pond. The runoff is then released through a water quality release structure, where is it conveyed underneath of the existing taxiway and eventually discharges into Coal Creek.

   Basin A-2 consists of the eastern half of the undeveloped site. Runoff within this basin is conveyed via overland flow towards the east and north, to the northeast corner of the site, and then north into the existing water quality pond. The proposed drainage Swale HA-2 located along the east property line will direct existing drainage into the pond. The runoff is then released through a water quality release structure, where is it conveyed underneath of the existing taxiway and eventually discharges into Coal Creek.

   Drainage from Basin C1 consists of the developed land east of the site, including a portion of Lot 2 Erie Air Park Subdivision Replat A. This drainage is conveyed via overland flow and into the offsite drainage system on Lot 2. The runoff is then conveyed through a 24" CMP storm sewer, underneath of the existing taxiway, and into the existing water quality pond. This pond was designed as part of the Lot 2 development and has been sized to accept the offsite drainage from this basin.

The roof drainage from Basin C1 (Basins C1-1 thought C1-4) will be collected in the proposed 18" storm sewer system, which is located adjacent to the existing taxiway located on the east side of the site. The existing PVC roof drains from Lot 2 Erie Air Park Subdivision Replat A will be connected to the proposed system, which will be conveyed north and into the existing water quality pond.

The existing and proposed conditions for the entire site were analyzed for the 5 and 100-year storm events. The results are shown in the following Table 1 and the relevant calculation sheets are provided in Appendix B.

TABLE 1
RUNOFF CALCULATIONS SUMMARY

Drainage Basin	Design Point	Area	C_5	C_{100}	5-Year Peak Runoff (cfs)	100-Year Peak Runoff (cfs)
HA1	1	6.659	2.40	5.78	0.05	0.49
HA2	1	3.682	2.48	5.98	0.05	0.49
A1	1	6.659	2.40	5.78	0.69	0.81
A2	1	3.682	2.48	5.98	0.69	0.81
B1	3	11.808	2.22	5.35	0.51	0.72
B2	2	2.340	2.42	5.83	0.44	0.68
B3	3	1.856	2.82	6.81	0.29	0.61
C1	1	5.170	2.51	6.05	0.69	0.81
C1-1	1	0.436	3.76	9.09	0.77	0.85
C1-2	1	0.689	3.76	9.09	0.77	0.85
C1-3	1	0.574	3.76	9.09	0.77	0.85
C1-4	1	0.689	3.76	9.09	0.77	0.85
C1-5	1	0.574	3.76	9.09	0.77	0.85
OS1	4	10.453	1.70	4.10	0.05	0.49
OS2	4	0.372	3.63	8.76	0.85	0.89
OS3	5	0.081	3.76	9.09	0.85	0.89
OS4	5	0.175	3.76	9.09	0.85	0.89
OS5	5	0.065	3.76	9.09	0.85	0.89

Onsite storm drainage conforms to the Drainage Study and Plan required per the SCA Report. There are no impacts to the existing storm sewer infrastructure or the major drainage conveyance into Coal Creek.

2. The proposed drainage swales will direct existing runoff to the existing water quality pond.
3. The existing storm sewer located along the east side of the site currently conveys the roof drainage from Lot 1 Erie Air Park Replat A. Roof downspouts are connected to the existing PVC pipe at various locations. The pipe will be removed and replaced, as required, in order to facilitate building improvements on the subject property. This work may be phased concurrent with the building construction to be located on the subject property.
4. Future developed runoff from the proposed site and building improvements will be directed into the proposed water quality pond that is located at the north east corner of the site. Details of this plan will be submitted during the Site Plan Review process and will be subject to a subsequent Phase III Drainage Report.
5. As noted in the SCA Report, the runoff for the initial and major storm events from the tributary basin can be conveyed directly to the major drainage system without adversely impacting upstream, surrounding, or downstream properties and facilities. Due to the location of the site relative to the floodplain, the site was previously approved for providing only water quality for the proposed developed areas. No detention is proposed for this site.

   A water quality pond has been designed to provide the recommended structural Best Management Practices (BMPs) outlined in the Mile High Flood District (MHFD), Urban Storm Drainage Criteria Manual, Volume 3. The calculations for the water quality pond and the limited release structure are enclosed in Appendix C. In addition, sections and details for the pond and limited release outlet structure are shown on the enclosed plan. This pond has been designed to accommodate the anticipated water quality requirements for the developed conditions of both Basins A and C1.

   A limited release orifice plate provides the required 40-hour drain time for the water quality capture volume. The orifice plate meets the requirements for an Extended Detention Basin and the 40-hour drain time as specified in the MHFD Manual.

   We have updated the water quality plans and calculations based on current Town STANDARDS. We used the new MHFD Detention spreadsheet to recalculate the required pond volume. The required pond volume has actually decreased slightly, largely due to changes that were made to the assumed basin area in 2009 SCA report, and changes in the WQCV formula. The required pond volume has been reduced from 36,645 CF to 25,700 CF.

The pond was surveyed in 2018. The as-built contour elevations were used in the pond analysis. The new water quality volume provided will be 42,917 CF.

The imperviousness used in the previous WQ pond design was 95%. The Town of Erie Light Industrial imperviousness per Table 800-3 is 80%. Therefore, the pond is slightly overdesigned and will accommodate subsequent land use changes. Rainfall data was updated based on the current Town of Erie One-Hour Rainfall Depth per Table 800-2.

The existing outlet structure will be sufficient for the proposed use. Although the holes in the existing perforated plate were slightly smaller than required to allow for the 40 hour drain time used on the new MHFD spreadsheet. This might have been due to calculation differences between the different spreadsheets. Regardless, we are proposing to modify the existing perforated plate to provide a higher drain time. New 1" diameter holes will be drilled into the existing 3/4" holes in order to meet current standards.

The adjacent taxiway and roadways around the pond will provide approximately 1.0 feet of freeboard above the WQCV water surface elevation. In the event the pond was to overflow, the flow is directed to overtop at the outlet structure and spill north and east across the existing taxiway and directly into the Coal Creek drainageway. The spillway is sized to convey two times (2X) the runoff from the full basin developed conditions during the 100-year storm from the basin.

TABLE 2
WATER POND SUMMARY

Pond	Basin Area (ac)	Release Rate		Volume Required			Water Surface Elevation		
		EURV (CFS)	100-yr (CFS)	WQCV (CF)	EURV (CF)	100-yr (CF)	WQCV WSEL (FT)	EURV WSEL (FT)	100-yr WSEL (FT)
A	15.82	n/a	n/a	25,853	n/a	n/a	5094.0	n/a	n/a

6. Maintenance of the water quality pond will be provided by the home owners association.
7. There is an existing drainage easement located on the north side of the site. This easement provides conveyance to the offsite drainage from Basins B1,

OS1 and OS2. The drainage easement also includes the existing water quality facility. There are no other drainage easements needed for the proposed development.

8. By maintaining this WQCV, it is our conclusion that the runoff for the initial and major storm events from the tributary basin can be conveyed directly to the major drainage system without adversely impacting upstream, surrounding, or downstream properties and facilities.
9. The proposed drainage facilities will not impact the 100-year floodplain which is located adjacent to the site.

V. SUMMARY

A. Compliance with Standards

1. This drainage report and plan are in general conformance with the Town of Erie Standards and Specifications for Design and Construction of Public Improvements (STANDARDS).
2. This drainage report and plan are in general conformance with the Town of Erie Outfall Systems Plan.
3. This drainage report and plan are in general conformance with the Town of Erie Unified Development Code (UDC).
4. This drainage report and plan are in general conformance with the Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual.
5. This drainage report and plan are in general conformance with the "Final Drainage Report for the Erie Convair Hangar Complex" prepared by Scott, Cox & Associates, Inc. (SCA Report) dated March 23, 2009.

B. Drainage Concept

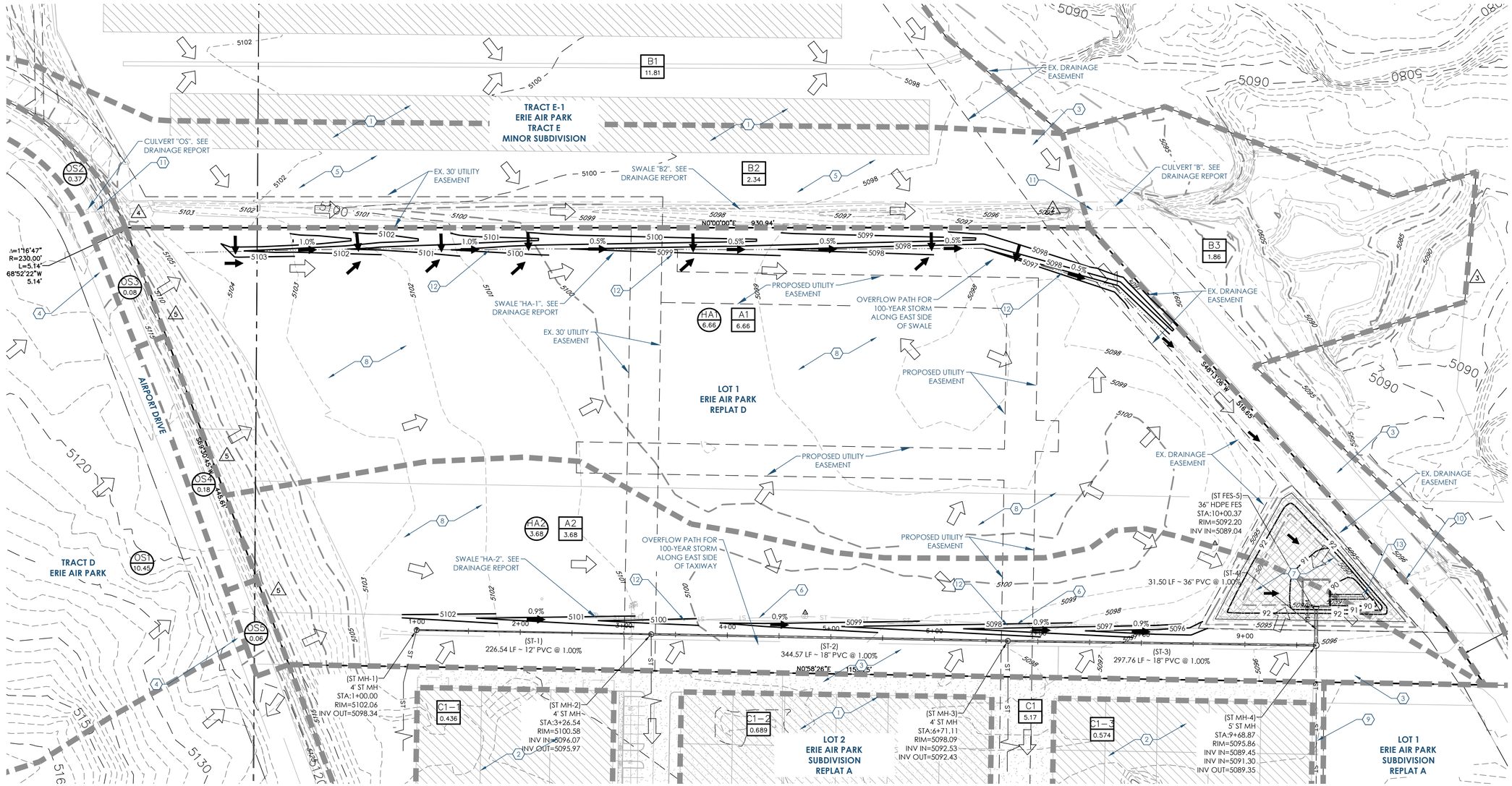
1. The primary consideration for this project was to design a drainage plan to offset the impact of the proposed construction. The drainage plan accommodates on-site runoff and off-site flows. The proposed site grading and storm sewers will direct water towards the water quality facility. The drainage will not negatively affect any upstream or downstream properties.
2. Onsite storm drainage conforms to the SCA Report. There are no impacts to the existing storm sewer infrastructure in the Erie Air Park or the major drainage conveyance into Coal Creek.

VI. REFERENCES

1. Town of Erie Unified Development Code (UDC) dated December 2019.
2. Town of Erie Standards and Specifications for Design and Construction of Public Improvements dated January 2021.
3. Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual, Volumes 1-3, dated August 2018.
4. Final Drainage Report for the Erie Convair Hangar Complex prepared by Scott, Cox & Associates, Inc. (SCA Report) dated March 23, 2009.

APPENDIX A

DRAINAGE PLAN



1 DRAINAGE PLAN

SCALE: 1" = 50'

0 50 100 Feet

RUNOFF SUMMARY

Drainage Basin	Design Point	Area	Rainfall Intensities (in/hr) I_5	I_{100}	Runoff Coefficients C_5	C_{100}	Peak Runoff (CFS) Q_5	Q_{100}
HA1	1	6.659	2.40	5.78	0.05	0.49	0.80	18.87
HA2	1	3.682	2.48	5.98	0.05	0.49	0.46	10.79
A1	1	6.659	2.40	5.78	0.69	0.81	11.01	31.19
A2	1	3.682	2.48	5.98	0.69	0.81	6.29	17.83
B1	3	11.808	2.22	5.35	0.51	0.72	13.42	45.58
B2	2	2.340	2.42	5.83	0.44	0.68	2.48	9.34
B3	3	1.856	2.82	6.81	0.29	0.61	1.50	7.69
C1	1	5.170	2.51	6.05	0.69	0.81	8.94	25.33
C1-1	1	0.436	3.76	9.09	0.77	0.85	1.26	3.37
C1-2	1	0.689	3.76	9.09	0.77	0.85	2.00	5.32
C1-3	1	0.574	3.76	9.09	0.77	0.85	1.66	4.43
C1-4	1	0.689	3.76	9.09	0.77	0.85	2.00	5.32
C1-5	1	0.574	3.76	9.09	0.77	0.85	1.66	4.43
OS1	4	10.453	1.70	4.10	0.05	0.49	0.89	20.99
OS2	4	0.372	3.63	8.76	0.85	0.89	1.15	2.90
OS3	5	0.081	3.76	9.09	0.85	0.89	0.26	0.66
OS4	5	0.175	3.76	9.09	0.85	0.89	0.56	1.42
OS5	5	0.065	3.76	9.09	0.85	0.89	0.21	0.53

WATER QUALITY POND SUMMARY

STAGE	VOLUME REQUIRED (CF)	VOLUME PROVIDED (CF)	WATER SURFACE ELEVATION (FT)	RELEASE RATE (CFS)
WQCV	25,700	25,950	5093.7	N/A
EURV	N/A	N/A	N/A	N/A
100-YR	N/A	N/A	N/A	N/A

KEYED NOTES

1.	EXISTING AIRCRAFT HANGARS TO REMAIN.
2.	EXISTING LIGHT INDUSTRIAL BUILDINGS TO REMAIN.
3.	EXISTING TAXIWAY TO REMAIN.
4.	EXISTING ASPHALT ROADWAY TO REMAIN.
5.	EXISTING AIRCRAFT APRON TO REMAIN.
6.	REMOVE AND REPLACE EXISTING 12" PVC STORM DRAIN PIPE.
7.	EXISTING STORMWATER QUALITY POND TO BE REGRADED.
8.	PROPOSED DRAINAGE SWALES WILL DIRECT RUNOFF TO THE EXISTING WATER QUALITY POND. FUTURE GRADING PLANS ON LOT 1 SHALL BE REVIEWED AND APPROVED DURING THE SITE PLAN REVIEW APPROVAL PROCESS.
9.	EXISTING 24" CMP STORM DRAIN PIPE TO REMAIN.
10.	EXISTING 30" PVC OUTLET PIPE TO REMAIN.
11.	EXISTING 24" CMP CULVERT TO REMAIN.
12.	TEMPORARY DRAINAGE SWALE TO ACCOMMODATE THE HISTORIC UNDEVELOPED RUNOFF. FUTURE DRAINAGE IMPROVEMENTS, INCLUDING SWALES AND STORM SEWER SYSTEM, WILL BE DESIGNED DURING THE SITE IMPROVEMENT PLAN SUBMITTAL. THESE FUTURE IMPROVEMENTS WILL ACCOMMODATE THE FULL DEVELOPED FLOW.
13.	WATER QUALITY OUTLET STRUCTURE TO BE MODIFIED. SEE GRADING PLANS FOR DETAILS

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Consultant

PROGRESS PRINTS NOT FOR CONSTRUCTION

Issue/Revisions Date No.

Project Information

LOT 1
ERIE AIR PARK REPLAT D
2800 AIRPORT DRIVE
ERIE, COLORADO

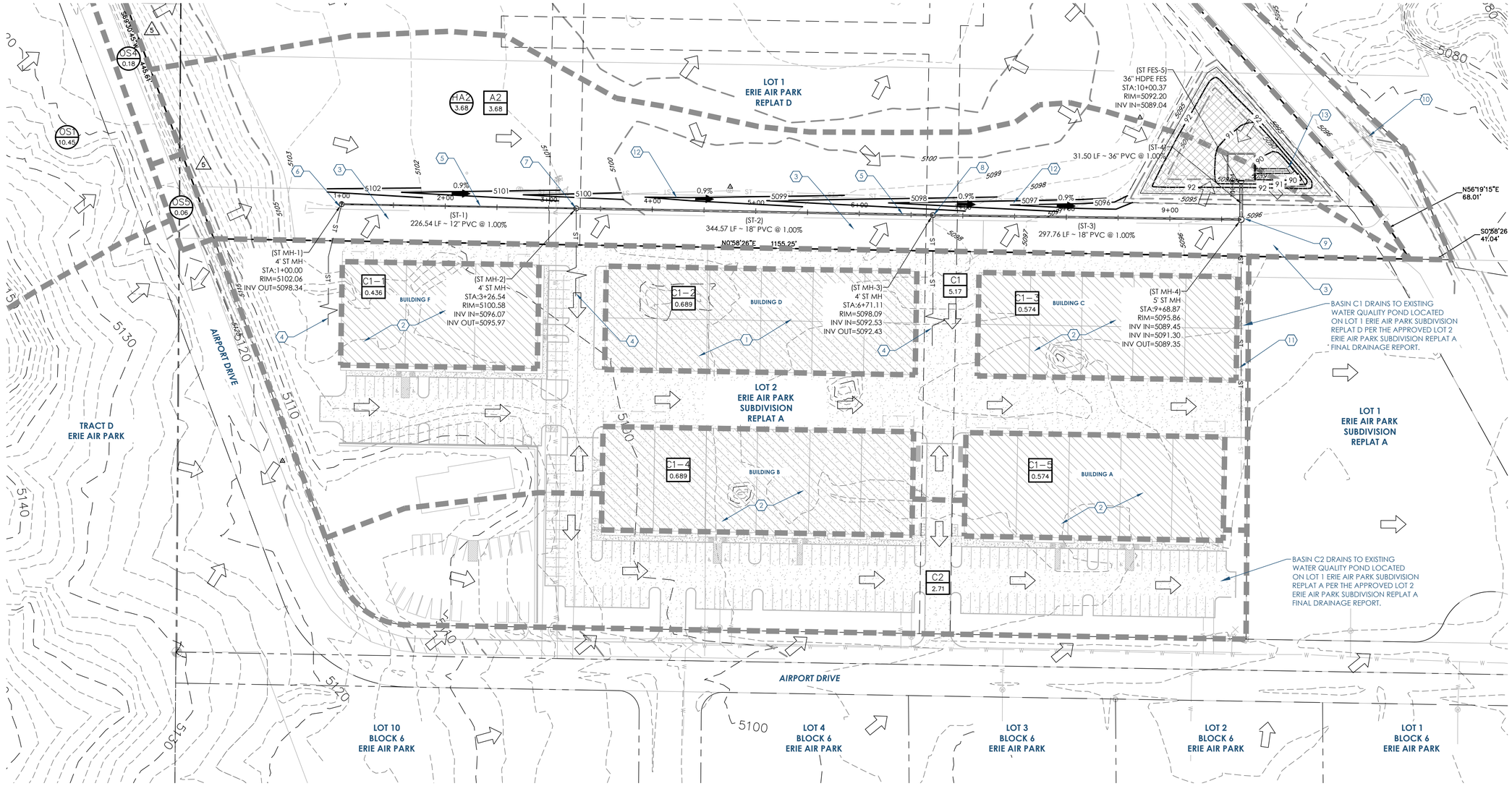
Sheet Information

Sheet Title:
DRAINAGE PLAN

MINOR SUBDIVISION 05/21/2021

Sheet Number:
D1.01

Nassar Project: 2019.xx



1 DRAINAGE PLAN
SCALE: 1" = 50'

0 50 100 Feet

RUNOFF SUMMARY

Drainage Basin	Design Point	Area	Rainfall Intensities (in/hr) I_5	Rainfall Intensities (in/hr) I_{100}	Runoff Coefficients C_5	Runoff Coefficients C_{100}	Peak Runoff (CFS) Q_5	Peak Runoff (CFS) Q_{100}
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B2	2	2.340	2.42	5.83	0.44	0.68	2.48	9.34
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C1	1	5.170	2.51	6.05	0.69	0.81	8.94	25.33
C1-1	1	0.436	3.76	9.09	0.77	0.85	1.26	3.37
C1-2	1	0.689	3.76	9.09	0.77	0.85	2.00	5.32
C1-3	1	0.574	3.76	9.09	0.77	0.85	1.66	4.43
C1-4	1	0.689	3.76	9.09	0.77	0.85	2.00	5.32
C1-5	1	0.574	3.76	9.09	0.77	0.85	1.66	4.43
OS1	4	10.453	1.70	4.10	0.05	0.49	0.89	20.99
OS2	4	0.372	3.63	8.76	0.85	0.89	1.15	2.90
OS3	5	0.081	3.76	9.09	0.85	0.89	0.26	0.66
OS4	5	0.175	3.76	9.09	0.85	0.89	0.56	1.42
OS5	5	0.065	3.76	9.09	0.85	0.89	0.21	0.53

WATER QUALITY POND SUMMARY

STAGE	VOLUME REQUIRED (CF)	VOLUME PROVIDED (CF)	WATER SURFACE ELEVATION (FT)	RELEASE RATE (CFS)
WQCV	25,700	25,950	5093.7	N/A
EURV	N/A	N/A	N/A	N/A
100-YR	N/A	N/A	N/A	N/A

KEYED NOTES

1.	EXISTING AIRCRAFT HANGARS TO REMAIN.
2.	EXISTING LIGHT INDUSTRIAL BUILDINGS TO REMAIN.
3.	EXISTING TAXIWAY TO REMAIN.
4.	EXISTING ROOF DRAINS INSTALLED AS PART OF LOT 2 DEVELOPMENT TO REMAIN.
5.	PROPOSED STORM SEWER TO BE INSTALLED TO COLLECT ROOF DRAINAGE FROM LOT 2 AS SHOWN.
6.	CONNECT 1/2 OF ROOF DRAINAGE FROM BUILDING F TO ST MH-1.
7.	CONNECT 1/2 OF ROOF DRAINAGE FROM BUILDING D AND 1/2 OF ROOF DRAINAGE FROM BUILDING B TO ST MH-2.
8.	CONNECT 1/2 OF ROOF DRAINAGE FROM BUILDING D, 1/2 OF ROOF DRAINAGE FROM BUILDING B, ROOF DRAINAGE FROM BUILDING C AND ROOF DRAINAGE FROM BUILDING A TO ST MH-3.
9.	CONNECT SITE DRAINAGE FROM BASIN C1 AND EXISTING 24" CMP TO ST MH-4.
10.	EXISTING 30" PVC OUTLET PIPE TO REMAIN.
11.	EXISTING 24" CMP CULVERT TO REMAIN.
12.	TEMPORARY DRAINAGE SWALE TO ACCOMMODATE THE HISTORIC UNDEVELOPED RUNOFF. FUTURE DRAINAGE IMPROVEMENTS, INCLUDING SWALES AND STORM SEWER SYSTEM, WILL BE DESIGNED DURING THE SITE IMPROVEMENT PLAN SUBMITTAL. THESE FUTURE IMPROVEMENTS WILL ACCOMMODATE THE FULL DEVELOPED FLOW.
13.	WATER QUALITY OUTLET STRUCTURE TO BE MODIFIED. SEE GRADING PLANS FOR DETAILS

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Consultant

PROGRESS PRINTS NOT FOR CONSTRUCTION

Issue/Revisions **Date** **No.**

Project Information

LOT 1
ERIE AIR PARK REPLAT D
2800 AIRPORT DRIVE
ERIE, COLORADO

Sheet Information

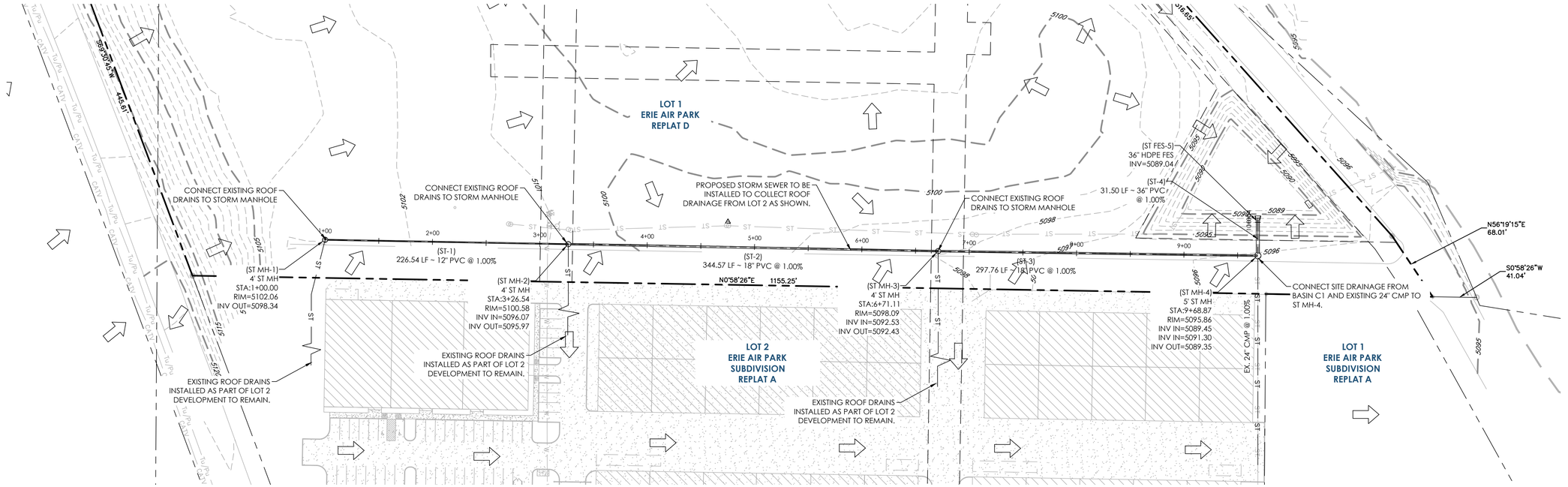
Sheet Title: DRAINAGE PLAN

MINOR SUBDIVISION 05/21/2021

Sheet Number:

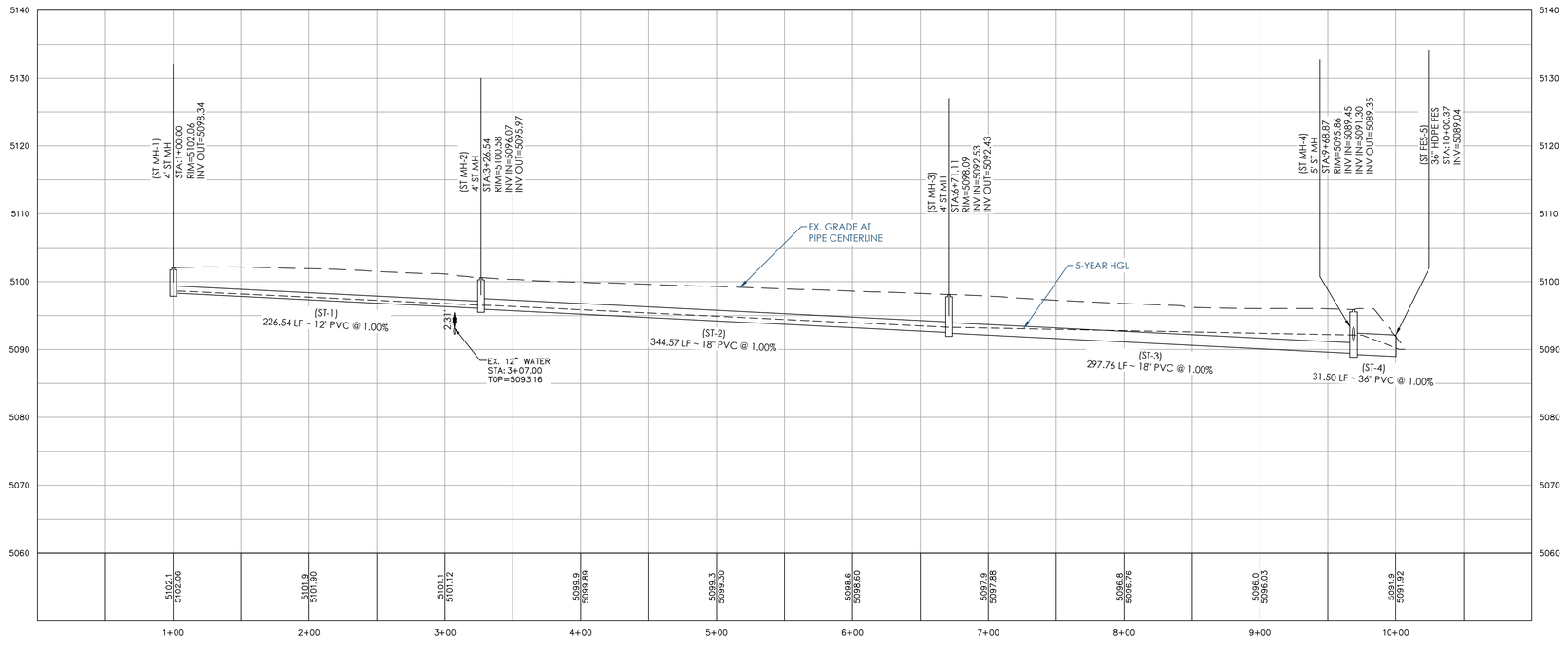
D1.02

Nassar Project: 2019.xx



1 STORM PLAN
SCALE: 1" = 50'

0 50 100 Feet



2 STORM PROFILE
SCALE: 1" = 50' H:1" = 5' V

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Issue/Revisions Date No.

Project Information

LOT 1
ERIE AIR PARK REPLAT D
2800 AIRPORT DRIVE
ERIE, COLORADO

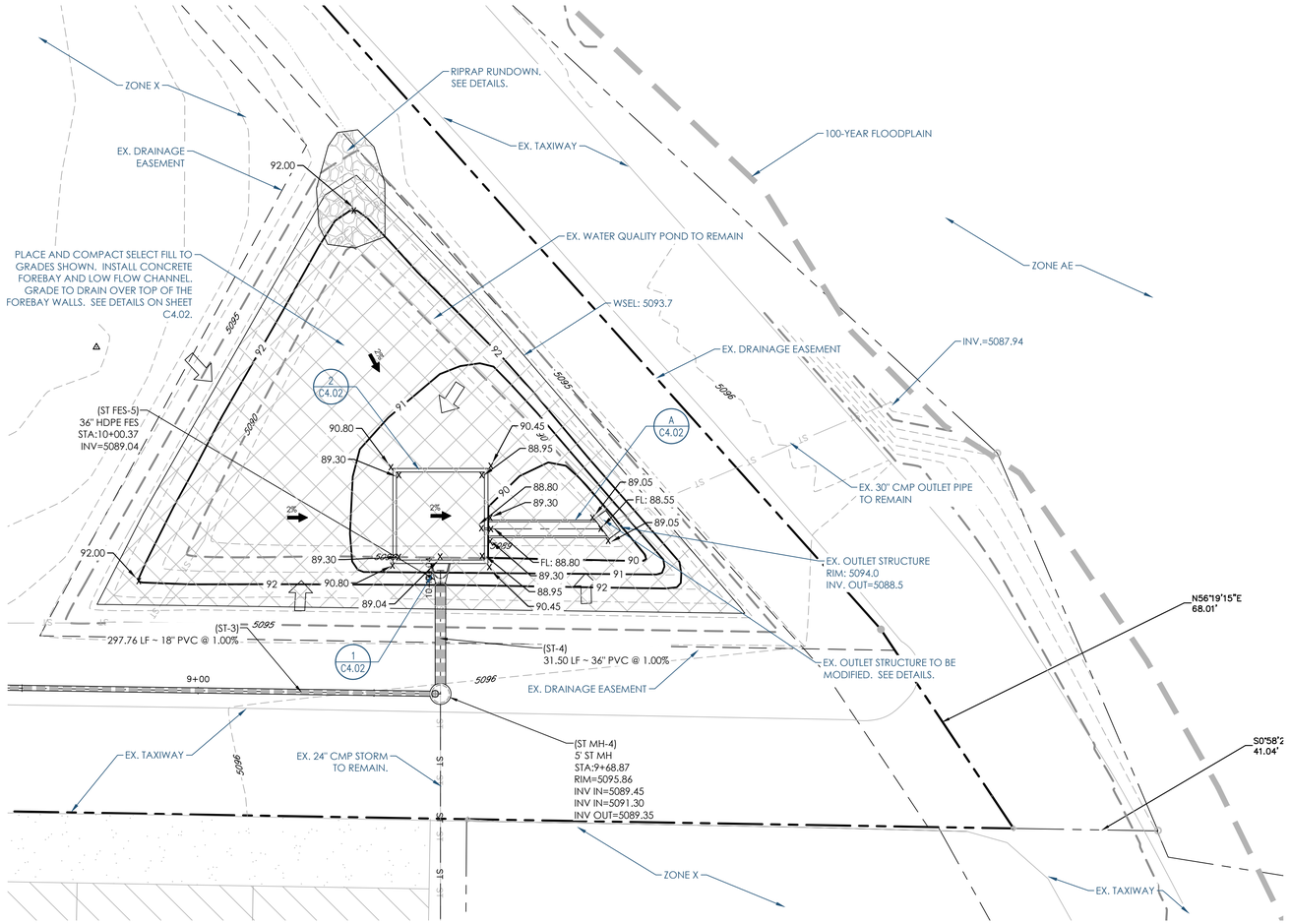
Sheet Information

Sheet Title:
STORM PLAN AND PROFILE

MINOR SUBDIVISION 05/21/2021

Sheet Number:
C3.01

Nassar Project: 2019.xx



1 POND DETAIL

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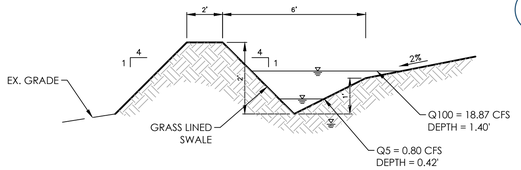

A SWALE 'HA-1' SECTION

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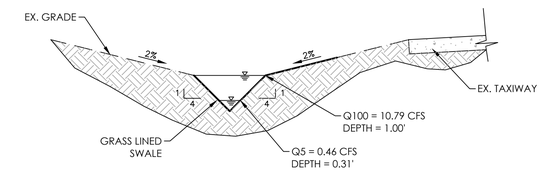
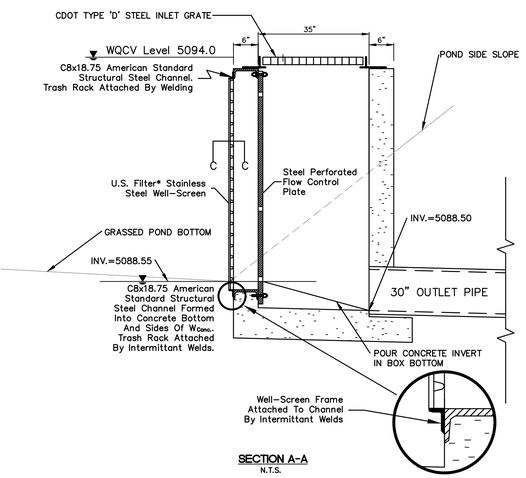


B SWALE 'HA-2' SECTION

SCALE: N.T.S.

WATER QUALITY POND SUMMARY

STAGE	VOLUME REQUIRED (CF)	VOLUME PROVIDED (CF)	WATER SURFACE ELEVATION (FT)	RELEASE RATE (CFS)
WQCV	25,700	25,950	5093.7	N/A
EURV	N/A	N/A	N/A	N/A
100-YR	N/A	N/A	N/A	N/A



SECTION A-A
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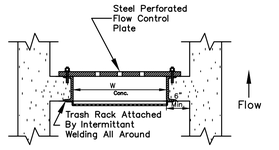
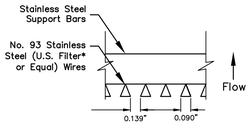


SECTION B-B - PLAN VIEW



SECTION C-C

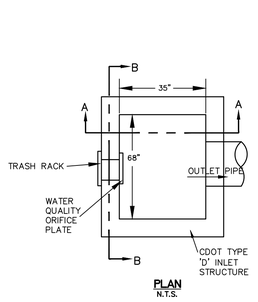
CIRCULAR OPENINGS ONLY

R VALUE = (NET OPEN AREA)/(GROSS RACK AREA) = 0.60

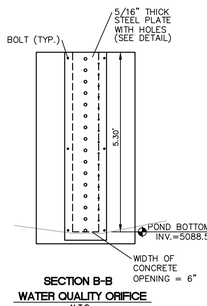
1. ALL OUTLET PLATE OPENINGS ARE CIRCULAR.
2. MAXIMUM DIAMETER OF OPENING = 2 INCHES. *U.S. FILTER, ST. PAUL, MINNESOTA, USA
3. TRASH RACK SHALL BE US FILTER (OR APPROVED EQUAL) STAINLESS STEEL WELL-SCREEN WITH #93 VEE WIRE, 0.139" OPENING BETWEEN WIRES, #156 VEE. SUPPORT RODS ON 3/4" ON-CENTER SPACING, TOTAL RACK THICKNESS OF 0.655" AND 3/4" X 1.0" FLAT BAR WELDED CARBON STEEL FRAME.

1 EXSITING TRASH RACK DETAIL

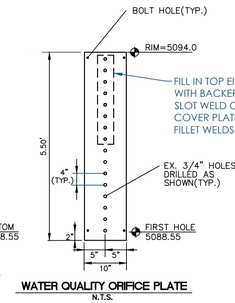
SCALE: N.T.S.



PLAN
N.T.S.



SECTION B-B
WATER QUALITY ORIFICE
N.T.S.



WATER QUALITY ORIFICE PLATE
N.T.S.

2 EXISTING POND OUTLET DETAIL

SCALE: N.T.S.

NASSAR DEVELOPMENT

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Consultant

PROGRESS PRINTS NOT FOR CONSTRUCTION

Issue/Revisions **Date** **No.**

Project Information

LOT 1
ERIE AIR PARK REPLAT D
2800 AIRPORT DRIVE
ERIE, COLORADO

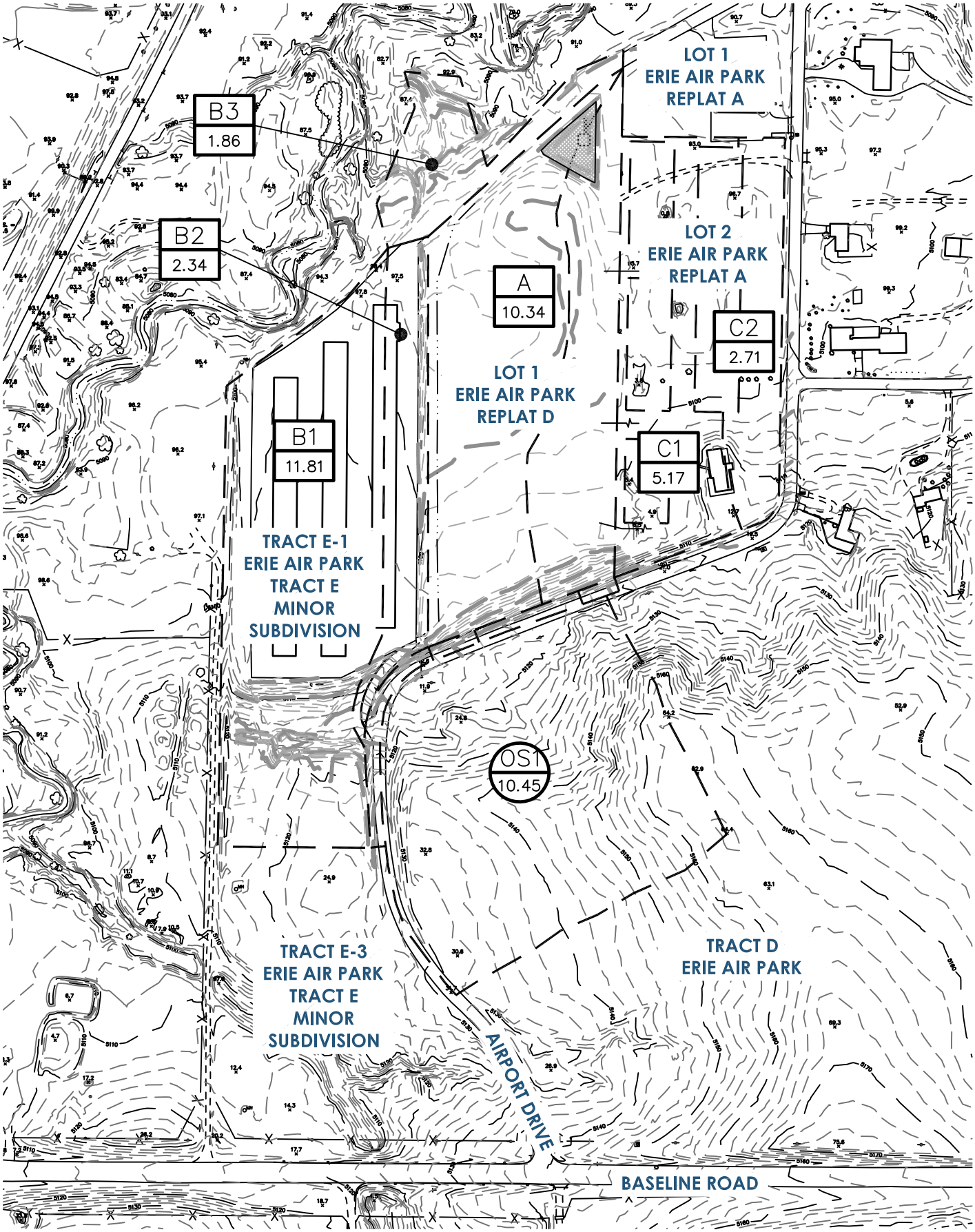
Sheet Information

Sheet Title:
CIVIL DETAILS

MINOR SUBDIVISION 05/21/2021

Sheet Number:
C4.01

Nassar Project: 2019.xx



OFFSITE DRAINAGE PLAN

1

SCALE: 1" = 300'

N

APPENDIX B

HYDROLOGIC CALCULATIONS

Runoff Summary

Summary Sheet

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Drainage Basin	Design Point	Area	Rainfall Intensities (in/hr)		Runoff Coefficients		Peak Runoff (CFS)	
			I_5	I_{100}	C_5	C_{100}	Q_5	Q_{100}
HA1	1	6.659	2.40	5.78	0.05	0.49	0.80	18.87
HA2	1	3.682	2.48	5.98	0.05	0.49	0.46	10.79
A1	1	6.659	2.40	5.78	0.69	0.81	11.01	31.19
A2	1	3.682	2.48	5.98	0.69	0.81	6.29	17.83
B1	3	11.808	2.22	5.35	0.51	0.72	13.42	45.58
B2	2	2.340	2.42	5.83	0.44	0.68	2.48	9.34
B3	3	1.856	2.82	6.81	0.29	0.61	1.50	7.69
C1	1	5.170	2.51	6.05	0.69	0.81	8.94	25.33
C1-1	1	0.436	3.76	9.09	0.77	0.85	1.26	3.37
C1-2	1	0.689	3.76	9.09	0.77	0.85	2.00	5.32
C1-3	1	0.574	3.76	9.09	0.77	0.85	1.66	4.43
C1-4	1	0.689	3.76	9.09	0.77	0.85	2.00	5.32
C1-5	1	0.574	3.76	9.09	0.77	0.85	1.66	4.43
OS1	4	10.453	1.70	4.10	0.05	0.49	0.89	20.99
OS2	4	0.372	3.63	8.76	0.85	0.89	1.15	2.90
OS3	5	0.081	3.76	9.09	0.85	0.89	0.26	0.66
OS4	5	0.175	3.76	9.09	0.85	0.89	0.56	1.42
OS5	5	0.065	3.76	9.09	0.85	0.89	0.21	0.53

Runoff Calculations

Basin HA1

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Existing Conditions - West Side of Lot 1

Design Point= 1

Runoff Coefficents (Ref. MHFD Table 6-4)

NRCS Soil Type= C/D

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	0.000	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.000	100%	0.83	0.85	0.87	0.89
Drive and walks	0.000	90%	0.74	0.77	0.79	0.85
Roofs	0.000	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	6.659	2%	0.01	0.05	0.15	0.49
TOTAL	**6.659**	**2%**	**0.01**	**0.05**	**0.15**	**0.49**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=0.395(1.1-C5)L1/2S-1/3

Travel Time (t_t) t_t=L/(V*60)

Overland Flow (Lo) (ft)=	500	Length (ft)=	700
Slope (ft/ft)=	0.034	Slope (ft/ft)=	0.014
t_i (min)=	28.59	Cv=	15
		Velocity (ft/s)=	1.79
t_c Urbanized Check	t_c=(L/180)+10 (min)	t_t (min)=	6.51
Total Length (ft)=	1,200	t_c Computed (t_i + t_t)=	35.10
t_c (min)=	16.67	t_c Mininum=	5.00
		t_c Final (min)=	**16.67**

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
1.75	2.40	3.00	5.78

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
0.12	0.80	3.00	18.87

Runoff Calculations

Basin HA2

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Existing Conditions - East Side of Lot 1

Design Point= 1

Runoff Coefficents (Ref. MHFD Table 6-4) NRCS Soil Type= C/D

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	0.000	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.000	100%	0.83	0.85	0.87	0.89
Drive and walks	0.000	90%	0.74	0.77	0.79	0.85
Roofs	0.000	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	3.682	2%	0.01	0.05	0.15	0.49
TOTAL	**3.682**	**2%**	**0.01**	**0.05**	**0.15**	**0.49**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=0.395(1.1-C5)L1/2S-1/3 Travel Time (t_t) t_t=L/(V*60)

Overland Flow (Lo) (ft)=	500	Length (ft)=	500
Slope (ft/ft)=	0.034	Slope (ft/ft)=	0.020
t_i (min)=	28.59	Cv=	15
		Velocity (ft/s)=	2.12
t_c Urbanized Check	t_c=(L/180)+10 (min)	t_t (min)=	3.93
Total Length (ft)=	1,000	t_c Computed (t_i + t_t)=	32.52
t_c (min)=	15.56	t_c Mininum=	5.00
		t_c Final (min)=	**15.56**

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
1.81	2.48	3.10	5.98

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
0.07	0.46	1.71	10.79

Runoff Calculations

Basin A1

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Proposed Conditions - West Side of Lot 1

Design Point= 1
NRCS Soil Type= C/D

Runoff Coefficents (Ref. MHFD Table 6-4)

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	6.659	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.000	100%	0.83	0.85	0.87	0.89
Drive and walks	0.000	90%	0.74	0.77	0.79	0.85
Roofs	0.000	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	0.000	2%	0.01	0.05	0.15	0.49
TOTAL	**6.659**	**80%**	**0.65**	**0.69**	**0.72**	**0.81**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=0.395(1.1-C5)L1/2S-1/3

Overland Flow (Lo) (ft)= 500
Slope (ft/ft)= 0.020
t_i (min)= 13.32

t_c Urbanized Check t_c=(L/180)+10 (min)

Total Length (ft)= 1,200
t_c (min)= 16.67

Travel Time (t_t) t_t=L/(V*60)

Length (ft)= 700
Slope (ft/ft)= 0.010
Cv= 20
Velocity (ft/s)= 2.00
t_t (min)= 5.83

t_c Computed (t_i + t_t)= 19.16
t_c Mininum= 5.00
t_c Final (min)= 16.67

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
1.75	2.40	3.00	5.78

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
7.57	11.01	14.38	31.19

Runoff Calculations

Basin A2

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Proposed Conditions - East Side of Lot 1

Design Point= 1
NRCS Soil Type= C/D

Runoff Coefficents (Ref. MHFD Table 6-4)

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	3.682	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.000	100%	0.83	0.85	0.87	0.89
Drive and walks	0.000	90%	0.74	0.77	0.79	0.85
Roofs	0.000	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	0.000	2%	0.01	0.05	0.15	0.49
TOTAL	**3.682**	**80%**	**0.65**	**0.69**	**0.72**	**0.81**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=0.395(1.1-C5)L1/2S-1/3

Overland Flow (Lo) (ft)= 500
Slope (ft/ft)= 0.020
t_i (min)= 13.32

t_c Urbanized Check t_c=(L/180)+10 (min)

Total Length (ft)= 1,000
t_c (min)= 15.56

Travel Time (t_t) t_t=L/(V*60)

Length (ft)= 500
Slope (ft/ft)= 0.017
Cv= 20
Velocity (ft/s)= 2.61
t_t (min)= 3.20

t_c Computed (t_i + t_t)= 16.52
t_c Mininum= 5.00
t_c Final (min)= 15.56

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
1.81	2.48	3.10	5.98

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
4.33	6.29	8.22	17.83

Runoff Calculations

Basin B1

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Existing Conditions - Developed portions of Tract E-1

Design Point= 3

Runoff Coefficents (Ref. MHFD Table 6-4)

NRCS Soil Type= C/D

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	0.000	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.000	100%	0.83	0.85	0.87	0.89
Drive and walks	5.067	90%	0.74	0.77	0.79	0.85
Roofs	2.527	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	4.215	2%	0.01	0.05	0.15	0.49
TOTAL	**11.808**	**59%**	**0.48**	**0.51**	**0.56**	**0.72**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=0.395(1.1-C5)L1/2S-1/3

Travel Time (t_t) t_t=L/(V*60)

Overland Flow (Lo) (ft)=	500	Length (ft)=	1,200
Slope (ft/ft)=	0.03	Slope (ft/ft)=	0.005
t_i (min)=	16.31	Cv=	20
		Velocity (ft/s)=	1.41
t_c Urbanized Check	t_c=(L/180)+10 (min)	t_t (min)=	14.14
Total Length (ft)=	1,700	t_c Computed (t_i + t_t)=	30.45
t_c (min)=	19.44	t_c Mininum=	5.00
		t_c Final (min)=	**19.44**

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
1.62	2.22	2.77	5.35

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
9.15	13.42	18.40	45.58

Runoff Calculations

Basin B2

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Existing Conditions - Eastern developed portions of Tract E-1

Design Point= 2

Runoff Coefficents (Ref. MHFD Table 6-4) NRCS Soil Type= C/D

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	0.000	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.000	100%	0.83	0.85	0.87	0.89
Drive and walks	0.819	90%	0.74	0.77	0.79	0.85
Roofs	0.446	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	1.075	2%	0.01	0.05	0.15	0.49
TOTAL	**2.340**	**50%**	**0.40**	**0.44**	**0.50**	**0.68**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=0.395(1.1-C5)L1/2S-1/3 Travel Time (t_t) t_t=L/(V*60)

Overland Flow (Lo) (ft)=	300	Length (ft)=	850
Slope (ft/ft)=	0.05	Slope (ft/ft)=	0.01059
t_i (min)=	12.54	Cv=	20
		Velocity (ft/s)=	2.06
t_c Urbanized Check	t_c=(L/180)+10 (min)	t_t (min)=	6.88
Total Length (ft)=	1,150	t_c Computed (t_i + t_t)=	19.43
t_c (min)=	16.39	t_c Mininum=	5.00
		t_c Final (min)=	**16.39**

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
1.76	2.42	3.02	5.83

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
1.67	2.48	3.51	9.34

Runoff Calculations

Basin B3

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Existing Conditions - Uneveloped portions of Tract E-1

Design Point= 3

Runoff Coefficents (Ref. MHFD Table 6-4) NRCS Soil Type= C/D

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	0.000	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.000	100%	0.83	0.85	0.87	0.89
Drive and walks	0.611	90%	0.74	0.77	0.79	0.85
Roofs	0.000	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	1.246	2%	0.01	0.05	0.15	0.49
TOTAL	**1.856**	**31%**	**0.25**	**0.29**	**0.36**	**0.61**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=0.395(1.1-C5)L1/2S-1/3 Travel Time (t_t) t_t=L/(V*60)

Overland Flow (Lo) (ft)=	300	Length (ft)=	0
Slope (ft/ft)=	0.03	Slope (ft/ft)=	0.0075
t_i (min)=	17.27	Cv=	20
		Velocity (ft/s)=	1.73
t_c Urbanized Check	t_c=(L/180)+10 (min)	t_t (min)=	0.00
Total Length (ft)=	300	t_c Computed (t_i + t_t)=	17.27
t_c (min)=	11.67	t_c Mininum=	5.00
		t_c Final (min)=	**11.67**

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
2.06	2.82	3.53	6.81

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
0.96	1.50	2.36	7.69

Runoff Calculations

Basin C1

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Existing Conditions - Western developed portions of Lot 2

Design Point= 1

Runoff Coefficents (Ref. MHFD Table 6-4)

NRCS Soil Type= C/D

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	5.170	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.000	100%	0.83	0.85	0.87	0.89
Drive and walks	0.000	90%	0.74	0.77	0.79	0.85
Roofs	0.000	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	0.000	2%	0.01	0.05	0.15	0.49
TOTAL	**5.170**	**80%**	**0.65**	**0.69**	**0.72**	**0.81**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=0.395(1.1-C5)L1/2S-1/3

Travel Time (t_t) t_t=L/(V*60)

Overland Flow (Lo) (ft)=	40	Length (ft)=	1,025
Slope (ft/ft)=	0.02	Slope (ft/ft)=	0.0056
t_i (min)=	3.77	Cv=	20
		Velocity (ft/s)=	1.50
t_c Urbanized Check	t_c=(L/180)+10 (min)	t_t (min)=	11.41
Total Length (ft)=	1,065	t_c Computed (t_i + t_t)=	15.18
t_c (min)=	15.92	t_c Mininum=	5.00
		t_c Final (min)=	**15.18**

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
1.83	2.51	3.14	6.05

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
6.14	8.94	11.68	25.33

Runoff Calculations

Basin C1-1

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Proposed Conditions - Building F

Design Point= 1

Runoff Coefficents (Ref. MHFD Table 6-4) NRCS Soil Type= C/D

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	0.000	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.000	100%	0.83	0.85	0.87	0.89
Drive and walks	0.000	90%	0.74	0.77	0.79	0.85
Roofs	0.436	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	0.000	2%	0.01	0.05	0.15	0.49
TOTAL	**0.436**	**90%**	**0.74**	**0.77**	**0.79**	**0.85**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=0.395(1.1-C5)L1/2S-1/3 Travel Time (t_t) t_t=L/(V*60)

Overland Flow (Lo) (ft)=	100	Length (ft)=	0
Slope (ft/ft)=	0.020	Slope (ft/ft)=	0.000
t_i (min)=	4.80	Cv=	20
		Velocity (ft/s)=	0.02
t_c Urbanized Check	t_c=(L/180)+10 (min)	t_t (min)=	0.00
Total Length (ft)=	100	t_c Computed (t_i + t_t)=	4.80
t_c (min)=	10.56	t_c Mininum=	5.00
		t_c Final (min)=	**5.00**

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
2.75	3.76	4.71	9.09

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
0.89	1.26	1.62	3.37

Runoff Calculations

Basin C1-2

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Proposed Conditions - Building D

Design Point= 1

Runoff Coefficents (Ref. MHFD Table 6-4) NRCS Soil Type= C/D

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	0.000	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.000	100%	0.83	0.85	0.87	0.89
Drive and walks	0.000	90%	0.74	0.77	0.79	0.85
Roofs	0.689	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	0.000	2%	0.01	0.05	0.15	0.49
TOTAL	**0.689**	**90%**	**0.74**	**0.77**	**0.79**	**0.85**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=0.395(1.1-C5)L1/2S-1/3

Overland Flow (Lo) (ft)= 100
Slope (ft/ft)= 0.020
t_i (min)= 4.80

t_c Urbanized Check t_c=(L/180)+10 (min)

Total Length (ft)= 100
t_c (min)= 10.56

Travel Time (t_t) t_t=L/(V*60)

Length (ft)= 0
Slope (ft/ft)= 0.000
Cv= 20
Velocity (ft/s)= 0.02
t_t (min)= 0.00

t_c Computed (t_i + t_t)= 4.80
t_c Mininum= 5.00
t_c Final (min)= 5.00

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
2.75	3.76	4.71	9.09

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
1.40	2.00	2.57	5.32

Runoff Calculations

Basin C1-3

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Proposed Conditions - Building C

Design Point= 1

Runoff Coefficents (Ref. MHFD Table 6-4) NRCS Soil Type= C/D

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	0.000	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.000	100%	0.83	0.85	0.87	0.89
Drive and walks	0.000	90%	0.74	0.77	0.79	0.85
Roofs	0.574	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	0.000	2%	0.01	0.05	0.15	0.49
TOTAL	**0.574**	**90%**	**0.74**	**0.77**	**0.79**	**0.85**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=0.395(1.1-C5)L1/2S-1/3 Travel Time (t_t) t_t=L/(V*60)

Overland Flow (Lo) (ft)=	100	Length (ft)=	0
Slope (ft/ft)=	0.020	Slope (ft/ft)=	0.000
t_i (min)=	4.80	Cv=	20
		Velocity (ft/s)=	0.02
t_c Urbanized Check	t_c=(L/180)+10 (min)	t_t (min)=	0.00
Total Length (ft)=	100	t_c Computed (t_i + t_t)=	4.80
t_c (min)=	10.56	t_c Mininum=	5.00
		t_c Final (min)=	**5.00**

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
2.75	3.76	4.71	9.09

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
1.17	1.66	2.14	4.43

Runoff Calculations

Basin C1-4

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Proposed Conditions - Building B

Design Point= 1

Runoff Coefficents (Ref. MHFD Table 6-4) NRCS Soil Type= C/D

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	0.000	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.000	100%	0.83	0.85	0.87	0.89
Drive and walks	0.000	90%	0.74	0.77	0.79	0.85
Roofs	0.689	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	0.000	2%	0.01	0.05	0.15	0.49
TOTAL	**0.689**	**90%**	**0.74**	**0.77**	**0.79**	**0.85**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=0.395(1.1-C5)L1/2S-1/3 Travel Time (t_t) t_t=L/(V*60)

Overland Flow (Lo) (ft)=	100	Length (ft)=	0
Slope (ft/ft)=	0.020	Slope (ft/ft)=	0.000
t_i (min)=	4.80	Cv=	20
		Velocity (ft/s)=	0.02
t_c Urbanized Check	t_c=(L/180)+10 (min)	t_t (min)=	0.00
Total Length (ft)=	100	t_c Computed (t_i + t_t)=	4.80
t_c (min)=	10.56	t_c Mininum=	5.00
		t_c Final (min)=	**5.00**

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
2.75	3.76	4.71	9.09

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
1.40	2.00	2.57	5.32

Runoff Calculations

Basin C1-5

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Proposed Conditions - Building A

Design Point= 1

Runoff Coefficents (Ref. MHFD Table 6-4) NRCS Soil Type= C/D

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	0.000	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.000	100%	0.83	0.85	0.87	0.89
Drive and walks	0.000	90%	0.74	0.77	0.79	0.85
Roofs	0.574	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	0.000	2%	0.01	0.05	0.15	0.49
TOTAL	**0.574**	**90%**	**0.74**	**0.77**	**0.79**	**0.85**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=0.395(1.1-C5)L1/2S-1/3 Travel Time (t_t) t_t=L/(V*60)

Overland Flow (Lo) (ft)=	100	Length (ft)=	0
Slope (ft/ft)=	0.020	Slope (ft/ft)=	0.000
t_i (min)=	4.80	Cv=	20
		Velocity (ft/s)=	0.02
t_c Urbanized Check	t_c=(L/180)+10 (min)	t_t (min)=	0.00
Total Length (ft)=	100	t_c Computed (t_i + t_t)=	4.80
t_c (min)=	10.56	t_c Mininum=	5.00
		t_c Final (min)=	**5.00**

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
2.75	3.76	4.71	9.09

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
1.17	1.66	2.14	4.43

Runoff Calculations

Basin OS1

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Existing Conditions - Tract 4 Offsite Basin

Design Point= 4

Runoff Coefficents (Ref. MHFD Table 6-4) NRCS Soil Type= C/D

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	0.000	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.000	100%	0.83	0.85	0.87	0.89
Drive and walks	0.000	90%	0.74	0.77	0.79	0.85
Roofs	0.000	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	10.453	2%	0.01	0.05	0.15	0.49
TOTAL	**10.453**	**2%**	**0.01**	**0.05**	**0.15**	**0.49**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=1.8(1.1-C5)L1/2S-1/3 Travel Time (t_t) t_t=L/(V*60)

Overland Flow (Lo) (ft)= 500
Slope (ft/ft)= 0.053
t_i (min)= 24.70

Length (ft)= 1,000
Slope (ft/ft)= 0.028
Cv= 15
Velocity (ft/s)= 2.51
t_t (min)= 6.64

t_c Urbanized Check t_c=(L/180)+10 (min)

Total Length (ft)= n/a
t_c (min)= n/a

t_c Computed (t_i + t_t)= 31.34
t_c Mininum= 5.00
t_c Final (min)= 31.34

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
1.24	1.70	2.13	4.10

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
0.13	0.89	3.33	20.99

Runoff Calculations

Basin OS2

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Existing Conditions - Airport Drive Offsite Basin

Design Point= 4
NRCS Soil Type= C/D

Runoff Coefficents (Ref. MHFD Table 6-4)

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	0.000	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.372	100%	0.83	0.85	0.87	0.89
Drive and walks	0.000	90%	0.74	0.77	0.79	0.85
Roofs	0.000	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	0.000	2%	0.01	0.05	0.15	0.49
TOTAL	**0.372**	**100%**	**0.83**	**0.85**	**0.87**	**0.89**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=1.8(1.1-C5)L1/2S-1/3 Travel Time (t_t) t_t=L/(V*60)

Overland Flow (Lo) (ft)= 50
Slope (ft/ft)= 0.02
t_i (min)= 2.57

Length (ft)= 400
Slope (ft/ft)= 0.02
Cv= 15
Velocity (ft/s)= 2.12
t_t (min)= 3.14

t_c Urbanized Check t_c=(L/180)+10 (min)

Total Length (ft)= n/a
t_c (min)= n/a

t_c Computed (t_i + t_t)= 5.71
t_c Mininum= 5.00
t_c Final (min)= 5.71

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
2.65	3.63	4.55	8.76

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
0.82	1.15	1.47	2.90

Runoff Calculations

Basin OS3

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Existing Conditions - Airport Drive Offsite Basin

Design Point= 5

Runoff Coefficents (Ref. MHFD Table 6-4)

NRCS Soil Type= C/D

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	0.000	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.081	100%	0.83	0.85	0.87	0.89
Drive and walks	0.000	90%	0.74	0.77	0.79	0.85
Roofs	0.000	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	0.000	2%	0.01	0.05	0.15	0.49
TOTAL	**0.081**	**100%**	**0.83**	**0.85**	**0.87**	**0.89**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=1.8(1.1-C5)L1/2S-1/3

Travel Time (t_t) t_t=L/(V*60)

Overland Flow (Lo) (ft)= 50
Slope (ft/ft)= 0.02
t_i (min)= 2.57

Length (ft)= 0
Slope (ft/ft)= 0.02
Cv= 15
Velocity (ft/s)= 2.12
t_t (min)= 0.00

t_c Urbanized Check t_c=(L/180)+10 (min)

Total Length (ft)= n/a
t_c (min)= n/a

t_c Computed (t_i + t_t)= 2.57
t_c Mininum= 5.00
t_c Final (min)= 5.00

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
2.75	3.76	4.71	9.09

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
0.19	0.26	0.33	0.66

Runoff Calculations

Basin OS4

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Existing Conditions - Airport Drive Offsite Basin

Design Point= 5

Runoff Coefficents (Ref. MHFD Table 6-4)

NRCS Soil Type= C/D

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	0.000	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.175	100%	0.83	0.85	0.87	0.89
Drive and walks	0.000	90%	0.74	0.77	0.79	0.85
Roofs	0.000	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	0.000	2%	0.01	0.05	0.15	0.49
TOTAL	**0.175**	**100%**	**0.83**	**0.85**	**0.87**	**0.89**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=1.8(1.1-C5)L1/2S-1/3

Travel Time (t_t) t_t=L/(V*60)

Overland Flow (Lo) (ft)= 50
Slope (ft/ft)= 0.02
t_i (min)= 2.57

Length (ft)= 0
Slope (ft/ft)= 0.02
Cv= 15
Velocity (ft/s)= 2.12
t_t (min)= 0.00

t_c Urbanized Check t_c=(L/180)+10 (min)

Total Length (ft)= n/a
t_c (min)= n/a

t_c Computed (t_i + t_t)= 2.57
t_c Mininum= 5.00
t_c Final (min)= 5.00

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
2.75	3.76	4.71	9.09

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
0.40	0.56	0.72	1.42

Runoff Calculations

Basin OS5

Lot 1 - Erie Airpark Replat D
2800 Airport Drive
Erie, Colorado

Project No: 1075
By: Dash
Date: 05/21/21

Existing Conditions - Airport Drive Offsite Basin

Design Point= 5

Runoff Coefficents (Ref. MHFD Table 6-4) NRCS Soil Type= C/D

Description	Area (AC)	Imp. (%)	Runoff Coefficients C_2	C_5	C_{10}	C_{100}
Industrial - Light	0.000	80%	0.65	0.69	0.72	0.81
Streets - Paved	0.065	100%	0.83	0.85	0.87	0.89
Drive and walks	0.000	90%	0.74	0.77	0.79	0.85
Roofs	0.000	90%	0.74	0.77	0.79	0.85
Lawns, clayey soil	0.000	2%	0.01	0.05	0.15	0.49
TOTAL	**0.065**	**100%**	**0.83**	**0.85**	**0.87**	**0.89**

Time of Concentration (Ref. MHFD Volume 2, Section 6, Chapter 2)

Initial Overland Time (t_i) ti=1.8(1.1-C5)L1/2S-1/3 Travel Time (t_t) t_t=L/(V*60)

Overland Flow (Lo) (ft)= 50
Slope (ft/ft)= 0.02
t_i (min)= 2.57

Length (ft)= 0
Slope (ft/ft)= 0.02
Cv= 15
Velocity (ft/s)= 2.12
t_t (min)= 0.00

t_c Urbanized Check t_c=(L/180)+10 (min)

Total Length (ft)= n/a
t_c (min)= n/a

t_c Computed (t_i + t_t)= 2.57
t_c Mininum= 5.00
t_c Final (min)= 5.00

Rainfall Intensity (I)
(Ref. MHFD Volume 2, Section 5, Chapter 4 and Town of Erie Precipitation Data)

I_2 (in/hr)	I_5 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)
2.75	3.76	4.71	9.09

Runoff (Q)
(Ref. MHFD Volume 2, Section 6, Chapter 2)

Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
0.15	0.21	0.27	0.53

APPENDIX C

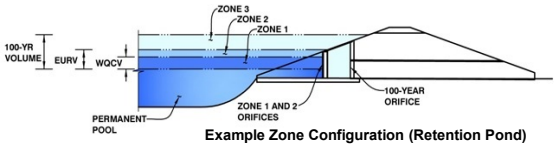
WATER QUALITY CALCULATIONS

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Lot 1 - Erie Air Park Replat D

Basin ID: Basins A and C1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	5.20	0.590	Orifice Plate
Zone 2			Not Utilized
Zone 3			Not Utilized
Total (all zones)		0.590	

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	ft²
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 =	3.056E-03	ft²
Depth at top of Zone using Orifice Plate =	5.50	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 =	0.44	sq. inches (diameter = 3/4 inch)	Elliptical Slot Area =	N/A	ft²

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	1.00	1.33	1.67	2.00	2.33
Orifice Area (sq. inches)	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44

	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			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Not Selected	Not Selected			Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	N/A	N/A	feet
Overflow Weir Front Edge Length =	N/A	N/A	feet	Overflow Weir Slope Length =	N/A	N/A	feet
Overflow Weir Grate Slope =	N/A	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	N/A	N/A	
Horiz. Length of Weir Sides =	N/A	N/A	feet	Overflow Grate Open Area w/o Debris =	N/A	N/A	ft²
Overflow Grate Open Area % =	N/A	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	N/A	N/A	ft²
Debris Clogging % =	N/A	N/A	%				

Calculated Parameters for Overflow Weir

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

	Not Selected	Not Selected			Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	N/A	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	N/A	N/A	ft²
Circular Orifice Diameter =	N/A	N/A	inches	Outlet Orifice Centroid =	N/A	N/A	feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5095.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.64	feet
Spillway Crest Length =	35.00	feet	Stage at Top of Freeboard =	5097.34	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.37	acres
Freeboard above Max Water Surface =	1.70	feet	Basin Volume at Top of Freeboard =	1.33	acre-ft

Calculated Parameters for Spillway

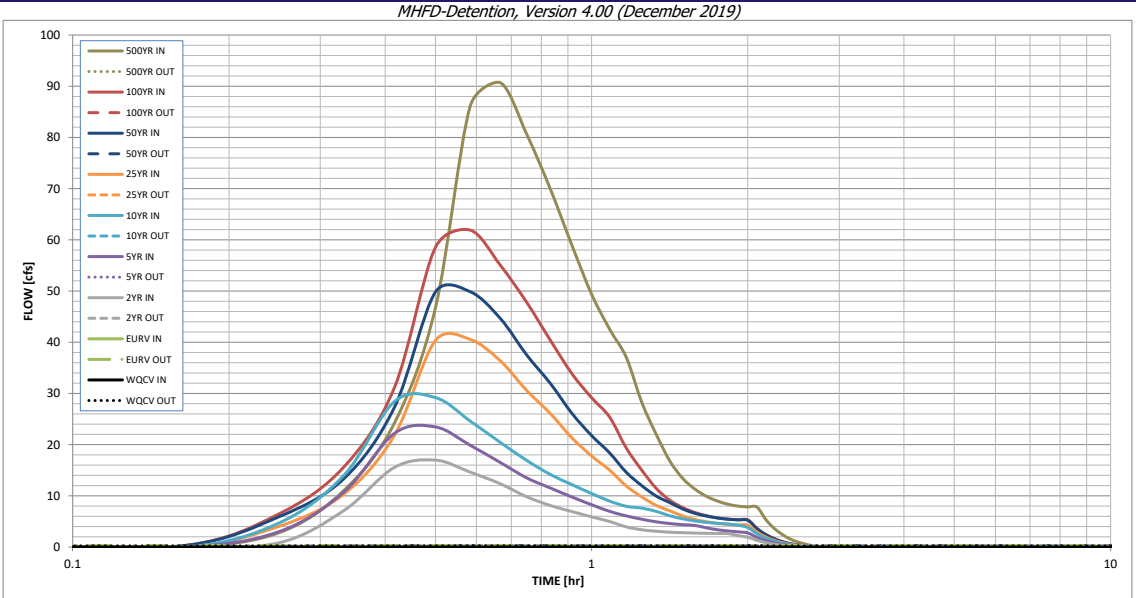
Routed Hydrograph Results

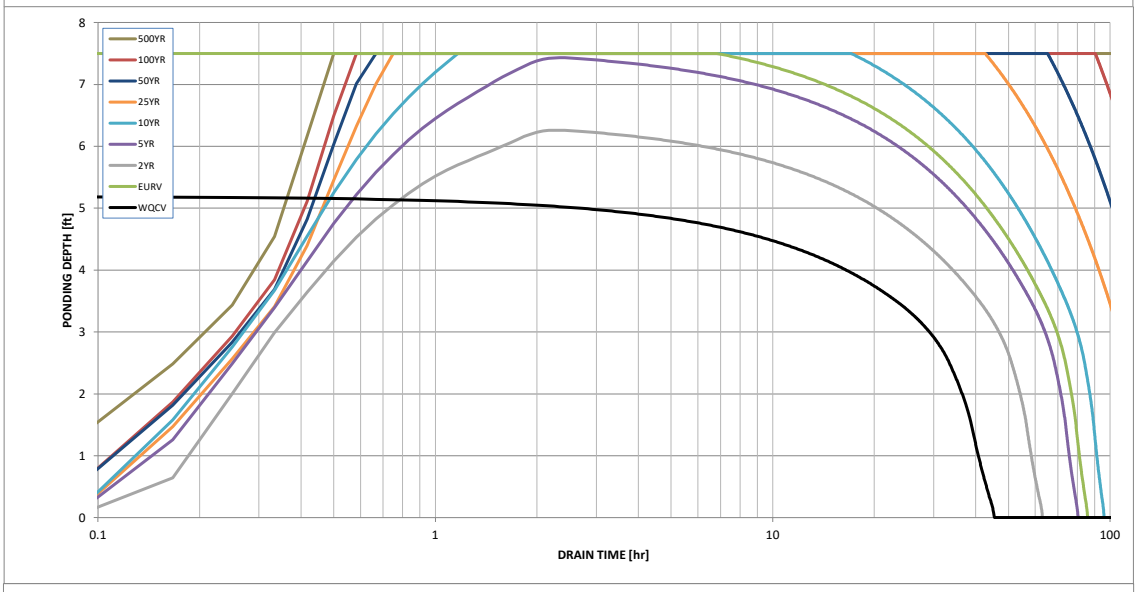
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

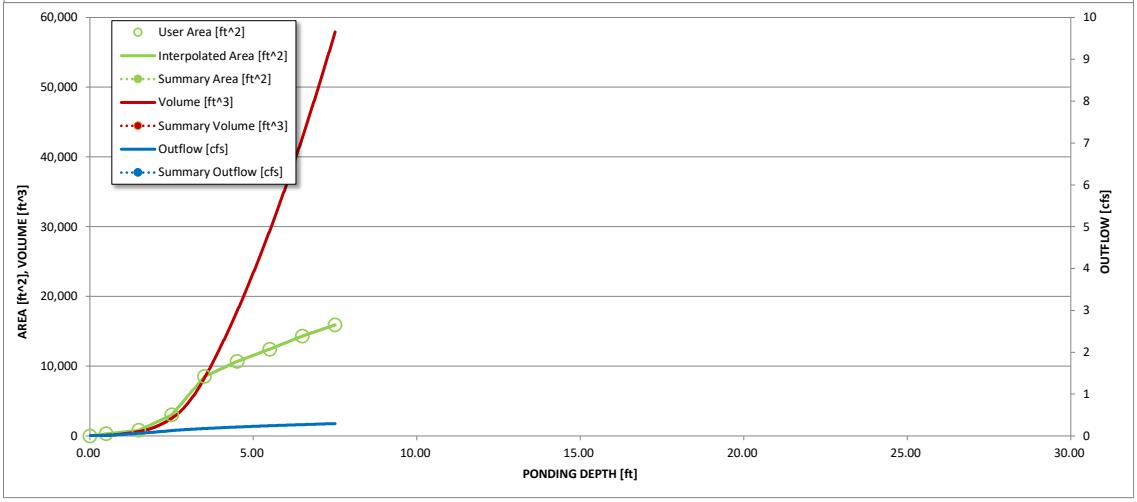
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.81	1.11	1.39	1.84	2.24	2.68	3.89
CUHP Runoff Volume (acre-ft) =	0.590	1.498	0.949	1.354	1.739	2.364	2.919	3.533	5.215
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.949	1.354	1.739	2.364	2.919	3.533	5.215
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	1.6	4.5	11.8	16.8	23.4	39.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.10	0.29	0.74	1.06	1.48	2.47
Peak Inflow Q (cfs) =	N/A	N/A	17.0	23.5	29.2	40.6	49.9	61.9	90.7
Peak Outflow Q (cfs) =	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.1	0.0	0.0	0.0	0.0
Structure Controlling Flow =	Plate	N/A	Plate	Plate	N/A	N/A	N/A	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) =	38	75	54	70	85	109	>120	>120	>120
Time to Drain 99% of Inflow Volume (hours) =	**41**	79	58	74	89	114	>120	>120	>120
Maximum Ponding Depth (ft) =	5.20	7.50	6.26	7.43	7.50	7.50	7.50	7.50	7.50
Area at Maximum Ponding Depth (acres) =	0.27	0.37	0.32	0.36	0.37	0.37	0.37	0.37	0.37
Maximum Volume Stored (acre-ft) =	0.592	1.330	0.905	1.304	1.330	1.330	1.330	1.330	1.330

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







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: _____

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	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]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.36	2.81
	0:15:00	0.00	0.00	0.84	3.02	4.71	4.06	5.94	6.50	11.08
	0:20:00	0.00	0.00	7.15	10.77	14.03	10.37	13.39	15.67	24.18
	0:25:00	0.00	0.00	15.55	22.20	28.40	21.79	27.24	31.09	46.67
	0:30:00	0.00	0.00	16.98	23.47	29.20	40.35	49.80	58.53	86.07
	0:35:00	0.00	0.00	14.64	19.90	24.62	40.57	49.88	61.92	90.73
	0:40:00	0.00	0.00	12.37	16.53	20.46	36.39	44.68	55.09	80.63
	0:45:00	0.00	0.00	9.82	13.51	16.92	30.57	37.51	47.79	69.87
	0:50:00	0.00	0.00	8.11	11.53	14.16	26.05	31.93	40.35	58.93
	0:55:00	0.00	0.00	6.93	9.78	12.19	21.32	26.11	33.85	49.39
	1:00:00	0.00	0.00	5.91	8.27	10.46	17.80	21.78	29.17	42.56
	1:05:00	0.00	0.00	4.99	6.98	8.98	15.02	18.39	25.39	37.04
	1:10:00	0.00	0.00	3.94	6.09	7.97	11.92	14.60	19.33	28.22
	1:15:00	0.00	0.00	3.38	5.43	7.60	9.77	11.98	15.00	21.94
	1:20:00	0.00	0.00	3.08	4.92	6.96	8.11	9.94	11.42	16.73
	1:25:00	0.00	0.00	2.90	4.59	6.10	7.07	8.66	9.12	13.37
	1:30:00	0.00	0.00	2.81	4.37	5.51	6.06	7.42	7.69	11.29
	1:35:00	0.00	0.00	2.74	4.23	5.10	5.37	6.58	6.74	9.89
	1:40:00	0.00	0.00	2.68	3.74	4.82	4.94	6.05	6.11	8.97
	1:45:00	0.00	0.00	2.65	3.38	4.63	4.64	5.68	5.69	8.35
	1:50:00	0.00	0.00	2.64	3.14	4.50	4.45	5.45	5.44	7.99
	1:55:00	0.00	0.00	2.23	2.97	4.26	4.34	5.31	5.35	7.86
	2:00:00	0.00	0.00	1.93	2.76	3.81	4.27	5.23	5.31	7.80
	2:05:00	0.00	0.00	1.32	1.88	2.60	2.92	3.58	3.66	5.38
	2:10:00	0.00	0.00	0.88	1.25	1.75	1.96	2.40	2.47	3.63
	2:15:00	0.00	0.00	0.58	0.82	1.16	1.31	1.61	1.65	2.43
	2:20:00	0.00	0.00	0.36	0.51	0.73	0.84	1.02	1.05	1.54
	2:25:00	0.00	0.00	0.21	0.32	0.46	0.53	0.65	0.67	0.98
	2:30:00	0.00	0.00	0.11	0.19	0.26	0.31	0.38	0.39	0.58
	2:35:00	0.00	0.00	0.05	0.09	0.12	0.15	0.18	0.19	0.28
	2:40:00	0.00	0.00	0.01	0.03	0.03	0.05	0.06	0.06	0.09
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	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
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

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).

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018) — Sheet 1 of 3

Designer: DASH
Company:
Date: May 24, 2021
Project: Lot 1 - Erie Air Park Replat D
Location: Erie, Colorado

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 95.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.950

C) Contributing Watershed Area — Area = 15.830 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = ____ in

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- (•) Water Quality Capture Volume (WQCV)
- ( ) Excess Urban Runoff Volume (EURV)

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)
V_{DESIGN} = 0.590 ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$)
$V_{DESIGN\ OTHER}$ = ____ ac-ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)
$V_{DESIGN\ USER}$ = ____ ac-ft

I) NRCS Hydrologic Soil Groups of Tributary Watershed
i) Percentage of Watershed consisting of Type A Soils — HSG_A = ____ %
ii) Percentage of Watershed consisting of Type B Soils — HSG_B = ____ %
iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = ____ %

J) Excess Urban Runoff Volume (EURV) Design Volume
For HSG A: $EURV_A = 1.68 * i^{1.28}$
For HSG B: $EURV_B = 1.36 * i^{1.08}$
For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
$EURV_{DESIGN}$ = ____ ac-ft

K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)
$EURV_{DESIGN\ USER}$ = ____ ac-ft

2. Basin Shape: Length to Width Ratio
(A basin length to width ratio of at least 2:1 will improve TSS reduction.)
L : W = 2.0 : 1

3. Basin Side Slopes

A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)
Z = 4.00 ft / ft

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)
V_{FMIN} = 0.018 ac-ft

B) Actual Forebay Volume
V_F = 0.020 ac-ft

C) Forebay Depth (D_F = 18 inch maximum)
D_F = 18.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge
Q_{100} = 75.21 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)
Q_F = 1.50 cfs

E) Forebay Discharge Design

Choose One
- ( ) Berm With Pipe
- (•) Wall with Rect. Notch
- ( ) Wall with V-Notch Weir

Flow too small for berm w/ pipe

F) Discharge Pipe Size (minimum 8-inches)
Calculated D_P = ____ in

G) Rectangular Notch Width
Calculated W_N = 6.6 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer: DASH
Company:
Date: May 24, 2021
Project: Lot 1 - Erie Air Park Replat D
Location: Erie, Colorado

6. Trickle Channel

A) Type of Trickle Channel — Choose One: (●) Concrete ( ) Soft Bottom

F) Slope of Trickle Channel — S = 0.0100 ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum) — D_M = 2.5 ft

B) Surface Area of Micropool (10 ft^2 minimum) — A_M = 10 sq ft

C) Outlet Type — Choose One: (●) Orifice Plate ( ) Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention) — $D_{orifice}$ = 0.75 inches

E) Total Outlet Area — A_{ot} = 3.52 square inches

8. Initial Surcharge Volume

A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches) — D_{IS} = 4 in

B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV) — V_{IS} = 77 cu ft

C) Initial Surcharge Provided Above Micropool — V_S = 3.3 cu ft

9. Trash Rack

A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$ — A_t = 126 square inches

B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.) — *S.S. Well Screen with 60% Open Area*

Other (Y/N): N

C) Ratio of Total Open Area to Total Area (only for type 'Other') — User Ratio =

D) Total Water Quality Screen Area (based on screen type) — A_{total} = 210 sq. in.

E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E) — H= 5.2 feet

F) Height of Water Quality Screen (H_{TR}) — H_{TR}= 90.4 inches

G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended) — $W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Design Procedure Form: Extended Detention Basin (EDB)

Designer: DASH
Company:
Date: May 24, 2021
Project: Lot 1 - Erie Air Park Replat D
Location: Erie, Colorado

10. Overflow Embankment

A) Describe embankment protection for 100-year and greater overtopping: Buried riprap

B) Slope of Overflow Embankment
(Horizontal distance per unit vertical, 4:1 or flatter preferred)
Ze = 10.00 ft / ft

11. Vegetation

Choose One
- (•) Irrigated
- ( ) Not Irrigated

AVOID PLACING IRRIGATION HEADS IN THE BOTTOM OF THE BASIN

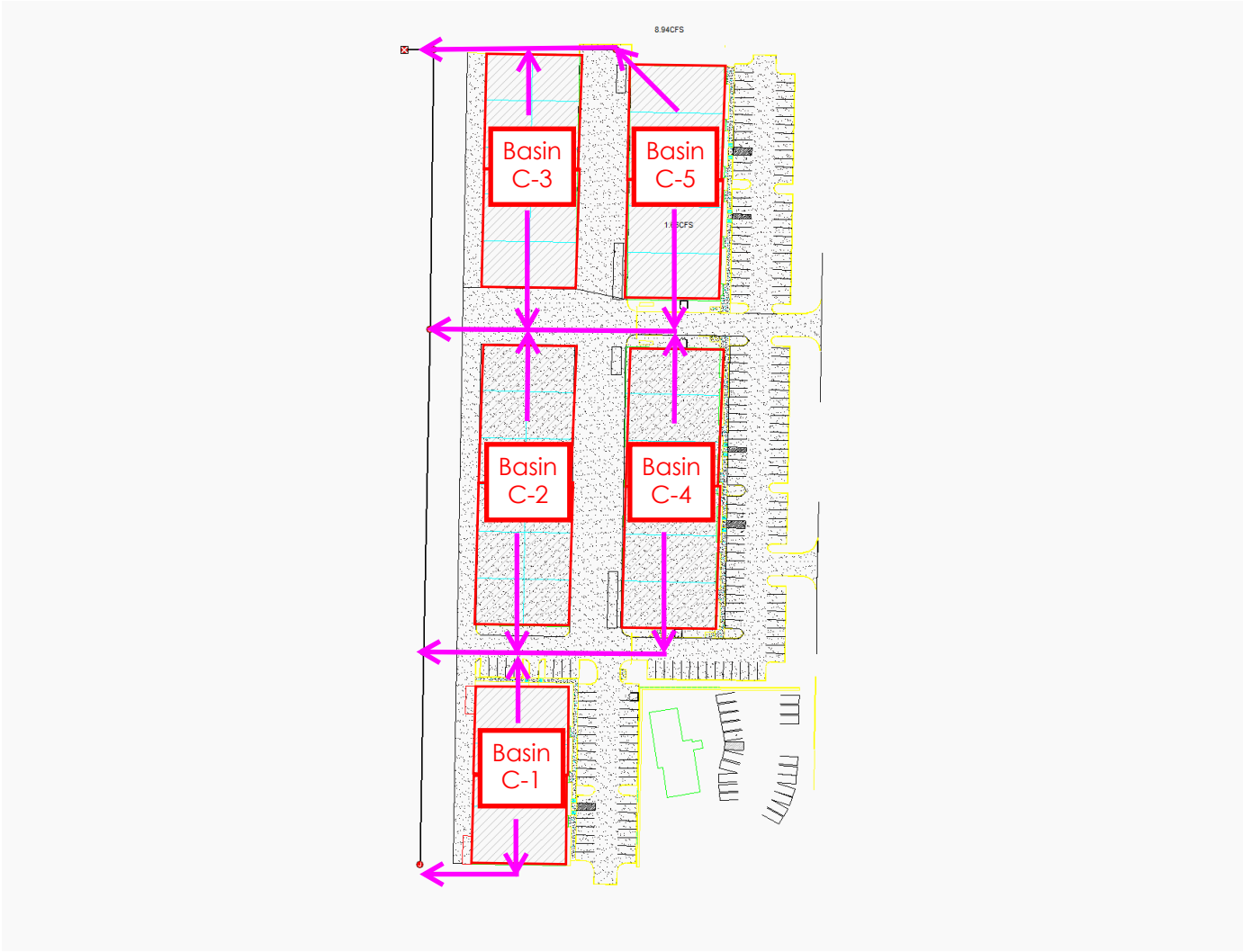
12. Access

A) Describe Sediment Removal Procedures

Notes:

APPENDIX D

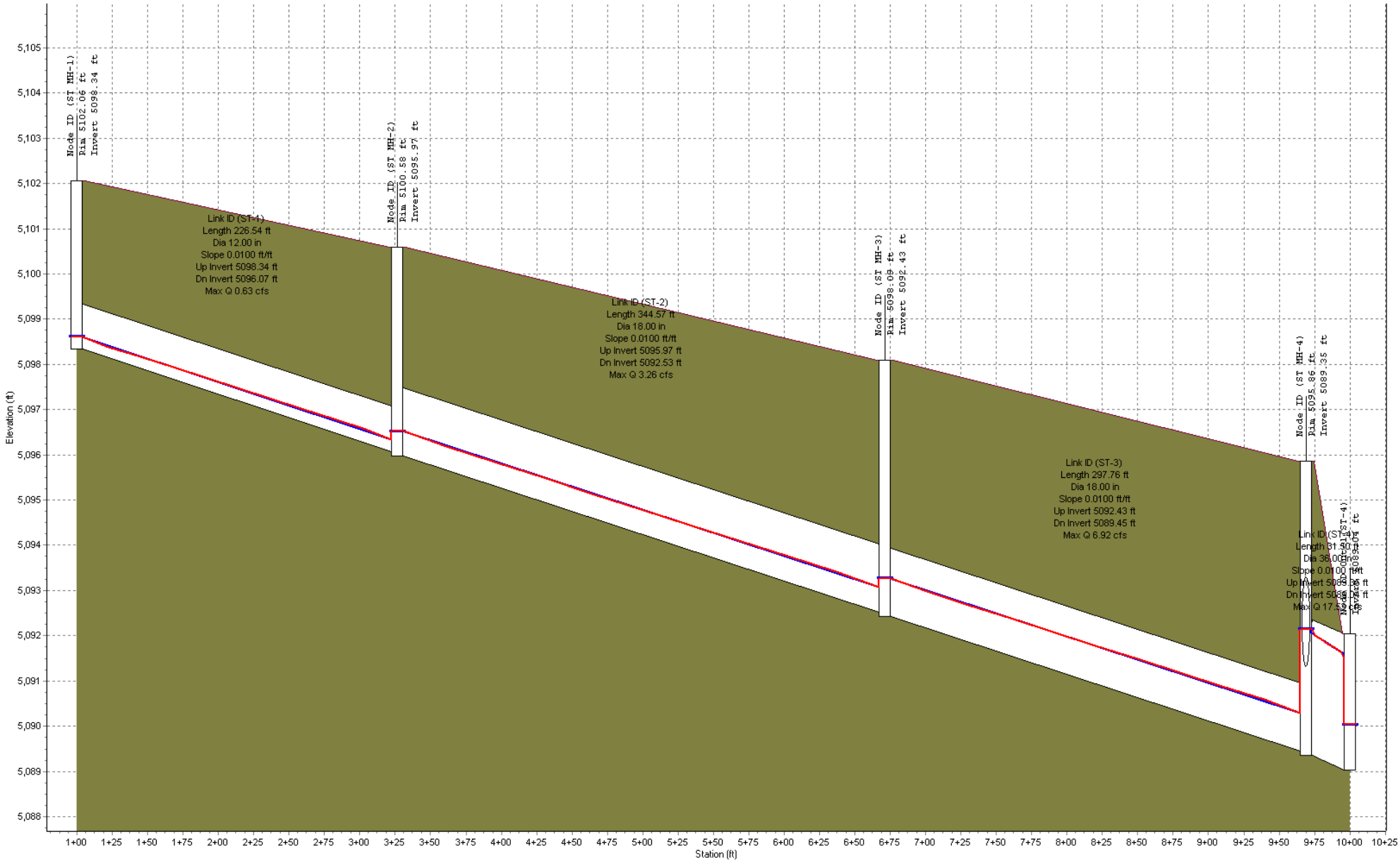
HYDRAULIC CALCULATIONS



Autodesk Storm and Sanitary Analysis

Profile Plot - 5-Year Storm

Lot 1 Erie Airpark Replat D



Node ID:	(ST MH-1)	(ST MH-2)	(ST MH-3)	(ST MH-4)	Out-1(ST-4)
Rim (ft):	5102.06	5100.58	5098.09	5095.86	
Invert (ft):	5098.34	5095.97	5092.43	5089.35	5089.04
Min Pipe Cover (ft):	2.72	3.11	4.07	2.56	
Max HGL (ft):	5098.61	5096.52	5093.27	5092.14	5090.04

Link ID:	(ST-1)	(ST-2)	(ST-3)	(ST-4)
Length (ft):	226.54	344.57	297.76	31.50
Dia (in):	12.00	18.00	18.00	36.00
Slope (ft/ft):	0.0100	0.0100	0.0100	0.0100
Up Invert (ft):	5098.34	5095.97	5092.43	5089.35
Dn Invert (ft):	5096.07	5092.53	5089.45	5089.04
Max Q (cfs):	0.63	3.26	6.92	17.53
Max Vel (ft/s):	3.62	5.56	6.75	8.42
Max Depth (ft):	0.27	0.55	0.84	1.01

Project Description

File Name	P-STRM.SPF
Description	
	C:\Users\Dash\AppData\Local\Temp\C2 Overall Plans_1_32432_bc64b9a7.sv$

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	EPA SWMM
EPA SWMM Infiltration Method	Horton
Link Routing Method	Steady Flow
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	YES

Analysis Options

Start Analysis On	Jan 05, 2021	00:00:00
End Analysis On	Jan 06, 2021	00:00:00
Start Reporting On	Jan 05, 2021	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	0
Nodes	8
Junctions	7
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links	7
Channels	0
Pipes	7
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	(ST MH-1) (P-STRM)	Junction	5097.26	5102.05	5097.26	5102.05	0.00	0.63	5097.55	0.00	4.50	0 00:00	0.00	0.00
2	(ST MH-2) (P-STRM)	Junction	5095.52	5101.27	5095.52	5101.27	0.00	1.26	5095.93	0.00	5.34	0 00:00	0.00	0.00
3	(ST MH-3) (P-STRM)	Junction	5094.73	5100.30	5094.73	5100.30	0.00	3.26	5095.30	0.00	5.00	0 00:00	0.00	0.00
4	(ST MH-4) (P-STRM)	Junction	5093.52	5099.43	5093.52	5099.43	0.00	3.26	5094.09	0.00	5.33	0 00:00	0.00	0.00
5	(ST MH-5) (P-STRM)	Junction	5091.70	5098.21	5091.70	5098.21	0.00	5.26	5092.46	0.00	5.75	0 00:00	0.00	0.00
6	(ST MH-6) (P-STRM)	Junction	5091.19	5097.79	5091.19	5097.79	0.00	6.92	5092.08	0.00	5.70	0 00:00	0.00	0.00
7	(ST MH-7) (P-STRM)	Junction	5089.53	5096.10	5089.53	5096.10	0.00	8.58	5090.56	0.00	5.54	0 00:00	0.00	0.00
8	(ST MH-8) (P-STRM)	Outfall	5088.99					8.58	5090.02					

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)
1	{P-STRM}.(ST-1) (P-STRM)	Pipe	(ST MH-1) (P-STRM)	(ST MH-2) (P-STRM)	174.04	5097.26	5095.52	1.0000	12.000	0.0130	0.63	3.56	0.18	3.41
2	{P-STRM}.(ST-2) (P-STRM)	Pipe	(ST MH-2) (P-STRM)	(ST MH-3) (P-STRM)	79.34	5095.52	5094.73	1.0000	12.000	0.0130	1.26	3.56	0.35	4.14
3	{P-STRM}.(ST-3) (P-STRM)	Pipe	(ST MH-3) (P-STRM)	(ST MH-4) (P-STRM)	120.83	5094.73	5093.52	1.0000	18.000	0.0130	3.26	10.50	0.31	5.24
4	{P-STRM}.(ST-4) (P-STRM)	Pipe	(ST MH-4) (P-STRM)	(ST MH-5) (P-STRM)	181.48	5093.52	5091.70	1.0000	18.000	0.0130	3.26	10.51	0.31	5.24
5	{P-STRM}.(ST-5) (P-STRM)	Pipe	(ST MH-5) (P-STRM)	(ST MH-6) (P-STRM)	51.06	5091.70	5091.19	1.0000	18.000	0.0130	5.26	10.50	0.50	5.94
6	{P-STRM}.(ST-6) (P-STRM)	Pipe	(ST MH-6) (P-STRM)	(ST MH-7) (P-STRM)	166.73	5091.19	5089.53	1.0000	18.000	0.0130	6.92	10.50	0.66	6.34
7	{P-STRM}.(ST-7) (P-STRM)	Pipe	(ST MH-7) (P-STRM)	(ST MH-8) (P-STRM)	53.74	5089.53	5088.99	1.0000	18.000	0.0130	8.58	10.50	0.82	6.62

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft^2)	Minimum Pipe Cover (in)
1	(ST MH-1) (P-STRM)	5097.26	5102.05	4.79	5097.26	0.00	5102.05	0.00	0.00	45.48
2	(ST MH-2) (P-STRM)	5095.52	5101.27	5.75	5095.52	0.00	5101.27	0.00	0.00	56.99
3	(ST MH-3) (P-STRM)	5094.73	5100.30	5.57	5094.73	0.00	5100.30	0.00	0.00	48.88
4	(ST MH-4) (P-STRM)	5093.52	5099.43	5.91	5093.52	0.00	5099.43	0.00	0.00	52.86
5	(ST MH-5) (P-STRM)	5091.70	5098.21	6.50	5091.70	0.00	5098.21	0.00	0.00	60.02
6	(ST MH-6) (P-STRM)	5091.19	5097.79	6.59	5091.19	0.00	5097.79	0.00	0.00	61.09
7	(ST MH-7) (P-STRM)	5089.53	5096.10	6.57	5089.53	0.00	5096.10	0.00	0.00	60.85

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	(ST MH-1) (P-STRM)	0.63	0.63	5097.55	0.29	0.00	4.50	5097.55	0.29	0 00:00	0 00:00	0.00	0.00
2	(ST MH-2) (P-STRM)	1.26	0.63	5095.93	0.41	0.00	5.34	5095.93	0.41	0 00:00	0 00:00	0.00	0.00
3	(ST MH-3) (P-STRM)	3.26	2.00	5095.30	0.57	0.00	5.00	5095.30	0.57	0 00:00	0 00:00	0.00	0.00
4	(ST MH-4) (P-STRM)	3.26	0.00	5094.09	0.57	0.00	5.33	5094.09	0.57	0 00:00	0 00:00	0.00	0.00
5	(ST MH-5) (P-STRM)	5.26	2.00	5092.46	0.76	0.00	5.75	5092.46	0.76	0 00:00	0 00:00	0.00	0.00
6	(ST MH-6) (P-STRM)	6.92	1.66	5092.08	0.89	0.00	5.70	5092.08	0.89	0 00:00	0 00:00	0.00	0.00
7	(ST MH-7) (P-STRM)	8.58	1.66	5090.56	1.03	0.00	5.54	5090.56	1.03	0 00:00	0 00:00	0.00	0.00

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses
1	{P-STRM}.(ST-1) (P-STRM)	174.04	5097.26	0.00	5095.52	0.00	1.74	1.0000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000
2	{P-STRM}.(ST-2) (P-STRM)	79.34	5095.52	0.00	5094.73	0.00	0.79	1.0000	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000
3	{P-STRM}.(ST-3) (P-STRM)	120.83	5094.73	0.00	5093.52	0.00	1.21	1.0000	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
4	{P-STRM}.(ST-4) (P-STRM)	181.48	5093.52	0.00	5091.70	0.00	1.82	1.0000	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
5	{P-STRM}.(ST-5) (P-STRM)	51.06	5091.70	0.00	5091.19	0.00	0.51	1.0000	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
6	{P-STRM}.(ST-6) (P-STRM)	166.73	5091.19	0.00	5089.53	0.00	1.67	1.0000	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
7	{P-STRM}.(ST-7) (P-STRM)	53.74	5089.53	0.00	5088.99	0.00	0.54	1.0000	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	{P-STRM}.(ST-1) (P-STRM)	0.63	0 00:00	3.56	0.18	3.41	0.85	0.29	0.29	0.00		Calculated
2	{P-STRM}.(ST-2) (P-STRM)	1.26	0 00:00	3.56	0.35	4.14	0.32	0.41	0.41	0.00		Calculated
3	{P-STRM}.(ST-3) (P-STRM)	3.26	0 00:00	10.50	0.31	5.24	0.38	0.57	0.38	0.00		Calculated
4	{P-STRM}.(ST-4) (P-STRM)	3.26	0 00:00	10.51	0.31	5.24	0.58	0.57	0.38	0.00		Calculated
5	{P-STRM}.(ST-5) (P-STRM)	5.26	0 00:00	10.50	0.50	5.94	0.14	0.75	0.50	0.00		Calculated
6	{P-STRM}.(ST-6) (P-STRM)	6.92	0 00:00	10.50	0.66	6.34	0.44	0.89	0.59	0.00		Calculated
7	{P-STRM}.(ST-7) (P-STRM)	8.58	0 00:00	10.50	0.82	6.62	0.14	1.03	0.69	0.00		Calculated

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 18 2021

Basin HA-1 Swale - 5-yr Storm Event

User-defined

Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.032

Calculations

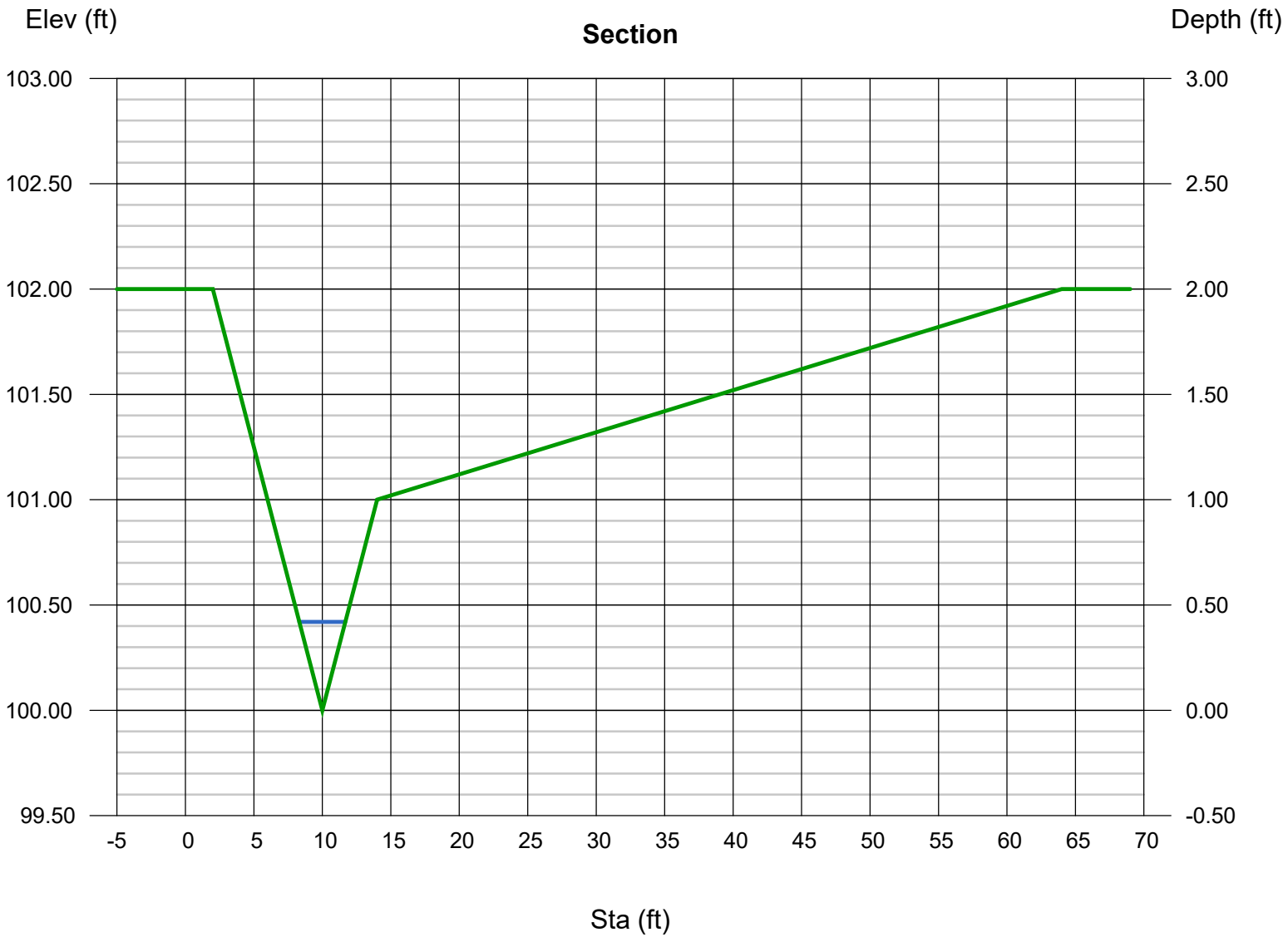
Compute by:	Known Q
Known Q (cfs)	= 0.80

Highlighted

Depth (ft)	= 0.42
Q (cfs)	= 0.800
Area (sqft)	= 0.71
Velocity (ft/s)	= 1.13
Wetted Perim (ft)	= 3.46
Crit Depth, Yc (ft)	= 0.31
Top Width (ft)	= 3.36
EGL (ft)	= 0.44

(Sta, El, n)-(Sta, El, n)...

(0.00, 102.00)-(2.00, 102.00, 0.032)-(10.00, 100.00, 0.032)-(14.00, 101.00, 0.032)-(64.00, 102.00, 0.032)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 18 2021

Basin HA-1 Swale - 100-yr Storm Event

User-defined

Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.032

Calculations

Compute by:	Known Q
Known Q (cfs)	= 18.87

Highlighted

Depth (ft)	= 1.20
Q (cfs)	= 18.87
Area (sqft)	= 6.68
Velocity (ft/s)	= 2.82
Wetted Perim (ft)	= 19.07
Crit Depth, Yc (ft)	= 1.14
Top Width (ft)	= 18.80
EGL (ft)	= 1.32

(Sta, El, n)-(Sta, El, n)...

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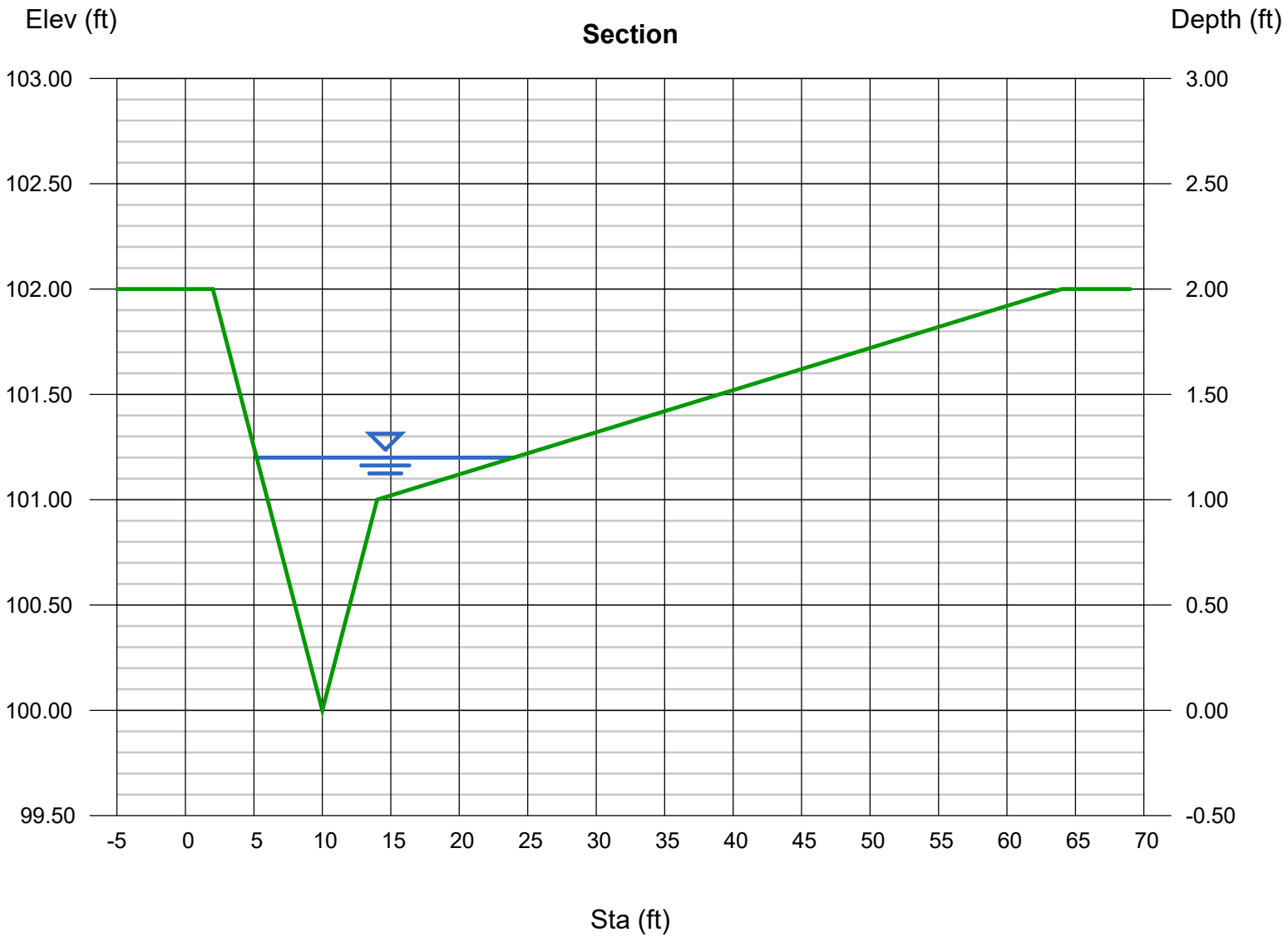

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 18 2021

Basin HA-1 Swale - 5-yr Storm Event

User-defined

Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.032

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.80

Highlighted

Depth (ft)	= 0.37
Q (cfs)	= 0.800
Area (sqft)	= 0.55
Velocity (ft/s)	= 1.46
Wetted Perim (ft)	= 3.05
Crit Depth, Yc (ft)	= 0.31
Top Width (ft)	= 2.96
EGL (ft)	= 0.40

(Sta, El, n)-(Sta, El, n)...

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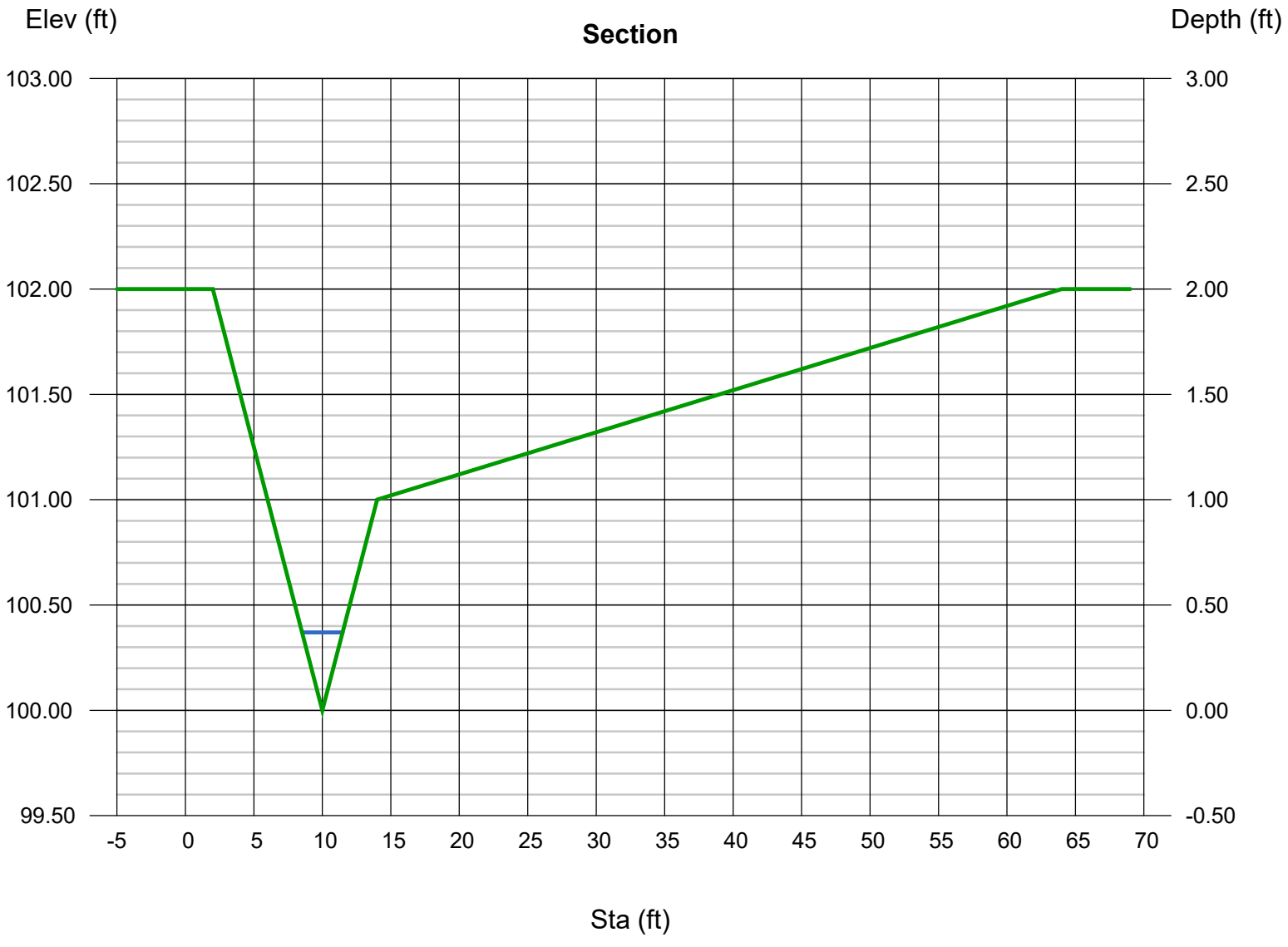

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 18 2021

Basin HA-1 Swale - 100-yr Storm Event

User-defined

Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.032

Calculations

Compute by:	Known Q
Known Q (cfs)	= 18.87

Highlighted

Depth (ft)	= 1.27
Q (cfs)	= 18.87
Area (sqft)	= 8.13
Velocity (ft/s)	= 2.32
Wetted Perim (ft)	= 22.86
Crit Depth, Yc (ft)	= 1.14
Top Width (ft)	= 22.58
EGL (ft)	= 1.35

(Sta, El, n)-(Sta, El, n)...

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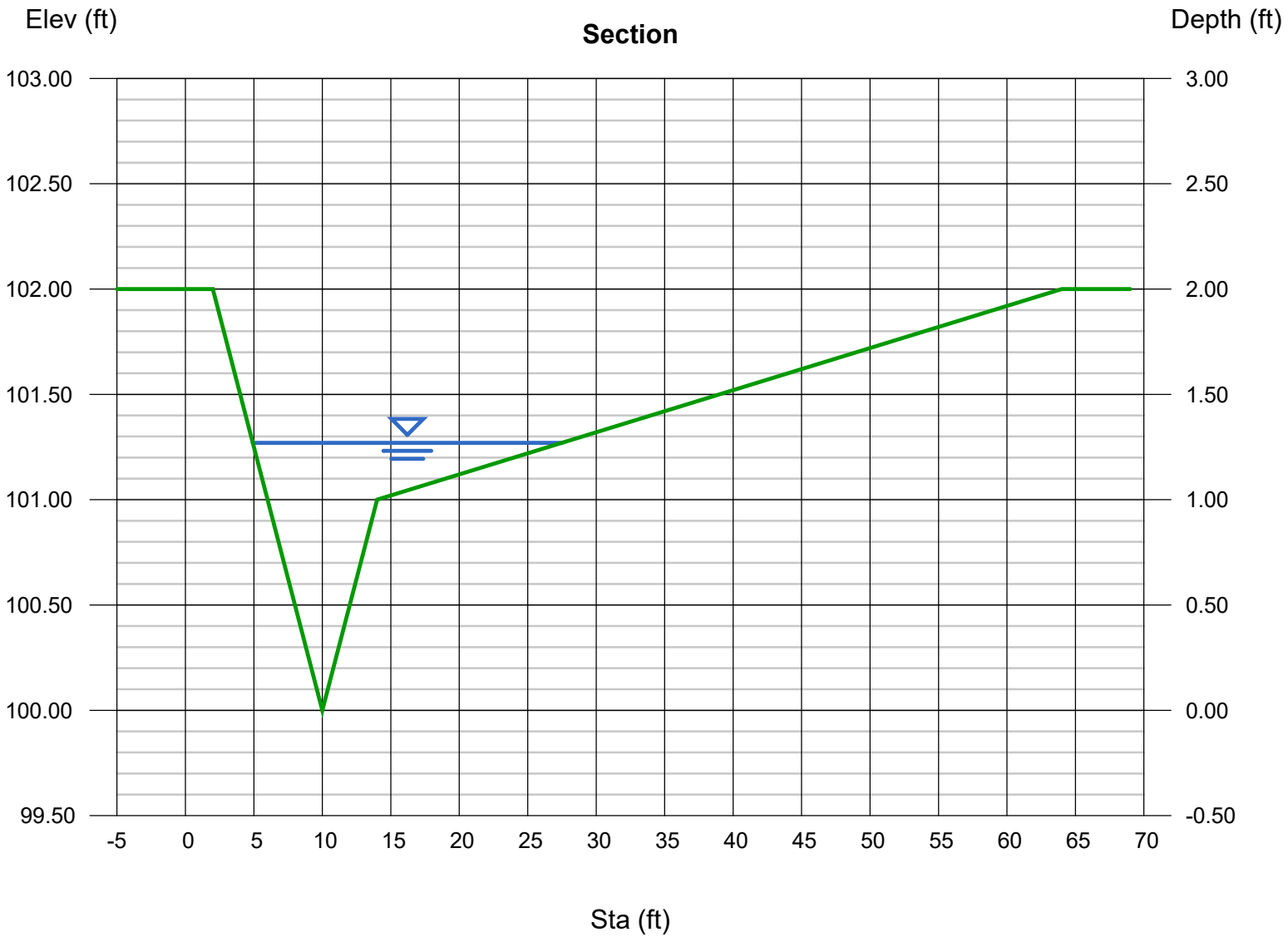

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 21 2021

Basin HA-2 Swale - 5-yr Storm Event

User-defined

Invert Elev (ft)	= 100.00
Slope (%)	= 0.90
N-Value	= 0.032

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.46

Highlighted

Depth (ft)	= 0.31
Q (cfs)	= 0.460
Area (sqft)	= 0.38
Velocity (ft/s)	= 1.20
Wetted Perim (ft)	= 2.56
Crit Depth, Yc (ft)	= 0.25
Top Width (ft)	= 2.48
EGL (ft)	= 0.33

(Sta, El, n)-(Sta, El, n)...

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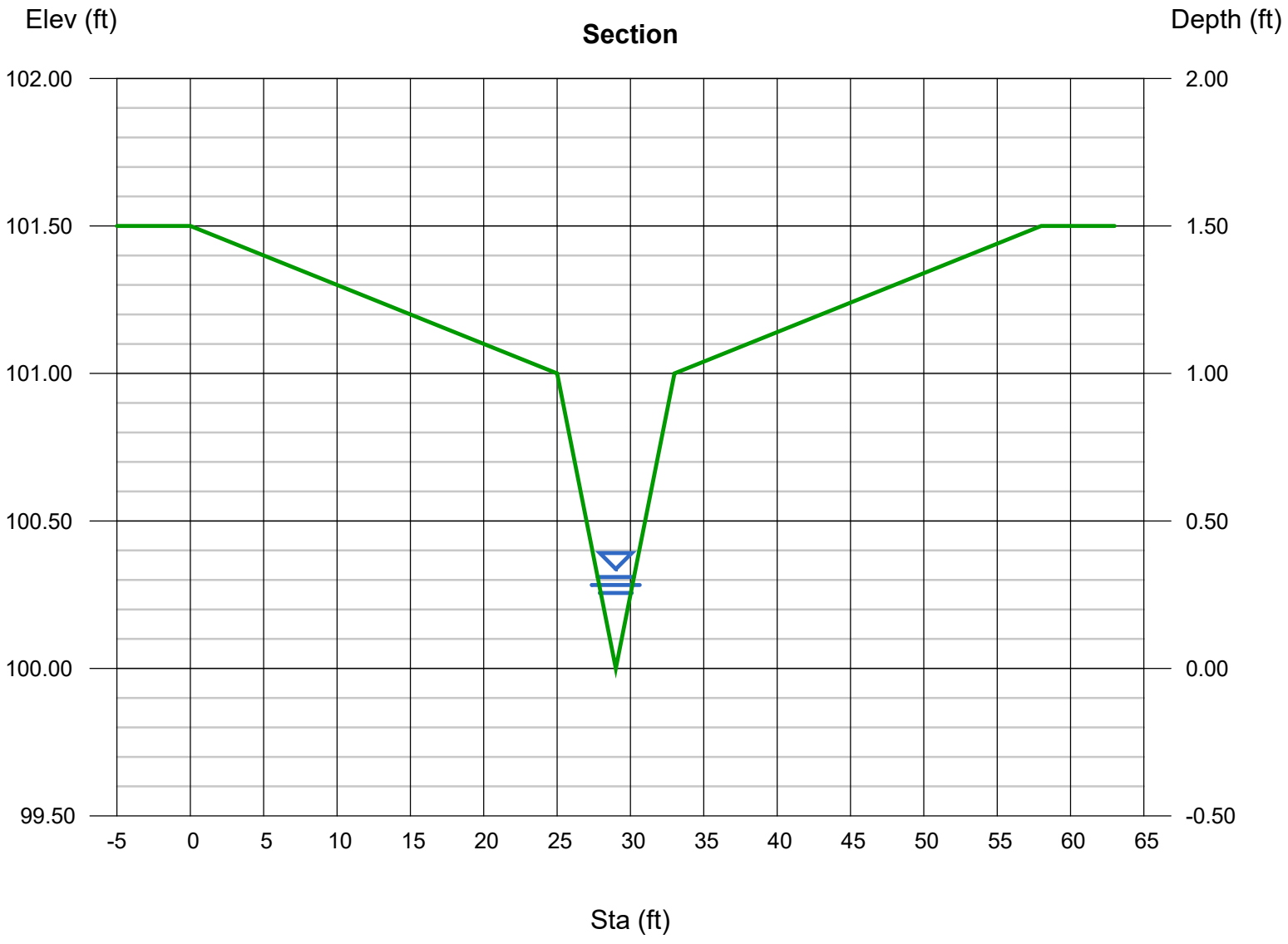

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, May 21 2021

Basin HA-2 Swale - 100-yr Storm Event

User-defined

Invert Elev (ft)	= 100.00
Slope (%)	= 0.90
N-Value	= 0.032

Calculations

Compute by:	Known Q
Known Q (cfs)	= 10.79

Highlighted

Depth (ft)	= 1.00
Q (cfs)	= 10.79
Area (sqft)	= 4.00
Velocity (ft/s)	= 2.70
Wetted Perim (ft)	= 8.25
Crit Depth, Yc (ft)	= 0.86
Top Width (ft)	= 8.00
EGL (ft)	= 1.11

(Sta, El, n)-(Sta, El, n)...

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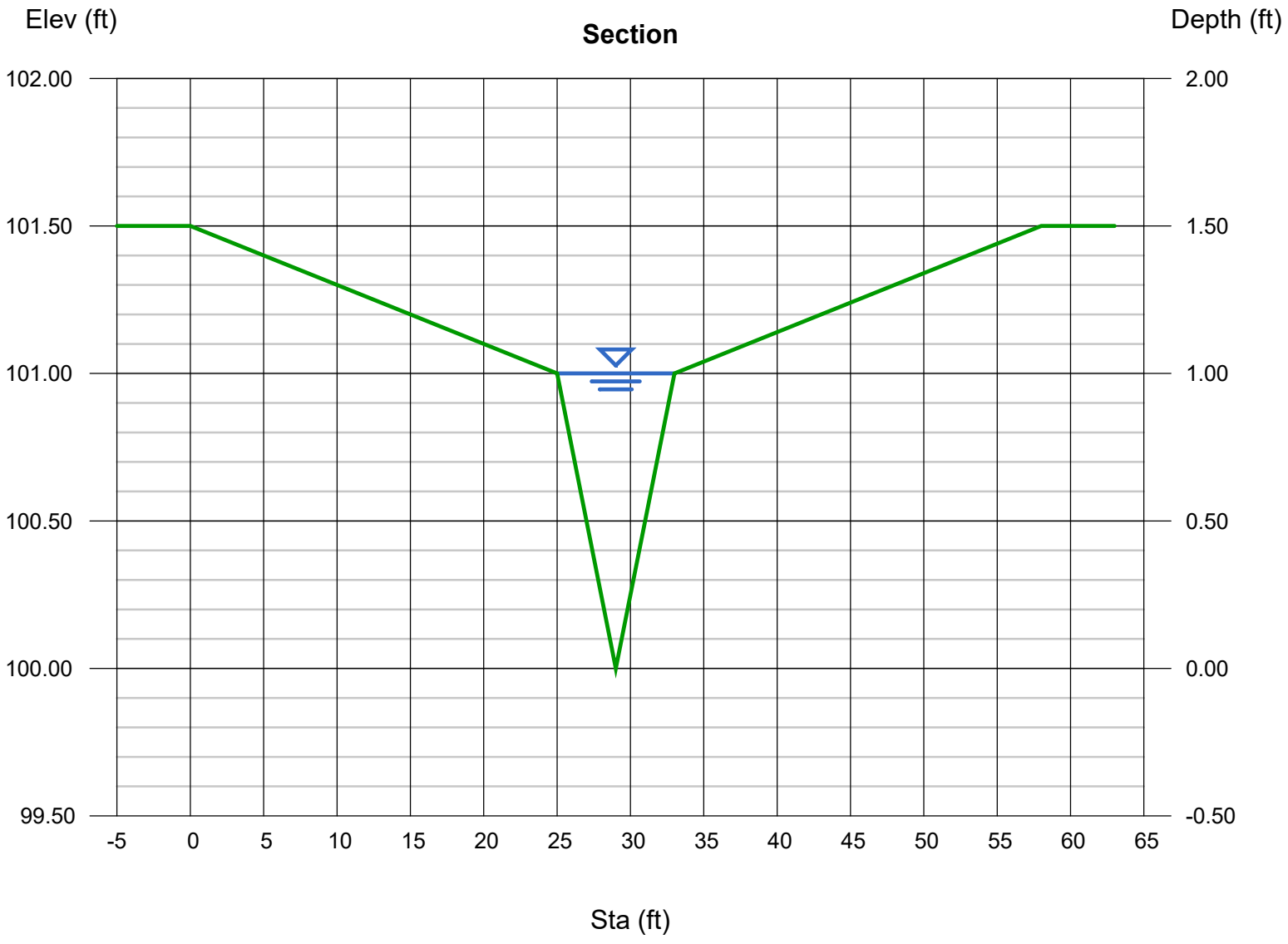


HYDRAULIC CALCULATIONS
(EXISTING IMPROVEMENTS)

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Oct 10 2019

Basin B - Culvert at Taxiway - 5-yr Storm Event

Invert Elev Dn (ft)	=	5090.60
Pipe Length (ft)	=	100.00
Slope (%)	=	3.20
Invert Elev Up (ft)	=	5093.80
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.016
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Mitered to slope (C)
Coeff. K,M,c,Y,k	=	0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

Top Elevation (ft)	=	5097.60
Top Width (ft)	=	30.00
Crest Width (ft)	=	60.00

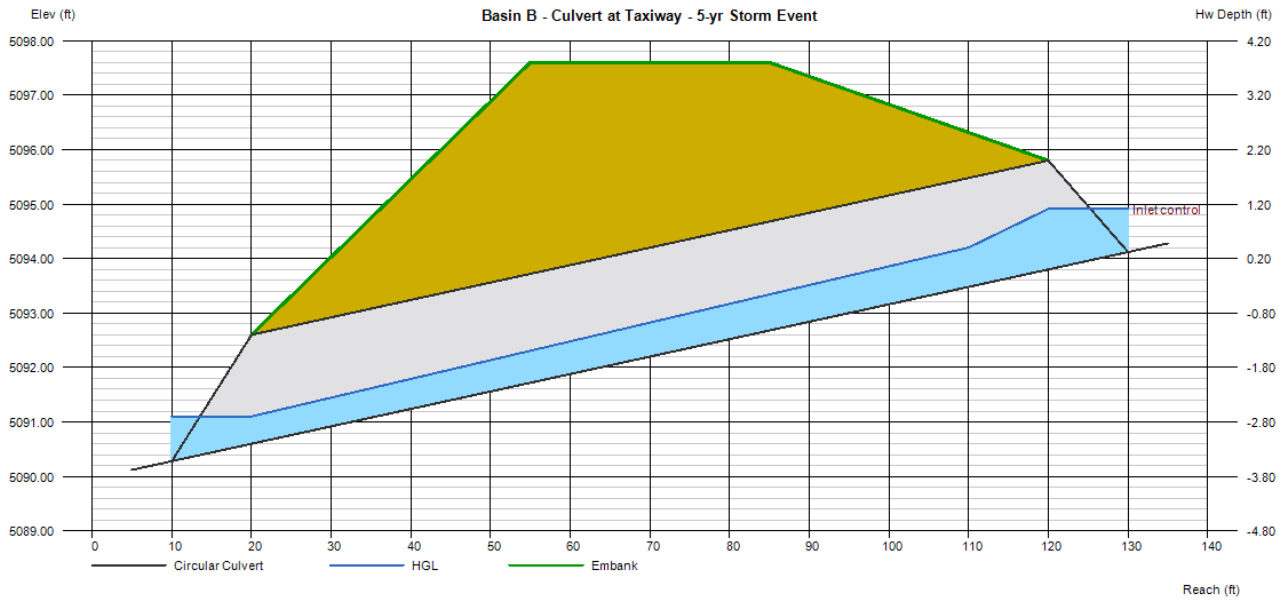
Calculations

Qmin (cfs)	=	4.52
Qmax (cfs)	=	4.52
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	4.52
Qpipe (cfs)	=	4.52
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	7.31
Veloc Up (ft/s)	=	4.22
HGL Dn (ft)	=	5091.10
HGL Up (ft)	=	5094.55
Hw Elev (ft)	=	5094.91
Hw/D (ft)	=	0.56
Flow Regime	=	Inlet Control

Existing culvert.
NE corner of Tract E-1



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Oct 10 2019

Basin B - Culvert at Taxiway - 100-yr Storm Event

Invert Elev Dn (ft)	=	5090.60
Pipe Length (ft)	=	100.00
Slope (%)	=	3.20
Invert Elev Up (ft)	=	5093.80
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.016
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Mitered to slope (C)
Coeff. K,M,c,Y,k	=	0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

Top Elevation (ft)	=	5097.60
Top Width (ft)	=	30.00
Crest Width (ft)	=	200.00

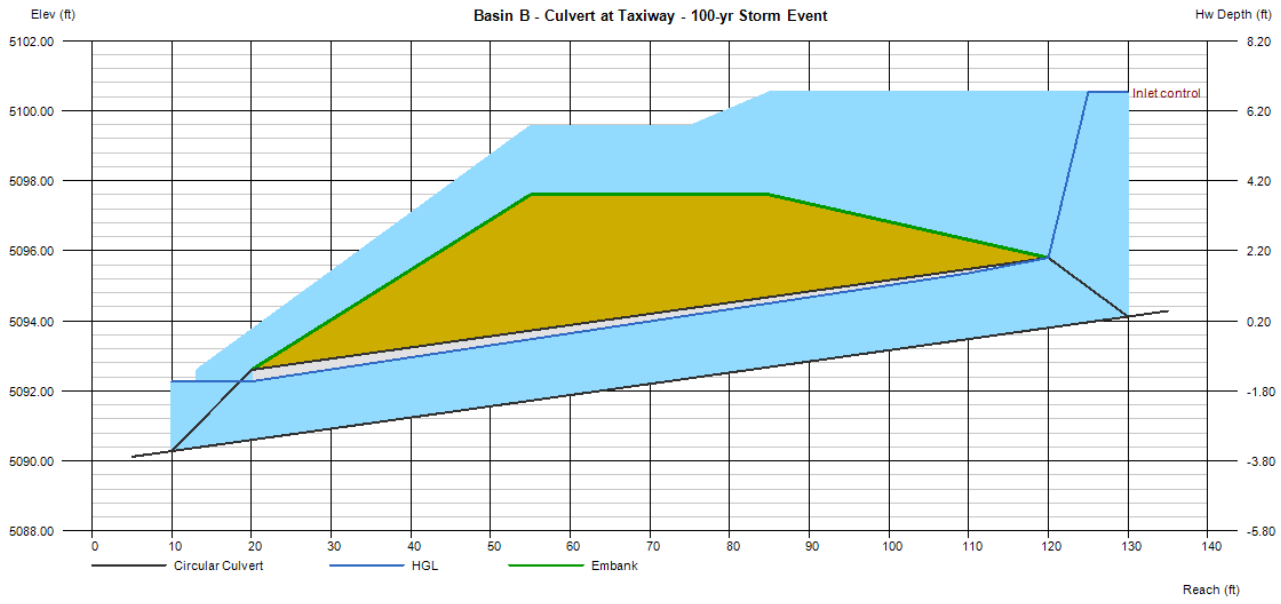
Calculations

Qmin (cfs)	=	33.23
Qmax (cfs)	=	33.23
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	33.23
Qpipe (cfs)	=	33.23
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	11.86
Veloc Up (ft/s)	=	10.77
HGL Dn (ft)	=	5092.27
HGL Up (ft)	=	5095.70
Hw Elev (ft)	=	5100.53
Hw/D (ft)	=	3.36
Flow Regime	=	Inlet Control

Existing culvert.
NE corner of Tract E-1



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Oct 10 2019

Basin B1 Swale - 5-yr Storm Event

Triangular

Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.035

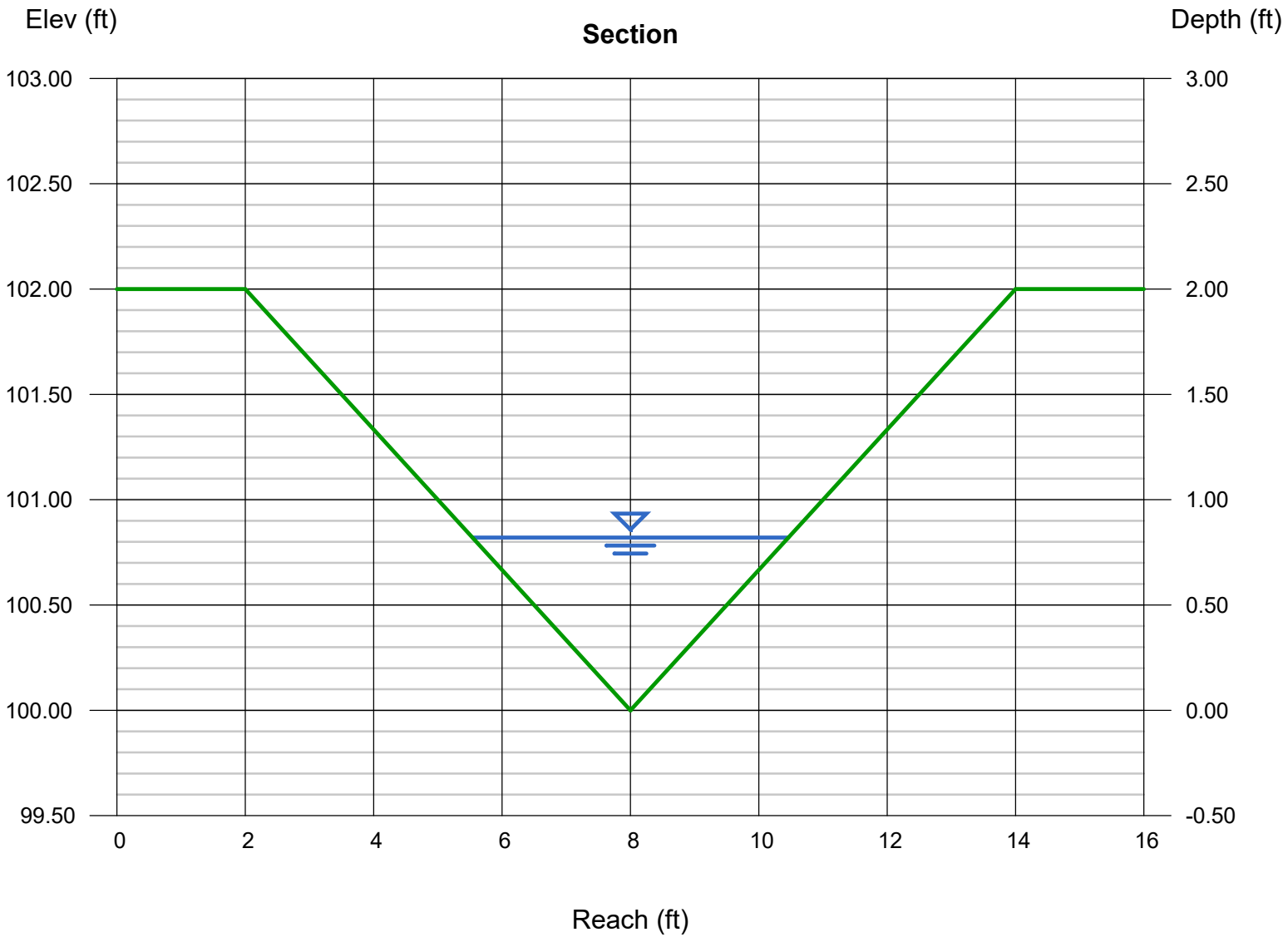
Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.52

Highlighted

Depth (ft)	= 0.82
Q (cfs)	= 4.520
Area (sqft)	= 2.02
Velocity (ft/s)	= 2.24
Wetted Perim (ft)	= 5.19
Crit Depth, Yc (ft)	= 0.68
Top Width (ft)	= 4.92
EGL (ft)	= 0.90

Existing swale
East side of Tract E-1



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Oct 10 2019

Basin B1 Swale - 100-yr Storm Event

Triangular

Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.035

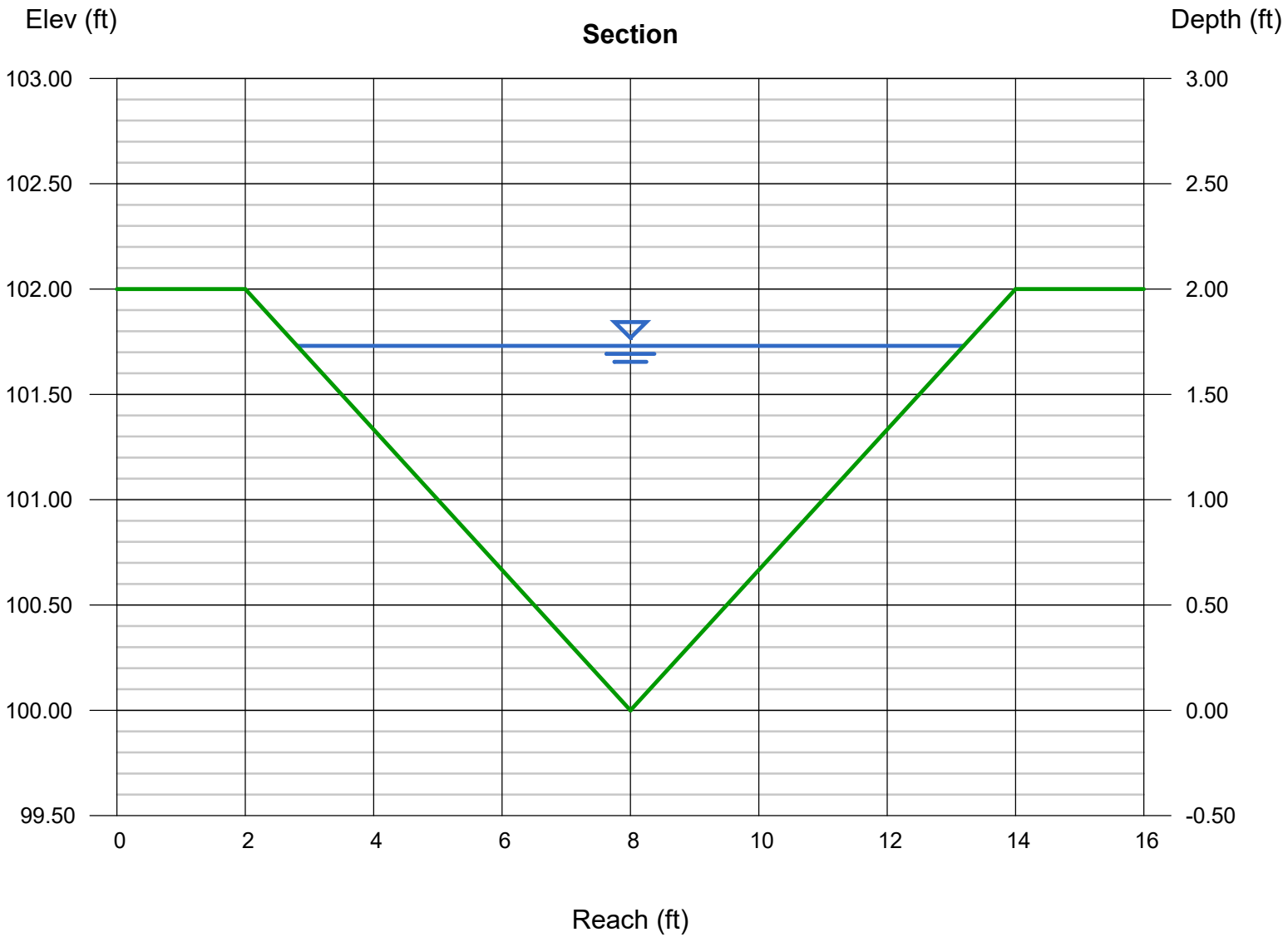
Calculations

Compute by:	Known Q
Known Q (cfs)	= 33.23

Highlighted

Depth (ft)	= 1.73
Q (cfs)	= 33.23
Area (sqft)	= 8.98
Velocity (ft/s)	= 3.70
Wetted Perim (ft)	= 10.94
Crit Depth, Yc (ft)	= 1.51
Top Width (ft)	= 10.38
EGL (ft)	= 1.94

Existing swale
East side of Tract E-1



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Oct 10 2019

Basin OS - Culvert at Airport Drive - 5-yr Storm Event

Invert Elev Dn (ft)	=	5107.20
Pipe Length (ft)	=	50.00
Slope (%)	=	2.00
Invert Elev Up (ft)	=	5108.20
Rise (in)	=	30.0
Shape	=	Circular
Span (in)	=	30.0
No. Barrels	=	1
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)	=	5113.50
Top Width (ft)	=	30.00
Crest Width (ft)	=	100.00

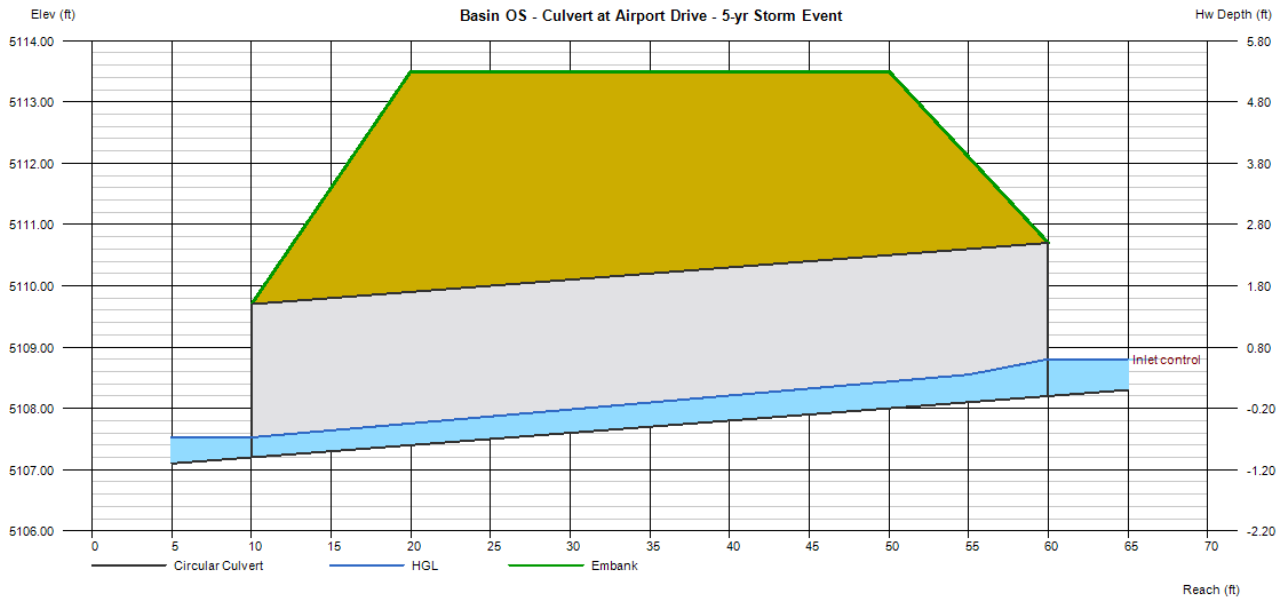
Calculations

Qmin (cfs)	=	2.03
Qmax (cfs)	=	2.03
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	2.03
Qpipe (cfs)	=	2.03
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.37
Veloc Up (ft/s)	=	3.23
HGL Dn (ft)	=	5107.53
HGL Up (ft)	=	5108.67
Hw Elev (ft)	=	5108.80
Hw/D (ft)	=	0.24
Flow Regime	=	Inlet Control

Existing culvert
SE corner of Tract E-1



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Oct 10 2019

Basin OS - Culvert at Airport Drive - 100-yr Storm Event

Invert Elev Dn (ft)	=	5107.20
Pipe Length (ft)	=	50.00
Slope (%)	=	2.00
Invert Elev Up (ft)	=	5108.20
Rise (in)	=	30.0
Shape	=	Circular
Span (in)	=	30.0
No. Barrels	=	1
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)	=	5113.50
Top Width (ft)	=	30.00
Crest Width (ft)	=	100.00

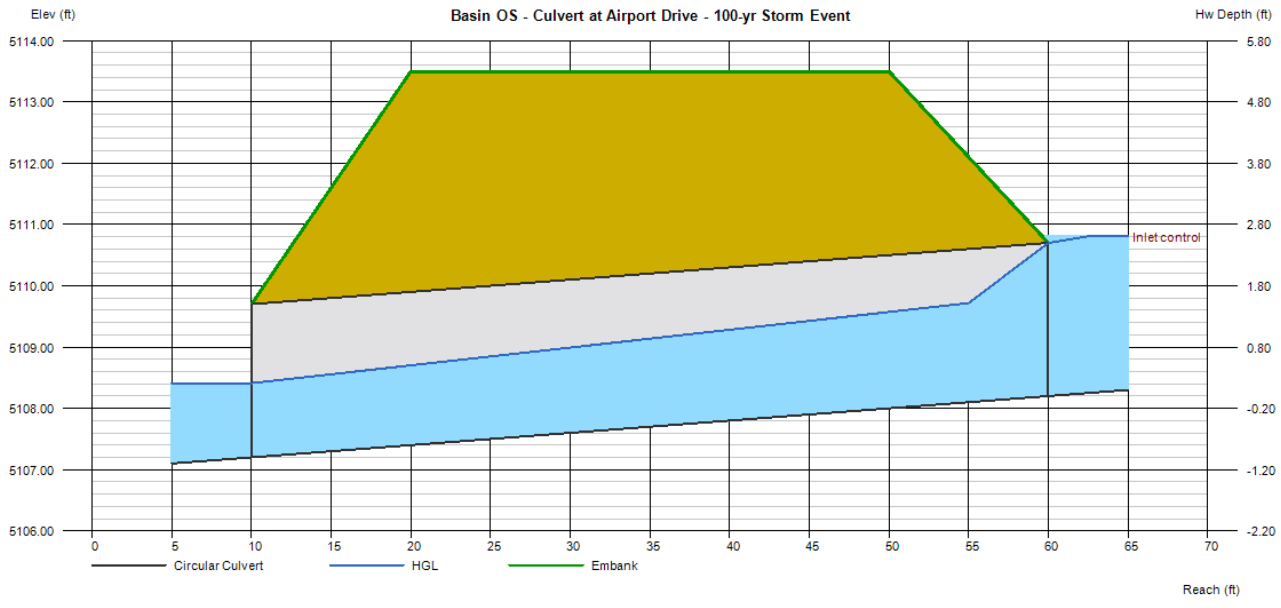
Calculations

Qmin (cfs)	=	23.89
Qmax (cfs)	=	23.89
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	23.89
Qpipe (cfs)	=	23.89
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	10.13
Veloc Up (ft/s)	=	6.89
HGL Dn (ft)	=	5108.41
HGL Up (ft)	=	5109.86
Hw Elev (ft)	=	5110.81
Hw/D (ft)	=	1.04
Flow Regime	=	Inlet Control

Existing culvert
SE corner of Tract E-1



APPENDIX E

RELEVANT DOCUMENTS

Table 6-3. Recommended percentage imperviousness values

Land Use or Surface Characteristics	Percentage Imperviousness (%)
Business:	
Downtown Areas	95
Suburban Areas	75
Residential lots (lot area only)**:**	
Single-family	
2.5 acres or larger	12
0.75 – 2.5 acres	20
0.25 – 0.75 acres	30
0.25 acres or less	45
Apartments	75
Industrial:	
Light areas	80
Heavy areas	90
Parks, cemeteries	10
Playgrounds	25
Schools	55
Railroad yard areas	50
Undeveloped Areas:	
Historic flow analysis	2
Greenbelts, agricultural	2
Off-site flow analysis (when land use not defined)	45
Streets:	
Paved	100
Gravel (packed)	40
Drive and walks	90
Roofs	90
Lawns, sandy soil	2
Lawns, clayey soil	2

Table 6-5. Runoff coefficients, *c* (continued)

Total or Effective % Impervious	NRCS Hydrologic Soil Group C						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
2%	0.01	0.05	0.15	0.33	0.40	0.49	0.59
5%	0.03	0.08	0.17	0.35	0.42	0.5	0.6
10%	0.06	0.12	0.21	0.37	0.44	0.52	0.62
15%	0.1	0.16	0.24	0.4	0.47	0.55	0.64
20%	0.14	0.2	0.28	0.43	0.49	0.57	0.65
25%	0.18	0.24	0.32	0.46	0.52	0.59	0.67
30%	0.22	0.28	0.35	0.49	0.54	0.61	0.68
35%	0.26	0.32	0.39	0.51	0.57	0.63	0.7
40%	0.3	0.36	0.43	0.54	0.59	0.65	0.71
45%	0.34	0.4	0.46	0.57	0.62	0.67	0.73
50%	0.38	0.44	0.5	0.6	0.64	0.69	0.75
55%	0.43	0.48	0.54	0.63	0.66	0.71	0.76
60%	0.47	0.52	0.57	0.65	0.69	0.73	0.78
65%	0.51	0.56	0.61	0.68	0.71	0.75	0.79
70%	0.56	0.61	0.65	0.71	0.74	0.77	0.81
75%	0.6	0.65	0.68	0.74	0.76	0.79	0.82
80%	0.65	0.69	0.72	0.77	0.79	0.81	0.84
85%	0.7	0.73	0.76	0.79	0.81	0.83	0.86
90%	0.74	0.77	0.79	0.82	0.84	0.85	0.87
95%	0.79	0.81	0.83	0.85	0.86	0.87	0.89
100%	0.83	0.85	0.87	0.88	0.89	0.89	0.9

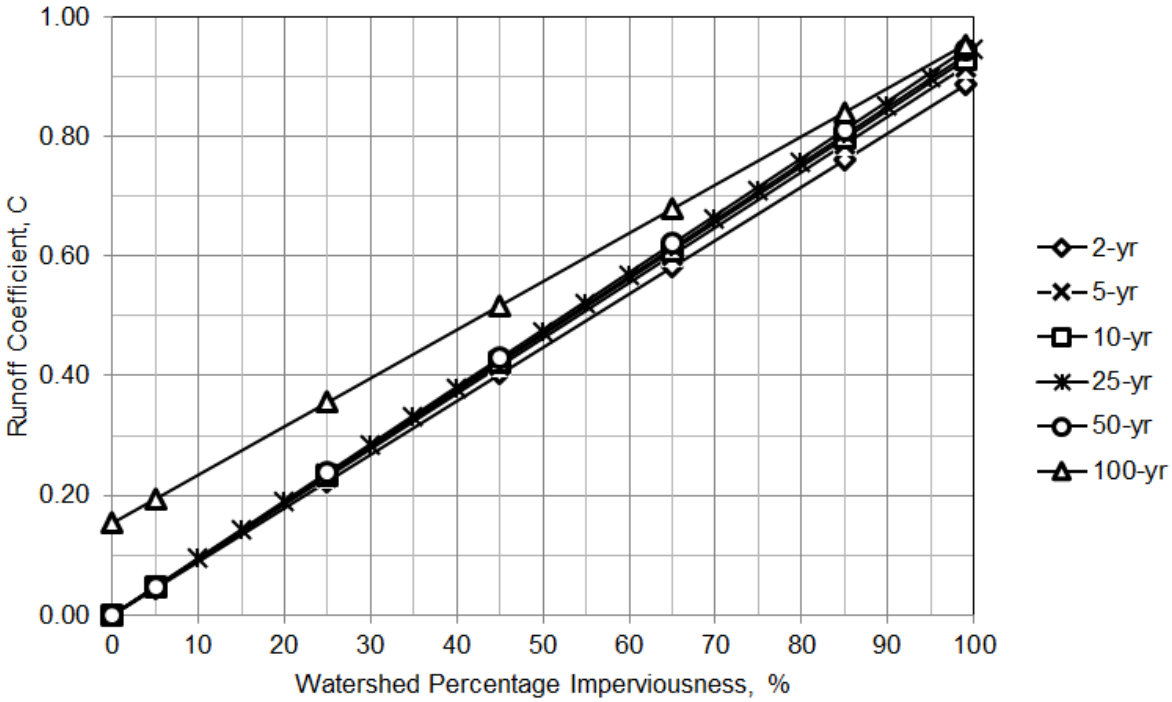


Figure 6-1. Runoff coefficient vs. watershed imperviousness NRCS HSG A

existence or function of a ditch. If a variance is requested to the Town Engineer for use of a ditch as an outfall, it is the design engineer's responsibility to complete all studies and designs deemed necessary by the Town Engineer to support the use of the ditch as well as a secondary drainage design should the ditch cease to exist.

Expressed written approval must be obtained from the managing organization for irrigation ditches being considered for crossing or easements.

813.00 Design Methods

813.01 Initial and Major Design Storms

Every urban area has two separate and distinct drainage systems whether or not they are actually planned for and designed. One is the initial system corresponding to the initial (or ordinary) storm recurring at regular intervals. The other is the major system corresponding to the major (or extraordinary storm), which is unlikely to occur more often than once in 100 or more years. Since the effects and routing of storm waters for the major storm may not be the same as for the initial storm, all storm drainage plans submitted for acceptance will detail two separate systems; one indicating the effects of the initial storm and the other showing the effects of the major storm.

A. *Initial storm provisions:* The objectives of such drainage system planning are to minimize inconvenience, to protect against recurring minor damage, to reduce rising maintenance costs, and to create an orderly drainage system. The initial storm drainage system may include such facilities as curb and gutter, storm sewer, swales, and other open drainageways and detention facilities.

B. *Major storm provisions:* The major storm will be considered the 100-year storm. The objectives of the major storm planning are to eliminate substantial property damage or loss of life and will be as directed and accepted by the Town Engineer. Major drainage systems may include storm sewers, open drainageways and detention facilities. The correlation between the initial and major storm system will be analyzed to insure a well-coordinated drainage system.

813.02 Storm Return Periods

The initial and major storm design return periods will not be less than those found in Table 800-1:

TABLE 800-1
DESIGN STORM RETURN PERIODS

Land Use or Zoning	Design Storm Return Period	
	Initial Storm	Major Storm
Residential	2-year	100-year
Commercial and Business	5-year	100-year
Public Building Areas	5-year	100-year
Parks, Greenbelts, etc.	2-year	100-year

813.03 Runoff Computations, Colorado Urban Hydrograph Procedure (CUHP)

The CUHP method is generally applicable to drainage 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	0.81
5-Year	1.11
10-Year	1.39
25-Year	1.84
50-Year	2.24
100-Year	2.68
500-Year	3.89

The hydrograph from the CUHP program must be routed through any proposed conveyance facility using the Storm Water Management Model (SWMM) or a similar method approved by the Town Engineer.

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	75
Residential Lots (Lot Area Only):	
Single-Family	
2.5 Acres or Larger	12
0.75 – 2.49 Acres	20
0.25 – 0.74 Acres	30
0.24 Acres or Less	45
Apartments	75
Industrial:	
Light Areas	80
Heavy Areas	90
Parks, Cemeteries	10
Playgrounds	25
Schools	55
Railroad Yard Areas	50
Undeveloped Areas:	
Historic Flow Analysis	2
Greenbelts, Agricultural	2
Offsite Flow Analysis (when land use not defined)	45
Streets:	
Paved	100
Gravel (Packed)	40
Drives and Walks	90
Roofs	90
Lawns, Sandy Soil	2
Lawns, Clay Soil	2

Note: These Rational Method coefficients may not be valid for large basins.

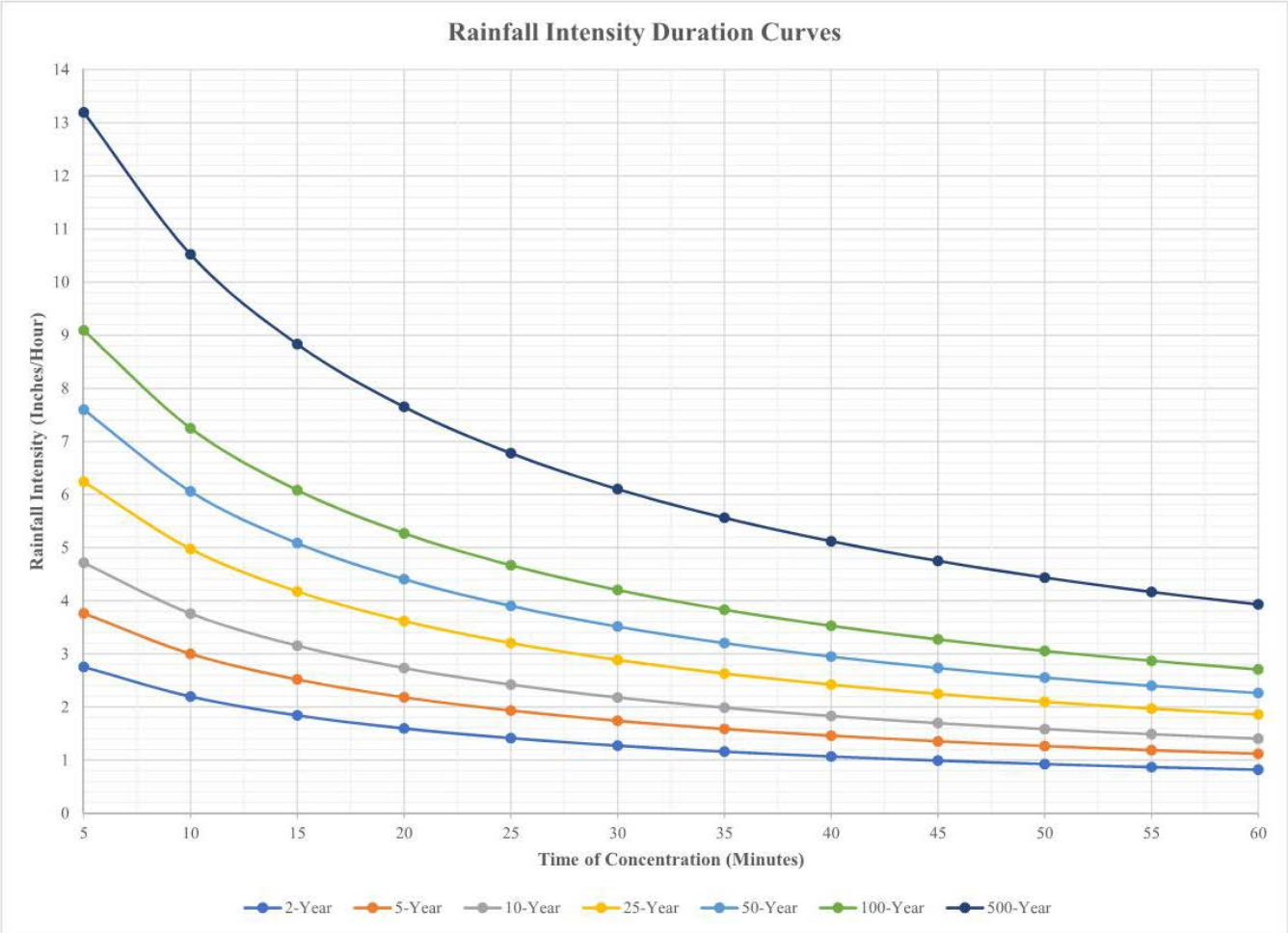
813.06 Rainfall Intensities

The rainfall intensities to be used in the computation of runoff using the Rational Method shall be obtained from the Rainfall Intensity Duration Curves for the Town of Erie, included in these STANDARDS AND SPECIFICATIONS, or can be computed using the following equation.

$$I = \frac{28.5\,P_1}{(10 + T_d)^{0.786}}$$

Where:

I = rainfall intensity (inches per hour)
P_1 = 1-hour point rainfall depth (inches)
T_d = storm duration (minutes)



814.00 Detention

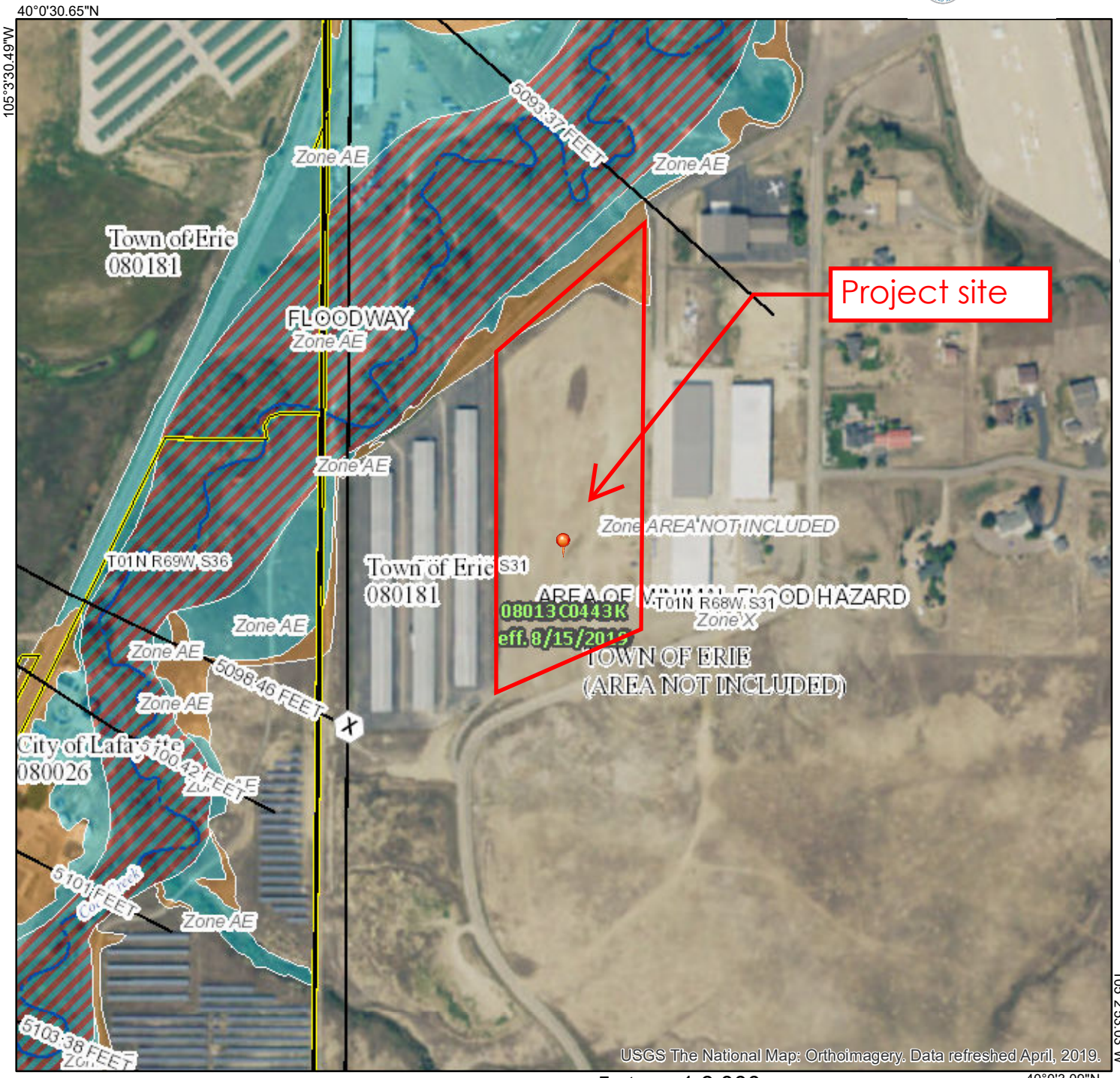
814.01 General

Onsite detention is required for all new development, expansion, and redevelopment. The required minimum detention volume and maximum release rates at these volumes shall be determined in accordance with the procedure and data set forth in these criteria.

For lands where the Town has adopted a Master Drainage Plan or Outfall Systems Plan, detention facilities identified in the Master Drainage Plan or Outfall Systems Plan shall be constructed. For lands where there is no Master Drainage Plan or Outfall Systems Plan, detention is required for all

National Flood Hazard Layer FIRMette

FEMA



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

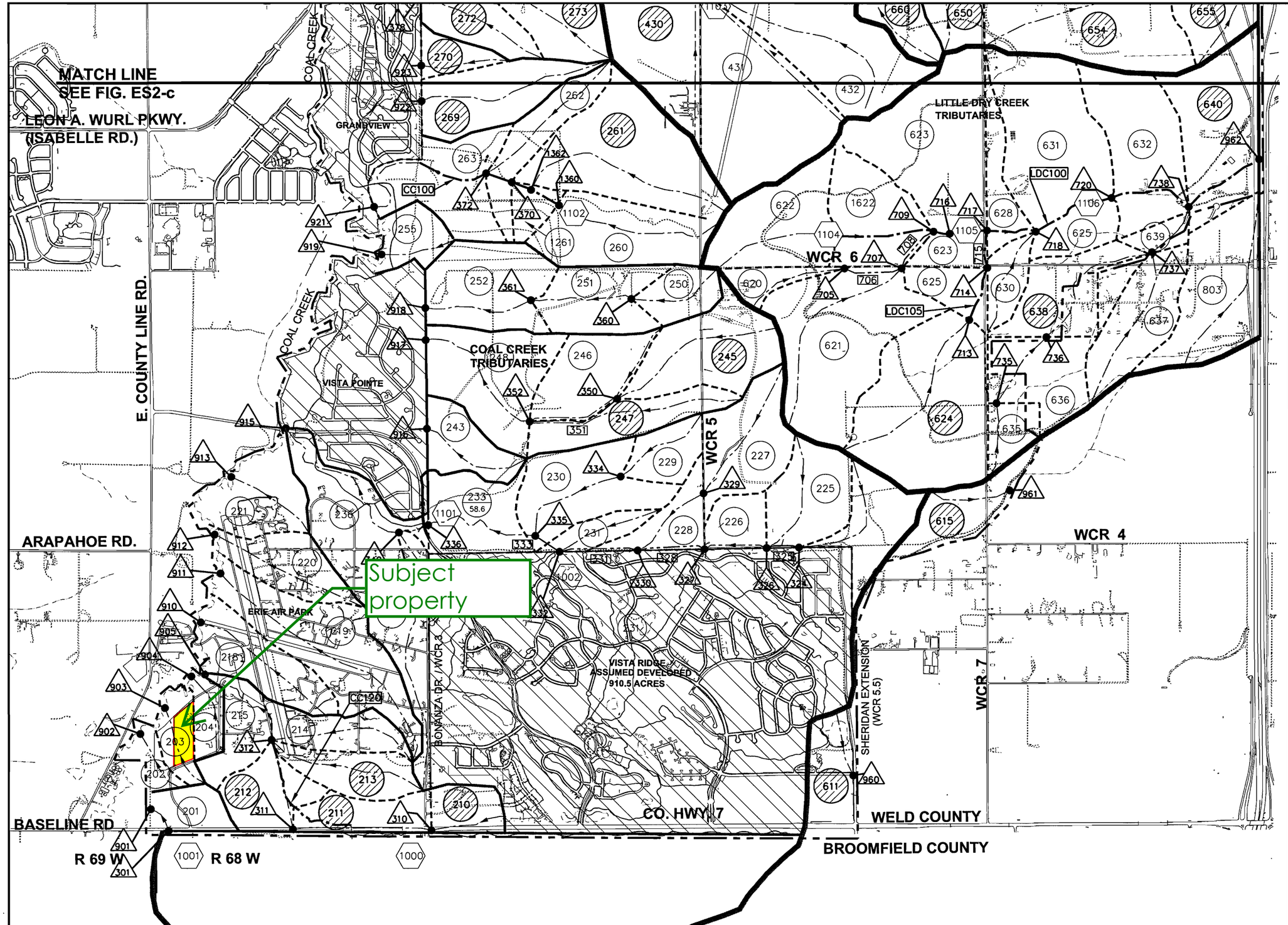
N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/4/2020 at 7:23:12 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

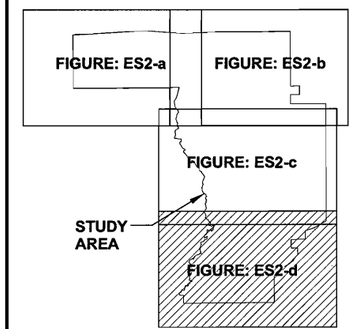


LEGEND

- ONSITE REGIONAL DETENTION REQUIRED (800)
- CATCHMENT I.D. (800)
- WATERSHED DIVIDE
- CATCHMENT BOUNDARY
- MINOR CATCHMENT BOUNDARY
- OUTFALL FLOW PATH
- UDSWM CHANNEL/PIPE ELEMENT (328)
- REGIONAL UDSWM CHANNEL/PIPE ELEMENT (328)
- REGIONAL DETENTION AREA (1001)
- DESIGN POINT/NODE (901)
- REGIONAL FACILITY
- STUDY AREA BOUNDARY

PLEASE REFER TO APPENDIX FOR DETAILED BASIN DELINEATION

MAP KEY



1800 0 900 1800
(IN FEET)
Original Scale:
1 inch = 1800 ft.

Love & Associates, Inc.
water resource consultants
800 Jefferson Avenue – Suite B
Louisville, Colorado 80027-1873
Phone: 303-673-9795
Fax: 303-673-9796

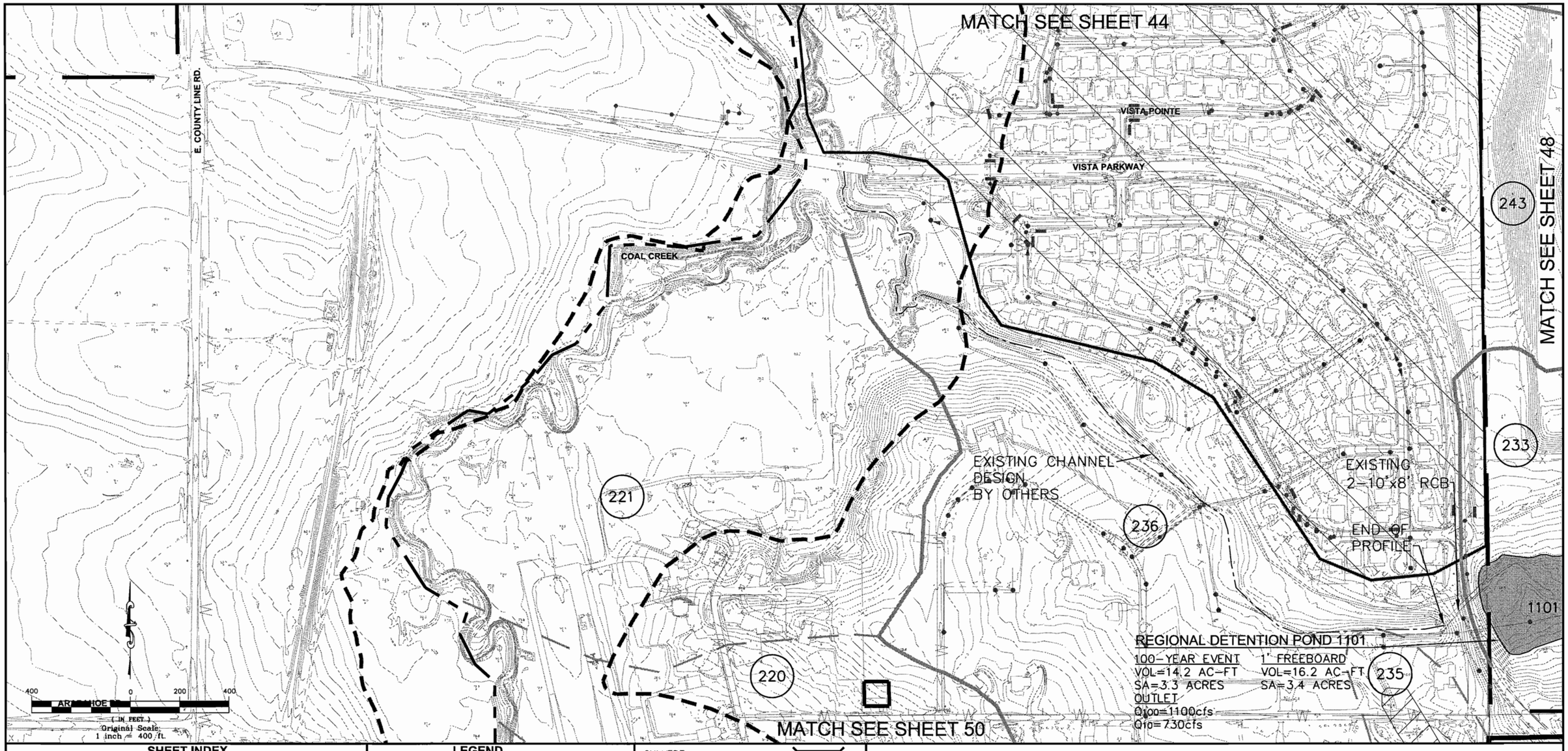
DESIGNED:	RJP
DRAWN:	PEM
CHECKED:	DJL
DATE:	7-07

TOWN OF ERIE

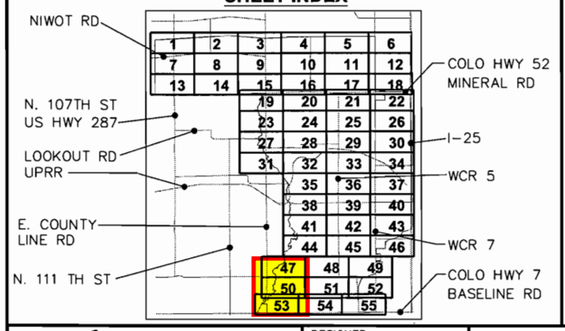
ERIE AND ADJACENT AREAS OUTFALL SYSTEMS PLANNING

PROPOSED DRAINAGE FACILITIES

Figure 11-d



SHEET INDEX



LEGEND

- CATCHMENT BOUNDARY
- MINOR CATCHMENT BOUNDARY
- STUDY AREA
- 100–YEAR REGULATORY FLOODPLAIN
- CATCHMENT I.D. (800)
- ON–SITE OR LOCAL DETENTION REQUIRED (800)
- ERIE TOWN BOUNDARY
- CHANNEL CENTERLINE
- DRAINAGE R.O.W.
- DETENTION BASIN
- CULVERT
- STORM SEWER
- POTENTIAL WETLANDS
- OVERHEAD ELECTRIC (OE)
- BURIED ELECTRIC (ELC)
- CABLE TV (TV)
- TELEPHONE (T)
- GAS (GAS)
- WATER (W)
- SANITARY SEWER (S)
- STORM SEWER (ST)

DATUM:
HORIZONTAL: COLORADO STATE PLANE NORTH ZONE, HARN ADJUSTMENT.
VERTICAL: NGVD 88

CONTROL POINTS:
USGS CONTROL POINT:
JR–53–1948

NOTES:

1. THIS DRAWING IS FOR MASTER PLANNING PURPOSES AND REPRESENTS PRELIMINARY AND CONCEPTUAL ENGINEERING. ALTERNATIVES TO THIS OUTFALL SYSTEM WILL BE CONSIDERED BY THE TOWN OF ERIE PROVIDED THE ALTERNATIVE OFFERS EQUAL HYDROLOGIC RESPONSE, HYDRAULIC CAPACITY AND STREAM STABILITY. THE ALTERNATIVE MUST COMPLY WITH ALL REQUIREMENTS OF THE TOWN OF ERIE. THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES.

2. THE TOWN OF ERIE, WELD AND BOULDER COUNTIES MANAGE AND REGULATE ALL LAND DEVELOPMENT AND REDEVELOPMENT WITHIN THE 100–YEAR FLOODPLAINS SO AS TO PREVENT FUTURE FLOOD DAMAGES BY FOLLOWING THE RECOMMENDATIONS OF THIS PLAN.

3. WHEN REGIONAL BASINS ARE NOT CONSTRUCTED:

a. IF DEVELOPMENT OCCURS IN ANY SUB–CATCHMENT SERVED BY ANY OF THE REGIONAL DETENTION BASINS BEFORE THE REGIONAL DETENTION BASIN IS IN EXISTENCE ON THE GROUND, DEVELOPMENT SHALL PROVIDE ON–SITE WATER QUALITY AND 10– AND 100–YEAR DETENTION.

b. STORAGE VOLUME AND THE ALLOWABLE RELEASE RATES FOR ALL ON–SITE DETENTION BASINS SHALL BE BASED ON THE EQUATIONS (CHARTS) FOR WATER QUALITY CAPTURE VOLUME CONTAINED IN UD&FCD URBAN STORM DRAINAGE CRITERIA MANUAL – VOLUME 3 AND FOR 10– AND 100– YEAR PEAK FLOW CONTROLS THE EQUATIONS DEVELOPED BY ENGINEER FOR THIS FINAL PLAN.

c. ALL DRAINAGE FACILITIES SHALL BE SIZED TO HANDLE FLOWS THAT ARE NOT REDUCED BY UPSTREAM DETENTION UNLESS THE DETENTION FACILITIES ARE PHYSICALLY IN PLACE AT THE TIME OF DESIGN. ASSUMING DETENTION WILL BE BUILT IN THE FUTURE IS NOT VALID AND WILL NOT BE ACCEPTED.

Love & Associates, Inc.
water resource consultants
800 Jefferson Avenue – Suite B
Louisville, Colorado 80027–1873
Phone: 303–673–9795
Fax: 303–673–9796

DESIGNED:	RJP
DRAWN:	PEM
CHECKED:	DJL
DATE:	6–07

TOWN OF ERIE

ERIE AND ADJACENT AREAS OUTFALL SYSTEMS PLANNING

PRELIMINARY DESIGN PLAN

SHEET 47 OF 67

COMMENTARY ON SHEET 48

No Regional Outfall System improvements are required on this sheet. (See Sheet 47 for Regional Detention Facility 1101.)

MATCH SEE SHEET 47

220

236

EXISTING REGIONAL DETENTION POND

1003

ERIE AIRPARK

219

235

218

Subject property

EXISTING REGIONAL CHANNEL DESIGNED BY OTHERS

215

MATCH SEE SHEET 51

BONANZA DR

WCR 3

MATCH SEE SHEET 53

218

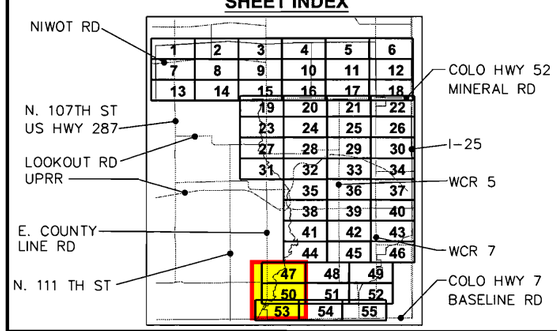
219

400 0 200 400

(IN FEET)

Original Scale:
1 inch = 400 ft.

SHEET INDEX



LEGEND

- CATCHMENT BOUNDARY
- MINOR CATCHMENT BOUNDARY
- STUDY AREA
- 100-YEAR REGULATORY FLOODPLAIN
- CATCHMENT I.D. (800)
- ON-SITE OR LOCAL DETENTION REQUIRED (800)
- ERIE TOWN BOUNDARY
- CHANNEL CENTERLINE
- DRAINAGE R.O.W.
- DETENTION BASIN
- CULVERT
- STORM SEWER
- POTENTIAL WETLANDS
- OVERHEAD ELECTRIC — OE
- BURIED ELECTRIC — ELC
- CABLE TV — TV
- TELEPHONE — T
- GAS — GAS
- WATER — W
- SANITARY SEWER — S
- STORM SEWER — ST

DATUM:
HORIZONTAL: COLORADO STATE PLANE NORTH ZONE, HARN ADJUSTMENT.
VERTICAL: NGVD 88

CONTROL POINTS:
USGS CONTROL POINT:
JR-53-1948

NOTES:

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2. THE TOWN OF ERIE, WELD AND BOULDER COUNTIES MANAGE AND REGULATE ALL LAND DEVELOPMENT AND REDEVELOPMENT WITHIN THE 100-YEAR FLOODPLAINS SO AS TO PREVENT FUTURE FLOOD DAMAGES BY FOLLOWING THE RECOMMENDATIONS OF THIS PLAN.

3. WHEN REGIONAL BASINS ARE NOT CONSTRUCTED:

a. IF DEVELOPMENT OCCURS IN ANY SUB-CATCHMENT SERVED BY ANY OF THE REGIONAL DETENTION BASINS BEFORE THE REGIONAL DETENTION BASIN IS IN EXISTENCE ON THE GROUND, DEVELOPMENT SHALL PROVIDE ON-SITE WATER QUALITY AND 10- AND 100-YEAR DETENTION.

b. STORAGE VOLUME AND THE ALLOWABLE RELEASE RATES FOR ALL ON-SITE DETENTION BASINS SHALL BE BASED ON THE EQUATIONS (CHARTS) FOR WATER QUALITY CAPTURE VOLUME CONTAINED IN UD&FCD URBAN STORM DRAINAGE CRITERIA MANUAL - VOLUME 3 AND FOR 10- AND 100- YEAR PEAK FLOW CONTROLS THE EQUATIONS DEVELOPED BY ENGINEER FOR THIS FINAL PLAN.

c. ALL DRAINAGE FACILITIES SHALL BE SIZED TO HANDLE FLOWS THAT ARE NOT REDUCED BY UPSTREAM DETENTION UNLESS THE DETENTION FACILITIES ARE PHYSICALLY IN PLACE AT THE TIME OF DESIGN. ASSUMING DETENTION WILL BE BUILT IN THE FUTURE IS NOT VALID AND WILL NOT BE ACCEPTED.

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DATE:	6-07

TOWN OF ERIE

ERIE AND ADJACENT AREAS OUTFALL SYSTEMS PLANNING

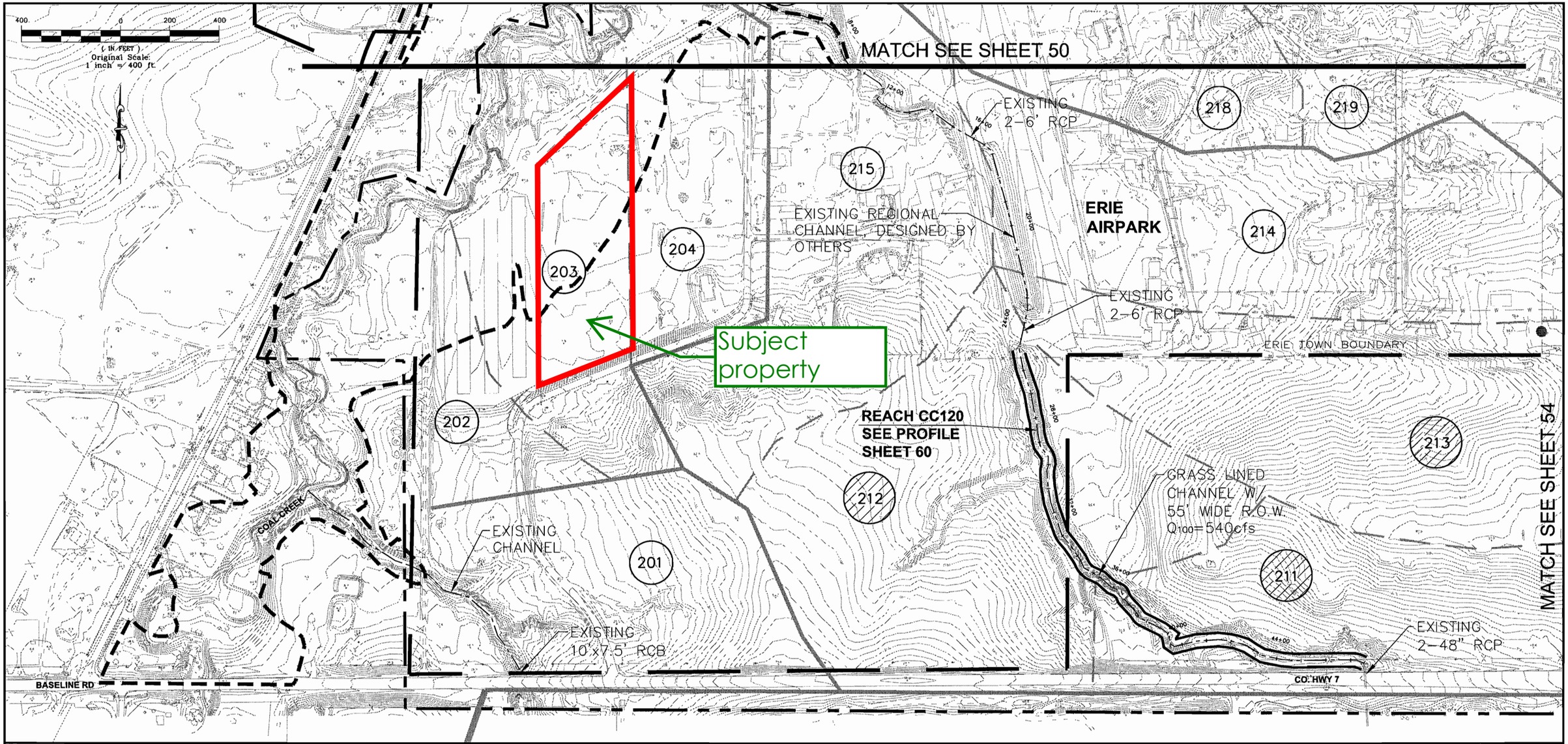
PRELIMINARY DESIGN PLAN

SHEET 50 OF 67

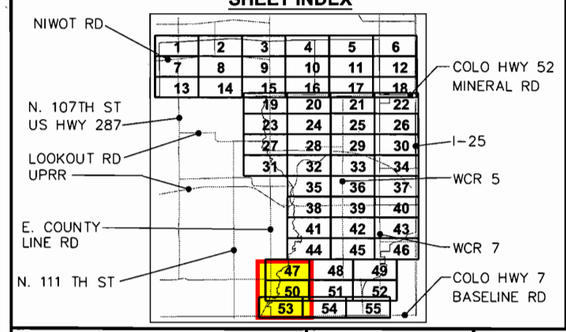
COMMENTARY ON SHEET 51

No Regional Outfall System improvements are required on this sheet.

Existing Detention Facility 1102 designed and constructed by others is also shown on this sheet.



SHEET INDEX



LEGEND

- CATCHMENT BOUNDARY
- MINOR CATCHMENT BOUNDARY
- STUDY AREA
- 100-YEAR REGULATORY FLOODPLAIN
- CATCHMENT I.D. (800)
- ON-SITE OR LOCAL DETENTION REQUIRED (800)
- ERIE TOWN BOUNDARY
- CHANNEL CENTERLINE
- DRAINAGE R.O.W.
- DETENTION BASIN

- CULVERT
- STORM SEWER
- POTENTIAL WETLANDS
- OVERHEAD ELECTRIC (OE)
- BURIED ELECTRIC (ELC)
- CABLE TV (TV)
- TELEPHONE (T)
- GAS (GAS)
- WATER (W)
- SANITARY SEWER (S)
- STORM SEWER (ST)

DATUM:
HORIZONTAL: COLORADO STATE PLANE
NORTH ZONE, HARN ADJUSTMENT.
VERTICAL: NGVD 88

CONTROL POINTS:
USGS CONTROL POINT:
JR-53-1948

NOTES:

1. THIS DRAWING IS FOR MASTER PLANNING PURPOSES AND REPRESENTS PRELIMINARY AND CONCEPTUAL ENGINEERING. ALTERNATIVES TO THIS OUTFALL SYSTEM WILL BE CONSIDERED BY THE TOWN OF ERIE PROVIDED THE ALTERNATIVE OFFERS EQUAL HYDROLOGIC RESPONSE, HYDRAULIC CAPACITY AND STREAM STABILITY. THE ALTERNATIVE MUST COMPLY WITH ALL REQUIREMENTS OF THE TOWN OF ERIE. THIS DRAWING SHALL NOT BE USED FOR CONSTRUCTION PURPOSES.

2. THE TOWN OF ERIE, WELD AND BOULDER COUNTIES MANAGE AND REGULATE ALL LAND DEVELOPMENT AND REDEVELOPMENT WITHIN THE 100-YEAR FLOODPLAINS SO AS TO PREVENT FUTURE FLOOD DAMAGES BY FOLLOWING THE RECOMMENDATIONS OF THIS PLAN.

3. WHEN REGIONAL BASINS ARE NOT CONSTRUCTED:

a. IF DEVELOPMENT OCCURS IN ANY SUB-CATCHMENT SERVED BY ANY OF THE REGIONAL DETENTION BASINS BEFORE THE REGIONAL DETENTION BASIN IS IN EXISTENCE ON THE GROUND, DEVELOPMENT SHALL PROVIDE ON-SITE WATER QUALITY AND 10- AND 100-YEAR DETENTION.

b. STORAGE VOLUME AND THE ALLOWABLE RELEASE RATES FOR ALL ON-SITE DETENTION BASINS SHALL BE BASED ON THE EQUATIONS (CHARTS) FOR WATER QUALITY CAPTURE VOLUME CONTAINED IN UD&FCD URBAN STORM DRAINAGE CRITERIA MANUAL - VOLUME 3 AND FOR 10- AND 100- YEAR PEAK FLOW CONTROLS THE EQUATIONS DEVELOPED BY ENGINEER FOR THIS FINAL PLAN.

c. ALL DRAINAGE FACILITIES SHALL BE SIZED TO HANDLE FLOWS THAT ARE NOT REDUCED BY UPSTREAM DETENTION UNLESS THE DETENTION FACILITIES ARE PHYSICALLY IN PLACE AT THE TIME OF DESIGN. ASSUMING DETENTION WILL BE BUILT IN THE FUTURE IS NOT VALID AND WILL NOT BE ACCEPTED.

Love & Associates, Inc.
water resource consultants
800 Jefferson Avenue - Suite B
Louisville, Colorado 80027-1873
Phone: 303-673-9795
Fax: 303-673-9796

DESIGNED:	RJP
DRAWN:	PEM
CHECKED:	DJL
DATE:	6-07

TOWN OF ERIE

ERIE AND ADJACENT AREAS OUTFALL SYSTEMS PLANNING

PRELIMINARY DESIGN PLAN

SHEET 53 OF 67

COMMENTARY ON SHEET 54

No Regional Outfall System improvements are required on this sheet.

FINAL
DRAINAGE REPORT

ERIE CONVAIR
HANGAR COMPLEX
3000 AIRPORT DRIVE
ERIE, COLORADO

October 9, 2008
Revised: March 23, 2009

Prepared for:

Erie Convair LLC
3000 Airport Drive,
Erie, Colorado

Prepared by:

SCOTT, COX & ASSOCIATES, INC.
consulting engineers - surveyors
1530 55th Street, Boulder, Colorado
303-444-3051

Project No. 06535F

ENGINEER'S STATEMENT

I hereby certify that this report for the final drainage design of the Erie Convair Hangar Complex was prepared under my direct supervision in accordance with the provisions of the Town of Erie Design and Development Standards for the owners thereof.

_____

Donald P. Ash, P.E.
Registered Professional Engineer
State of Colorado No. 36045

TABLE OF CONTENTS

INTRODUCTION

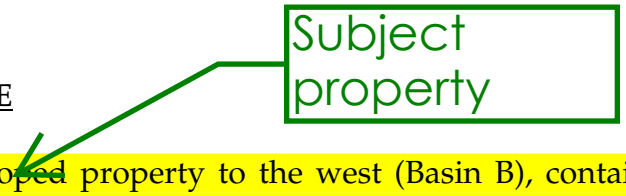
This report is submitted as the final drainage design study of the historic and developed conditions for the proposed and existing commercial airport development at 3000 Airport Drive. The site is located in the northwest quarter of the southwest quarter of Section 31, Township 1 North, Range 68 West of the 6th Principal Meridian in the Town of Erie, Weld County, State of Colorado. The area of the project site is approximately 7.88 acres. This project involves the construction of a water quality pond on the adjacent lot for the existing Convair Lot 2 development and a portion of the proposed Schofield Tract E development.

This drainage report analyzes the existing storm runoff and the storm runoff based on the existing and proposed improvements. This study meets the requirements set forth in the Town of Erie Standards and Specifications for Design and Construction of Public Improvements.

DRAINAGE BASIN DESCRIPTION

An existing commercial development to the north, existing aircraft hangars to the west, and Airport Drive to the east and south currently border the site. The western portion of the Lot 2 site (Basin A) currently slopes from the southeast towards the northwest, to an existing inlet that crosses the Taxiway DELTA. From there flows are directed into an existing sedimentation basin that discharges into the Coal Creek Drainageway. The location of this sedimentation basin will be the future location of the proposed water quality pond. The eastern portion of the Lot 2 site (Basin C) flows from the southwest to the northeast into the Airport Drive right-of-way, ultimately discharging into the existing water quality pond located on the Rocky Mountain Propeller site. The elevation differential across the site is approximately 5 feet.

OFFSITE DRAINAGE



The adjacent undeveloped property to the west (Basin B), contains approximately 10.94 acres, and currently flows via overland and channel flow into the existing sedimentation basin. The developed runoff from this basin will ultimately flow through the proposed site via overland and channel flow, into the proposed water quality pond. Developed runoff calculations for Basin B are provided in Appendix A. No other significant flows enter from offsite.

PROPOSED ON-SITE DRAINAGE

The Grading, Drainage and Erosion Control Plan shows the proposed on-site grading and drainage improvements. Under developed conditions, runoff from Basin A will be directed via sheet/gutter/channel flow and a storm pipe to the proposed water quality pond located at the northeast corner of Tract E. All roof drainage will be directed to the proposed water quality pond. Runoff from a portion of the Tract E development will also be conveyed to the north and east via overland and gutter flow to the proposed water quality pond. Runoff from Basin C will be directed northeast to the existing water quality pond located at the northeast corner of the Rocky Mountain Propeller site. Proposed runoff from the 5-year, 10-year and 100-year storms are provided in Appendix A.

DRAINAGE DESIGN CRITERIA

As required in the Town of Erie Standards and Specifications for Design and Construction of Public Improvements for all non-single family residential uses, hydrologic information was developed for an initial storm return period of 5-years and major storm return period of 100-years. The criteria and methodology used in determining the storm runoff peaks and volumes were those outlined in the Standards and Specifications.

The design rainfall data used in this study was taken from the time-intensity-frequency curve for the Town of Erie (Section 813.06) as developed by Urban Drainage and Flood Control District (UD&FCD). Runoff calculations were obtained using the Rational Method as outlined in the Standards and Specifications for basins having less than 160 acres.

The Rational Formula is:

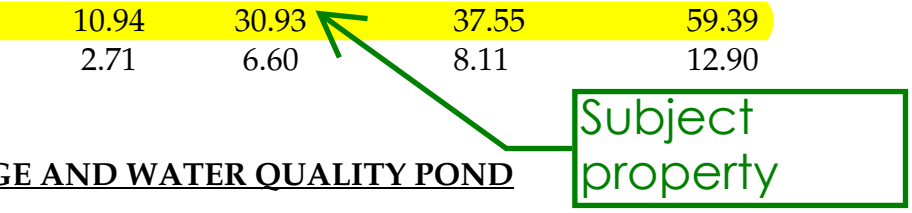
$$Q = CIA$$

Where:
- Q = Peak Discharge (cfs)
- C = Runoff Coefficient (Table 7-2 CBDCS)
- I = Rainfall Intensity (in/hr) (Figure 7-1 CBDCS)
- A = Drainage Basin Tributary Area (acres)

The exiting and proposed conditions were analyzed for the 5-year, 10-year, and 100-year storm events and runoffs were calculated. These results are shown in the following Table 1. Calculation sheets are provided in Appendix A. Open channels and drainage ways have been designed to convey the 10-year storm event and the storm pipe has been designed to convey the 5-year storm event.

TABLE 1
RUNOFF CALCULATIONS SUMMARY

Drainage Basin	Area (acres)	5-year Peak Runoff (cfs)	10-year Peak Runoff (cfs)	100-year Peak Runoff (cfs)
Basin A – Undeveloped	5.17	2.52	5.04	15.77
Basin A – Developed	5.17	14.17	17.06	27.15
Basin B – Undeveloped	10.94	5.17	10.26	32.27
Basin B – Developed	10.94	30.93	37.55	59.39
Basin C – Developed	2.71	6.60	8.11	12.90



DETENTION STORAGE AND WATER QUALITY POND

The increase in storm runoff due to the proposed improvements is relatively large as shown in Table 1 above. The runoff for the initial and major storm events from the tributary basin can be conveyed directly to the major drainage system without adverse impact upstream, surrounding, or downstream properties and facilities. Due to the location of the site relative to the floodplain, we will only be providing water quality for the proposed developed areas. No detention is proposed for this site.

A water quality pond has been designed to provide the recommended structural Best Management Practices (BMPs) outlined in the Urban Drainage and Flood Control District (UDFCD), Urban Storm Drainage Criteria Manual, Volume 3. The calculations for the water quality pond and the limited release structure are enclosed in Appendix C. In addition, sections and details for the pond and limited release outlet structure are shown on the enclosed plan. This pond has been designed to accommodate the anticipated water quality requirements for the developed conditions of both Basins A and B.

A limited release orifice plate provides the required 40-hour drain time for the water quality capture volume. The orifice plate meets the requirements for an Extended Detention Basin and the 40-hour drain time as specified in the UDFCD Manual.

The adjacent taxiway and roadways around the pond will provide approximately 1.0 feet of freeboard above the WQCV water surface elevation. In the event the pond was to overflow, the flow is directed to overtop at the outlet structure and spill north and east across Taxiway Delta and directly to the Coal Creek drainageway.

STORM WATER QUALITY AND EROSION CONTROL

The principal form of storm water quality runoff enhancement is the utilization of an Extended Detention Basin (EDB) as water quality enhancements. Surface drainage from the developed surfaces of the two sites will drain to the natural area at the water quality pond. Drainage from the pond will then be conveyed through the water quality outlet structure, into a proposed 30" CMP culvert, and into the Coal Creek drainage basin. The use of an EDB as a storm water quality runoff enhancement is consistent with the Urban Drainage and Flood Control District, Urban Storm Drainage Criteria Manual, Volume 3, Best Management Practices.

Erosion control measures will consist of hay bales at grass swales and inlets, tracking control measures at the access point to the site, riprap protection at all proposed culverts, and revegetation with appropriate plant species.

FLOOD STATEMENT

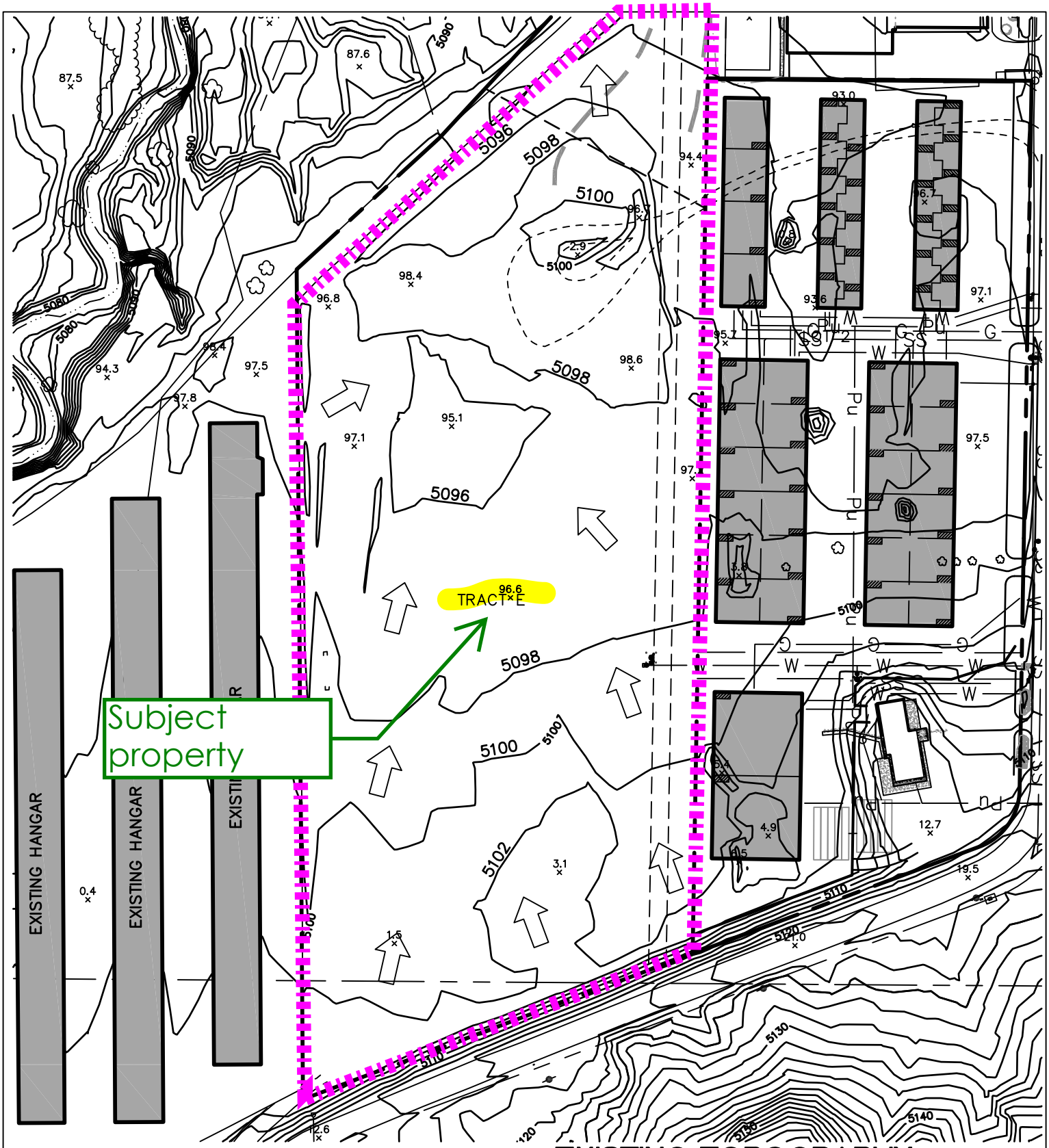
According to the National Flood Insurance Program Flood Insurance Rate Map, FIRM Panel 0801810018E dated December 2, 2004, a portion of the site is located in Zone AE, indicating that it is in an area determined to be inside of the 100-year floodplain. The limits of the floodplain are shown on the Grading, Drainage and Erosion Control Plan that is included in the back pocket of this report. The proposed building improvements have been located and designed to remain outside of the 100-year floodplain.

CONCLUSION

The primary consideration for this project was to design a final drainage plan for the site to mitigate runoff from the proposed development. The drainage plan accommodates runoff from 5-year, 10-year, and 100-year storm events. All analyses were performed in accordance with the Town of Erie Standards and Specifications for Design and Construction of Public Improvements.

APPENDIX A

DRAINAGE BASIN RUNOFF CALCULATIONS



EXISTING TOPOGRAPHY
ERIE CONVAIR HANGAR COMPLEX
ERIE, COLORADO

SCOTT, COX & ASSOCIATES, INC.
consulting engineers • surveyors
1530 55th Street • Boulder, Colorado 80303
(303) 444 – 3051

10/09/08 JOB NO. 06535F DRAWING NO. 06535D-3

TABLE 800-3
RUNOFF COEFFICIENTS (C) FOR RATIONAL METHOD

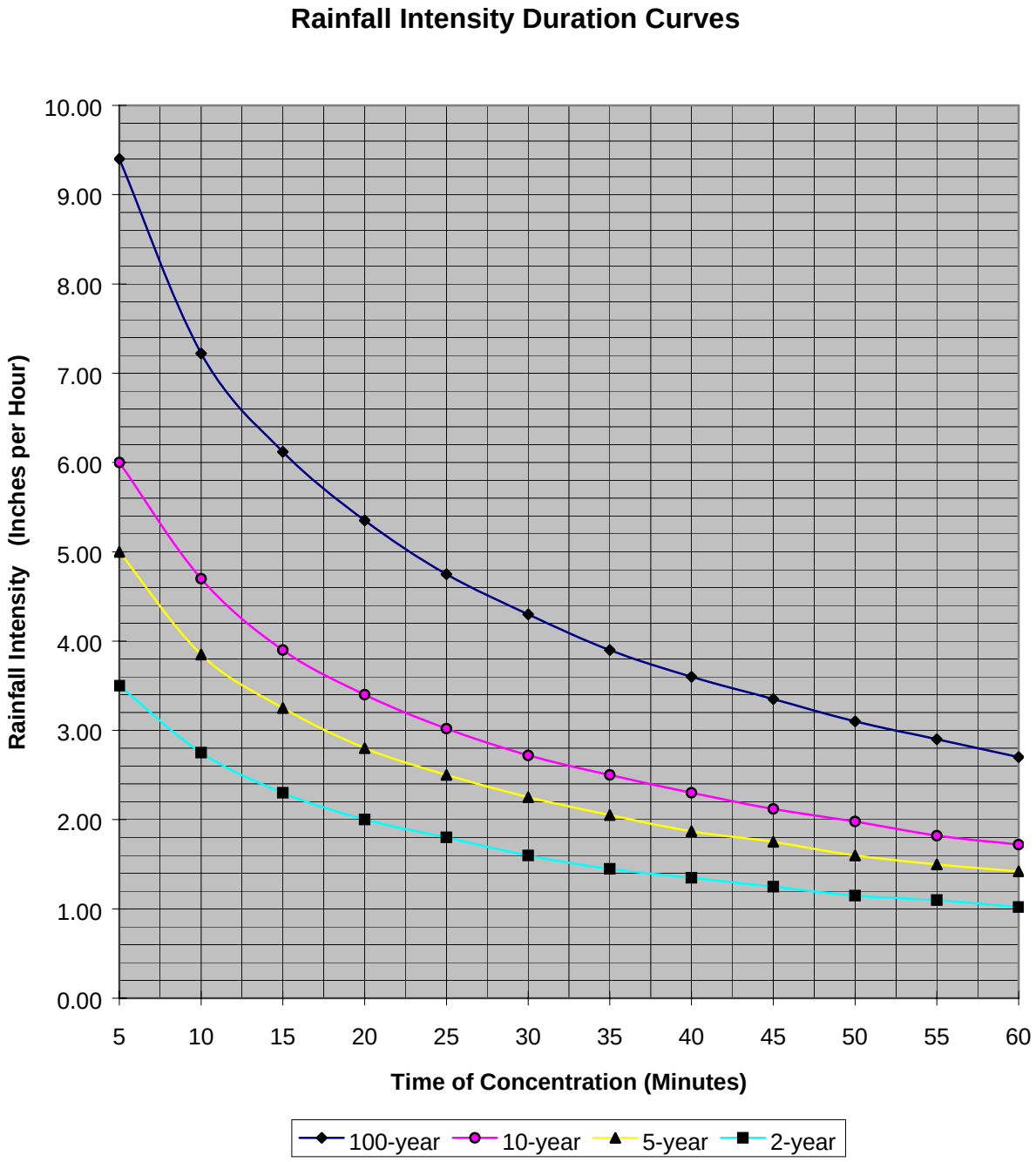
		FREQUENCY			
LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	2	5	10	100
Business					
Commercial Areas	95	.87	.87	.88	.89
Neighborhood Areas	70	.60	.65	.70	.80
Residential					
Single-Family	*	.40	.45	.50	.60
Multi-Unit (detached)	50	.45	.50	.60	.70
Multi-Unit (attached)	70	.60	.65	.70	.80
1/2 Acre Lot or Larger	*	.30	.35	.40	.60
Apartments	70	.65	.70	.70	.80
Industrial					
Light Areas	80	.71	.72	.76	.82
Heavy Areas	90	.80	.80	.85	.90
Parks, Cemeteries	7	.10	.18	.25	.45
Playgrounds	13	.15	.20	.30	.50
Schools	50	.45	.50	.60	.70
Railroad Yard Areas	20	.20	.25	.35	.45
Undeveloped Areas					
Historic Flow Analysis	2	(See "Lawns")			
Greenbelts, Agricultural					
Offsite Flow Analysis					
(when land use not defined)	45	.43	.47	.55	.65
Streets					
Paved	100	.87	.88	.90	.93
Gravel	40	.40	.45	.50	.60
Drives and Walks	96	.87	.87	.88	.89
Roofs	90	.80	.85	.90	.90
Lawns, Sandy Soil	0	.00	.01	.05	.20
Lawns, Clay Soil	0	.05	.15	.25	.50

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

The rainfall intensities to be used in the computation of runoff using the Rational Method shall be obtained from the Rainfall Intensity Duration Curves for the Town of Erie, included in these STANDARDS AND SPECIFICATIONS.



814.00 Detention

814.01 General

On site detention is required for all new development, expansion, and redevelopment. The required minimum detention volume and maximum release rates at these volumes for the 10-year and 100-year storms shall be determined in accordance with the procedure and data set forth in this criteria.

SCOTT, COX & ASSOCIATES INC.
consulting engineers - surveyors

PROJECT NO.: 06535D
DATE: 3/19/2009
BY: WMK

STORM RUNOFF HYDROLOGY

Rational Method

Condition: EXISTING
Land Use: UNDEVELOPED
Basin Area (A) = 5.17 acres

Basin Identification: A
Design Frequencies: 2, 5, 10 & 100 year
Comments:

Runoff Coefficients (C) = From Town of Erie Standards for Lawns - Clay Soil

2 year	5 year	10 year	100 year
0.05	0.15	0.25	0.50

Given

Overland flow length (Lo)	210	feet (500 feet maximum)
Overland flow slope (S)	5.2	%
Channel travel length (Lc)	720.0	feet
Channel velocity (V)	0.8	feet/second

Ti, Initial time of Concentration:

Urban Basin

Ti = 1.8*(1.1-C5)*(Lo^0.5)/(S^0.333) (intial design pt.) Ti = 14.3 min.

Ti minimum for Non-Urban Basins = 5 min.

Greater of Calculated Ti and 5 minutes Ti = 14.3 min.

Urban Basin

Ti = (Lo/180) + 10 min. (initial design pt.) Ti = 15.2 min.

Tt, Travel time of Flow:

Urban and Non-Urban Basins

Travel time, Tt = Lc/V(fps)*60 sec./min. Tt = 15.0 min.

Tc, Time of Concentration (Tc = Ti + Tt)

Non-Urban Tc = 29.3 min.
Urban Tc = 15.2 min.

Intensity (I) From Intensity - Duration - Frequency Curve
Town of Erie Standards and Specifications

2 year	5 year	10 year	100 year
2.30	3.25	3.90	6.10

Peak Flow (Q) = C*I*A (cfs)

2 year	5 year	10 year	100 year
0.59	2.52	5.04	15.77

SCOTT, COX & ASSOCIATES INC.
consulting engineers - surveyors

Subject property

PROJECT NO.: 06535D
DATE: 3/19/2009
BY: WMK

STORM RUNOFF HYDROLOGY
Rational Method

Condition: EXISTING
Land Use: UNDEVELOPED
Basin Area (A) = 10.94 acres

Basin Identification: B
Design Frequencies: 2, 5, 10 & 100 year
Comments:

Runoff Coefficients (C) = From Town of Erie Standards for Lawns - Clay Soil

2 year	5 year	10 year	100 year
0.05	0.15	0.25	0.50

Given

Overland flow length (Lo)	500	feet (500 feet maximum)
Overland flow slope (S)	1.0	%
Channel travel length (Lc)	650	feet
Channel velocity (V)	2	feet/second

Ti, Initial time of Concentration:

Urban Basin

Ti = 1.8*(1.1-C5)*(Lo^0.5)/(S^0.333) (intial design pt.) Ti = 38.2 min.

Ti minimum for Non-Urban Basins = 5 min.

Greater of Calculated Ti and 5 minutes Ti = 38.2 min.

Urban Basin

Ti = (Lo/180) + 10 min. (initial design pt.) Ti = 16.4 min.

Tt, Travel time of Flow:

Urban and Non-Urban Basins

Travel time, Tt = Lc/V(fps)*60 sec./min. Tt = 5.4 min.

Tc, Time of Concentration (Tc = Ti + Tt)

Non-Urban Tc = 43.7 min.
Urban Tc = 16.4 min.

Intensity (I) From Intensity - Duration - Frequency Curve
Town of Erie Standards and Specifications

2 year	5 year	10 year	100 year
2.20	3.15	3.75	5.90

Peak Flow (Q) = C*I*A (cfs)

2 year	5 year	10 year	100 year
1.20	5.17	10.26	32.27

SCOTT, COX & ASSOCIATES INC.
consulting engineers - surveyors

PROJECT NO.: 06535D
DATE: 3/19/2009
BY: WMK

STORM RUNOFF HYDROLOGY

Rational Method

Condition: PROPOSED
Land Use: BUSINESS-COMMERCIAL AREA
Basin Area (A) = 5.17 acres

Basin Identification: A
Design Frequencies: 2, 5, 10 & 100 year
Comments:

Runoff Coefficients (C) = From Town of Erie Standards for Business - Commercial Area

2 year	5 year	10 year	100 year
0.87	0.87	0.88	0.89

Given

Overland flow length (Lo)	40	feet (500 feet maximum)
Overland flow slope (S)	2.0	%
Channel travel length (Lc)	1025	feet
Channel velocity (V)	1.5	feet/second

Ti, Initial time of Concentration:

Urban Basin

Ti = 1.8*(1.1-C5)*(Lo^0.5)/(S^0.333) (intial design pt.) Ti = 2.1 min.

Ti minimum for Non-Urban Basins = 5 min.

Greater of Calculated Ti and 5 minutes Ti = 5.0 min.

Urban Basin

Ti = (Lo/180) + 10 min. (initial design pt.) Ti = 15.9 min.

Tt, Travel time of Flow:

Urban and Non-Urban Basins

Travel time, Tt = Lc/V(fps)*60 sec./min. Tt = 11.4 min.

Tc, Time of Concentration (Tc = Ti + Tt)

Non-Urban Tc = 16.4 min.
Urban Tc = 15.9 min.

Intensity (I) From Intensity - Duration - Frequency Curve
Town of Erie Standards and Specifications

2 year	5 year	10 year	100 year
2.20	3.15	3.75	5.90

Peak Flow (Q) = C*I*A (cfs)

2 year	5 year	10 year	100 year
9.90	14.17	17.06	27.15

SCOTT, COX & ASSOCIATES INC.
consulting engineers - surveyors

Subject property

PROJECT NO.: 06535D
DATE: 3/19/2009
BY: WMK

STORM RUNOFF HYDROLOGY
Rational Method

Condition: PROPOSED
Land Use: BUSINESS-COMMERCIAL AREA
Basin Area (A) = 10.94 acres

Basin Identification: B
Design Frequencies: 2, 5, 10 & 100 year
Comments:

Runoff Coefficients (C) = From Town of Erie Standards for Business - Commercial Area

2 year	5 year	10 year	100 year
0.87	0.87	0.88	0.89

Given

Overland flow length (Lo)	500	feet (500 feet maximum)
Overland flow slope (S)	1.0	%
Channel travel length (Lc)	650	feet
Channel velocity (V)	2	feet/second

Ti, Initial time of Concentration:

Urban Basin

Ti = 1.8*(1.1-C5)*(Lo^0.5)/(S^0.333) (intial design pt.) Ti = 9.3 min.

Ti minimum for Non-Urban Basins = 5 min.

Greater of Calculated Ti and 5 minutes Ti = 9.3 min.

Urban Basin

Ti = (Lo/180) + 10 min. (initial design pt.) Ti = 16.4 min.

Tt, Travel time of Flow:

Urban and Non-Urban Basins

Travel time, Tt = Lc/V(fps)*60 sec./min. Tt = 5.4 min.

Tc, Time of Concentration (Tc = Ti + Tt)

Non-Urban Tc = 14.7 min.
Urban Tc = 16.4 min.

Intensity (I) From Intensity - Duration - Frequency Curve
Town of Erie Standards and Specifications

2 year	5 year	10 year	100 year
2.30	3.25	3.90	6.10

Peak Flow (Q) = C*I*A (cfs)

2 year	5 year	10 year	100 year
21.89	30.93	37.55	59.39

SCOTT, COX & ASSOCIATES INC.
consulting engineers - surveyors

PROJECT NO.: 06535D
DATE: 3/19/2009
BY: WMK

STORM RUNOFF HYDROLOGY

Rational Method

Condition: PROPOSED
Land Use: BUSINESS-COMMERCIAL AREA
Basin Area (A) = 2.71 acres

Basin Identification: C
Design Frequencies: 2, 5, 10 & 100 year
Comments:

Runoff Coefficients (C) = From Town of Erie Standards for Business - Commercial Area

2 year	5 year	10 year	100 year
0.87	0.87	0.88	0.89

Given

Overland flow length (Lo)	130	feet (500 feet maximum)
Overland flow slope (S)	2.0	%
Channel travel length (Lc)	640	feet
Channel velocity (V)	0.75	feet/second

Ti, Initial time of Concentration:

Urban Basin

Ti = 1.8*(1.1-C5)*(Lo^0.5)/(S^0.333) (intial design pt.) Ti = 3.7 min.

Ti minimum for Non-Urban Basins = 5 min.

Greater of Calculated Ti and 5 minutes Ti = 5.0 min.

Urban Basin

Ti = (Lo/180) + 10 min. (initial design pt.) Ti = 14.3 min.

Tt, Travel time of Flow:

Urban and Non-Urban Basins

Travel time, Tt = Lc/V(fps)*60 sec./min. Tt = 14.2 min.

Tc, Time of Concentration (Tc = Ti + Tt)

Non-Urban Tc = 19.2 min.
Urban Tc = 14.3 min.

Intensity (I) From Intensity - Duration - Frequency Curve
Town of Erie Standards and Specifications

2 year	5 year	10 year	100 year
2.00	2.80	3.40	5.35

Peak Flow (Q) = C*I*A (cfs)

2 year	5 year	10 year	100 year
4.72	6.60	8.11	12.90

APPENDIX B

HYDRAULIC CALCULATIONS

Culvert Calculator Report
24" Discharge Pipe into Pond

Solve For: Section Size

Culvert Summary					
Allowable HW Elevation	15.50	ft	Headwater Depth/Height	1.49	
Computed Headwater Elev	15.18	ft	Discharge	14.17	cfs
Inlet Control HW Elev.	14.55	ft	Tailwater Elevation	14.55	ft
Outlet Control HW Elev.	15.18	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	12.20	ft	Downstream Invert	10.70	ft
Length	75.00	ft	Constructed Slope	0.020000	ft/ft

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	3.85	ft
Slope Type	N/A		Normal Depth	0.89	ft
Flow Regime	N/A		Critical Depth	1.36	ft
Velocity Downstream	4.51	ft/s	Critical Slope	0.005195	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Corrugated HDPE (Smooth Interior)		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	15.18	ft	Upstream Velocity Head	0.32	ft
Ke	0.20		Entrance Loss	0.06	ft

Inlet Control Properties					
Inlet Control HW Elev.	14.55	ft	Flow Control	N/A	
Inlet Type	Beveled ring, 33.7° bevels		Area Full	3.1	ft²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	B	
C	0.02430		Equation Form	1	
Y	0.83000				

Culvert Calculator Report
30" Oulet Pipe

Solve For: Section Size

Culvert Summary					
Allowable HW Elevation	15.00	ft	Headwater Depth/Height	2.46	
Computed Headwater Elev	14.03	ft	Discharge	44.10	cfs
Inlet Control HW Elev.	13.35	ft	Tailwater Elevation	0.00	ft
Outlet Control HW Elev.	14.03	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	8.50	ft	Downstream Invert	7.50	ft
Length	100.00	ft	Constructed Slope	0.010000	ft/ft

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	2.14	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	2.14	ft
Velocity Downstream	11.30	ft/s	Critical Slope	0.017562	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Corrugated HDPE (Smooth Interior)		Span	2.25	ft
Section Size	27 inch		Rise	2.25	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	14.03	ft	Upstream Velocity Head	1.91	ft
Ke	0.20		Entrance Loss	0.38	ft

Inlet Control Properties					
Inlet Control HW Elev.	13.35	ft	Flow Control	N/A	
Inlet Type	Beveled ring, 33.7° bevels		Area Full	4.0	ft²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	B	
C	0.02430		Equation Form	1	
Y	0.83000				

SCOTT, COX & ASSOCIATES INC.
consulting engineers - surveyors

PROJECT # 06535F
DATE 3/19/09
BY WMK

RIPRAP 'A' SIZING

Per Urban Drainage & Flood Control District Volume 1
Major Drainage - Section 7.3

Outfall into WQ Pond
Pipe Size = 24" PVC
Q(5-yr) = 14.17 cfs

(V*(S**0.17))/((Ss-1)**0.66)

VELOCITY	5.89	fps	
SLOPE	0.02	ft/ft	2.00 %
Ss	2.5	(fixed)	

RESULT 2.32

	TYPE
1.4 to 3.2	VL
3.3 to 3.9	L
4.0 to 4.5	M
4.6 to 5.5	H
5.6 to 6.4	VH

USE TYPE 'L' RIPRAP
L = 3D = 5.25' (USE 6' LENGTH)
W = 21" MIN (USE 3' WIDTH)
D = 18" DEPTH

SCOTT, COX & ASSOCIATES INC.
consulting engineers - surveyors

PROJECT # 06535D
DATE 3/19/09
BY WMK

RIPRAP 'B' SIZING

Per Urban Drainage & Flood Control District Volume 1
Major Drainage - Section 7.3

Outfall into Drainageway
Pipe Size = 30" PVC
Q(5-yr) = 44.10 cfs

(V*(S**0.17))/((Ss-1)**0.66)

VELOCITY	9.61	fps (max)	
SLOPE	0.01	ft/ft	1 %
Ss	2.5	(fixed)	

RESULT **3.36**

	TYPE
1.4 to 3.2	VL
3.3 to 3.9	L
4.0 to 4.5	M
4.6 to 5.5	H
5.6 to 6.4	VH

USE TYPE 'L' RIPRAP
L = 3D = 8.5' (USE 10' LENGTH)
W = 30" MIN (USE 5' WIDTH)
D = 18" DEPTH

SCOTT, COX & ASSOCIATES INC.
consulting engineers - surveyors

PROJECT # 06535F
DATE 3/19/09
BY WMK

RIPRAP 'C' SIZING

Per Urban Drainage & Flood Control District Volume 1
Major Drainage - Section 7.3

Pond Overflow
Width = 34'
Q(100-yr) = 86.54 cfs

(V*(S**0.17))/((Ss-1)**0.66)

VELOCITY	2	fps	
SLOPE	0.02	ft/ft	2.00 %
Ss	2.5	(fixed)	

RESULT 0.79

	TYPE
1.4 to 3.2	VL
3.3 to 3.9	L
4.0 to 4.5	M
4.6 to 5.5	H
5.6 to 6.4	VH

USE TYPE 'L' RIPRAP
L = 8' LENGTH
W = 34' WIDTH
D = 18" DEPTH

SCOTT, COX & ASSOCIATES, INC.
consulting engineers - surveyors

Project No.: 06535F
Date: 3/19/09

GRATE FLOW CALCULATIONS

RE: Outlet Structure, Type 'D' Inlet Standard Grate

Q=Cd*A*(2gH)**0.5	**45.53**	**CFS**	**Q= CALCULATED FLOW**
	0.60		Cd= ORIFICE COEF.
	12.8	Sq. Ft.	A= OPEN AREA
	0.55	FT	H=HEAD IN FEET
	32.20	FT/s^2	g=gravitation force 32.2 ft/sec2

5-yr flow = 44.10 cfs Therefore grate is sufficient to convey 5-yr event.

W.S.E.	14.55
RIM	14.00
H=HEIGHT FROM BOTTOM OF THE OPENING	0.55

APPENDIX C

WATER QUALITY POND CALCULATIONS

SCOTT, COX & ASSOCIATES, INC.
consulting engineers - surveyors

PROJECT #: 06535D
DATE: 3/19/09
BY: WMK

Calculate Water Quality Capture Volume
Reference UDFCD Manual - Volume 3

Calculate the required Water Quality Capture Volume using the Imperviousness Ratio from the Town of Erie Standards for Business - Commercial Areas and the total developed conditions for the two lots.

1. Basin Storage Volume

A. Imperviousness Ratio ($I = I_a / 100$) — I_A = 95.00%
(From Town of Erie Design Standards for Business - Neighborhood Area) — i = 0.950

B. Contributing Watershed — A = 18.81 Acres

C. Water Quality Capture Volume (WQCV)
$WQCV = 1.0 \times (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$
WQCV = 0.447 in / acre

D. Design Volume
Volume = (WQCV / 12) * Area * 1.2
Volume = 0.8413 acre - feet
36,645 cubic feet

WQCV = 36,645 cubic feet

SCOTT, COX & ASSOCIATES, INC.
consulting engineers - surveyors

PROJECT #: 06535D
DATE: 3/19/09
BY: WMK

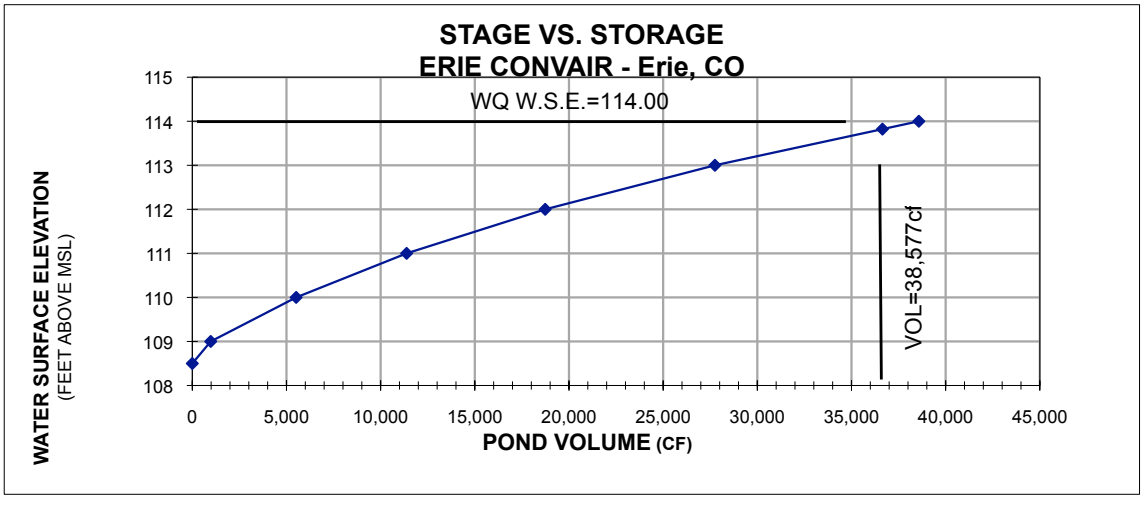
PROPOSED W.S.E.: 114.00

POND VOLUME CALCULATION

ELEVATION	DEPTH	AREA S.I.	AREA S.F.	WEIGHTED AVG AREA S.F.	INCREMENTAL VOLUME C.F.	CUMMULATIVE VOLUME C.F.
108.5			0			
	0.5			1,956	978	978
109.0			3,912			
	1.0			4,536	4,536	5,514
110.0			5,160			
	1.0			5,865	5,865	11,379
111.0			6,570			
	1.0			7,358	7,358	18,737
112.0			8,145			
	1.0			9,013	9,013	27,749
113.0			9,880			
	1.0			10,828	10,828	38,577
114.0			11,775			
	5.5		TOTAL (CUBIC FEET)		38,577	

Volume Provided=38,577 cubic feet >
Volume Required = 36,645 cubic feet **OK**

STAGE/STORAGE		
STAGE(SF)	VOL(CF)±	CUM VOL(CF)
108.5	0	0
109.0	1,956	978
110.0	4,536	5,514
111.0	5,865	11,379
112.0	7,358	18,737
113.0	9,013	27,749
113.8		36,645
114.0	10,828	38,577



20' different in datum.
5114 = 5094' NAVD 88

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer: WMK
Company: Scott, Cox & Associates, Inc., 1530 55th Street, Boulder, CO 80303
Date: October 6, 2008
Project: Erie Convair
Location: Lot 2 - Replat A - Erie Air Park, 2865 Airport Drive, Erie, CO

1. Basin Storage Volume	
A) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	I_a = 95.00 % i = 0.95
B) Contributing Watershed Area (Area)	Area = 18.82 acres
C) Water Quality Capture Volume (WQCV) (WQCV =1.0 * (0.91 * I^3 - 1.19 * I^2 + 0.78 * I))	WQCV = 0.45 watershed inches
D) Design Volume: Vol = (WQCV / 12) * Area * 1.2	Vol = 0.842 acre-feet
2. Outlet Works	
A) Outlet Type (Check One)	X Orifice Plate Perforated Riser Pipe Other:
B) Depth at Outlet Above Lowest Perforation (H)	H = 5.30 feet
C) Required Maximum Outlet Area per Row, (A_o)	A_o = 0.49 square inches
D) Perforation Dimensions **(enter one only)**: i) Circular Perforation Diameter **OR** ii) 2" Height Rectangular Perforation Width	 D = 0.770 inches, **OR** W = inches
E) Number of Columns (nc, See Table 6a-1 For Maximum)	nc = 1 number
F) Actual Design Outlet Area per Row (A_o)	A_o = 0.47 square inches
G) Number of Rows (nr)	nr = 16 number
H) Total Outlet Area (A_{ot})	A_{ot} = 7.40 square inches
3. Trash Rack	
A) Needed Open Area: A_t = 0.5 * (Figure 7 Value) * A_{ot}	A_t = 259 square inches
B) Type of Outlet Opening (Check One)	X ≤ 2" Diameter **Round** 2" High **Rectangular** Other:
C) For 2", or Smaller, **Round Opening** (Ref.: Figure 6a):	
i) Width of Trash Rack and Concrete Opening (W_{conc}) from Table 6a-1	W_{conc} = 6 inches
ii) Height of Trash Rack Screen (H_{TR})	H_{TR} = 66 inches

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer: WMK
Company: Scott, Cox & Associates, Inc., 1530 55th Street, Boulder, CO 80303
Date: October 6, 2008
Project: Erie Convair
Location: Lot 2 - Replat A - Erie Air Park, 2865 Airport Drive, Erie, CO

iii) Type of Screen (Based on Depth H), Describe if "Other"	X S.S. #93 VEE Wire (US Filter) Other:
iv) Screen Opening Slot Dimension, Describe if "Other"	X 0.139" (US Filter) Other:
v) Spacing of Support Rod (O.C.) Type and Size of Support Rod (Ref.: Table 6a-2)	0.75 inches **#156 VEE**
vi) Type and Size of Holding Frame (Ref.: Table 6a-2)	**3/8 in. x 1.0 in. flat bar**
D) For 2" High **Rectangular Opening** (Refer to Figure 6b):	
I) Width of Rectangular Opening (W)	W = inches
ii) Width of Perforated Plate Opening (W_{conc} = W + 12")	W_{conc} = inches
iii) Width of Trashrack Opening ($W_{opening}$) from Table 6b-1	$W_{opening}$ = inches
iv) Height of Trash Rack Screen (H_{TR})	H_{TR} = inches
v) Type of Screen (based on depth H) (Describe if "Other")	Klemp™ KPP Series Aluminum Other:
vi) Cross-bar Spacing (Based on Table 6b-1, Klemp™ KPP Grating). Describe if "Other"	inches Other:
vii) Minimum Bearing Bar Size (Klemp™ Series, Table 6b-2) (Based on depth of WQCV surcharge)	
4. Detention Basin length to width ratio	1.00 (L/W)
5 Pre-sedimentation Forebay Basin - Enter design values	
A) Volume (no less than 5% of Design Volume from 1D)	acre-feet
B) Surface Area	acres
C) Connector Pipe Diameter (Size to drain this volume in 5-minutes under inlet control)	inches
D) Paved/Hard Bottom and Sides	yes/no

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

Designer: WMK
Company: Scott, Cox & Associates, Inc., 1530 55th Street, Boulder, CO 80303
Date: October 6, 2008
Project: Erie Convair
Location: Lot 2 - Replat A - Erie Air Park, 2865 Airport Drive, Erie, CO

6. Two-Stage Design - See Figure EDB-1	
A) Top Stage (Depth D_{WQ} = 2' Minimum)	D_{WQ} = _____ feet Storage= _____ acre-feet
B) Bottom Stage Depth (D_{BS} = 1.0' Minimum, 2.0' Maximum) Bottom Stage Storage (no less than 3% of Design Volume (0.025250958675 acre-feet.)	D_{BS} = _____ feet Storage= _____ acre-feet Surf. Area= _____ acres
C) Micro Pool (Minimum Depth = the Larger of 0.5 * Top Stage Depth or 2.5 Feet)	Depth= _____ feet Storage= _____ acre-feet Surf. Area= _____ acres
D) Total Volume: Vol_{tot} = Storage from 5A + 6A + 6B (Must be > Design Volume in 1D, or 0.8416986225 acre-feet.)	Vol_{tot} = _____ acre-feet
7. Basin Side Slopes (Z, horizontal distance per unit vertical) Minimum Z = 4, Flatter Preferred	Z = 4.00 (horizontal/vertical)
8. Dam Embankment Side Slopes (Z, horizontal distance) per unit vertical) Minimum Z = 3, Flatter Preferred	Z = 4.00 (horizontal/vertical)
9. Vegetation (Check the method or describe "Other")	X Native Grass _____ Irrigated Turf Grass _____ Other: _____

Notes: _____

SCOTT, COX & ASSOCIATES, INC.
consulting engineers - surveyors

Project No.: 06535F
Date: 3/19/2009

POND
Rectangular Weir Flow Calculations "Emergency Overflow Capacity"

Enter starting C, L, H to calculate Q.

Q=C*L*(H**1.5)

Q=Flow=	**88.40**	CFS	
C=Weir Coef.=	2.6		
L=Weir Length=	34	FT	
H=Height=	1.000	FT	(12.00 IN.)

Inv. of Overflow Weir=Pond W.S.E.=	5115.00
Top of Wall=	5116.00

Qallow = 88.40 CFS >> Q100-yr,A,B = 86.54 CFS(Design Flow),
∴ O.K.

20' different in datum.
5115 = 5095' NAVD 88

SITE IMPROVEMENT PLAN
(INCLUDES AMENDMENT NO. 2)
ERIE CONVAIR LLC

LOT 2 AND OUTLOT A, ERIE AIR PARK SUBDIVISION, REPLAT A, AND A PART OF TRACT D, ERIE AIR PARK SUBDIVISION. ALL LOCATED IN THE SW1/4 OF SEC. 31, T1N, R68W OF THE 6TH P.M. TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

EASEMENTS

THERE IS AN AVIATION EASEMENT ABOVE THE SURFACE OF SUBJECT PROPERTY RECORDED MAY 11, 1978, IN BOOK 831 AT RECEPTION NO. 1753139.

THERE IS A SOLAR EASEMENT APPURTENANT TO EACH LOT AND TRACT IN ERIE AIR PARK SUBDIVISION RECORDED MAY 11, 1978, AS DEFINED IN BOOK 831 AT RECEPTION NO. 1753143. PLAN DOES COMPLY WITH SOLAR EASEMENT.

THERE IS A MINERAL / COAL EASEMENT OWNED BY NORTH AMERICAN RESOURCES CO. COVERING THE ENTIRE PROPERTY AS RECORDED IN THE WELD COUNTY DEED IN BK. 1518, PG. 604 AND DESCRIBED AS:
PARCEL 1; LOT 2 AND OUTLOT A OF ERIE AIR PARK SUBDIVISION REPLAT A.
PARCEL 2; THAT PART OF TRACT D, ERIE AIR PARK SUBDIVISION, WHICH IS LOCATED IN THE NORTH 1/2 OF THE SOUTHWEST 1/4 OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, LYING SOUTH AND EAST OF AIRPORT DRIVE, COUNTY OF WELD, STATE OF COLORADO AS RECORDED IN AN AGREEMENT FOR COMPATIBLE DEVELOPMENT, RECEIPT NO. 265309, WELD COUNTY, DATED 11-16-1998.

THERE IS A 50' TAXIWAY EASEMENT ALONG THE WEST PROPERTY LINE, CONSISTING OF A 30' EASEMENT AND 20' SETBACK. RECP # 3442230.

THERE IS A WATER EASEMENT CONSISTING OF A NORTH BOUNDARY SETBACK LINE SETBACK FROM FURTHEST EXISTING WATERLINE SOUTH IN AIRPORT RD. LINE SETBACK FROM FURTHEST EXISTING WATERLINE SOUTH IN AIRPORT RD. RECP # 3442230.

THERE IS AN EXISTING 40-FOOT UTILITY EASEMENT CENTERED ON AIRPORT DRIVE BOOK 1598 RECP #1366570

ANY OFF-SITE AND ON-SITE EASEMENTS FOR UTILITIES, ACCESS, TAXIWAYS AND LANDSCAPING NEED TO BE IN PLACE PRIOR TO CONSTRUCTION. SUCH EASEMENTS SHALL BE DEDICATED BY SEPARATE INSTRUMENT WHERE APPLICABLE.

THERE IS A 30' EASEMENT FOR WATER UTILITIES AT 951.85' DUE SOUTH OF THE NW 1/16 COR. SEC. 31 T1N R68W OF THE 6TH PM, WELD COUNTY, COLORADO FOR A DISTANCE WEST OF 370.02'. WELD COUNTY 3411156 DATED 8-11-06.

THERE IS A DRAINAGE EASEMENT FOR THE PROPOSED WATER QUALITY POND CURRENTLY BEING RECORDED.

THERE IS A POND EASEMENT FOR THE PROPOSED WATER QUALITY POND CURRENTLY BEING RECORDED.

THERE IS A UTILITY EASEMENT FOR THE FIRE HYDRANT CURRENTLY BEING RECORDED.

SITE IMPROVEMENT PLAN CERTIFICATE OF APPROVAL

SITE PLAN APPROVAL CERTIFICATE – PLANNING COMMISSION

THIS SITE PLAN HAS BEEN REVIEWED AND FOUND TO BE COMPLETED AND IN ACCORDANCE WITH APPLICABLE TOWN OF ERIE REGULATIONS.

_____ _____
PLANNING COMMISSION–CHAIR DATE

_____ _____
DIRECTOR OF COMMUNITY DEVELOPMENT DATE

THE UNDERSIGNED AS THE OWNER OR OWNER'S REPRESENTATIVE OF THE LANDS DESCRIBED HEREIN, HEREBY AGREES ON BEHALF OF HIMSELF/HERSELF, THEIR HEIRS, SUCCESSORS, AND ASSIGNS TO DEVELOP AND MAINTAIN THE PROPERTY DESCRIBED HEREON IN ACCORDANCE WITH THIS APPROVED SITE PLAN AND IN COMPLIANCE WITH THE TOWN OF ERIE UNIFIED DEVELOPMENT CODE AND MUNICIPAL CODE:

_____ _____ _____

ACKNOWLEDGED BEFORE ME THIS ___ DAY OF _____, 200__.

BY _____ AS _____.

WITNESS MY HAND AND OFFICIAL SEAL

_____ (SEAL)
NOTARY PUBLIC

MY COMMISSION EXPIRES: _____

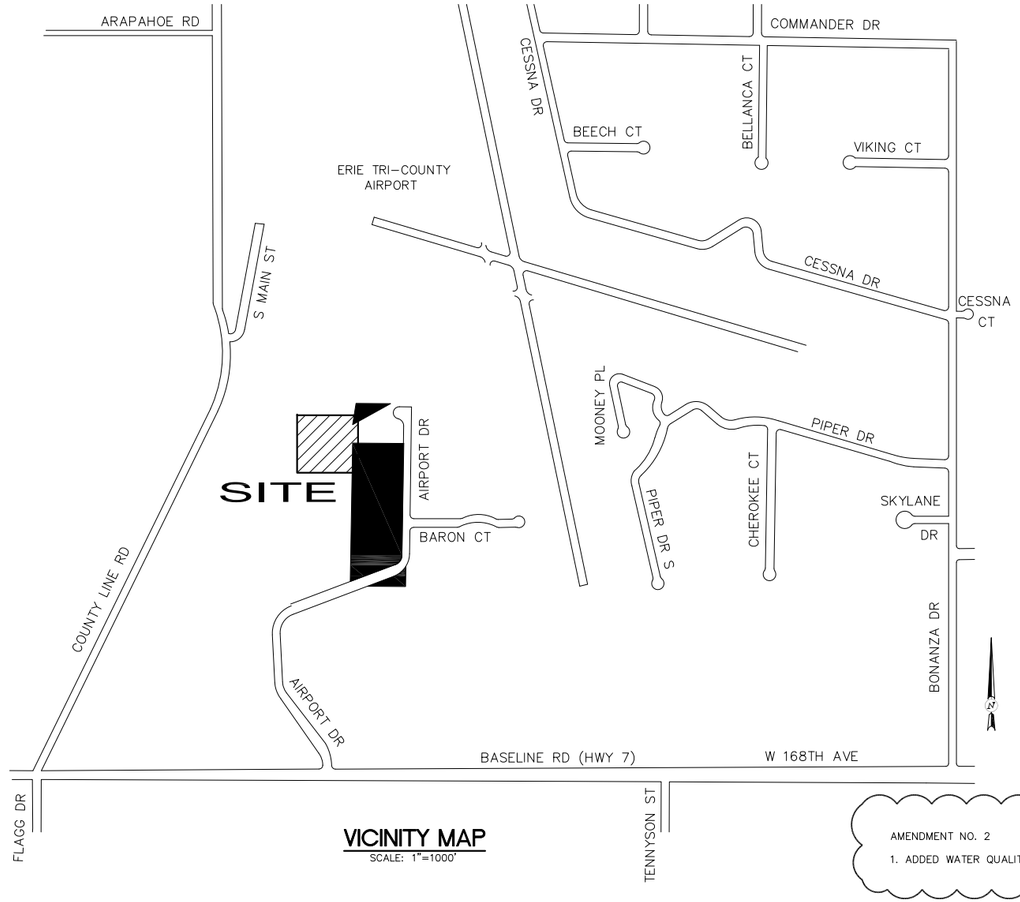
LEGAL DESCRIPTION

OUTLOT A AND LOT 2, ERIE AIR PARK SUBDIVISION REPLAT A, AS PER PLAT RECORDED SEPTEMBER 4, 1992 IN BOOK 1350 AT RECEPTION NO. 2302520, COUNTY OF WELD, STATE OF COLORADO.

AND

THAT PART OF TRACT D, ERIE AIR PARK SUBDIVISION, WHICH IS LOCATED IN THE NORTH 1/2 OF THE SOUTHWEST 1/4 OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, LYING SOUTH AND EAST OF AIRPORT DRIVE, COUNTY OF WELD, STATE OF COLORADO TOGETHER WITH ALL ITS APPURTENANCES.

A.K.A. 3000 AIRPORT DRIVE



VICINITY MAP
SCALE: 1"=1000'

SHEET SCHEDULE

SHT NO	DESCRIPTION
C1.0	COVER SHEET
C1.1	GRADING AND DRAINAGE PLAN
C2.1	CIVIL DETAILS

AMENDMENT NO. 2 (2)

1. ADDED WATER QUALITY POND DESIGN AND OUTFALL.

CERTIFICATION

I A. JOHN BURI, A PROFESSIONAL LAND SURVEYOR REGISTERED IN THE STATE OF COLORADO, HEREBY CERTIFY TO ERIE CONVAIR, LLC., THAT A BOUNDARY SURVEY AND A TOPOGRAPHIC SURVEY OF THE PROPERTY DESCRIBED HEREON WAS CONDUCTED UNDER MY SUPERVISION ON DECEMBER 13, 2006.

AND FURTHER CERTIFY THAT THE PROPERTY DESCRIBED HEREON IS NOT IN A 100-YEAR FLOOD PLAIN PER FEMA FLOOD INSURANCE RATE MAP COMMUNITY PANEL NO. 080180018 E, DATED SEPTEMBER 2, 2004.

FOR SCOTT, COX, & ASSOCIATES, INC.

_____
COLORADO P.L.S. No. 24302

NOTICE: According to Colorado law, you must commence any legal action based upon any defect in this survey within 3 years after you first discover such defect. In no event, may any action based upon any defect in this survey be commenced more than ten year from the date of this survey certification shown hereon.

(2) CLOUDED AREAS INDICATE SIP – AMENDMENT NO. 2

COLORADO REGISTERED DONALD P. ASH 36045 PROFESSIONAL ENGINEER

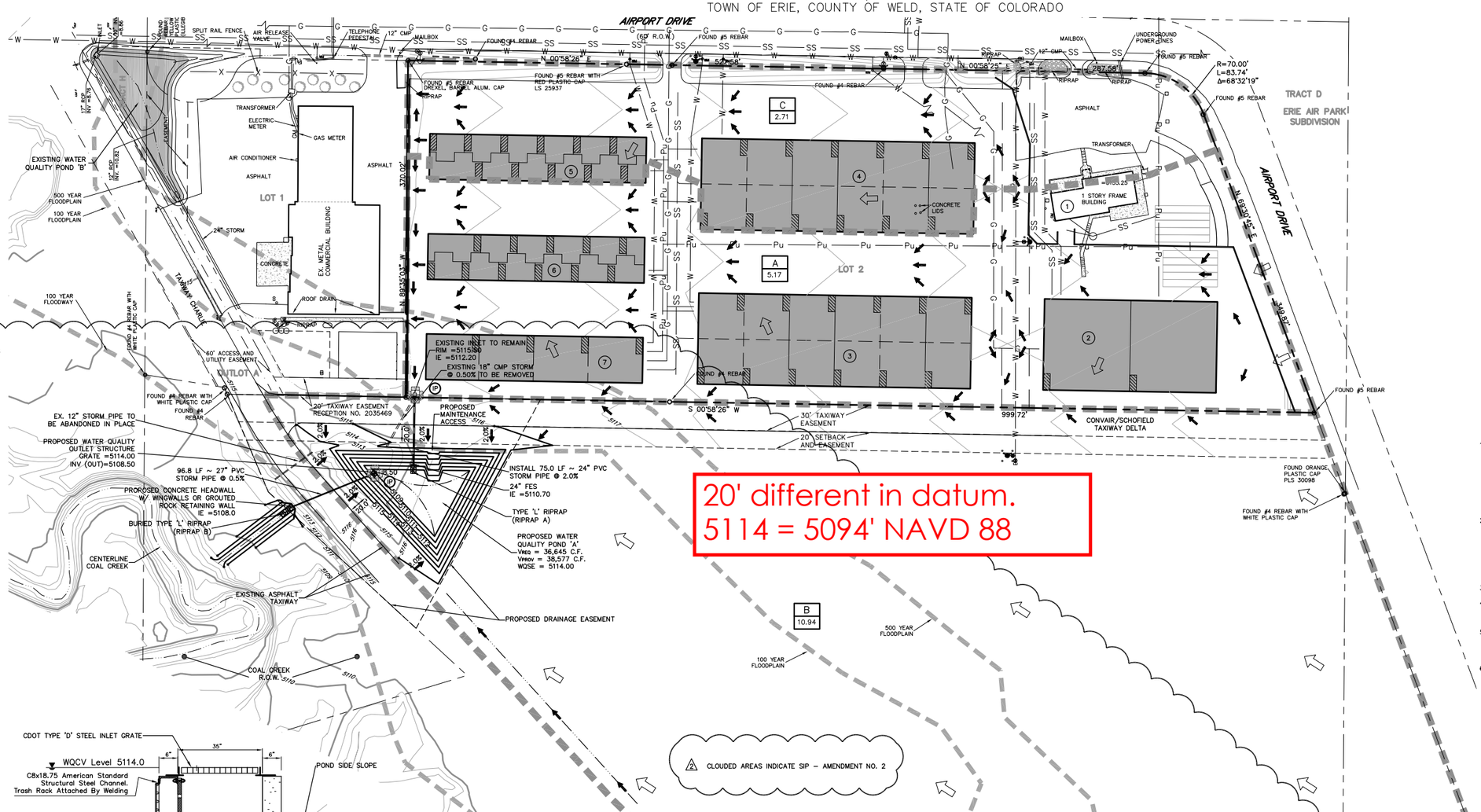
SITE IMPROVEMENT PLAN
ERIE CONVAIR HANGAR COMPLEX
3000 AIRPORT DRIVE
ERIE, COLORADO

SCOTT, COX & ASSOCIATES, INC.
consulting engineers • surveyors
1530 55th Street • Boulder, Colorado 80303
(303) 444 – 3051

Designed by WMK	Date	Scale	Drawing no.		Sheet
Drawn by WMK	10/09/08	1"=60'	06535D-3		C1.1
Checked by DPA	Revision	Description		Date	Project no.
	1	TOWN COMMENTS		04/02/09	06535D
	2	TOWN COMMENTS		04/22/09	

SITE IMPROVEMENT PLAN
(INCLUDES AMENDMENT NO. 2)
ERIE CONVAIR LLC

LOT 2 AND OUTLOT A, ERIE AIR PARK SUBDIVISION, REPLAT A, AND A PART OF TRACT D, ERIE AIR PARK SUBDIVISION. ALL LOCATED IN THE SW1/4 OF SEC. 31, T1N, R68W OF THE 6TH P.M. TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO


AIRPORT DRIVE
(60' R.O.W.)
N 00°58'26" E
522.68'
N 00°58'25" E
267.58'
R=70.00'
L=83.74'
Δ=68°32'19"
TRACT D
ERIE AIR PARK SUBDIVISION
LOT 1
LOT 2
OUTLOT A
EXISTING WATER QUALITY POND 'B'
500 YEAR FLOODPLAIN
100 YEAR FLOODPLAIN
100 YEAR FLOODWAY
TANNAY CIRCLE
60' ACCESS AND UTILITY EASEMENT
20' TAXIWAY EASEMENT RECEPTION NO. 2035469
30' TAXIWAY EASEMENT
20' SETBACK AND EASEMENT
CONVAIR/SCHOFIELD TAXIWAY DELTA
EXISTING INLET TO REMAIN RIM =5115.80 IE =5112.20
EXISTING 18" CMP STORM @ 0.50% TO BE REMOVED
PROPOSED MAINTENANCE ACCESS
EX. 12" STORM PIPE TO BE ABANDONED IN PLACE
PROPOSED WATER QUALITY OUTLET STRUCTURE GRATE =5114.00 INV (OUT)=5108.50
96.8 LF ~ 27" PVC STORM PIPE @ 0.5%
PROPOSED CONCRETE HEADWALL W/ WINGWALLS OR GROUTED ROCK RETAINING WALL IE =5108.0
BURIED TYPE 'L' RIPRAP (RIPRAP B)
INSTALL 75.0 LF ~ 24" PVC STORM PIPE @ 2.0%
24" FES IE =5110.70
TYPE 'L' RIPRAP (RIPRAP A)
PROPOSED WATER QUALITY POND 'A' Vwqcv = 36,645 C.F. Vmrov = 38,577 C.F. WQSE = 5114.00
PROPOSED DRAINAGE EASEMENT
EXISTING ASPHALT TAXIWAY
CENTERLINE COAL CREEK
COAL CREEK R.O.W.
CONCRETE LIDS
1 STORY FRAME BUILDING
EX. METAL COMMERCIAL BUILDING
CONCRETE
ASPHALT
TRANSFORMER
ELECTRIC METER
GAS METER
AIR CONDITIONER
ROOF DRAIN
24" STORM
SPLIT RAIL FENCE
AIR RELEASE VALVE
TELEPHONE PEDESTAL
MAILBOX
UNDERGROUND POWER LINES
FOUND #5 REBAR
FOUND #4 REBAR
FOUND #4 REBAR WITH WHITE PLASTIC CAP
FOUND ORANGE PLASTIC CAP PLS 30098
FOUND #5 REBAR DREXEL BARRELL ALUM. CAP
FOUND #5 REBAR WITH RED PLASTIC CAP LS 25937
RIPRAP
C 2.71
A 5.17
B 10.94
S 00°58'26" W
999.72'
S 89°35'03" W
370.00'
349.82'
N 68°39'55" E
FOUND #5 REBAR
FOUND #4 REBAR WITH WHITE PLASTIC CAP
FOUND #4 REBAR
IP
2.0%
5.0%
8.50
5114
5115
5116
5117
5118
5119
5120
5121
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5123
5124
5125
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GENERAL NOTES - CONSTRUCTION

1. ALL CONSTRUCTION SHALL CONFORM TO THE LATEST "STANDARDS AND SPECIFICATIONS FOR DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS" BY THE TOWN OF ERIE. COPIES OF THE TOWN OF ERIE STANDARDS AND SPECIFICATIONS MAY BE OBTAINED FROM THE TOWN OF ERIE.

2. THE OWNER SHALL SCHEDULE A PRE-CONSTRUCTION MEETING WITH THE TOWN OF ERIE ENGINEERING STAFF AT LEAST 48 HOURS PRIOR TO THE START OF CONSTRUCTION. THOSE IN ATTENDANCE SHALL INCLUDE THE OWNER, HIS ENGINEER, THE TOWN OF ERIE ENGINEERING STAFF, REPRESENTATIVES OF THE CONTRACTORS AND OTHER AFFECTED AGENCIES. PLANS WITH THE TOWN OF ERIE REVIEW STAMP WILL BE DISTRIBUTED AT THE PRE-CONSTRUCTION MEETING.

3. EXCEPT WHERE OTHERWISE PROVIDED FOR IN THESE PLANS AND SPECIFICATIONS, THE COLORADO DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, AND THE COLORADO DEPARTMENT OF TRANSPORTATION M & S STANDARDS, LATEST EDITION, SHALL APPLY.

4. PRIOR TO BEGINNING THE WORK, THE CONTRACTOR SHALL OBTAIN ANY/ALL WRITTEN AGREEMENTS FOR INGRESS AND EGRESS TO THE WORK SITE FROM ADJACENT PRIVATE PROPERTY OWNERS. ACCESS TO ANY ADJACENT PRIVATE PROPERTY SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD.

5. ALL MATERIALS AND WORKMANSHIP SHALL BE SUBJECT TO INSPECTION BY THE TOWN OF ERIE ENGINEERING STAFF. THE TOWN RESERVES THE RIGHT TO ACCEPT OR REJECT ANY SUCH MATERIALS AND WORKMANSHIP THAT DOES NOT CONFORM TO TOWN STANDARDS AND SPECIFICATIONS. APPLICATION FOR INSPECTION BY THE TOWN OF ERIE SHALL BE MADE BY THE CONTRACTOR AT LEAST TWENTY-FOUR (24) HOURS BEFORE THE SERVICE THEREOF WILL BE REQUIRED. IF A TOWN OF ERIE ENGINNERING INSPECTOR IS NOT AVAILABLE AFTER PROPER NOTICE OF CONSTRUCTION ACTIVITY HAS BEEN PROVIDED, THE PERMITTEE MAY COMMENCE WORK IN THE INSPECTOR'S ABSENCE. HOWEVER, THE TOWN OF ERIE RESERVES THE RIGHT TO REJECT THE IMPROVEMENT IF SUBSEQUENT TESTING REVEALS AN IMPROPER INSTALLATION.

6. UNDERGROUND UTILITIES IN THE AREA OF CONSTRUCTION ARE APPROXIMATE ONLY. THEY HAVE BEEN LOCATED FROM FIELD INVESTIGATION AND THE BEST AVAILABLE UTILITY RECORDS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION, PROTECTION AND REPAIR OF ALL UTILITIES ENCOUNTERED DURING CONSTRUCTION WHETHER SHOWN ON THESE PLANS OR NOT. THE CONTRACTOR SHALL CONTACT ALL RESPECTIVE UTILITIES AND HAVE ALL UTILITIES FIELD-LOCATED PRIOR TO CONSTRUCTION. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATION OF ALL EXISTING STRUCTURES AND UTILITIES SHOWN ON THE DRAWINGS, TO ASCERTAIN WHETHER ANY STRUCTURES AND UTILITIES MAY EXIST, AND TO REPAIR OR REPLACE ANY STRUCTURES AND UTILITIES THAT MIGHT BE DAMAGED. IF ANY UNKNOWN SUBSURFACE STRUCTURES ARE ENCOUNTERED DURING CONSTRUCTION, IT SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE SOILS ENGINEER AND DESIGN CIVIL ENGINEER PRIOR TO PROCEEDING.

7. THE CONTRACTOR SHALL COORDINATE HIS ACTIVITIES WITH THE AFFECTED UTILITY COMPANIES AND SHALL NOTIFY THE UTILITY NOTIFICATION CENTER, PHONE NUMBER 1-800-922-1987, FORTY-EIGHT (96) HOURS PRIOR TO THE START OF CONSTRUCTION.

8. CONTRACTOR SHALL HAVE IN HIS POSSESSION AT ALL TIMES ONE (1) SIGNED AND STAMPED BY THE DESIGN ENGINEER, COPY OF PLANS ACCEPTED BY THE TOWN OF ERIE. THE TOWN OF ERIE, THROUGH ACCEPTANCE OF THIS DOCUMENT, ASSUMES NO RESPONSIBILITY FOR THE COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT. THE OWNER AND ENGINEER UNDERSTAND THAT THE RESPONSIBILITY FOR THE ENGINEERING ADEQUACY OF THE FACILITIES DEPICTED IN THIS DOCUMENT LIES SOLELY WITH THE REGISTERED PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE ARE AFFIXED TO THIS DOCUMENT. REPORT ALL DISCREPANCIES TO THE DESIGN ENGINEER IMMEDIATELY.

9. CONTRACTOR SHALL OBTAIN, AT HIS OWN EXPENSE, ALL APPLICABLE SPECIFICATIONS AND PERMITS NECESSARY TO PERFORM THE PROPOSED WORK.

10. AS-BUILT DRAWINGS AND AN AUTOCAD CD, AS REQUIRED IN THE SPECIFICATIONS, ARE TO BE SUBMITTED BY THE CONTRACTOR PRIOR TO SUBSTANTIAL COMPLETION/CONSTRUCTION ACCEPTANCE OF THE CONSTRUCTION.

11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND REPLACING ANY EXISTING SIGNS, STRUCTURES, FENCES, ETC., ENCOUNTERED ON THE JOB AND RESTORING THEM TO THEIR ORIGINAL CONDITION.

12. THE CONTRACTOR IS RESPONSIBLE FOR:

   A. NOTIFYING THE TOWN OF ERIE UTILITY CUSTOMERS OF POTENTIAL SERVICE OUTAGES, AND COORDINATE WITH THE TOWN OF ERIE FOR DETERMINATION OF MINIMUM TIME REQUIREMENT.

   B. NOTIFYING THE TOWN OF ERIE TWENTY-FOUR (24) HOURS IN ADVANCE FOR OBSERVATIONS OF WORK IN PROGRESS. OBSERVATION AND ON-SITE VISITS ARE NOT TO BE CONSTRUED AS A GUARANTEE BY THE TOWN ENGINEERING STAFF OF THE CONTRACTORS' CONTRACTUAL COMMITMENT. IF WORK IS SUSPENDED FOR ANY PERIOD OF TIME AFTER INITIAL START-UP, THE CONTRACTOR SHALL NOTIFY THE TOWN OF ERIE FORTY-EIGHT (48) HOURS PRIOR TO RESTART.

   C. IN THE EVENT OF AN AFTER HOURS EMERGENCY, CALL 303-441-4444.

   D. NOTIFYING THE MOUNTAIN VIEW FIRE PROTECTION DISTRICT OF ALL STREET CLOSURES AND EXISTING FIRE HYDRANTS TAKEN OUT OF SERVICE FOR AT LEAST FORTY-EIGHT (48) HOURS PRIOR TO THE START OF CONSTRUCTION.

13. PRIOR TO INSTALLATION OF UTILITY MAINS, ROAD CONSTRUCTION MUST HAVE PROGRESSED TO AT LEAST THE "SUB-GRADE" STAGE. THE CONTRACTOR WILL ADJUST ALL VALVE BOXES AND FIRE HYDRANTS TO THE FINAL FINISHED GRADE.

14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING ANY GROUNDWATER ENCOUNTERED DURING THE CONSTRUCTION OF ANY PORTION OF THIS PROJECT. A CONSTRUCTION DEWATERING PERMIT MUST BE OBTAINED FROM THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT (CDPHE). GROUNDWATER SHALL BE PUMPED, PIPED, REMOVED AND DISPOSED OF IN A MANNER WHICH DOES NOT CAUSE FLOODING OF NEITHER EXISTING STREET NOR EROSION OF ABUTTING PROPERTIES IN ORDER TO CONSTRUCT THE IMPROVEMENTS SHOWN ON THESE PLANS. THE USE OF ANY SANITARY SEWER TO DISPOSE OF TRENCH WATER WILL NOT BE PERMITTED. NO CONCRETE SHALL BE PLACED WHERE GROUNDWATER IS VISIBLE OR UNTIL THE GROUNDWATER TABLE HAS BEEN LOWERED BELOW THE PROPOSED IMPROVEMENTS. ANY UNSTABLE AREAS, AS A RESULT OF GROUNDWATER, ENCOUNTERED DURING THE CONSTRUCTION OF THE PROPOSED IMPROVEMENTS SHALL BE STABILIZED AS AGREED UPON BY THE CONTRACTOR, THE TOWN OF ERIE, AND THE DESIGN ENGINEER AT THE TIME OF THE OCCURRENCE. THE CONTRACTOR SHALL PROVIDE POSITIVE DRAINAGE AND/OR MAINTAIN ALL EXISTING DRAINAGE PATTERNS AT ALL TIMES WITHIN THE CONSTRUCTION AREAS.

15. IT SHALL BE THE RESPONSIBILITY OF THE DESIGN ENGINEER TO RESOLVE CONSTRUCTION PROBLEMS WITH THE TOWN OF ERIE DUE TO CHANGED CONDITIONS ENCOUNTERED BY THE CONTRACTOR DURING THE PROGRESS OF ANY PORTION OF THE PROPOSED WORK. IF, IN THE OPINION OF THE TOWN OF ERIE, PROPOSED ALTERATIONS TO THE SIGNED CONSTRUCTION PLANS INVOLVES SIGNIFICANT CHANGES TO THE CHARACTER OF THE WORK, OR TO THE FUTURE CONTIGUOUS PUBLIC OR PRIVATE IMPROVEMENTS, THE DESIGN ENGINEER SHALL BE RESPONSIBLE FOR SUBMITTING REVISED PLANS TO THE TOWN OF ERIE FOR REVIEW, PRIOR TO ANY FURTHER CONSTRUCTION RELATED TO THAT PORTION OF THE WORK.

16. DURING THE COURSE OF CONSTRUCTION OF THE PROJECT, THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITIONS AT AND ADJACENT TO THE JOB INCLUDING SAFETY OF ALL PERSONS AND PROPERTY DURING PERFORMANCE OF THE WORK. THE CONTRACTOR SHALL PROVIDE ALL LIGHTS, SIGNS, BARRICADES, FLAGMEN, OR OTHER DEVICES NECESSARY TO PROVIDE FOR PUBLIC SAFETY. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND IS NOT LIMITED TO NORMAL WORKING HOURS. THE TOWN OF ERIE OR THE ENGINEER EXERCISE NO CONTROLS OVER THE SAFETY OR ADEQUACY OF ANY EQUIPMENT, BUILDING COMPONENTS, SCAFFOLDING, FORMS OR OTHER WORK AIDS USED IN OR ABOUT THE PROJECT, OR IN THE SUPERINTENDING OF THE SAME. THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD HARMLESS FROM ANY AND ALL LIABILITY, REAL AND ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER, THE DESIGN ENGINEER OR THE TOWN. THE TOWN OF ERIE ENGINEERING STAFF, OR ANY CONTRACTED ENGINEER, ARE NOT RESPONSIBLE FOR SAFETY IN, ON OR ABOUT THE PROJECT SITE, NOR FOR COMPLIANCE BY THE APPROPRIATE PARTY OF ANY REGULATIONS RELATING THERETO.

17. WORK IN PUBLIC STREETS, ONCE BEGUN, SHALL BE PROSECUTED TO COMPLETION WITHOUT DELAY SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO THE TRAVELING PUBLIC.

18. THE CONTRACTOR SHALL TAKE ALL NECESSARY AND PROPER PRECAUTIONS TO PROTECT ADJACENT PROPERTIES FROM ANY AND ALL DAMAGE THAT MAY OCCUR FROM STORM WATER RUNOFF AND/OR DEPOSITION OF DEBRIS RESULTING FROM ANY AND ALL WORK.

19. EACH TYPE OF CONSTRUCTION SHALL BE COMPLETED BY A CONTRACTOR THAT HAS DEMONSTRATED ACCEPTABLE QUALIFICATIONS TO THE TOWN AND IS A LICENSED CONTRACTOR IN THE TOWN OF ERIE.

20. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TRAFFIC CONTROL DURING CONSTRUCTION. ALL TRAFFIC CONTROLS SHALL CONFORM TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, (MUTCD) LATEST EDITION.

21. ALL BACKFILL SHALL CONFORM TO THE TRENCH DETAIL LOCATED IN THE TOWN OF ERIE STANDARDS & SPECIFICATIONS.

22. THE CONTRACTOR SHALL IMMEDIATELY REMOVE ANY CONSTRUCTION DEBRIS OR MUD TRACKED ONTO EXISTING ROADWAYS. THE CONTRACTOR SHALL REPAIR ANY EXCAVATION OR PAVEMENT FAILURES CAUSED BY HIS CONSTRUCTION.

23. THE CONTRACTOR SHALL RENEW OR REPLACE ANY EXISTING TRAFFIC STRIPING AND/OR PAVEMENT MARKINGS, WHICH HAVE BEEN EITHER REMOVED OR THE EFFECTIVENESS OF WHICH HAS BEEN REDUCED DURING HIS OPERATION. RENEWAL OF PAVEMENT STRIPING AND MARKING SHALL BE DONE IN CONFORMANCE WITH THE TOWN OF ERIE STANDARD SPECIFICATIONS.

24. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO TAKE EVERY MEASURE NECESSARY TO COMPLY WITH ANY STATE, COUNTY OR TOWN DUST CONTROL ORDINANCE. CONSTRUCTION VEHICLES SHALL USE TRUCK ROUTES DESIGNATED BY THE TOWN.

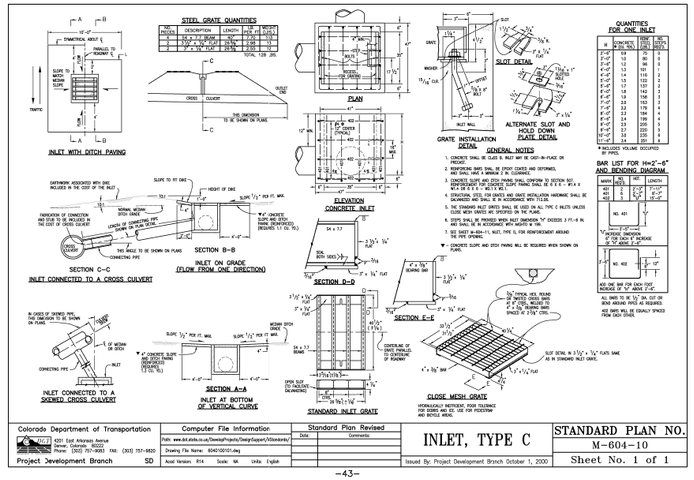
25. THE CONTRACTOR WILL BE HELD RESPONSIBLE FOR THE PROPER FUNCTIONING OF THE IMPROVEMENTS FOR A MINIMUM OF TWO (2) YEARS FROM THE DATE OF SUBSTANTIAL COMPLETION/ CONSTRUCTION ACCEPTANCE OF THE IMPROVEMENTS BY THE TOWN OF ERIE. ANY FAILURE DURING THIS PERIOD OF GUARANTEE SHALL BE REMEDIED BY THE CONTRACTOR TO THE SATISFACTION OF THE TOWN OF ERIE AT NO EXPENSE TO THE TOWN.

26. THE DESIGN CIVIL ENGINEER SHALL PERFORM SUFFICIENT INSPECTIONS AND SURVEYS DURING GRADING AND CONSTRUCTION SO THAT HE MAY RENDER AN OPINION VERIFIED IN WRITING AS TO COMPLIANCE WITH THE PLANS AND CODES WITHIN HIS PURVIEW.

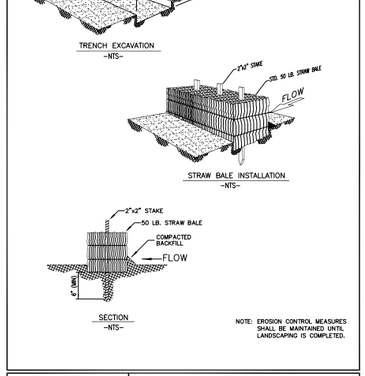
27. THE SOILS ENGINEER SHALL PERFORM SUFFICIENT INSPECTIONS DURING GRADING AND CONSTRUCTION SO THAT HE MAY RENDER AN OPINION VERIFIED IN WRITING AS TO COMPLIANCE WITH THE PLANS AND CODES WITHIN HIS PURVIEW.

SITE IMPROVEMENT PLAN
(INCLUDES AMENDMENT NO. 2)
ERIE CONVAIR LLC

LOT 2 AND OUTLOT A, ERIE AIR PARK SUBDIVISION, REPLAT A, AND A PART OF TRACT D, ERIE AIR PARK SUBDIVISION. ALL LOCATED IN THE SW1/4 OF SEC. 31, T1N, R68W OF THE 6TH P.M. TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

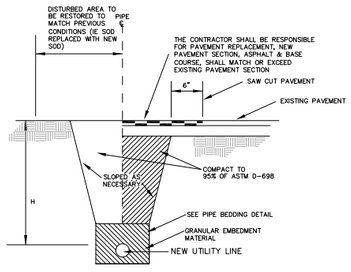


Colorado Department of Transportation	Computer File Information	Standard Plan Revised		STANDARD PLAN NO.
4201 East Arkansas Avenue, Denver, Colorado 80222, Phone: (303) 757-9353 FAX: (303) 757-9820	Path: www.dot.state.co.us\Standard Plans\StandardPlans\M-604-010.dwg; Drawing File Name: 604010010.dwg	Date	Comments	M-604-10
Project Development Branch SD	Excel Version: R14 Scale: NA Units: English		Issued By: Project Development Branch October 1, 2000	Sheet No. 1 of 1

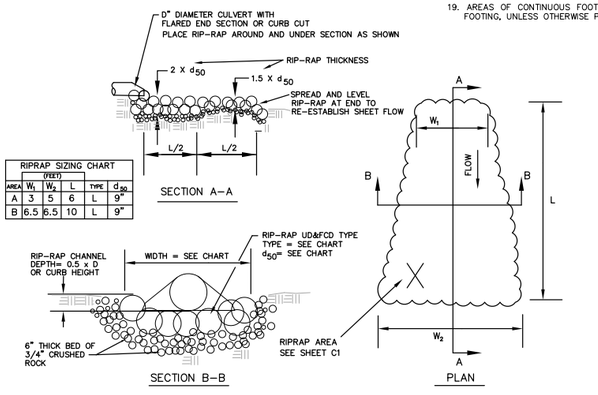


The Town of ERIE COLORADO

DRAWING TITLE: **STRAW BALE EROSION BARRIER**
DRAWING NUMBER: **ST#5**
DRAWN BY: **D. JENKINS** APPROVED BY: **G. BEHLEN** DATE: **06/2004**



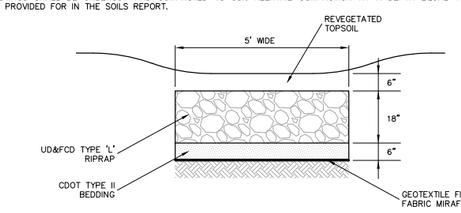
UTILITY TRENCH DETAIL
N.T.S.



RIPRAP SIZING CHART (FEET)						
AREA	W_1	W_2	L	TYPE	d_{50}
A	3	5	6	L	9"
B	6.5	6.5	10	L	9"

NOTES:
1. STONE SHALL BE PLACED HOMOGENOUSLY AND TO THE FULL COURSE THICKNESS IN ONE OPERATION; DISPLACEMENT OF UNDERLYNING MATERIAL SHALL BE AVOIDED.
2. QUALITY, AND PLACEMENT OF RIPRAP SHALL CONFORM TO SECTION 506 OF CDOT'S STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.
3. 3/4" CRUSHED ROCK SHALL CONFORM TO CDOT CLASS A FILTER MATERIAL (SECTION 703.09 CLASS A). PER UD & FCD REQUIREMENTS.

RIP-RAP RUNDOWN
N.T.S.



BURIED RIPRAP DETAIL
N.T.S.

GENERAL NOTES - GRADING

1. NO GRADING SHALL COMMENCE WITHOUT OBTAINING A GRADING AND STORMWATER QUALITY PERMIT FROM THE TOWN OF ERIE. A PRE-GRADE MEETING AT THE SITE IS REQUIRED BEFORE THE START OF GRADING WITH THE FOLLOWING PEOPLE PRESENT: OWNER, GRADING CONTRACTOR, DESIGN CIVIL ENGINEER, SOILS ENGINEER, TOWN OF ERIE ENGINEERING STAFF, AND UTILITY COMPANY REPRESENTATIVES. A TWENTY-FOUR (24) HOUR NOTICE IS REQUIRED.

2. ALL CONSTRUCTION ACTIVITIES THAT DISTURBS ONE OR MORE ACRES OF LAND, AS WELL AS ACTIVITIES THAT DISTURB LESS THAN ONE ACRE OF LAND, BUT IS PART OF A LARGER COMMON PLAN OF DEVELOPMENT, MUST COMPLY WITH BOTH LOCAL AND STATE REGULATIONS REGARDING STORMWATER DRAINAGE ON CONSTRUCTION SITES. OWNERS OR CONTRACTORS MUST OBTAIN A COLORADO STORMWATER DISCHARGE PERMIT FOR CONSTRUCTION ACTIVITIES, FROM THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT (CDPHE).

   A. MAINTAIN A COPY OF THE SWMP ONSITE AT ALL TIMES. THE APPROVED SWMP MUST BE MAINTAINED AND MADE AVAILABLE TO MUNICIPAL INSPECTORS UPON REQUEST.

   B. INSTALL AND MAINTAIN EROSION, SEDIMENT, AND MATERIALS MANAGEMENT CONTROL BMPS AS SPECIFIED IN THE SWMP.

   C. INSPECT ALL BMPS AT LEAST EVERY FOURTEEN (14) DAYS AND WITHIN TWENTY FOUR (24) HOURS AFTER ANY PRECIPITATION OR SNOWMELT EVENT THAT CAUSES SURFACE RUNOFF.

   D. MAINTAIN INSPECTION AND MAINTENANCE RECORDS OF BMPS ONSITE WITH THE SWMP.

   E. BASED ON INSPECTIONS PERFORMED BY THE OWNER OR BY TOWN PERSONNEL, MODIFICATIONS TO THE SWMP WILL BE NECESSARY IF AT ANY TIME THE SPECIFIED BMPS DO NOT MEET THE OBJECTIVES OF THIS CHAPTER. IN THIS CASE, THE OWNER SHALL MEET WITH TOWN PERSONNEL TO DETERMINE THE APPROPRIATE MODIFICATIONS. ALL MODIFICATIONS SHALL BE COMPLETED WITHIN SEVEN (7) DAYS OF THE REFERENCED INSPECTION, AND SHALL BE RECORDED ON THE OWNER'S COPY OF THE SWMP.

   F. THE OPERATOR SHALL AMEND THE PLAN WHENEVER THERE IS A SIGNIFICANT CHANGE IN DESIGN, CONSTRUCTION, OPERATION, OR MAINTENANCE, WHICH HAS A SIGNIFICANT EFFECT ON THE POTENTIAL FOR DISCHARGE OF POLLUTANTS TO THE RECEIVING WATERS, OR IF THE SWMP PROVES TO BE INEFFECTIVE IN ACHIEVING THE GENERAL OBJECTIVES OF CONTROLLING POLLUTANTS IN STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES.

   G. INSTALLATION AND MAINTENANCE OF BMPS SHALL BE SUPERVISED BY PERSONNEL CERTIFIED IN EROSION AND SEDIMENT CONTROL.

3. ALL SITE GRADING (EXCAVATION, EMBANKMENT, AND COMPACTION) SHALL CONFORM TO THE RECOMMENDATIONS OF THE LATEST SOILS INVESTIGATION FOR THIS PROPERTY AND SHALL FURTHER BE IN CONFORMANCE WITH THE TOWN OF ERIE "STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS", LATEST EDITION.

4. ALL GRADING AND FILLING OPERATIONS SHALL BE OBSERVED, INSPECTED AND TESTED BY A LICENSED SOILS ENGINEER, ALL TEST RESULT SHALL BE SUBMITTED TO THE TOWN OF ERIE ENGINEERING STAFF.

5. CONTOURS AND SPOT ELEVATIONS SHOWN ARE ONLY CONTROLS AND THE PROFILES THEY FORM SHALL BE SMOOTH AND CONTINUOUS.

6. NATURAL VEGETATION SHALL BE RETAINED AND PROTECTED WHEREVER POSSIBLE. EXPOSURE OF SOIL TO EROSION BY REMOVAL OR DISTURBANCE OF VEGETATION SHALL BE LIMITED TO THE AREA REQUIRED FOR IMMEDIATE CONSTRUCTION OPERATION AND FOR THE SHORTEST PRACTICAL PERIOD OF TIME. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO AVOID ANY DAMAGE TO EXISTING FOLIAGE THAT LIES IN THE PROJECT AREA UNLESS DESIGNATED FOR REMOVAL AND SHALL BE LIABLE FOR SUCH DAMAGE AT HIS/HER EXPENSE.

7. TOPSOIL SHALL BE STOCKPILED TO THE EXTENT PRACTICABLE ON THE SITE FOR USE ON AREAS TO BE REVEGATATED. ANY AND ALL STOCKPILES SHALL BE LOCATED AND PROTECTED FROM EROSIVE ELEMENTS.

8. TEMPORARY VEGETATION SHALL BE INSTALLED ON ALL DISTURBED AREAS WHERE PERMANENT SURFACE IMPROVEMENTS ARE NOT SCHEDULED FOR IMMEDIATE INSTALLATION. SEEDING WILL BE DONE ACROSS THE SLOPE FOLLOWING THE CONTOURS. VEGETATION SHALL BE A VIGOROUS, DROUGHT TOLERANT NATIVE SPECIES MIX. PROJECT SCHEDULING SHOULD TAKE ADVANTAGE OF SPRING OR FALL PLANTING SEASONS FOR NATURAL GERMINATION. SEEDED AREAS SHALL BE IRRIGATED IF CONDITIONS SO MERIT.

9. AT ALL TIMES, THE PROPERTY SHALL BE MAINTAINED AND/OR WATERED TO PREVENT WIND-CAUSED EROSION. EARTHWORK OPERATIONS SHALL BE DISCONTINUED WHEN FUGITIVE DUST SIGNIFICANTLY IMPACTS ADJACENT PROPERTY. IF EARTHWORK IS COMPLETE OR DISCONTINUED AND DUST FROM THE SITE CONTINUES TO CREATE PROBLEMS, THE OWNER/DEVELOPER SHALL IMMEDIATELY INSTITUTE MITIGATIVE MEASURES AND SHALL CORRECT DAMAGE TO ADJACENT PROPERTY.

10. TEMPORARY SILT FENCES SHALL BE INSTALLED ALONG ALL BOUNDARIES OF THE CONSTRUCTION LIMITS AS SHOWN ON THE APPROVED EROSION CONTROL PLAN. IN ADDITION, THE TOWN OF ERIE MAY REQUIRE AN ADDITIONAL TEMPORARY SILT FENCE IF FIELD CONDITIONS SO MERIT THEM.

11. THE OWNER/DEVELOPER SHALL PROVIDE ANY ADDITIONAL DUST ABATEMENT AND EROSION CONTROL MEASURES DEEMED NECESSARY BY THE TOWN OF ERIE SHOULD CONDITIONS MERIT THEM.

12. DURING CONSTRUCTION THE FILL AREAS WILL BE WETTED FOR COMPACTION AND THE HAUL ROUTES AND CUT AREAS WILL BE MAINTAINED WITH WATER TO REDUCE WIND EROSION.

13. FILL SLOPES SHALL BE COMPACTED BY MEANS OF SHEEPSFOOT COMPACTOR OR OTHER SUITABLE EQUIPMENT. COMPACTING SHALL CONTINUE UNTIL SLOPES ARE STABLE AND THERE IS NOT AN APPRECIABLE AMOUNT OF LOOSE SOIL ON THE SLOPES.

14. TEMPORARY CUT/FILL SLOPES SHALL NOT BE STEEPER THAN 2:1 (2H:1V). PERMANENT SLOPES SHALL NOT BE STEEOER THAN 4:1 (4H:1V) IN AREAS TO BE SEEDED OR SODDED.

15. DEPTH OF MOISTURE-DENSITY CONTROL SHALL BE FULL DEPTH ON ALL EMBANKMENT AND SIX (6) INCHES ON THE BASE OF CUTS AND FILLS.

16. OUTLET SIDES OF ALL PIPES SHALL BE GRADED TO DRAIN AND SHALL HAVE SUFFICIENT EROSION PROTECTION.

17. THE PERMITTEE OR HIS AGENT SHALL NOTIFY THE TOWN OF ERIE ENGINEERING STAFF WHEN THE GRADING OPERATION IS READY FOR EACH OF THE FOLLOWING INSPECTIONS:

   A. INITIAL INSPECTION WHEN THE PERMITTEE IS READY TO BEGIN WORK, BUT NOT LESS THAN TWO (2) DAYS BEFORE ANY GRADING OR GRUBBING IS STARTED.

   B. TOWN OF ERIE INSPECTION AFTER THE NATURAL GROUND OR BEDROCK IS EXPOSED AND PREPARED TO RECEIVE FILL, BUT BEFORE FILL IS PLACED.

   C. EXCAVATION INSPECTION AFTER THE EXCAVATION IS STARTED BUT BEFORE THE VERTICAL DEPTH OF THE EXCAVATION EXCEEDS TEN (10) FEET.

   D. FILL INSPECTION AFTER THE FILL PLACEMENT IS STARTED, BUT BEFORE THE FILL EXCEEDS TEN (10) FEET.

   E. DRAINAGE DEVICE INSPECTION AFTER FORMING OF TERRACE DRAINS, DOWNDRAINS, OR AFTER PLACEMENT OF PIPE BUT BEFORE ANY CONCRETE OR FILL MATERIAL IS PLACED.

   F. FINAL INSPECTION WHEN ALL WORK INCLUDING INSTALLATION OF ALL DRAINAGE STRUCTURES AND OTHER PROTECTIVE DEVICES HAS BEEN COMPLETED AND THE AS-GRADED PLAN, PROFESSIONAL VERIFICATIONS AND REQUIRED REPORTS HAVE BEEN SUBMITTED.

18. SOILS IN THE AREA OF THE PROPOSED STRUCTURE SHALL BE CUT TO THE PROPOSED GRADE, AND THE SURFACE SHALL BE SCARIFIED TO A MINIMUM DEPTH OF ONE (1) FOOT, MOISTURE CONDITIONED AND PROOF ROLLED TO A MINIMUM OF 95% RELATIVE COMPACTION, UNLESS OTHERWISE PROVIDED FOR IN THE SOILS REPORT.

19. AREAS OF CONTINUOUS FOOTINGS SHALL BE UNDERCUT AND COMPACTED TO 95% RELATIVE COMPACTION AT A DEPTH EQUAL TO THE WIDTH OF THE FOOTING, UNLESS OTHERWISE PROVIDED FOR IN THE SOILS REPORT.

CIVIL DETAILS
SITE IMPROVEMENT PLAN
ERIE CONVAIR HANGAR COMPLEX
3000 AIRPORT DRIVE
ERIE, COLORADO

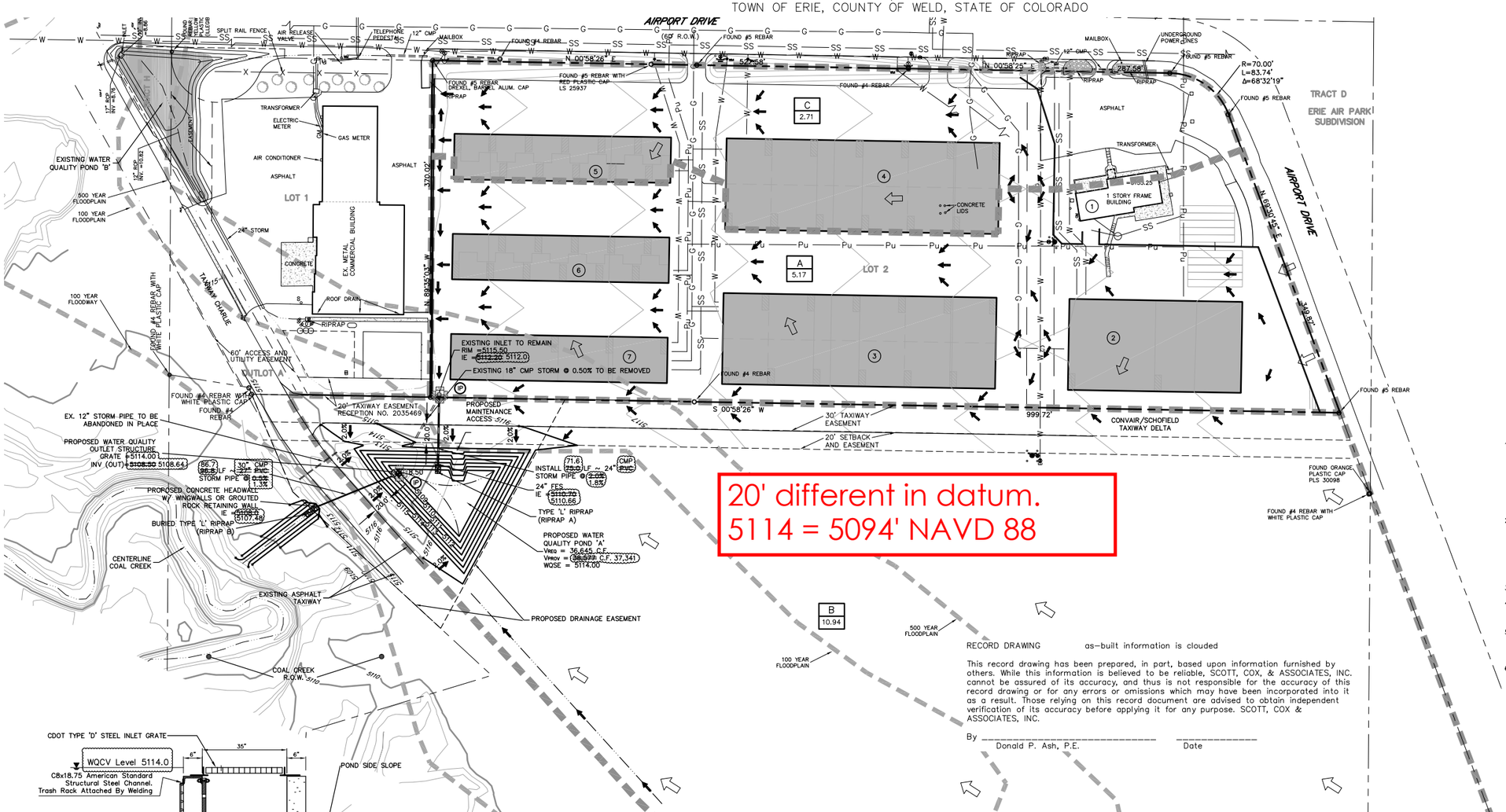
COLORADO REGISTERED DONALD P. ASH 36045 PROFESSIONAL ENGINEER

SCOTT, COX & ASSOCIATES, INC.
consulting engineers • surveyors
1530 55th Street • Boulder, Colorado 80303
(303) 444 - 3051

Designed by	WMK	Date	Scale	Drawing no.	Sheet
Drawn by	WMK	10/09/08	1"=60'	06535D-3	C2.1
Checked by	DPA	Revision	Description	Date	Project no.
		1	TOWN COMMENTS	04/02/09	06535D
		2	TOWN COMMENTS	04/22/09	

SITE IMPROVEMENT PLAN
(INCLUDES AMENDMENT NO. 2)
ERIE CONVAIR LLC

LOT 2 AND OUTLOT A, ERIE AIR PARK SUBDIVISION, REPLAT A, AND A PART OF TRACT D, ERIE AIR PARK SUBDIVISION. ALL LOCATED IN THE SW1/4 OF SEC. 31, T1N, R68W OF THE 6TH P.M. TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO



20' different in datum.
5114 = 5094' NAVD 88

LEGEND

- EXISTING FENCE
- EXISTING CONTOUR
- EXISTING SWALE
- FOUND MONUMENT AS NOTED
- EXISTING GAS METER
- EXISTING WATER METER
- EXISTING LIGHT POLE
- EXISTING SIGN
- EXISTING UNDERGROUND TELEPHONE
- EXISTING UNDERGROUND POWER LINE
- EXISTING GAS LINE
- EXISTING WATER W/FIRE HYDRANT
- PROPOSED CONTOUR
- POINT WHERE PROPOSED GRADE MEETS EXISTING GRADE
- PROPOSED SPOT ELEVATION (ADD 5100 TO ALL SPOT ELEVATIONS)
- EXISTING SPOT ELEVATION
- HISTORIC SHEET FLOW
- PROPOSED FLOW DIRECTION
- DRAINAGE BASIN BOUNDARY (HISTORIC)
- SUB-BASIN DESIGNATION (HISTORIC)
- AREA IN ACRES
- PROPOSED SUB-BASIN DESIGNATION
- AREA IN ACRES
- PROPOSED INLET PROTECTION

Scale: 1" = 60'
0 30 60 120

NOTES

1. ORIGIN BENCH MARK: NGS DESIGNATION-ERIE AIR PARK, PID-- AI5917. ALUMINUM DISK SET INTO THE TOP OF A ROUND CONCRETE POST FLUSH WITH THE GROUND. 122.4 FEET SW FROM CENTER OF RUNWAY 15-33, 109.9 FEET WEST FROM THE WESTERN MOST ONE OF FOUR RED-BLUE LIGHTS AT THE END OF RUNWAY 33, 99.1 FEET SE FROM THE TOP CENTER OF SIGN A/33, 19.7 FEET SE FROM THE SOUTH EDGE TAXIWAY AT STOP BAR A1. ELEVATION =5117.70 (NAVD 88).
PROJECT BENCH MARK: FOUND YELLOW PIN&CAP MARKING THE NORTHWEST CORNER OF LOT 3, BLOCK 6, ERIE AIR PARK SUBDIVISION. LOCATED ON EAST ROW AIRPORT DRIVE. ELEVATION =5116.77' (NAVD 88).
2. THE LOCATION OF THE ABOVE GROUND UTILITIES SHOWN HEREON ARE BASED ON THE FIELD SURVEY BY SCOTT, COX & ASSOCIATES, INC. THE LOCATIONS OF THE UNDERGROUND UTILITIES SHOWN HEREON ARE BASED ON SAID SURVEY AND INFORMATION PROVIDED BY OTHERS (WHICH MAY INCLUDE THE UTILITY OWNER OR UTILITY LOCATING SERVICES). SCOTT, COX & ASSOCIATES, INC. IS NOT RESPONSIBLE FOR UTILITY INFORMATION PROVIDED BY OTHERS. SCOTT, COX & ASSOCIATES, INC. RECOMMENDS THAT THE LOCATION OF THE UTILITIES BE FIELD VERIFIED PRIOR TO ANY DIGGING ON, OR ADJACENT TO THE SUBJECT PROPERTY.
3. THIS DRAWING IS BASED ON A FIELD SURVEY COMPLETED ON 01/15/08.
4. THE WATER QUALITY POND HAS BEEN DESIGNED TO ACCEPT DEVELOPED RUNOFF FROM BOTH THE 7.88 ACRE BASIN ON LOT 2 AND THE 10.94 ACRE BASIN ON A PORTION OF LOT E.
5. ACCORDING TO THE NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE RATE MAP, FIRM PANEL 08018I0018E DATED DECEMBER 2, 2004, A PORTION OF THE SITE IS LOCATED IN ZONE AE, INDICATING THAT IT IS IN AN AREA DETERMINED TO BE INSIDE OF THE 100-YEAR FLOODPLAIN.
6. THE CONTOURS SHOWN WITHIN THE COAL CREEK DRAINAGE WAY ARE PER THE AERIAL CONTOURS PROVIDED BY THE TOWN OF ERIE AND WERE NOT SURVEYED AS A PART OF THIS PROJECT.

RECORD DRAWING as-built information is clouded

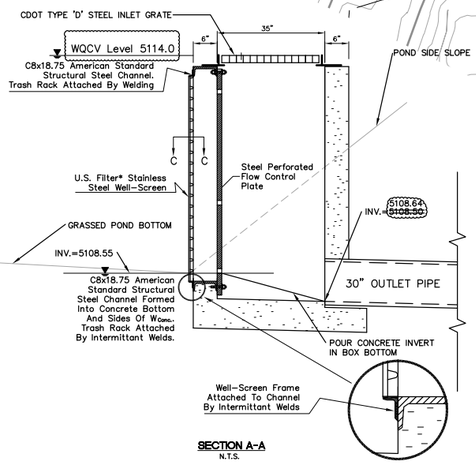
This record drawing has been prepared, in part, based upon information furnished by others. While this information is believed to be reliable, SCOTT, COX, & ASSOCIATES, INC. cannot be assured of its accuracy, and thus is not responsible for the accuracy of this record drawing or for any errors or omissions which may have been incorporated into it as a result. Those relying on this record document are advised to obtain independent verification of its accuracy before applying it for any purpose. SCOTT, COX & ASSOCIATES, INC.

By _____ Donald P. Ash, P.E. _____ Date

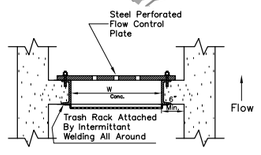
BASIN SUMMARY

BASIN	Q_2 (CFS)	Q_5 (CFS)	Q_{10} (CFS)	OUTFALL
A	5.17	14.17	27.15	PROPOSED POND 'A'
B	10.97	30.93	59.39	
C	2.71	6.60	12.90	EX. POND 'B'

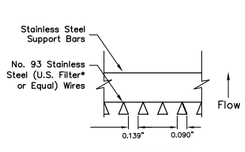
AS-BUILT POND GRADING, DRAINAGE, AND EROSION CONTROL PLAN SITE IMPROVEMENT PLAN ERIE CONVAIR HANGAR COMPLEX 3000 AIRPORT DRIVE ERIE, COLORADO



SECTION A-A
N.T.S.



SECTION B-B - PLAN VIEW



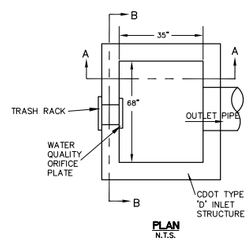
SECTION C-C

CIRCULAR OPENINGS ONLY

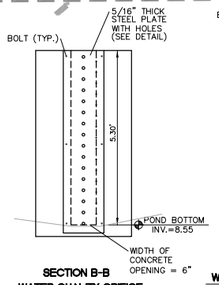
R VALUE = (NET OPEN AREA)/(GROSS RACK AREA) = 0.60

1. ALL OUTLET PLATE OPENINGS ARE CIRCULAR.
2. MAXIMUM DIAMETER OF OPENING = 2 INCHES. *U.S. FILTER, ST. PAUL, MINNESOTA, USA
3. TRASH RACK SHALL BE US FILTER (OR APPROVED EQUAL) STAINLESS STEEL WELL-SCREEN WITH #93 VEE WIRE, 0.139" OPENING BETWEEN WIRES, #156 VEE SUPPORT RODS ON 3/4" ON-CENTER SPACING. TOTAL RACK THICKNESS OF 0.655" AND 3/4" X 1.0" FLAT BAR WELDED CARBON STEEL FRAME.

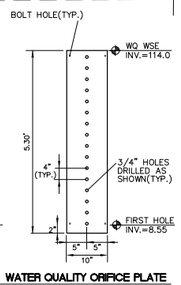
TRASH RACK DETAIL
N.T.S.



PLAN
N.T.S.



SECTION B-B
WATER QUALITY ORIFICE
N.T.S.



WATER QUALITY ORIFICE PLATE
N.T.S.

POND OUTLET STRUCTURE
N.T.S.

COLORADO REGISTERED DONALD P. ASH 36045 PROFESSIONAL ENGINEER

SCOTT, COX & ASSOCIATES, INC.
consulting engineers • surveyors
1530 55th Street • Boulder, Colorado 80303
(303) 444 - 3051

Designed by	WMK	Date	Scale	Drawing no.	Sheet
Drawn by	WMK	10/09/08	1"=60'	06535D-3	C1.1
Checked by	DPA	Revision	Description	Date	Project no.
		1	TOWN COMMENTS	04/02/09	06535D
		2	TOWN COMMENTS	04/22/09	
		3	POND AS-BUILT	05/19/09	

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 Weld County, Colorado, Southern Part

Lot 2 Erie Air Park Tract E Minor Subdivision Replat A

June 3, 2019

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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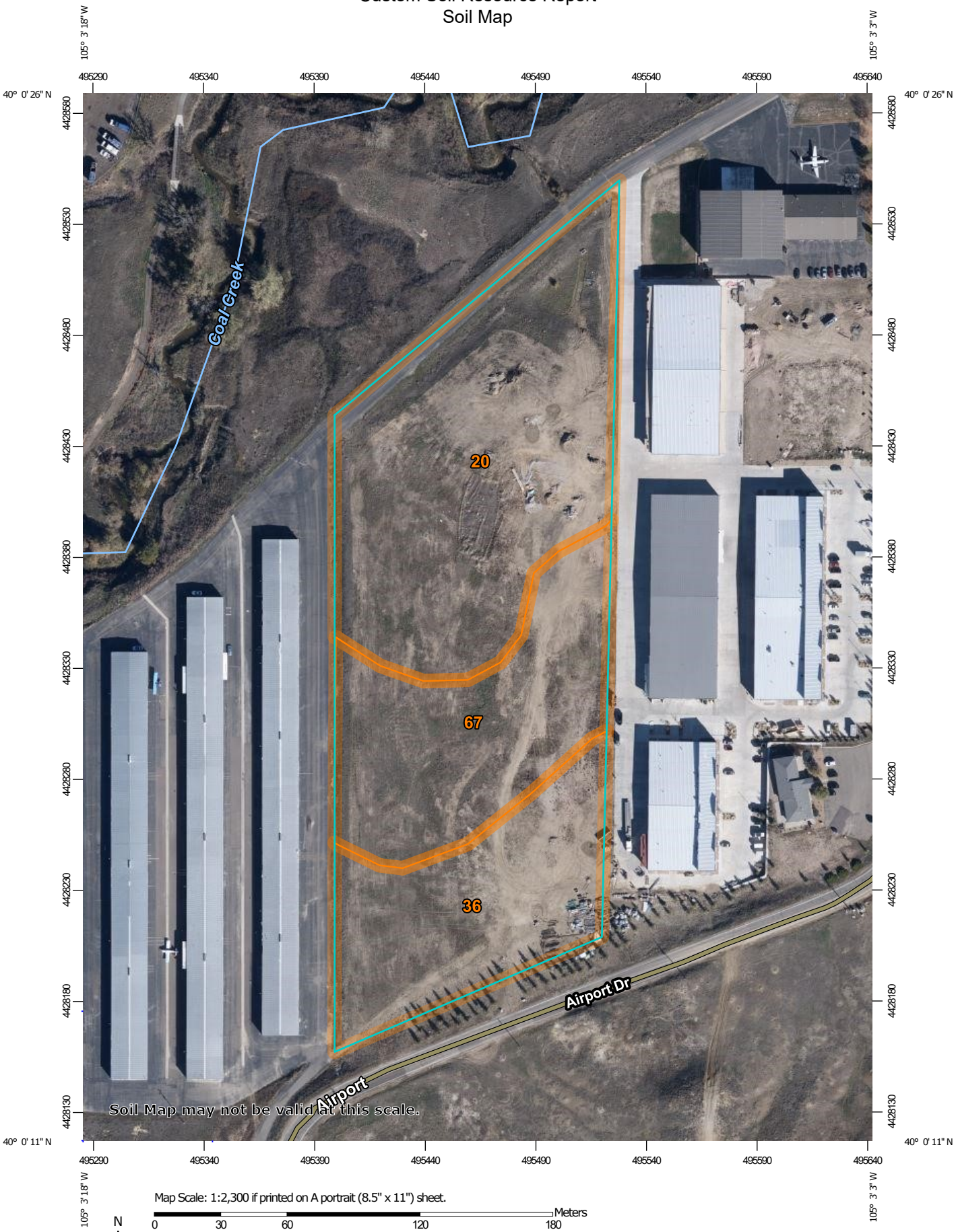
Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:2,300 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 30 60 120 180

Feet
0 100 200 400 600

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 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:
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: Weld County, Colorado, Southern Part
Survey Area Data: Version 17, Sep 10, 2018

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

Date(s) aerial images were photographed: Oct 1, 2018—Oct 31, 2018

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 of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
20	Colombo clay loam, 1 to 3 percent slopes	4.7	48.4%
36	Midway-Shingle complex, 5 to 20 percent slopes	2.3	24.3%
67	Ulm clay loam, 3 to 5 percent slopes	2.6	27.3%
Totals for Area of Interest		**9.6**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Weld County, Colorado, Southern Part

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: Terraces, flood plains
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)
Hydric soil rating: No

Minor Components

Dacono

Percent of map unit: 5 percent

Hydric soil rating: No

Heldt

Percent of map unit: 5 percent
Hydric soil rating: No

Nunn

Percent of map unit: 5 percent
Hydric soil rating: No

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)
Hydric soil rating: No

Description of Shingle

Setting
Landform: Hills, ridges
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)
Hydric soil rating: No

Minor Components

Renohill
Percent of map unit: 8 percent
Hydric soil rating: No

Tassel
Percent of map unit: 7 percent
Hydric soil rating: No

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)
Hydric soil rating: No

Minor Components

Renohill

Percent of map unit: 11 percent
Hydric soil rating: No

Heldt

Percent of map unit: 4 percent
Hydric soil rating: No

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