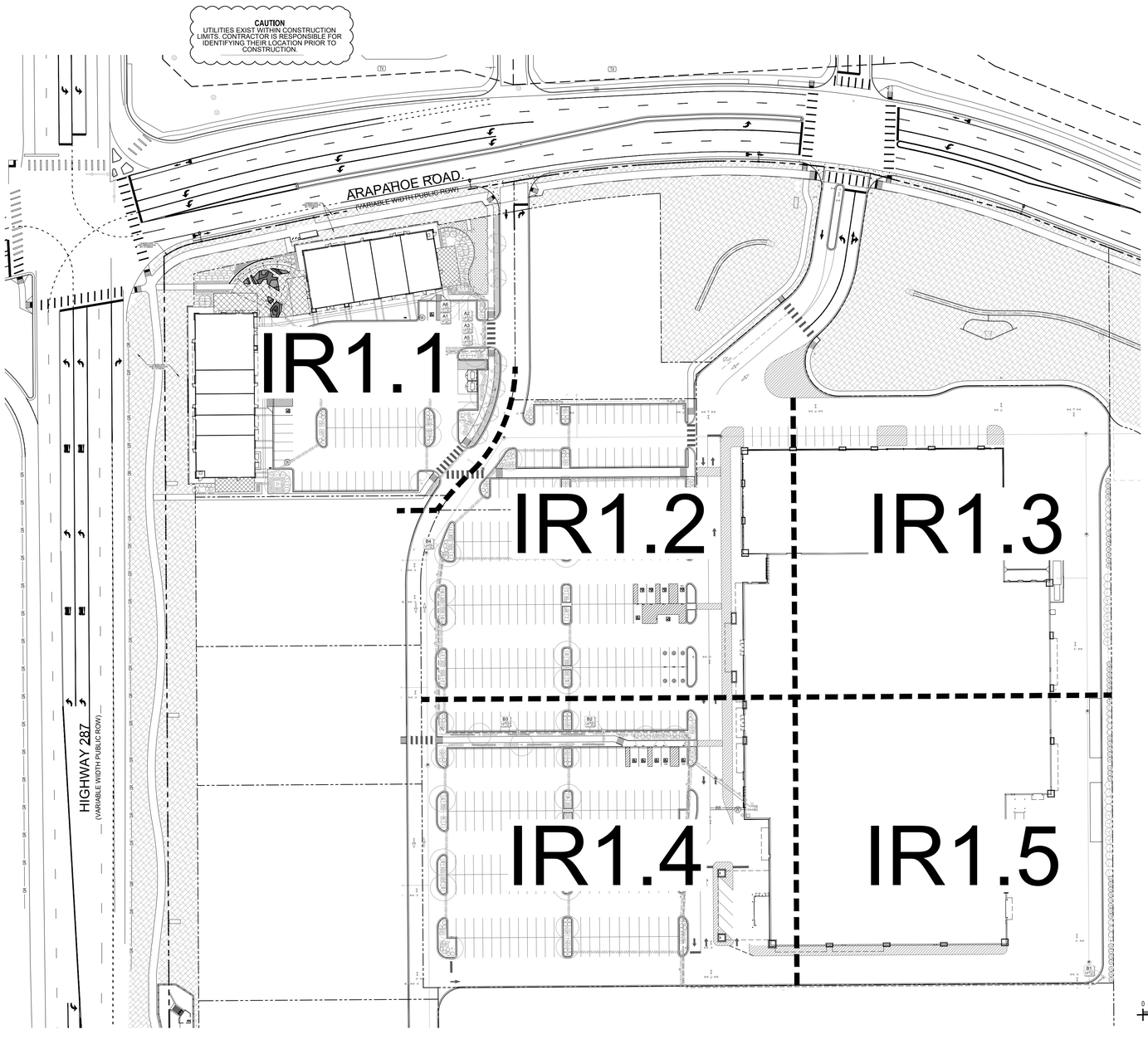
NINE MILE CORNER - SITE PLAN CONSTRUCTION DOCUMENTS

A PORTION OF NE 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST AND THE
SOUTHEAST QUARTER OF SECTION 27, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE OF THE
6TH PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, COLORADO
SITE PLAN: SP-001117-2019



IRRIGATION LEGEND

SYMBOL	MANUF.	MODEL NO.	DESCRIPTION	REMARKS/DETAIL
CONTROLLERS AND SENSORS				
A	HUNTER	I-CORE 10 STATION	IRRIGATION CONTROLLER TO BE A HUNTER IC-1000-M, WITHIN METAL VANDAL RESISTANT LOCKABLE PEDESTAL CABINET. IRRIGATION CONTROLLER TO BE LOCATED AS DIRECTED BY OWNER OR OWNERS REPRESENTATIVE.	DETAIL 13 / IR1.6
B, B$_S$	WEATHERTRAK	LOWE'S FURNISHED	IRRIGATION CONTROLLER TO BE A WEATHERTRAK LC+, WITHIN PLASTIC VANDAL RESISTANT LOCKABLE CABINET FURNISHED BY LOWES. IRRIGATION CONTROLLER TO BE FURNISHED BY LOWE'S AND LOCATED BY OWNER OR OWNERS REPRESENTATIVE.	DETAIL 1&2 / IR1.5
R	HUNTER	SOLAR-SYNC	ET/RAIN/FREEZE SENSOR - MOUNT PER DETAIL AND PLAN LOCATION	DETAIL 2 / IR1.5
POINT OF CONNECTION				
	PER CITY OR WATER DISTRICT CODES AND STANDARDS		1" POINT OF CONNECTION, REFERENCE CIVIL PLANS FOR TAP LOCATION.	SEE P.O.C. DIAGRAM
	FEBCO	MODEL 825YA	1" BACKFLOW PREVENTER-MOUNT IN GUARDSHACK MODEL #GS-1 W/ FROST GUARD BAG MODEL #FG-1 FOR WINTERIZATION, SEE POINT OF CONNECTION SCHEMATIC DIAGRAMS	DETAIL 3 / IR1.5
VALVES				
MV	HUNTER	IBV-101G-FS	1" MASTER VALVE	DETAIL 4 / IR1.5
FS	FLOMEC	QS200-10	1" ULTRASONIC FLOWMETER WITH 1" PVC TEE RECEPTACLE	DETAIL 9 / IR1.6
	HUNTER	ICV-FS-ADJ	REMOTE CONTROL VALVE, SIZE PER PLAN. ADJUST PRESSURE REGULATOR BETWEEN 60-55PSI. GROUP VALVES TO FIT WITHIN WATER SCHEDULES/MAXIMIZE AVAILABLE GPMS.	DETAIL 1 / IR1.6
	RAINBIRD	XCZ-100-PRB-COM (0.3-20 GPM)	DRIP CONTROL ZONE KITS (24 VAC-60Hz)-IRRIGATION CONTRACTOR TO VERIFY DRIP ZONES PRESSURE REQUIREMENTS AND USE VALVE REGULATOR FOR HIGH PRESSURES. GROUP VALVES TO FIT WITHIN WATER SCHEDULES/MAXIMIZE AVAILABLE GPMS.	DETAIL 2 / IR1.6
QC	HUNTER	HQ-44-LRC	1" QUICK COUPLER WITH LOCK	DETAIL 6 / IR1.6
	WATTS	WGV-X	GATE VALVE, SEE POINT OF CONNECTION SCHEMATIC DIAGRAMS	DETAIL 4 / IR1.6
	ANY APPROVED	ANY APPROVED	PVC BALL VALVE - SIZE PER MAINLINE SIZE	DETAIL 8 / IR1.6
MAIN LINE/ LATERALS & SLEEVES				
	ANY APPROVED		PRESSURIZED PVC MAINLINE - 1-1/2" CLASS 200 PVC PIPE UNLESS OTHERWISE NOTED ON THE PLANS	DETAIL 7 / IR1.6
	ANY APPROVED		LATERAL LINE - USE CLASS 200 PVC, SIZE 1"-INCH SIZE UNLESS OTHERWISE NOTED ON THE PLANTS. INSTALL ANTI-FREEZE DRAINS AT LOW POINTS	DETAIL 7 / IR1.6
	ANY APPROVED		IRRIGATION SLEEVE - SCHEDULE 40 PVC TWICE THE SIZE OF THE PIPE TO BE INSERTED, ONE SLEEVE PER PIPE	DETAIL 7 / IR1.6
	ANY APPROVED		CONTROL WIRING SLEEVE - 2" SCHEDULE 40 PVC PIPE (SEE WIRING/SPLICING/SLEEVE NOTE, THIS SHEET)	DETAIL 7 / IR1.6

ROTORS & SPRAY HEADS

SYMBOL	MANUF.	MODEL NO.	DESCRIPTION	NOZZLE	RADIUS	G.P.M.	P.S.I.	REMARKS/DETAIL
L	HUNTER	PROS-06-CV/MPLCS515 (TURF) PROS-12-CV/MPLCS515 (SEED)	MP ROTATOR-STRIP	IVORY	4.5' X 14'	0.19	40	DETAIL 10 / IR1.6
R	HUNTER	PROS-06-CV/MPRCS515 (TURF) PROS-12-CV/MPRCS515 (SEED)	MP ROTATOR-STRIP	COPPER	4.5' X 14'	0.19	40	DETAIL 10 / IR1.6
S	HUNTER	PROS-06-CV/MPMPSS530 (TURF) PROS-12-CV/MPMPSS530 (SEED)	MP ROTATOR-STRIP	BROWN	4.5' X 28'	0.38	40	DETAIL 10 / IR1.6
	HUNTER	PROS-06-CV/MP1000-90 (TURF) PROS-12-CV/MP1000-90 (SEED)	MP ROTATOR-QUARTER	MAROON	8'-13'	0.16	40	DETAIL 10 / IR1.6
	HUNTER	PROS-06-CV/MP1000-90 (TURF) PROS-12-CV/MP1000-90 (SEED)	MP ROTATOR-135°	MAROON	8'-13'	0.24	40	DETAIL 10 / IR1.6
	HUNTER	PROS-06-CV/MP1000-90 (TURF) PROS-12-CV/MP1000-90 (SEED)	MP ROTATOR-HALF	MAROON	8'-13'	0.32	40	DETAIL 10 / IR1.6
	HUNTER	PROS-06-CV/MP1000-360 (TURF) PROS-12-CV/MP1000-360 (SEED)	MP ROTATOR-FULL	OLIVE	8'-13'	0.65	40	DETAIL 10 / IR1.6

SPRAY NOTES:
1. CONTRACTOR SHALL USE RADIUS REDUCTION SCREWS ON MP ROTATORS AS NECESSARY TO ACHIEVE APPROPRIATE RADII COVERAGE.

DRIP SYSTEM

POINT SOURCE EMITTERS	RAINBIRD	FOR LANDSCAPE BED AREAS - XBS-XXX	XERI BLACK STRIPE POLY TUBING (OR APPROVED EQUAL), CONNECTION TO PVC LATERAL PER CONTRACTOR. ATTACH TREE & SHRUB DRIP EMITTERS PER THE EMITTER SCHEDULE BELOW. USE 3/4-INCH POLY TUBING SIZE UNLESS OTHERWISE NOTED. FLOWS IN GPM FOR LINE CHANGES SHALL BE: (3/4"-1 TO 7 GPM), (1"-8 TO 14 GPM), (1-1/2"-15 TO 35 GPM). INSTALL SEVERAL INLINE CHECK VALVES IN ZONES W/ LARGE ELEVATION DIFFERENCES. GROUP DRIP CONTROLLER VALVES TOGETHER TO MAXIMIZE WATER WINDOWS.	DETAIL 5 / IR1.6
PV	HUNTER	AFV-B	AUTOMATIC FLUSH VALVE WITH BARB CONNECTION.	DETAIL 11 / IR1.6
DRIP EMITTER SCHEDULE	PROVIDE THE FOLLOWING DRIP EMITTERS FOR EACH PLANT:	PLANTS, 1 GALLON AND SMALLER: PLANTS, 5 GALLON: UPRIGHT JUNIPERS, 10-15 GALLON: TREES, 1" TO 2-1/2" CALIPER: TREES, 3" TO 4" CALIPER:	1, XB-10PC - (1 GPH) EMITTER PER PLANT 2, XB-10PC - (2 GPH) EMITTERS PER PLANT 3, XB-10PC - (3 GPH) EMITTERS PER TREE 4, XB-10PC - (4 GPH) EMITTERS PER TREE 7, XB-10PC - (7 GPH) EMITTERS PER TREE	– – –

IRRIGATION DISCLAIMER

1. IRRIGATION DESIGN IS NOT AN EXACT SCIENCE. IT IS BASED ON THEORIES, ASSUMPTIONS, AND/OR INFORMATION PROVIDED BY CIVIL MODELS/UTILITIES/MUNICIPALITIES AND THUS DIAGRAMMATIC IN NATURE.
2. CONTRACTOR SHALL INSTALL MAINLINES ±12" FROM PAVEMENT EDGE IN PLANTING AREAS. ALL PIPING, VALVES, AND OTHER EQUIPMENT SHOWN WITHIN PAVED AREAS OR OUT OF PROPERTY BOUNDARIES ARE FOR DESIGN CLARIFICATION ONLY, AND SHALL BE INSTALLED IN PLANTING AREAS WITHIN THE PROPERTY LINES OR LIMITS AS INDICATED ON THESE PLANS.
3. THE IRRIGATION CONTRACTOR SHALL VERIFY THE LOCATIONS OF ALL ABOVE-GRADE AND VISIBLE IRRIGATION EQUIPMENT (CONTROLLERS, BACKFLOW PREVENTERS, METER PITS, ETC.) WITH THE OWNER'S AUTHORIZED REPRESENTATIVE AND / OR LANDSCAPE ARCHITECT PRIOR TO INSTALLATION. THE INSTALLATION OF THESE ITEMS SHALL BE INTEGRATED WITHIN DESIGNATED LANDSCAPE AREAS. FAILURE TO LOCATE THIS EQUIPMENT IN AN APPROVED LOCATION MAY RESULT IN THE IRRIGATION CONTRACTOR BEING REQUIRED TO MOVE SUCH ITEMS AT HIS OWN COST.
4. THE IRRIGATION SYSTEM DESIGN IS BASED ON THE MINIMUM OPERATING PRESSURE AND THE MAXIMUM FLOW DEMAND SHOWN ON THE DRAWINGS. THE IRRIGATION CONTRACTOR SHALL FIELD VERIFY THE STATIC & OPERATING WATER PRESSURE PRIOR TO CONSTRUCTION OF ANY COMPONENT OF THE IRRIGATION SYSTEM. AFTER FIELD VERIFICATION, THE IRRIGATION CONTRACTOR SHALL NOTIFY THE OWNER, OWNER'S REPRESENTATIVE, LANDSCAPE ARCHITECT, & IRRIGATION DESIGNER OF THE PRESSURE READING FOR THE TAP.
5. ALL PRESSURIZED MAINLINES, VALVES, DRIP, AND ROTOR AND SPRAY HEADS SHALL BE INSTALLED A MINIMUM OF 5' AWAY FROM ANY BUILDING FOUNDATION. ADDITIONAL REQUIREMENTS MAY BE LISTED IN THE GEOTECHNICAL REPORT REGARDING IRRIGATION NEAR BUILDING FOUNDATIONS. CONTRACTOR IS RESPONSIBLE TO ABIDE BY THE 5' MINIMUM DISTANCE AND/OR THE GEOTECHNICAL REPORT REQUIREMENTS. IF THIS EQUIPMENT IS SHOWN WITHIN THE 5' OFFSET ON THESE PLANS, IT IS FOR THE PURPOSE OF GRAPHIC CLARITY ONLY.
6. REFER TO SHEET IR1.5 & IR1.6 FOR IRRIGATION DETAILS AND IR1.3 FOR IRRIGATION NOTES.

UTILITY NOTES

1. THE LANDSCAPE CONTRACTOR IS REQUIRED TO CONTACT THE COUNTY PUBLIC WORKS DEPARTMENT, AND ANY OTHER PUBLIC OR PRIVATE AGENCY NECESSARY FOR UTILITY LOCATION PRIOR TO ANY CONSTRUCTION.
2. THIS DRAWING IS A PART OF A COMPLETE SET OF BID DOCUMENTS, SPECIFICATIONS, ADDITIONAL DRAWINGS, AND EXHIBITS. UNDER NO CIRCUMSTANCES SHOULD THESE PLANS BE USED FOR CONSTRUCTION PURPOSES WITHOUT EXAMINING ACTUAL LOCATIONS OF UTILITIES ON SITE, AND REVIEWING ALL RELATED DOCUMENTS.
3. THE LOCATION OF THE ALL UNDERGROUND UTILITIES ARE LOCATED ON THE ENGINEERING DRAWINGS FOR THIS PROJECT. THE MOST CURRENT REVISION IS HERE IN MADE PART OF THIS DOCUMENT. UNDERGROUND UTILITIES EXIST THROUGHOUT THIS SITE AND MUST BE LOCATED PRIOR TO ANY CONSTRUCTION ACTIVITY. WHERE UNDERGROUND UTILITIES EXIST, FIELD ADJUSTMENT MAY BE NECESSARY AND MUST BE APPROVED BY A REPRESENTATIVE OF THE OWNER. NEITHER THE OWNER NOR THE LANDSCAPE ARCHITECT ASSUMES ANY RESPONSIBILITY WHATSOEVER, IN RESPECT TO THE CONTRACTORS ACCURACY IN LOCATING THE INDICATED PLANT MATERIAL, AND UNDER NO CIRCUMSTANCES SHOULD THESE PLANS BE USED WITHOUT REFERENCING THE ABOVE MENTIONED DOCUMENTS.

REVISIONS
PRE-BID SET ISSUE DATE | POST BID SET ISSUE DATE

DATE	DESCRIPTION

Evergreen Development | Services | Investments

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LOWE'S

SITE PLAN CONSTRUCTION DOCUMENTS
IRRIGATION PLAN
LOWE'S OF:
ERIE, COLORADO

PROJECT No: ED000018.20 | DRAWN BY: SRA | CHECKED BY: DTT

CRITERIA ISSUE DATE:	11.21.19
PERMIT SET ISSUE DATE:	
CONSTRUCTION SET ISSUE DATE:	

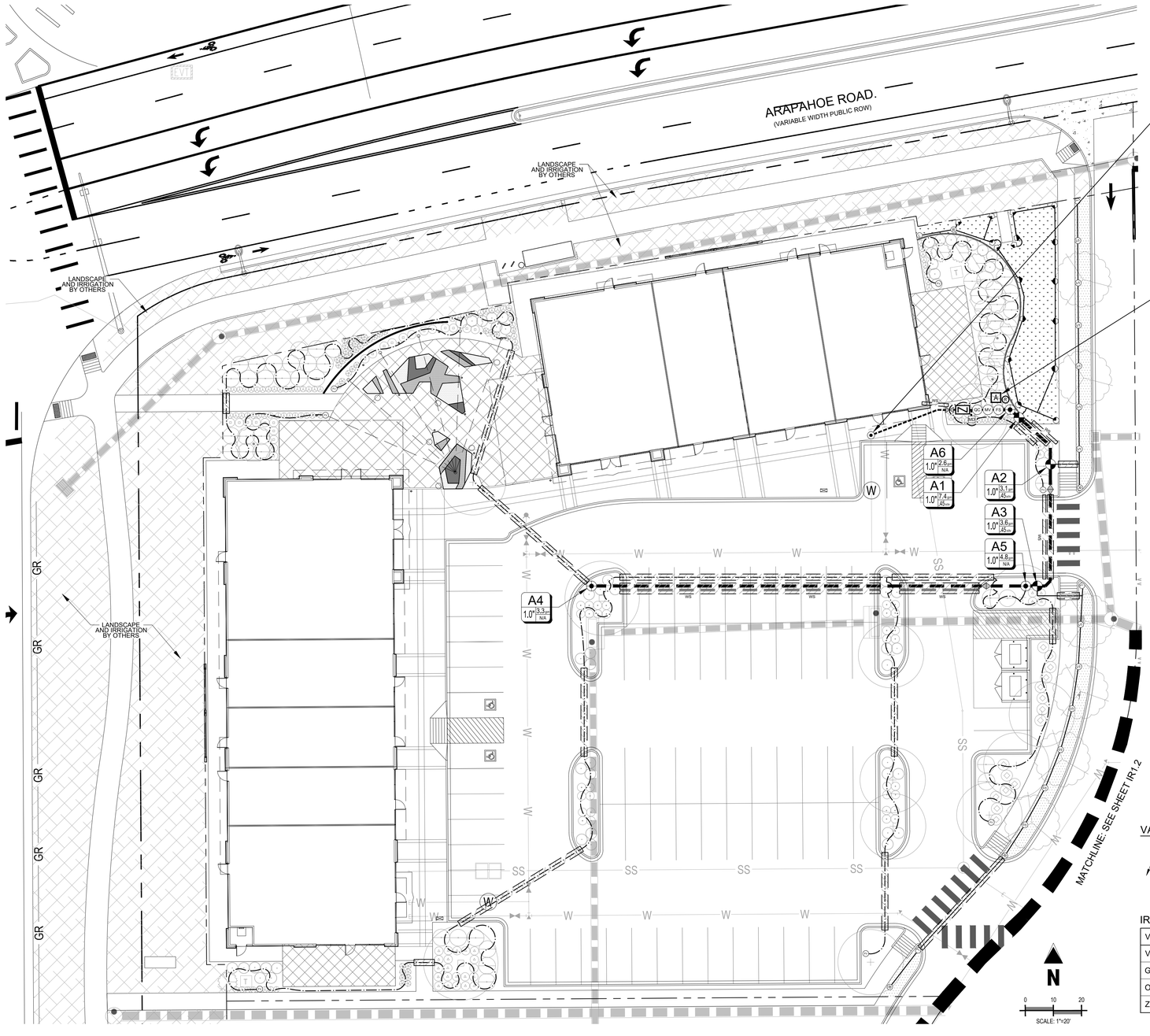
DRAWING NUMBER:
IR1.0

NINE MILE CORNER - SITE PLAN CONSTRUCTION DOCUMENTS

A PORTION OF NE 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST AND THE SOUTHEAST QUARTER OF SECTION 27, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE OF THE 6TH PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, COLORADO

SITE PLAN: SP-001117-2019

CAUTION
UTILITIES EXIST WITHIN CONSTRUCTION LIMITS. CONTRACTOR IS RESPONSIBLE FOR IDENTIFYING THEIR LOCATION PRIOR TO CONSTRUCTION.



POINT OF CONNECTION 'A'

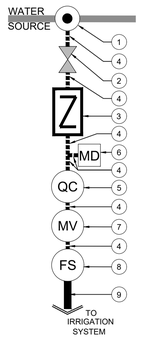
STATIC PRESSURE: +/- 74 SIZE OF TAP: 1"

- USE 1" TAP INTO THE DOMESTIC WATER LINE DOWNSTREAM OF THE BUILDING METER.
- 1" TYPE K COPPER SERVICE FROM THE TAP THROUGH THE IRRIGATION BACKFLOW, TO THE FLOW SENSOR.
- CONTRACTOR SHALL VERIFY LOCATION OF THE EQUIPMENT, IN THE FIELD WITH OWNER OR OWNER'S AUTHORIZED REPRESENTATIVE AND/OR LANDSCAPE ARCHITECT.
- SEE POINT OF CONNECTION DIAGRAM A, THIS SHEET, FOR THE IRRIGATION SYSTEM EQUIPMENT CONFIGURATION.
- THE IRRIGATION CONTRACTOR SHALL FIELD VERIFY THE STATIC & OPERATING WATER PRESSURE PRIOR TO CONSTRUCTION. SEE GENERAL IRRIGATION NOTES.
- WHEN WATER PRESSURE TO THE IRRIGATION SYSTEM EXCEEDS 100 PSI, THE IRRIGATION CONTRACTOR SHALL INSTALL A PRESSURE REDUCING / REGULATING VALVE (PRV) TO LIMIT THE WATER TO 80 PSI MAXIMUM. WHEN PRESSURE DROPS BELOW 60 PSI, THE IRRIGATION CONTRACTOR SHALL INSTALL A BOOSTER PUMP TO A MINIMUM PRESSURE OF 80 PSI.

CONTROLLER NOTE 'A'

- ONE (1) 10 STATION CONTROLLER, SEE LEGEND.
- SIX (6) OPEN STATIONS FOR FUTURE EXPANSION.
- STATION RUN ORDER SHALL MATCH PLANS.
- LOCATE CONTROLLER IN THE LANDSCAPE AREA FOR ALL MULTI-TENANT ACCESS. VERIFY LOCATION WITH OWNER OR REPRESENTATIVE.
- 120 VAC POWER TO CONTROLLER LOCATION SHALL BE PROVIDED BY OTHERS. HOOK-UP OF CONTROLLERS TO 120 VAC SHALL BE PERFORMED BY THE LANDSCAPE CONTRACTOR.
- CONDUIT FROM INSIDE THE BUILDING TO EXTERIOR IRRIGATION SYSTEM SHALL BE PROVIDED BY OTHERS.

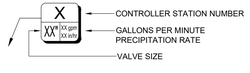
TYPICAL POINT OF CONNECTION SCHEMATIC DIAGRAM (A)



1. 1" TAP INTO DOMESTIC WATER LINE DOWN STREAM OF THE BUILDING METER
2. 1" GATE VALVE
3. 1" BACKFLOW DEVICE
4. 1" K COPPER WATER SERVICE TUBING
5. QUICK COUPLER/FOR BLOW OUT
6. MANUAL DRAIN VALVE, SEE SHEET IR1.2 DETAIL 14
7. 1" MASTER VALVE
8. 1" FLOW SENSOR
9. 1-1/2" MAINLINE, CLASS 200 PIPE

WINTERIZATION PROCEDURES:
TURN OFF SYSTEM AT STOP AND WASTE VALVE DOWNSTREAM OF THE IRRIGATION METER. OPEN ONE CONTROL VALVE TO RELIEVE PRESSURE SLOWLY OPEN BLOW OUT VALVE. REPEAT PROCEDURE FOR ALL BLOW OUT VALVES ALONG IRRIGATION MAINLINE.

VALVE KEY DIAGRAM



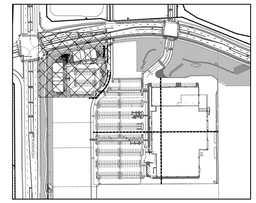
WIRING/SLEEVING NOTES

IN ADDITION TO PROVIDING SLEEVES FOR ALL PIPING UNDER ROADWAYS AND WALKWAYS, PROVIDE AND INSTALL SCH. 40 PVC SLEEVES FOR ALL CONTROLLER WIRES OCCURRING UNDER ALL ROADWAYS AND WALKWAYS. SLEEVES FOR CONTROLLER WIRES SHALL BE 2" DIA. AND CONTAIN NO MORE THAN 25 WIRES.

IRRIGATION CONTROLLER 'A'

VALVE NUMBER	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
VALVE SIZE	1.0"	1.0"	1.0"	1.0"	1.0"	1.0"	OPEN	OPEN	OPEN	OPEN
G.P.M.	7.4	3.1	3.6	3.3	4.8	2.6	OPEN	OPEN	OPEN	OPEN
OPERATION PSI	40	40	40	40	40	40	OPEN	OPEN	OPEN	OPEN
ZONE TYPE	ROTATOR	ROTATOR	ROTATOR	DRIP	DRIP	DRIP	OPEN	OPEN	OPEN	OPEN

KEY MAP



REVISIONS

PRE-BID SET ISSUE DATE	POST BID SET ISSUE DATE

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Evergreen Development | Services | Investments
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SITE PLAN CONSTRUCTION DOCUMENTS
IRRIGATION PLAN

LOWE'S OF:
ERIE, COLORADO

PROJECT No: ED0000818.20 | DRAWN BY: SRA | CHECKED BY: DTT

CRITERIA
ISSUE DATE: 11.21.19

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CONSTRUCTION SET
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NINE MILE CORNER - SITE PLAN CONSTRUCTION DOCUMENTS

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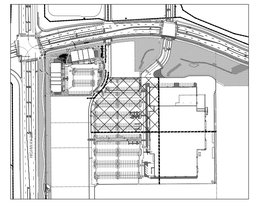
SITE PLAN: SP-001117-2019

KEY MAP



IRRIGATION CONTROLLER 'B'

VALVE NUMBER	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
VALVE SIZE	1.0"	1.0"	1.0"	1.0"	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
G.P.M.	2.7	5.9	6.5	2.6	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
OPERATION PSI	40	40	40	40	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
ZONE TYPE	DRIP	DRIP	DRIP	DRIP	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN

CAUTION
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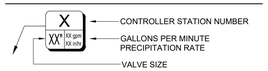
VALVE KEY DIAGRAM



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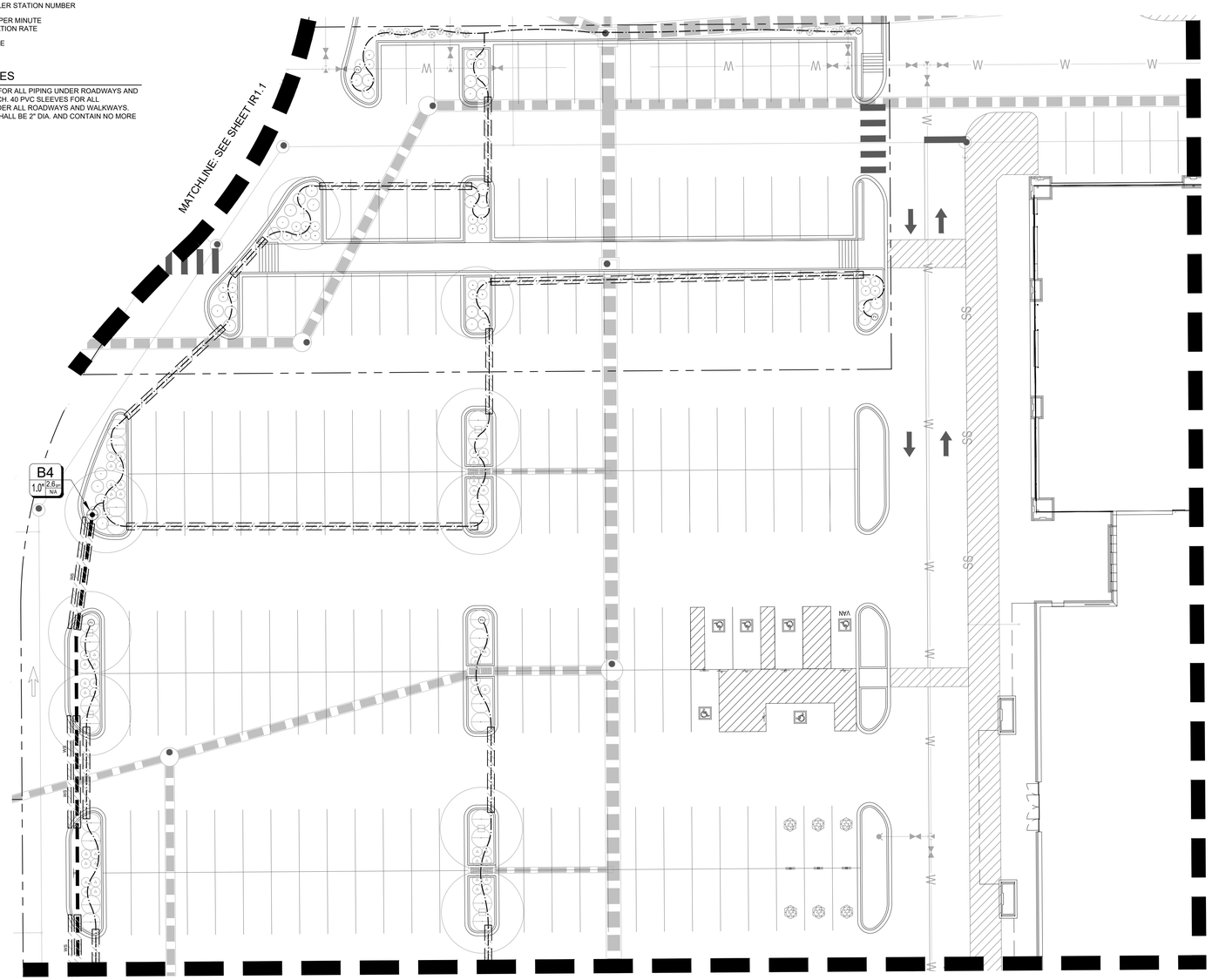

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LOWE'S

SITE PLAN CONSTRUCTION DOCUMENTS
IRRIGATION PLAN
LOWE'S OF:
ERIE, COLORADO

PROJECT No: EDI000018.20 | DRAWN BY: SRA | CHECKED BY: DTT

CRITERIA ISSUE DATE:	11.21.19
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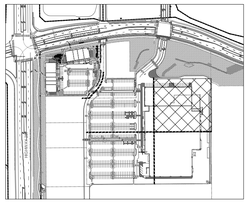

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DATE	DESCRIPTION

IRRIGATION CONTROLLER 'B'

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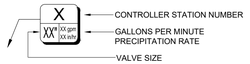
G.P.M.	2.7	5.9	6.5	2.6	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
OPERATION PSI	40	40	40	40	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
ZONE TYPE	DRIP	DRIP	DRIP	DRIP	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN

VALVE KEY DIAGRAM



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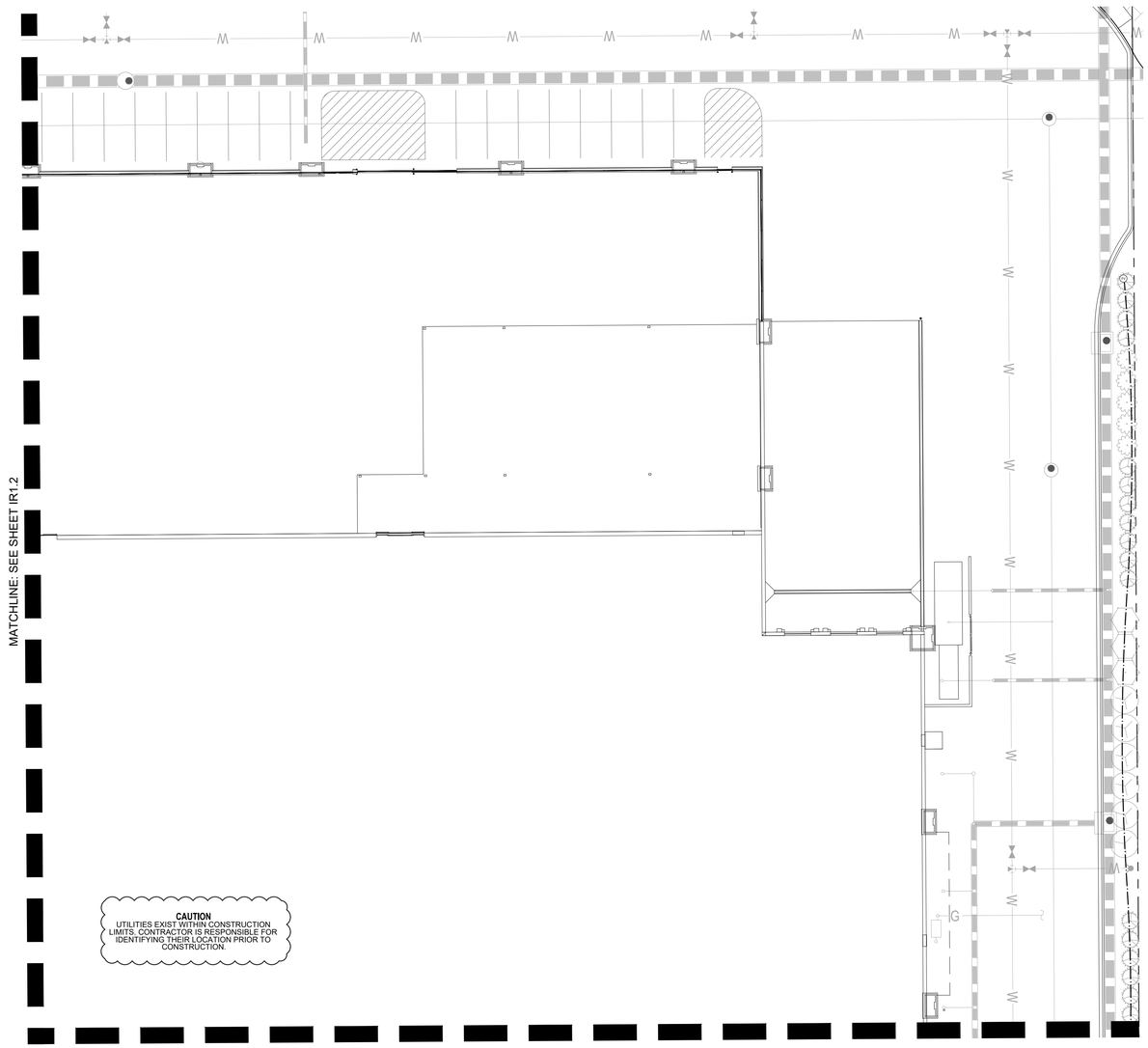
1. IRRIGATION DESIGN IS NOT AN EXACT SCIENCE. IT IS BASED ON THEORIES, ASSUMPTIONS, AND/OR INFORMATION PROVIDED BY CIVIL MODELS/UTILITIES/MUNICIPAL ENTITIES AND THUS, IS DIAGRAMMATIC IN NATURE. ALL PIPING, VALVES, AND OTHER EQUIPMENT SHOWN WITHIN PAVED AREAS OR OUT OF PROPERTY BOUNDARIES ARE FOR GRAPHIC CLARIFICATION ONLY, AND SHALL BE INSTALLED IN PLANTING AREAS WITHIN THE PROPERTY LINES OR LIMITS INDICATED ON PLAN. THE IRRIGATION CONTRACTOR SHALL VERIFY THE LOCATIONS OF ALL ABOVE-GRADE IRRIGATION EQUIPMENT WITH THE OWNER'S AUTHORIZED REPRESENTATIVE PRIOR TO INSTALLATION, OR IRRIGATION CONTRACTOR MAY BE REQUIRED TO MOVE SUCH ITEMS AT HIS OWN COST.
2. REFER TO SPECIFICATIONS (AS APPROPRIATE) FOR SUBMITTALS, INSPECTIONS AND OTHER APPLICABLE INFORMATION. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING A COPY OF THE PROJECT SPECIFICATIONS PRIOR TO BIDDING. THE PROJECT SPECIFICATIONS ARE A PART OF THESE PLANS AND SHALL BE CONSULTED BY THE IRRIGATION CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING WORK AS SPECIFIED IN THE PROJECT SPECIFICATIONS AND ON THE PLANS.
3. THE IRRIGATION CONTRACTOR SHALL MEET WITH THE OWNER'S REPRESENTATIVE PRIOR TO COMMENCEMENT OF WORK, AND SHALL OBTAIN ALL ENGINEERING, LANDSCAPE, AND OTHER APPLICABLE PLANS & DOCUMENTS. CONTRACTOR SHALL THOROUGHLY REVIEW PLANS & REPORT ANY CONFLICTS OR DISCREPANCIES TO OWNER'S REPRESENTATIVE IMMEDIATELY.
4. CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS, EQUIPMENT QUANTITIES, AND UTILITY LOCATIONS PRIOR TO BEGINNING WORK. DO NOT INSTALL THE IRRIGATION SYSTEM AS SHOWN ON THE DRAWINGS WHEN IT IS OBVIOUS IN THE FIELD THAT OBSTRUCTIONS, GRADE DIFFERENCES, OR DIFFERENCES IN THE AREA DIMENSIONS EXIST THAT MIGHT NOT HAVE EXISTED AT THE TIME OF THE IRRIGATION DESIGN PREPARATION. SUCH OBSTRUCTIONS OR DIFFERENCES SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE OWNER'S AUTHORIZED REPRESENTATIVE AND LANDSCAPE ARCHITECT. IN THE EVENT THIS NOTIFICATION IS NOT GIVEN, THE IRRIGATION CONTRACTOR SHALL ASSUME FULL RESPONSIBILITY FOR ANY REVISIONS NECESSARY TO BRING THE SYSTEM TO A PROPER WORKING CONDITION, AND TO THE OWNER'S SATISFACTION.
5. IT IS THE RESPONSIBILITY OF THE IRRIGATION CONTRACTOR TO FAMILIARIZE HIMSELF WITH ALL GRADE DIFFERENCES, LOCATIONS OF WALLS, RETAINING WALLS, ETC. THE IRRIGATION CONTRACTOR SHALL COORDINATE HIS WORK WITH THE GENERAL CONTRACTOR AND OTHER SUBCONTRACTORS FOR THE LOCATION AND INSTALLATION OF PIPE SLEEVES THROUGH WALL, UNDER ROADWAY PAVING, ETC.
6. THE CONTRACTOR SHALL MAKE NO SUBSTITUTIONS, DELETIONS, OR ADDITIONS TO THIS PLAN WITHOUT APPROVAL OF THE LANDSCAPE ARCHITECT.
7. SEE CIVIL ENGINEER'S DRAWINGS FOR IRRIGATION POINT OF CONNECTION (TAP) AND DOMESTIC WATER SUPPLY.
8. ALL CONSTRUCTION SHALL CONFORM TO CITY, COUNTY, STATE, AND FEDERAL REQUIREMENTS. IT SHALL BE THE RESPONSIBILITY OF THE IRRIGATION CONTRACTOR TO ENSURE THAT ALL IRRIGATION EQUIPMENT MEETS GOVERNMENT REGULATIONS. CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR OBTAINING ANY NECESSARY PERMITS OR APPROVALS
9. THE IRRIGATION SYSTEM DESIGN IS BASED ON THE MINIMUM OPERATING PRESSURE AND THE MAXIMUM FLOW DEMAND SHOWN ON THE POINT OF CONNECTION NOTE TAG(S) ON THE DRAWINGS. THE IRRIGATION CONTRACTOR SHALL FIELD VERIFY THE STATIC & OPERATING WATER PRESSURE PRIOR TO CONSTRUCTION, AND SHALL REPORT ANY DIFFERENCES BETWEEN THE WATER PRESSURE INDICATED ON THE DRAWINGS AND THE ACTUAL PRESSURE READING AT THE IRRIGATION POINT OF CONNECTION TO THE OWNER'S AUTHORIZED REPRESENTATIVE AND LANDSCAPE ARCHITECT. IN THE EVENT PRESSURE DIFFERENCES ARE NOT REPORTED OR PRESSURES HAVE GREATLY CHANGED PRIOR TO THE START OF THE IRRIGATION SYSTEM CONSTRUCTION, THE IRRIGATION CONTRACTOR SHALL BE RESPONSIBLE FOR RECOMMENDING A SOLUTION AND PROVIDING AN ADD ALTERNATE BID FOR IRRIGATION COSTS.
10. CONTRACTOR SHALL NOTIFY LANDSCAPE ARCHITECT IF AVAILABLE WATER PRESSURE EXCEEDS 5 PSI HIGHER OR LOWER THAN AVAILABLE WATER PRESSURE.
11. NO MORE THAN 90% OF AVAILABLE MINIMUM STATIC WATER PRESSURE WAS USED IN PREPARATION OF THESE PLANS, FURTHERMORE, THE MAXIMUM FLOW THROUGH THE METER SHOULD NOT EXCEED 75% OF THE MAXIMUM SAFE FLOW.
12. SUPPLY LINE AND METER TO BE PROVIDED BY GENERAL CONTRACTOR. BACKFLOW PREVENTER TO BE PROVIDED BY IRRIGATION CONTRACTOR. IRRIGATION CONTRACTOR'S POINT OF CONNECTION TO BEGIN AFTER THE IRRIGATION WATER METER.
13. INSTALL ALL MATERIALS AND EQUIPMENT AS SHOWN ON THE PLANS AND DETAILS. NO SUBSTITUTIONS OF EQUIPMENT WILL BE ACCEPTABLE WITHOUT PRIOR WRITTEN APPROVAL BY THE LANDSCAPE ARCHITECT OR THE OWNERS REPRESENTATIVE. THE IRRIGATION CONTRACTOR MAY BE REQUIRED TO REMOVE AND REPLACE ALL UNAPPROVED SUBSTITUTED EQUIPMENT AT HIS OWN COST IF SO DIRECTED BY THE OWNER.
14. WHEN INSTALLING IRRIGATION PIPE AND EQUIPMENT NEXT TO HARDSCAPE (SUCH AS WALLS, CURBS, OR WALKS), PLACE PIPE AS CLOSE AS POSSIBLE TO HARDSCAPE TO AVOID CONFLICTS WITH PLANTING. REFER TO MAINLINE TRENCHING DETAILS FOR ADDITIONAL INFORMATION.
15. THE IRRIGATION CONTRACTOR SHALL COORDINATE 120 V.A.C. ELECTRICAL POWER TO CONTROLLERS AND DEDICATE ONE (1) 20-AMP BREAKER FOR EACH CONTROLLER. IT SHALL BE THE RESPONSIBILITY OF THE IRRIGATION CONTRACTOR TO MAKE THE FINAL HOOK-UP FROM THE ELECTRICAL SOURCE TO THE CONTROLLER UNIT ONLY.
16. THE RAIN SENSOR SHALL BE LOCATED NEAR THE IRRIGATION CONTROLLER, AND SHALL BE MOUNTED AS SHOWN ON THE DETAIL AND/OR LEGEND. LOCATE SENSOR AWAY FROM TALL TREES, SHRUBS, AND OTHER POTENTIAL OBSTRUCTIONS.
17. ALL VALVE CONTROL WIRE SHALL BE AWG 14 TYPE UF, 600 VOLT TEST, DIRECT BURIAL. NO SPLICES SHALL BE ALLOWED EXCEPT AT VALVES AND CONTROLLER. WHERE SPLICES MAY BE NECESSARY DUE TO EXCESSIVELY LONG WIRE RUNS, THE CONTRACTOR SHALL MAKE ALL SPLICES IN 6" ROUND VALVE BOXES WITH 3M'S "DBY-DIRECT BURIAL SPLICE KIT". THE CONTRACTOR SHALL LABEL ALL WIRES WITH WATERPROOF TAGS AND MARKERS AT ALL SPLICES AND VALVE MANIFOLDS, AND SHALL LEAVE A 24" COIL OF EXCESS WIRE AT EACH CONNECTION.
18. CONTRACTOR SHALL PROVIDE #10 COMMON WIRE, DIRECT BURIAL, TO ALL REMOTE CONTROL VALVES.
19. CONNECT ALL DIRECT BURIAL WIRES TO VALVES USING 3M'S "DBY-DIRECT BURIAL SPLICE KIT" (UNLESS OTHERWISE SPECIFIED).
20. PROVIDE ADDITIONAL IRRIGATION CONTROL WIRES TO THE AMOUNT OF OPEN ZONES ON THE CONTROLLER ALONG EACH BRANCH OF MAINLINE FOR FUTURE EXPANSION. STUB ADDITIONAL CONTROL WIRES INTO BACK OF IRRIGATION CONTROLLERS.
21. THE IRRIGATION CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING ALL CONTROL WIRE SLEEVES AND PIPE SLEEVES UNDER PAVED AREAS PRIOR TO PAVING. ELECTRICAL WIRES FOR IRRIGATION VALVES AND IRRIGATION LINES ARE TO BE PLACED IN SEPARATE SLEEVES. ALL SLEEVING SHALL BE PVC SCHEDULE 40 PIPE. SLEEVES FOR MAINLINE AND LATERAL LINES SHALL BE A MINIMUM TWICE THE DIAMETER OF THE ENCLOSED PIPE; SLEEVES FOR CONTROL WIRES SHALL BE AS PER THE SLEEVING / WIRING NOTE AND THE WIRING SLEEVE LEGEND ITEM AS SHOWN ON THESE DRAWINGS.
22. TRENCH BACKFILL MATERIAL SHALL BE FREE OF ROCKS, GLASS, AND OTHER EXTRANEOUS MATERIALS LARGER THAN 1" IN DIAMETER. BACKFILL SHALL BE COMPACTED TO 90% MAXIMUM DRY DENSITY.
23. WHERE VALVES ARE LOCATED IN CLOSE PROXIMITY TO EACH OTHER, CLUSTER VALVES INTO MANIFOLDS. INSTALL NO MORE THAN ONE VALVE PER VALVE BOX.
24. MANUAL DRAIN VALVE, FOR FREEZE PROTECTION, ARE TO BE LOCATED AT ALL LOW POINTS OF IRRIGATION LATERAL LINES. WHERE THE LOW POINT IS AT THE END OF THE LINE, LOCATE DRAIN VALVE A MINIMUM OF 12" DOWNSTREAM FROM THE LAST SPRINKLER HEAD. SEE DETAIL FOR VALVE ORIENTATION.
25. USE TEFLON TAPE ON ALL PVC MALE PIPE THREADS ON ALL SWING JOINT AND VALVE ASSEMBLIES.
26. ALL IRRIGATION HEADS, INCLUDING FIXED-SPRAY AND DRIP DEVICES, SHALL BE SET PERPENDICULAR TO THE FINISH GRADE OF THE AREA TO BE IRRIGATED.
27. ALL PRESSURIZED MAINLINES, VALVES, DRIP, AND ROTOR AND SPRAY HEADS SHALL BE INSTALLED A MINIMUM OF 3' AWAY FROM ANY BUILDING FOUNDATION. IF THIS EQUIPMENT IS SHOWN WITHIN THE 3' OFFSET ON THESE PLANS, IT IS FOR THE PURPOSE OF GRAPHIC CLARITY ONLY.
28. EXCEPT WHERE SPECIFICALLY NOTED OTHERWISE, IT IS THE INTENT OF THE IRRIGATION DESIGN TO INDICATE ALL SPRAY HEADS AS "POP-UPS". IN THE EVENT THAT POP-UP HEADS HAVE NOT BEEN SPECIFIED IN TURF AREAS, IT SHALL BE THE RESPONSIBILITY OF THE IRRIGATION CONTRACTOR TO BRING THIS TO THE ATTENTION OF THE LANDSCAPE ARCHITECT PRIOR TO BIDDING AND CONSTRUCTION.
29. ALL SPRAY AND ROTOR HEAD LOCATIONS SHALL BE STAKED, FLAGGED AND/OR OTHERWISE CLEARLY MARKED ON THE GROUND PRIOR TO INSTALLATION. SPRINKLER HEAD STAKING SHALL BE INSPECTED AND APPROVED BY THE OWNER'S REPRESENTATIVE OR THE LANDSCAPE ARCHITECT BEFORE INSTALLATION. STAKED LOCATIONS SHALL BE SPACED TO PROVIDE HEAD-TO-HEAD COVERAGE. RECOMMENDED SETBACK DISTANCE OF ALL PROPOSED IRRIGATION HEADS IS 12" FROM BACK OF CURB AND EDGE OF PAVEMENT.
30. FLUSH AND ADJUST ALL SPRINKLER HEADS FOR OPTIMUM PERFORMANCE AND TO PREVENT OVERSPRAY ONTO WALKS, ROADWAYS, AND/OR BUILDINGS AS MUCH AS POSSIBLE. THIS SHALL INCLUDE SELECTING THE BEST NOZZLE ARC AND RADIUS TO FIT THE EXISTING SITE CONDITIONS.
31. ALL POP-UP TYPE SPRINKLER HEADS INSTALLED IN TURF AREAS SHALL BE INSTALLED SO THE TOP OF THE SPRINKLER HEAD IS FLUSH WITH THE ADJACENT SIDEWALK, OR PAVING. ALL POP-UP HEADS AWAY FROM HARDSCAPE EDGES IN TURF SHALL BE 1" ABOVE THE FINISH GRADE TO PREVENT CONTACT WITH MOWERS.
32. EXISTING TREES TO REMAIN ARE TO BE PROTECTED FROM DAMAGE. DO NOT TRENCH OR EXCAVATE WITHIN THE CRITICAL ROOT ZONE OF ANY TREE.
33. ALL PLANT MATERIAL IN TREE HOLDING AREAS SHALL BE MANUALLY WATERED/IRRIGATED TO KEEP MOIST UNTIL PLANTED.
34. UPON COMPLETION OF INSTALLATION OF IRRIGATION SYSTEM, IRRIGATION CONTRACTOR SHALL PROVIDE THE FOLLOWING:
    A. ACCURATE AND COMPLETE "AS BUILT" PLANS OF IRRIGATION SYSTEM INCLUDING 8-1/2" X 11" ZONE MAP TO BE PLACED INSIDE EACH CONTROLLER BOX.
    B. LOG ON ALL WATER WINDOWS, RUN SCHEDULE TIMES, AND OTHER CHANGES AND/OR MODIFICATIONS TO THE IRRIGATION SYSTEM SINCE INSTALLATION.
    C. ONE HOUR OF TRAINING TO OWNER ON IRRIGATION SYSTEM AND CONTROLLER OPERATION.
    D. THREE OF EACH TYPE OF HEAD AND EMITTER INSTALLED.
    E. ONE OF EACH TYPE OF VALVE INSTALLED.
    F. REVIEW WINTERIZATION PROCEDURES FOR IRRIGATION SYSTEM WITH OWNERS REPRESENTATIVE.
35. PRIOR TO ACCEPTANCE OF IRRIGATION SYSTEM AT THE END OF THE MAINTENANCE PERIOD, THE IRRIGATION CONTRACTOR SHALL PROVIDE THE FOLLOWING: CURRENT SCHEDULE RUN TIME AND WATER WINDOW LOG, ALONG WITH NOTING ANY OTHER PERTINENT INFORMATION.
36. UNLESS OTHERWISE SPECIFIED, THE IRRIGATION CONTRACTOR SHALL REPAIR OR REPLACE ANYTHING DAMAGED BY HIS WORK AT NO ADDITIONAL COST TO THE OWNER.
37. CONTRACTOR SHALL INSTALL MAINLINES ±12" FROM PAVEMENT EDGE IN PLANTING AREAS. ALL PIPING, VALVES, AND OTHER EQUIPMENT SHOWN WITHIN PAVED AREAS OR OUT OF PROPERTY BOUNDARIES ARE FOR DESIGN CLARIFICATION ONLY, AND SHALL BE INSTALLED IN PLANTING AREAS WITHIN THE PROPERTY LINES OR LIMITS AS INDICATED ON THESE PLANS.
38. IN THE EVENT OF A DISCREPANCY BETWEEN THE PLAN AND SPECIFICATIONS, THE PLAN SHALL TAKE PRECEDENCE.
39. THE IRRIGATION SYSTEM SHALL BE INSTALLED BY A QUALIFIED IRRIGATION CONTRACTOR.



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LOWE'S

SITE PLAN CONSTRUCTION DOCUMENTS
IRRIGATION PLAN
LOWE'S OF:
ERIE, COLORADO

PROJECT No: EI0000018.20 | DRAWN BY: SRA | CHECKED BY: DTT

CRITERIA
ISSUE DATE: 11.21.19
PERMIT SET
ISSUE DATE:
CONSTRUCTION SET
ISSUE DATE:
DRAWING NUMBER:

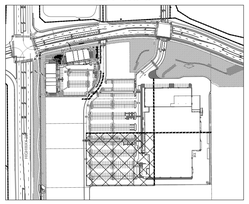
IR1.3

NINE MILE CORNER - SITE PLAN CONSTRUCTION DOCUMENTS

A PORTION OF NE 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST AND THE SOUTHEAST QUARTER OF SECTION 27, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE OF THE 6TH PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, COLORADO

SITE PLAN: SP-001117-2019

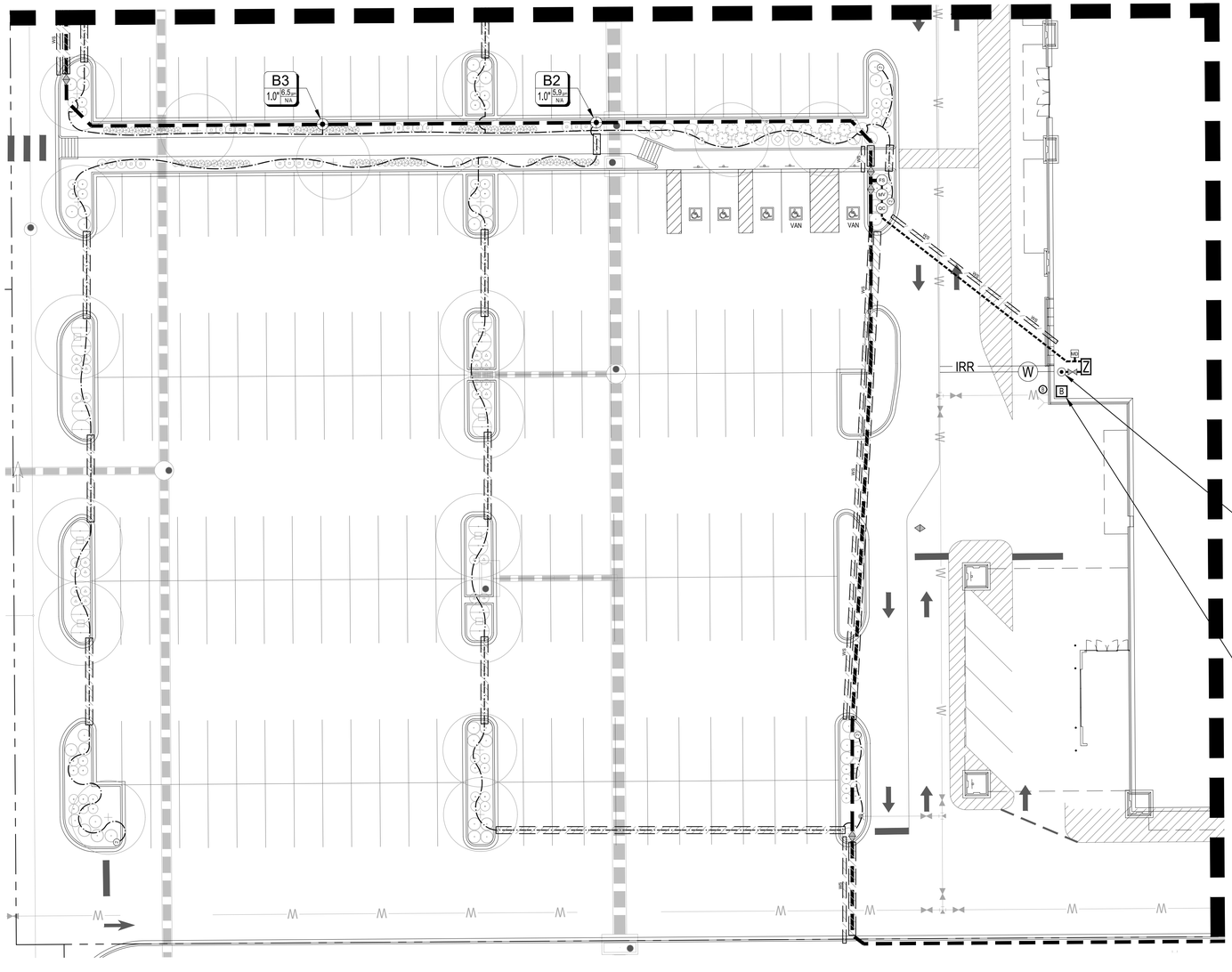
KEY MAP



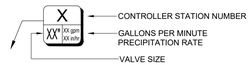
IRRIGATION CONTROLLER 'B'

VALVE NUMBER	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
VALVE SIZE	1.0"	1.0"	1.0"	1.0"	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
G.P.M.	2.7	5.9	6.5	2.6	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
OPERATION PSI	40	40	40	40	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
ZONE TYPE	DRIP	DRIP	DRIP	DRIP	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN

MATCHLINE: SEE SHEET IR1.2



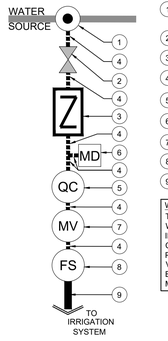
VALVE KEY DIAGRAM



WIRING/SLEEVING NOTES

IN ADDITION TO PROVIDING SLEEVES FOR ALL PIPING UNDER ROADWAYS AND WALKWAYS, PROVIDE AND INSTALL SCH. 40 PVC SLEEVES FOR ALL CONTROLLER WIRES OCCURRING UNDER ALL ROADWAYS AND WALKWAYS. SLEEVES FOR CONTROLLER WIRES SHALL BE 2" DIA. AND CONTAIN NO MORE THAN 25 WIRES.

TYPICAL POINT OF CONNECTION SCHEMATIC DIAGRAM (B)



1. 1" TAP INTO DOMESTIC WATERLINE DOWNSTREM OF THE BUILDING METER
2. 1" GATE VALVE
3. 1" BACKFLOW DEVICE
4. 1" K COPPER WATER SERVICE TUBING
5. QUICK COUPLER/FOR BLOW OUT
6. MANUAL DRAIN VALVE, SEE SHEET IR1.2 DETAIL 14
7. 1" MASTER VALVE
8. 1" FLOW SENSOR
9. 1-1/2" MAINLINE, CLASS 200 PIPE

WINTERIZATION PROCEDURES:
TURN OFF SYSTEM AT STOP AND WASTE VALVE DOWNSTREAM OF THE IRRIGATION METER. OPEN ONE CONTROL VALVE TO RELIEVE PRESSURE SLOWLY OPEN BLOW OUT VALVE. REPEAT PROCEDURE FOR ALL BLOW OUT VALVES ALONG IRRIGATION MAINLINE.

POINT OF CONNECTION 'B'

STATIC PRESSURE: +/- 74 SIZE OF TAP: 1"

- USE 1" TAP INTO THE DOMESTIC WATERLINE DOWN STREAM OF THE BUILDING METER
- 1" TYPE K COPPER SERVICE FROM THE TAP THROUGH THE IRRIGATION BACKFLOW, TO THE FLOW SENSOR.
- CONTRACTOR SHALL VERIFY LOCATION OF THE EQUIPMENT, IN FIELD WITH OWNER OR OWNER'S AUTHORIZED REPRESENTATIVE AND/OR LANDSCAPE ARCHITECT.
- SEE POINT OF CONNECTION DIAGRAM, THIS SHEET, FOR THE IRRIGATION SYSTEM EQUIPMENT CONFIGURATION.
- THE IRRIGATION CONTRACTOR SHALL FIELD VERIFY THE STATIC & OPERATING WATER PRESSURE PRIOR TO CONSTRUCTION. SEE GENERAL IRRIGATION NOTES.
- WHEN WATER PRESSURE TO THE IRRIGATION SYSTEM EXCEEDS 100 PSI, THE IRRIGATION CONTRACTOR SHALL INSTALL A PRESSURE REDUCING / REGULATING VALVE (PRV) TO LIMIT THE WATER TO 80 PSI MAXIMUM. WHEN PRESSURE DROPS BELOW 60 PSI, THE IRRIGATION CONTRACTOR SHALL INSTALL A BOOSTER PUMP TO A MINIMUM PRESSURE OF 80 PSI.

CONTROLLER NOTE 'B'

- ONE (1) 10 STATION CONTROLLER, SEE LEGEND.
- SIX (6) OPEN STATIONS FOR FUTURE EXPANSION.
- STATION RUN ORDER SHALL MATCH PLANS.
- LOCATE CONTROLLER IN THE SPRINKLER ROOM AS SPECIFIED ON THE BUILDING PLANS. VERIFY LOCATION WITH OWNER OR REPRESENTATIVE.
- 120 VAC POWER TO CONTROLLER LOCATION SHALL BE PROVIDED BY OTHERS. HOOK-UP OF CONTROLLERS TO 120 VAC SHALL BE PERFORMED BY THE LANDSCAPE CONTRACTOR.
- CONDUIT FROM INSIDE THE BUILDING TO EXTERIOR IRRIGATION SYSTEM SHALL BE PROVIDED BY OTHERS.

REVISIONS

PRE-BID SET ISSUE DATE / POST BID SET ISSUE DATE

DATE	DESCRIPTION

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LOWE'S

SITE PLAN CONSTRUCTION DOCUMENTS
IRRIGATION PLAN

LOWE'S OF:
ERIE, COLORADO

PROJECT No: ED000018.20 | DRAWN BY: SRA | CHECKED BY: DTF

CRITERIA
ISSUE DATE: 11.21.19

PERMIT SET
ISSUE DATE:

CONSTRUCTION SET
ISSUE DATE:

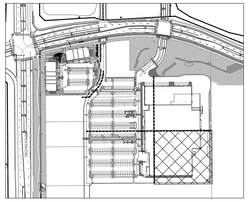
DRAWING NUMBER:

IR1.4

NINE MILE CORNER - SITE PLAN CONSTRUCTION DOCUMENTS

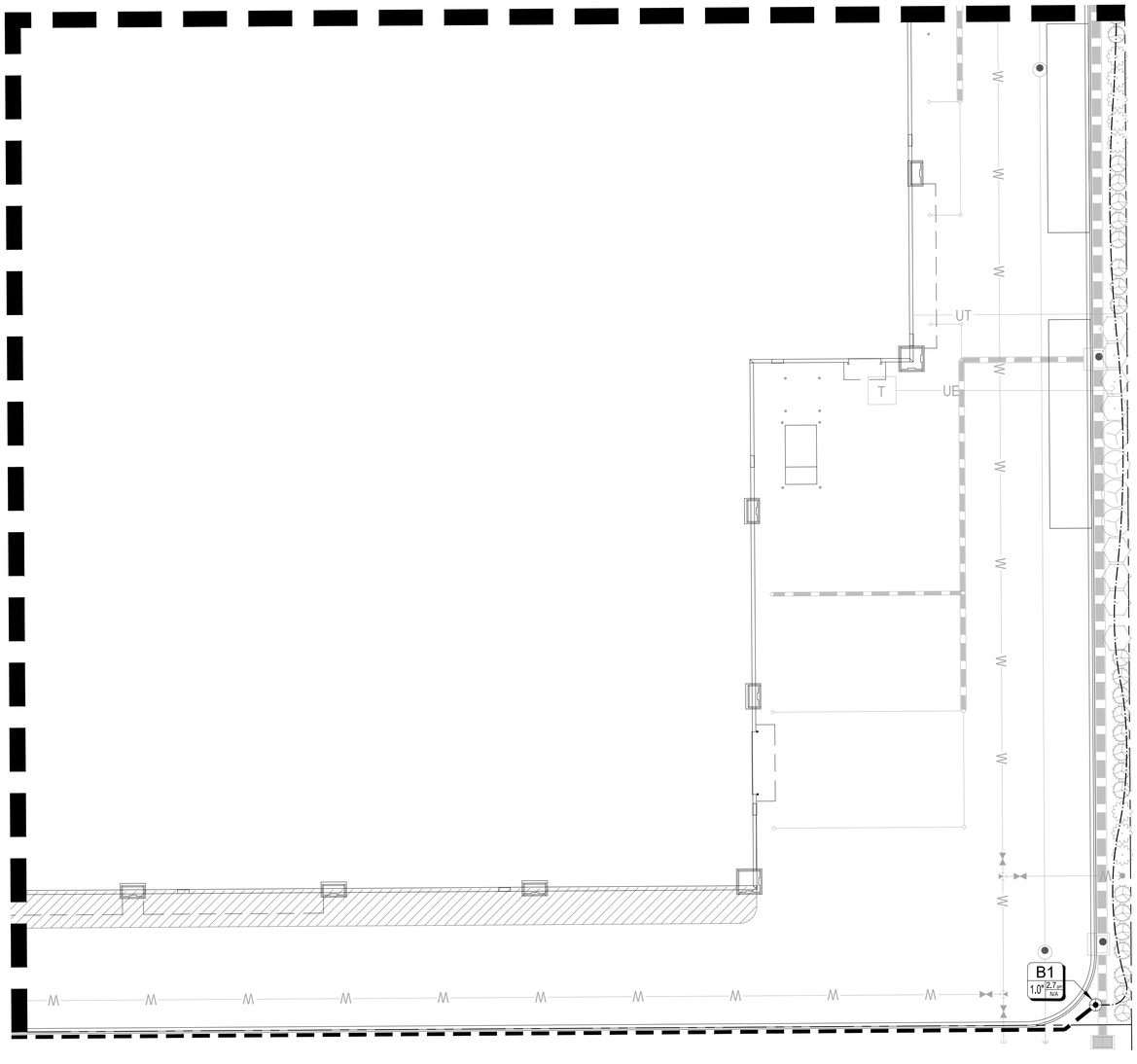
A PORTION OF NE 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST AND THE SOUTHEAST QUARTER OF SECTION 27, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE OF THE 6TH PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, COLORADO
SITE PLAN: SP-001117-2019

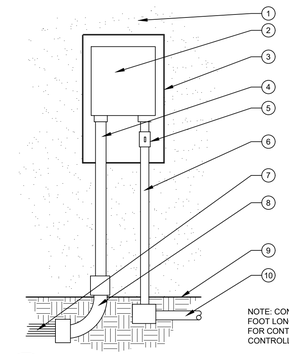
KEY MAP



MATCHLINE: SEE SHEET IR1.3

MATCHLINE: SEE SHEET IR1.4



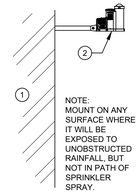


NOTE: VERIFY FINAL LOCATION WITH OWNER PRIOR TO INSTALLATION

1. EXTERIOR WALL
2. CONTROLLER PER LEGEND
3. LOCKING VANDAL-RESISTANT ENCLOSURE. ATTACH TO WALL PER MANUFACTURER'S SPECIFICATIONS.
4. PVC CONDUIT FOR CONTROL WIRES
5. POWER SWITCH
6. 120 VOLT POWER WIRES IN CONDUIT. INSTALL PER ALL APPLICABLE CODES.
7. CONTROL WIRES
8. INSTALL PVC SWEEP 1'-6" BELOW FINISH GRADE. WIRES SHALL SHARE MAINLINE TRENCHING WHEREVER POSSIBLE.
9. FINISH GRADE
10. ELECTRICAL SOURCE PER ALL APPLICABLE ELECTRICAL CODES

NOTE: CONTRACTOR SHALL PROVIDE AND INSTALL AN EIGHT FOOT LONG COPPER GROUNDING ROD INTO THE GROUND FOR CONTROLLER. PROVIDE PROPER INSTALLATION FOR CONTROLLER PER MANUFACTURER RECOMMENDATIONS.

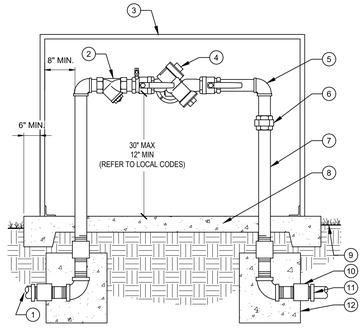
1 WALL MOUNT CONTROLLER
SCALE: NOT TO SCALE



NOTE:
MOUNT ON ANY SURFACE WHERE IT WILL BE EXPOSED TO UNOBSTRUCTED RAINFALL, BUT NOT IN PATH OF SPRINKLER SPRAY.

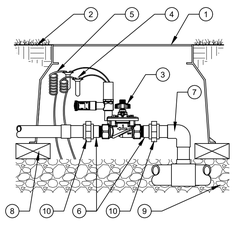
1. EXTERIOR WALL OR POLL
2. RAIN SENSOR

2 WEATHER SENSOR
SCALE: NOT TO SCALE



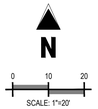
1. TO POINT OF CONNECTION- ADAPT AS NECESSARY ALL WORK SHALL CONFORM TO ALL APPLICABLE CODES
2. BRASS WYE STRAINER W/60 MESH SCREEN
3. ENCLOSURE PER IRRIGATI0N LEGEND
4. BACKFLOW PREVENTER UNIT
5. BRASS 90 DEGREE ELLS (TYP.)
6. BRASS UNION (TYPICAL)
7. BRASS NIPPLES (TYPICAL)
8. 4" CONCRETE PAD - SLOPE TO DRAIN AWAY FROM BACKFLOW PREVENTER
9. FINISH GRADE 2" BELOW PAD
10. BRASS COUPLING
11. PIPE ADAPTER AND MAINLINE PIPE
12. 12"X12"X12" THRUST BLOCKS

3 BACKFLOW PREVENTER, REDUCED PRESSURE
SCALE: NOT TO SCALE



1. STANDARD VALVE BOX EQUIPMENT TYPE BRAND ONTO BOX LID
2. FINISH GRADE
3. REMOTE CONTROL VALVE
4. WATERPROOF CONNECTORS (2)
5. 18-24" COILED WIRE
6. SCH 80 T.O.E. NIPPLE
7. MAIN LINE PIPE & FITTINGS
8. BRICK SUPPORTS (4)
9. 3/4" MINUS WASHED GRAVEL
10. PVC SLIP UNIONS

4 MASTER VALVE
SCALE: NOT TO SCALE



IRRIGATION CONTROLLER 'B'

VALVE NUMBER	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
VALVE SIZE	1.0"	1.0"	1.0"	1.0"	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
G.P.M.	2.7	5.9	6.5	2.6	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
OPERATION PSI	40	40	40	40	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN
ZONE TYPE	DRIP	DRIP	DRIP	DRIP	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN

REVISIONS
◇ PRE-BID SET ISSUE DATE △ POST BID SET ISSUE DATE

DATE	DESCRIPTION

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LOWE'S

SITE PLAN CONSTRUCTION DOCUMENTS
IRRIGATION PLAN
LOWE'S OF:
ERIE, COLORADO

PROJECT No: ED000018.20 | DRAWN BY: SRA | CHECKED BY: DTT

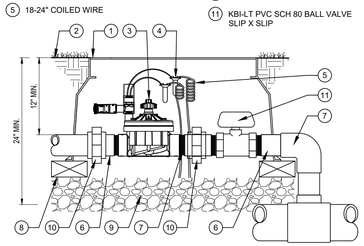
CRITERIA
ISSUE DATE: 11.21.19
PERMIT SET
ISSUE DATE:
CONSTRUCTION SET
ISSUE DATE:
DRAWING NUMBER:

IR1.5

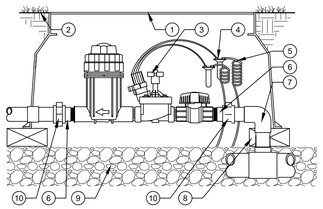
NINE MILE CORNER - SITE PLAN CONSTRUCTION DOCUMENTS

A PORTION OF NE 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST AND THE
SOUTHEAST QUARTER OF SECTION 27, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE OF THE
6TH PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, COLORADO
SITE PLAN: SP-001117-2019

1. STANDARD VALVE BOX EQUIPMENT TYPE BRAND ONTO BOX LID
2. FINISH GRADE
3. REMOTE CONTROL VALVE WITH FILTER SENTRY (FS')
4. WATERPROOF CONNECTORS (2)
5. 18-24" COILED WIRE
6. SCH 80 T.O.E. NIPPLE
7. MAIN LINE PIPE & FITTINGS
8. BRICK SUPPORTS (4)
9. 3/4" MINUS WASHED GRAVEL
10. PVC SLIP UNIONS
11. KBILLT PVC SCH 80 BALL VALVE SLIP X SLIP

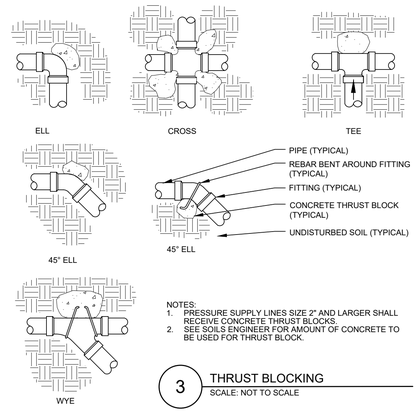


1 REMOTE CONTROL VALVE
SCALE: NOT TO SCALE



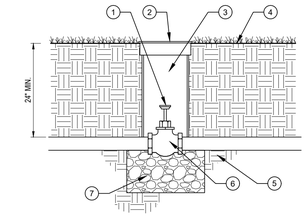
1. STANDARD VALVE BOX, BRAND EQUIPMENT TYPE AND ZONE NUMBER ONTO LID
2. FINISH GRADE
3. DRIP ZONE KIT PER PLAN
4. WATERPROOF CONNECTORS (2)
5. 18-24" COILED WIRE
6. SCH 80 T.O.E. NIPPLE
7. MAIN LINE PIPE & FITTINGS
8. BRICK SUPPORTS (4)
9. 6" MINIMUM LAYER OF 3/4" MINUS WASHED GRAVEL
10. PVC SLIP UNIONS

2 REMOTE DRIP CONTROL VALVE
SCALE: NOT TO SCALE



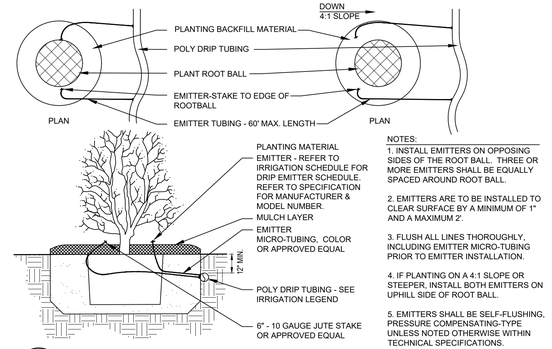
NOTES:
1. PRESSURE SUPPLY LINES SIZE 2" AND LARGER SHALL RECEIVE CONCRETE THRUST BLOCKS.
2. SEE SOILS ENGINEER FOR AMOUNT OF CONCRETE TO BE USED FOR THRUST BLOCK.

3 THRUST BLOCKING
SCALE: NOT TO SCALE



1. KEY HEAD PER HEAD
2. 9" ROUND VALVE BOX-EQUIPMENT TYPE BRAND ONTO BOX LID
3. 4" PVC SLEEVE
4. FINISH GRADE AT 1" BELOW TOP OF BOX IN TURF AREAS. 2" BELOW TOP OF BOX IN SHRUB/GROUNDCOVER AREAS
5. IRRIGATION MAINLINE
6. GATE VALVE (SIZED PER MAINLINE)
7. 1' DIA. x 12-INCH MINIMUM DEPTH OF ¾-INCH CRUSHED ROCK

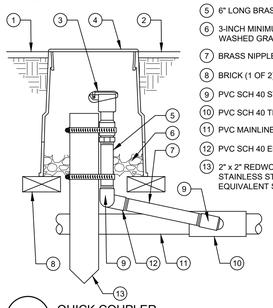
4 GATE STOP VALVE
SCALE: NOT TO SCALE



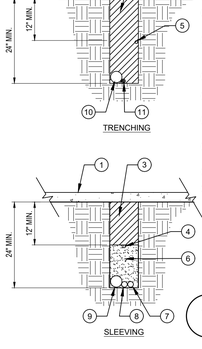
NOTES:
1. INSTALL EMITTERS ON OPPOSING SIDES OF THE ROOT BALL. THREE OR MORE EMITTERS SHALL BE EQUALLY SPACED AROUND ROOT BALL.
2. EMITTERS ARE TO BE INSTALLED TO CLEAR SURFACE BY A MINIMUM OF 1" AND A MAXIMUM 2'.
3. FLUSH ALL LINES THOROUGHLY, INCLUDING EMITTER MICRO-TUBING PRIOR TO EMITTER INSTALLATION.
4. IF PLANTING ON A 4:1 SLOPE OR STEEPER, INSTALL BOTH EMITTERS ON UPHILL SIDE OF ROOT BALL.
5. EMITTERS SHALL BE SELF-FLUSHING, PRESSURE COMPENSATING-TYPE UNLESS NOTED OTHERWISE WITHIN TECHNICAL SPECIFICATIONS.

5 DRIP EMITTERS LAYOUT
SCALE: NOT TO SCALE

1. TOP OF MULCH
2. FINISHED GRADE-1" BELOW TOP OF BOX IN TURF AREAS, 2" IN SHRUB AREAS
3. QUICK-COUPLING VALVE
4. 10" ROUND PLASTIC VALVE BOX BY CARSON (OR EQUAL) EQUIPMENT TYPE BRAND ONTO BOX LID
5. 6" LONG BRASS NIPPLE
6. 3-INCH MINIMUM DEPTH OF 3/4-INCH WASHED GRAVEL
7. BRASS NIPPLE (LENGTH AS REQUIRED)
8. BRICK (1 OF 2)
9. PVC SCH 40 STREET ELL
10. PVC SCH 40 TEE OR ELL
11. PVC MAINLINE PIPE
12. PVC SCH 40 ELL
13. 2" x 2" REDWOOD STAKE WITH STAINLESS STEEL GEAR CLAMPS OR EQUIVALENT SUPPORT SYSTEM



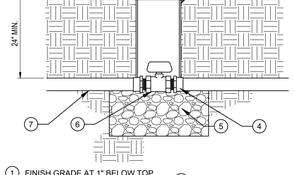
6 QUICK COUPLER
SCALE: NOT TO SCALE



1. PAVEMENT SURFACE
2. FINISH GRADE
3. TRENCH BACKFILL
4. LOCATOR WIRE W/BURIED CAUTION TAPE
5. PVC IRRIGATION LATERAL - BURIED MIN. 12" BELOW GRADE
6. SAND BACKFILL
7. PVC LATERAL SLEEVE SEE PLANS FOR SIZE
8. 2" MIN. PVC WIRE SLEEVE FOR CONTROL WIRES
9. PVC MAINLINE SLEEVE SEE PLANS FOR SIZE
10. PVC IRRIGATION MAINLINE
11. CONTROL WIRES - TAPE TO MAINLINE AT 10' INTERVALS

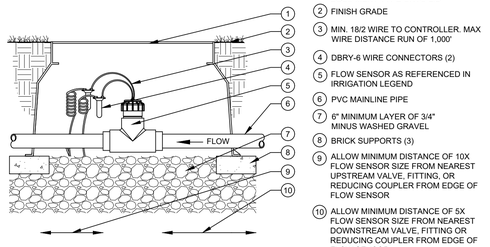
NOTE:
EXTEND SLEEVES INTO LANDSCAPE AREAS 12" BEYOND EDGE OF HARDSCAPE

7 PIPE AND SLEEVE INSTALLATION
SCALE: NOT TO SCALE



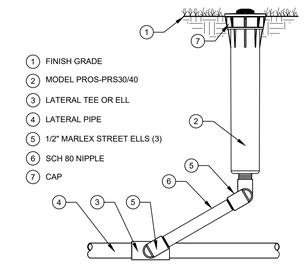
1. FINISH GRADE AT 1" BELOW TOP OF BOX IN TURF AREAS: 2" BELOW TOP OF BOX IN SHRUB/GROUNDCOVER AREAS
2. 9" ROUND VALVE BOX WITH LOCKABLE LID-EQUIPMENT TYPE BRAND ONTO BOX LID
3. EXTENSION SECTION AS NECESSARY TO MEET GRADE
4. PVC MALE ADAPTER
5. 3-INCH MINIMUM DEPTH OF ¾-INCH WASHED GRAVEL
6. PLASTIC BALL VALVE (SIZED PER MAINLINE)
7. IRRIGATION MAINLINE

8 PLASTIC BALL VALVE
SCALE: NOT TO SCALE



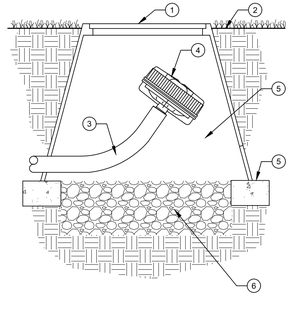
1. 10" DIA ROUND VALVE BOX, BRAND EQUIPMENT TYPE ONTO LID
2. FINISH GRADE
3. MIN. 18/2 WIRE TO CONTROLLER. MAX WIRE DISTANCE RUN OF 1,000'
4. DBRY-6 WIRE CONNECTORS (2)
5. FLOW SENSOR AS REFERENCED IN IRRIGATION LEGEND
6. PVC MAINLINE PIPE
7. 6" MINIMUM LAYER OF 3/4" MINUS WASHED GRAVEL
8. BRICK SUPPORTS (3)
9. ALLOW MINIMUM DISTANCE OF 10X FLOW SENSOR SIZE FROM NEAREST UPSTREAM VALVE, FITTING, OR REDUCING COUPLER FROM EDGE OF FLOW SENSOR
10. ALLOW MINIMUM DISTANCE OF 5X FLOW SENSOR SIZE FROM NEAREST DOWNSTREAM VALVE, FITTING OR REDUCING COUPLER FROM EDGE OF FLOW SENSOR

9 FLOW SENSOR
SCALE: NOT TO SCALE



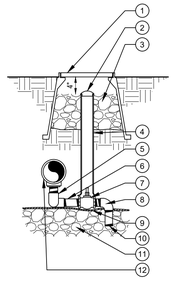
1. FINISH GRADE
2. MODEL PROS-PRS30/40
3. LATERAL TEE OR ELL
4. LATERAL PIPE
5. 1/2" MARLEX STREET ELLS (3)
6. SCH 80 NIPPLE
7. CAP

10 MP ROTATOR SPRINKLER
SCALE: NOT TO SCALE



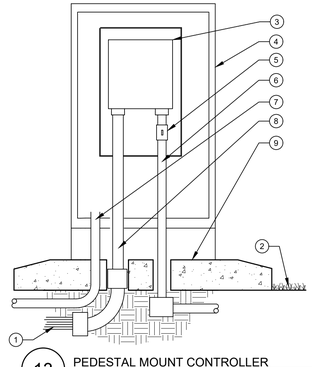
1. 6" DIA ROUND VALVE BOX, BRAND EQUIPMENT TYPE ONTO LID
2. FINISH GRADE
3. POLYPIPE DRIP LINE
4. AUTOMATIC FLUSH VALVE
5. BRICK SUPPORTS (3)
6. 6" MINIMUM LAYER OF 3/4" MINUS WASHED GRAVEL

11 FLUSH DRAIN VALVE
SCALE: NOT TO SCALE



1. CARSON-BROOKS VALVE BOX. EQUIPMENT TYPE BRAND ONTO BOX LID - REFER TO TECHNICAL SPECIFICATIONS
2. 2" VALVE MARKER
3. 3/4" CRUSHED GRAVEL SUMP 1 CU. FT.
4. 2" CL160 PVC ACCESS SLEEVE - LENGTH AS REQUIRED
5. 3/4" FxF SCH.80 PVC 90 ELL (2) 3/4"xCL PVC NIPPLE SCH. 80 (2)
6. 3/4"x6" SCH. 80 GALVANIZED STEEL NIPPLE
7. 3/4" McDONALD #6101 SERIES VALVE
8. 3/4" MxF SCH.40 PVC 90 ELL
9. SOIL BLANKET COVERING SUMP
10. 3/4"x4" PVC NIPPLE SCH. 80
11. 3/4" CRUSHED GRAVEL SUMP SEE TECHNICAL SPECIFICATIONS FOR SUMP SIZE
12. PRESSURE MAINLINE

12 MANUAL DRAIN VALVE
SCALE: NOT TO SCALE



1. DIRECT BURIAL CONTROL WIRES
2. FINISH GRADE
3. CONTROLLER MOUNTED IN VANDAL-RESISTANT ENCLOSURE
4. VANDAL-RESISTANT ENCLOSURE PER LEGEND
5. POWER SWITCH
6. POWER WIRES IN CONDUIT. INSTALL PER ALL APPLICABLE CODES
7. 1-1/2" CONDUIT FOR SENSOR AND FLOW METER CABLE
8. 2" PVC CONDUIT AND SWEEP WITH CONTROL AND COMMON WIRES
9. CONCRETE BASE PER MANUFACTURER'S SPECIFICATIONS

NOTE: CONTRACTOR SHALL PROVIDE AND INSTALL AN EIGHT FOOT LONG COPPER GROUNDING ROD INTO THE GROUND FOR CONTROLLER. PROVIDE PROPER INSTALLATION FOR CONTROLLER PER MANUFACTURER RECOMMENDATIONS.

13 PEDESTAL MOUNT CONTROLLER
SCALE: NOT TO SCALE

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SITE PLAN CONSTRUCTION DOCUMENTS
EDI18_L_IR1.1-IRRIGATION - IR1.6
LOWE'S OF:
ERIE, COLORADO
PROJECT No: EDI000018.28 | DRAWN BY: SRA | CHECKED BY: DTT

CRITERIA
ISSUE DATE: 11.21.19
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ISSUE DATE:
CONSTRUCTION SET
ISSUE DATE:
DRAWING NUMBER:

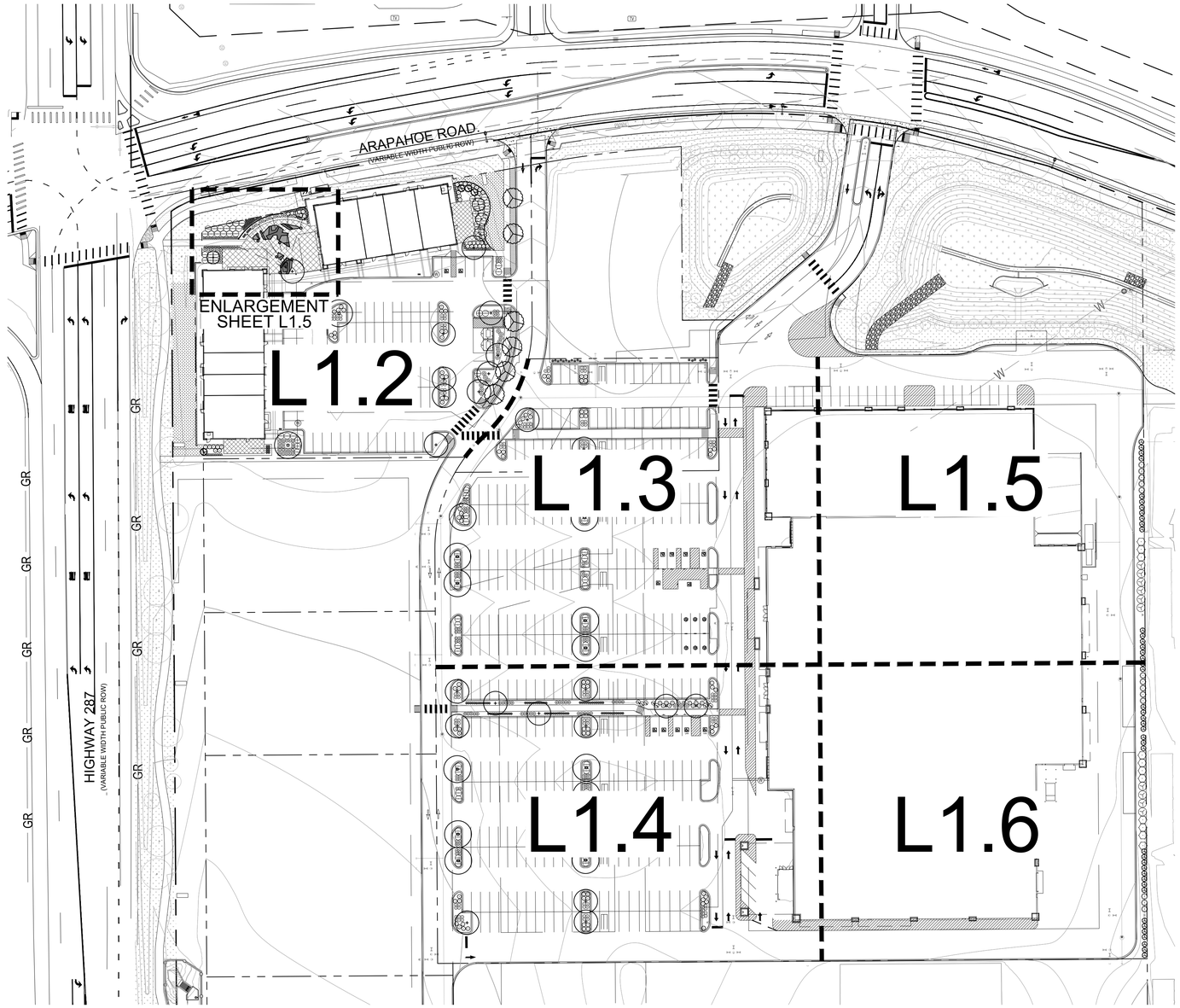
IR1.6

IF TRANSFORMERS, GROUND MOUNTED HVAC EQUIPMENT, UTILITY PEDESTALS, ETC. ARE NOT SHOWN ON THE SITE IMPROVEMENT PLAN, ADDITIONAL LANDSCAPING/SCREENING MAY BE REQUIRED BASED UPON FIELD CONDITIONS DISCOVERED VIA THE SITE INSPECTION BY STAFF, MADE PRIOR TO THE ISSUANCE OF THE CERTIFICATE OF OCCUPANCY, OR FINAL INSPECTION AS APPLICABLE.

NINE MILE CORNER - SITE PLAN CONSTRUCTION DOCUMENTS

A PORTION OF NE 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST AND THE SOUTHEAST QUARTER OF SECTION 27, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE OF THE 6TH PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, COLORADO

SITE PLAN: SP-001117-2019



PLANTING LEGEND

LEGEND ABBREV.	QTY	BOTANIC NAME	COMMON NAME	PLANTING SIZE (MINIMUM)	MATURE SIZE	WATER USE (VL,L,M,H)
DECIDUOUS TREES						
GIBI	6	GINKGO BILOBA 'AUTUMN GOLD'	AUTUMN GOLD GINKGO	2.5" CAL. B&B	40'X30'	M
GLTR	23	GLEDITSIA TRIACANTHOS INERMIS 'SHADEMASTER'	SHADEMASTER HONEYLOCUST	2.5" CAL. B&B	50'X35'	L
GYDI	16	GYMNOCLADUS DIOICUS	KENTUCKY COFFEETREE	2.5" CAL. B&B	60'X50'	L
EVERGREEN TREES						
PIGL	4	PICEA GLAUCA 'DENSATA'	BLACK HILLS SPRUCE	8' HEIGHT B&B	20'X10'	M
ORNAMENTAL TREES						
ACTA	5	ACER TATARICUM 'HOT WINGS'	HOT WINGS MAPLE	1.5" CAL. B&B	25'X20'	M
UPRIGHT JUNIPERS						
JUVI	13	JUNIPERUS VIRGINIANA 'SKYROCKET'	SKYROCKET JUNIPER	#5 CONT. 3' HEIGHT	20'X5'	VL
DECIDUOUS SHRUBS						
AMCA	10	AMORPHA CANESCENS	LEADPLANT	#5 CONT. 18-24"	4'X4'	VL
CACL	114	CARYOPTERIS X CLANDONENSIS	BLUE MIST SPIREA	#5 CONT. 18-24"	3'X3'	VL
CHNA	20	CHRYSOTHAMNUS NAUSEOSUS	RABBITBRUSH	#5 CONT. 18-24"	4'X4'	VL
COCO	10	COTINUS COGGYGRIA	PURPLE SMOKE TREE	#5 CONT. 18-24"	15'X8'	L/M
GELY	126	GENISTA 'LYDIA'	LYDIA WOADWAXEN	#5 CONT. 18-24"	2'X2'	VL
PEAT	8	PEROVSKIA ATRIPLICIFOLIA	RUSSIAN SAGE	#5 CONT. 18-24"	4'X4'	VL
POFR	51	POTENTILLA FRUTICOSA 'FARGO'	DAKOTA SUNSPOT POTENTILLA	#5 CONT. 18-24"	3'X3'	L/M
POTA	101	POTENTILLA FRUTICOSA 'TANGERINE'	TANGERINE POTENTILLA	#5 CONT. 18-24"	2'X3'	L/M
PRBE	93	PRUNUS BESSEYI 'PAWNEE BUTTES'	PAWNEE BUTTES SAND CHERRY	#5 CONT. 18-24"	18"X6'	VL
SYVU	11	SYRINGA VULGARIS	COMMON PURPLE LILAC	#5 CONT. 18-24"	15'X8'	VL
EVERGREEN SHRUBS						
ARPA	137	ARCTOSTAPHYLOS 'PANCHITO'	PANCHITO MANZANITA	#5 CONT. 18-24"	2'X4'	VL
MAAQ	42	MAHONIA AQUIFOLIUM	OREGON GRAPE HOLLY	#5 CONT. 18-24"	6'X5'	VL
MISCELLANEOUS						
	1,218 SF	FESCUE SOD	RTF (RHIZOMATOUS TALL FESCUE)	SOD		M
	1,495 SF	NATIVE SEED	NATIVE SEED TO MATCH MASTER DEVELOPMENT	SEED		L
	23,428 SF	ROCK COBBLE MULCH	2"-4" ROCK COBBLE MULCH WITH WOOD MULCH RING AROUND ALL PLANT MATERIAL, SEE PLANTING NOTES & DETAILS	MULCH		N/A
	AS NEEDED	WOOD MULCH	DARK BROWN SHREDDED HARDWOOD MULCH	MULCH		N/A
	100 LF	STEEL EDGING	BLACK STEEL EDGING, SEE LANDSCAPE NOTE	EDGING		N/A
	AS SHOWN	LANDSCAPE BY OTHERS	LANDSCAPE PER MASTER DEVELOPMENT, NOT THIS SUBMITTAL	LS		N/A

LANDSCAPE CALCULATIONS

CODE SECTION	REQUIREMENT	CALCULATION	REQUIRED	PROVIDED
10-6-4E 1A	1 TREE PER 40 LF OF STREET FRONTAGE	INCLUDED IN MASTER DEVELOPMENT	INCLUDED IN MASTER DEVELOPMENT	INCLUDED IN MASTER DEVELOPMENT
10-6-4E 7B	15% GROSS SITE AREA LANDSCAPED	523,634 SF GROSS SITE AREA	78,545 SF LANDSCAPE AREA	26,141 SF LANDSCAPE AREA*
10-6-4E 7C1	1 TREE PER 1,000 SF OF LANDSCAPE AREA	78,545 SF REQUIRED LANDSCAPE AREA	79 TREES	20 TREES**
10-6-4E 7C2	1 SHRUB PER 150 SF OF LANDSCAPE AREA	78,545 SF REQUIRED LANDSCAPE AREA	524 SHRUBS	234 SHRUBS** (60 SHRUBS SUB FOR 6 TREES)
10-6-4E 8E1	1 TREE PER 15 PARKING SPACES	506 PARKING SPACES	34 TREES	34 TREES
10-6-4E 8E2	1 SHRUB PER PARKING SPACE	506 PARKING SPACES	506 SHRUBS	506 SHRUBS

*52,404 SF OF LANDSCAPE AREA AND ASSOCIATED 52 TREES & 349 SHRUBS WILL BE PROVIDED WITH TRACTS C, D & E IN THE MASTER DEVELOPMENT PLANS.

REVISIONS
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SITE PLAN CONSTRUCTION DOCUMENTS
LANDSCAPE PLAN
LOWE'S OF:
ERIE, COLORADO

PROJECT No: ED000018.20 | DRAWN BY: SRA | CHECKED BY: DTT

CRITERIA
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L1.1

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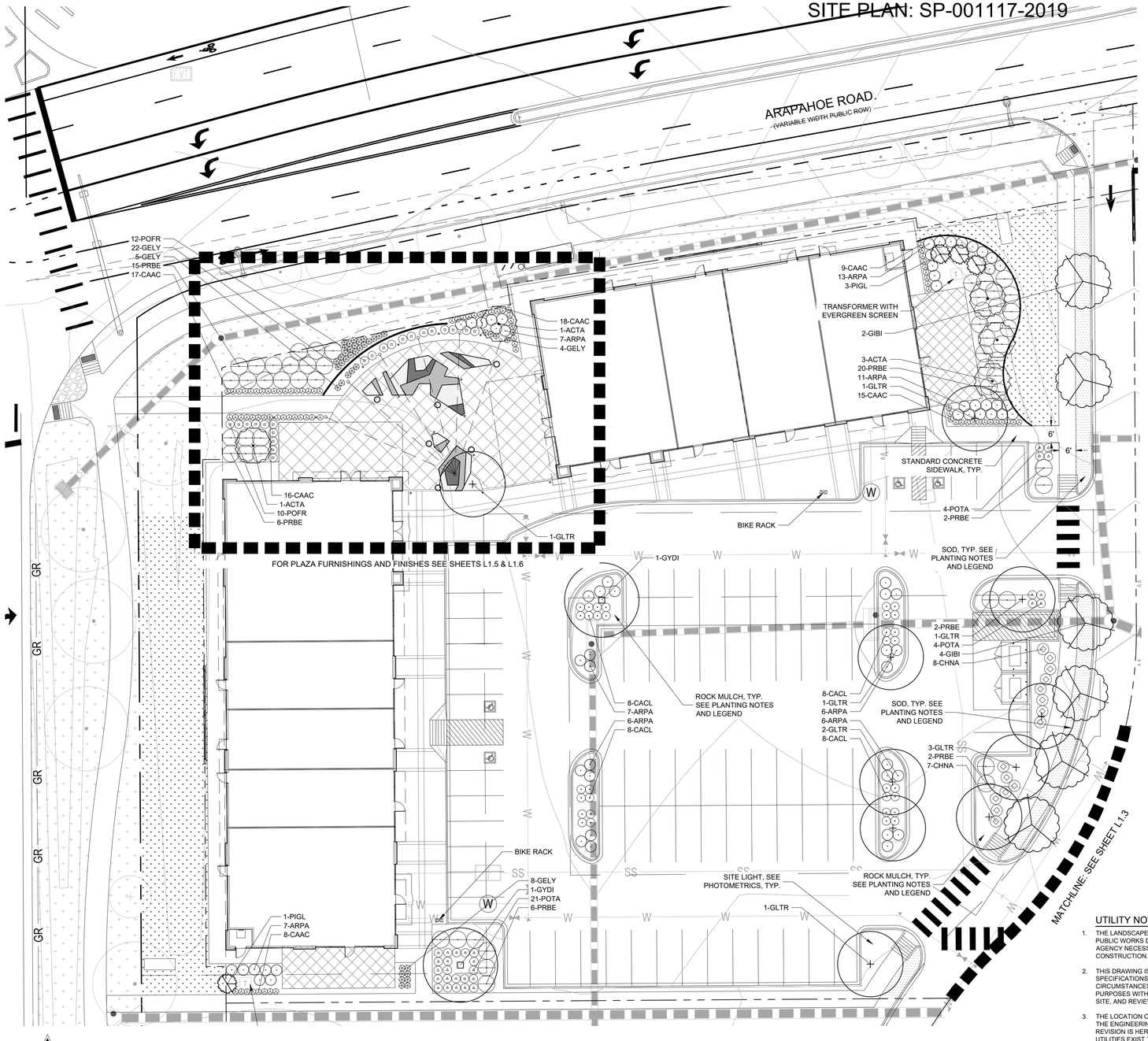
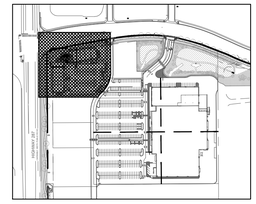
SITE PLAN: SP-001117-2019



KEY MAP



UTILITY NOTES

1. THE LANDSCAPE CONTRACTOR IS REQUIRED TO CONTACT THE COUNTY PUBLIC WORKS DEPARTMENT, AND ANY OTHER PUBLIC OR PRIVATE AGENCY NECESSARY FOR UTILITY LOCATION PRIOR TO ANY CONSTRUCTION.
2. THIS DRAWING IS A PART OF A COMPLETE SET OF BID DOCUMENTS, SPECIFICATIONS, ADDITIONAL DRAWINGS, AND EXHIBITS. UNDER NO CIRCUMSTANCES SHOULD THESE PLANS BE USED FOR CONSTRUCTION PURPOSES WITHOUT EXAMINING ACTUAL LOCATIONS OF UTILITIES ON SITE, AND REVIEWING ALL RELATED DOCUMENTS.
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REVISIONS

PRE-BID SET ISSUE DATE | POST BID SET ISSUE DATE

DATE	DESCRIPTION

Evergreen Development | Services | Investments

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Greenwood Village, CO 80111
303.770.8884
GallowayUS.com

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LOWE'S

SITE PLAN CONSTRUCTION DOCUMENTS
LANDSCAPE PLAN
LOWE'S OF:
ERIE, COLORADO

PROJECT No: EDI0000182 | DRAWN BY: SRA | CHECKED BY: DTT

CRITERIA
ISSUE DATE: 11.21.19

PERMIT SET
ISSUE DATE:

CONSTRUCTION SET
ISSUE DATE:

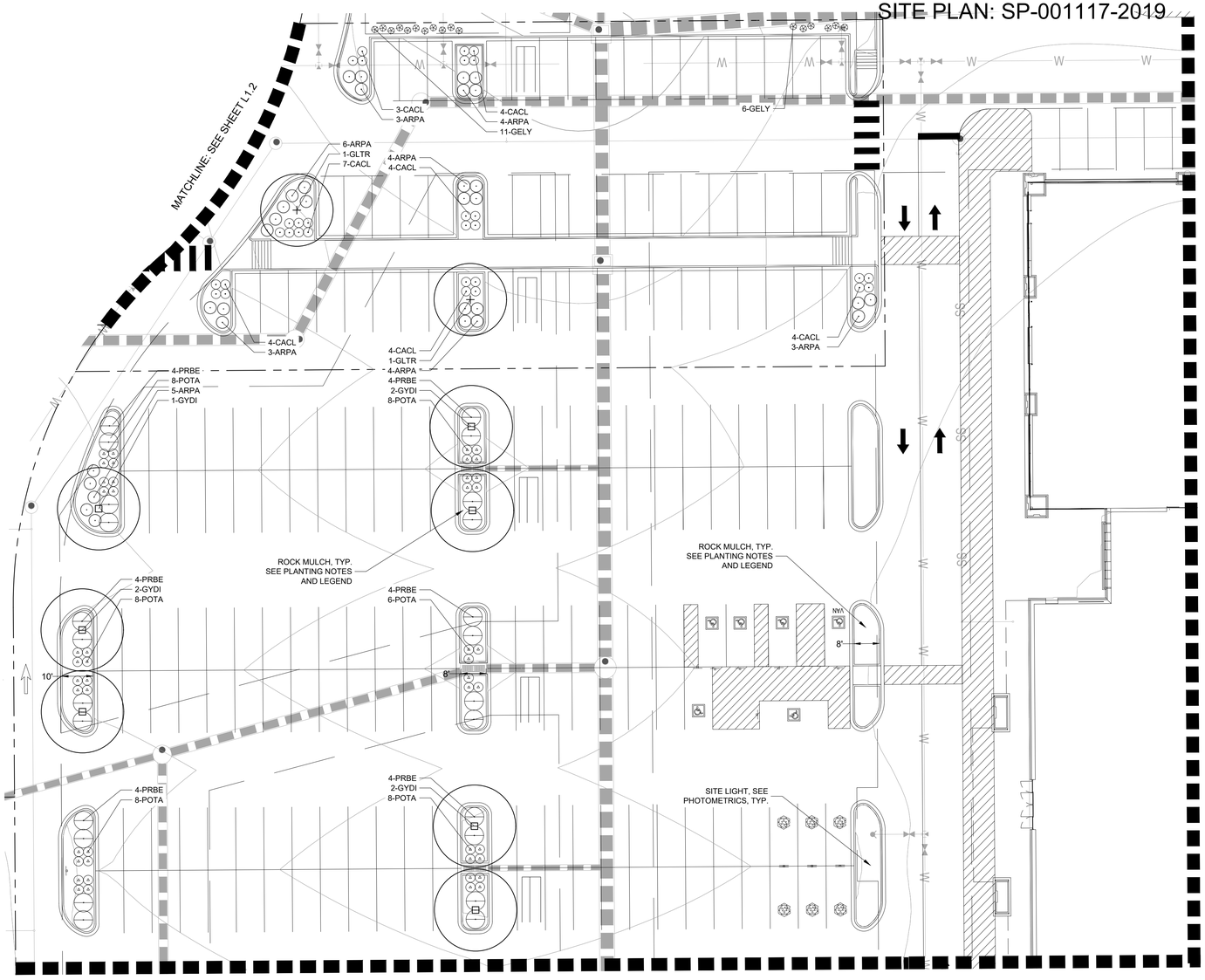
DRAWING NUMBER:
L1.2

IF TRANSFORMERS, GROUND MOUNTED HVAC EQUIPMENT, UTILITY PEDESTALS, ETC. ARE NOT SHOWN ON THE SITE IMPROVEMENT PLAN, ADDITIONAL LANDSCAPING/SCREENING MAY BE REQUIRED BASED UPON FIELD CONDITIONS DISCOVERED VIA THE SITE INSPECTION BY STAFF, MADE PRIOR TO THE ISSUANCE OF THE CERTIFICATE OF OCCUPANCY, OR FINAL INSPECTION AS APPLICABLE.

NINE MILE CORNER - SITE PLAN CONSTRUCTION DOCUMENTS

A PORTION OF NE 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST AND THE SOUTHEAST QUARTER OF SECTION 27, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE OF THE 6TH PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, COLORADO

SITE PLAN: SP-001117-2019



N

0 10 20

SCALE: 1"=20'

UTILITY NOTES

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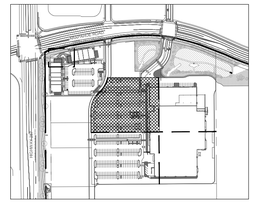
KEY MAP



REVISIONS

◇ PRE-BID SET ISSUE DATE △ POST BID SET ISSUE DATE

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LANDSCAPE PLAN
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ERIE, COLORADO

PROJECT No: ED000018.20 | DRAWN BY: SRA | CHECKED BY: DTT

CRITERIA
ISSUE DATE: 11.21.19

PERMIT SET
ISSUE DATE:

CONSTRUCTION SET
ISSUE DATE:

DRAWING NUMBER:

L1.3

IF TRANSFORMERS, GROUND MOUNTED HVAC EQUIPMENT, UTILITY PEDESTALS, ETC. ARE NOT SHOWN ON THE SITE IMPROVEMENT PLAN, ADDITIONAL LANDSCAPING/SCREENING MAY BE REQUIRED BASED UPON FIELD CONDITIONS DISCOVERED VIA THE SITE INSPECTION BY STAFF, MADE PRIOR TO THE ISSUANCE OF THE CERTIFICATE OF OCCUPANCY, OR FINAL INSPECTION AS APPLICABLE.

NINE MILE CORNER - SITE PLAN CONSTRUCTION DOCUMENTS

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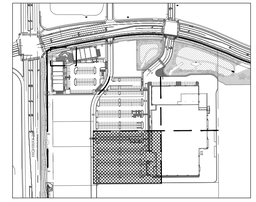
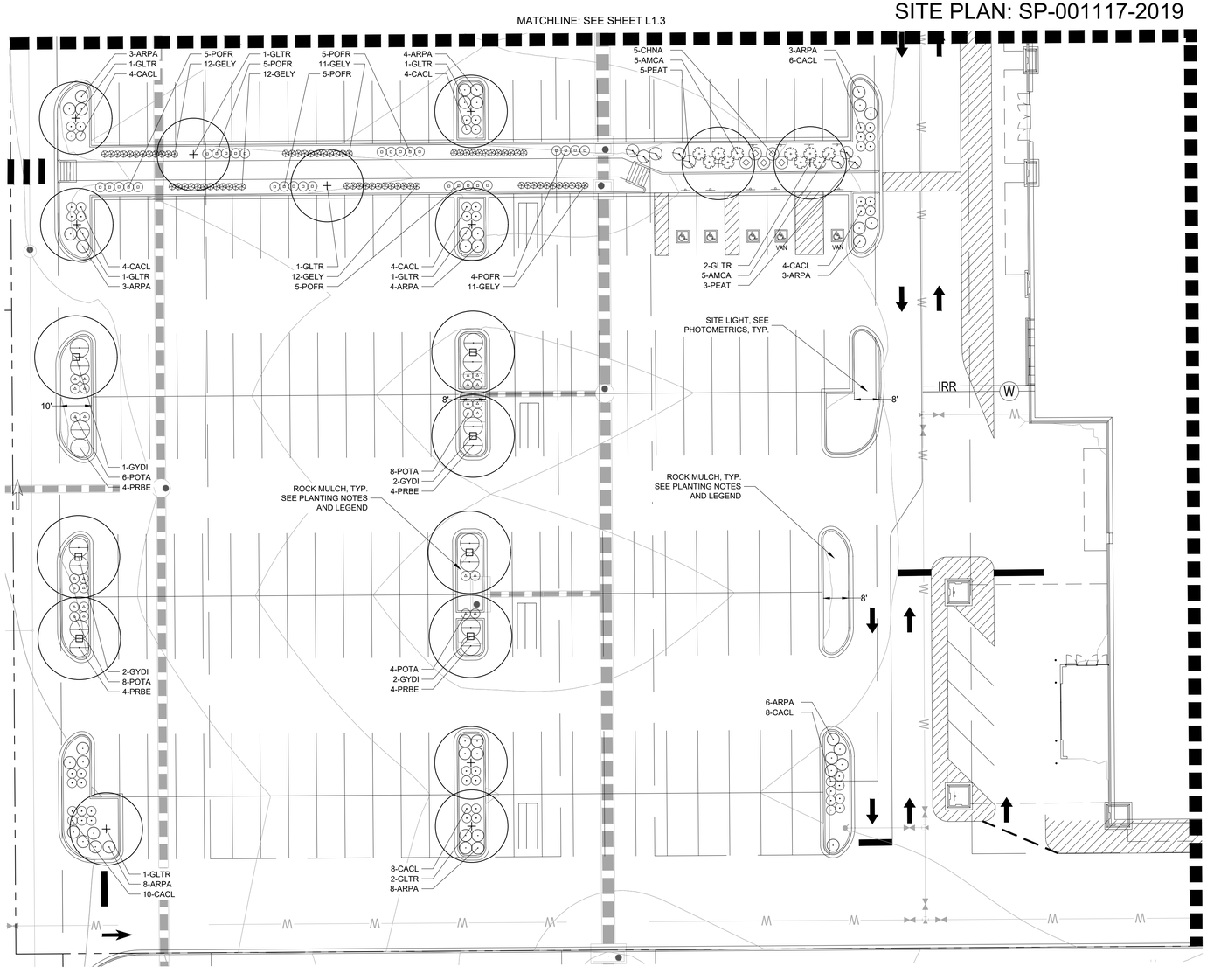
SITE PLAN: SP-001117-2019

KEY MAP





N

0 10 20

SCALE: 1"=20'

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LANDSCAPE PLAN
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ERIE, COLORADO

PROJECT No: ED0000118.20 | DRAWN BY: SRA | CHECKED BY: DTT

CRITERIA
ISSUE DATE: 11.21.19

PERMIT SET
ISSUE DATE:

CONSTRUCTION SET
ISSUE DATE:

DRAWING NUMBER:

L1.4

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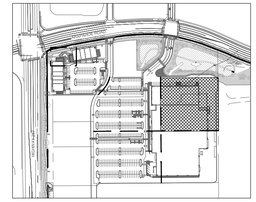
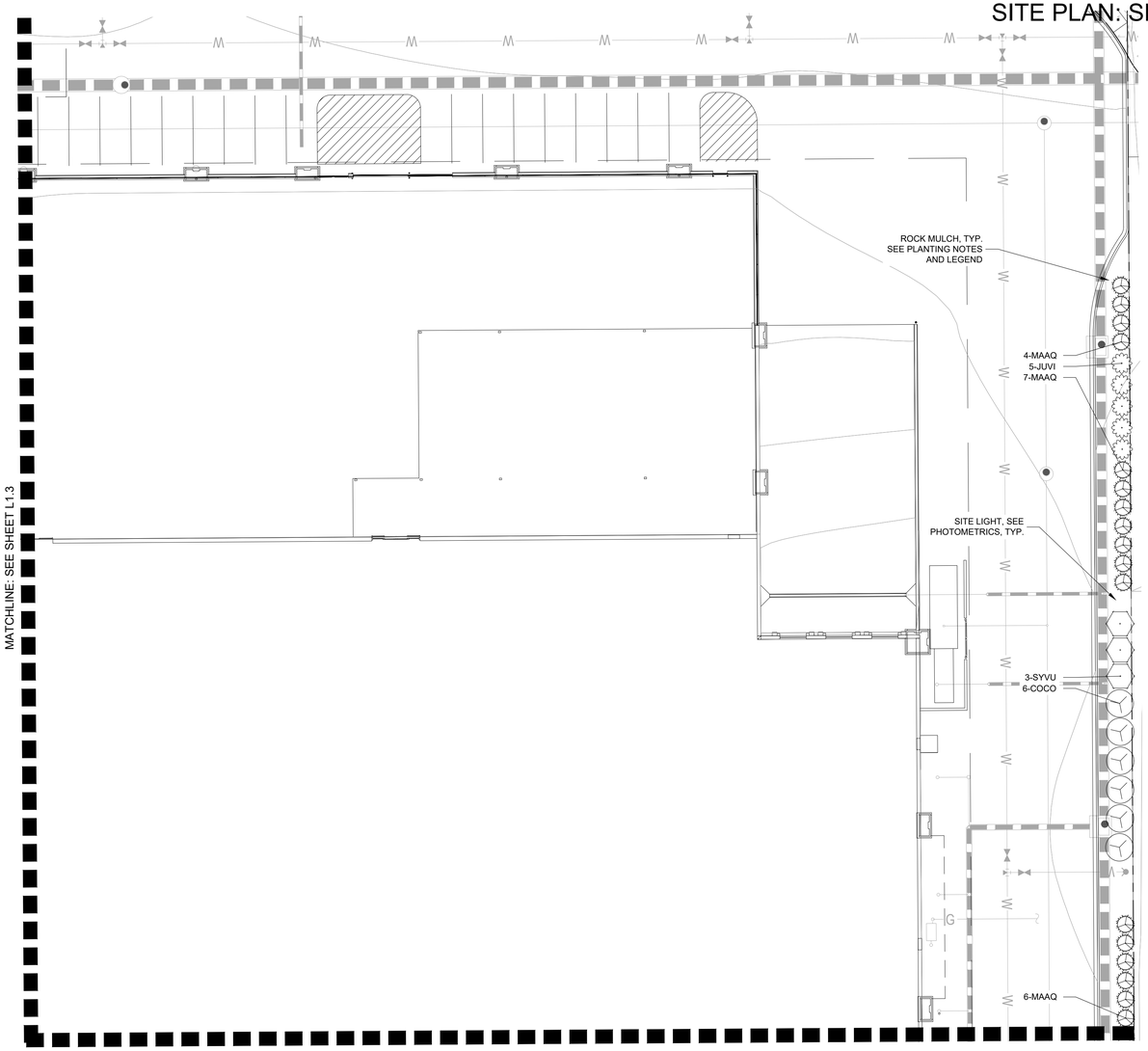
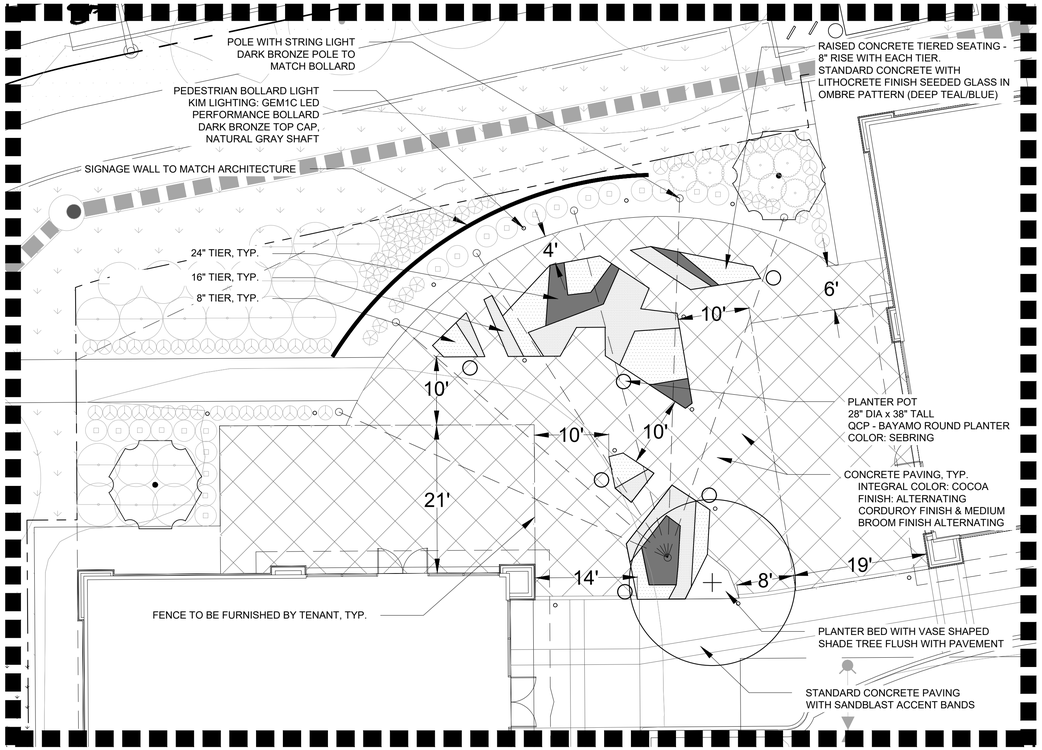
SITE PLAN: SP-001117-2019

KEY MAP





MATCHLINE: SEE SHEET L1.6



PLAZA ENLARGEMENT: SEE DETAILS SHEET L1.6

N

0 5 10

SCALE: 1"=10'

N

0 10 20

SCALE: 1"=20'

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SITE PLAN CONSTRUCTION DOCUMENTS
LANDSCAPE PLAN
LOWE'S OF:
ERIE, COLORADO

PROJECT No: ED#00018.20 | DRAWN BY: SRA | CHECKED BY: DTT

CRITERIA ISSUE DATE:	11.21.19
PERMIT SET ISSUE DATE:	
CONSTRUCTION SET ISSUE DATE:	
DRAWING NUMBER:	L1.5

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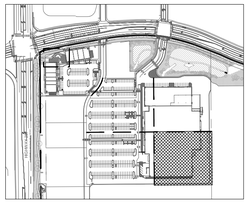
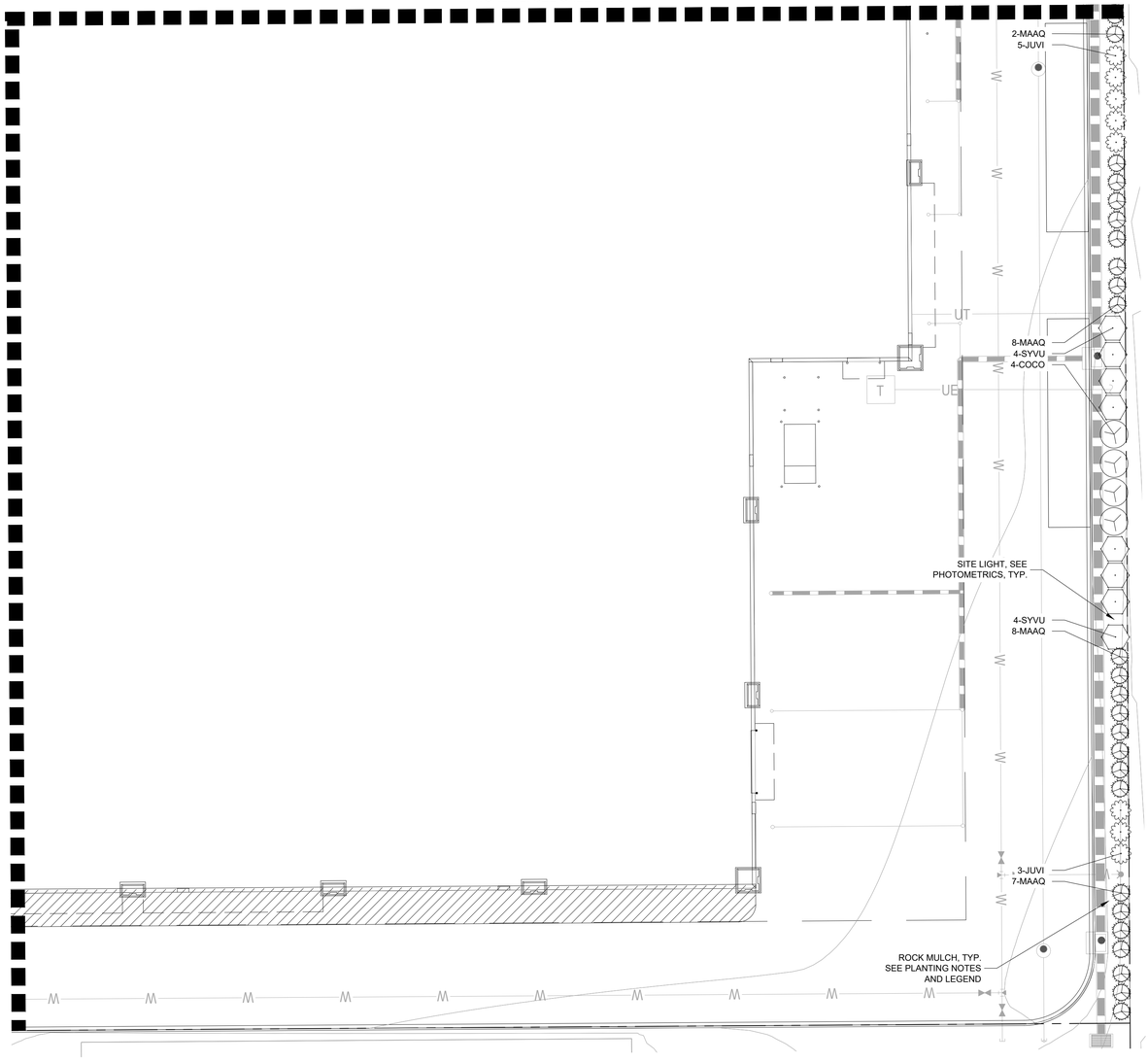
SITE PLAN: SP-001117-2019

KEY MAP



MATCHLINE: SEE SHEET L1.5



MATCHLINE: SEE SHEET L1.4

N

0 10 20

SCALE: 1"=20'

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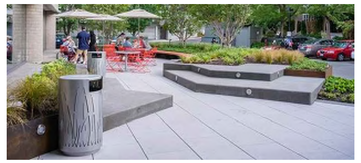

CONCRETE TIERED SEATING
8" CONCRETE TIERS

FINISH: LITHOCRETE WITH SEEDED GLASS
CONCRETE COLOR: STANDARD
GLASS COLOR: DEEP TEAL/BLUE
LOCATION: SEE PLANS

A TIERED SEATING

NOT TO SCALE

PLAZA CONCRETE
ALTERNATING CORDUROY AND BROOM FINISH

DIMENSIONS: 24" X 24" SCORE JOINTS, ALTERNATE FINISH IN GROUPS OF 4 TILES
COLOR: COCOA DAVIS COLOR
LOCATION: SEE PLANS

SHOPS: STORE FRONT PAVING
STANDARD CONCRETE WITH MEDIUM SANDBLAST ACCENT BANDS

DIMENSIONS: SEE PLANS
COLOR : NO ADDED COLOR

B PAVING FINISHES

NOT TO SCALE

BAYAMO ROUND PLANTER
QCP

SIZE: 28" DIAMETER X 36" HEIGHT
COLOR & FINISH: SEBRING SRC
LOCATION: SEE PLANS
AVAILABLE: QCP-CORP.COM

C PLANTER POT

NOT TO SCALE

STRING LIGHTS
NEW HOUSE LIGHTING

OUTDOOR WEATHERPROOF
COMMERCIAL GRADE LED STRING LIGHTS WITH HANGING SOCKETS AND DIMMER.
MOUNTING: ROUND ALUMINUM
NON-TAPERED POLE BY KIM LIGHTING - BRONZE TO MATCH BOLLARDS
LOCATION: SEE PLANS

D STRING LIGHTS

NOT TO SCALE

SAGE LITTER RECEPTACLE
VICTOR STANLEY

MATERIAL: PERFORATED STEEL
SIZE: 36 GALLON
COLOR: BRONZE
LOCATION: TBD

E TRASH RECEPTACLE

NOT TO SCALE

BK-4 TUBULAR STEEL BIKE RACK
VICTOR STANLEY

MATERIAL: STEEL
CAPACITY: 7 BIKES
COLOR: BRONZE
MOUNT: SURFACE
LOCATION: SEE PLANS

F BIKE RACK

NOT TO SCALE

REVISIONS

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SITE PLAN CONSTRUCTION DOCUMENTS
LANDSCAPE PLAN
LOWE'S OF:
ERIE, COLORADO

PROJECT No: EI0300018.20 | DRAWN BY: SRA | CHECKED BY: DTT

CRITERIA
ISSUE DATE: 11.21.19
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L1.6

NINE MILE CORNER - SITE PLAN CONSTRUCTION DOCUMENTS

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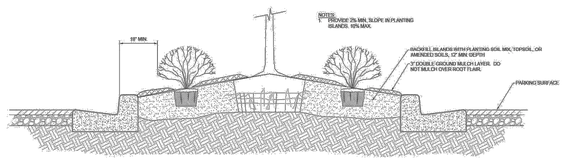
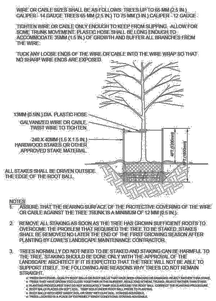
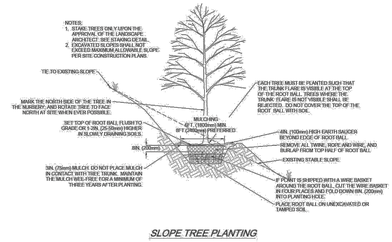
SITE PLAN: SP-001117-2019



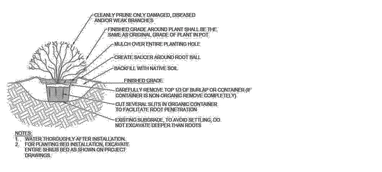
ISLAND PLANTING DETAIL



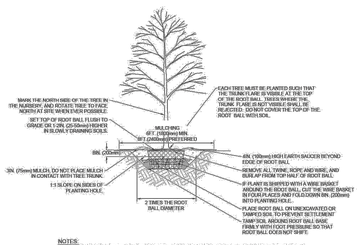
TREE STAKING DETAIL
TREES 3IN. CALIPER OR LESS



SLOPE TREE PLANTING



SHRUB DETAIL - POTTED



NOTES:
1. "DO NOT HEAVILY PRUNE TREE AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO-DOMINANT LEADERS, AND BROKEN OR DEAD BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED; HOWEVER, DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN.
2. STAKE TREES ONLY UPON THE APPROVAL OF THE LANDSCAPE ARCHITECT. SEE STAKING DETAIL.
3. WRAP TREE TRUNKS ONLY UPON THE APPROVAL OF THE LANDSCAPE ARCHITECT. SEE WRAPPING DETAIL.
4. MASONRY MIX=EXISTING SOIL IN SANDY LOAM SOILS, ADD 20% MIX, BY VOLUME COMPOSTED ORGANIC MATERIAL TO THE EXISTING SOIL.

TREE PLANTING DETAIL
B&B TREES IN ALL SOIL TYPES

LOWES STANDARD LANDSCAPE NOTES

1. LANDSCAPE CONTRACTOR SHALL VERIFY LOCATIONS OF ALL UNDERGROUND UTILITIES AND ASSOCIATED EASEMENTS PRIOR TO EXCAVATION AND PLANTING AND PROTECT ALL EXISTING TREES, SHRUBS AND OTHER SITE FEATURES, STRUCTURES AND UTILITIES WITHIN THE WORK AREA. THE LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DAMAGE RESULTING FROM NEGLECT OR FAILURE TO COMPLY WITH THIS REQUIREMENT.
2. ALL PLANT NAMES AND DESCRIPTIONS SHALL BE AS DEFINED IN HORTUS THIRD. ALL PLANT MATERIALS SHALL CONFORM TO THE AMERICAN STANDARD FOR NURSERY STOCK, ANSI Z60.1 ALL WORK SHALL CONFORM TO AMERICAN NATIONAL STANDARDS FOR TREE CARE OPERATIONS, ANSI A300, AMERICAN NATIONAL STANDARDS INSTITUTE.
3. IT IS THE LANDSCAPE CONTRACTORS RESPONSIBILITY TO VERIFY QUANTITIES OF PLANT MATERIAL NECESSARY TO COMPLETE THE PROJECT. WHERE DISCREPANCIES EXIST BETWEEN THE DRAWINGS AND THE PLANT LIST, THE DRAWINGS SHALL GOVERN. ANY DISCREPANCIES FOUND BY THE LANDSCAPE CONTRACTOR SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE LOWE'S PROJECT MANAGER.
4. PLANTING SHALL BE PERFORMED WITHIN ACCEPTABLE SEASONS FOR THE REGION, CLIMATIC CONDITION AND TYPE OF PLANT MATERIAL. IF SPECIAL CONDITIONS EXIST, THE LANDSCAPE CONTRACTOR SHALL OBTAIN WRITTEN PERMISSION FROM THE OWNER TO PLANT OUT OF SEASON. ANY VARIANCE IN THE PLANTING SEASON SHALL NOT AFFECT THE WARRANTEE PERIOD.
5. CLEAR, REMOVE, AND DISPOSE OF ANY BRUSH, SNAGS, AND TRASH WITHIN THE PLANTING AREA. GRADE AREA TO MATCH EXISTING LANDSCAPE.
6. EXCAVATE PLANTING HOLES WITH SIDE SLOPES AT A 45 DEGREE ANGLE TAKING CARE NOT TO GLAZE THE SIDES WITH EQUIPMENT USED. BOTTOM AREA OF THE PLANTING HOLE/BED SHALL SLOPE PARALLEL TO THE PROPOSED GRADES.
7. EXCAVATE PLANTING HOLES FOR INDIVIDUAL TREES AND SHRUBS TO THE DEPTH OF THE ROOT BALL AND TO WIDTHS SHOWN ON THE DRAWING. DO NOT OVER-EXCAVATE PLANTING HOLE AND BACKFILL PRIOR TO SETTING PLANT.
8. PLANTS SHALL BE SET ON UNEXCAVATED PADS AT THE SAME RELATIONSHIP TO FINISHED GRADE AS THEY WERE IN THE GROUND FROM WHICH THEY WERE DUG UNLESS OTHERWISE NOTED ON THE DRAWINGS. PLANTS ARE TO BE SET PLUMB AND BRACED IN POSITION UNTIL PLANTING BACKFILL MIX HAS BEEN PLACED AND TAMPED AROUND THE BASE OF THE ROOT BALL. PROPER PLANTING DEPTH REQUIRES THE ROOT FLARE TO BE AT OR SLIGHTLY ABOVE THE FINISHED GRADE.
9. LIFT PLANTS ONLY FROM BOTTOM OF ROOT BALLS OR WITH BELTS OR LIFTING HARNESSES OF SUFFICIENT WIDTH NOT TO DAMAGE THE ROOT BALLS. DO NOT LIFT TREES BY THEIR TRUNK OR USE THE TRUNK AS A LEVER IN POSITIONING OR MOVING THE TREE IN THE HOLE.
10. REMOVE ALL PLASTIC, PAPER, FIBER POTS OR TAGS FROM CONTAINERIZED PLANT MATERIALS. PULL ROOTS OUT OF A ROOT MAT AND CUT CIRCLING ROOTS WITH A SHARP KNIFE. INSTALL THE PLANT IMMEDIATELY AFTER REMOVING FROM THE CONTAINER.
11. CUT ROPES OR STRINGS FROM TOP OF ROOT BALL AFTER PLANT HAS BEEN SET. REMOVE BURLAP OR CLOTH WRAPPING AND ANY WIRE BASKETS FROM TOP HALF OF BALLS. DO NOT TURN UNDER OR BURY PORTIONS OF BURLAP AT TOP OF BALL. COMPLETELY REMOVE ANY SYNTHETIC WATERPROOF OR WATER-REPELLENT STRINGS OR WRAPPINGS FROM ROOT BALL AND TRUNK BEFORE BACKFILLING.
12. FORM WATERING SAUCERS IMMEDIATELY OUTSIDE AREA OF ROOT BALL OF EACH TREE AS INDICATED ON DRAWINGS. WATER ALL PLANS IMMEDIATELY AFTER PLANTING. APPLY WATER BY HOSE DIRECTLY TO ROOT BALL AND THE ADJACENT SOIL.
13. STAKE TREE ACCORDING TO DETAIL ON PLAN ONLY WHEN NECESSARY FOR SPECIFIC CONDITIONS ENCOUNTERED AND WITH APPROVAL OF OWNER. STAKING MAY BE REQUIRED IN SANDY SOILS OR IN WINDY LOCATIONS. SEE DETAILS FOR TRUNK WRAPPING AND/OR PRUNING REQUIREMENTS.
14. ALL TREES, SHRUBS, GROUND COVERS AND OTHER PLANTINGS SHALL BE MULCHED WITH MULCH DOUBLE SHREDDED HARDWOOD MULCH OR OTHER MULCH AS APPROVED AND SPECIFIED WITHIN 24 HOURS OF PLANTING. MULCH SHALL NOT BE PLACED WITHIN 3 INCHES (8 CM) OF THE TRUNKS OF TREES OR SHRUBS.
15. LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR ALL PLANT MATERIAL MAINTENANCE UNTIL FINAL ACCEPTANCE BY THE OWNER. LANDSCAPE CONTRACTOR IS REQUIRED TO NOTIFY OWNER IN WRITING OF ANY MAINTENANCE PRACTICE THAT MAY AFFECT ITS WARRANTEE DURING THE WARRANTEE PERIOD.
16. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH DIVISION 2 OF LOWE'S STANDARD SPECIFICATIONS.

LANDSCAPING SHALL BE PLANTED AND MAINTAINED IN A NEAT, CLEAN AND HEALTHY CONDITION BY THE OWNER. THIS SHALL INCLUDE PROPER PRUNING, MOWING AND AERATION OF LAWNS, REPLACEMENT OF MULCH, WEEDING, REMOVAL OF LITTER AND THE REGULAR WATERING OF ALL PLANTINGS. IRRIGATION SHALL BE MAINTAINED TO MAXIMIZE WATER CONSUMPTION. SHOULD ANY PLANT MATERIAL DIE, THE OWNER, SUCCESSOR, OR ASSIGNS SHALL BE RESPONSIBLE FOR THE REPLACEMENT OF PLANT(S) WITHIN ONE PLANTING SEASON. REPLACEMENT OF PLANT MATERIALS SHALL OCCUR AT THE FOLLOWING RATE.

TYPE	PLANT REPLACEMENT WITHIN	
	1 YEAR	2+ YEARS
TREE - DECIDUOUS	INCREASE CALIPER BY 1"	INCREASE CALIPER BY 1.5"
TREE - CONIFEROUS	INCREASE HEIGHT BY 1.5'	INCREASE HEIGHT BY 2'
SHRUB	REPLACE WITH PLANTS OF AT LEAST 1/2 MATURE SIZE	REPLACE WITH PLANTS OF AT LEAST 1/2 MATURE SIZE

PLANTING NOTES

GENERAL

1. ALL WORK SHALL CONFORM TO ALL APPLICABLE STATE AND LOCAL CODES, STANDARDS, AND SPECIFICATIONS.
2. LANDSCAPE DESIGN IS DIAGRAMMATIC IN NATURE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR HIS OWN TAKEOFFS AND QUANTITY CALCULATIONS. IN THE EVENT OF A DISCREPANCY BETWEEN THE PLAN AND THE LANDSCAPE LEGEND, THE PLANT QUANTITY AS SHOWN ON THE PLAN SHALL TAKE PRECEDENCE AND NOTIFY THE LANDSCAPE ARCHITECT OF THESE DISCREPANCIES. MINOR ADJUSTMENTS TO THE LANDSCAPE MATERIAL AND LOCATIONS MAY BE PROPOSED FOR CITY CONSIDERATION AT THE CONSTRUCTION DOCUMENT STAGE TO RESPOND TO MARKET AND FIELD CONDITIONS. HOWEVER, THERE SHALL BE NO REDUCTION IN THE NUMBER AND SIZE OF MATERIALS.
3. CONTRACTOR SHALL MAKE HIMSELF AWARE OF THE LOCATIONS OF EXISTING AND PROPOSED UTILITIES, AND SHALL BE RESPONSIBLE FOR ANY DAMAGE TO THE UTILITIES AND/OR ANY INJURY TO ANY PERSON. THIS DRAWING IS PART OF A COMPLETE SET OF CONTRACT DOCUMENTS. UNDER NO CIRCUMSTANCES SHOULD THIS PLAN BE USED FOR CONSTRUCTION PURPOSES WITHOUT EXAMINING ACTUAL LOCATIONS OF UTILITIES ON SITE AND REVIEW ALL RELATED PLANS AND DOCUMENTS.
4. ALL UTILITY EASEMENTS SHALL REMAIN UNOBSTRUCTED AND FULLY ACCESSIBLE ALONG THEIR ENTIRE LENGTH FOR MAINTENANCE EQUIPMENT.
5. THE CONTRACTOR SHALL TAKE EXTREME CARE NOT TO DAMAGE ANY EXISTING PLANTS INDICATED AS "TO REMAIN". ANY SUCH PLANTS DAMAGED BY THE CONTRACTOR SHALL BE REPLACED WITH THE SAME SPECIES, SIZE, AND QUANTITY AT THE CONTRACTOR'S OWN EXPENSE, AND AS ACCEPTABLE TO THE OWNER. REFER TO THE TREE PROTECTION NOTES ON THE PLANS (AS APPLICABLE).
6. LANDSCAPE CONTRACTOR SHALL EXAMINE THE SITE CONDITIONS UNDER WHICH THE WORK IS TO BE PERFORMED AND NOTIFY THE GENERAL CONTRACTOR IN WRITING OF UNSATISFACTORY CONDITIONS. IF SITE CONDITIONS OR PLANT AVAILABILITY REQUIRE CHANGES TO THE PLAN, THEN AN APPROVAL WILL BE OBTAINED FROM THE CITY. DO NOT PROCEED UNTIL CONDITIONS HAVE BEEN CORRECTED.
7. ALL CONSTRUCTION DEBRIS AND MATERIAL SHALL BE REMOVED AND CLEANED OUT PRIOR TO INSTALLATION OF TOPSOIL, TREES, SHRUBS, AND TURF.
8. FOR ALL INFORMATION ON SURFACE MATERIAL OF WALKS, DRIVES, AND PARKING LOTS, SEE THE SITE PLAN. SEE PHOTOMETRIC PLAN FOR FREE STANDING LIGHTING INFORMATION.
9. THE LANDSCAPE CONTRACTOR SHALL NOTIFY THE LANDSCAPE ARCHITECT ONE WEEK PRIOR TO BEGINNING CONSTRUCTION.
10. WINTER WATERING SHALL BE AT THE EXPENSE OF THE CONTRACTOR UNTIL SUCH TIME AS FINAL ACCEPTANCE IS RECEIVED.
11. ALL LANDSCAPE CONSTRUCTION PRACTICES, WORKMANSHIP, AND ETHICS SHALL, BE IN ACCORDANCE WITH INDUSTRY STANDARDS SET FORTH IN THE CONTRACTORS HANDBOOK PUBLISHED BY THE COLORADO LANDSCAPE CONTRACTORS ASSOCIATION.
12. LANDSCAPE AND IRRIGATION WORK SHALL BE COMPLETED PRIOR TO THE ISSUANCE OF THE FINAL CERTIFICATE OF OCCUPANCY.

FINISH GRADING AND SOIL PREPARATION

13. CONTRACTOR SHALL CONSTRUCT AND MAINTAIN FINISH GRADES AS RECOMMENDED BY THE GEOTECHNICAL REPORT. ALL LANDSCAPE AREAS SHALL HAVE POSITIVE DRAINAGE AWAY FROM STRUCTURES AT THE MINIMUM SLOPE SPECIFIED IN THE REPORT, AND AREAS OF POTENTIAL PONDING SHALL BE REGRADED TO BLEND IN WITH THE SURROUNDING GRADES AND ELIMINATE PONDING POTENTIAL. SHOULD ANY CONFLICTS AND/OR DISCREPANCIES ARISE BETWEEN THE GEOTECHNICAL REPORT, THE GRADING PLANS, THESE NOTES, AND ACTUAL CONDITIONS, THE CONTRACTOR SHALL IMMEDIATELY BRING SUCH ITEMS TO THE ATTENTION OF THE LANDSCAPE ARCHITECT AND OWNER.
14. AFTER FINISH GRADES HAVE BEEN ESTABLISHED, IT IS RECOMMENDED THAT THE CONTRACTOR SHALL HAVE SOIL SAMPLES TESTED BY AN ESTABLISHED SOIL TESTING LABORATORY FOR THE FOLLOWING: GENERAL SOIL FERTILITY, PH, ORGANIC MATTER CONTENT, SALT (CEC), LIME, SODIUM ADSORPTION RATIO (SAR) AND BORON CONTENT. EACH SAMPLE SUBMITTED SHALL CONTAIN NO LESS THAN ONE QUART OF SOIL. CONTRACTOR SHALL ALSO SUBMIT THE PROJECT'S PLANT LIST TO THE LABORATORY ALONG WITH THE SOIL SAMPLES. THE SOIL REPORT PRODUCED BY THE LABORATORY SHALL CONTAIN RECOMMENDATIONS FOR THE FOLLOWING (AS APPROPRIATE): GENERAL SOIL PREPARATION AND BACKFILL MIXES, PRE-PLANT FERTILIZER APPLICATIONS, AND ANY OTHER SOIL RELATED ISSUES. THE REPORT SHALL ALSO PROVIDE A FERTILIZER PROGRAM FOR THE ESTABLISHMENT PERIOD AND FOR LONG-TERM MAINTENANCE.
15. THE CONTRACTOR SHALL RECOMMEND INSTALLATION OF SOIL AMENDMENTS AND FERTILIZERS PER THE SOILS REPORT FOR THE THE OWNER/OWNER'S REPRESENTATIVE CONSIDERATION.
16. AT A MINIMUM, ALL TOPSOIL SHALL BE AMENDED WITH NITROGEN STABILIZED ORGANIC AMENDMENT COMPOST AT A RATE OF 5.0 CUBIC YARDS AND AMMONIUM PHOSPHATE 16-20-0 AT A RATE OF 15 POUNDS PER THOUSAND SQUARE FEET OF LANDSCAPE AREA. COMPOST SHALL BE MECHANICALLY INTEGRATED INTO THE TOP 6" OF SOIL BY MEANS OF ROTOTILLING AFTER CROSS-RIPPING. GROUND COVER & PERENNIAL BED AREAS SHALL BE AMENDED AT A RATE OF 8 CUBIC FEET PER THOUSAND SQUARE FEET OF NITROGEN STABILIZED ORGANIC AMENDMENT AND 10 LBS. OF 12-12-12 FERTILIZER PER CU. YD., ROTOTILLED TO A DEPTH OF 8". NO MANURE OR ANIMAL-BASED PRODUCTS SHALL BE USED FOR ORGANIC AMENDMENTS.

PLANTING

17. ALL DECIDUOUS TREES SHALL HAVE FULL, WELL-SHAPED HEADS/ALL EVERGREENS SHALL BE UNSHEARED AND FULL TO THE GROUND; UNLESS OTHERWISE SPECIFIED. TREES WITH CENTRAL LEADERS WILL NOT BE ACCEPTED IF LEADER IS DAMAGED OR REMOVED. PRUNE ALL DAMAGED TWIGS AFTER PLANTING.
18. ALL PLANTS WITHIN A SPECIES SHALL HAVE SIMILAR SIZE, AND SHALL BE OF A FORM TYPICAL FOR THE SPECIES. ANY PLANT DEEMED UNACCEPTABLE BY THE LANDSCAPE ARCHITECT SHALL BE IMMEDIATELY REMOVED FROM THE SITE AND SHALL BE REPLACED WITH AN ACCEPTABLE PLANT OF LIKE TYPE AND SIZE AT THE CONTRACTOR'S OWN EXPENSE. ANY PLANTS APPEARING TO BE UNHEALTHY, EVEN IF DETERMINED TO STILL BE ALIVE, SHALL NOT BE ACCEPTED. THE LANDSCAPE ARCHITECT SHALL BE THE SOLE JUDGE AS TO THE ACCEPTABILITY OF PLANT MATERIAL.
19. ALL TREES SHALL BE GUYED AND WOOD STAKED AS PER DETAILS. NO 'T-STAKES' SHALL BE USED FOR TREES.
20. ALL PLANT MATERIALS SHALL BE TRUE TO TYPE, SIZE, SPECIES, QUALITY, AND FREE OF INJURY, BROKEN ROOT BALLS, PESTS, AND DISEASES, AS WELL AS CONFORM TO THE MINIMUM REQUIREMENTS DESCRIBED IN THE "AMERICAN STANDARD FOR NURSERY STOCK". FOLLOW GREENCO TREE PLANTING RECOMMENDATIONS FOR MINIMUM QUALITY REQUIREMENTS FOR TREES.
21. ALL TREE AND SHRUB BED LOCATIONS ARE TO BE STAKED OUT ON SITE FOR APPROVAL BY THE LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.
22. ALL TREES PLANTED ADJACENT TO PUBLIC AND/OR PEDESTRIAN WALKWAYS SHALL BE PRUNED CLEAR OF ALL BRANCHES BETWEEN GROUND AND A HEIGHT OF EIGHT (8) FEET FOR THAT PORTION OF THE PLAN LOCATED OVER THE SIDEWALK AND/OR ROAD.
23. RTF TALL FESCUE HAS BEEN APPROVED IN MANY JURISDICTIONS AS A LOW-MODERATE HYDROZONE PLANT MATERIAL. INSTALL AND MAINTAIN IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
24. ALL PLANT MATERIAL SHALL NOT BE PLANTED PRIOR TO INSTALLATION OF TOPSOIL.
25. ALL PLANT BEDS SHALL BE CONTAINED WITH STEEL EDGER. STEEL EDGER IS NOT REQUIRED ALONG CURBS, WALKS OR BUILDING FOUNDATIONS. ALL EDGING SHALL OVERLAP AT JOINTS A MINIMUM OF 6-INCHES, AND SHALL BE FASTENED WITH A MINIMUM OF 4 PINS PER EACH 10 FOOT SECTION. THE TOP OF ALL EDGING MATERIAL SHALL BE A ROLLED TOP AND 1/2 INCH ABOVE THE FINISHED GRADE OF ADJACENT LAWN OR MULCH AREAS. COLOR: BLACK.
26. THE DEVELOPER, HIS SUCCESSOR, OR ASSIGNEE SHALL BE RESPONSIBLE FOR ESTABLISHING AND CONTINUING A REGULAR PROGRAM OF MAINTENANCE FOR ALL LANDSCAPED AREAS. SEE LANDSCAPE GUARANTEE AND MAINTENANCE NOTE.
27. A 3-FOOT CLEAR SPACE SHALL BE MAINTAINED AROUND THE CIRCUMFERENCE OF ALL FIRE HYDRANTS.
28. LANDSCAPE CONTRACTOR TO SUBMIT SAMPLES OF MISCELLANEOUS LANDSCAPING MATERIALS TO THE LANDSCAPE ARCHITECTS AND OWNER'S REPRESENTATIVE FOR APPROVAL PRIOR TO INSTALLATION, IE.; MULCH, EDGER, LANDSCAPE FABRIC, ETC.

MULCHING

29. AFTER ALL PLANTING IS COMPLETE, THE CONTRACTOR SHALL INSTALL A MINIMUM 4" THICK LAYER OF MULCH AS SPECIFIED IN THE PLANTING LEGEND. INSTALL A 4" THICK RING OF DOUBLE SHREDDED CEDAR BARK MULCH AROUND ALL PLANT MATERIAL IN ROCK MULCH BEDS WHERE LANDSCAPING IS SHOWN ON THE PLANS. WOOD MULCH RING SIZE SHALL BE THE CONTAINER SIZE OF THE SHRUBS, PERENNIALS, AND ORNAMENTAL GRASSES. TREE RING SIZE SHALL BE GREEN INDUSTRIES OF COLORADO INDUSTRY STANDARD WIDTH.
30. ALL MULCH SHALL BE HARVESTED IN A SUSTAINABLE MANNER FROM A LOCAL SOURCE.
31. INSTALL DEWITT PRO-5 WEED BARRIER FABRIC UNDER ALL ROCK MULCH SHRUB BEDS SPECIFIED ON THE PLANS ONLY. NO LANDSCAPE FABRIC SHALL BE USED IN WOOD MULCH AREAS. NO PLASTIC WEED BARRIERS SHALL BE SPECIFIED.
32. ABSOLUTELY NO EXPOSED GROUND SHALL BE LEFT SHOWING ANYWHERE ON THE PROJECT AFTER MULCH HAS BEEN INSTALLED.
33. ALL PLANTING AREAS WITH LESS THAN A 4:1 GRADIENT SHALL RECEIVE A LAYER OF MULCH, TYPE AND DEPTH PER PLANS. SUBMIT 1 CUBIC FOOT SAMPLE OF MULCH (ONE SAMPLE PER TYPE) TO LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO INSTALLATION. THE MULCH SHALL BE SPREAD EVENLY THROUGHOUT ALL PLANTING AREAS EXCEPT SLOPES 4:1 OR STEEPER, OR AS OTHERWISE DENOTED ON THE PLAN. ABSOLUTELY NO EXPOSED GROUND SHALL REMAIN IN AREAS TO RECEIVE MULCH AFTER MULCH HAS BEEN INSTALLED.
34. ALL PLANTING AREAS ON SLOPES OVER 4:1 SHALL RECEIVE COCONUT FIBER EROSION CONTROL NETTING FROM ROLLS. NETTING SHALL BE #CT-125, AS MANUFACTURED BY NORTH AMERICAN GREEN (OR EQUAL) INSTALL AND STAKE PER MANUFACTURER'S SPECIFICATIONS. SEE ALSO THE CIVIL ENGINEER'S EROSION CONTROL PLAN.

IRRIGATION CONCEPT

1. AN AUTOMATIC IRRIGATION SYSTEM SHALL BE INSTALLED AND OPERATIONAL BY THE TIME OF FINAL INSPECTION. THE ENTIRE IRRIGATION SYSTEM SHALL BE INSTALLED BY A QUALIFIED IRRIGATION CONTRACTOR.
2. THE IRRIGATION SYSTEM WILL HAVE APPROPRIATE BACKFLOW PREVENTION DEVICES INSTALLED TO PREVENT CONTAMINATION OF THE WATER SOURCE IF APPLICABLE.
3. ALL NON-TURF/SEED PLANTED AREAS WILL BE DRIP IRRIGATED. TURF SOD/SEED SHALL RECEIVE POP-UP SPRAY IRRIGATION FOR HEAD TO HEAD COVERAGE.
4. ALL PLANTS SHARING SIMILAR HYDROZONE CHARACTERISTICS SHALL BE PLACED ON A VALVE DEDICATED TO PROVIDE THE NECESSARY WATER REQUIREMENTS SPECIFIC TO THAT HYDROZONE.
5. THE IRRIGATION SYSTEM SHALL BE DESIGNED AND INSTALLED, TO THE MAXIMUM EXTENT POSSIBLE, TO CONSERVE WATER BY USING THE FOLLOWING DEVICES AND SYSTEMS: MATCHED PRECIPITATION RATE TECHNOLOGY ON ROTOR AND SPRAY HEADS (WHEREVER POSSIBLE), RAIN SENSORS, AND SMART MULTI-PROGRAM COMPUTERIZED IRRIGATION CONTROLLERS FEATURING SENSORY INPUT CAPABILITIES.

LANDSCAPE GUARANTEE AND MAINTENANCE

1. THE LANDSCAPE CONTRACTOR SHALL GUARANTEE ALL TREES, SHRUBS, PERENNIALS, SOD, SEEDED AREAS, AND IRRIGATION SYSTEMS FOR A PERIOD OF ONE YEAR FROM THE DATE OF THE OWNER'S ACCEPTANCE. THE CONTRACTOR SHALL REPLACE, AT HIS OWN EXPENSE, ANY PLANTS WHICH DIE IN THAT TIME, OR REPAIR ANY PORTIONS OF THE IRRIGATION SYSTEM WHICH OPERATE IMPROPERLY.
2. THE LANDSCAPE CONTRACTOR SHALL MAINTAIN THE LANDSCAPE IN A NEAT, CLEAN, AND HEALTHY CONDITION FOR A PERIOD OF 90 DAYS. THIS SHALL INCLUDE PROPER PRUNING, MOWING AND AERATION OF LAWNS, WEEDING, REPLACEMENT OF MULCH, REMOVAL OF LITTER, AND THE APPROPRIATE WATERING OF ALL PLANTINGS. IRRIGATION SHALL BE MAINTAINED IN PROPER WORKING ORDER, WITH SCHEDULING ADJUSTMENTS BY SEASON AND TO MAXIMIZE WATER CONSERVATION. IF SITE OPENS DURING WINTER, TO AVOID FREEZE DAMAGE ON PLANTINGS, THE 90 DAYS SHOULD BEGIN AFTER ACCEPTANCE OF THE WORK.
3. DURING THE LANDSCAPE MAINTENANCE PERIOD, THE LANDSCAPE CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE AWAY FROM STRUCTURES IN ALL LANDSCAPE AREAS AT THE MINIMUM SLOPE SPECIFIED IN THE GEOTECHNICAL REPORT. LANDSCAPE AREAS WHICH SETTLE AND CREATE THE POTENTIAL FOR PONDING SHALL BE REPAIRED TO ELIMINATE PONDING POTENTIAL AND BLEND IN WITH THE SURROUNDING GRADES. SHOULD ANY CONFLICTS AND/OR DISCREPANCIES ARISE BETWEEN THE GEOTECHNICAL REPORT, THE GRADING PLANS, THESE NOTES, AND ACTUAL CONDITIONS, THE CONTRACTOR SHALL IMMEDIATELY BRING SUCH ITEMS TO THE ATTENTION OF THE LANDSCAPE ARCHITECT AND OWNER.

SEED NOTES

ALL SEED MIXES TO MATCH OVERALL MASTER DEVELOPMENT

1. ALL SEED APPLICATIONS SHALL BE DRILL SEEDED. WITH HYDROSLURRY APPLIED OVER THE SEED BED AFTER SEEDING. THE SLURRY MIX SHALL CONTAIN THE

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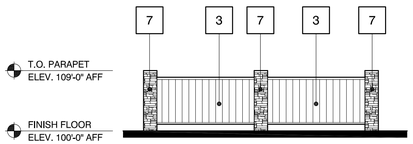
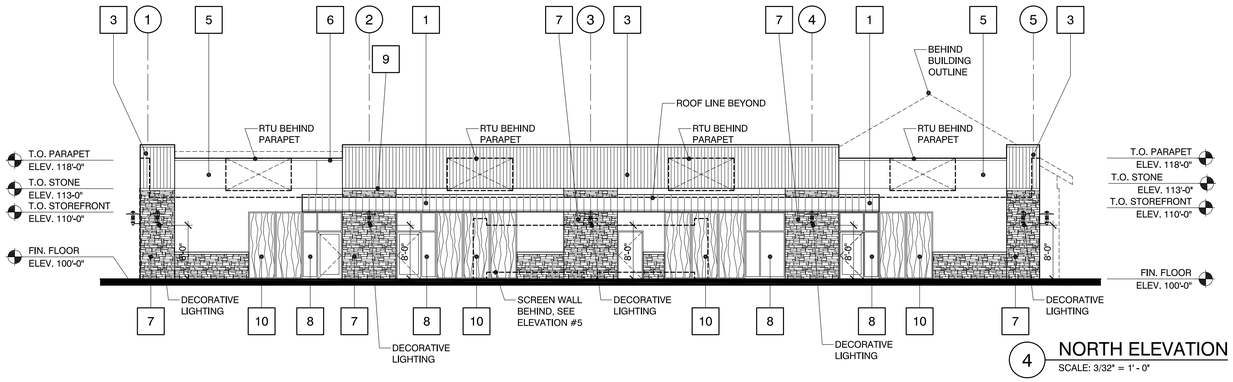
SITE PLAN - SP-001117-2019



5 SCREEN WALL ELEVATION
SCALE: 3/32" = 1' - 0"



4 NORTH ELEVATION
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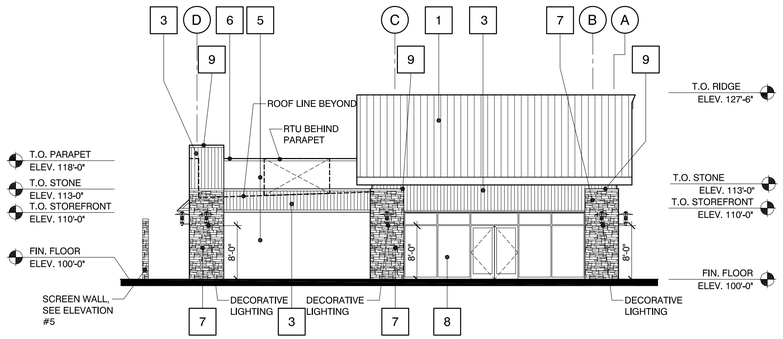

3 WEST ELEVATION
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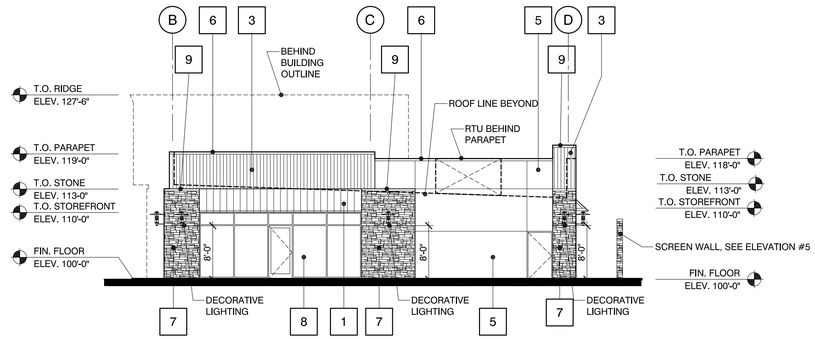

2 EAST ELEVATION
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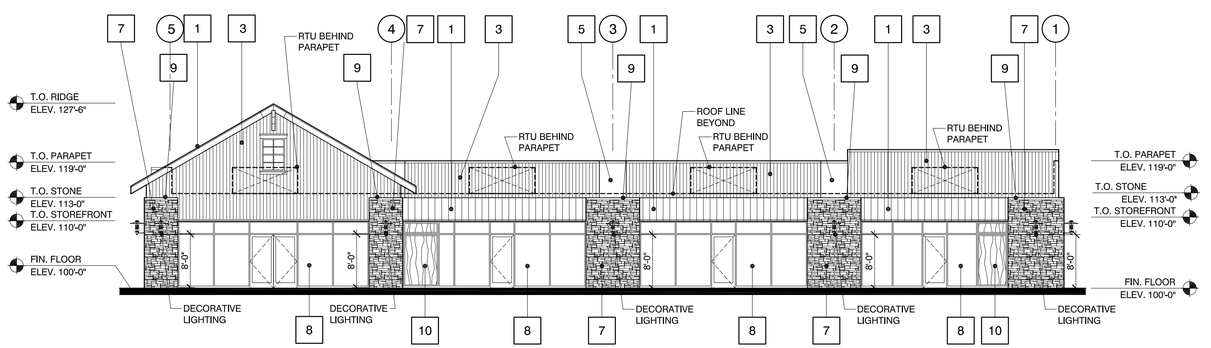

1 SOUTH ELEVATION
SCALE: 3/32" = 1' - 0"

THE BUILDING ELEVATIONS SHOWN AND APPROVED HEREON ARE INTENDED TO DEMONSTRATE HOW ALL HVAC AND OTHER MECHANICAL EQUIPMENT SHALL BE SCREENED ACCORDING TO TOWN OF ERIE, UNIFIED DEVELOPMENT CODE REQUIREMENTS. IT IS THE APPLICATIONS RESPONSIBILITY TO ENSURE THAT THIS APPROVED SCREENING OCCURS IN THE FIELD AS DEMONSTRATED BY THESE PLANS, REGARDLESS OF CURB REQUIREMENTS, MECHANICAL PLAN CHANGES, OR OTHER CIRCUMSTANCES. FAILURE TO PROVIDE APPROVED SCREENING MAY RESULT IN DELAY OF FINAL INSPECTIONS AND/OR ISSUANCE OF A CERTIFICATE OF OCCUPANCY.

EXTERIOR FINISH SCHEDULE	
	MATERIAL
1	METAL PANEL: BERRIDGE KYNAR 500 "CITYSCAPE"
2	METAL PANEL: BERRIDGE KYNAR 500 "COPPER-COTE"
3	FIBER CEMENT BOARD: HARDIE PLANK LAP SIDING "MOUNTAIN SAGE"
4	FIBER CEMENT BOARD: HARDIE PLANK LAP SIDING "BOOTHBAY BLUE"
5	EIFS: SHERWIN WILLIAMS, SW 7036, "ACCESSIBLE BEIGE"
6	PAINT: SHERWIN WILLIAMS, SW 7018, "DOVETAIL"
7	CULTURED STONE PRO-FIT LEDGESTONE GRAY
8	STOREFRONT: MEDIUM BRONZE ANODIZED ALUMINUM
9	PRECAST CONCRETE NATURAL GRAY CAP
10	DECORATE METAL PERFORATED PANEL

BUILDING LIGHTING: SPECTRA FIXTURES SP1 IND5 AWM1 WALL MOUNTED, BLACK FINISH WITH COPPER HOOD

ENTRANCE SOFFITS: WOODTONE "MOUNTAIN CEDAR" ON HARDIE

TRASH ENCLOSURE: BASALITE SPLIT FACE CMU BLOCK 600R

8" PILASTER DEPTH TYPICAL.

REVISIONS
◇ PRE-BID SET ISSUE DATE △ POST BID SET ISSUE DATE

DATE	DESCRIPTION

7730 E. Belleview, Suite A 150
Greenwood Village, CO 80111
architecture | planning | interiors

LOWE'S HOME CENTERS, LLC
1000 Lowes Boulevard
Mooresville, NC 28117
704.758.1000 (V)

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RETAIL BUILDING A ELEVATIONS
LOWE'S OF: ERIE, COLORADO
PROJECT NO: E0000018.20 | DRAWN BY: | CHECKED BY:

CRITERIA
ISSUE DATE: 10.11.19
PERMIT SET
ISSUE DATE:
CONSTRUCTION SET
ISSUE DATE:
DRAWING NUMBER:
A1.1

NINE MILE - COMMERCIAL SITE PLAN (BLOCK 1, LOTS 1 & 3)

A PORTION OF NE 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST AND THE
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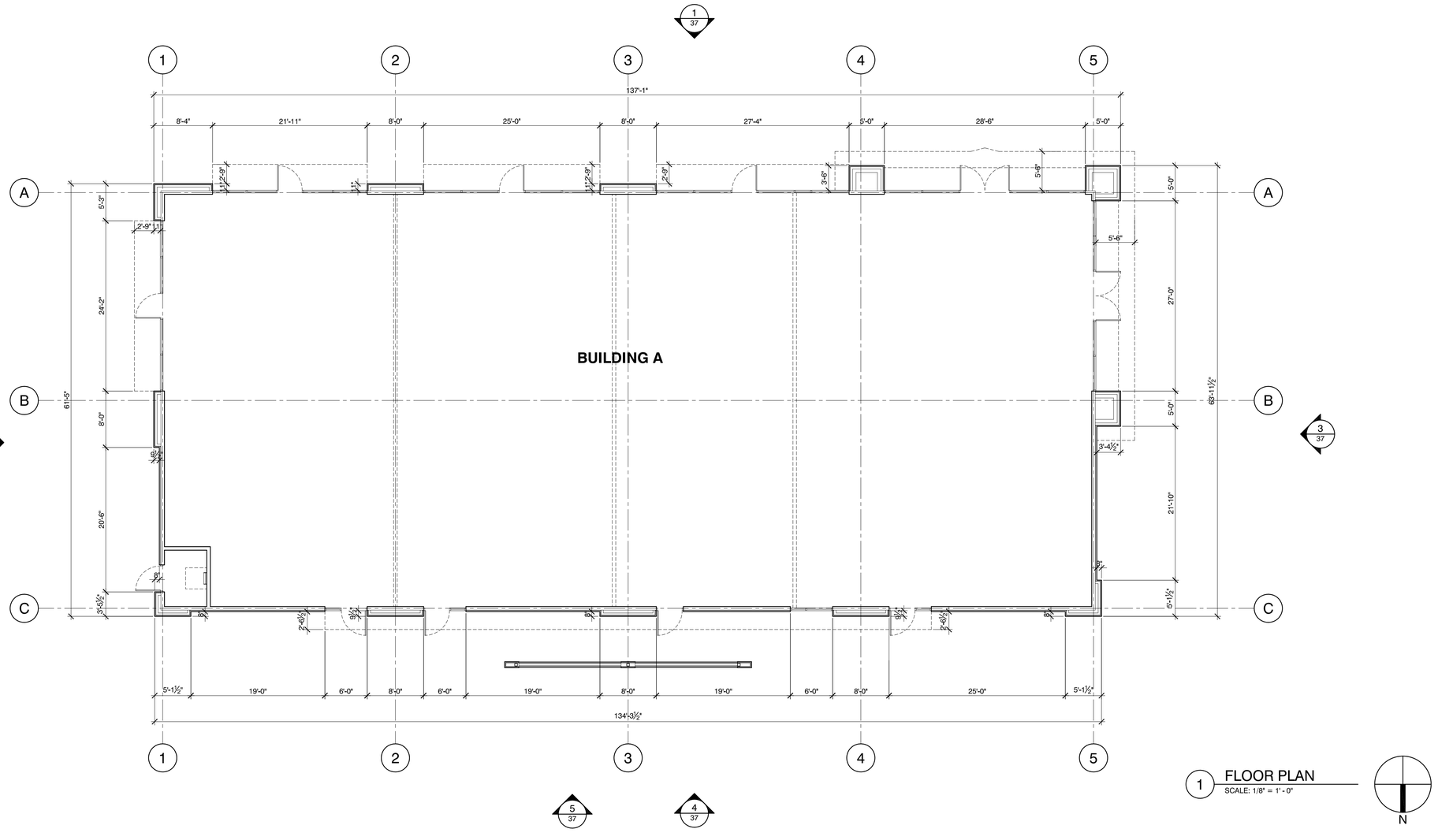

1 FLOOR PLAN
SCALE: 1/8" = 1' - 0"

N

REVISIONS
◇ PRE-BID SET ISSUE DATE △ POST BID SET ISSUE DATE

DATE		DESCRIPTION

7730 E. Belleview, Suite A 150
Greenwood Village, CO 80111
ARCHITECTURE
architecture | planning | interiors

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LOWE'S

RETAIL BUILDING A
FLOOR PLAN

LOWE'S OF:
ERIE, COLORADO

PROJECT No: ED0000018.20 | DRAWN BY: | CHECKED BY:

CRITERIA
ISSUE DATE: 10.11.19
PERMIT SET
ISSUE DATE:
CONSTRUCTION SET
ISSUE DATE:
DRAWING NUMBER:
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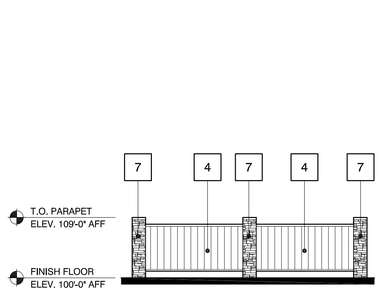
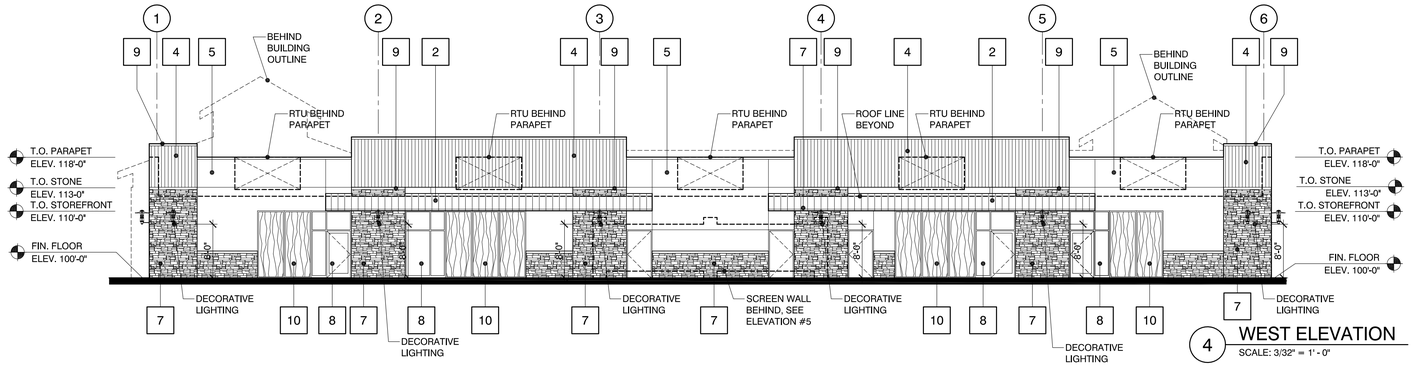
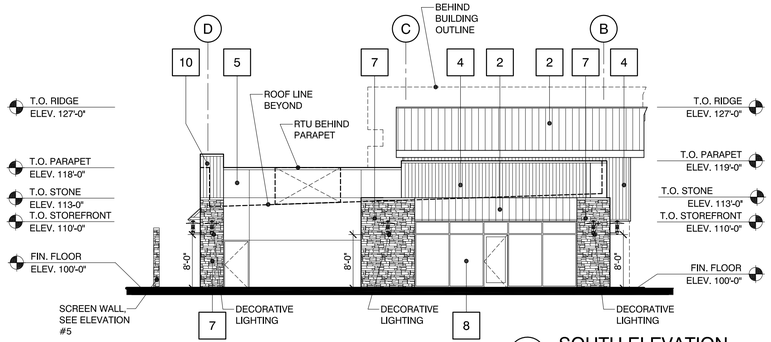
6TH PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, COLORADO
SITE PLAN - SP-001117-2019



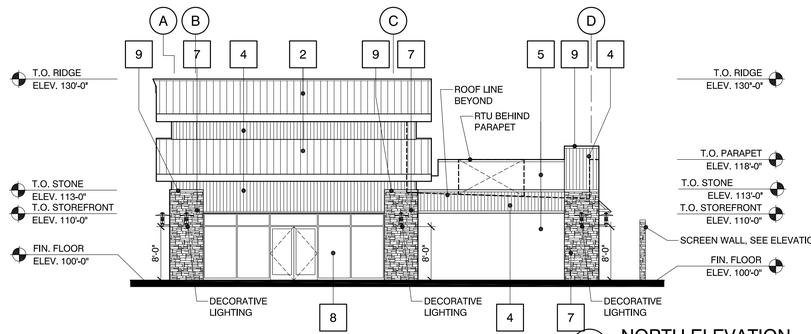
5 SCREEN WALL ELEVATION
SCALE: 3/32" = 1' - 0"



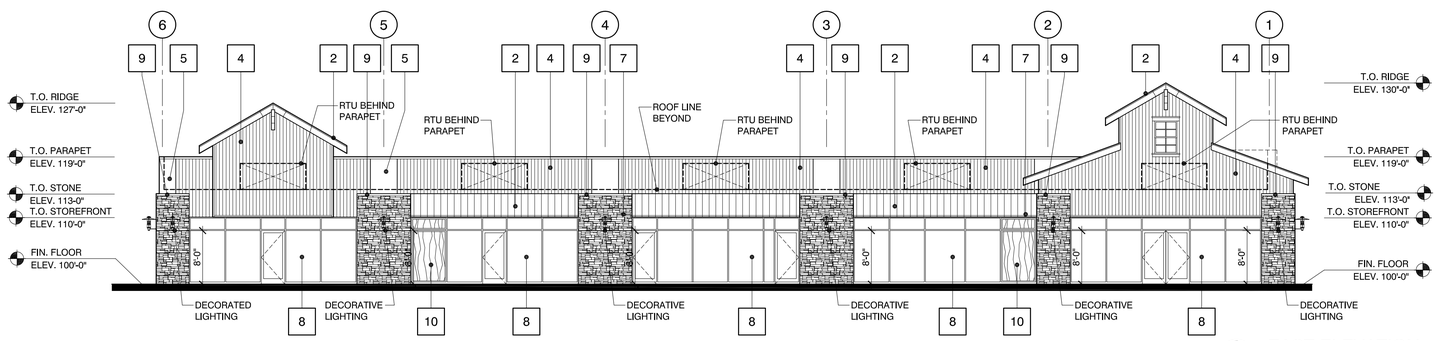
4 WEST ELEVATION
SCALE: 3/32" = 1' - 0"



3 SOUTH ELEVATION
SCALE: 3/32" = 1' - 0"



2 NORTH ELEVATION
SCALE: 3/32" = 1' - 0"



1 EAST ELEVATION
SCALE: 3/32" = 1' - 0"

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EXTERIOR FINISH SCHEDULE	
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2	METAL PANEL: BERRIDGE KYNAR 500 "COPPER-COTE"
3	FIBER CEMENT BOARD: HARDIE PLANK LAP SIDING "MOUNTAIN SAGE"
4	FIBER CEMENT BOARD: HARDIE PLANK LAP SIDING "BOOTHBAY BLUE"
5	EIFS: SHERWIN WILLIAMS, SW 7036, "ACCESSIBLE BEIGE"
6	PAINT: SHERWIN WILLIAMS, SW 7018, "DOVETAIL"
7	CULTURED STONE PRO-FIT LEDGESTONE GRAY
8	STOREFRONT: MEDIUM BRONZE ANODIZED ALUMINUM
9	PRECAST CONCRETE NATURAL GRAY CAP
10	DECORATE METAL PERFORATED PANEL

BUILDING LIGHTING: SPECTRA FIXTURES SP1 IND5 AWM1 WALL MOUNTED, BLACK FINISH WITH COPPER HOOD

ENTRANCE SOFFITS: WOODTONE "MOUNTAIN CEDAR" ON HARDIE

TRASH ENCLOSURE: BASALITE SPLIT FACE CMU BLOCK 600R

8" PILASTER DEPTH TYPICAL.

REVISIONS
◇ PRE-BID SET ISSUE DATE △ POST BID SET ISSUE DATE

DATE		DESCRIPTION

7730 E. Belleview, Suite A 150
Greenwood Village, CO 80111
architecture | planning | interiors

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1000 Lowes Boulevard
Mooresville, NC 28117

704.758.1000 (V)

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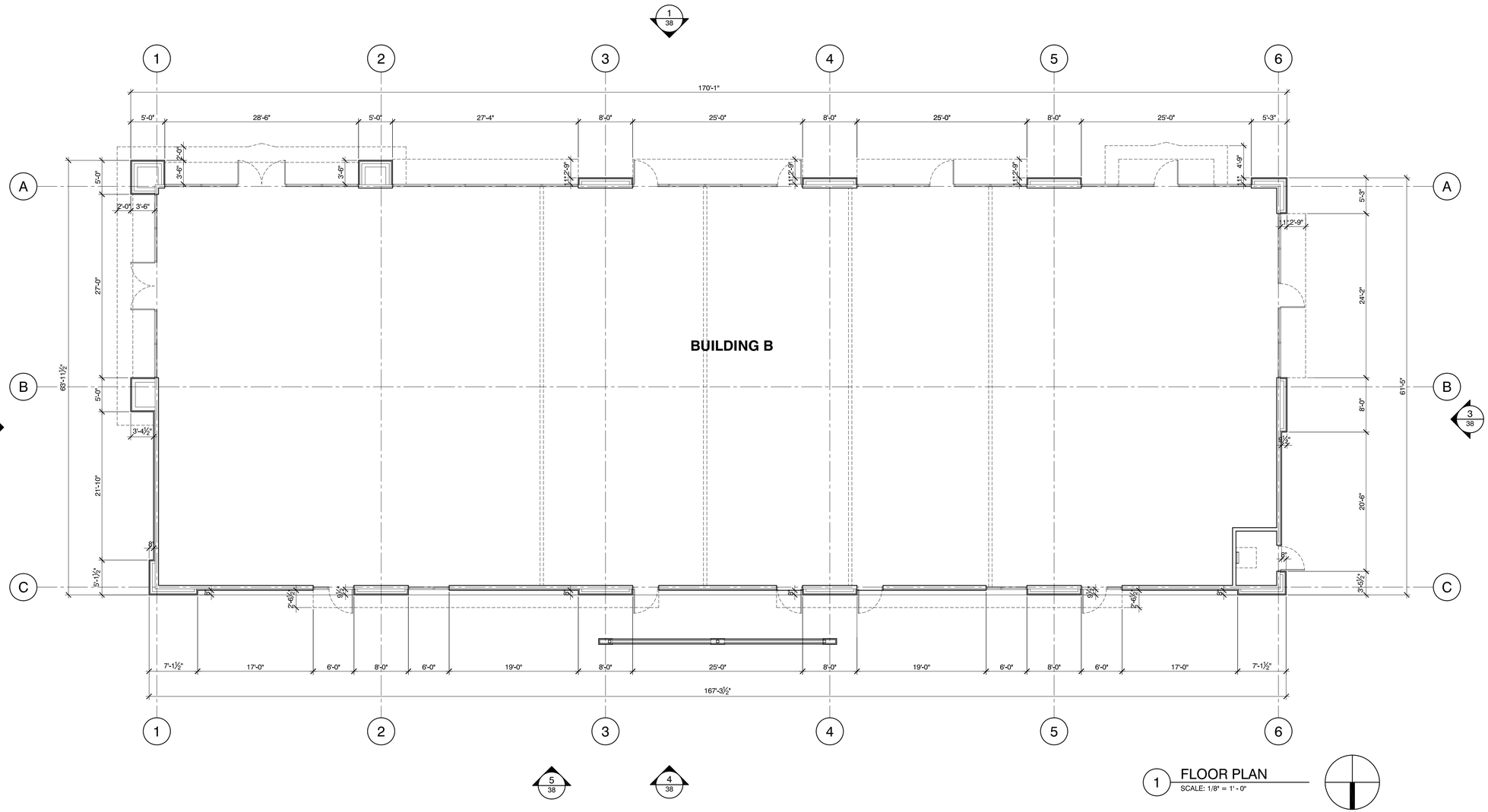
RETAIL BUILDING B
ELEVATIONS
LOWE'S OF:
ERIE, COLORADO

PROJECT No: ED0000182 | DRAWN BY: | CHECKED BY:

CRITERIA
ISSUE DATE: 10.11.19
PERMIT SET
ISSUE DATE:
CONSTRUCTION SET
ISSUE DATE:
DRAWING NUMBER:
A1.3

NINE MILE - COMMERCIAL SITE PLAN (BLOCK 1, LOTS 1 & 3)

A PORTION OF NE 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST AND THE
SOUTHEAST QUARTER OF SECTION 27, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE OF THE
6TH PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, COLORADO
SITE PLAN - SP-001117-2019



1 FLOOR PLAN
SCALE: 1/8" = 1' - 0"

N

REVISIONS
PRE-BID SET ISSUE DATE
POST BID SET ISSUE DATE

DATE	DESCRIPTION

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Greenwood Village, CO 80111
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RETAIL BUILDING B
FLOOR PLAN

LOWE'S OF:
ERIE, COLORADO

PROJECT No: ED0000018.20 | DRAWN BY: | CHECKED BY:

CRITERIA
ISSUE DATE: 10.11.19
PERMIT SET
ISSUE DATE:
CONSTRUCTION SET
ISSUE DATE:
DRAWING NUMBER:

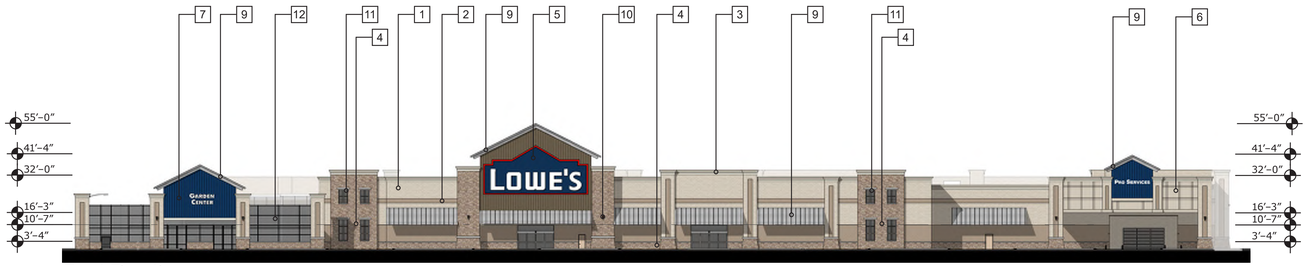
A1.4

Lowe's - Erie, Colorado

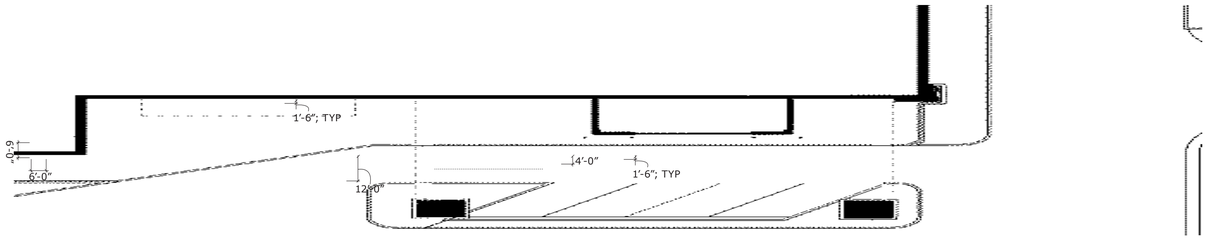
Perspectives & Elevations

Material Key

1. CMU - Splitface - To Match SW 7036 "Accessible Beige"
2. CMU - Smoothface - To Match SW 7513 "Sanderling"
3. Cornice - To Match SW 7036 "Accessible Beige"
4. Environmental Stoneworks - "Nantucket Cobble Ledgestone"
5. EIFS - To Match Lowe's Blue
6. EIFS - To Match SW 7036 "Accessible Beige"
7. Metal Panels - To Match SW 7054 "Suitable Brown"
8. Metal Panels - To Match Lowe's Blue
9. Metal Standing Seam - Berridge Cityscape 12"
10. Light to Match Adjacent Shops
11. Black Spandrel Glazing in 2" Aluminum Framing - Black
12. Combination expanded metal and behind ornamental fencing - all black. Similar to Beta Fence Product

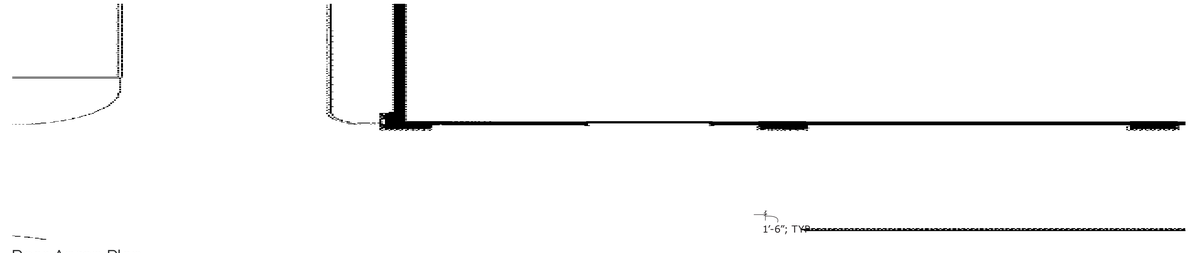


Front Elevation

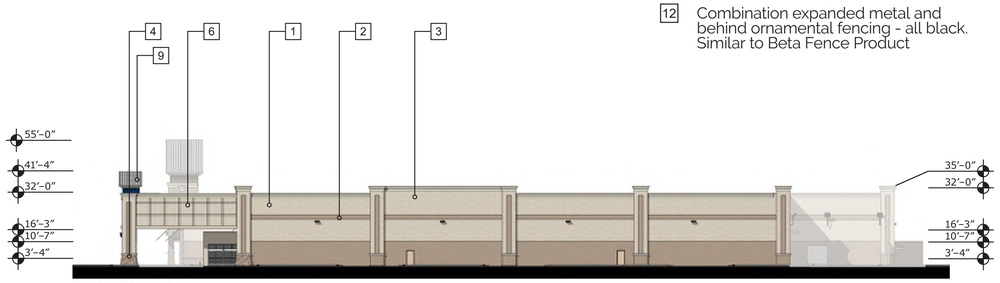


Front Apron Plan

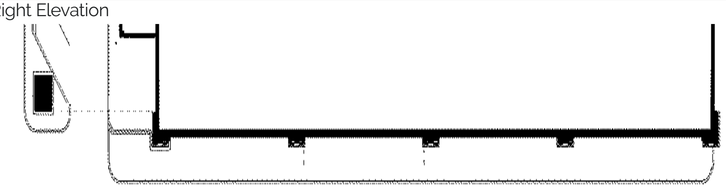
Rear Elevation



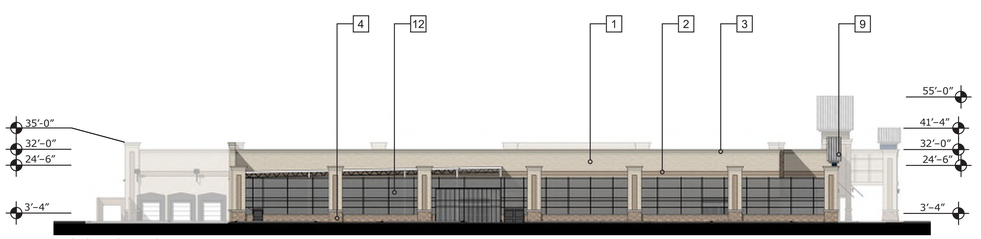
Rear Apron Plan



Right Elevation



Right Apron Plan



Right Elevation

Right Apron Plan

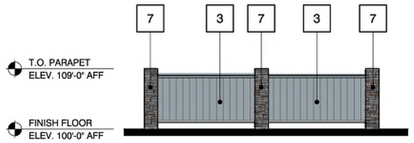
brr

50'-0" 100'-0" 200'-0"

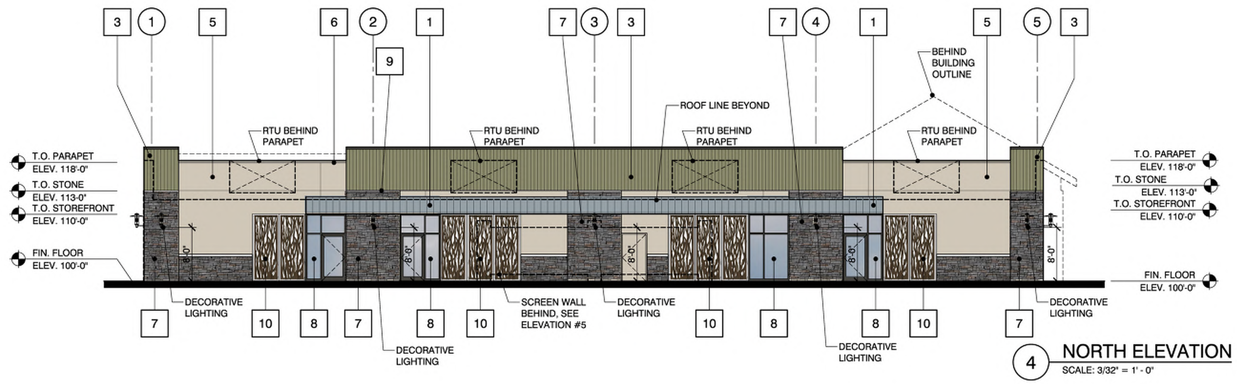
Bar Scale

NINE MILE - COMMERCIAL SITE PLAN (BLOCK 1, LOTS 1 & 3)

A PORTION OF NE 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST AND THE SOUTHEAST QUARTER OF SECTION 27, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE OF THE 6TH PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, COLORADO
SITE PLAN - SP-001117-2019



5 SCREEN WALL ELEVATION
SCALE: 3/32" = 1' - 0"



4 NORTH ELEVATION
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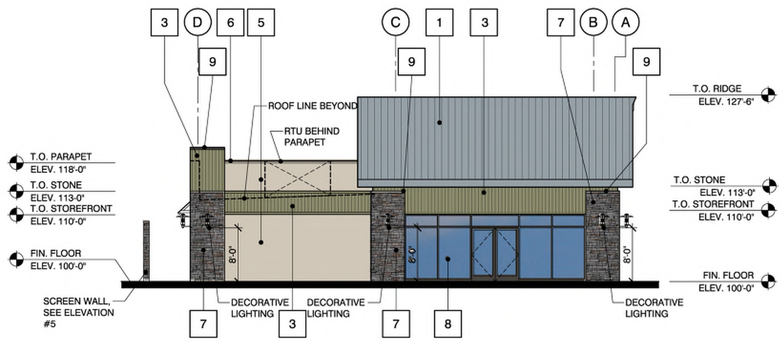

3 WEST ELEVATION
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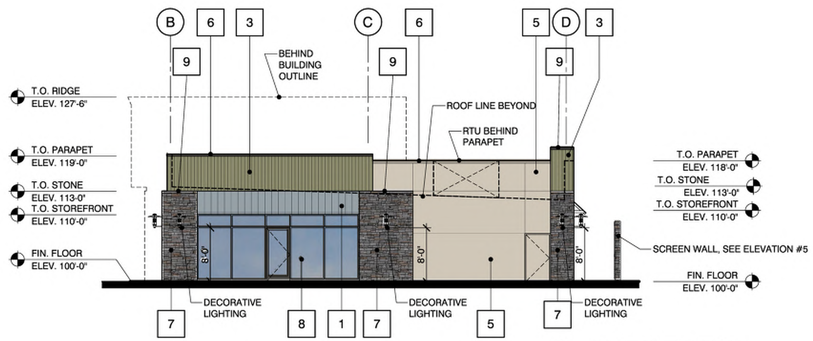

2 EAST ELEVATION
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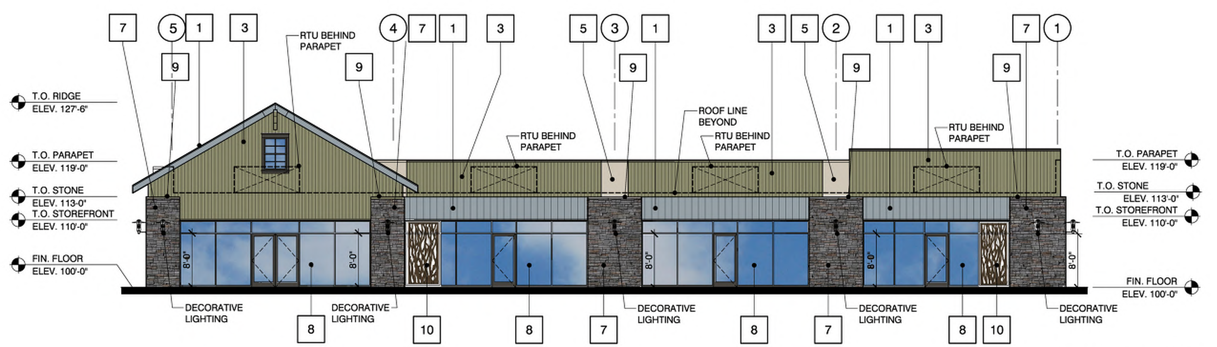

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8" PILASTER DEPTH TYPICAL.

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Greenwood Village, CO 80111
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1000 Lowes Boulevard
Mooresville, NC 28117
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LOWE'S

RETAIL BUILDING A ELEVATIONS
LOWE'S OF: ERIE, COLORADO

PROJECT No: ED/000018.20 | DRAWN BY: | CHECKED BY:

CRITERIA
ISSUE DATE: 10.11.19
PERMIT SET
ISSUE DATE:
CONSTRUCTION SET
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DRAWING NUMBER:
37
OF 39

NINE MILE - COMMERCIAL SITE PLAN (BLOCK 1, LOTS 1 & 3)

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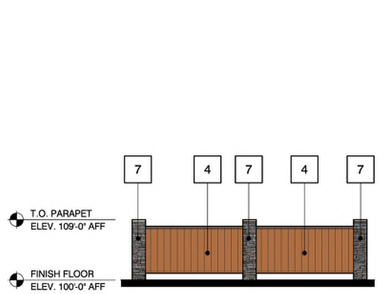

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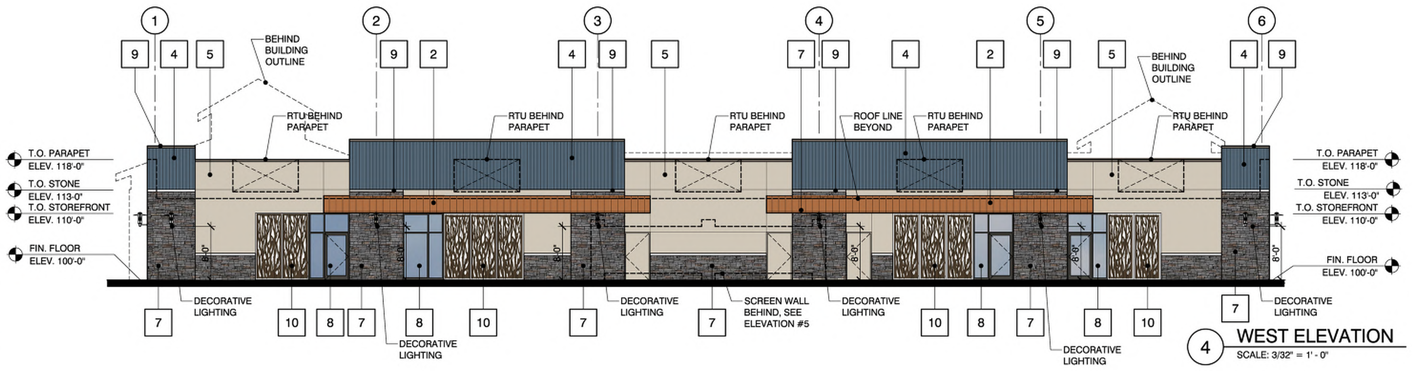

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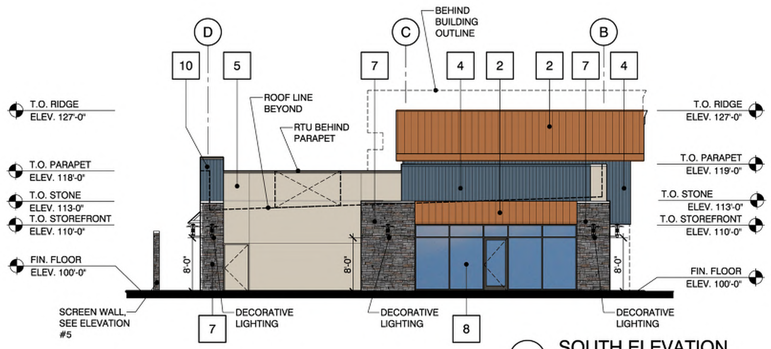

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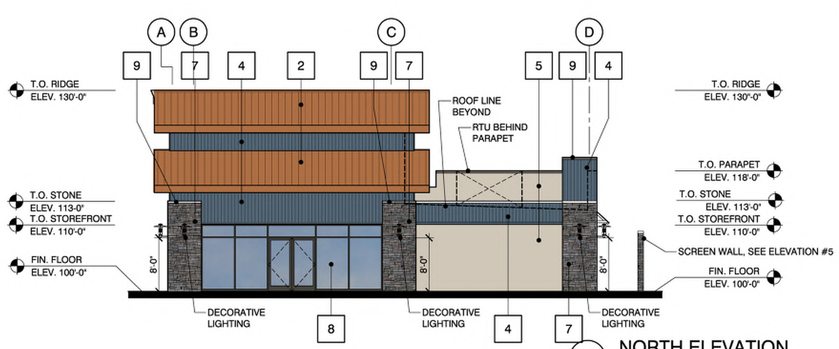

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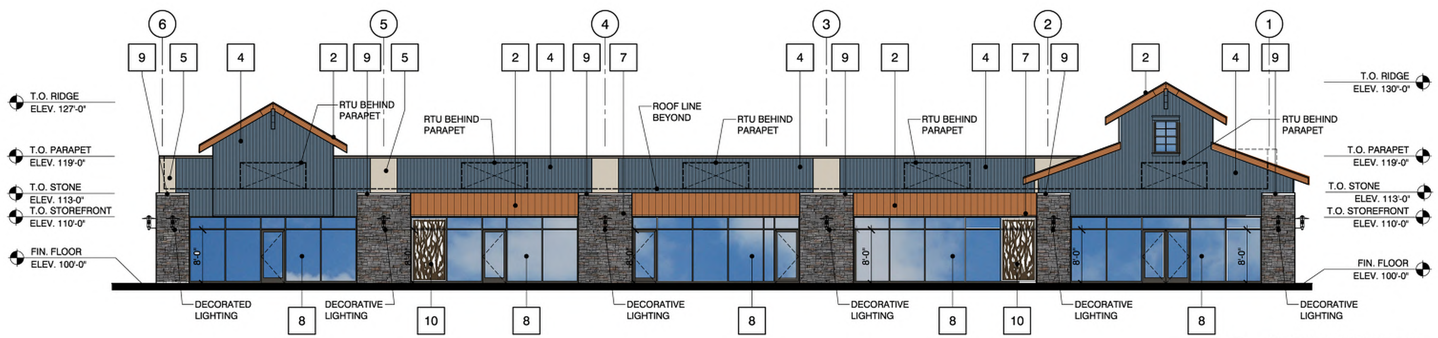

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LOWE'S

RETAIL BUILDING B
ELEVATIONS

LOWE'S OF:
ERIE, COLORADO

PROJECT No: ED0000182 | DRAWN BY: | CHECKED BY:

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ISSUE DATE: 10.11.19
PERMIT SET
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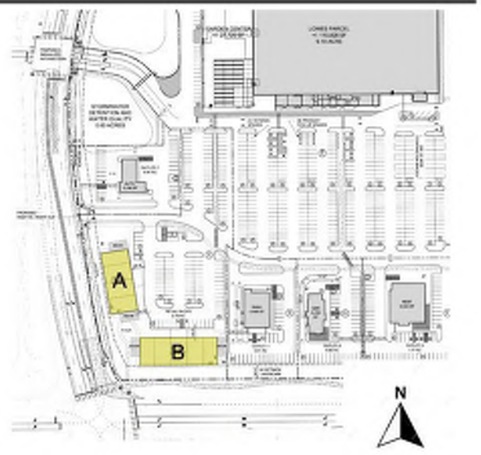
38

OF 39

Northeast View A

Northeast View B

North View



Key Plan

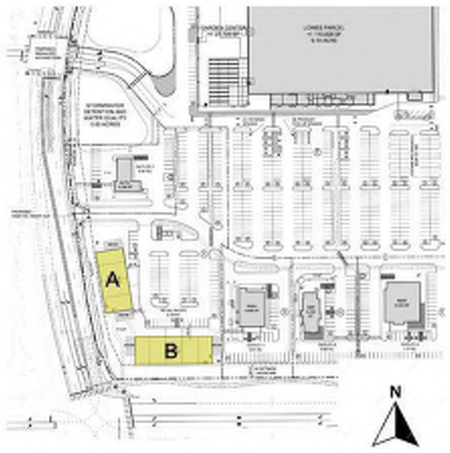
Nine Mile
Erie, CO

G3 ARCHITECTURE INC. architecture | planning | interiors
Evergreen Development | Services | Investments
Galloway Planning. Architecture. Engineering.
HKS HARRIS KOCHER SMITH
KEPHART community • planning • architecture
NORRIS DESIGN Planning | Landscape Architecture | Branding

Southwest View

Detail View

West View

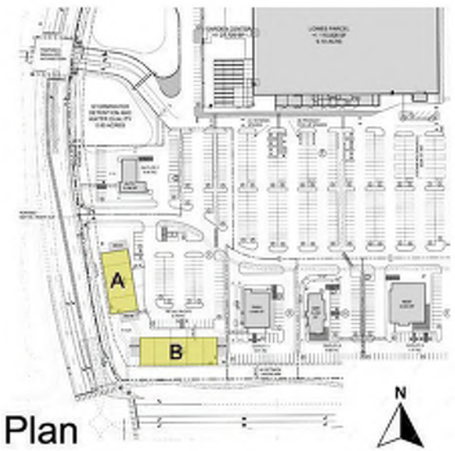


Key Plan

Nine Mile
Erie, CO

Aerial View

South View



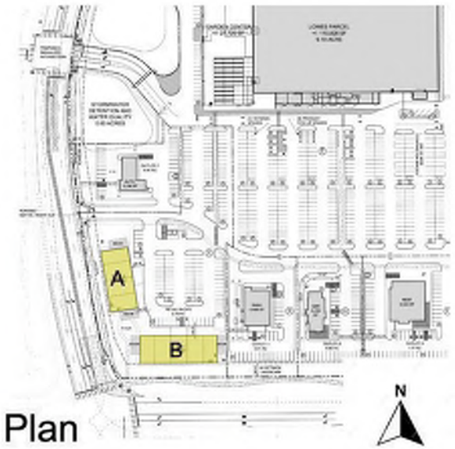
Key Plan

Nine Mile
Erie, CO

G2 ARCHITECTURE INC. architecture | planning | interiors
Evergreen Development | Services | Investments
Galloway Planning. Architecture. Engineering.
HKS HARRIS KOCHER SMITH
KEPHART community ■ planning ■ architecture
NORRIS DESIGN Planning | Landscape Architecture | Branding

Patio Plan View

SHOP-B
10,000 SF



Key Plan

Nine Mile
Erie, CO

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Evergreen Development | Services | Investments
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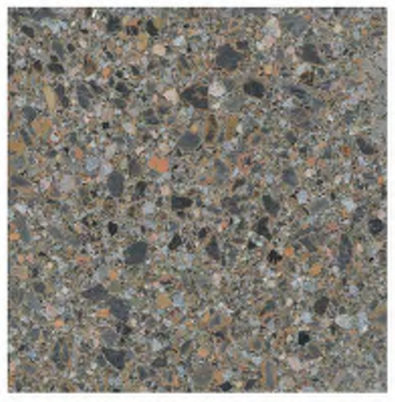
PRECAST CONCRETE
GRAY CAP

ENVIROMENTAL STONE
“NANTUCKET
COBBLE LEDGESTONE”

METAL PANEL: BERRIDGE
KYNAR 50 "COPPER-COTE"

METAL PANEL: BERRIDGE
KYNAR 50 "CITYSCAPE"



BASALITE SPLIT FACE
CMU BLOCK 600R

ENTRANCE SOFFIT:
WOODTONE “MOUNTAIN
CEDAR”

STOREFRONT:
KAWNEER
“CLASSIC BRONZE”

Material Board

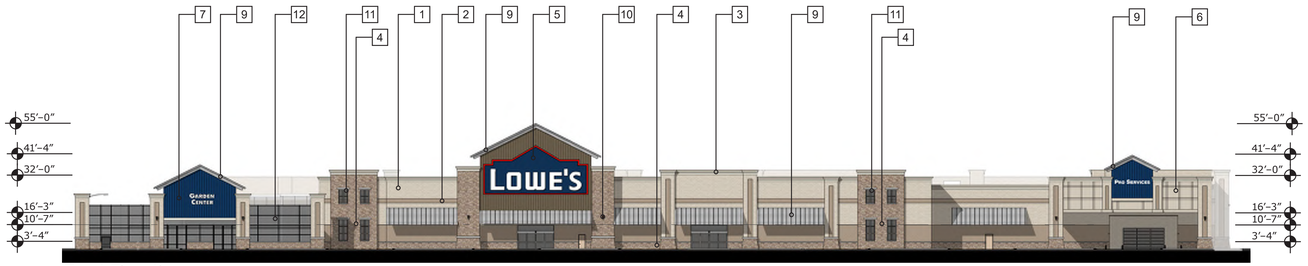
Nine Mile
Erie, CO

Lowe's - Erie, Colorado

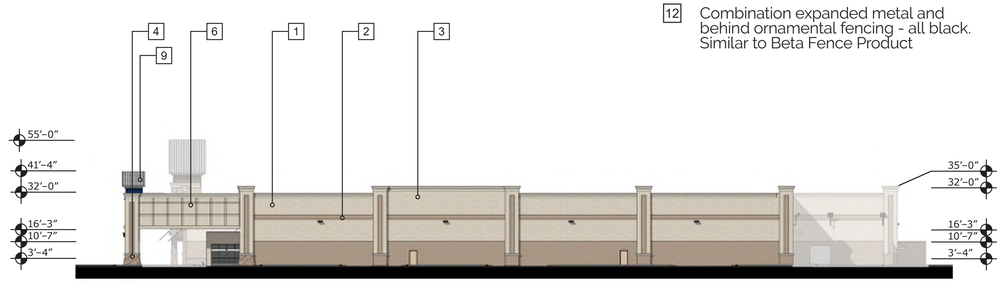
Perspectives & Elevations

Material Key

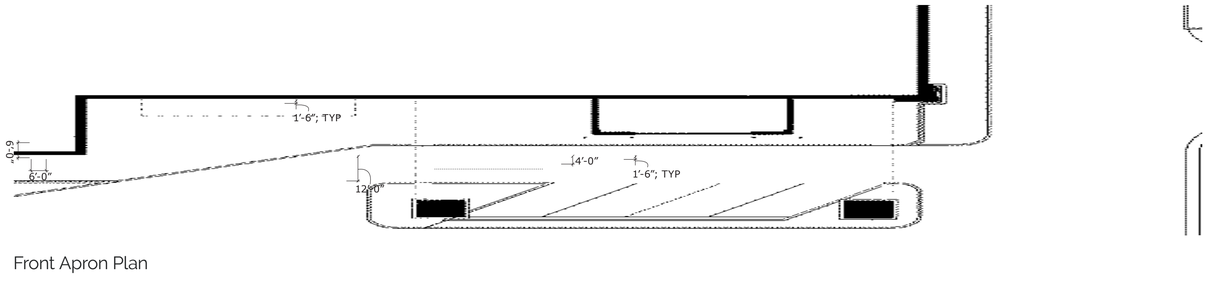
1. CMU - Splitface - To Match SW 7036 "Accessible Beige"
2. CMU - Smoothface - To Match SW 7513 "Sanderling"
3. Cornice - To Match SW 7036 "Accessible Beige"
4. Environmental Stoneworks - "Nantucket Cobble Ledgestone"
5. EIFS - To Match Lowe's Blue
6. EIFS - To Match SW 7036 "Accessible Beige"
7. Metal Panels - To Match SW 7054 "Suitable Brown"
8. Metal Panels - To Match Lowe's Blue
9. Metal Standing Seam - Berridge Cityscape 12"
10. Light to Match Adjacent Shops
11. Black Spandrel Glazing in 2" Aluminum Framing - Black
12. Combination expanded metal and behind ornamental fencing - all black. Similar to Beta Fence Product



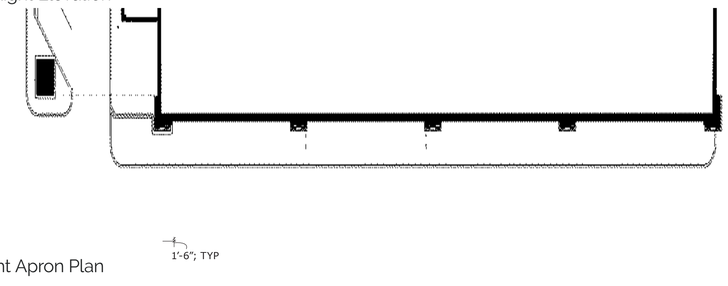
Front Elevation



Right Elevation

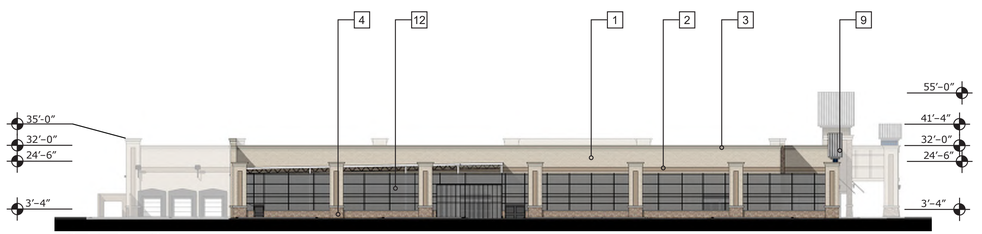


Front Apron Plan

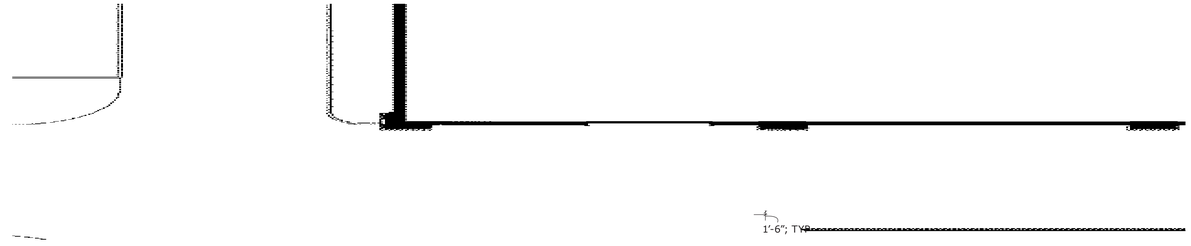


Right Apron Plan

Rear Elevation

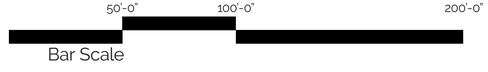


Right Elevation



Rear Apron Plan

Right Apron Plan



Bar Scale

brr

Evergreen Development | Services | Investments
Galloway Planning. Architecture. Engineering.
HKS HARRIS KOCHER SMITH
KEPHART community ■ planning ■ architecture
NORRIS DESIGN Planning | Landscape Architecture | Branding

Northwest Perspective

Northeast Perspective

Southwest Perspective

Southeast Perspective

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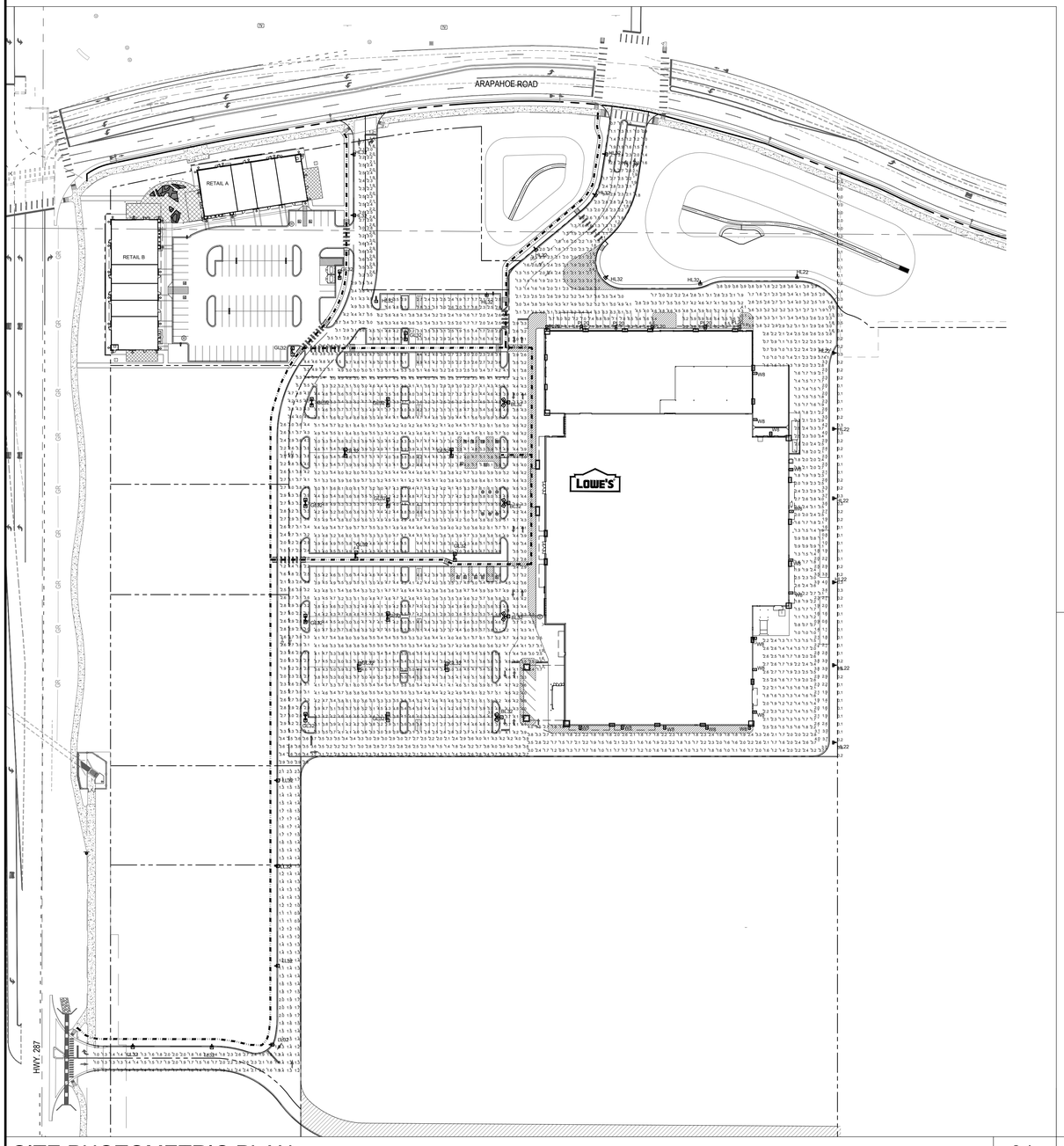
HKS HARRIS KOCHER SMITH
KEPHART community ■ planning ■ architecture
NORRIS DESIGN Planning | Landscape Architecture | Branding

LUMINAIRE SCHEDULE								
Symbol	Qty	Label	Arrangement	Total Lamp Lumens	LLF	Description	Lum. Watts	BUG Rating
	4	BL32	3 @ 120 DEGREES	N.A.	0.750	VP-L-96NB-220-5K-T5QM-480-DBT	217.6	B4-U0-G2
	17	GL32	D180°	N.A.	0.750	VP-L-96NB-220-5K-T5QM-480-DBT	217.6	B4-U0-G2
	6	LL32	SINGLE	N.A.	0.750	VP-L-96NB-220-5K-T5QM-480-DBT	217.6	B4-U0-G2
	9	HL32	SINGLE	N.A.	0.750	VP-L-96NB-220-5K-T4-BC-480-DBT	217.6	B1-U0-G4
	7	HL22	SINGLE	N.A.	0.750	VP-L-96NB-220-5K-T4-BC-480-DBT	217.6	B1-U0-G4
	14	W8	SINGLE	N.A.	0.750	VP-S-22NB-50-T3	53.27	B1-U0-G2
	6	PL20	SINGLE	N.A.	0.750	VP-L-64NB-135-5K-T3	137.6	B2-U0-G3



SITE PHOTOMETRIC PLAN 01

SCALE: 1"=80'-0"

CALCULATION SUMMARY							
Label	CalcType	Units	Avg	Max	Min	Max/Min	EXCEPTION
CUSTOMER ENTRY DRIVE 1	Illuminance	Fc	2.47	6.4	0.7	9.14	
CUSTOMER ENTRY DRIVE 2	Illuminance	Fc	3.09	6.1	1.1	5.55	
CUSTOMER ENTRY DRIVE 3	Illuminance	Fc	2.99	4.3	1.1	3.91	
CUSTOMER ENTRY DRIVE 4	Illuminance	Fc	1.53	2.7	0.9	3.00	
FRONT DRIVE AISLE	Illuminance	Fc	3.86	5.2	1.3	4.00	
MAIN PARKING	Illuminance	Fc	4.52	6.6	1.3	5.08	
PROPERTY LINE-EAST (RESIDENTIAL)	Illuminance	Fc	0.16	0.5	0.0	N.A.	1
REAR DRIVE AREA	Illuminance	Fc	2.09	4.2	0.6	7.00	
SECONDARY PARKING	Illuminance	Fc	5.03	7.6	1.7	4.47	

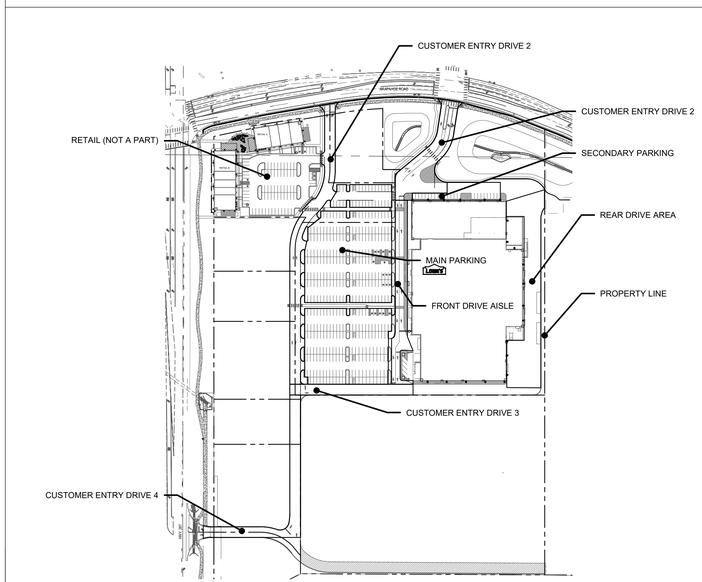
LOWE'S CALCULATION TARGET VALUES				
Label	Avg	Max	Min	Max/Min
CUSTOMER ENTRY DRIVE 1	1.25	N/A	N/A	10.0
CUSTOMER ENTRY DRIVE 2	1.25	N/A	N/A	10.0
CUSTOMER ENTRY DRIVE 3	1.25	N/A	N/A	10.0
FRONT DRIVE AISLE	2.50	N/A	1.0	5.0
MAIN PARKING	2.00	N/A	0.75	5.0
NON-CUSTOMER ENTRY DRIVE	N/A	N/A	0.6	10.0
PROPERTY LINE	N/A	0.8	N/A	N/A
REAR DRIVE AREA	N/A	N/A	0.6	10
SECONDARY PARKING	2.00	N/A	0.75	10.0

EXCEPTION:
1. GENERAL EXCEPTION-REVIEWING AUTHORITY LIMITS OVERALL ASSEMBLY HEIGHT TO 35'-0". POLES WILL NEED TO BE ORDERED AT 32'-0" LENGTHS. ANY ASSEMBLY WITHIN 100' OF RESIDENTIAL USE, WHICH IS TO THE EAST OF LOWE'S.

NOTE:
SITE PHOTOMETRIC PLANS SHALL NOT BE SUBMITTED TO ANY REVIEWING AUTHORITY PRIOR TO APPROVAL BY LOWE'S ENGINEERING MANAGER.

NOTE:
THIS LIGHTING DESIGN IS BASED ON INFORMATION SUPPLIED BY OTHERS TO GALLOWAY & CO., INC. SITE DETAILS PROVIDED HEREON ARE REPRODUCED ONLY AS A VISUALIZATION AID. FIELD DEVIATIONS MAY SIGNIFICANTLY AFFECT PREDICTED PERFORMANCE. PRIOR TO INSTALLATION, CRITICAL SITE INFORMATION (POLE LOCATIONS, ORIENTATION, MOUNTING HEIGHT, ETC.) SHOULD BE COORDINATED WITH THE CONTRACTOR AND/OR SPECIFIER RESPONSIBLE FOR THE PROJECT.

NOTE:
LUMINAIRE DATA IS TESTED TO INDUSTRY STANDARDS UNDER LABORATORY CONDITIONS. OPERATING VOLTAGE AND NORMAL MANUFACTURING TOLERANCES OF LAMP, BALLAST, AND LUMINAIRE MAY AFFECT FIELD RESULTS.



PHOTOMETRIC ZONE MAP 02

SCALE: 1"=200'-0"

REVISIONS		
◇ PRE-BID SET ISSUE DATE	△ POST BID SET ISSUE DATE	
DATE		DESCRIPTION

Evergreen Development | Services | Investments
Galloway
6161 S. Willow Drive, Suite 320
Greenwood Village, CO 80111
303.770.8884
gallowayus.com

LOWE'S HOME CENTERS, LLC
1000 Lowes Boulevard
Mooresville, NC 28117

704.758.1000 (V)

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LOWE'S

SITE PLAN
SITE PHOTOMETRIC PLAN

LOWE'S OF:
ERIE, COLORADO

PROJECT No: ED0000818.20 | DRAWN BY: JMG | CHECKED BY: JMG

CRITERIA ISSUE DATE:	10.11.19
PERMIT SET ISSUE DATE:	
CONSTRUCTION SET ISSUE DATE:	

DRAWING NUMBER:

PH-1.00

CIVIL SITE PLAN CHECKLIST

Project Location: *Erie Nine Mile*

Engineering Firm: *Galloway & Company, Inc.*

Contact: *Brandon McCrary, PE* Phone: *303-770-8884*

Email: *BrandonMcCrary@GallowayUS.com*

Please sign below when submitting plans. This certifies that you have complied with checklist for appropriate plan submittal.

40% Plans **Comments:**

Due: _____ _____

Rec'd: _____ _____

Returned: _____ _____

Consultant Signature _____

90% Plans **Comments:**

Due: _____ _____

Rec'd: _____ _____

Returned: _____ _____

Consultant Signature _____

Bid Set **Comments:**

Due: _____ _____

Rec'd: _____ _____

Returned: _____ _____

Consultant Signature _____

CIVIL SITE PLAN CHECKLIST

Geotechnical Report **Date of Report:** 2/24/17
Geotechnical Firm: CTL/Thompson

- Pavement Sections

Heavy Duty Asphalt Pavement
7" Full Depth Asphalt OR ___4___" Surface Course
_____" Binder Course
___9___" Stone Base

Standard Duty Asphalt Pavement
6" Full Depth Asphalt OR ___4___" Surface Course
_____" Binder Course
___6___" Stone Base

Heavy Duty Concrete Pavement
___6___" Concrete Reinforcement _____
_____" Stone Base

Standard Duty Concrete Pavement
___5___" Concrete Reinforcement _____
_____" Stone Base

Underdrains Proposed? No

Internal Friction Angle of Material to be used for Slopes and Retaining Walls 23-degrees

Foundation Proposed (Shallow, deep, etc.) Shallow

Undercut required? Yes ☒ No ☐ 3 ft - 5 ft sub-excavation

Maximum Dry Density (onsite soils) 113 pcf Optimum Moisture Content (onsite soils) 15.5%

List any issues/areas of concern on site, i.e., sinkholes, etc. _____

LAR ~ Water Flow Analysis Report **Date** 8/7/19

Separate Taps required for domestic and fire? Yes ☒ No ☐

FDC to be located: On building ☒ Freestanding ☐ other: _____

Maximum allowable distance from FDC to Hydrant: 100 ft.

Maximum allowable spacing between Hydrants: 500 ft.

Domestic Meter located: Outside meter vault Irrigation Meter located: Inside building

Fire backflow prevention device required? Type Reduced Pressure Inside ☒ Outside ☐

Reduced pressure zone (RPZ) backflow preventer required? Yes ☒ No ☐

Maximum allowable distance from any point on building to hydrant: 400 ft.

Firemain size: 10" Firemain material requirements: DIP (PVC, DIP…)

Are hydrants required to be operational prior to above grade building construction: Yes ☐ No ☐

Water tank required: Yes ☐ No ☐ Maybe ☒

Fire Pump required: Yes ☐ No ☐ Maybe ☒

Available Pressure (Residual): 44 PSI Available Pressure (Static) 74 PSI

Available Flow: 1250 GPM

CIVIL SITE PLAN CHECKLIST

Earthwork Quantities **Date** 11/21/19

Finished Floor Elevation: 5,264 Shrink/Swell Factor: 8.7 %

Import: 69,260 CY Export: _____ CY Rock: _____ CY Cut: 300,000 CY Fill: 369,260 CY

Pavement Sections, Utility Spoils and building slabs have been considered in Earthwork Calculations:

Yes ☐ No ☒

A quantity of 0 CY of topsoil/strippings has been included in the above calculations.

A quantity of 0 CY of undercut has been included in the above calculations.

Lowe's site plan checklist is to be used as a guide for plan completion, but *not* as an all-inclusive checklist. Other pertinent information is required per Lowe's Site Development Criteria, Government Authorities, and other agencies having jurisdiction for the proposed project.

100%	90%	40%	**General Plan Requirements**
☐	☒	☐	Scale 1"=60' Minimum; 1"=40' maximum, use 24"X36" paper
☐	☒	☐	Lowe's Standard Title Block Used
☐	☐		Provide Lowe's Division 2 Standard Site Specs - Special Provisions Section 02000 in electronic format
☐	☒		Include a site specific SWPPP in Division 2 - Special Provisions Section 02000 in electronic format
☐			Provide reproducible plans (24"X36"), signed and sealed by a registered engineer
☐	☒	☐	Provide hardcopies of plans
☐	☐	☐	Construction Cost Estimate
☐	☐	☐	Email plans to Aon Fire Protection Engineering and Project Architect

100%	90%	**Demolition Plan**
☐	☐	Graphic Scale & North Arrow
☐	☐	Metes & Bounds of Property
☐	☐	Limits of demolition
☐	☐	Limits of milling, sawcutting and replacement of paving.
☐	☐	Label all utilities to be abandoned or removed (remove all utilities under building)
☐	☐	Show tree protection for any trees to remain and/or undisturbed buffers
☐	☒	Demolition Notes
☐	☐	Existing utilities
☐	☐	"Miss Utility" phone number

100%	90%	40%	**Existing Survey**
☐	☐	☐	Graphic Scale & North Arrow
☐	☐	☐	Metes & Bounds of Property
☐	☐	☐	Lot #'s and acreages
☐	☐	☐	Legend
☐	☐	☐	Show existing roadway striping
☐	☐	☐	Existing contours at one-foot intervals
☐	☐	☐	Tree location, type & size
☐	☐	☐	All existing utilities with line sizes
☐	☐	☐	Vicinity Map
☐	☐	☐	All existing storm drainage with rim elevations and inverts
☐	☐	☐	All existing structures, fences, paving, tanks, sidewalks, buried objects…

CIVIL SITE PLAN CHECKLIST

☐	☐	☐	Benchmark(s)
☐	☐	☐	Adjacent property owners
☐	☐	☐	Adjacent roads with names
☐	☐	☐	Easements and building setbacks
☐	☐	☐	Verified existing and proposed R.O.W. widths
☐	☐	☐	Are there existing jurisdictional waters or wetlands? Yes ☐ No ☐
☐	☐	☐	Delineate jurisdictional waters or wetland boundaries and linear feet or wetland acreage
☐	☐	☐	100 Year Floodplain Elevation _____
☐	☐		Surveyor's certification, seal and signature

100%	90%	40%	**Site Plan**
☐	☒	☐	Graphic Scale & North Arrow
☐	☒	☐	Metes & Bounds of Property
☐	☒	☐	Legend
☐	☒	☐	Location of Building from property (at least two points)
☐	☒	☐	Dimensions of parking spaces, access drives and drive aisles
☐	☒	☐	Dimension easements, landscape buffers, rights of ways, building & parking setbacks
☐	☒	☐	Building and garden center dimensions
☐	☒	☐	Label building size and type (prototype if used)
☐	☒		Horizontal control (curve data for driveway stakeout)
☐	☒	☐	24 ~ 10' wide contractor spaces
☐	☒		Label all radii larger than 4'
☐	☒	☐	Delineate heavy-duty asphalt pavement with solid shade hatch
☐	☒	☐	Delineate heavy-duty concrete pavement with concrete hatch
☐	☒	☐	Label curb & gutter and all tie-ins
☐	☒		Traffic markings at all entrances and in parking area
☐	*N/A*	☐	Fire lane striping (if required)
☐	☒	☐	Stop bars/signs
☐	*N/A*	☐	Retaining walls labeled by letter (A, B, C...) and stationed
☐	*N/A*		Retaining walls (dimension and tie to property line)
☐	*N/A*		Retaining wall fence/guardrail
☐	*N/A*	☐	Guardrails labeled
☐	☒	☐	Guard post and/or Bollards shown and labeled
☐	☒		Show and label transformer & generator, and trash compactor
☐	☒		Pavement markings labeled per SP-1
☐	☒		Site Notes
☐	☒	☐	Lowe's Site Data block
☐	☒	☐	Label # of spaces per row of parking on plan (Cart returns not considered a space)
☐	☒	☐	Sidewalk and pedestrian circulation shown on plan as req'd by city & ADA
☐	☒	☐	Completed ADA Checklist
☐	*N/A*	☐	Show existing and proposed signals
☐	*N/A*	☐	Lowe's pylon/monument signs
☐	☒	☐	Cart Returns shown w/note: Furnished and installed by Lowe's
☐	☒		Customer Loading Canopy Detail
☐	☒	☐	Handicap Parking & Signs
☐	*N/A*		4' Detention/retention pond fence with (2) 8' wide access gates (if used)
☐	☒	☐	Truck Turning Diameter (110')
☐	☒	☐	Check all WB-67 truck turning movements
☐	☒	☐	Wheel Stops at Garden Center Fence where parking is provided
☐	☒		Site Lighting Poles
☐	☒		I have contacted the Architect to ensure correct / latest building criteria for the proposed prototype.

CIVIL SITE PLAN CHECKLIST

100%	90%	
☐	☒	Graphic Scale & North Arrow
☐	☒	ESC Plans showing locations of points of stormwater discharge (latitude & longitude) to surface waters or MS4 and identification of surface waters or MS4
☐	☐	Vicinity Map
☐	☐	Metes & Bounds of Property
☐	☒	Legend
☐	☒	Construction Entrance, 24' access drive and show limits of disturbed area
☐	☒	30,000 SF laydown pad w/detail (do not locate over storm drainage & utilities)
☐	☒	Existing and proposed contours, spot elevations and limits of disturbed areas
☐	☒	All existing storm drainage with rim elevations and inverts
☐	☒	Erosion and Sediment Control Notes
☐	☒	Phasing/Construction Sequence including timing for installation, maintenance and removal of all structural BMPs.
☐	☐	"Future Home of Lowe's" Sign location
☐	☒	Seeding and Mulching Specs and location and timing of stabilization measures
☐	☐	Sediment basin(s) and/or sediment trap(s) – with site specific details
☐	☒	Velocity dissipation devices at discharge points (e.g. rip rap apron)
☐	*N/A*	Location of all erosion control blanket used (RECP)
☐	*N/A*	Protection for any trees to remain and/or undisturbed areas to remain
☐	☒	Locations of all structural and non-structural BMPs included in the SWPPP
☐	☒	Provide SWPPP in accordance with Section 800 of Lowe's Development and Design Criteria (electronic and 1 hard copy required at 100%)

Erosion and Sediment Control Plan (Provide Phase I and Phase II Plans)

100%	90%	40%	
☐	☒	☐	Graphic Scale & North Arrow
☐	☐	☐	Metes & Bounds of Property
☐	☒		Legend
☐	☒	☐	Finished Floor Elevation = *5,264* (show on building)
☐	☒	☐	Existing & Proposed Grades (1' contours) Proposed contours not computer generated.
☐	☒	☐	2% Minimum grades in parking lot; 1% minimum in gutter
☐	☒	☐	2% Maximum grades to end of handicapped spaces to meet ADA requirements
☐	☒	☐	3% Maximum grades in rear of building
☐	☒	☐	4% Maximum grades in parking lot
☐	☒	☐	7% Maximum grades at entrances to parking lot
☐	☒	☐	Benchmark(s)
☐	☐	☐	Show limits of grading disturbance
☐	*N/A*		Show tree protection for any trees to remain and/or undisturbed buffers
☐	☒	☐	All existing storm drainage with rim elevations and inverts
☐	☒		Hi/Low Spot Elevations Shown per SP-1 Drawings
☐	☒	☐	All proposed drainage structures with rim elevations and inverts
☐	☒		Label all proposed drainage structures (i.e. inlet types)
☐	☐		Label all proposed stormwater pipe slopes, length, size and type
☐	☒	☐	10" truckwell drain
☐	☒	☐	Show all 10"/12" downspout locations per SP-1 and/or architectural elevations (Do not run under generator/transformer)
☐	☐	☐	If RPZ required, show 10" storm drain pipe from sprinkler room
☐	☒		Grading & Drainage Notes
☐	*N/A*		Retaining walls (Top, bottom spot elevations)
☐	☒		Show all proposed swales, flumes and channels with elevations
☐	*N/A*	☐	Show stormwater pond with dimensions
☐	*N/A*		Drainage structure schedule
☐	☐		"Miss Utility" phone number

Grading & Drainage Plan

CIVIL SITE PLAN CHECKLIST

☐	☒	☐	Show site utilities (ghosted) for conflict purposes
☐	☒		Site Lighting Poles
☐	☒		Show summary of hydraulic calculations with storm frequency and duration
☐	☒		Forward Drainage Calculations sealed by registered engineer to Lowe's
☐	☒		Design Year Storm *100-yr* "Storm" Calculation Method *Rational*
☐	☒		Detention/Retention Storage Required *4.297ac-ft* Storage Provided *4.381ac-ft*
☐	☒		Retaining what year storm *100-yr*
☐	☒		High water elevation *5259.65* Year Storm *100-yr*
☐	☒		100 year storm passes though detention outlet structure: Yes ☐ No ☒
☐	☒		Amount of "freeboard" provided *1 ft*
☐	☒	☐	100 Year flood line is greater than 150' from building
☐	☒		I have contacted the Architect and PM&E consultant and coordinated location of all downspouts, condensation lines, etc. and ensured no overlap between plans.

100%	90%	40%	**Site Utilities Plan**
☐	☒	☐	Graphic Scale & North Arrow
☐	☐	☐	Metes & Bounds of Property
☐	☒	☐	Legend
☐	☒	☐	Finished Floor Elevation Shown
☐	☒		Site utility notes
☐	☒	☐	Show storm drainage (ghosted) for conflict purposes
☐	☒	☐	Fire Department Connection (Siamese)
☐	☒	☐	All existing utilities with all pipe sizes, slope, tops and inverts.
☐	☒	☐	All easements existing and proposed w/ dimensions, metes and bounds, and use
☐	☒	☐	Label all utilities to be abandoned or removed (remove all utilities under building)
☐	☒		Label all bends, tees, valves, etc.
☐	☒		Show and label generator and transformer
☐	☒		Routing of gas line and gas meter with bollards (if applicable)
☐	☒	☐	6" Sanitary Sewer lines with slope & cleanouts @100' o/c to office
☐	☒		Label all manholes with top elevations and inverts
☐	☐		Show location of backflow prevention device(s)
☐	☒	☐	Show water mains with type and size
☐	☒	☐	10" minimum firemain, D.I.P. for lead-in.
☐	☒	☐	1-1/2" Domestic water meter ☒ Pit ☐ Building
☐	☒	☐	1-1/2" Irrigation water meter w/connection for Garden Center and Landscape Irrigation ☐ Pit ☒ Building
☐	☐		Lift Station calculations (if required)
☐	☒	☐	Show fire hydrants and gate valves
☐	☒		Telephone conduits (2) 4" PVC
☐	☒		Show and label electrical conduits from source to transformer
☐	☒		Site Lighting Poles
☐	☒		Sanitary sewer schedule
☐	☒		Check all utility crossings for conflicts; list all conflicts (crossing information)
☐	☐		Watertank location identified (if required)
☐	☐		"Miss Utility" phone number
☐	☐	☐	Forward electronic utility drawings to Aon Fire Protection Engineering
☐	☒		I have contacted the Architect and PM&E consultant and coordinated all utility connections at building and ensured no overlap between plans.
☐	☐		I have reviewed the "LAR" as provided by Aon Engineering and coordinated all utility connections at building for the fire suppression system.
☐	☐		I have contacted all utility companies to coordinate available service and routing options.
☐	☒		Dimension utilities (From building, face of curb, etc.)

CIVIL SITE PLAN CHECKLIST

100%	90%	
		Site Details
		Utilize all Standard Lowe's Details unless required by local authority.
☐	☒	Asphalt & concrete pavement sections (heavy duty & standard)
☐	*N/A*	Offsite pavement details (if required)
☐	☒	Concrete/asphalt joint detail
☐	☒	Building slab/concrete pavement joint detail
☐	☒	Concrete paving joint details
☐	☒	Cart return detail
☐	☐	"Future Home of Lowe's" sign
☐	☐	Lowe's road sign
☐	☒	Handicap parking sign detail
☐	☒	Handicap painted symbol detail for parking space.
☐	☒	Stop sign detail
☐	☒	Pavement markings (stop bar, traffic arrows, etc).
☐	☒	Concrete curb & gutter detail
☐	☒	Inlet Structures
☐	☐	Bollard detail
☐	☒	Sidewalk detail
☐	☒	Curb-ramp detail
☐	*N/A*	Rip-rap aprons
☐	☐	French drain
☐	☒	Sanitary Sewer trench/bedding/backfill detail(s)
☐	☒	Storm Drainage trench/bedding/backfill detail(s)
☐	*N/A*	Retaining & screening wall details (if needed)
☐	*N/A*	Headwalls (if needed)
☐	*N/A*	Flared end sections (if needed)
☐	*N/A*	Outfall structures (if needed)
☐	*N/A*	Post-Construction Stormwater pond sections and details
☐	☒	Thrust blocks for pressure piping
☐	☒	Cleanout detail
☐	☒	Fire Hydrant detail
☐	☒	Manhole detail (Storm and Sanitary)
☐	☒	Valve pit details (if backflow prevention not allowed in building)
☐	☒	Valve box and valve vault detail (if needed)
☐	*N/A*	Free standing FDC (If not allowed on building)
☐	*N/A*	Guardrail detail (if needed)
☐	*N/A*	Fence and gate detail (if needed)
☐	☒	Erosion and Sediment Control (ESC) temporary structural details such as silt fence, sediment trap, check dams and slope drains
☐	☐	ESC temporary stabilization details such as temporary seeding, mulching and chemical stabilization
☐	☒	ESC permanent stabilization such as RECP, seeding and vegetation protection
☐	*N/A*	ESC permanent structural details such as outlet energy dissipaters, ponds, channels and bioretention facilities

100%	90%	
		Landscape <u>Planting Plan (*See Criteria Drawings L-1 and L-2*)</u>
☐	☒	Graphic Scale & North Arrow
☐	☐	Metes & Bounds of Property
☐	☒	Planting Notes
☐	☒	Show proposed storm drainage and utilities (ghosted) for conflict purposes only
☐	☒	Plant material list: botanical & common name, quantity, size, spacing, remarks
☐	☒	Label all areas to be seeded or sodded
☐	☒	Seeding and mulching specs (Coordinate with Erosion and Sediment Control Plans)

CIVIL SITE PLAN CHECKLIST

☐	N/A	Existing plant material list for any trees to remain and/or undisturbed buffers
☐	N/A	Show tree protection for any trees to remain
☐	☒	Tree location notes if needed
☐	☒	Key designation
☐	☒	Label all trees, shrubs and ground cover on plan
☐	☒	Shrub & tree planting details (see Lowe's standards)
☐	☒	Clearly identify local green space/landscaping requirements
☐	☐	Site Lighting Poles

100%	90%	
		Irrigation Plan (*See Criteria Drawings IR-1, IR-2 and IR-3*)
☐	☒	Irrigation required/recommended? Yes ☒ No ☐
☐	☒	Graphic Scale & North Arrow
☐	☐	Metes & Bounds of Property
☐	☒	All physical improvements to property
☐	☒	Show proposed storm drainage and utilities (ghosted) for conflict purposes only
☐	☒	Show proposed landscape plant beds, trees and turf (ghosted) for conflict purposes only
☐	☒	Point of connection, meter, backflow preventer, master valve and flow sensor
☐	☒	Show zone valve locations, size and gallons per minute for each zone
☐	☒	Irrigation main and lateral pipe type and size
☐	☒	Sleeve locations, sizes, and timing for installation
☐	☒	Sprinkler head layout showing type and configuration of sprinkler used
☐	☒	Rain sensor or rain/freeze sensor type and location (Lowe's furnished item)
☐	☐	Pump location and type (if used)
☐	☒	Irrigation Notes, Legend and Schedule
☐	☒	Irrigation Controller shown in sprinkler riser room per SP-1 (Lowe's furnished item)
☐	☒	Irrigation details

100%	90%	40%	
			Site Lighting Plan
☐	☒		Graphic Scale & North Arrow
☐	☐		Metes & Bounds of Property
☐	☐		Show proposed drainage and utilities (for conflict purposes only)
☐	☒		Light pole locations 35' tall (typ)
☐	☐		Circuitry (circuit numbers, amps, volts, type of circuit) NL, FL, or EMS
☐	☐		Provide pole mounted 400W flood lights along front of building
☐	☐		Road sign location and circuitry
☐	☐		Pole base detail with electrical grounding
☐	☒		Easements if applicable
☐	☒		Site lighting fixture notes; fixture type Beacon (Hubbel)
☐	☒		Site lighting fixture schedule
☐	☒		Lighting pole schedules
☐	☒	☐	Photometric with 20X20 grid (light loss factor 0.80 for high pressure sodium; 0.75 for metal halide) for review purposes only, not part of final plans unless "Pre-Developed" project
☐	☒		Identify lighting restrictions
☐	☒		Ensure building mounted fixtures are as shown on building plans are included in photometric study.
☐	☐		I have contacted the Architect and PM&E consultant and coordinated connections to correct panels

100%	90%	
		Due Diligence
☐	☐	I have ensured environmental reports have been updated within 6 months of closing

100%	90%	40%	
			Upload Requirements
	☐	☐	Ensure LAR has been uploaded by Aon Fire Protection Engineering

CIVIL SITE PLAN CHECKLIST

	☐	☐	Phase I ESA and any updates
	☐	☐	Phase II (if applicable)
	☒	☐	Geotechnical Report and any updates
☐	☐		Geotechnical Review Letter
☐	☐		SWPPP Ledger - Bid Copy (Project Bidding/Bid Documents Folder)
☐			SWPPP Ledger - 100% Copy (after SWPPP pre-con meeting upload to Site Folio
☐	☐	☐	Plans (see note on general requirements)
		☐	Miscellaneous Reports (i.e. TIA, drainage calculations, lift station calculations, etc.)
		☐	Completed Site Development Checklist
☐	☐	☐	Electronic copies of plans (AutoCAD DWG file)

CIVIL SITE PLAN CHECKLIST

ADA CHECKLIST - Code of Federal Regulations (28 CFR Part 36) - ADA Standards for Accessible Design

Project Name & Location: *Erie Nine Mile*

Review Date: *11/21/19*

Type of Review: *90% Construction Documents*

Prototype: *110,828 SF*

Project Manager: *Brandon McCrary*

Project Technician:

Client's Project Manager:

Plan Checker: *A. Johnston*

P = Required for Preliminary, Initial, or Pre-Application Plans
FS = Required for Formal Submittal Plans
F = Required for Final Plans

S = Satisfactory
U = Unsatisfactory
N/A = Non-Applicable

X. SITE PLAN

P	FS	F		S	U	N/A
			Parking:			
		X	Accessible Parking Spaces are provided in parking area in conformance with the table below.	X		
			Total Parking Provided In Lot / **Required Minimum No. of Accessible Spaces** **301 to 400** / **8** **401 to 500** / **9** **501 to 1000** / **2 percent of total** **1001 and Over** / **20 plus 1 for each 100 or fraction thereof over 1000**	X		
		X	Access aisles adjacent to accessible spaces shall be 60" wide minimum unless aisle is adjacent to VAN accessible space.	X		
		X	One in every six accessible spaces, but not less than one, shall be served by an access aisle 96" wide minimum and shall be designated "Van Accessible" as required	X		
		X	Vertical clearance of 98" at the parking space and along at least one vehicle access route to such spaces from site entrance(s) and exit(s). All such spaces may be grouped on one level of a parking structure.	X		
		X	Accessible parking spaces serving a particular building shall be located on the shortest accessible route of travel from adjacent parking to an accessible entrance.	X		

CIVIL SITE PLAN CHECKLIST

P	FS	F		S	U	NA
		X	Accessible parking spaces shall be at least 96".	X		
		X	Two accessible parking spaces may share a common access aisle.	X		
		X	Parking spaces & access aisles shall be level with the surface slopes not exceeding 1:48 in all directions.	X		
			Accessible Routes:			
		X	One accessible route provided within boundary of site from public transportation stops, accessible parking spaces, passenger loading zones, public streets or sidewalks to an accessible building entrance.	X		
		X	At least one accessible route connecting accessible buildings and accessible spaces that are on the same site.	X		
		X	Minimum clear width for single wheelchair is 36" except at doors.	X		
		X	Minimum clear width for two wheelchair is 60"	X		
		X	If an accessible route has less than 60" clear width, then passing spaces at least 60" by 60" shall be located at reasonable intervals not to exceed 200 ft.	X		
		X	Parking vehicle overhangs shall not reduce the clear width of an accessible route.	X		
		X	Nowhere shall the cross slope of an accessible route exceed 1:48.	X		
		X	If an accessible route has changes in level greater than 1/2" then a curb ramp is to be provided.	X		
			Curb Ramps:			
		X	Maximum slopes of gutters or road surface immediately adjacent to the curb ramp, or accessible route shall not exceed 1:20.	X		
		X	Minimum width of a curb ramp shall be 36", exclusive of flared sides.	X		
		X	Maximum slope of the flare shall be 1:10.	X		
		X	Curb ramp shall have a detectable warning. The detectable warning shall extend the full width and depth of the curb ramp.	X		
		X	Curb ramps at marked crossings shall be wholly contained within the markings excluding any flared sides.	X		
		X	Road Intersections - Bottom of diagonal curb ramps shall have 48" minimum clear space.	X		
		X	Road Intersections - At marked crossings the 48" minimum clear space shall be within the markings	X		
		X	With flared sides, diagonal curb ramps shall have at least a 24" long segment of straight curb on each side of curb ramp and within marked crossing.	X		
		X	Islands - Any raised islands in crossings shall be cut through level with the street or have curb ramps at both sides and a level area at least 48" long between the curb ramps.	X		
		X	Detectable Warnings - Shall consist of raised truncated domes with a diameter of nominal 0.9", a height of nominal 0.2" and a center-to-center spacing of nominal 2.35" and shall contrast visually with adjoining surfaces.	X		
			Ramps:			
		X	An accessible route with a running slope greater than 1:20 is considered a ramp.	X		
		X	Ramps - The maximum slope of a ramp shall be 1:12	X		
		X	Ramps - The maximum rise for any run shall be 30"	X		
		X	Ramps - The minimum clear width shall be 36"	X		

CIVIL SITE PLAN CHECKLIST

P	FS	F		S	U	NA
		X	Ramps - The cross slope shall be no greater than 1:48	X		
		X	Landings - Level landings shall be at bottom and top of each ramp and ramp run.	X		
		X	Landings - Landing shall be at least as wide as the ramp running to it.	X		
		X	Landings - The landing length shall be a minimum of 60" clear.	X		
		X	Landings - If ramps change direction at landings, the minimum landing size shall be 60" by 60".	X		
		X	Ramps and landings with drop-offs shall have curbs, walls, railings, or projecting projecting surfaces that prevent people from slipping off ramp. Curbs shall be a minimum of 2" high.	X		
		X	Handrails - If a ramp run has a rise greater than 6", or a horizontal projection greater than 72", then handrails are required on both sides.			X
		X	Handrails - Inside handrail on switchback or dogleg ramps shall be continuous.			X
		X	Handrails - If not continuous, they shall extend at least 12" beyond top and bottom of ramp segment and shall be parallel with the ground surface			X
		X	Handrails - The clear space between the handrail and the wall shall be 1.5".			X
		X	Handrails - Top of handrail gripping surface shall be mounted between 34" and 38" above ramp surfaces.			X
		X	Handrails - End of handrails shall be either rounded or returned smoothly to floor, wall, or post.			X
		X	Handrails - Handrails shall not rotate within their fittings			X
			Signs:			
		X	Elements and spaces of accessible facilities which shall be identified by the International Symbol of Accessibility. a) Parking spaces designated as reserved for individuals with disabilities b) Accessible passenger loading zones c) Accessible entrances when not all are accessible (inaccessible entrances shall have directional signage to indicate the route to the nearest accessible entrance.)	X		
		X	Accessible parking spaces shall be designated as reserved by a sign showing the symbol of accessibility.	X		
		X	Van Accessible spaces are required to have an additional sign mounted below the symbol of accessibility reading "VAN-ACCESSIBLE". Such signs shall be located so they cannot be obscured by a vehicle parked in the space.	X		

Final Utility Report

NINE MILE CORNER
AT NINE MILE SUBDIVISION FILING NO. 1

Erie, Colorado

PREPARED FOR:
Evergreen Devco, Inc.
1873 South Bellaire Street
Denver, CO 80222

PREPARED BY:
Galloway & Company, Inc.
6162 S. Willow Drive, Suite 320
Greenwood Village, CO 80111

DATE:
August 16, 2019

REVISED:
November 13, 2019

Engineer's Statement

The enclosed utility report and associated calculations and exhibits were prepared by me or under my direct supervision and are correct to the best of my knowledge and belief. Said utility report has been prepared in accordance with applicable Town of Erie criteria and is in conformance with the master utility plans for the affected area. I accept responsibility for any liability caused by negligent acts, errors, or omissions on my part in preparing this report.

Brandon McCrary, PE 40276 *Date*
For and on behalf of Galloway & Company

Developer's Certification

As the owner and developer of the land identified within this report I agree to proceed, implement, and comply with all recommendations and requirements outlined herein.

Evergreen Devco, Inc.

Authorized Signature *Date*

TABLE OF CONTENTS

I. Project Location and Description 4
- Location 4
- Description of Property 4

II. Calculated Water Demands 4
- Average Day Demands/Peak Hour Demands 4
- Water Demand Calculations 5
- Fire Flow Demands 5

III. Water System 6
- Existing Distribution System 6
- Proposed Distribution System 6
- Proposed Water System Analysis and Modeling 7

IV. Calculated Wastewater Flows 7
- Average Daily Flows 7
- Sanitary Flow Calculations 8

V. Wastewater System 8
- Existing Wastewater Collection System 8
- Proposed Wastewater Collection System 9
- Proposed Wastewater Facilities 9
- Proposed Wastewater System Analysis and Modeling 9

VI. Future Development Requirements 9

VII. References 9

Appendix A – Water Distribution System 11
- Hydrant Flow Test 11
- Water Demand Calculations 11
- WaterCAD Hydraulic Analysis and Modeling – PHD + FF 11

Appendix B – Sanitary Sewer Collection System 12
- Sanitary Sewer Demand Calculations 12
- Flowmaster Hydraulic Analysis 12

Appendix C – *Street Sewer Capacity Evaluation* by Merrick & Company 13

Appendix D – Maps and Plans 14
- Water Schematic 14
- Overall Grading Plan 14
- Overall Utility Plan 14

I. Project Location and Description

Location

Nine Mile Corner (site) is located at the southeast corner of N. 107th Street (U.S. Highway 287) and Arapahoe Road in Erie, Colorado. The site is located in the northeast quarter of Section 34 and the southeast quarter of Section 27, Township 1 North, Range 69 West of the 6th Principal Meridian, Town of Erie, County of Boulder, State of Colorado. The site is bounded by Arapahoe Road right-of-way to the north, a mix of vacant land and a single-family residence (compound) to the east, an existing single-family residential development to the south, and N. 107th Street (U.S. 287) to the west. Refer to Appendix A for a Vicinity Map.

The surrounding developments are Beacon Hill subdivision to the south, Arapahoe Ridge to the north, and vacant land to the west and east.

Description of Property

The total project area is ±47.2 acres. The commercial area comprises ±32.5 acres and the multi-family area comprises ±14.7 acres. The development will be served by four major access points: two (2) along N. 107th Street (U.S. 287) and two (2) along Arapahoe Road.

Vegetative cover consists of native vegetation and bare ground with approximately 40% coverage. The existing ground generally slopes from southwest to northeast, with grades ranging from 0.5% to 25%.

The existing property consists of a mix of land uses including: vacant land, Prince Lake Number I and its associated infrastructure, South Boulder Canyon Ditch, and two single-family residences with associated out-buildings.

The proposed land use will include several commercial developments and approximately 290 units of multi-family (i.e. high-density residential). Half (145) of these will be one-bedroom units and half (145) will be two-bedroom units. The commercial site tenant mix has not been determined. Site improvements common to this type of development include installing site-specific wet and dry utility mains and service lines, improved parking areas and drive aisles (i.e. asphalt and/or concrete), landscaping, and site detention and water quality facilities. The south side of Arapahoe Road will be widened as part of this development.

All proposed water and sanitary sewer infrastructure associated with the development will be publicly owned, maintained and dedicated to the Town of Erie as part of the Nine Mile Corner improvements. On-site utilities serving the commercial and multi-family lots will connect to these improvements in the future.

II. Calculated Water Demands

Average Day Demands/Peak Hour Demands

Average Daily Demand (ADD) for the water distribution flows were calculated per the Town of Erie *Standards and Specifications, Section 600 – Water Facilities*, being 1,651 gallons/day/acre for the commercial area and 140 gallons/capita/day for the multi-family area. The Peak Hour Demand (PHD) was calculated by multiplying the ADD by the Peak Hour Demand Factor of 3 for commercial uses and by the Peak Hour Demand Factor of 3.9 for the multi-family use. The Water System Average Daily Demand (ADD) was calculated as 166,932 gpd and the Peak Hour Demand (PHD) was calculated as 418.57 gpm. Average Daily and Peak Hour Demands for the development are presented in the Water Demand Calculations section below.

Water Demand Calculations

Lot/Parcel	Land Use	Area (acre)	Capita	ADF/Capita* Gal/Capita/Day	ADF (gpd)	PHD Factor **	PHD (gpm)	PDD Factor ***	PDD (gpm)
Block 1	Commercial	32.50		1,651	53,658	3	111.79	2.0	74.52
Block 2	Multi-Family		809	140	113,274	3.9	306.78	2.6	204.52
				Total Flow	**166,932**		**418.57**		**279.05**

* ADF taken from Water Facilities, Section 611, Town of Erie Public Works Standards and Specifications
** PHD = 3 per Commercial, 3.9 per Multi-Family - Water Facilities, Section 611, Town of Erie Public Works Standards and Specifications
*** PDD = 2 per Commercial, 2.6 per Multi-Family - Water Facilities, Section 611, Town of Erie Public Works Standards and Specifications

Fire Flow Demands

Fire flow was calculated based on 2015 International Fire Code flow rates. All buildings were assumed to be construction type IIIB or better, except for the proposed Lowe's anchor retail (100,828 SF) and the proposed Anchor 2 retail (54,000 SF). These two buildings are being analyzed because they would require the highest potential fire flow demand within the development. The Lowe's building shall be construction type IIB and the Anchor 2 retail building is assumed to be construction type VB. It was also assumed that only one fire would be fought at a time. Based on Table B 105.1, a minimum fire flow demand of 6,750 GPM was derived for the Lowe's and a minimum fire flow demand of 6,250 GPM was derived for the Anchor 2 retail. An automatic commercial sprinkler system is to be installed within the buildings allowing a 50% reduction in flow, resulting in a final required fire flow of 4,000 GPM for a 4-hour duration for the Lowe's and a fire flow of 3,500 GPM for a 3-hour duration for the Anchor 2 retail. An excerpt of Table B 105.1 is below for reference.

TABLE B105.1
MINIMUM REQUIRED FIRE-FLOW AND FLOW DURATION FOR BUILDINGS

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute)[b]	FLOW DURATION (hours)
Type IA and IB[a]	Type IIA and IIIA[a]	Type IV and V-A[a]	Type IIB and IIIB[a]	Type V-B[a]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.
a. Types of construction are based on the *International Building Code*.
b. Measured at 20 psi residual pressure.

III. Water System

Existing Distribution System

An existing 12" water main is located along the north side of Arapahoe Road. Hydrant flow tests have been performed and results are provided in Appendix C of this report.

Proposed Distribution System

The proposed on-site water infrastructure is designed to accommodate the entire development. Service sizes for the future buildings are currently unknown.

The water system will be looped throughout the commercial and multi-family residential areas of the development and will connect to the existing water main located along the north side of Arapahoe Road. The water main will be connected at two locations: the intersection of Arapahoe Road and the Safeway drive aisle and the intersection of Arapahoe Road and Beasley Drive. This will complete the water main loop for the proposed development.

Proposed Water System Analysis and Modeling

Bentley WaterCAD was used to model the water hydraulics throughout this development. Per the Town of Erie minimum design standards, the following hydraulic scenarios have been analyzed:

- Average Daily Demand
- Peak Hour Demand
- Peak Hour Demand plus Fire Flow

The Town of Erie minimum design standards requires that water distribution pipes have a maximum velocity of 10 feet per second. Per the WaterCAD hydraulic analysis this criterion is being met throughout the development during the highest demand scenario of PHD plus Fire Flow (refer to Appendix A).

A fire flow analysis was conducted for the Anchor 2 retail building. The peak hour demands for each commercial and multi-family lot were modeled concurrently with fire flow demands for the Anchor 2 retail sprinkler system and fire line and for four fire hydrants. A building type of VB was used with a total area of 54,000 square feet. The fire flow assumed for the sprinkler system is 800 gpm. Based on IFC Table B-105.1, a hydrant flow of 2,500 gpm spread out between three fire hydrants is also required. Based on hydraulic modeling and the fire flow test (Appendix C), the required fire flow for the Anchor 2 retail fire suppression system can be supplied by the existing municipal water system while maintaining a required 20 psi residual pressure. A fire pump will not be required to satisfy the Anchor 2 retail sprinkler design requirements at adequate pressures and pipe velocities. Pipe, junction, and fire hydrant tables from the WaterCAD analysis are included in Appendix E.

Henderson Engineers performed a fire flow analysis for the Lowe's retail building (refer to Appendix A). This analysis of the Lowe's fire line indicates that a fire pump will be required, but a storage tank is not be required. Henderson's analysis was based on fire flow tests performed on August 7, 2019 with the Town of Erie distribution system pump(s) turned on. The residual pressure at the sprinkler base of the riser after the backflow preventer is 34.7 psi, which is above the IFC requirement of 20 psi. This calculation is presented in the Henderson report and includes friction loss through the pipes and double check valve backflow preventer. The Town of Erie water distribution system will provide sufficient pressure to the Lowe's fire line so long as 12-inch water mains are installed throughout the site. The report also states that if any additional water system appurtenances are required (i.e. a reduced pressure backflow preventer) the analysis will need to be updated to ensure that the residual pressure does not fall below 20 psi.

IV. Calculated Wastewater Flows

Average Daily Flows

Average Daily Flows (ADF) for wastewater were calculated per the Town of Erie *Standards and Specifications, Section 700 – Sanitary Sewer Facilities*, being 1,000 gallons/acre/day for the commercial area and 90 gallons/capita/day for the multi-family area.

Peak Design Flows (PDF) were determined by multiplying the Average Daily Flow by the Peaking Factor (PF). The Peaking Factor is calculated using the following equation:

$$PF = \frac{3.8}{(ADF)^{0.17}}$$

The Peaking Factor shall not be less than 2.5 or greater than 5 per Town of Erie criteria.

Sanitary sewer mains 10" or smaller in diameter must convey the Peak Design Flow at a maximum flow depth of 80% of the pipe diameter. Sanitary sewer mains 12" or larger in diameter may be designed to flow full at the Peak Design Flow rate.

The Peak Design Flow rate for the entire development was calculated as 526,595 gpd or 0.81 cfs.

Average Daily Flows and Peak Design Flows for the development are presented in the Sanitary Flow Calculations section below.

Sanitary Flow Calculations

Multi-Family Area

	290	Units
	2.79	Capita/Unit
	90	Gal/Capita/Day
Average Day	72,819	Gal/Day
	0.11	cfs
	5	Peaking Factor
Max Flow Rate	364,095	Gal/Day
	0.56	cfs

Commercial Area

	32.5	Acres
	1,000	Gal/Acre
Average Day	32,500	Gal/Day
	0.05	cfs
	5	Peaking Factor
Max Flow Rate	162,500	Gal/Day
	0.25	cfs

Total Nine Mile Corner Flows

Average Day	105,319	Gal/Day
	0.16	cfs
Max Flow Rate	526,595	Gal/Day
	0.81	cfs

V. Wastewater System

Existing Wastewater Collection System

An existing 8-inch sanitary sewer main is located adjacent to the property within the Arapahoe Road right-of-way near its intersection with Beasley Drive. This line is currently operating at or above capacity per the *Street Sewer Capacity Evaluation* completed by Merrick and Company on June 28, 2017. Therefore, a new bypass line shall be extended from the Nine Mile Corner development to the existing interceptor line as described in the Proposed Wastewater Collection System section below.

Proposed Wastewater Collection System

The proposed on-site sanitary infrastructure will be designed to accommodate the entire development. Service sizes for the future buildings are currently unknown.

The sanitary infrastructure will generally flow from southwest to northeast within the development. A new bypass line shall be extended from the Nine Mile Corner development to the interceptor line that runs north from the Arapahoe Ridge subdivision within N. 111th Street to prevent overload of the existing sanitary system. This line shall run east along Arapahoe Road and then turn north and run north along N. 111th Street to the existing interceptor line (manhole AR156 designated in the *Street Sewer Capacity Evaluation*).

Proposed Wastewater Facilities

No new wastewater facilities will be constructed as part of this development.

Proposed Wastewater System Analysis and Modeling

Bentley Flowmaster v8i was used to model the sanitary hydraulics throughout this development. Per the Town of Erie minimum design standards, the following hydraulic scenarios have been analyzed:

- Peak Daily Flow for each proposed pipe slope
- Average Daily Flow for each proposed pipe slope

Town of Erie Wastewater Pipe Slopes and Velocity Criteria

Minimum Velocity	Maximum Velocity	Minimum Slope (8-inch Line)
2 fps	10 fps	0.40%

The minimum velocity is 1.98 fps occurs when the Average Daily Flow is conveyed through the on-site pipes with 0.5% slope. All other proposed pipes meet the minimum velocity criteria.

The maximum velocity is 5.13 fps occurs when the Peak Daily Flow is conveyed through the off-site pipe with a 2.0% slope. All proposed pipes meet the maximum velocity criteria.

All proposed sanitary pipes carry the Peak Design Flow below eighty percent (80%) of the maximum flow depth, which meets the Town of Erie criteria.

VI. Future Development Requirements

The water and sewer distribution systems have been designed to accommodate demands from the future anchor retail buildings and outlots. These future buildings will be responsible for constructing their respective water and sanitary sewer service taps.

VII. References

1. Standards and Specifications, Section 600 – Water Facilities, Town of Erie, July 2019.

2. Standards and Specifications, Section 700 – Sanitary Sewer Facilities, Town of Erie, July 2019.

3. Street Sewer Capacity Evaluation, Merrick and Company, June 28, 2017.

Appendix A – Water Distribution System

Hydrant Flow Test
Water Demand Calculations
WaterCAD Hydraulic Analysis and Modeling – PHD + FF

HENDERSON ENGINEERS

Fire Tank Sizing Calculation (v1.03)

7/17/2018
C. Culp

Lowe's Erie CO

Given:

Waterworks capacity by:	74.0	High Static	
Henderson Flow Test	74.0	Static(S)	
	55.0	Resid Press(R_1)	
	2500	Resid Flow(Q_1)	

DEMAND:

Sprinkler Demand:	1750	gpm	
Inside Hose Allowance:	100	gpm	
Hydrant Demand:	0	gpm	For IBC Fire Flow
Total Tank Flow Demand:	1850	gpm	

Residual Pressure Conversion

Minimum Residual Pressure (R_2)	40.0	psi
- Friction thru Cla-Val Level Ctrl Vlv	10.0	psi
- Friction thru Backflow Preventer	14.0	psi
- Loss for Tank Elevation (25 ft)	10.4	psi
= Resultant Pressure at Tank Fill	6	psi
Flow at Residual Pressure (Q_2)	3423	gpm

REFILL:

City Supply	3423	gpm
Outside Hose Allowance:	400	gpm
Total Tank Flow Refill:	3023	gpm

Duration Demand

Sprinkler Duration (min)	120	min
Hydrant Duration (min)	240	min
Refill Duration (min)	240	min

Determine:

Required Storage Volume

Tank Volume = (Sprinkler Demand * Duration) + (Hydrant Demand * Duration) - (Tank Refill * Refill Duration)

Sprinkler Demand	(120 min x 1850 gpm):	222000 gal
+ Hydrant Demand	+ (240 min x 0 gpm):	+ 0 gal
- Refill	- (240 min x 3023 gpm):	- 725520 gal
= Required Storage Volume (gal)		-503520 gal

Tank Selection

Tank Height:	*24*	ft.	*Do not exceed 24' tank height w/o architect's approval*
Tank Diameter:	*41*	ft.	
Tank Capacity (gal):	237,029	gal	
- Volume Lost (gal)	26,748	gal	
= Available Storage Capacity (gal)	210,281	gal	Sizing OK

Refill Rate Requirement:

Refill Rate:	3023	gpm	
Time to Refill:	78.4	min	
Time to Refill:	1.2	Hrs	Refill time OK
Time to Refill per NFPA 22:	480	Min	
Min Refill Rate per NFPA 22:	493.8	gpm	

Freeboard/Suction Empty Volume

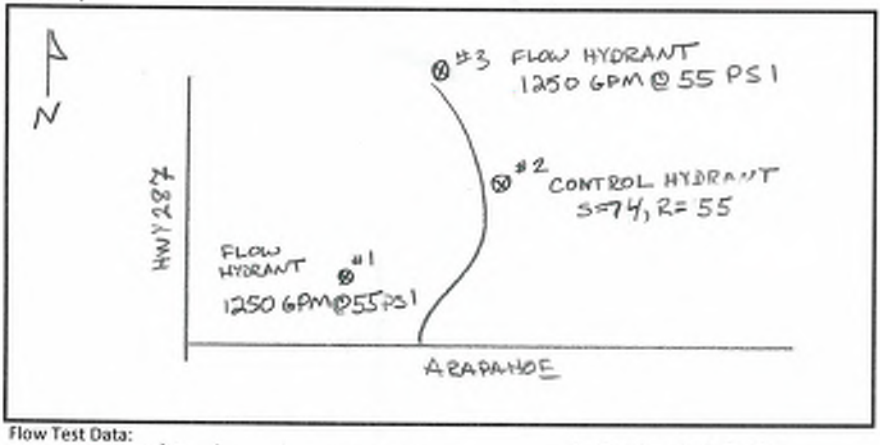
	Select if Seismic Design Category C or higher **OR**	
x	Seismic Design Category A or B	1 ft
Add 6" loss for suction:		0.5 ft
Add loss for height of Long Turn Elbow based on suction pipe size		6 inches
Add loss for 1/2 pipe dimension above centerline of suction pipe		0.25 ft
Tank Volume per foot of storage:		9,876 gal
= Storage Volume Lost		26,748.01 gal

Flow Test Information Report

Date: 8/7/19 Time: 10:30AM

Project Name: ERIE

Address: HWY 287 and ARAPAHOE, ERIE, CO
Test conducted by: Jim Maxwell FireTest Company (3)697-7377
Test witnessed by: Scott Brown, Town of Erie + DEREKLIS, EVERGREEN
Source of water supply: Town of Erie, PUMPS
Name of Water District: " " "
Area Map:



Flow Test Data:
Hose size: 4 inch / 2.5 inch Number of Hoses: 1 @ 1250 GPM / 2 @ " PSI

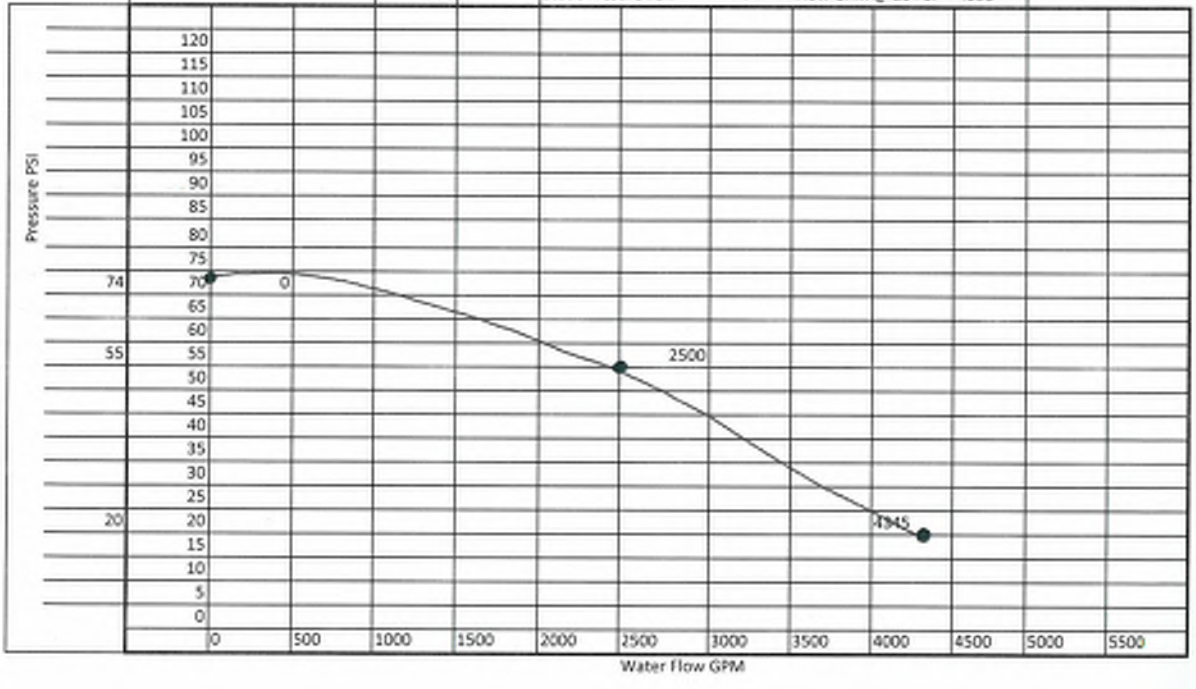
Flow at Hydrant No.	Static at Hydrant No.	Static PSIG	Residual PSIG	Flow GPM
1	2	74	55	1250
3	2	74	55	1250
TOTAL		74	55	2500

See second page for graph

Signed [signature] 08/07/2019

Water Flow Test Summary & Graph

Hydrant No.	Outlet I.D> Inches	Pitot or Gauge Pressure	Flow GPM	Residual PSI	**FireTest** Company 13724 W. Auburn Ave. Lakewood, CO 80228 (303) 697-7377
1	4		1250	55	Date: 8/7/2019 Time: 10:30 AM
3	2.5	11	625	55	Name: Erie, Safeway Hwy 287 and Arapahoe
3	2.5	11	625	55	Address: 3331 Arapahoe, Erie, CO
Total Flow			2500		Static Presure PSI: 74 Flow GPM @ 20 PSI 4395



PROJECT: Erie Nine Mile
LOCATION: Highway 287 & Arapahoe
Erie, CO

Project No.: EDI000018.01
Date: November 13, 2019
Designed By: Jessica Greenough
Checked By: Brandon McCrary, PE

Water Demand Calculations

Lot/Parcel	Land Use	Area (acre)	Capita	ADF/Capita* Gal/Capita/Day	ADF (gpd)	PHD Factor **	PHD (gpm)	PDD Factor ***	PDD (gpm)
Block 1	Commercial	32.50		1,651	53,658	3	111.79	2.0	74.52
Block 2	Multi-Family		809	140	113,274	3.9	306.78	2.6	204.52
				Total Flow	166,932		418.57		279.05

* ADF taken from Water Facilities, Section 611, Town of Erie Public Works Standards and Specifications
** PHD = 3 per Commercial, 3.9 per Multi-Family - Water Facilities, Section 611, Town of Erie Public Works Standards and Specifications
*** PDD = 2 per Commercial, 2.6 per Multi-Family - Water Facilities, Section 611, Town of Erie Public Works Standards and Specifications

Scenario Summary Report
Scenario: PHD + FF - Anchor 2

Scenario Summary	
ID	334
Label	PHD + FF - Anchor 2
Notes	
Active Topology	<I> Base Active Topology
Physical	<I> Base Physical
Demand	King Soopers Store Fire
Initial Settings	<I> Base Initial Settings
Operational	<I> Base Operational
Age	<I> Base Age
Constituent	<I> Base Constituent
Trace	<I> Base Trace
Fire Flow	King Soopers Fire Flow
Energy Cost	<I> Base Energy Cost
Transient	<I> Base Transient
Pressure Dependent Demand	<I> Base Pressure Dependent Demand
Failure History	<I> Base Failure History
SCADA	<I> Base SCADA
User Data Extensions	<I> Base User Data Extensions
Steady State/EPS Solver Calculation Options	<I> Base Calculation Options
Transient Solver Calculation Options	<I> Base Calculation Options

Hydraulic Summary			
Time Analysis Type	EPS	Simulation Start Date	1/1/2000
Friction Method	Hazen-Williams	Hydraulic Time Step	3.000 hours
Accuracy	0.001	Duration	3.000 hours
Trials	40	Calculation Type	Hydraulics Only

Scenario: PHD + FF - Anchor 2
Current Time Step: 0.000Hr
FlexTable: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Has Check Valve?	Minor Loss Coefficient (Local)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Has User Defined Length?	Length (User Defined) (ft)
37	A-103	253	J-1	J-2	12.0	PVC	120.0	False	0.000	1,598	4.53	0.007	False	0
41	A-108	202	J-3	J-4	8.0	PVC	120.0	False	0.000	695	4.43	0.011	False	0
43	A-109	229	J-4	J-5	8.0	PVC	120.0	False	0.000	583	3.72	0.008	False	0
45	A-110	107	J-5	J-6	8.0	PVC	120.0	False	0.000	583	3.72	0.008	False	0
47	A-111	251	J-6	J-7	8.0	PVC	120.0	False	0.000	583	3.72	0.008	False	0
54	A-117	275	J-2	J-10	12.0	PVC	120.0	False	0.000	-305	0.86	0.000	False	0
75	A-106	37	J-20	J-21	8.0	PVC	120.0	False	0.000	695	4.43	0.011	False	0
184	p-watr-06in (Polyline)-42	24	FH-1	H-1	8.0	PVC	120.0	False	0.000	0	0.00	0.000	False	0
185	p-watr-06in (Polyline)-31	17	FH-10	H-10	8.0	PVC	120.0	False	0.000	0	0.00	0.000	False	0
186	p-watr-06in (Polyline)-58	16	FH-3	H-3	8.0	PVC	120.0	False	0.000	0	0.00	0.000	False	0
187	p-watr-06in (Polyline)-55	52	FH-9	H-9	8.0	PVC	120.0	False	0.000	0	0.00	0.000	False	0
188	p-watr-06in (Polyline)-64	48	FH-12	H-12	8.0	PVC	120.0	False	0.000	0	0.00	0.000	False	0
189	p-watr-06in (Polyline)-59	17	FH-4	H-4	8.0	PVC	120.0	False	0.000	0	0.00	0.000	False	0
190	p-watr-06in (Polyline)-29	13	FH-2	H-2	8.0	PVC	120.0	False	0.000	0	0.00	0.000	False	0
191	p-watr-06in (Polyline)-30	13	FH-11	H-11	8.0	PVC	120.0	False	0.000	0	0.00	0.000	False	0
192	p-watr-06in (Polyline)-52	13	FH-7	H-7	8.0	PVC	120.0	False	0.000	0	0.00	0.000	False	0
193	p-watr (Polyline)-63	366	B4-D	FH-8	8.0	PVC	120.0	False	0.000	1,130	7.21	0.028	False	0
194	p-watr-06in (Polyline)-61	23	FH-6	H-6	6.0	Ductile Iron	120.0	False	0.000	0	0.00	0.000	False	0
195	p-watr-06in (Polyline)-60	21	FH-5	H-5	6.0	Ductile Iron	120.0	False	0.000	0	0.00	0.000	False	0
196	p-watr-06in (Polyline)-62	21	FH-8	H-8	8.0	Ductile Iron	120.0	False	0.000	1,167	7.45	0.060	False	0
197	p-watr (Polyline)-25	335	B14-F	FH-7	8.0	PVC	120.0	False	0.000	648	4.13	0.011	False	0
198	p-watr (Polyline)-40	189	B3-F	A-B Tee 2	8.0	PVC	120.0	False	0.000	333	2.12	0.003	False	0
199	p-watr (Polyline)-32	187	A-C Tee 2	FH-9	8.0	PVC	120.0	False	0.000	1,130	7.21	0.030	False	0
202	p-watr (Polyline)-27	344	B2-F	FH-11	8.0	PVC	120.0	False	0.000	333	2.12	0.003	False	0
203	p-watr (Polyline)-50	133	FH-6	B14-D	8.0	PVC	120.0	False	0.000	648	4.13	0.014	False	0
204	p-watr (Polyline)-37	196	A-C Tee 1	A-B Tee 2	8.0	PVC	120.0	False	0.000	622	3.97	0.010	False	0
205	p-watr (Polyline)-26	130	FH-11	B3-D	8.0	PVC	120.0	False	0.000	333	2.12	0.004	False	0
206	p-watr (Polyline)-49	163	FH-5	FH-6	8.0	PVC	120.0	False	0.000	648	4.13	0.011	False	0
207	p-watr (Polyline)-7	68	B12-F	B13-F	8.0	PVC	120.0	False	0.000	648	4.13	0.009	False	0
208	p-watr (Polyline)-43	129	FH-1	FH-2	8.0	PVC	120.0	False	0.000	955	6.09	0.023	False	0
209	p-watr (Polyline)-35	128	A-C Tee 1	BCH-F	12.0	PVC	120.0	False	0.000	1,147	3.25	0.005	False	0
210	p-watr (Polyline)-33	105	A-C Tee 2	A-D Tee	12.0	PVC	120.0	False	0.000	17	0.05	0.000	False	0
211	p-watr (Polyline)-11	100	B8-D	B9-D	8.0	PVC	120.0	False	0.000	648	4.13	0.009	False	0
212	p-watr (Polyline)-38	86	A-B Tee 1	FH-10	8.0	PVC	120.0	False	0.000	333	2.12	0.003	False	0
213	p-watr (Polyline)-57	75	B7-F	FH-3	8.0	PVC	120.0	False	0.000	648	4.13	0.012	False	0
214	p-watr (Polyline)-34	131	FH-12	A-C Tee 2	12.0	PVC	120.0	False	0.000	1,147	3.25	0.005	False	0
215	p-watr (Polyline)-14	59	B5-F	B7-D	8.0	PVC	120.0	False	0.000	955	6.09	0.019	False	0
216	p-watr (Polyline)-36	48	A-B Tee 1	A-C Tee 1	12.0	PVC	120.0	False	0.000	1,769	5.02	0.015	False	0
217	p-watr (Polyline)-1	5	B4-F	B4-D	8.0	PVC	120.0	False	0.000	1,130	7.21	0.027	False	0
218	p-watr (Polyline)-3	8	B10-D	B10-F	8.0	PVC	120.0	False	0.000	37	0.24	0.000	False	0
219	p-watr (Polyline)-2	32	B10-F	FH-8	8.0	PVC	120.0	False	0.000	37	0.24	0.000	False	0
220	p-watr (Polyline)-9	60	IRR	B12-D	8.0	PVC	120.0	False	0.000	648	4.13	0.009	False	0
221	p-watr (Polyline)-4	210	B11-F	B10-D	8.0	PVC	120.0	False	0.000	37	0.24	0.000	False	0
222	p-watr (Polyline)-53	43	B11-D	FH-7	8.0	PVC	120.0	False	0.000	-648	4.13	0.014	False	0
223	p-watr (Polyline)-39	30	FH-10	B2-D	8.0	PVC	120.0	False	0.000	333	2.12	0.005	False	0
224	p-watr (Polyline)-46	30	B9-F	FH-4	8.0	PVC	120.0	False	0.000	648	4.13	0.016	False	0
225	p-watr (Polyline)-47	28	FH-4	IRR	8.0	PVC	120.0	False	0.000	648	4.13	0.017	False	0
226	p-watr (Polyline)-56	28	B1-F	FH-12	8.0	PVC	120.0	False	0.000	1,147	7.32	0.050	False	0
227	p-watr (Polyline)-41	21	A-B Tee 2	FH-1	12.0	PVC	120.0	False	0.000	955	2.71	0.007	False	0
228	p-watr (Polyline)-45	18	FH-3	B8-F	8.0	PVC	120.0	False	0.000	648	4.13	0.021	False	0
229	p-watr (Polyline)-23	17	A-D Tee	COM Connection	8.0	PVC	120.0	False	0.000	0	0.00	0.000	False	0
230	p-watr (Polyline)-54	16	FH-9	B4-F	8.0	PVC	120.0	False	0.000	1,130	7.21	0.067	False	0
231	p-watr (Polyline)-48	10	B13-D	FH-5	8.0	PVC	120.0	False	0.000	648	4.13	0.031	False	0
232	p-watr (Polyline)-44	6	FH-2	B6-D	8.0	PVC	120.0	False	0.000	955	6.09	0.093	False	0
233	p-watr (Polyline)-21	6	BCH-D	B1-D	8.0	PVC	120.0	False	0.000	1,147	7.32	0.027	False	0

234	p-watr (Polyline)-51	5	B14-D	B14-F	8.0	PVC	120.0	False	0.000	648	4.13	0.009	False	0
235	p-watr (Polyline)-19	5	B3-D	B3-F	8.0	PVC	120.0	False	0.000	333	2.12	0.003	False	0
236	p-watr (Polyline)-8	5	B12-D	B12-F	8.0	PVC	120.0	False	0.000	648	4.13	0.009	False	0
237	p-watr (Polyline)-15	5	B6-F	B5-F	8.0	PVC	120.0	False	0.000	955	6.09	0.019	False	0
238	p-watr (Polyline)-20	5	BCH-F	BCH-D	8.0	PVC	120.0	False	0.000	1,147	7.32	0.027	False	0
239	p-watr (Polyline)-10	5	B9-D	B9-F	8.0	PVC	120.0	False	0.000	648	4.13	0.009	False	0
240	p-watr (Polyline)-16	5	B5-D	B6-F	8.0	PVC	120.0	False	0.000	955	6.09	0.019	False	0
241	p-watr (Polyline)-5	5	B11-F	B11-D	8.0	PVC	120.0	False	0.000	-648	4.13	0.009	False	0
242	p-watr (Polyline)-22	5	B1-D	B1-F	8.0	PVC	120.0	False	0.000	1,147	7.32	0.027	False	0
243	p-watr (Polyline)-18	5	B2-D	B2-F	8.0	PVC	120.0	False	0.000	333	2.12	0.003	False	0
244	p-watr (Polyline)-6	5	B13-F	B13-D	8.0	PVC	120.0	False	0.000	648	4.13	0.009	False	0
245	p-watr (Polyline)-13	5	B7-D	B7-F	8.0	PVC	120.0	False	0.000	955	6.09	0.019	False	0
246	p-watr (Polyline)-12	5	B8-F	B8-D	8.0	PVC	120.0	False	0.000	648	4.13	0.009	False	0
247	p-watr (Polyline)-17	4	B6-D	B5-D	8.0	PVC	120.0	False	0.000	955	6.09	0.019	False	0
256	P-29	8	A-D Tee	J-24	12.0	PVC	120.0	False	0.000	17	0.05	0.000	False	0
257	P-30	480	J-1	J-24	12.0	PVC	120.0	False	0.000	1,019	2.89	0.003	False	0
258	P-31	70	J-24	J-10	12.0	PVC	120.0	False	0.000	1,036	2.94	0.003	False	0
261	A-114	72	J-8	J-25	12.0	PVC	120.0	False	0.000	-69	0.19	0.000	False	0
262	P-34	72	J-25	B11-F	12.0	PVC	120.0	False	0.000	-611	1.73	0.001	False	0
284	A-104	101	J-2	J-28	12.0	PVC	120.0	False	0.000	1,903	5.40	0.010	False	0
287	A-112	401	J-7	J-29	8.0	PVC	120.0	False	0.000	583	3.72	0.008	False	0
293	B-103	595	J-29	J-B2	8.0	PVC	120.0	False	0.000	-42	0.27	0.000	False	0
294	B-2	40	J-B2	H-B2	8.0	Ductile Iron	120.0	False	0.000	1,167	7.45	0.028	False	0
296	B-101	137	J-28	J-B1	8.0	PVC	120.0	False	0.000	1,209	7.71	0.030	False	0
297	B-102	390	J-B1	J-B2	8.0	PVC	120.0	False	0.000	1,209	7.71	0.030	False	0
298	B-1	23	J-B1	H-B1	6.0	Ductile Iron	120.0	False	0.000	0	0.00	0.000	False	0
318	P-67	70	J-8	Anchor 2	2.0	Copper	120.0	False	0.000	0	0.00	0.000	False	0
329	P-74	69	J-33	Lowes	2.0	Copper	120.0	False	0.000	0	0.00	0.000	False	0
336	P-77	500	J-33	J-36	12.0	PVC	120.0	False	0.000	731	2.07	0.002	False	0
337	P-78	25	J-36	J-8	12.0	PVC	120.0	False	0.000	-69	0.19	0.000	False	0
339	P-79	69	J-36	Anchor 2 Fire Demand	6.0	Ductile Iron	120.0	False	0.000	800	9.08	0.057	False	0
341	P-80	50	J-29	J-38	8.0	PVC	120.0	False	0.000	625	3.99	0.009	False	0
342	P-81	492	J-25	J-38	12.0	PVC	120.0	False	0.000	542	1.54	0.001	False	0
344	P-82	29	J-38	H-4	8.0	Ductile Iron	120.0	False	0.000	1,167	7.45	0.028	False	0
363	P-91	995	R-4	J-40	12.0	PVC	120.0	False	0.000	6	0.02	0.000	False	0
364	P-92	470	R-3	J-40	12.0	PVC	120.0	False	0.000	-6	0.02	0.000	False	0
365	P-93	335	J-33	J-10	6.0	Ductile Iron	120.0	False	0.000	-731	8.30	0.048	False	0
368	P-95	125	J-21	J-42	8.0	PVC	120.0	False	0.000	695	4.43	0.011	False	0
369	P-96	113	J-42	J-3	8.0	PVC	120.0	False	0.000	695	4.43	0.011	False	0
374	P-98	100	J-28	J-45	8.0	PVC	120.0	False	0.000	695	4.43	0.011	False	0
375	P-99	185	J-45	J-20	8.0	PVC	120.0	False	0.000	695	4.43	0.011	False	0
379	P-101	400	J-40	J-47	8.0	PVC	120.0	False	0.000	0	0.00	0.000	True	419
383	A-102	232	NW Connection	J-1	12.0	PVC	120.0	False	0.000	2,617	7.42	0.017	False	0
385	P-41	146	NE Connection	A-B Tee 1	12.0	PVC	120.0	False	0.000	2,102	5.96	0.012	False	0

Scenario: PHD + FF - Anchor 2
Current Time Step: 0.000Hr
FlexTable: Junction Table

ID	Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
34	J-1	5,262.00	<None>	<Collection: 0 items>	0	5,415.77	67
36	J-2	5,263.00	<None>	<Collection: 0 items>	0	5,414.00	65
38	J-3	5,264.00	<None>	<Collection: 0 items>	0	5,406.99	62
40	J-4	5,265.00	<None>	<Collection: 1 item>	112	5,404.81	60
42	J-5	5,268.00	<None>	<Collection: 0 items>	0	5,403.02	58
44	J-6	5,270.00	<None>	<Collection: 0 items>	0	5,402.19	57
46	J-7	5,273.50	<None>	<Collection: 0 items>	0	5,400.24	55
48	J-8	5,268.20	<None>	<Collection: 0 items>	0	5,397.14	56
52	J-10	5,262.50	<None>	<Collection: 0 items>	0	5,414.09	66
70	J-20	5,259.50	<None>	<Collection: 0 items>	0	5,409.95	65
74	J-21	5,261.50	<None>	<Collection: 0 items>	0	5,409.55	64
122	B4-D	5,257.57	<None>	<Collection: 0 items>	0	5,407.55	65
123	IRR	5,263.08	<None>	<Collection: 0 items>	0	5,406.99	62
124	B5-D	5,259.74	<None>	<Collection: 0 items>	0	5,411.74	66
125	FH-9	5,257.35	<None>	<Collection: 0 items>	0	5,408.72	65
126	FH-12	5,256.10	<None>	<Collection: 0 items>	0	5,414.94	69
127	FH-1	5,257.90	<None>	<Collection: 0 items>	0	5,415.35	68
128	FH-6	5,266.31	<None>	<Collection: 0 items>	0	5,403.63	59
129	FH-5	5,264.52	<None>	<Collection: 0 items>	0	5,405.38	61
130	FH-8	5,261.82	<None>	<Collection: 0 items>	0	5,397.21	59
131	FH-10	5,252.05	<None>	<Collection: 0 items>	0	5,417.83	72
132	FH-4	5,262.76	<None>	<Collection: 0 items>	0	5,407.46	63
133	FH-3	5,261.24	<None>	<Collection: 0 items>	0	5,409.37	64
134	FH-2	5,259.64	<None>	<Collection: 0 items>	0	5,412.39	66
135	FH-11	5,254.10	<None>	<Collection: 0 items>	0	5,416.61	70
136	FH-7	5,265.43	<None>	<Collection: 0 items>	0	5,397.89	57
137	B4-F	5,257.51	<None>	<Collection: 0 items>	0	5,407.68	65
138	B12-F	5,263.70	<None>	<Collection: 0 items>	0	5,406.37	62
139	B5-F	5,259.85	<None>	<Collection: 0 items>	0	5,411.54	66
140	BCH-F	5,256.54	<None>	<Collection: 0 items>	0	5,416.79	69
141	B3-F	5,255.30	<None>	<Collection: 0 items>	0	5,416.07	70
142	B10-F	5,262.25	<None>	<Collection: 0 items>	0	5,397.21	58
143	B7-F	5,260.51	<None>	<Collection: 1 item>	307	5,410.29	65
144	B14-F	5,267.46	<None>	<Collection: 0 items>	0	5,401.69	58
145	B11-F	5,265.88	<None>	<Collection: 0 items>	0	5,397.22	57
146	B2-F	5,251.76	<None>	<Collection: 0 items>	0	5,417.68	72
147	B1-F	5,256.38	<None>	<Collection: 0 items>	0	5,416.36	69
148	B6-F	5,259.80	<None>	<Collection: 0 items>	0	5,411.64	66
149	B9-D	5,262.41	<None>	<Collection: 0 items>	0	5,408.00	63
150	B13-F	5,264.37	<None>	<Collection: 0 items>	0	5,405.73	61
151	B8-F	5,261.41	<None>	<Collection: 0 items>	0	5,409.00	64
152	B12-D	5,263.66	<None>	<Collection: 0 items>	0	5,406.42	62
153	B7-D	5,260.46	<None>	<Collection: 0 items>	0	5,410.39	65
154	B10-D	5,262.38	<None>	<Collection: 0 items>	0	5,397.21	58
155	COM Connection	5,256.18	<None>	<Collection: 0 items>	0	5,414.31	68
156	B3-D	5,255.28	<None>	<Collection: 0 items>	0	5,416.09	70
157	B14-D	5,267.41	<None>	<Collection: 0 items>	0	5,401.74	58
158	B2-D	5,251.81	<None>	<Collection: 0 items>	0	5,417.69	72
159	B1-D	5,256.43	<None>	<Collection: 0 items>	0	5,416.49	69
160	B11-D	5,264.93	<None>	<Collection: 0 items>	0	5,397.27	57
161	B13-D	5,264.42	<None>	<Collection: 0 items>	0	5,405.68	61

162	B8-D	5,261.46	<None>	<Collection: 0 items>	0	5,408.95	64
163	B6-D	5,259.70	<None>	<Collection: 0 items>	0	5,411.82	66
164	B9-F	5,262.46	<None>	<Collection: 0 items>	0	5,407.95	63
165	BCH-D	5,256.49	<None>	<Collection: 0 items>	0	5,416.66	69
166	A-C Tee 2	5,256.18	<None>	<Collection: 0 items>	0	5,414.31	68
167	A-C Tee 1	5,254.66	<None>	<Collection: 0 items>	0	5,417.41	70
168	A-B Tee 2	5,257.00	<None>	<Collection: 0 items>	0	5,415.50	69
169	A-B Tee 1	5,252.99	<None>	<Collection: 0 items>	0	5,418.12	71
170	A-D Tee	5,257.69	<None>	<Collection: 0 items>	0	5,414.31	68
255	J-24	5,257.76	<None>	<Collection: 0 items>	0	5,414.31	68
259	J-25	5,268.57	<None>	<Collection: 0 items>	0	5,397.14	56
283	J-28	5,262.08	<None>	<Collection: 0 items>	0	5,413.03	65
286	J-29	5,271.40	<None>	<Collection: 0 items>	0	5,397.12	54
291	J-B2	5,271.09	<None>	<Collection: 0 items>	0	5,397.15	55
295	J-B1	5,267.24	<None>	<Collection: 0 items>	0	5,408.89	61
317	Anchor 2	5,268.20	<None>	<Collection: 0 items>	0	5,397.14	56
325	J-33	5,263.99	<None>	<Collection: 0 items>	0	5,397.96	58
328	Lowes	5,263.99	<None>	<Collection: 0 items>	0	5,397.96	58
335	J-36	5,268.00	<None>	<Collection: 0 items>	0	5,397.14	56
338	Anchor 2 Fire Demand	5,268.00	<None>	<Collection: 1 item>	800	5,393.20	54
340	J-38	5,271.14	<None>	<Collection: 0 items>	0	5,396.67	54
353	J-40	5,289.00	<None>	<Collection: 0 items>	0	5,404.50	50
367	J-42	5,262.81	<None>	<Collection: 0 items>	0	5,408.21	63
373	J-45	5,261.18	<None>	<Collection: 0 items>	0	5,411.95	65
378	J-47	5,278.43	<None>	<Collection: 0 items>	0	5,404.50	55

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Scenario: PHD + FF - Anchor 2
Current Time Step: 0.000Hr
FlexTable: Hydrant Table

ID	Label	Hydrant Status	Include Lateral Loss?	Emitter Coefficient (gpm/psi^n)	Lateral Length (ft)	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
32	H-1	Closed	False	0.000	20	5,262.29	<None>	<Collection: 0 items>	0	5,415.35	66
171	H-8	Closed	False	0.000	20	5,266.71	<None>	<Collection: 1 item>	1,167	5,395.94	56
172	H-7	Closed	False	0.000	20	5,270.02	<None>	<Collection: 0 items>	0	5,397.89	55
173	H-6	Closed	False	0.000	20	5,270.84	<None>	<Collection: 0 items>	0	5,403.63	57
174	H-5	Closed	False	0.000	20	5,269.17	<None>	<Collection: 0 items>	0	5,405.38	59
175	H-4	Closed	False	0.000	20	5,267.46	<None>	<Collection: 0 items>	0	5,407.46	61
176	H-3	Closed	False	0.000	20	5,266.01	<None>	<Collection: 0 items>	0	5,409.37	62
177	H-2	Closed	False	0.000	20	5,264.27	<None>	<Collection: 0 items>	0	5,412.39	64
178	H-9	Closed	False	0.000	20	5,261.87	<None>	<Collection: 0 items>	0	5,408.72	64
179	H-11	Closed	False	0.000	20	5,259.34	<None>	<Collection: 0 items>	0	5,416.61	68
180	H-10	Closed	False	0.000	20	5,256.63	<None>	<Collection: 0 items>	0	5,417.83	70
181	H-12	Closed	False	0.000	20	5,260.14	<None>	<Collection: 0 items>	0	5,414.94	67
265	H-B1	Closed	False	0.000	20	5,260.20	<None>	<Collection: 1 item>	0	5,408.89	64
270	H-B2	Closed	False	0.000	20	5,260.20	<None>	<Collection: 1 item>	1,167	5,396.04	59
343	H-4	Closed	False	0.000	20	5,270.00	<None>	<Collection: 1 item>	1,167	5,395.85	54

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HENDERSON ENGINEERS

LOCATION ANALYSIS REPORT
LOWE'S OF ERIE, COLORADO
ARAPAHOE AND HWY 287

DATE: JULY 26, 2018 – REVISED: AUGUST 29, 2019

HENDERSON PROJECT 1850002794

The following summarizes fire and general life safety requirements for the proposed store. Also included are requirements for automatic sprinkler systems, fire alarms, fire department access, fire hydrant locations, and fire flow. These requirements are based on the codes in effect as of July 20, 2018.

TABLE OF CONTENTS

PART 1 4

1. **APPLICABLE BUILDING AND FIRE CODES** 4
2. **CONTACTS** 4
3. **PERMIT/PLAN REVIEW POLICY** 5
4. **FIRE LANES** 5
5. **BUILDING ACCESS** 5
6. **FIRE ALARM SYSTEM** 6
7. **SMOKE REMOVAL AND CURTAIN BOARD REQUIREMENTS** 6
8. **FIRE EXTINGUISHERS** 6
9. **EMERGENCY GENERATOR** 6
10. **WASTE STORAGE AREA** 7
11. **STORAGE RACKS** 7
12. **FIRE PROTECTION DURING CONSTRUCTION** 7
13. **DELAYED EGRESS DOOR LOCKS** 7

PART 2 7

1. **PUBLIC WATER SUPPLY** 7
2. **PUBLIC WATER MAINS** 8

8345 Lenexa Drive, Suite 300
Lenexa, KS 66214
(913) 742-5000

NEW YORK PHILADELPHIA ORLANDO TAMPA BENTONVILLE KANSAS CITY
HOUSTON DALLAS PHOENIX LAS VEGAS LOS ANGELES

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Texas [Firm ID: F-001236]

3. **ON-SITE WATER MAINS** 8
4. **FIRE HYDRANT FLOW TEST RESULTS** 8
5. **FIRE PROTECTION WATER SUPPLY ANALYSIS** 9
6. **WATER DEPARTMENT REQUIREMENTS FOR FIRE PROTECTION WATER** 10
7. **FIRE HYDRANTS** 10
8. **FIRE DEPARTMENT CONNECTIONS** 11
9. **SPRINKLER SYSTEMS** 11
10. **FIRE HOSE SYSTEMS** 11

LOCATION ANALYSIS REPORT
LOWE'S OF ERIE, COLORADO
ARAPAHOE AND HWY 287

THE INFORMATION CONTAINED IN THIS REPORT IS FOR THE EXCLUSIVE USE OF LOWE'S HOME CENTERS, INC. AND LOWE'S HIW, INC. ("LOWE'S"), LOWE'S DESIGNATED DEVELOPERS, ARCHITECTS AND ENGINEERS. IT APPLIES ONLY TO LOWE'S PROPOSED USE OF THIS SITE. THIS REPORT OR ANY INFORMATION CONTAINED IN THIS REPORT MAY NOT BE PROVIDED TO ANYONE WITHOUT THE EXPRESS WRITTEN PERMISSION OF HENDERSON ENGINEERS AND LOWE'S ENGINEERING MANAGER-FIRE PROTECTION, AS DIRECTED BY LOWE'S.

SPRINKLER SYSTEMS ☒ Lowe's sprinkler design acceptable ☒ Dry pipe systems required ☐ Sway bracing required ☐ Full design drawings required for building permit	**ON-SITE WATER MAINS** Connection to public water main ☒ 12" ☐ 8" ☐ 16" Fire Protection water loop ☐ 10" ☐ 8" ☒ 12"
FIRE DEPARTMENT CONNECTION ☒ Front wall ☐ Freestanding	**BACKFLOW PREVENTER** ☐ Double Check ☒ Double Check Detector ☐ RPZ ☒ Inside Bldg. ☐ Pump House ☐ Exterior
PUBLIC WATER SYSTEM ☐ Public water supply adequate ☐ Off-site improvements needed ☒ On-site improvements needed	**INTERIOR HOSE CONNECTIONS** ☐ Connections (valves) required ☐ Hose required
FIRE PUMP ☒ Pump Required ☐ Suction Control Device required	**WATER TANK** ☒ Tank Required 237,000 gal per tank 1 tank(s) required
FIRE HYDRANTS Spacing required: 300ft. Distance to FDC: 300ft.	**FIRE ALARM SYSTEM** ☐ Manual stations required ☒ One/constantly attended location ☐ Multiple locations ☐ Voice System required ☐ Horn/strobe required
SMOKE REMOVAL SYSTEM ☒ None required ☐ Mechanical smoke removal ☐ Smoke and heat vents with manual release ☐ Smoke and heat vents with automatic release ☐ Curtain boards required	**ALTERNATE METHODS SUBMITTALS REQUIRED** ☒ None ☐ Smoke removal ☐ Fire flow demand ☐ Barriers in racks ☐ Other

PART 1

1. APPLICABLE BUILDING AND FIRE CODES

A. The following codes are applicable to this location.

1. 2006 edition, International Building Code
2. 2006 edition, International Fire Code
3. 2006 edition, International Mechanical Code
4. 2006 edition, International Plumbing Code
5. 2006 edition NFPA 70, National Electrical Code
6. *The 2015 International Code Package will be adopted around August 2018 along with amendments.

2. CONTACTS

BUILDING DEPARTMENT Ed Kotlinski Chief Building Official Building Department 645 Holbrook Street P.O. Box 750 Erie, CO 80516 303-926-2781 Fx: 303-926-2704 bldgfax@erieco.gov	**INSPECTIONS** Doug Saba Fire Marshal Mountain Valley Fire Protection Dist. 3561 N Stagecoach Rd. Longmont, CO 80504 303-772-0710 dsaba@mvfpd.org
WATER DEPARTMENT / BACKFLOW PREVENTION Todd Fessenden Public Works Director Town of Erie Public Works 645 Holbrook Street P.O. Box 750 Erie, CO 80516 303-926-2895 Fx: 303-926-2867	**FIRE DEPARTMENT/FIRE MARSHAL** Doug Saba Fire Marshal Mountain Valley Fire Protection Dist. 3561 N Stagecoach Rd. Longmont, CO 80504 303-772-0710 dsaba@mvfpd.org
TOWN/CITY CODE WEBSITE erieco.gov	**FIRE DEPARTMENT WEBSITE** erieco.gov/490/Fire
WATER DEPARTMENT WEBSITE erieco.gov/348/Public-Works	

3. PERMIT/PLAN REVIEW POLICY

Plans are reviewed by the following:

FIRE SPRINKLER AND FIRE ALARM PLANS Doug Saba Fire Marshal Mountain Valley Fire Protection Dist. 3561 N Stagecoach Rd. Longmont, CO 80504 303-772-0710 dsaba@mvfpd.org	

A. Electronic / Online Submittals

1. Electronic submittals are required

B. Paper Submittals

1. One paper submittal is required for each electronic submittal.

C. All required forms and permit applications can be found on the City web site (mvfpd.org)

D. Submittals are generally reviewed within two (2) weeks.

E. Material safety data sheets (MSDS) and anticipated maximum stores quantities will not be required for a building permit.

F. A high pile racking plan is required for a building permit.

G. Code equivalencies are permitted on a case by case basis under the provisions of the International Building and Fire Code. The process includes submitting a letter explaining the position.

H. The fire department will witness all tests such as underground pipe hydrostatic tests, flushing, fire pump test, and sprinkler systems hydrostatic test in accordance with applicable NFPA standards.

4. FIRE LANES

A. Fire lanes are designated by the Fire Marshall. Contact the Fire Marshall for marking requirements.

B. Fire lanes are to be in place prior to receiving the Certificate of Occupancy.

C. Two means of emergency access are required to be maintained into the site during construction.

5. BUILDING ACCESS

A. Knox Boxes are required for emergency responders.

B. Two Knox Boxes will be required. One at the main entry and one near the entry to the riser room.

C. A specific Knox Box type and size are not designated but must accommodate all required keys.

D. Knox Boxes are to be ordered through the Knox Box company web site.

6. FIRE ALARM SYSTEM

A. The National Fire Alarm Code (NFPA 72) and the National Electrical Code (NFPA 70) are to be used for the design and installation of the fire alarm. The fire alarm system designer needs to verify all design requirements.

B. An electronic submittal and one paper submittal of fire alarm shop drawings are required.

C. The fire alarm system is required to monitor sprinkler control valves, flow switches and fire pump conditions if a pump is required.

D. Distinctly different alarm signals are required to be transmitted to a central station for fire alarms, supervisory signals and trouble signals.

E. A sprinkler water flow alarm audible device is required on the exterior of the building by the fire department connection. A horn / strobe device is required.

F. Remote test switches for duct smoke detectors are required *if located greater than 10 ft. AFF*.

G. A separate zone or address point shall be provided for each water flow initiating device.

H. Automatic fire suppression system zones do have to coincide with the fire alarm zones.

I. The emergency generator is not required to be supervised by the fire alarm system.

J. The main fire alarm control panel located in the telephone equipment room is acceptable.

K. A fire alarm annunciator panel is required at a constantly-attended location, such as the main front entrance.

7. SMOKE REMOVAL AND CURTAIN BOARD REQUIREMENTS

A. A smoke removal system and curtain boards may be required per adopted codes as of August 2018.

8. FIRE EXTINGUISHERS

A. Fire extinguishers are required in accordance with NFPA 10. Portable fire extinguisher must have a minimum rating of 2-A:10-B:C. The maximum travel distance to an extinguisher is 75 feet.

9. EMERGENCY GENERATOR

A. An emergency generator with a UL listed 1500-gallon double-walled diesel fuel tank can be located outside the store as shown on the site plan.

B. Bollards between the generator and vehicle traffic need to be installed.

C. The generator should be clearly identified on the site plan.

10. WASTE STORAGE AREA

A. A hazardous materials storage shed constructed with sides of chain link fencing and with treated lumber for the posts and roof framing is acceptable.

B. Sprinkler protection will be required weather the shed is attached to (or detached from) the building unless the minimum setback distance from the building is maintained per the International Building Code.

C. Waste Storage Area should be clearly identified on the site plan.

11. STORAGE RACKS

A. Non-combustible storage racks may be installed prior to the completion of the sprinkler and fire alarm systems.

B. Storage racks may be installed prior to Temporary Certificate of Occupancy but not to interfere with sprinkler inspections.

C. Merchandise may be introduced into the store after sprinkler and fire alarm systems are in service and issuance of a Temporary Certificate of Occupancy. Must comply with all stipulations of the TCO.

D. Aerosol product storage cages not required.

12. FIRE PROTECTION DURING CONSTRUCTION

A. On-site hydrants do need to be in service prior to combustible construction on site.

B. Temporary stabilized access roads that can support the weight of a fire truck do need to be in place prior to bring combustible materials on-site. Weight limits are to be determined.

C. Fire extinguishers are required in all storage and construction sheds and in the building prior to introducing combustible materials are based on the Fire Marshal's determination.

13. DELAYED EGRESS DOOR LOCKS

A. Delayed-egress locks can be used in accordance the applicable sections of the International Building Code 2006 Edition.

PART 2

1. PUBLIC WATER SUPPLY

A. The public water system is operated by the City of Erie, CO Water Department.

B. The Town of Erie's primary water source is the Colorado-Big Thompson Project (C-BT), which originates on the western slope and is delivered via pipeline from Carter Lake in Berthoud to our Lynn R. Morgan Water Treatment Facility in Erie. C-BT water is also delivered via pipeline to reservoirs in Erie. Windy Gap is a secondary water source which is delivered to Erie from the Northern Colorado Water Conservancy District (NCWCD) via a pipeline to the Water Treatment Facility.

C. The Town of Erie also fills reservoirs via the South Boulder Canyon Ditch which originates from Gross Reservoir in Boulder. There are pipelines that carry water from our reservoirs directly to our Water Treatment Facility. Potable water is distributed from the water treatment facility to customers.

D. The gridded water main system is supplied by a pumping station three quarters of a mile northeast of the site east of N 119th street, approximately one half mile south of Erie Parkway. The station utilizes six electrically driven pumps with a total capacity 3600 gpm. The pumping station is supplied by three reservoirs in the north Denver metro area.

E. A backup generator provides electricity for normal pumping conditions.

2. PUBLIC WATER MAINS

A. A 12 in. existing water main is located on the north side of Arapahoe Rd between Beasley Dr. and the east entrance into the Safeway shopping complex. The Safeway retail complex is located northeast of Arapahoe Rd. and Hwy 287.

3. ON-SITE WATER MAINS

A. There are no existing underground water service mains on the site south of Arapahoe Rd and east of Hwy. 287 at this time.

For purposes of hydraulic modeling, Henderson assumed a layout of on-site piping as shown on Attachment 1.

4. FIRE HYDRANT FLOW TEST RESULTS

A. Flow test results as determined on site:

	Flow Test
Date / Time	8/7/2019 / 10:30 AM
Initial Static Pressure (psi)	74
Residual Pressure (psi)	55
Total Water Flow (gpm)	2500
Number & Size of Hydrant Outlets	1 – 4" and 2 – 2 ½"
Pitot Pressure (psi)	22 and 11
Nozzle Coefficient	0.9
Pressure Hydrant Location	Pressure Node (Hydrant #2): Northeast hydrant, behind Safeway near back east corner of building. North of the east Arapahoe Rd. entrance to the Safeway complex
Pressure Hydrant Elevation	5240 ft Estimated

Flow Hydrant Location	Flow Node 1 (Hydrant #1): Southeast parking lot hydrant, north of the east Arapahoe Rd. entrance to the Safeway complex. Flow Node 2 (Hydrant #3): North hydrant behind Safeway near back northwest corner of Safeway building.

5. FIRE PROTECTION WATER SUPPLY ANALYSIS

A. The sprinkler system demand is required to be designed with a safety factor of 5 psi.

B. See the calculations below for results of hydraulic modeling based upon the attached site utility plan.

Table 1: Conclusion C1 – 12" Piping as sketched on REC Site Plan

Test Pressure at 2,250 gpm demand	58.4	psi
Backflow Prevention	-5.0	psi
Fire Flow Meter	0	psi
Estimated Friction Loss	-13.7	psi
Safety Factor	-5.0	psi
Available at Sprinkler Base of Riser (after backflow)	34.7	psi

Table 2: Conclusion C2 - 10" Piping as sketched on REC Site Plan

Test Pressure at 2,250 gpm demand	58.4	psi
Backflow Prevention	-5.0	psi
Fire Flow Meter	0	psi
Estimated Friction Loss	-21.7	psi
Safety Factor	-5.0	psi
Available at Sprinkler Base of Riser (after backflow)	26.7	psi

Table 3: Conclusion C2 - 8" Piping as sketched on REC Site Plan

Test Pressure at 2,250 gpm demand	58.4	psi
Backflow Prevention	-5.0	psi
Fire Flow Meter	0	psi
Estimated Friction Loss	-46.9	psi
Safety Factor	-5.0	psi
Available at Sprinkler Base of Riser (after backflow)	1.5	psi

Henderson Engineers used Hydracalc to hydraulically-model the attached site utility plan for purposes of determining friction loss in the underground piping network.

C. The pipe lengths measured were obtained by scaling the REC site plan and satellite images and are approximate measurements. The hydraulic models account for a 12 in. water lead-in to the site and a 12 in. lead-in, but may not accurate reflect all underground pipe sizes on the Safeway shopping center site north of Arapahoe Road.

D. **As designed with 12" piping, a fire pump will be necessary to satisfy Lowe's sprinkler design criteria. Additional coordination is required to confirm if Lowe's may draw the water supply in the site piping below 20 psi. If the pressure in the site piping falls below 20 psi, then an on-site water storage tank may be required.**

E. **If a Reduced-Pressure backflow assembly is required (refer to section 6), an on-site water storage tank may be required with the 10" configuration. The water department was non-responsive to multiple requests for information.**

F. **Due to multiple coordination items that could not be confirmed via phone and email, we currently recommend planning for a fire pump on-site to ensure an adequate water supply. An on-site water storage tank may be required based on the final piping configurations and jurisdictional requirements. An estimated tank size required is 237,000 gallons, or 24 ft height x 41 ft diameter.**

G. Regardless of pipe upsize, it is not possible to avoid a fire pump for the project. If on-site mains are reduced to 8 in. (refer to attachments) as shown for conclusion C3 on the attached site utility plan, the available water supply at the base of riser would be 1.5 psi, and a fire pump and water storage tank would be required.

H. A fire pump will be necessary to satisfy Lowe's sprinkler design criteria. A fire pump rated for at least 1500 gpm at 80 psi is recommended for Conclusions C1 and C2. A fire pump rated for at least 1500 gpm at 100 psi (nominal 150 hp) is recommended, if a water storage tank is provided.

1. The fire pump room shall be located at an exterior wall and provided with an exterior fire department access door that is not less than 3 feet in width and 6 feet 8 inches in height, regardless of any interior doors that are provided. An approved key box with access keys shall be provided at this door.

6. WATER DEPARTMENT REQUIREMENTS FOR FIRE PROTECTION WATER

A. Per the Town of Erie, CO, the backflow preventer must comply with the requirements of the 2006 International Plumbing Code Section 608.

B. The location of a backflow preventer shall comply with the 2006 International Plumbing Code Section 608.14.

C. The on-site water supply will be private mains.

7. FIRE HYDRANTS

A. Hydrants are to consist of 2 - 2 ½" outlets, locate 180 degrees apart and 1 – 4 ½" outlet. All outlets are to be at the same elevation.

B. The color of the onsite hydrants is to be determined by the Town of Erie, CO.

C. A fire hydrant is required to be no further than 150' from the fire department connection.

D. Hydrants shall not be more than 20' from an access road.

E. Hydrants are required to be within 600 feet a building as measured along approved fire apparatus access routes.

F. At least one hydrant shall be located such that it is within 450' of all portions of the building.

G. On site fire hydrants are required to be no further than 300' apart.

H. The maximum hose lay to a building shall not exceed 150'.

I. Hydrants are required to have National Standard threads.

8. FIRE DEPARTMENT CONNECTIONS

A. The fire department connection is permitted to be located on the building near the riser room.

B. Information regarding the required distance of a remote fire department connection from an access road was not provided.

C. A 5" Storz or the required number of 2 ½" fire department connections are acceptable.

D. Locking fire department connection caps are not required.

9. SPRINKLER SYSTEMS

A. Sprinkler contractors need to be licensed by the Colorado Division of Fire Prevention and Control.

B. Sprinkler shop drawings are to be submitted by the fire protection contractor.

C. Dry pipe systems will be needed for unheated areas.

D. Seismic bracing requirement were differed by the Fire Marshall to the Building Department.

10. FIRE HOSE SYSTEMS

A. Hose valve station are not required if less than 400f t of hose is maintained.

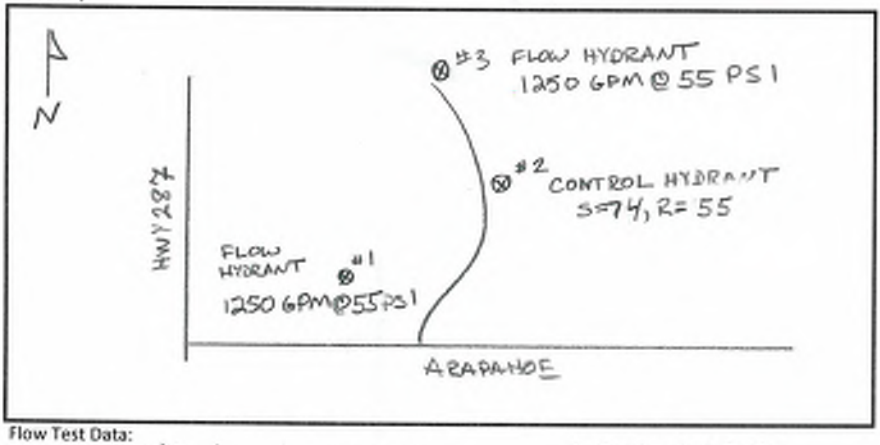
1. If required, the hose valves shall be installed at the required exits and so that all portions of the facility are located within 200 feet of a hose valve. A Class I standpipe may be installed as an alternate method.

Flow Test Information Report

Date: 8/7/19 Time: 10:30AM

Project Name: ERIE

Address: HWY 287 and ARAPAHOE, ERIE, CO
Test conducted by: Jim Maxwell FireTest Company (3)697-7377
Test witnessed by: Scott Brown, Town of Erie + DEREKLIS, EVERGREEN
Source of water supply: Town of Erie, PUMPS
Name of Water District: " " "
Area Map:



Flow Test Data:
Hose size: 4 inch / 2.5 inch Number of Hoses: 1 @ 1250 GPM / 2 @ " PSI

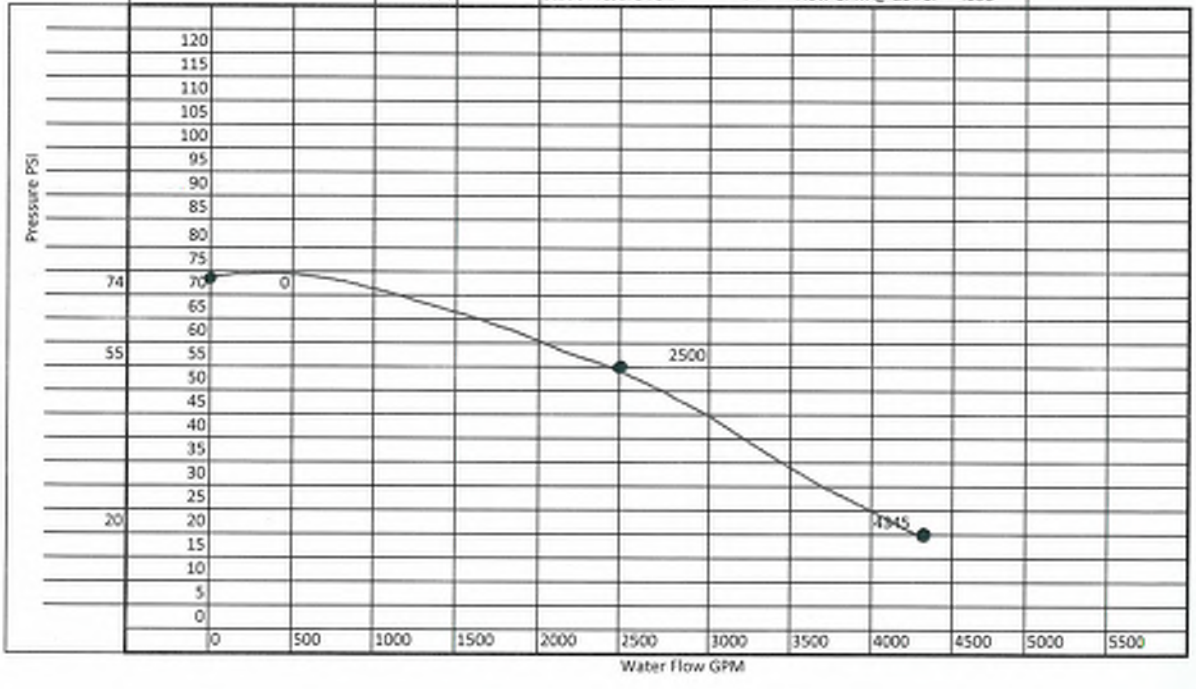
Flow at Hydrant No.	Static at Hydrant No.	Static PSIG	Residual PSIG	Flow GPM
1	2	74	55	1250
3	2	74	55	1250
TOTAL		74	55	2500

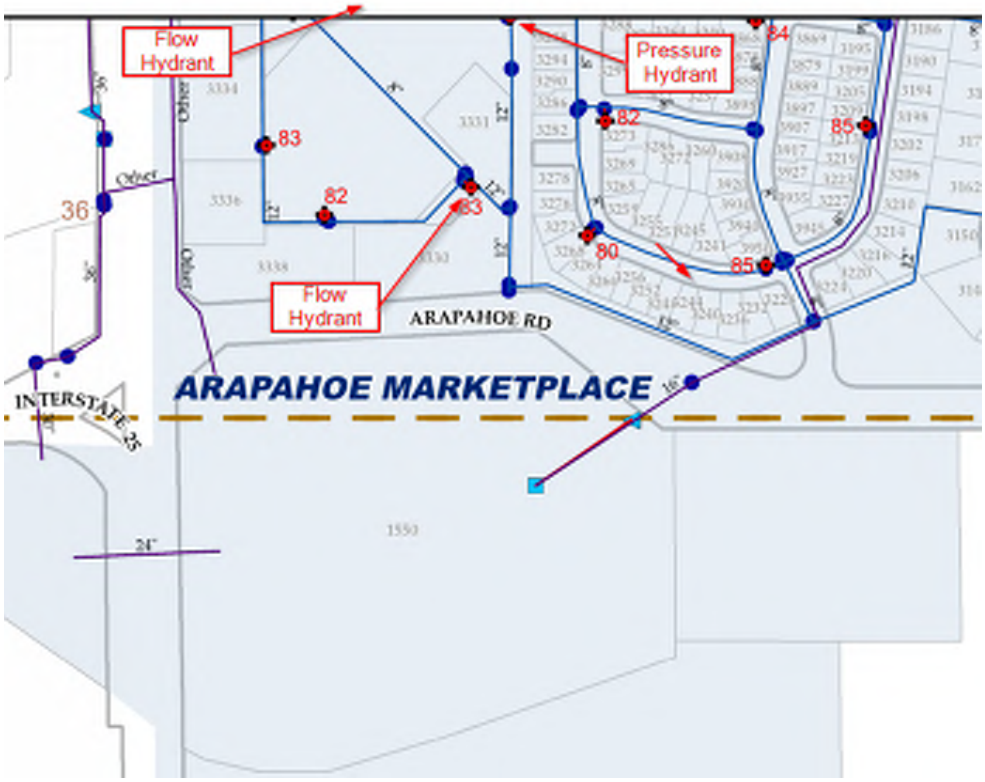
See second page for graph

Signed [signature] 08/07/2019

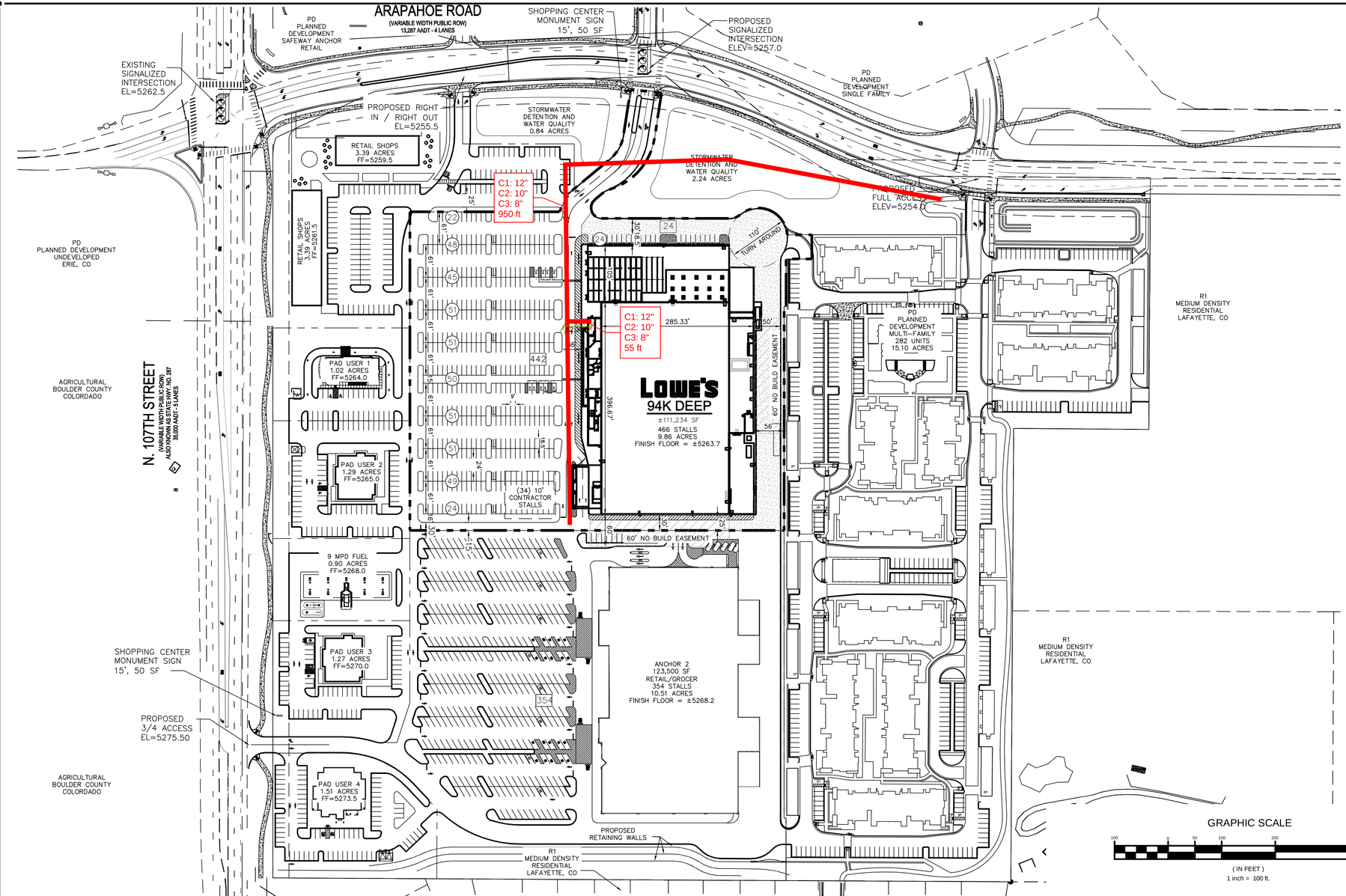
Water Flow Test Summary & Graph

Hydrant No.	Outlet I.D> Inches	Pitot or Gauge Pressure	Flow GPM	Residual PSI	**FireTest** Company 13724 W. Auburn Ave. Lakewood, CO 80228 (303) 697-7377
1	4		1250	55	Date: 8/7/2019 Time: 10:30 AM
3	2.5	11	625	55	Name: Erie, Safeway Hwy 287 and Arapahoe
3	2.5	11	625	55	Address: 3331 Arapahoe, Erie, CO
Total Flow			2500		Static Presure PSI: 74 Flow GPM @ 20 PSI 4395




Flow Hydrant
Pressure Hydrant
Flow Hydrant
ARAPAHOE RD
ARAPAHOE MARKETPLACE
INTERSTATE 25
83
82
83
82
84
85
80
85
36

Domino's Pizza
Safeway
Shell
Papa Murphy's Take 'N' Bake Pizza
Circle K
Starbucks
Distance
1,400 ft
Arapahoe Rd
Arapahoe Rd
N 104th St
N 107th St
Prince Lake Number 1



SITE DEVELOPMENT NOTES

1. ZONING : THE PARCEL(S) ARE CURRENTLY ZONED PLANNED DEVELOPMENT (PD) WHICH ALLOWS LOWE'S USE IN ADDITION TO OUTDOOR STORAGE, SALES AND OUTDOOR DISPLAY.

2. ACCESS : PROPOSING ONE RIGHT-IN/RIGHT-OUT/LEFT-IN ENTRANCE ALONG N 107TH STREET (HWY 287) AND ONE RIGHT IN/RIGHT OUT AND ONE SIGNALIZED FULL MOVEMENT ENTRANCE ALONG ARAPAHOE ROAD. A SIGNALIZED INTERSECTION EXISTS AT N 107TH STREET AND ARAPAHOE ROAD. ACCESSES HAVE TENTATIVELY BEEN CONFIRMED /APPROVED BY CDOT (HWY 287) AND THE TOWN OF ERIE (ARAPAHOE ROAD).

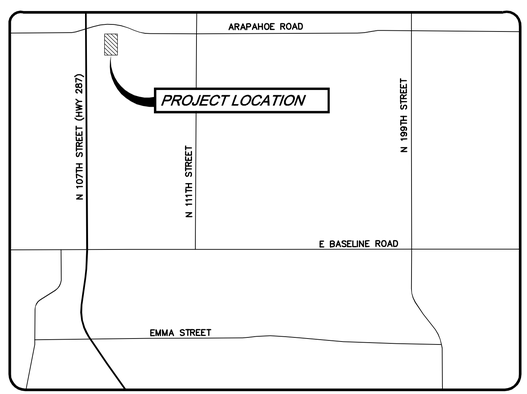
3. STORMWATER : STORMWATER QUALITY WILL BE REQUIRED ALONG WITH AN ABOVE GROUND STORMWATER DETENTION SYSTEM PRIOR TO BEING RELEASED INTO THE TOWN OF ERIE'S MS4 SYSTEM.

4. WETLANDS: THERE ARE NO KNOWN WETLANDS WITHIN THE PROJECT AREA.

5. BUILDING MODIFICATIONS: THE BUILDING FOOTPRINT IS PROTOTYPICAL (LEFT HAND). SIGNIFICANT ARCHITECTURAL UPGRADES ANTICIPATED WITH FOUR-SIDED ARCHITECTURE, GLAZING AND ARTICULATION TO BREAKUP MASS OF BUILDING WHICH WILL BE DETERMINED DURING ENTITLEMENT PROCESS WITH THE TOWN OF ERIE.

6. DEVELOPMENT AGREEMENT: DEVELOPER TO BUILD ALL ON & OFF-SITE IMPROVEMENTS INCLUDING: EARTHWORK, SITE ENTRANCES, SIGNAL AT ARAPAHOE ROAD, DETENTION FACILITIES, UTILITIES, PARKING LOT, LANDSCAPING, AND PROVIDE LOWE'S WITH A FINISH GRADED BUILDING PAD INCLUDING ALL UTILITIES STUBBED TO THE BUILDING PAD.

7. SITE DEVELOPMENT CONCERNS:
- BOULDER CANYON DITCH CURRENTLY BISECTS THE PROPERTY. DEVELOPER TO PIPE AND RELOCATE THE DITCH ALONG SOUTH PROPERTY LINE.
- PRINCE LAKE #1 LIES ON THE NORTHERN HALF OF THE SITE AND IS CURRENTLY BEING FILLED BY THE TOWN OF ERIE. THE MAJORITY OF THE LOWE'S SITE FALLS WITHIN THE PRE-EXSITING LAKE. THE TOWN OF ERIE IS FOLLOWING RECOMMENDATIONS PROVIDED BY A GEOTECHNICAL REPORT ON THE PROPER PLACEMENT AND COMPACTION OF FILL FOR THE LAKE.
- THE DEVELOPER IS DRAFTING THE PD WHICH ALLOWS FOR A REDUCTION IN PARKING PER CURRENT ORDINANCES (5 STALLS/1000 SF TO 4 STALLS/1000 SF), IN ADDITION TO A REDUCTION IN PARKING STALL DIMENSIONS (9'X20' TO 9'X18.5'). THE TOWN OF ERIE HAS VERBALLY AGREED TO THE PROPOSED REVISIONS, BUT WILL HAVE TO GO THROUGH A PROPER ENTITLEMENT PROCESS.



VICINITY MAP - NOT TO SCALE

SITE DATA

GENERAL

Site Acreage:
- Total: 32.83 ACRES
- Lowe's: 9.86 ACRES

Latitude: 40.013219
Longitude: -105.099919

Building:
- Classification: 94K DEEP
- Total Building Area (sf): 111,234 sf
- Garden Center Area (sf): 27,720 sf

List Architectural Upgrades Required: Four-Sided Architecture, glazing and articulation to break up mass of building. TBD during Entitlements.

List Limits to Visibility of Building: Pad users will obscure some of the Lowe's Building along Highway 287 and at the intersection of Arapahoe.

SIGNS

Road Signage Requested:
- No. of Pylon Signs: --
- Max. Area (sf): --
- Max. Height (ft): --
- Shopping Center? YES(2)
- Position on SC Sign: TOP & 2ND

No. of Monument Signs: 2
- Max. Area (sf): 2-50
- Max. Height (ft): 15

List Limits to Visibility of Road Sign: ELEVATION_DIFFERENCES

Building Signage Requested:
- Front Elevation Max. Area (sf): 500+
- Additional Building Signs Requested:
  - Right Side:
  - Left Side: 100+
  - Rear:

PARKING

Lowe's Standard Requirements:
- Standard Spaces: 381
- Handicapped Spaces: 9
- Total Spaces: 390
- Ratio (spaces/1,000sf): 3.50

City/Municipality Parking Requirements:
- Standard Spaces: 436
- Handicapped Spaces: 9
- Total Spaces: 445
- Ratio (spaces/1,000sf): 4.0
- Ratio w/GC: 3.20

Parking Provided:
- Standard Spaces: 457
- Handicapped Spaces: 9
- Total Spaces: 466
- Ratio (spaces/1,000sf): 4.19
- Ratio w/ GC: 3.35

TRAFFIC

Signals:
- Existing: X Yes ____ No
- Location: ARAPAHOE ROAD & HIGHWAY 287
- Proposed: X Yes ____ No
- Location: MAIN ENTRANCE & ARAPAHOE ROAD
- Required: ____ Yes X No

Traffic Counts:
- 13,287 AADT on ARAPAHOE ROAD (2014)
- 35,000 AADT on HIGHWAY 287 (2015)
- ____ AADT on ____
- ____ AADT on ____
- ____ AADT on ____

(AADT= Annual Average Daily Traffic)

Infrastructure:
ADDITIONAL LANE(S) ON ARAPAHOE RD

Original Issue Date:10/19/2016
Last Revised: 11/29/2017

PROJECT TEAM

Tim Cooksey
VP of Real Estate, Engineering & Construction

Matthew Minton
Engineering & Construction Director

Mark Stoner
Real Estate Director

Robert Davis
Real Estate Manager

Kimley»Horn
BRANDON MCDOUGALD
215 S STATE STREET, STE 400
SALT LAKE CITY, UT 84111

LOWE'S HOME CENTERS, LLC
1605 CURTIS BRIDGE ROAD
WILKESBORO, NC 28697
336.658.4000 (V) 336.658.3257 (F)

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LOWE'S

Preliminary Site Plan

LOWE'S OF:
ERIE, CO

PROJECT No:0935600004

CHECKED BY: BM

DRAWING NUMBER:

REC

Strt Pnt.	Fnsh Pnt.	Dia	Pipe Type	Length & Fittings	C Fact	Chng Mark	Num Hds	K Fact	Den Area	Press	Elev
*MAINS											
BOR	LEAD	12	CL52CLDI	55 1E1T	120	Mn-S		+2250		65	0
LEAD	ARAP	12	CL52CLDI	950 2E1F	120	Mn-S				0	0
ARAP	SRC	12	CL52CLDI	1450 3F2E1T	120	Mn-S				0	0
SRC											

Common Elevation
Common Elevation = 0

Calculation Question Answers
Remote Point = BOR
Source Point = SRC
Auto Peak Move Length = 0

Locate Remote Head = Y
Auto Alter Fittings Lengths = Y
Auto Peak = No
Alter Lengths After Auto Peak = No

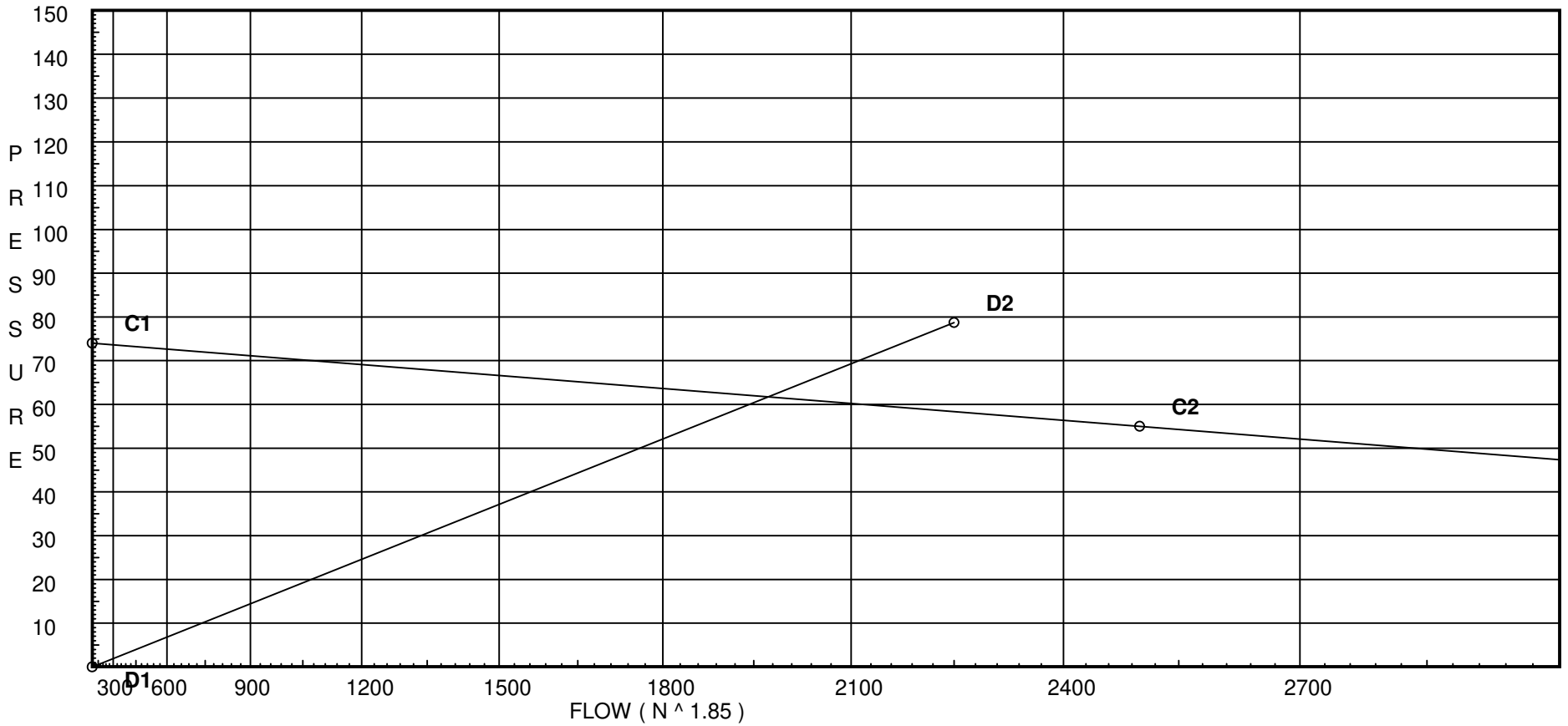
City Water Supply Information
Connection Point = SRC
Static Pressure = 74
Residual Pressure = 55
Residual Flow = 2500

Water Supply Curve C

Henderson Enginers, Inc
Lowe's Erie CO

City Water Supply:
- C1 - Static Pressure : 74
- C2 - Residual Pressure: 55
- C2 - Residual Flow : 2500

Demand:
- D1 - Elevation : _____
- D2 - System Flow : 2250
- D2 - System Pressure : 78.677
- Hose (Demand) : _____
- D3 - System Demand : 2250
- Safety Margin : -20.313



Pressure / Flow Summary - STANDARD

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
BOR	0.0		65.0	na	2250.0			
LEAD	0.0		65.78	na				
ARAP	0.0		70.88	na				
SRC	0.0		78.68	na				

The maximum velocity is 6.04 and it occurs in the pipe between nodes BOR and LEAD

Final Calculations - Hazen-Williams

Henderson Enginers, Inc
Lowe's Erie CO

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
BOR	2250.00	12.34	E	31.726	55.000	65.000		Qa = 2250.00
to		120.0	T	70.502	102.228	0.0		
LEAD	2250.0	0.0050		0.0	157.228	0.780		Vel = 6.04
LEAD	0.0	12.34	2E	63.451	950.000	65.780		
to		120.0	F	15.275	78.726	0.0		
ARAP	2250.0	0.0050		0.0	1028.726	5.102		Vel = 6.04
ARAP	0.0	12.34	3F	45.826	1450.000	70.882		
to		120.0	2E	63.451	179.779	-0.289		
SRC	2250.0	0.0050	T	70.502	1629.779	8.084		Vel = 6.04
	0.0							
	2250.00					78.677		K Factor = 253.66

Strt Pnt.	Fnsh Pnt.	Dia	Pipe Type	Length & Fittings	C Fact	Chng Mark	Num Hds	K Fact	Den Area	Press	Elev
*MAINS											
BOR	LEAD	10	CL52CLDI	55 1E1T	120	Mn-S		+2250		65	0
LEAD	ARAP	10	CL52CLDI	950 2E1F	120	Mn-S				0	0
ARAP	SRC	12	CL52CLDI	1450 3F2E1T	120	Mn-S				0	0
SRC											

8/29/2019 3:21:52 PM
Section 3
Raw Data for Lowe's Erie CO
File = (Untitled)
Misc Information and Water Supplies

Common Elevation
Common Elevation = 0

Calculation Question Answers
Remote Point = BOR
Source Point = SRC
Auto Peak Move Length = 0

Locate Remote Head = Y
Auto Alter Fittings Lengths = Y
Auto Peak = No
Alter Lengths After Auto Peak = No

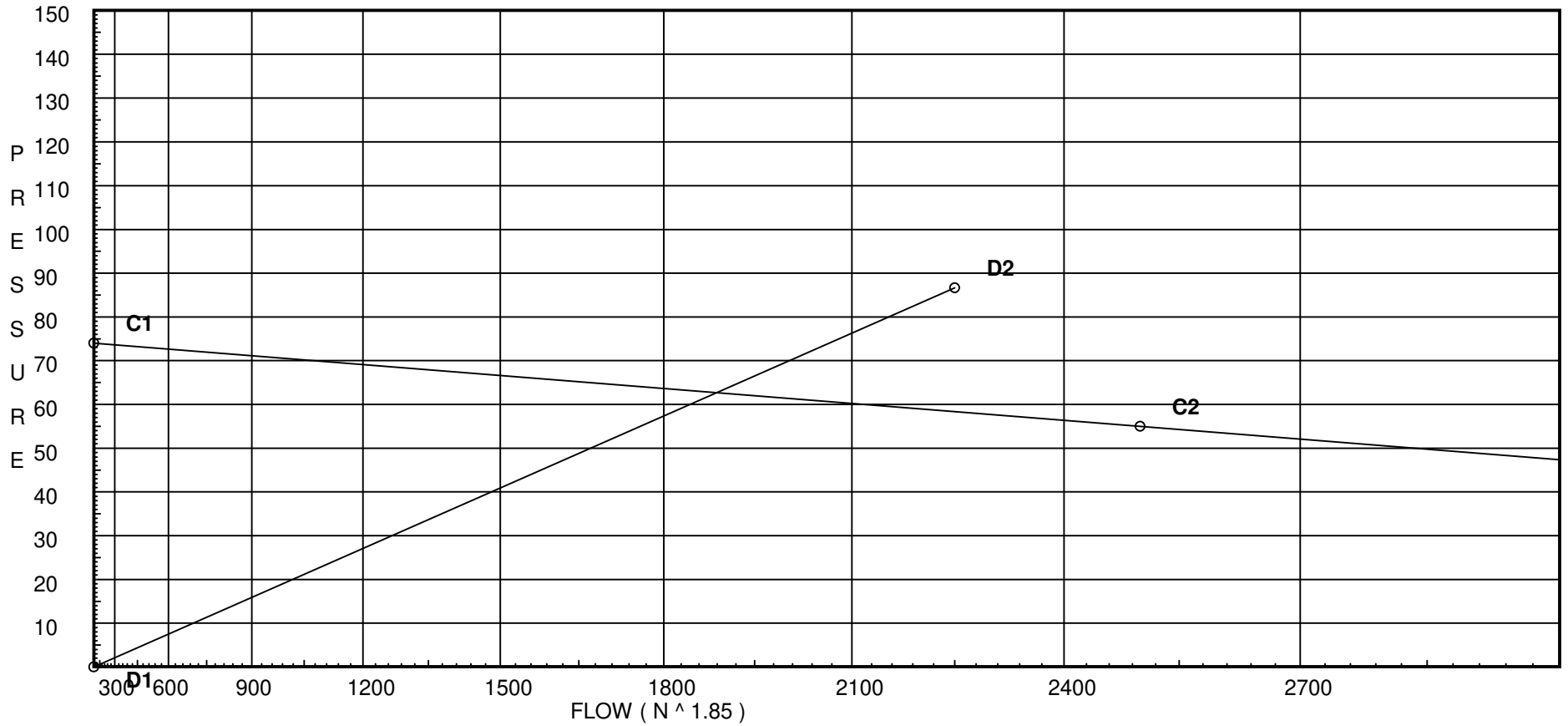
City Water Supply Information
Connection Point = SRC
Static Pressure = 74
Residual Pressure = 55
Residual Flow = 2500

Water Supply Curve C

Henderson Enginers, Inc
Lowe's Erie CO

City Water Supply:
- C1 - Static Pressure : 74
- C2 - Residual Pressure: 55
- C2 - Residual Flow : 2500

Demand:
- D1 - Elevation : _____
- D2 - System Flow : 2250
- D2 - System Pressure : 86.664
- Hose (Demand) : _____
- D3 - System Demand : 2250
- Safety Margin : -28.300



Pressure / Flow Summary - STANDARD

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
BOR	0.0		65.0	na	2250.0			
LEAD	0.0		66.65	na				
ARAP	0.0		78.87	na				
SRC	0.0		86.66	na				

The maximum velocity is 8.7 and it occurs in the pipe between nodes BOR and LEAD

Final Calculations - Hazen-Williams

Henderson Enginers, Inc
Lowe's Erie CO

Page 4
Date 07.26.18

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
BOR	2250.00	10.28	E	24.923	55.000	65.000		Qa = 2250.00
to		120.0	T	56.644	81.567	0.0		
LEAD	2250.0	0.0121		0.0	136.567	1.649		Vel = 8.70
LEAD	0.0	10.28	2E	49.846	950.000	66.649		
to		120.0	F	12.462	62.308	0.0		
ARAP	2250.0	0.0121		0.0	1012.308	12.220		Vel = 8.70
ARAP	0.0	12.34	3F	45.826	1450.000	78.869		
to		120.0	2E	63.451	179.779	-0.289		
SRC	2250.0	0.0050	T	70.502	1629.779	8.084		Vel = 6.04
	0.0							
	2250.00					86.664		K Factor = 241.69

Strt Pnt.	Fnsh Pnt.	Dia	Pipe Type	Length & Fittings	C Fact	Chng Mark	Num Hds	K Fact	Den	Area	Press	Elev
*MAINS												
BOR	LEAD	8	CL52CLDI	55 1E1T	120	Mn-S		+2250			65	0
LEAD	ARAP	8	CL52CLDI	950 2E1F	120	Mn-S					0	0
ARAP	SRC	12	CL52CLDI	1450 3F2E1T	120	Mn-S					0	0
SRC												

Common Elevation
Common Elevation = 0

Calculation Question Answers
Remote Point = BOR
Source Point = SRC
Auto Peak Move Length = 0

Locate Remote Head = Y
Auto Alter Fittings Lengths = Y
Auto Peak = No
Alter Lengths After Auto Peak = No

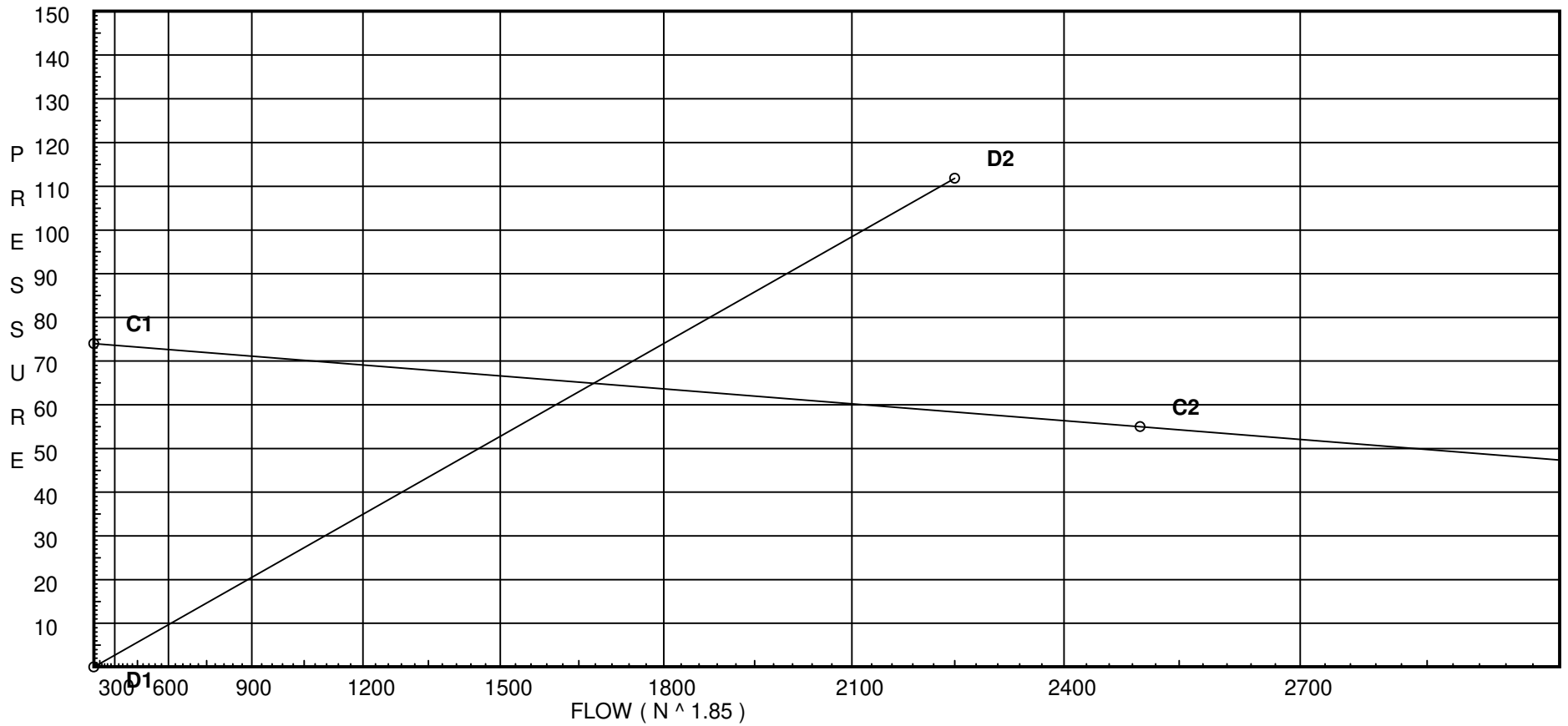
City Water Supply Information
Connection Point = SRC
Static Pressure = 74
Residual Pressure = 55
Residual Flow = 2500

Water Supply Curve C

Henderson Enginers, Inc
Lowe's Erie CO

City Water Supply:
- C1 - Static Pressure : 74
- C2 - Residual Pressure: 55
- C2 - Residual Flow : 2500

Demand:
- D1 - Elevation : _____
- D2 - System Flow : 2250
- D2 - System Pressure : 111.857
- Hose (Demand) : _____
- D3 - System Demand : 2250
- Safety Margin : -53.492



Pressure / Flow Summary - STANDARD

Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
BOR	0.0		65.0	na	2250.0			
LEAD	0.0		69.11	na				
ARAP	0.0		104.06	na				
SRC	0.0		111.86	na				

The maximum velocity is 13.44 and it occurs in the pipe between nodes BOR and LEAD

Final Calculations - Hazen-Williams

Henderson Enginers, Inc
Lowe's Erie CO

Hyd. Ref. Point	Qa Qt	Dia. "C" Pf/Ft	Fitting or Eqv.	Ln.	Pipe Ftng's Total	Pt Pe Pf	Pt Pv Pn	******* Notes ******
BOR	2250.00	8.27	E	21.405	55.000	65.000		Qa = 2250.00
to		120.0	T	41.62	63.025	0.0		
LEAD	2250.0	0.0348		0.0	118.025	4.111		Vel = 13.44
LEAD	0.0	8.27	2E	42.809	950.000	69.111		
to		120.0	F	10.702	53.511	0.0		
ARAP	2250.0	0.0348		0.0	1003.511	34.951		Vel = 13.44
ARAP	0.0	12.34	3F	45.826	1450.000	104.062		
to		120.0	2E	63.451	179.779	-0.289		
SRC	2250.0	0.0050	T	70.502	1629.779	8.084		Vel = 6.04
	0.0							
	2250.00					111.857		K Factor = 212.74

Appendix B – Sanitary Sewer Collection System

Sanitary Sewer Demand Calculations
Flowmaster Hydraulic Analysis

Galloway
Planning Architecture Engineering

6162 S. Willow Drive, Suite 320
Greenwood Village, CO 80111
(303) 770-8884 (Phone)

Date: 11/13/19
Project: Nine Mile Corner
Location: Erie, Colorado
By: Brandon McCrary

Multi-Family Area

	290	Units
	2.79	Capita/Unit
	90	Gal/Capita/Day
Average Day	72,819	Gal/Day
	0.11	cfs
	5	Peaking Factor
Max Flow Rate	364,095	Gal/Day
	0.56	cfs

Commercial Area

	32.5	Acres
	1,000	Gal/Acre
Average Day	32,500	Gal/Day
	0.05	cfs
	5	Peaking Factor
Max Flow Rate	162,500	Gal/Day
	0.25	cfs

Total Nine Mile Corner Flows

Average Day	105,319	Gal/Day
	0.16	cfs
Max Flow Rate	526,595	Gal/Day
	0.81	cfs

Offsite Sanitary - 1.2% Slope - ADD

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.012	
Channel Slope	0.01200	ft/ft
Diameter	0.67	ft
Discharge	0.16	ft^3/s

Results

Normal Depth	0.15	ft
Flow Area	0.06	ft^2
Wetted Perimeter	0.66	ft
Hydraulic Radius	0.09	ft
Top Width	0.56	ft
Critical Depth	0.18	ft
Percent Full	22.5	%
Critical Slope	0.00548	ft/ft
Velocity	2.71	ft/s
Velocity Head	0.11	ft
Specific Energy	0.26	ft
Froude Number	1.47	
Maximum Discharge	1.54	ft^3/s
Discharge Full	1.44	ft^3/s
Slope Full	0.00015	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	22.54	%
Downstream Velocity	Infinity	ft/s

Offsite Sanitary - 1.2% Slope - ADD

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.15	ft
Critical Depth	0.18	ft
Channel Slope	0.01200	ft/ft
Critical Slope	0.00548	ft/ft

Offsite Sanitary - 1.2% Slope - PDD

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.012	
Channel Slope	0.01200	ft/ft
Diameter	0.67	ft
Discharge	0.81	ft^3/s

Results

Normal Depth	0.36	ft
Flow Area	0.19	ft^2
Wetted Perimeter	1.10	ft
Hydraulic Radius	0.17	ft
Top Width	0.67	ft
Critical Depth	0.43	ft
Percent Full	53.7	%
Critical Slope	0.00702	ft/ft
Velocity	4.23	ft/s
Velocity Head	0.28	ft
Specific Energy	0.64	ft
Froude Number	1.39	
Maximum Discharge	1.54	ft^3/s
Discharge Full	1.44	ft^3/s
Slope Full	0.00382	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	53.74	%
Downstream Velocity	Infinity	ft/s

Offsite Sanitary - 1.2% Slope - PDD

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.36	ft
Critical Depth	0.43	ft
Channel Slope	0.01200	ft/ft
Critical Slope	0.00702	ft/ft

Offsite Sanitary - 2.0% Slope - ADD

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.012	
Channel Slope	0.02000	ft/ft
Diameter	0.67	ft
Discharge	0.81	ft³/s

Results

Normal Depth	0.31	ft
Flow Area	0.16	ft²
Wetted Perimeter	1.00	ft
Hydraulic Radius	0.16	ft
Top Width	0.67	ft
Critical Depth	0.43	ft
Percent Full	46.2	%
Critical Slope	0.00702	ft/ft
Velocity	5.13	ft/s
Velocity Head	0.41	ft
Specific Energy	0.72	ft
Froude Number	1.86	
Maximum Discharge	1.99	ft³/s
Discharge Full	1.85	ft³/s
Slope Full	0.00382	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	46.23	%
Downstream Velocity	Infinity	ft/s

Offsite Sanitary - 2.0% Slope - ADD

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.31	ft
Critical Depth	0.43	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.00702	ft/ft

Offsite Sanitary - 2.0% Slope - PDD

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.012	
Channel Slope	0.02000	ft/ft
Diameter	0.67	ft
Discharge	0.81	ft³/s

Results

Normal Depth	0.31	ft
Flow Area	0.16	ft²
Wetted Perimeter	1.00	ft
Hydraulic Radius	0.16	ft
Top Width	0.67	ft
Critical Depth	0.43	ft
Percent Full	46.2	%
Critical Slope	0.00702	ft/ft
Velocity	5.13	ft/s
Velocity Head	0.41	ft
Specific Energy	0.72	ft
Froude Number	1.86	
Maximum Discharge	1.99	ft³/s
Discharge Full	1.85	ft³/s
Slope Full	0.00382	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	46.23	%
Downstream Velocity	Infinity	ft/s

Offsite Sanitary - 2.0% Slope - PDD

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.31	ft
Critical Depth	0.43	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.00702	ft/ft

Onsite Sanitary - 1.14% Slope - ADD

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.012	
Channel Slope	0.01140	ft/ft
Diameter	0.67	ft
Discharge	0.16	ft³/s

Results

Normal Depth	0.15	ft
Flow Area	0.06	ft²
Wetted Perimeter	0.66	ft
Hydraulic Radius	0.09	ft
Top Width	0.56	ft
Critical Depth	0.18	ft
Percent Full	22.9	%
Critical Slope	0.00548	ft/ft
Velocity	2.66	ft/s
Velocity Head	0.11	ft
Specific Energy	0.26	ft
Froude Number	1.43	
Maximum Discharge	1.51	ft³/s
Discharge Full	1.40	ft³/s
Slope Full	0.00015	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	22.85	%
Downstream Velocity	Infinity	ft/s

Onsite Sanitary - 1.14% Slope - ADD

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.15	ft
Critical Depth	0.18	ft
Channel Slope	0.01140	ft/ft
Critical Slope	0.00548	ft/ft

Onsite Sanitary - 1.14% Slope - PDD

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.012	
Channel Slope	0.01140	ft/ft
Diameter	0.67	ft
Discharge	0.81	ft³/s

Results

Normal Depth	0.36	ft
Flow Area	0.20	ft²
Wetted Perimeter	1.11	ft
Hydraulic Radius	0.18	ft
Top Width	0.66	ft
Critical Depth	0.43	ft
Percent Full	54.6	%
Critical Slope	0.00702	ft/ft
Velocity	4.15	ft/s
Velocity Head	0.27	ft
Specific Energy	0.63	ft
Froude Number	1.35	
Maximum Discharge	1.51	ft³/s
Discharge Full	1.40	ft³/s
Slope Full	0.00382	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	54.59	%
Downstream Velocity	Infinity	ft/s

Onsite Sanitary - 1.14% Slope - PDD

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.36	ft
Critical Depth	0.43	ft
Channel Slope	0.01140	ft/ft
Critical Slope	0.00702	ft/ft

Onsite Sanitary - 0.5% Slope - ADD

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.012	
Channel Slope	0.00500	ft/ft
Diameter	0.67	ft
Discharge	0.16	ft^3/s

Results

Normal Depth	0.19	ft
Flow Area	0.08	ft^2
Wetted Perimeter	0.75	ft
Hydraulic Radius	0.11	ft
Top Width	0.60	ft
Critical Depth	0.18	ft
Percent Full	28.1	%
Critical Slope	0.00551	ft/ft
Velocity	1.98	ft/s
Velocity Head	0.06	ft
Specific Energy	0.25	ft
Froude Number	0.95	
Maximum Discharge	1.00	ft^3/s
Discharge Full	0.93	ft^3/s
Slope Full	0.00015	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	28.14	%
Downstream Velocity	Infinity	ft/s

Onsite Sanitary - 0.5% Slope - ADD

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.19	ft
Critical Depth	0.18	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00551	ft/ft

Onsite Sanitary - 0.5% Slope - PDD

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.012	
Channel Slope	0.00500	ft/ft
Diameter	0.67	ft
Discharge	0.81	ft^3/s

Results

Normal Depth	0.48	ft
Flow Area	0.27	ft^2
Wetted Perimeter	1.36	ft
Hydraulic Radius	0.20	ft
Top Width	0.60	ft
Critical Depth	0.43	ft
Percent Full	72.4	%
Critical Slope	0.00703	ft/ft
Velocity	2.99	ft/s
Velocity Head	0.14	ft
Specific Energy	0.62	ft
Froude Number	0.78	
Maximum Discharge	1.00	ft^3/s
Discharge Full	0.93	ft^3/s
Slope Full	0.00382	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	72.37	%
Downstream Velocity	Infinity	ft/s

Onsite Sanitary - 0.5% Slope - PDD

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.48	ft
Critical Depth	0.43	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00703	ft/ft

Appendix C – *Street Sewer Capacity Evaluation* by Merrick & Company

MERRICK & COMPANY

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Denver, Colorado 80211
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Fax: +1 303-964-3355

www.merrick.com

June 28, 2017

Town of Erie
c/o Ms. Wendi Palmer, Civil Engineer
Mr. Matthew Wiederspahn, Development Engineer
645 Holbrook Street
Eire, Colorado 80516

RE: Nine Mile Development – 111th Street Sewer Capacity Evaluation

At the Town's request, we revised analysis of the Nine Mile development, changing the planned develop density to 302 residential units. The commercial area remains the same, i.e. 32.52 acres. Per previous analysis, the commercial development equates to approximately 130 EQR.

Residential units will be multifamily, with an average of 2.85 people per unit. Using the Wastewater Utility Plan's design flow of 90 gpd per capita, the residential contribution equates to 89,775 gpd, or approximately 310 EQRs using our design day flow of 250 gpd/EQR.

The total EQR from the Nine Development is 440 EQR. Applying peaking factors based on formula from the Denver Sanitary Sewer Design Technical Criteria Manual, resulted in a peaking factor of 3.45 and peak hour flows of 379,670 gpd.

Analyses

Sewer capacity by reach was evaluated for an ultimate design loading for the N. 111th Street sewer of 679 EQR plus the additional 440 EQR from Nine Mile. Once again, it was assumed that flow would enter the existing sewer on Beasley Drive and incremental contributing flows were calculated. All sewers in the Arapahoe Ridge subdivisions were evaluated for an allowable capacity at d/D = 0.5 and, in 111th Street, at an allowable capacity of d/D = 0.7; both using a Manning's n = 0.012.

The results of the analyses, showing the capacity for each sewer reach, are presented in the attached spreadsheet. The enclosed maps, Figures 1 and 2, based on the Town's GIS geodatabase, show the sanitary sewer and manholes analyzed, with red sewer lines indicating that the reach does not have enough capacity to take on the additional flows from the Nine Mile development under the d/D = 0.5 and 0.7 design criteria for Arapahoe Ridge and N. 111th Street, respectively.

In the West Arapahoe Development, the existing sewer capacity is adequate for existing flows, but when the Nine Mile flows are added, the pipe capacity is exceeded for most reaches, including the reaches on 111th Street between manholes AR38 and AR40.

Similarly, the capacity of all of the sewers in the East Arapahoe Ridge Development is exceeded with the additional flows.

North of the Arapahoe Ridge development, the sewer continues along N. 111th Street to Erie Parkway. Under 70% full design criteria with the additional flows, capacity is exceeded for more than a third the reaches of the sewer. However, surcharging this sewer is possible, as discussed in previous analysis.

Given the similar results of this iteration of the sewer capacity analysis, our recommendations remain the same. Please contact us if you have any questions.

Respectfully Submitted,
Merrick & Company

Allyson Junker

Terrence P. Kenyon, P.E.

Attachments: Figure 1 - Arapahoe Ridge Sewer Capacity Evaluation – d/D 50% Design
Figure 2 - N. 111th Street Sewer Capacity Evaluation – d/D 70% Design
Sewer Capacity Analysis Spreadsheets

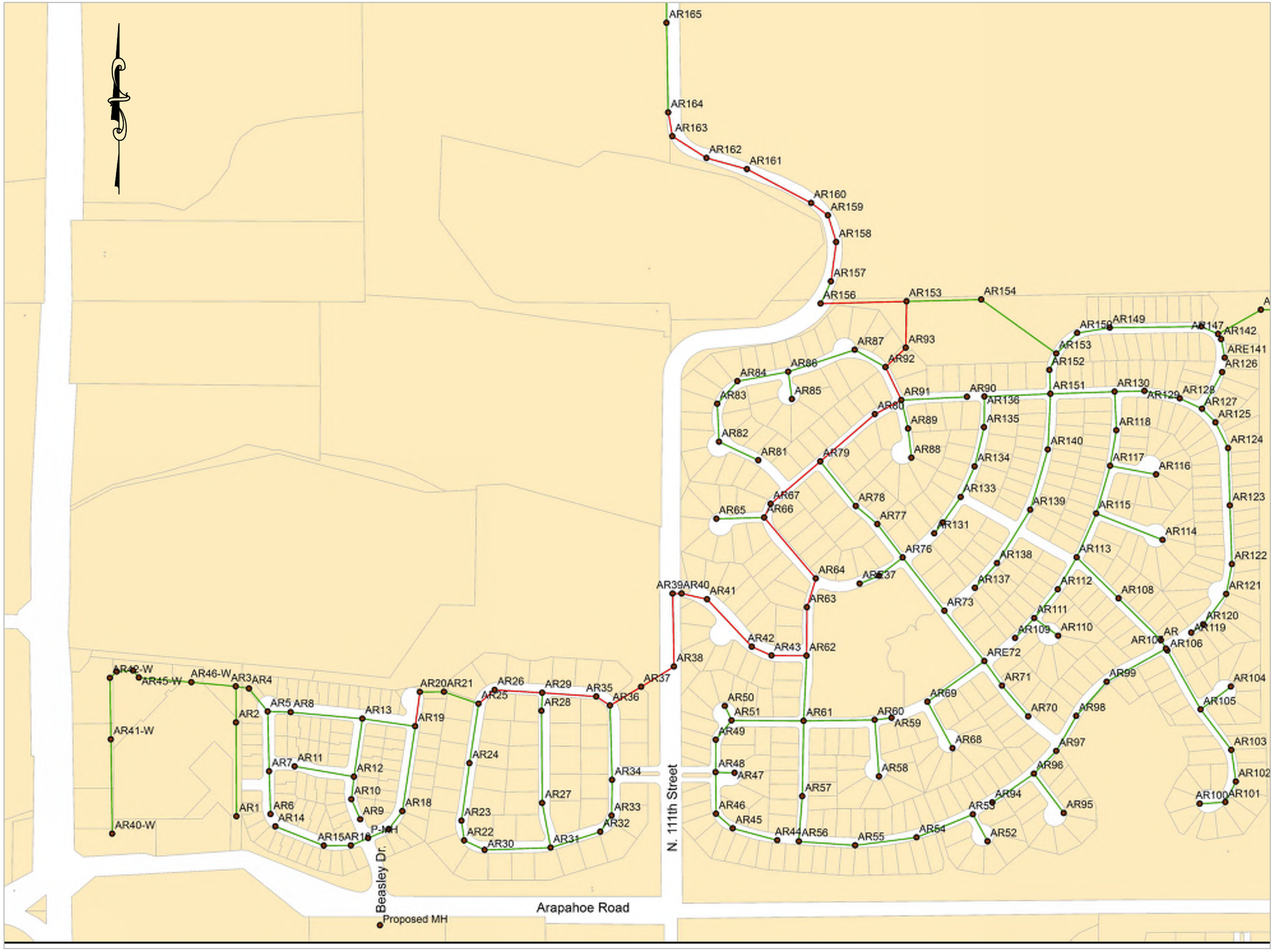
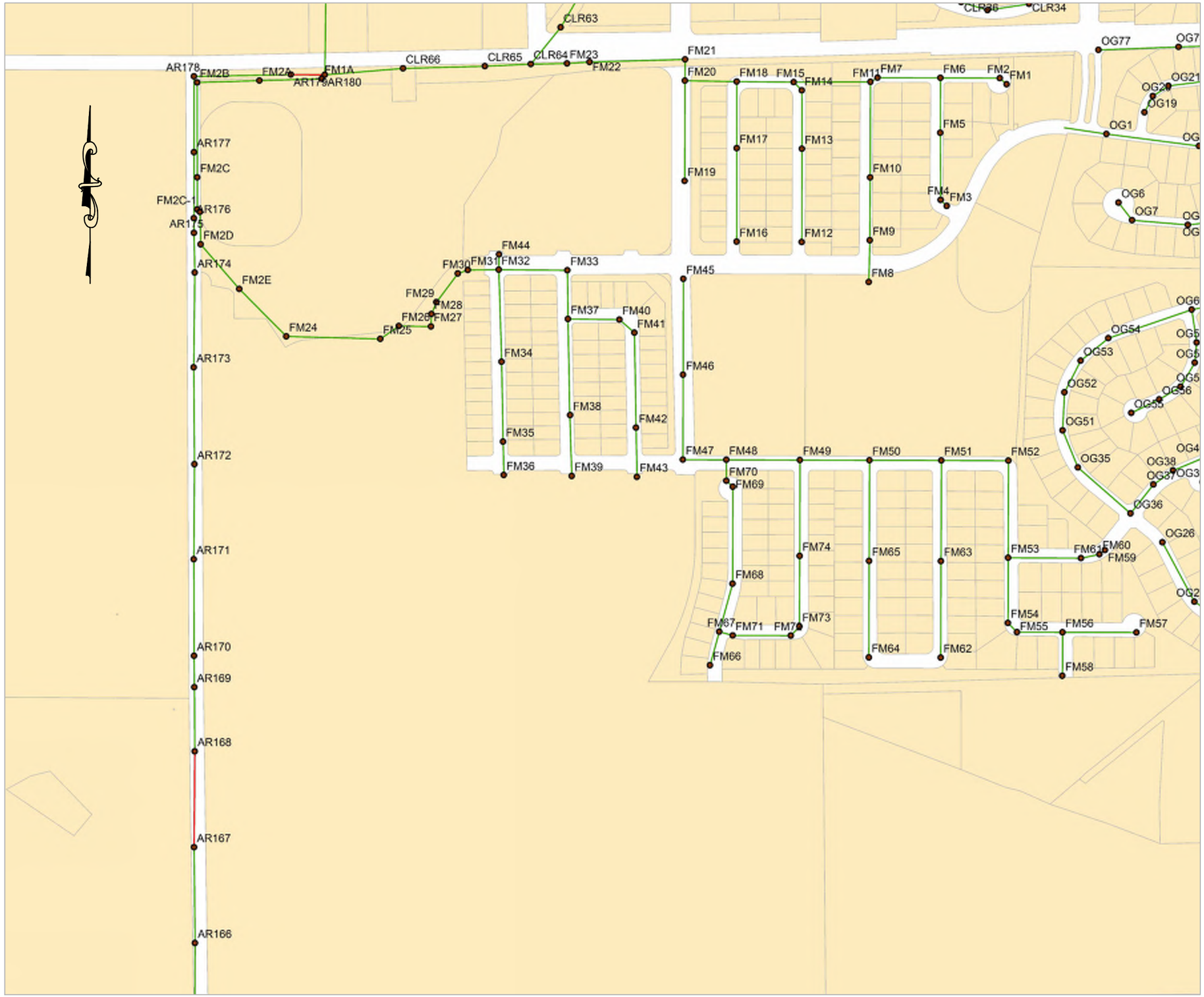


FIGURE 1 - ARAPAHOE RIDGE SEWER CAPACITY EVALUATION - dD 50% DESIGN

TOWN OF ERIE
1874

MERRICK & COMPANY

JUNE 2017



TOWN OF ERIE
1874

MERRICK & COMPANY

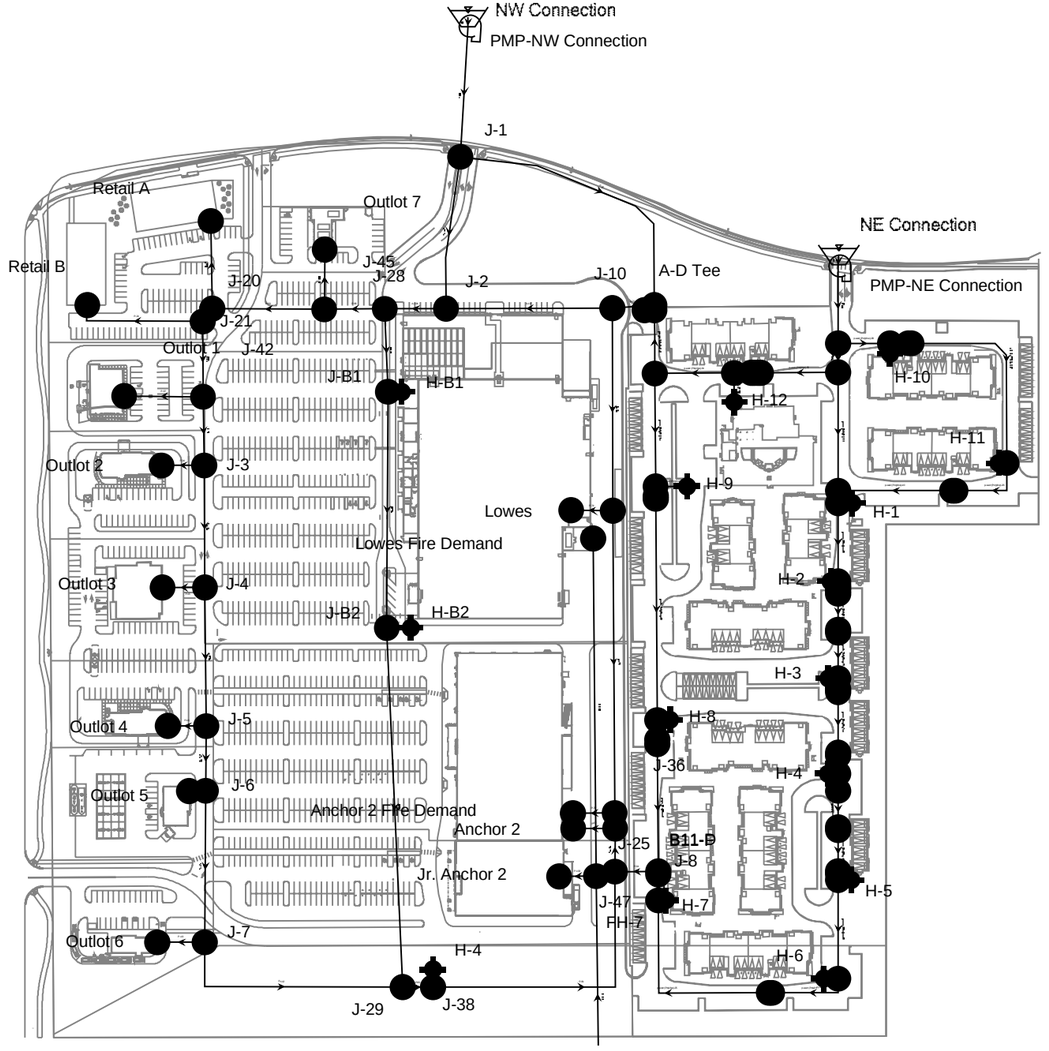
JUNE 2017

FIGURE 2 – N. 111TH STREET SEWER CAPACITY EVALUATION – dD 70% DESIGN

Appendix D – Maps and Plans

Water Schematic
Overall Grading Plan
Overall Utility Plan

Scenario: PHD + FF - Anchor 2



Phase III Drainage Report

NINE MILE CORNER
AT NINE MILE SUBDIVISION FILING NO. 1

Erie, Colorado

PREPARED FOR:
Evergreen Devco., Inc.
1873 South Bellaire Street
Denver, CO 80222

PREPARED BY:
Galloway & Company, Inc.
6162 S. Willow Drive, Suite 320
Greenwood Village, CO 80111

DATE:
August 16, 2019

REVISED:
November 13, 2019

Engineer's Statement

I hereby certify that this Phase III Drainage Report for the design of Nine Mile Corner was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Erie Engineering Standards and Specifications for Design and Construction and the Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual 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.

_____ _____

Brandon McCrary, PE 40276 *Date*
For and on behalf of Galloway & Company

Town Acceptance

This report has been reviewed and found to be in general compliance with the Town of Erie Engineering Standards and Specifications for Design and Construction and other Town requirements. ***THE ACCURACY AND VAILIDTY 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

Introduction 5
I. General Location and Description 5
Location 5
Description of Property 5
Drainage Studies Relevant to the Site 7
II. Drainage Basins 7
Major Basin Description – Overview 7
Major Basin Description – Offsite Flows 8
Project Basin Descriptions 9
III. Drainage Design Criteria 10
Regulations 10
Hydrology 10
Hydraulics 11
Water Quality Enhancement 12
IV. Drainage Facility Design 12
On-Site Stormwater Conveyance and Storage Facilities 12
Offsite Stormwater Conveyance Facilities 13
Water Quality Enhancement Best Management Practices 13
V. Conclusions 13
Compliance with Standards 13
VI. References 14
Appendix A – Reference Material 15
Vicinity Map 15
FEMA FIRMette Map 15
NRCS Soils Data 15
ALTA/NSPS Land Title Survey 15
Appendix B – Hydrology Calculations 16
Rational Method Calculations 16
CUHP 16
Appendix C – Hydraulic Calculations 16
EPA SWMM 17
UD-Detention Calculation Spreadsheet – Commercial Area ..... **Error! Bookmark not defined.**
UD-Detention Calculation Spreadsheet – Existing Settling Pond ..... **Error! Bookmark not defined.**
StormCAD Model 17
Inlet Capacity Calculations 17

Culvert Capacity Calculations – Highway 287 17
Grass-Lined Channel Capacity Calculations – Highway 287 17
Grass-Lined Channel Capacity Calculations/Proposed Modifications – N. 111th Street 17
Appendix D – Supporting Documentation 17
Love & Associates, Inc. Report 18
RESPEC Consulting & Services Report 18
Olsson Associates Memo and Design Plans 18
Appendix E – Drainage Map 19

Introduction

This Phase III Drainage Report is being prepared for the development of a ±47.2-acre site located at Nine Mile Corner in Erie, Colorado. Evergreen Development (Evergreen) has proposed to develop ±31.47 acres within the larger development as a commercial site. The remaining ±14.7-acre site area will be developed separately as multi-family (i.e. high-density residential). The objective of this report is to identify the master drainage basins which the development is a part of and address the general conformance of the proposed drainage design with previous drainage studies. This report will also provide analysis of the commercial site, which will be designed and permitted concurrently with the Nine Mile Corner infrastructure development.

I. General Location and Description

Location

Nine Mile Corner (site) is located at the southeast corner of N. 107th Street (U.S. Highway 287) and Arapahoe Road in Erie, Colorado. The site is located in the northeast quarter of Section 34 and the southeast quarter of Section 27, Township 1 North, Range 69 West of the 6th Principal Meridian, Town of Erie, County of Boulder, State of Colorado. The site is bounded by Arapahoe Road right-of-way to the north, a mix of vacant land and a single-family residence (compound) to the east, an existing single-family residential development to the south, and N. 107th Street (U.S. 287) to the west. Refer to Appendix A for a Vicinity Map.

The prominent existing on-site drainage features are:

- Prince Lake Number I (Lake), which is located in the northwest corner of the project site. It contained water as recently as October 2013 (according to Google Earth satellite imagery). Since then, the Lake was drained and partially backfilled.

- South Boulder Canyon Ditch (Ditch), which enters the west side of the site through an existing box culvert underneath N. 107th Street (U.S. 287) and then crosses the site along a northeasterly alignment. The ditch generally flows from west to northeast.

The surrounding developments are Beacon Hill subdivision to the south, Arapahoe Ridge to the north, and vacant land to the west and east.

Description of Property

The total project area is ±47.2 acres. The commercial area comprises ±31.47 acres and the multi-family area comprises ±14.7 acres. Separate tracts along the north and east portions of the site are set aside for water quality and detention ponds for the commercial and multi-family sites. The development will be served by four major access points: one (1) along N. 107th Street (U.S. 287) and three (3) along Arapahoe Road.

Vegetative cover within Prince Lake Number I consists of native vegetation; the coverage is generally poor. The existing grades along the side slopes of the Lake are as steep as 4:1 and direct water toward an existing concrete drainage structure in the northeast region of the Lake.

The existing vegetation along the Ditch is robust and consists of native grasses, shrubs and mature trees. The vegetative cover to the south of the Ditch is generally fair and consists of native grasses. The existing

grades are moderately steep and generally vary between 5% and 10%. The excess runoff in this region drains south-to-north and towards the Ditch.

The existing property consists of a mix of land uses including: vacant land, Prince Lake Number I (Lake) and its associated infrastructure (i.e. gravel loop road, access drive, and concrete drainage structures, which will be demolished and removed during construction, South Boulder Canyon Ditch (Ditch) and two single-family residences with associated out-buildings. The irrigation ditch alignment flows from west to northeast and divides the project site.

Parcel A is located south of the Ditch and is mostly undeveloped except for a single-family residence, associated out-buildings and gravel access drive. The northern portion of Parcel B (multi-family project area) and Parcel C1 (Prince Lake Number I) are generally located north of the Ditch. The south portion of Parcel B is located south of the Ditch. Refer to Appendix A for an ALTA survey of the project site.

There is an existing 10-foot utility easement along the south property line of Parcel B. There is a utility easement of unknown width for a petroleum pipeline that starts midway down on the west property line, continuing east and following the southern and eastern boundary of the Lake. The Town of Erie will abandon this line as part of this project.

The existing site will require approximately twenty feet of fill to achieve the proposed design grades. Roughly thirty feet of cut is necessary along the south property line to achieve the proposed design grades.

The proposed storm drain system will convey stormwater (refer to sheet DR01 for the proposed alignment) from the following infrastructure to an existing grass-lined channel along the west side of 111th Street:

- An existing 24" RCP along the west edge of the site. This pipe currently drains water from the Town of Erie-owned settling pond at the southwest corner of N. 107th Street (U.S. 287) and Arapahoe Road to the Lake.

- Outflow from the commercial site water quality and detention ponds

- Outflow from the multi-family site water quality and detention pond

The existing South Boulder Canyon Ditch, which is an existing irrigation ditch, will be abandoned just east of N. 107th Street (U.S. 287) and piped across the south boundary of the project site in a 48" RCP within a proposed easement. The proposed pipe will connect to an off-site section of the ditch located near the southeast corner of the project (refer to sheet DR01 for the proposed alignment).

Separate tracts along the north and east portions of the site have been set aside for water quality and detention ponds. The commercial and multi-family sites drain to separate facilities that release into a proposed storm drain system. Harris Kocher Smith (HKS) will design the water quality and detention facility for the multi-family site.

The commercial site tenant mix has not been fully determined. The north retail anchor will consist of a 100,828 SF Lowe's retail building with a garden center, parking areas, drive aisles, and associated landscaping and sidewalks on Lot 1. Lot 3 is located in the northwest corner of the development and will consist of two multi-tenant retail buildings (8,000 SF and 10,000 SF) and associated infrastructure. The spine road will be constructed from the northwest access on Arapahoe Road to the southwest access on

Highway 287 to provide circulation to the outlots and fire access. The road across the south side of the site will also be constructed to provide circulation to the adjacent multi-family site. The south anchor retail (Lot 10) and the remaining outlots will be overlot graded. Utility services will also be provided to these lots. Site improvements common to this type of development include installing site-specific wet and dry utility service lines, improved parking areas and drive aisles (i.e. asphalt and/or concrete), building construction, and landscaping.

The project site was investigated for wetlands and cultural resources. *Outlook at Nine Mile: Wetland Delineation and Cultural Resource Report* dated November 2016 was prepared by IRIS Mitigation and Design. According to the report no wetlands or historic properties were found on the site.

The project site is not impacted by a FEMA designated floodplain (refer to Appendix A for FEMA FIRMette map).

According to the USDA NRCS Web Soil Survey a mix of 'Ascalon sandy loam, 3 to 5 percent slopes' and 'Ascalon sandy loam, 5 to 9 percent slopes' covers the existing site. This soil is associated with Hydrologic Soil Group (HSG) 'B'. HSG 'B' soils have a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission. Refer to Appendix A for additional soils information and excerpts from the *Preliminary Geotechnical Investigation for Nine Mile Corner – Commercial Area* prepared by CTL Thompson and dated February 24, 2017.

Drainage Studies Relevant to the Site

There are several existing drainage studies applicable to the site:

- *Town of Erie Outfall Systems Plan (West of Coal Creek)* prepared by RESPEC Consulting & Services in January 2014. The main objectives of the study were to identify any existing drainage problems in the watershed and develop practical solutions that can be implemented through engineering analysis and coordination with the project sponsors and public.

- *Erie Outfall Systems Planning Preliminary Design – Erie and Adjacent Boulder and Weld County Areas* prepared by Love & Associates, Inc. in May 2001. This study (OSP) provided preliminary design of conveyance facilities to transport the 100-year storm event when proposed future development occurs within the study area. This report was updated in December 2007, but the updated area was all to the east of Coal Creek, so it did not affect the project area.

- Improvements to the existing grass-lined channel along the west side of 111th Street (reach 6 of the Prince Tributary in the OSP and Reach BP20) were proposed by Olsson Associates (Olsson) in 2006. In February 2006 Olsson prepared a memorandum summarizing their evaluation of the existing conditions and presenting the preliminary design of Reach BP20 improvements. The preliminary design for the conveyance of 275 cfs along the west side of 111th Street upstream is based on results presented in the Love & Associates OSP (May 2001).

II. Drainage Basins

Major Basin Description – Overview

In general, the project site overlaps SWMM sub-basins 201 and 203 (OSP). These basins combine with SWMM sub-basins 200, 202 and 204 at SWMM design point 303. This design point is located at the

intersection of N. 111th Street and Arapahoe Road and serves as the design flow at the upstream (south) end of the channel along the west side of N. 111th Street. Refer to Appendix C for the SWMM schematic covering this area.

Major Basin Description – Offsite Flows

The project site is impacted by offsite flow from SWMM sub-basin 200 (200) and the southwest region of SWMM sub-basin 201 (201). 200 is located along the west side of N. 107th Street (U.S. 287). According to the OSP report this largely undeveloped basin is ±98 acres and generally drains to the northeast. Per the SWMM schematic, runoff from the Nine Mile Corner project combines with runoff from 200 at Design Point 300. The existing excess runoff in 200 likely flows into the South Boulder Canyon Ditch; however, per Section 812.02 of the Town of Erie *Standards and Specifications, Section 800 – Storm Drainage Facilities*, "Irrigation ditches cannot be used as an outfall point for the storm drainage system because of physical limitations". The Nine Mile Corner project is required to convey the outflow from the future detention pond in 200 to the existing grass-lined channel along the west side of 111th Street (i.e. SWMM conveyance element 303).

The future detention pond in 200 has an estimated release rate of ±83.3 cfs (98 acres * 0.85 cfs/acre). We propose using the existing settling basin at the southwest corner of N. 107th Street (U.S. 287) and Arapahoe Road to attenuate outflow from the future detention pond and release it at the capacity available in the existing 24" RCP that runs under N.107th Street (U.S. 287) to the Nine Mile Corner site, which is ±28.2 cfs. The Town of Erie owns the land containing the settling pond, which is located in the northeast corner of SWMM sub-basin 200. It appears the water is routed into the settling pond via an existing outlet structure and into Prince Lake Number I.

Appendix C includes a SWMM model of the area west of N. 107th Street (U.S. 287). The model investigates and demonstrates the feasibility of using the settling pond to further attenuate outflow from the future detention pond in sub-basin 200 down to the capacity of the existing 24" RCP underneath N. 107th Street (U.S. 287), which is ± 28.2 cfs.

The inflow hydrograph to the future detention pond from the future development in sub-basin 200 was generated with CUHP. Specifically, the input values shown in Table B-1 CUHP Input (OSP) were used. Since there is no site plan for the future development the percent imperviousness for the entire 98 acres was increased from 37.3% (OSP) to 70% for conservativeness.

This future condition hydrograph was set as inflow to the future pond. An orifice plate was used to set the release into the settling pond at ±83.3 cfs (98 acres * 0.85 cfs/acre). The outflow from the settling pond was limited by the inlet hydraulics (i.e., the inlet control) of the existing 24" RCP. The settling pond will attenuate the outflow from the future detention pond if additional volume is provided by increasing the maximum water surface elevation from 5259 to 5261.13 (5256 to 5258.13 – Town of Erie datum). This additional two feet of depth will be contained within the existing settling pond with no 100-year overtopping, and with no changes made to or grading done in the pond. The future developer of this lot will need to make modifications to the settling pond berm and outlet structure to meet the criteria listed above.

Other offsite flows considered in this design come from the southwest, west, and north portions of SWMM sub-basin 201 (shown as Basins 1-4 on Sheet DR01).

Project Basin Descriptions

Roadside Basins

Basin 1 (4.80 acres) consists of a portion of the residential development south of the project site. Runoff from Basin 1 flows to a detention pond within the residential development and from there outlets to the existing roadside swale along N. 107th Street (U.S. 287). It is assumed that the release rate from this detention pond is 1 cfs per acre per Town of Erie's previous design criteria and standards.

Basin 2 (7.76 acres) consists of a portion of the residential development and the east half of N. 107th Street (U.S. 287) south of the project site. Runoff from Basin 2 flows via an existing roadside swale to the South Boulder Canyon Ditch in the existing condition.

The existing South Boulder Canyon Ditch, which is an existing irrigation ditch, will be abandoned just east of N. 107th Street (U.S. 287) and piped across the south boundary of the project site in a 48" RCP within a proposed easement. This pipe was sized based on a maximum flow of 66 cfs provided by the ditch company. The proposed pipe will connect to an off-site section of the ditch located near the southeast corner of the project (refer to Sheet DR01 for the pipe alignment).

Because the existing South Boulder Canyon Ditch will be realigned and conveyed in a pipe, the runoff from Basin 2 can no longer flow into it. Instead, this water will flow further north via grass swale and culvert (Design Point 2) to Basin 3.

Basin 3 (2.45 acres) consists of the east half of N. 107th Street (U.S. 287) along the west side of the project site. Runoff from Basins 1 and 2 will flow north via grass swale to a CDOT type D area inlet (Design Point 3). From there it will flow via RCP storm sewer to the CDOT Type R curb inlet at Design Point 4.

Basin 4 (1.71 acres) consists of the south half of Arapahoe Road along the north side of the project site. It starts at the west end of the site and ends approximately halfway along the project site frontage where the road crests. Runoff from Basin 4 will flow via proposed curb and gutter to the proposed Type R inlet on the south side of Arapahoe Road (Design Point 4). There is no curb and gutter in the existing condition. From there it will combine with runoff from Basins 1, 2 and 3 and flow northeast via the existing storm drain system to an existing detention pond northeast of Arapahoe Ridge (just west of the intersection of N. 111th Street and Dickens Street).

Basin 5 (0.53 acres) consists of the south half of Arapahoe Road along the north side of the project site. It starts at the east end of the site and ends approximately halfway along the project site frontage where the road crests. Runoff from Basin 5 will flow via proposed curb and gutter to the proposed Type R inlet on the south side of Arapahoe Road (Design Point 5). From there it will be conveyed to the proposed storm sewer bypass line and outfall into the existing grass-lined channel along N. 111th Street.

As part of this project Arapahoe Road will have curb and gutter installed along the south side of the road from N. 107th Street (U.S. 287) to N. 111th Street. The existing grate inlet at Design Point 4 will be converted into a CDOT Type R curb inlet that will utilize the existing pipe under Arapahoe Road. The inlet at Design Point 4 is tributary to SWMM sub-basin 205 as defined in the OSP report. The total tributary area to DP4 is ±11.9 acres. The Q_5 and Q_{100} flows at DP4 are ±10.1 cfs and ±45.5 cfs, respectively. The time of concentration for the peak flow from these basins to reach the outfall north of the Safeway site is approximately 32 minutes. Per the *Final Drainage Study for Arapahoe Ridge Filing*

No. 3 prepared by CLC Associates, Inc. and dated December 30, 1998, the time of concentration for the peak flow from the Safeway site and associated basins to reach the outfall is 8.77 minutes. Therefore when flows are routed and time of concentration is considered, the impact of the proposed additional flows on SWMM sub-basin 205 are negligible.

Basin 4 (0.53 acres) consists of the south half of Arapahoe Road along the north side of the project site. It starts approximately halfway along the project site frontage where the road crests and ends at the east end of the site. Runoff from Basin 4 will flow east within the proposed curb and gutter to an existing inlet at the northwest corner of Arapahoe Road and N. 111th Street (Design Point 4). There is no curb and gutter in the existing condition. From there it will flow into the existing grass-lined channel along N. 111th Street, as it ultimately does in the existing condition.

Commercial Site Basins

The proposed drainage plan for the commercial site consists of three major drainage basins (31.47 acres). The twenty-eight 100-series basins consist of the multi-tenant and Lowe's retail buildings, parking lots, drive aisles, outparcels, and a portion of the future south retail anchor site. This series drains to the east side of the proposed extended detention basin. The eight 200-series basins consist of the Lowe's building, future south retail anchor building, and rear drive aisles and loading areas. This series drains to the east side of the proposed extended detention basin. The two 300-series basins consist of drive aisles. This series drains to the proposed 36" pipe that connects the eastern and western portions of the proposed extended detention basin.

A detailed hydrologic analysis of the proposed sub-basins is included in Appendix B for reference. The sub-basin delineation of the commercial site can bee seen on Drainage Map DR02 (Appendix E). The storm sewer is designed to accommodate the developed south retail anchor site and outlot conditions. Inlets in settling basins are proposed on Lot 10 for the interim condition. These inlets are designed to accommodate runoff from Lot 10 based on a native seed land cover in the interim condition.

III. Drainage Design Criteria

Regulations

The proposed drainage design complies with the Town of Erie *Standards and Specifications, Section 800 – Storm Drainage Facilities* and the Urban Drainage and Flood Control District *Urban Storm Drainage Criteria Manual*.

Hydrology

The drainage calculations are based on the *Urban Storm Drainage Criteria Manual, Volume 1* and the Town of Erie *Standards and Specifications, Section 800 – Storm Drainage Facilities*. The design point rainfall values listed below were utilized in design calculations. These values were obtained from Section 813.03 of the Town of Erie *Standards and Specifications, Section 800 – Storm Drainage Facilities*.

	Average Recurrence Interval (years)						
Duration	**2**	**5**	**10**	**25**	**50**	**100**	**500**
60-min	0.81	1.11	1.39	1.84	2.24	2.68	3.89

The time of concentration for each basin was calculated using the SF-2 form, which is based on the *Urban Storm Drainage Criteria Manual, Chapter 6* (refer to Appendix B).

The rational method was used to calculate peak flows as the tributary areas are less than 100 acres. The rational method has proven to be accurate for basins of this size and is based on the following formula:

$$Q = CIA$$

Where:

Q = Peak Discharge (cfs)
C = Runoff Coefficient that is the ratio between the runoff volume from an area and the average rate of rainfall depth over a given duration for that area
I = Runoff Intensity (inches/hour) for a duration equal to the time of concentration
A = Drainage Area (acres)

The runoff coefficients are calculated based on the catchment's soil type, land use, percent imperviousness, and design storm for each basin per Chapter 6, Section 2.5.1 of the UDFCD *Urban Storm Drainage Criteria manual, Volume 1*. Appendix B contains runoff coefficient calculations for all sub-basins. The 5-year runoff coefficient was used for the minor storm event and the 100-year runoff coefficient was used for the major storm event.

Hydraulics

Offsite storm sewer pipe sizes will typically range from 18-inch to 48-inch RCP. A detailed analysis of the off-site storm drainage infrastructure was completed using EPA SWMM Release 5.1.010, Bentley StormCAD v8i, Bentley Flowmaster, and various Urban Drainage and Flood Control District spreadsheets including UD-Detention v3.07 and UD-Inlet v4.05 (refer to Appendix C for hydraulic calculations). The UDFCD *Urban Storm Drainage Criteria Manual, Chapters 8 and 9* was used to size riprap aprons at the off-site storm outfall and the South Boulder Canyon Ditch outfall (refer to Appendix C).

The storm system layout for the offsite settling pond outlet, the on-site commercial detention pond outlet, and associated piping and structures are shown on the Drainage Plan DR01. The area inlet that will be replaced with a curb inlet along the south side of Arapahoe Road and the relocated South Boulder Canyon Ditch 48" RCP are also shown on the Drainage Plan DR01.

On-site storm sewer pipe sizes will typically range from 10-inch PVC roof drains to 54-inch RCP. A detailed analysis of the on-site storm drainage infrastructure was completed using Bentley StormCAD v8i and UD-Inlet v4.05 (refer to Appendix C for hydraulic calculations).

The storm system layout for the on-site storm sewer system, commercial detention pond and appurtenances, and associated structures are shown on the Drainage Plan DR02.

The proposed Nine Mile Corner on-site detention facilities will conform to sections 814.01 General and 814.08 Release Rates.

The aggregate release from the on-site commercial and multi-family areas will be commensurate with the peak discharges described by Olsson for the design of Reach BP20. The aggregate release from the off-site area (i.e. SWMM sub-basin 200) will be reduced to ±28.2 cfs by the capacity of the existing 24" RCP underneath N. 107th Street (U.S. 287). This equates to ±0.29 cfs/acre, which slightly exceeds the allowable 10-year release rate.

Reach BP20 | 111th Street Channel

The existing grass-lined channel along N. 111th Street has been analyzed and provides capacity for conveyance of the flows from the Nine Mile Corner improvements. The existing channel conveys approximately 44 cfs with 6 inches of freeboard and 94 cfs with no freeboard at 1.5 feet and 2.0 feet of depth, respectively. Flowmaster calculations have been provided showing the channel flows for the 100-year runoff from Nine Mile Corner plus the existing runoff from the parcel west of Highway 287 and for the 100-year runoff from Nine Mile Corner plus the future development west of Highway 287.

The existing runoff to the channel from other regional basins is currently unknown. Per anecdotal information from the Town of Erie the channel does not currently flood near the intersection of N. 111th Street and Arapahoe Road. The Nine Mile Corner subdivision is reducing runoff to the channel from what was originally anticipated in the Olsson study, therefore no negative impacts to the existing channel are anticipated.

The Town of Erie pursued making the recommended improvements, but due to lack of support from Boulder County, the project was closed, and no improvements were made. No downstream improvements are anticipated at this time for the existing channel.

Water Quality Enhancement

Stormwater quality will be provided by the proposed full-spectrum extended detention basin. The Full Spectrum Detention method is designed to best replicate pre-development peak flows for a broad range of storm intensities and durations. Water quality capture volume is calculated per UDFCD Volume 3, Chapter 3, Section 3.0, Equation 3-1 as a function of imperviousness and BMP drain time.

IV. Drainage Facility Design

On-Site Stormwater Conveyance and Storage Facilities

Stormwater runoff will be conveyed onsite through a series of concrete drain pans, curb and gutter, inlets, and storm sewer pipe. The commercial and multi-family areas will drain to separate extended detention basins. These facilities will outlet to the storm drain outfall that discharges into the channel along the west side of 111th Street. Both the commercial and multi-family extended detention basins are designed to release at or below historic rates and as a result the Nine Mile Corner development will not adversely impact the existing condition of the channel.

The proposed extended detention basin associated with the commercial development and all associated pipes and drainage structures will be within a dedicated storm drainage easement. The proposed extended detention basin was sized using UD-Detention, Version 3.07 (February 2017, UDFCD). Sheets DR01 and DR02 illustrate proposed locations for the facility.

The tributary area drainage to the proposed extended detention basin associated with the commercial development is ±31.47 acres. The overall percent imperviousness for the commercial development was calculated to be 75.5%. All stormwater will outlet from the extended detention basins at a maximum rate of 0.85 cfs per acre per Town of Erie criteria, resulting in a release rate of 26.55 cfs. The extended detention basin will utilize a standard concrete outlet structure with a water quality orifice plate and restrictor plate to regulate the release. A maintenance access will be constructed into each area of the pond to facilitate

routine maintenance procedures. Full Spectrum Detention sizing, outlet structure, and restrictor plate calculations for the commercial site are presented in the UD-Detention spreadsheet (refer to Appendix C).

Offsite Stormwater Conveyance Facilities

The project site is impacted by offsite flows from SWMM sub-basin 200 (200) and the southwest region of SWMM sub-basin 201 (201). 200 is located along the west side of N. 107th Street (U.S. 287). According to the OSP report this largely undeveloped basin is ±98 acres and generally drains to the northeast. Per the SWMM schematic, runoff from the Nine Mile Corner project combines with runoff from 200 at Design Point 300. The existing excess runoff in 200 likely flows into the South Boulder Canyon Ditch; however, per Section 812.02 of the Town of Erie *Standards and Specifications, Section 800 – Storm Drainage Facilities*, "Irrigation ditches cannot be used as an outfall point for the storm drainage system because of physical limitations". The Nine Mile Corner project is required to convey the outflow from the future detention pond in 200 to the existing grass-lined channel along the west side of 111th Street (i.e. SWMM conveyance element 303).

The future detention pond in 200 has an estimated release rate of ±83.3 cfs (98 acres * 0.85 cfs/acre). We propose using the existing settling basin at the southwest corner of N. 107th Street (U.S. 287) and Arapahoe Road to attenuate outflow from the future detention pond and release it at the capacity available in the existing 24" RCP that runs under N. 107th Street (U.S. 287) to the Nine Mile Corner site. The Town of Erie owns the land containing the settling pond, which is located in the northeast corner of SWMM sub-basin 200. The Town of Erie has given permission to use this settling pond for detention storage.

There is a Town-identified wetland in the bottom of the settling pond. A small amount of grading will be required by the future developer to fill a gap in the berm at the northwest corner of the settling pond to provide the required volume without allowing any overtopping flow into the intersection of N. 107th Street (U.S. 287) and Arapahoe Road. This grading will not disturb the area of the settling pond identified as wetlands. Pipe capacity calculations for the existing 24" RCP are presented in Appendix C of this report. The detention calculations for the settling pond are presented in Appendix C of this report. This work will need to be verified and performed by the future developer at the time of development of the southwest corner of State Highway 287 and Arapahoe Road.

Water Quality Enhancement Best Management Practices

Water quality for the site will be provided by the proposed extended detention basin, which is designed to accommodate all improvements for the commercial development except for the minor runoff that free releases to Arapahoe Road due to grade constraints. A water quality orifice plate and trash rack will be installed on the pond outlet structure to ensure the WQCV is provided with a 40-hour minimum drain time. Detailed orifice sizing calculations are included in the UD-Detention spreadsheet (refer to Appendix C).

V. Conclusions

Compliance with Standards

This Phase III Drainage Report is in compliance with applicable standards including the Town of Erie *Standards and Specifications, Section 800 – Storm Drainage Facilities* and the Urban Drainage and Flood Control District *Urban Storm Drainage Criteria Manual*. This design provides for a maximum on-site release of 0.85 cfs per acre. It also provides stormwater quality management and protection of the downstream drainage system during the 100-year storm event.

VI. References

1. Urban Storm Drainage Criteria Manual – Volumes 1, 2, & 3, Urban Drainage and Flood Control District, August 2018 (with current revisions).

2. Standards and Specifications, Section 800 – Storm Drainage Facilities, Town of Erie, July 2019.

3. Federal Emergency management Agency Flood Insurance Rate Map, Community-Panel No. 08117C0239F, effective November 16, 2018.

4. Soil Map – Summit County Area, Colorado as available through the Natural Resources Conservation Service National Cooperative Soil Survey web site via Web Soil Survey 2.0.

5. Outlook at Nine Mile: Wetland Delineation and Cultural Resource Report, IRIS Mitigation and Design, November 2016.
6. Preliminary Engineering Investigation for Nine Mile Corner – Commercial Area, CTL Thompson, Inc., February 24, 2017.

7. Town of Erie Outfall Systems Plan (West of Coal Creek), RESPEC Consulting & Services, January 2014.

8. Erie Outfall Systems Planning Preliminary Design – Town of Erie and Weld County, Love & Associates, Inc., December 2007.

9. Erie Outfall Systems Planning Preliminary Design – Erie and Adjacent Boulder and Weld County Areas, Love & Associates, Inc., May 2001.

10. Erie Reach BP 20 Preliminary Design, Olsson Associates, February 2006.

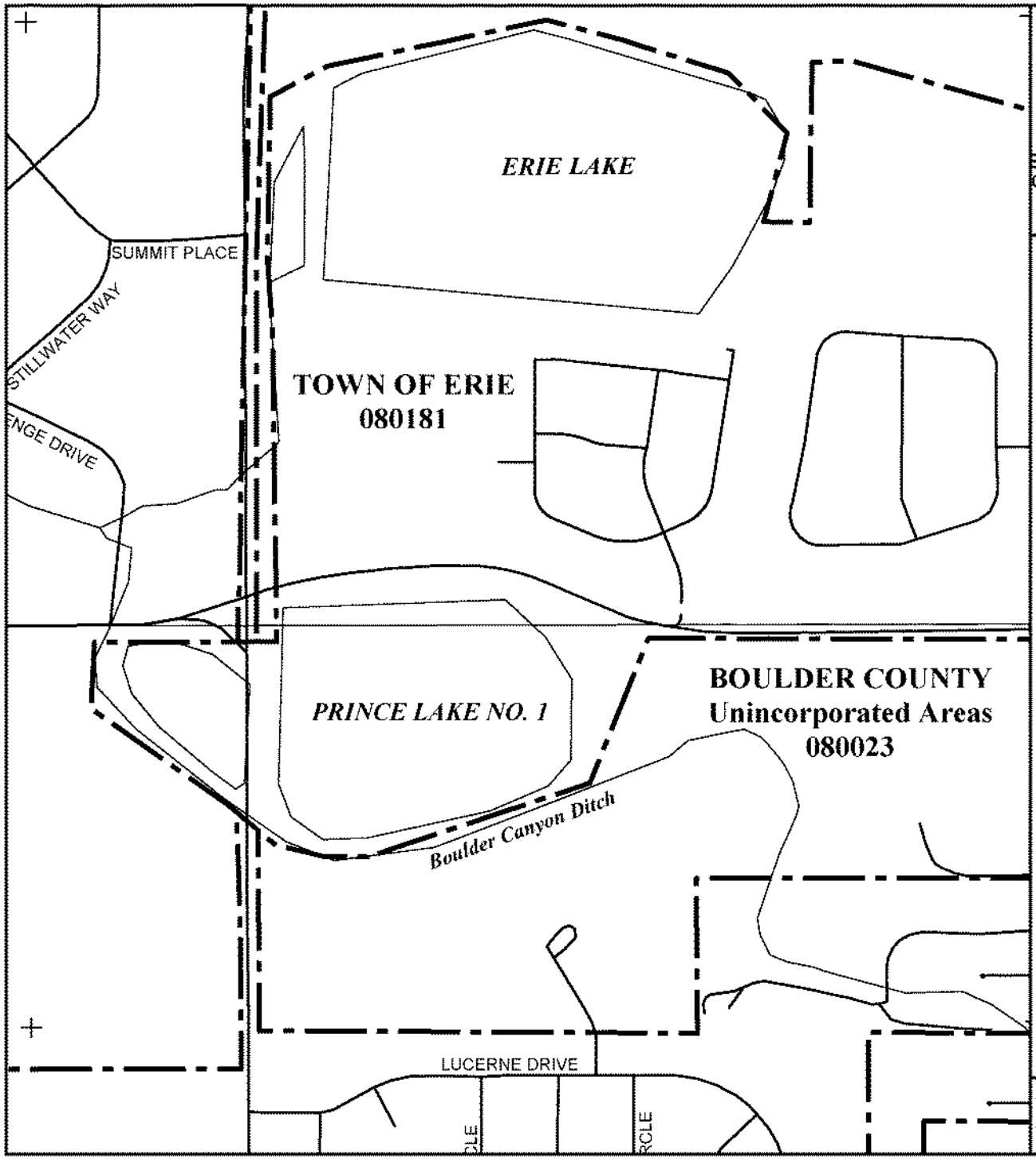
11. Final Drainage Study for Arapahoe Ridge Filing No. 3, CLC Associates, Inc., December 30, 1998.

Appendix A – Reference Material

Vicinity Map
FEMA FIRMette Map
NRCS Soils Data
ALTA/NSPS Land Title Survey

Vicinity Map | Erie - Nine Mile Corner

Not to Scale



MAP SCALE 1" = 500'

250 0 500 1000 FEET

0 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0438J

FIRM

FLOOD INSURANCE RATE MAP

BOULDER COUNTY, COLORADO

AND INCORPORATED AREAS

PANEL 438 OF 615

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BOULDER COUNTY	080023	0438	J
ERIE, TOWN OF	080181	0438	J
LAFAYETTE, CITY OF	080026	0438	J

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

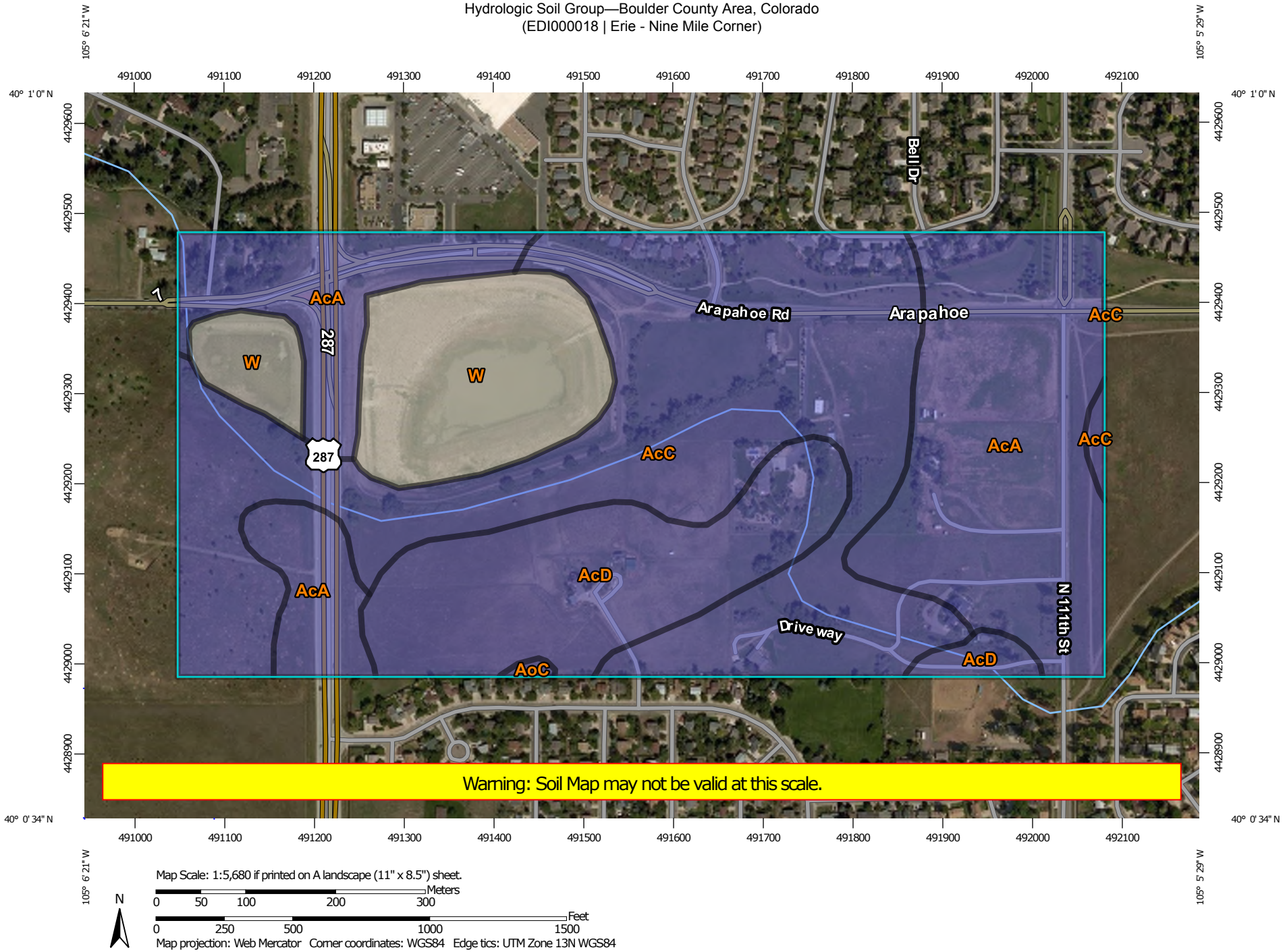
MAP NUMBER
08013C0438J

MAP REVISED
DECEMBER 18, 2012

Federal Emergency Management Agency

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

Hydrologic Soil Group—Boulder County Area, Colorado
(EDI000018 | Erie - Nine Mile Corner)



Map Scale: 1:5,680 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

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 Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 1:20,000.

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

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

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

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

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

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

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

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

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

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Boulder County Area, Colorado (CO643)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
AcA	Ascalon sandy loam, 0 to 3 percent slopes	B	39.4	31.2%
AcC	Ascalon sandy loam, 3 to 5 percent slopes	B	50.3	39.7%
AcD	Ascalon sandy loam, 5 to 9 percent slopes	B	19.8	15.6%
AoC	Ascalon-Otero complex, 3 to 5 percent slopes	B	0.2	0.2%
W	Water		16.8	13.3%
Totals for Area of Interest			**126.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

ALTA/NSPS LAND TITLE SURVEY

PORTION OF THE NORTHEAST QUARTER OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST AND THE SOUTHEAST QUARTER OF SECTION 27, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN,
TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO.

VICINITY MAP

GENERAL NOTES

1) ACCESS TO THE PROPERTY IS OBTAINED DIRECTLY VIA ARAPAHOE ROAD AND HWY 287.

2) FIELD WORK WAS COMPLETED ON: MAY 1, 2016.

3) BASIS OF BEARING: BEARINGS ARE BASED ON THE NORTH LINE OF THE NORTHEAST QUARTER OF SECTION 34 AND MONUMENTED ON THE WEST BY A 2.5" ALUMINUM CAP STAMPED "PLS29752" IN A RANGE BOX FOR THE N 1/4 CORNER AND MONUMENTED ON THE EAST BY A 2.5" ALUMINUM CAP STAMPED "PLS12405" FOR THE NE CORNER AND ASSUMED TO BEAR S 89°58'01" E.

4) UTILITY NOTE: THE LOCATION OF UTILITIES SHOWN HEREON WAS ESTABLISHED FROM SURFACE EVIDENCE, EXISTING UTILITY MARKERS AND UTILITY LOCATES FROM A UTILITY CONTRACTOR. THE EXACT LOCATION OF BURIED UTILITIES IS UNCERTAIN. PRIOR TO ANY EXCAVATION THE CONTRACTOR SHOULD CONTACT THE UTILITY NOTIFICATION CENTER. THE SURVEYOR MAKES NO GUARANTEE EITHER EXPRESSED OR IMPLIED THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION DEPICTED ALTHOUGH THE UTILITIES ARE LOCATED AS ACCURATELY AS POSSIBLE FROM THE INFORMATION AVAILABLE AT THE TIME OF THE SURVEY. THIS SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

5) THIS MAP OR PLAT WAS PREPARED FOR THE EXCLUSIVE USE OF THE PERSON, PERSONS OR ENTITY NAMED IN THE SURVEYOR'S STATEMENT HEREON. SAID STATEMENT DOES NOT EXTEND TO ANY UNNAMED PERSON WITHOUT AN EXPRESS RE-STATEMENT BY THE SURVEYOR.

6) PER THE FEMA FLOOD INSURANCE RATE MAPS (FIRM), MAP NO. 08013C0438J, HAVING AN MAP REVISED DATE OF DECEMBER 18, 2015, INDICATES THE SUBJECT PROPERTY TO BE DESIGNATED AS ZONE X OUTSIDE 0.2% CHANCE OF FLOOD . THIS SURVEY MAKES THIS STATEMENT BY GRAPHIC PLOTTING ONLY. THE SURVEYOR RECOMMENDS A FLOOD STUDY IF MORE INFORMATION IS REQUIRED.

7) ALL LINEAL MEASUREMENTS SHOWN ARE GROUND DISTANCES AND U.S. SURVEY FEET.

8) EASEMENTS AND PUBLIC DOCUMENTS SHOWN OR NOTED ON THIS SURVEY WERE EXAMINED AS TO LOCATION AND PURPOSE AND WERE NOT EXAMINED AS TO RESTRICTIONS, EXCLUSIONS, CONDITIONS, OBLIGATIONS, TERMS OR AS THE RIGHT TO GRANT THE SAME.

9) CAUTION: THE SURVEYOR PREPARING THIS MAP WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THIS MAP. ALL CHANGES TO THIS EXHIBIT MUST BE APPROVED IN WRITING BY THE SURVEYOR IN CHARGE.

10) ELEVATIONS SHOWN ARE NAVD 88 AND ARE DERIVED VIA GPS OBSERVATIONS FROM THE LIECA SMARTNET RTK GPS NETWORK AND GEOID 12B.

11) ALL HOUSES WITHIN THE SUBJECT PROPERTIES SHOWN HAVE BEEN VACATED AND PRINCE LAKE NO.1 HAS BEEN DRAINED

12) THERE WAS OBSERVABLE EVIDENCE OF CURRENT EARTH MOVING WORK, BUILDING CONSTRUCTION OR BUILDING ADDITIONS AT THE TIME OF SURVEY. PRINCE LAKE NO.1 HAS HAD RECENT FILL DIRT BROUGHT IN AND THE BOTTOM OF THE LAKE RAISED BY THE TOWN OF ERIE PUBLIC WORKS DEPARTMENT.

13) NO PROPOSED CHANGES IN STREET RIGHT OF WAY LINES WERE DISCOVERED AT THE TIME OF SURVEY. HOWEVER, IT IS ANTICIPATED THAT ROW CHANGES WILL OCCUR ALONG ARAPAHOE ROAD FOR FUTURE DEVELOPMENTS.

14) THERE WAS NO OBSERVABLE EVIDENCE OF THE SITE USED AS A SOLID WASTE DUMP, SUMP OR SANITARY LANDFILL AT THE TIME OF SURVEY.

15) UNDERGROUND UTILITIES WERE MARKED AND LOCATED WITHIN THE ADJACENT RIGHT OF WAY OF ARAPAHOE ROAD AND NORTH 117TH STREET. PRIVATE UNDERGROUND UTILITIES MAY EXIST WITHIN THE BOUNDARIES OF THE PRIVATE LANDS AND WERE NOT MARKED. WITHIN THE PRIVATE LANDS, ONLY ABOVE GROUND VISIBLE UTILITIES WERE FIELD LOCATED AND SHOWN HEREON.

16) NOTICE: ACCORDING TO COLORADO LAW YOU MUST COMMENCE ANY LEGAL ACTION BASED UPON ANY DEFECT IN THIS SURVEY WITHIN THREE YEARS AFTER YOU FIRST DISCOVER SUCH DEFECT. IN NO EVENT MAY ANY ACTION BASED UPON ANY DEFECT IN THIS SURVEY BE COMMENCE MORE THAN TEN YEARS FROM THE DATE OF THE CERTIFICATION SHOWN HEREON. C.R.S. 13-80-105(3)(A).

17) ALL FENCES SHOWN ARE BARBED WIRE FENCES EXCEPT AS NOTED.

18) THIS SURVEY DISCOVERED POTENTIAL DISCREPANCIES REGARDING THE RIGHT OF WAY WIDTH AND LOCATION OF ARAPAHOE ROAD BASED ON ACTUAL CONSTRUCTION OF THE ROAD. THE RIGHT OF WAY WIDTH AND LOCATION SHOWN ON THIS SURVEY IS THE BEST CONCLUSION BY THE SURVEYOR BASED ON THE INFORMATION POSSESSED BY THE SURVEYOR AT THE TIME OF SURVEY.

19) THIS SURVEY IS COMPRISED OF MULTIPLE PARCELS/TRACTS. THE PARCELS/TRACTS ARE CONTIGUOUS WITH NO HIATUSES OR OVERLAPS.

20) THE UNDERGROUND WATER LINES WERE NOT ABLE TO BE LOCATED BY LOCATE SPECIALIST. IT IS BELIEVED THE WATER LINES ARE CONCRETE WITHOUT TRACER WIRES.

TITLE COMMITMENT/REPORT INFORMATION

THIS MAP DOES NOT REPRESENT A TITLE SEARCH BY GALLOWAY & COMPANY, INC. TO DETERMINE OWNERSHIP OR THIS TRACT, VERIFY THE SECRIPTION SHOWN, VERIFY THE COMPATIBILITY OF THIS DESCRIPTION WITH THAT OF ADJACENT TRACTS OR VERIFY EASEMENTS OF RECORD. FOR ALL INFORMATION REGARDING EASEMENTS, RIGHT OF WAY OR TITLE THEREOF, GALLOWAY & COMPANY INC. RELIED UPON THE INFORMATION OR TITLE COMMITMENT/REPORT PROVIDED AT THE TIME OF SURVEY BY THE CLIENT.
TITLE INFORMATION IS BASED ON TITLE COMMITMENT/REPORT BY LAND TITLE GUARANTEE COMPANY, AND OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY AT FILE NO.: ABZ70471321-11 WITH AN EFFECTIVE DATE OF JANUARY 15, 2019, AT 5:00 P.M.

ONLY THOSE ITEMS LISTED IN THE SCHEDULE B-2 EXCEPTIONS ARE ADDRESS

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. (A PORTION OF THE PAVING FOR ARAPAHOE ROAD CROSSES THE NORTHERLY PROPERTY LINE).

2. EASEMENTS, LIENS OR ENCUMBRANCE, OR CLAIMS THEREOF, NOT SHOWN BY THE PUBLIC RECORDS. (EASEMENTS AND ENCUMBRANCES ARE SHOWN ON THE SURVEY THAT ARE KLNOWN BY THE SURVEYOR AT THE TIME OF SURVEY)

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. (ENCROACHMENTS, ENCUMBRANCES AND ADVERSE CIRCUMSTANCES ARE SHOWN ON THE SURVEY IF OBSERVED BY THE SURVEYOR. VIOLATIONS AND VARIATIONS ARE NOT SURVEY RELATED AND ARE NOT ADDRESSED HEREON).

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. (NOT SURVEY RELATED).

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. (NO DEFECTS ARE KNOWN BY THE SURVEYOR AT THE TIME OF SURVEY, LIENS ARE NOT SURVEY RELATED, ENCUMBRANCES ARE SHOWN ON THE SURVEY, ADVERSE CLAIMS ARE SHOWN, OTHER MATTERS ARE BEYOND THE SCOPE OF THIS SURVEY).

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 PUBLICS 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. (NOT SURVEY RELATED)

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. (NOT SURVEY RELATED)

8. ALL COAL THAT MAY BE UNDERNEATH THE SURFACE OF THE LAND HEREIN DESCRIBED, ALSO SUCH RIGHT OF WAY AND OTHER GROUNDS AS MAY BE NECESSARY FOR THE PROPER WORKING OF ANY COAL MINES THAT MAY BE DEVELOPED UPON SAID PREMISES AND FOR THE TRANSPORTATION OF THE COAL FROM THE SAME, AS RESERVED UNTO THE UNION PACIFIC RAILWAY COMPANY IN THE DEED RECORDED JUNE 11, 1891 IN BOOK 138 AT PAGE 469, AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN. (AFFECTS PARCEL C (III)) (AFFECTS AND IS BLANKET IN NATURE)

9. (ITEM INTENTIONALLY DELETED)

10. ALL COAL THAT MAY BE UNDERNEATH THE SURFACE OF THE LAND, AND THE EXCLUSIVE RIGHT TO PROSPECT, SINK SHAFT OR SHAFTS AND MINE FOR THE SAME; ALSO RESERVING SUCH RIGHT OF WAY AND OTHER GROUNDS AS MAY BE NECESSARY FOR THE PROPER WORKING OF ANY COAL MINE THAT MAY BE DEVELOPED UPON SAID PREMISES AND FOR THE TRANSPORTATION OF COAL FROM THE SAME, AS RESERVED UNTO THE COLORADO MORTGAGE AND INVESTMENT CO., LTD., A CORPORATION ORGANIZED AND EXISTING UNDER THE LAWS OF GREAT BRITAIN AND IRELAND; ANDREW WHITTON; JAMES GUTHRIE; AND ALEXANDER GOURLAY IN THE DEED RECORDED OCTOBER 18, 1901 IN BOOK 249 AT PAGE 209, AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN.
NOTE: MINERAL DEED RECORDED FEBRUARY 27, 1907 IN BOOK 296 AT PAGE 299.
NOTE: MINERAL DEED RECORDED SEPTEMBER 11,1929 IN BOOK 568 AT PAGE 360.
(AFFECTS PARCELS A AND B) (AFFECTS AND IS BLANKET IN NATURE)

11. ALL COAL OR OTHER MINERALS THAT MAY BE UNDERNEATH THE SURFACE OF THE LAND; AND THE EXCLUSIVE RIGHT TO PROSPECT, SING SHAFT OR SHAFTS, AND MINE FOR THE SAME, AS RESERVED UNTO THE COLORADO MORTGAGE & INVESTMENT COMPANY, LIMITED, A CORPORATION ORGANIZED AND EXISTING UNDER THE LAWS OF GREAT BRITAIN AND IRELAND; ANDREW WHITTON, JAMES GUTHRIE; AND ALEXANDER GOURLEY IN THE DEED RECORDED JANUARY 21, 1904 IN BOOK 251 AT PAGE 460, AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN.
(AFFECTS PARCELS B AND C (I)) (AFFECTS AND IS BLANKET IN NATURE)

12. AN UNDIVIDED ONE-HALF INTEREST IN THE COAL AND OTHER MINERALS LYING UNDERNEATH THE SURFACE OF THE LAND AS CONVEYED TO GEORGE MURRAY, EDWARD E. HOLMES AND ALFRED N. GOSSETT BY THE DEED RECORDED FEBRUARY 27, 1907 IN BOOK 296 AT PAGE 299.
(AFFECTS PARCELS A, B AND C (III)) (AFFECTS AND IS BLANKET IN NATURE)

13. ALL COAL AND OTHER MINERALS UNDERNEATH THE SURFACE OF THE LAND, AND THE EXCLUSIVE RIGHT TO PROSPECT, SINK OR SHAFTS, AND MINE FOR THE SAME; ALSO RESERVING SUCH RIGHT OF WAY AND OTHER GROUNDS AS MAY BE NECESSARY FOR THE PROPER WORKING OF ANY COAL OR OTHER MINE OR MINES THAT MAY BE DEVELOPED UPON SAID PREMISES AND FOR THE TRANSPORTATION OF THE PRODUCTS THEREFROM, AND FOR SUCH SURFACE AREA SO REQUIRED, AS RESERVED UNTO THE COLORADO MORTGAGE AND INVESTMENT COMPANY, LIMITED, AND CORPORATION ORGANIZED AND EXISTING UNDER THE LAWS OF GREAT BRITAIN AND IRELAND; ANDREW WHITTON; JAMES GUTHRIE; AND ALEXANDEAR GOURLAY IN THE DEED RECORDED JANUARY 15, 1910 IN BOOK 340 AT PAGE 259, AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN.
(AFFECTS A, B AND C (II)) (AFFECTS AND IS BLANKET IN NATURE)

14. AN UNDIVIDED 2 1/2% INTEREST IN A ND TO ALL THE OIL AND GAS IN AND UNDER AND THAT MAY BE PRODUCED FROM THE LAND, AS CONVEYED TO ROY R. CARPENTER BY THE DEED RECORDED JULY 22, 1924 IN BOOK 511 AT PAGE 168. AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN.
(AFFECTS ALL PARCELS) (AFFECTS AND IS BLANKET IN NATURE)

15. (ITEM INTENTIONALLY DELETED)

16. ANY RIGHTS OR INTERESTS OF THIRD PARTIES WHICH EXIST OR ARE CLAIMED TO EXIST IN AND OVER THE PRESENT AND PAST BED, BANKS OR WATERS OF SOUTH BOULDER CANYON DITCH, SAID DITCH BEING REFERRED TO IN THE LEGAL DESCRIPTION CONTAINED IN DEED RECORDED APRIL 29, 1968 UNDER RECEPTION NO. 877395 AND DEED RECORDED MAY 21, 1969 UNDER RECEPTION NO. 913694.
(AFFECTS PARCELS A, AND C (II)) (AFFECTS AND IS BLANKET IN NATURE)

17. ANY CHANGES IN AREA DUE TO THE RELOCATION OR MOVEMENT OF SOUTH BOULDER CANYON DITCH, SAID DITCH BEING DESCRIBED IN THE LEGAL DESCRIPTION CONTAINED IN DEED RECORDED APRIL 29, 1968 UNDER RECEPTION NO. 877395 AND DEED RECORDED MAY 21, 1969 UNDER RECEPTION NO. 913694.
(AFFECTS PARCEL A AND C (II)) (MAY AFFECT AND IS SHOWN ON SURVEY)

18. AN EASEMENT FOR ROADWAY AND FOR THE MAINTENANCE AND REPAIR OF RESERVOIR, AS RESERVED UNTO THE TOWN OF ERIE IN THE DEED RECORDED APRIL 29, 1968 UNDER RECEPTION NO. 877396. NOTE: THE ABOVE EXCEPTION WILL BE DELETED UPON RECORDATION OF A RELEASE OR TERMINATION AS SET FORTH IN THE REQUIREMENT #6 HEREIN.
(AFFECTS PARCEL B) (AFFECTS AND IS PLOTTED HEREON)

19. EASEMENT GRANTED TO PUBLIC SERVICE COMPANY OF COLORADO, FOR NATURAL GAS FACILITIES, AND INCIDENTAL PURPOSES, BY INSTRUMENT RECORDED AUGUST 04, 1981, UNDER RECEPTION NO. 457820.
(AFFECTS PARCEL A) (AFFECTS AND IS PLOTTED HEREON)

20. (ITEM INTENTIONALLY DELETED)

21. (ITEM INTENTIONALLY DELETED)

22. RIGHT OF WAY EASEMENT FOR PIPELINE, AND INCIDENTAL PURPOSES, AS GRANTED TO CDM PIPELINE COMPANY, INC., A COLORADO CORPORATION IN INSTRUMENT RECORDED JULY 16, 1984 UNDER RECEPTION NO. 634026, AND CORRECTION AND AMENDMENT OF PIPELINE RIGHT-OF-WAY GRANT RECORDED OCTOBER 15, 1984 UNDER RECEPTION NO. 652036. (AFFECTS AND IS BLANKET IN NATURE) PIPELINE SURVEY MAP RECORDED SEPTEMBER 28, 1984 UNDER RECEPTION NO. 649253. (AFFECTS PARCEL A) (AFFECTS AND IS PLOTTED HEREON)

23. (ITEM INTENTIONALLY DELETED)

24. ANY TAX, LIEN, FEE, OR ASSESSMENT BY REASON OF INCLUSION OF SUBJECT PROPERTY IN THE LONGMONT FIRE PROTECTION DISTRICT, AS EVIDENCED BY INSTRUMENT RECORDED APRIL 29, 1985, UNDER RECEPTION NO. 685397 AND MODIFIED ORDER OF INCLUSION RECOREDED SEPTEMBER 3, 1985 UNDER RECEPTION NO. 710155.
(AFFECTS ALL PARCELS) (AFFECTS AND IS BLANKET IN NATURE)

25. (ITEM INTENTIONALLY DELETED)

26. OIL AND GAS LEASE BETWEEN ROY N. AUSTIN, LESSOR, AND O.D. PRESLEY, LESSEE, RECORDED MAY 06, 1985 UNDER RECEPTION NO. 686626, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN. NOTE: AFFIDAVIT OF PRODUCTION RECORDED JULY 30, 1985 UNDER RECEPTION NO. 702639. REVISED AFFIDAVIT OF PRODUCTION RECORDED APRIL 21, 1986 UNDER RECEPTION NO. 754068 AND RECORDED JUNE 12, 1986 UNDER RECEPTION NO. 766082.
(AFFECTS ALL PARCELS) (AFFECTS AND IS BLANKET IN NATURE)

27. OIL AND GAS LEASE BETWEEN JANE KUEHNER, MARY F. DEHAAN, MICHAEL R. SHELTON, MARK L. SHELTON, BRUCE D. CARPENTER, JEAN K. CARPENTER, GLENN C. CARPENTER AND SARAH A. CARPENTER, LESSORS, AND O.D. PRESLEY, LESSEE, RECORDED AUGUST 06, 1985 UNDER RECEPTION NO. 703693, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN. NOTE: REVISED AFFIDAVIT OF PRODUCTION RECORDED APRIL 21, 1986 UNDER RECEPTION NO. 754068 AND RECORDED JUNE 12, 1986 UNDER RECEPTION NO. 766082. NOTE: RATIFICATION OF OIL AND GAS LEASE RECORDED JUNE 12, 1986 UNDER RECEPTION NOS. 766084, 766085, AND 766086.
(AFFECTS ALL PARCELS) (AFFECTS AND IS BLANKET IN NATURE)

28. OIL AND GAS LEASE BETWEEN CLAUDE JONES AND ALINE JONES, LESSORS, AND O.D. PRESLEY, LESSEE, RECORDED AUGUST 06, 1985 UNDER RECEPTION NO. 703694, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN. NOTE: REVISED AFFIDAVIT OF PRODUCTION RECORDED APRIL 21, 1986 UNDER RECEPTION NO. 754068 AND RECORDED JUNE 12, 1986 UNDER RECEPTION NO. 766082.
(AFFECTS ALL PARCELS) (AFFECTS AND IS BLANKET IN NATURE)

29. (ITEM INTENTIONALLY DELETED)

30. OIL AND GAS LEASE BETWEEN WINNIFRED H. EWALT, LESSOR, AND O.D. PRESLEY, LESSEE, TECORDED OCTOBER 08, 1985 UNDER RECEPTION NO. 717948, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN. NOTE: REVISED AFFIDAVIT OF PRODUCTION RECORDED APRIL 21, 1986 UNDER RECEPTION NO. 754068 AND RECORDED JUNE 12, 1986 UNDER RECEPTION NO. 766082. NOTE: RATIFICATION OF OIL AND GAS LEASE RECORDED JUNE 12, 1986 UNDER RECEPTION NO. 766083.
(AFFECTS ALL PARCELS) (AFFECTS AND IS BLANKET IN NATURE)

31. OIL AND GAS LEASE BETWEEN JAY P. WALKER, LESSOR, AND O.D. PRESLEY, LESSEE, RECORDED JULY 09, 1986 UNDER RECEPTION NO. 772253, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.
(AFFECTS ALL PARCELS) (AFFECTS AND IS BLANKET IN NATURE)

32. MINERAL DEED RECORDED MARCH 5, 1992 UNDER RECEPTION NO. 1165768.
(AFFECTS SE 1/4 OF SECTION 27 AND THE N 1/2 OF THE NE 1/4 OF SECTION 34) (AFFECTS AND IS BLANKET IN NATURE)

33. OIL AND GAS LEASE BETWEEN PAUL K. LASNIK, LESSOR, AND MARTIN EXPLORATION MANAGEMENT COMPANY, LESSEE, RECORDED MARCH 17, 1992 UNDER RECEPTION NO. 1168168, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.
(AFFECTS ALL PARCELS) (AFFECTS AND IS BLANKET IN NATURE)

34. OIL AND GAS LEASE BETWEEN HELEN M. MASTRIONA AND FRANK M. MASTRIONA, LESSORS, AND MARTIN EXPLORATION MANAGEMENT COMPANY, LESSEE, RECORDED MARCH 24, 1922 UNDER RECEPTION NO. 1169721, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.
(AFFECTS ALL PARCELS) (AFFECTS AND IS BLANKET IN NATURE)

35. OIL AND GAS LEASE BETWEEN DOROTHY J. BLACKBURN AND JOSEPH BLACKBURN, LESSORS, AND MARTIN EXPLORATION MANAGEMENT COMPANY, LESSEE, RECORDED MARCH 24, 1992 UNDER RECEPTION NO. 1169722, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.
(AFFECTS ALL PARCELS) (AFFECTS AND IS BLANKET IN NATURE)

36. OIL AND GAS LEASE BETWEEN DOLORES T. FORBIS AND DERL D. FORBIS, LESSORS, AND MARTIN EXPLORATION MANAGEMENT COMPANY, LESSEE, RECORDED MARCH 30, 1992 UNDER RECEPTION NO. 1171195, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.
(AFFECTS ALL PARCELS) (AFFECTS AND IS BLANKET IN NATURE)

37. OIL AND GAS LEASE BETWEEN MARTIN EXPLORATION MANAGEMENT COMPANY, LESSOR, AND BASIN EXPLORATION INCORPORATED, LESSEE, RECORDED NOVEMBER 08,1993 UNDER RECEPTION NO. 1358710, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN. NOTE: NOTICE OF OIL AND GAS INTERESTS AND SURFACE USE IN CONNECTION WITH THE ABOVE LEASE RECORDED JANUARY 23, 2001 UNDER RECEPTION NO. 2112332.
(AFFECTS ALL PARCELS) (AFFECTS AND IS PLOTTED HEREON)

38. RESOLUTION #94-25, PERTAINING TO ANNEXATION, RECORDED NOVEMBER 9, 1994 UNDER RECEPTION NO. 1477392 AND MAP IN CONNECTION THEREWITH RECORDED NOVEMBER 9, 1994 UNDER RECEPTION NO. 1477393.
(AFFECTS PARCEL C (I, II, III) AND A PORTION OF PARCEL B) (AFFECTS AND IS BLANKET IN NATURE)

39. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN NELSON AGREEMENT REGARDING USE OF PUBLIC STREET RECORDED JULY 24, 1998 UNDER RECEPTION NO. 1827415.
(AFFECTS PARCEL A) (AFFECTS. NOT A PLOTTABLE DESCRIPTION)

40. REQUEST FOR NOTIFICATION OF SURFACE DEVELOPMENT AS EVIDENCED BY INSTRUMENT RECORDED MAY 17, 2002 UNDER RECEPTION NO. 2288464.
(AFFECTS PARCEL C(IIII)) (PARCEL CIII NOT A PART OF THIS SURVEY)

41. REQUEST FOR NOTIFICATION OF SURFACE DEVELOPMENT AS EVIDENCED BY INSTRUMENT RECORDED OCTOBER 23, 2007 UNDER RECEPTION NO. 2890878.
(AFFECTS PARCEL C (IIII)) (PARCEL CIII NOT A PART OF THIS SURVEY)

42. REQUEST FOR NOTIFICATION OF SURFACE DEVELOPMENT AS EVIDENCED BY INSTRUMENT RECORDED DECEMBER 21, 2007 UNDER RECEPTION NO. 2900941.
(AFFECTS PARCEL C(IIII)) (PARCEL CIII NOT A PART OF THIS SURVEY)

43. (ITEM INTENTIONALLY DELETED)

44. OIL AND GAS LEASE BETWEEN NOBLE ENERGY, INC., A DELAWARE CORPORATION AND EXTRACTION OIL & GAS, LLC, A DELAWARE LIMITED LIABILITY COMPANY, RECORDED MARCH 11, 2015 UNDER RECEPTION NO. 3432573 AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.
(AFFECTS PARCEL C (IIII)) (PARCEL CIII NOT A PART OF THIS SURVEY)

45. RESOLUTION #05-2015, PERTAINING TO ANNEXATION, RECORDED APRIL 21, 2015 UNDER RECEPTION NO. 3440934 AND MAP IN CONNECTION THEREWITH RECORDED APRIL 21, 2015 UNDER RECEPTION NO. 3440932.
(AFFECTS AND IS BLANKET IN NATURE)

46. RESOLUTION #06-2015, PERTAINING TO ZONING, RECORDING APRIL 21, 2015 UNDER RECEPTION NO. 3440935 AND MAP IN CONNECTION THEREWITH RECORDED APRIL 21, 2015 UNDER RECEPTION NO. 3440933.
(ITEMS 45-46 AFFECT PARCEL A AND A PORTION OF PARCEL B)
(AFFECTS AND IS BLANKET IN NATURE)

47. EXISTING UNRECORDED LEASES AND TENANCIES, IF ANY. (NONE OBSERVED AT TIME OF SURVEY)

48. ANY AND ALL RIGHTS OF THE BOULDER CANYON DITCH COMPANY RELATING TO BOULDER CANYON DITCH, WHICH TRAVERSES PARCELS A, B AND C-II OF SUBJECT PROPERTY, INCLUDING BUT NOT LIMITED TO DITCH MAINTENANCE AND ACCESS RIGHTS TO LANDS ADJOINING THE DITCH, APPROXIMATE LOCATION OF WHICH DITCH IS DISCLOSED BY ALTA/NSPS LAND TITLE SURVEY BY GALLOWAY, DATED DECEMBER 9, 2016, LAST REVISED _____ JOB NO. ED1000018. (PLOTTED HEREON)

49. ANY FACTS, RIGHTS, INTERESTS OR CLAIMS WHICH MAY EXIST OR ARISE BY REASON OF THE FOLLOWING FACTS SHOWN ON ALTA/NSPS LAND TITLE SURVEY DATED DECEMBER 09, 2016, LAST REVISED _____, PREPARED BY GALLOWAY, JOB NO. ED1000018, SAID DOCUMENT STORED AS OUR ESI 33770381
A. FENCES ARE NOT ENTIRELY COINCIDENT WITH BOUNDARY LINES.
B. PORTION OF ARAPAHOE ROAD ENCROACHES ONTO PARCEL C-III OF SUBJECT PROPERTY.
C. WELL SITE MAY BE LOCATED OUTSIDE OF GRANTED OPERATION AREA.
D. GAS LINE TRAVERSES PARCELS A AND B WITHOUT BENEFIT OF A RECORDED EASEMENT.
(PLOTTED HEREON)

50. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN APPROVED NINE MILE CORNER PD-DEVELOPMENT PLAN RECORDED SEPTEMBER 26, 2017 UNDER RECEPTION NO. 03616633, AND ORDINANCE NO. 16-2017 IN CONNECTION THEREWITH RECORDED SEPTEMBER,26, 2017 UNDER RECEPTION NO. 03616632. (BLANKET IN NATURE)

LEGAL DESCRIPTION (PER TITLE COMMITMENT)

PARCEL A:
PART OF THE NORTH HALF NORTHEAST QUARTER OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN, DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF THE NORTH HALF NORTHEAST QUARTER FROM WHENCE THE NORTHWEST CORNER OF SAID NORTH HALF NORTHEAST QUARTER BEARS NORTH 00°04'00" EAST; THENCE SOUTH 89°48'30" EAST ALONG THE SOUTH LINE OF SAID NORTH HALF NORTHEAST QUARTER, A DISTANCE OF 1434.83 FEET; THENCE NORTH 00°14'20" EAST, 845.98 FEET TO THE SOUTH LINE OF THAT PROPERTY CONVEYED BY FLOYD E. HARRIS AND NEVADIA HARRIS TO LEONARD L. LANHAM AND NINA E. LANHAM, RECORDED MAY 15, 1968 ON FILM 635 AT RECEPTION NO. 876012; THENCE NORTH 89°41'50" WEST ALONG SAID SOUTH LINE, A DISTANCE OF 366.57 FEET TO A POINT ON THE EAST LINE OF THAT PROPERTY CONVEYED BY DEED FROM FLOYD EUGENE HARRIS AND NEVADIA HARRIS TO THE TOWN OF ERIE, A MUNICIPAL CORPORATION, RECORDED APRIL 29, 1968 IN FILM 633 AT RECEPTION NO. 877395; THENCE SOUTH 00°18'00" WEST ALONG SAID EAST LINE, 31.12 FEET TO THE CENTERLINE OF THE SOUTH BOULDER CANYON IRRIGATION DITCH; THENCE TRAVERSING ALONG THE CENTERLINE OF SAID DITCH AND THE SOUTH LINE OF PROPERTY DESCRIBED ON FILM 633 AT RECEPTION NO. 877396, THE FOLLOWING COURSES AND DISTANCES: SOUTH 71°36'00" WEST 508.65 FEET;
THENCE SOUTH 73°48'00" WEST, 241.52 FEET;
THENCE NORTH 89°40'00" WEST, 140.82 FEET;
THENCE NORTH 77°42'00" WEST, 114.23 FEET;
THENCE NORTH 62°24'00" WEST, 118.52 FEET TO A POINT ON THE WEST LINE OF THE NORTH HALF NORTHEAST QUARTER OF SAID SECTION 34;
SAID POINT BEING ALSO THE SOUTHWEST CORNER OF THAT PROPERTY DESCRIBED ON FILM 633 AT RECEPTION NO. 877395; THENCE SOUTH 00°04'00" WEST ALONG SAID WEST LINE OF THE NORTH HALF NORTHEAST QUARTER, A DISTANCE OF 675.12 FEET TO THE TRUE POINT OF BEGINNING,

EXCEPTING THEREFROM THAT PORTION DESCRIBED IN DEED RECORDED APRIL 15, 1983 AT RECEPTION NO. 543786, AND IN DEED RECORDED FEBRUARY 20, 1997 ON FILM NO. 2187 AT RECEPTION NO. 1678309,
COUNTY OF BOULDER, STATE OF COLORADO.

PARCEL B:

A PORTION OF THE NORTH 1/2 OF THE NORTHEAST 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN, DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE NORTH LINE OF SAID NORTHEAST 1/4, 20 FEET WEST OF THE NORTHEAST CORNER OF THE NORTHWEST 1/4 OF THE NORTHEAST 1/4; THENCE NORTH 89°41'50" WEST ALONG SAID NORTH LINE, 230.64 FEET;
THENCE SOUTH 00°58' WEST, 469.96 FEET; THENCE SOUTH 89°41'50" EAST, 618.52; THENCE NORTH 00°14'20" EAST, 469.93 FEET TO THE NORTH LINE OF SAID NORTHEAST 1/4; THENCE NORTH 89°41'50" WEST, ALONG SAID NORTH LINE TO THE TRUE POINT OF BEGINNING;
EXCEPTING THEREFROM THAT PORTION CONVEYED TO THE COUNTY OF BOULDER BY THE DEED RECORDED NOVEMBER 29, 1913 IN BOOK 381 AT PAGE 127;

COUNTY OF BOULDER, STATE OF COLORADO.

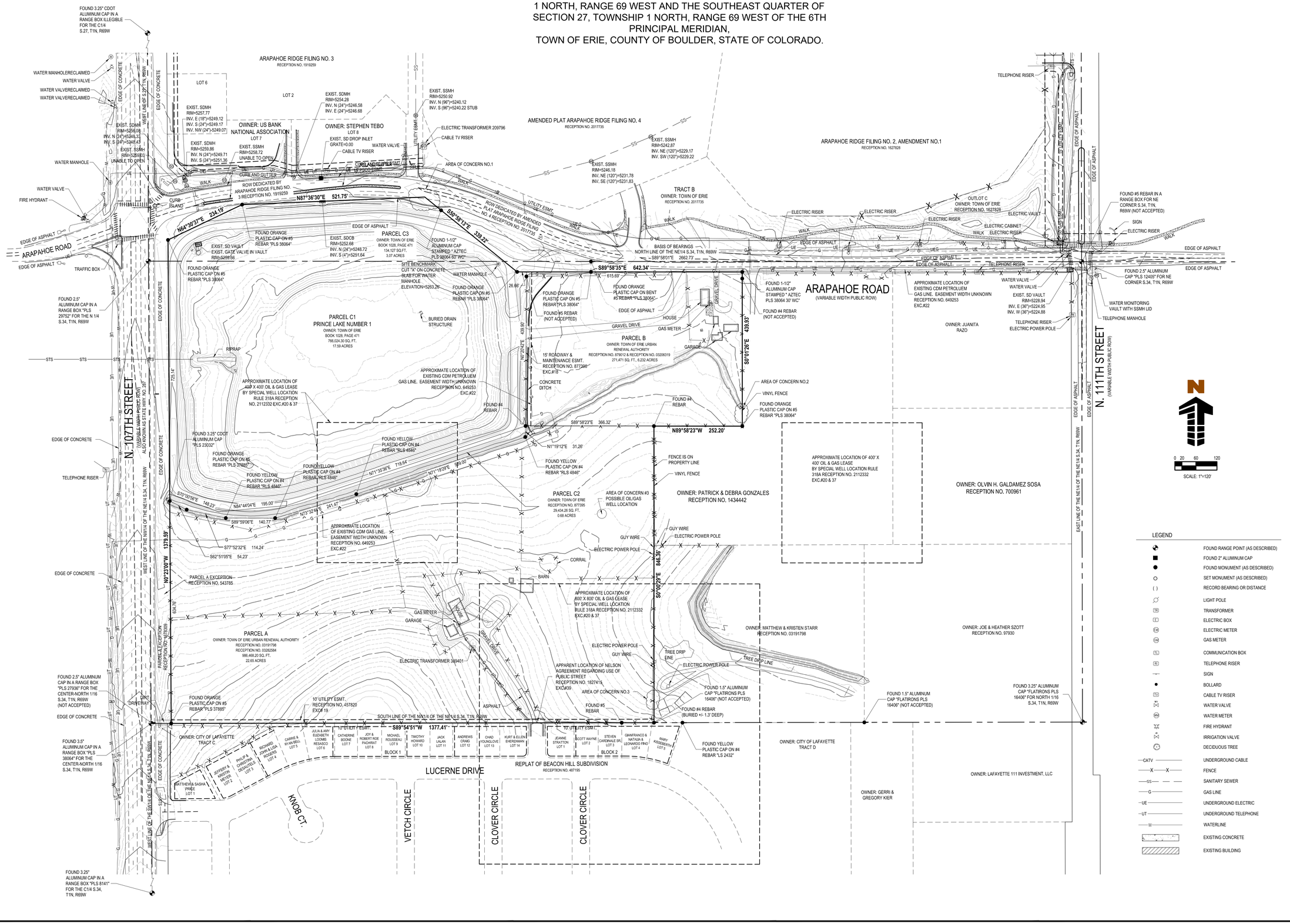
PARCEL C:

PARCEL I:

A PART OF THE NORTHWEST 1/4 OF THE NORTHEAST 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE

ALTA/NSPS LAND TITLE SURVEY

PORTION OF THE NORTHEAST QUARTER OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST AND THE SOUTHEAST QUARTER OF SECTION 27, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN,
TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO.



LEGEND

- FOUND RANGE POINT (AS DESCRIBED)
- FOUND 2" ALUMINUM CAP
- FOUND MONUMENT (AS DESCRIBED)
- SET MONUMENT (AS DESCRIBED)
- ( ) RECORD BEARING OR DISTANCE
- LIGHT POLE
- TRANSFORMER
- ELECTRIC BOX
- ELECTRIC METER
- GAS METER
- COMMUNICATION BOX
- TELEPHONE RISER
- SIGN
- BOLLARD
- CABLE TV RISER
- WATER VALVE
- WATER METER
- FIRE HYDRANT
- IRRIGATION VALVE
- DECIDUOUS TREE
- CATV — UNDERGROUND CABLE
- X — X — FENCE
- SS — SANITARY SEWER
- G — GAS LINE
- UE — UNDERGROUND ELECTRIC
- UT — UNDERGROUND TELEPHONE
- W — WATERLINE
- EXISTING CONCRETE
- EXISTING BUILDING

Galloway
Planning, Architecture, Engineering.
6162 S. Willow Drive, Suite 320
Greenwood Village, CO 80111
303.770.8884 O
www.gallowayUS.com

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#	Date	Issue / Description	Init.
1	08.30.16	ADD A.O.C. #3	BJD
2	12.06.16	UPDATED TITLE	TJK
3	06.29.18	OWNERSHIP NAME	BJD
4	08.29.18	PARCEL B AREA	BJD
5	01.31.19	UPDATED TITLE	JGH
6	05.29.19	UPDATED LEGAL	BJD

ALTA/NSPS LAND TITLE SURVEY
EVERGREEN DEVCO INC

TOWN OF ERIE PARCELS
TOWN OF ERIE, COUNTY OF BOULDER, COLORADO

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Project No:	EDI000018
Drawn By:	TJK
Checked By:	BJD
Date:	DECEMBER 9, 2016

ALTA/NSPS LAND TITLE SURVEY

SHEET
2 OF 2

Appendix B – Hydrology Calculations

CUHP
Rational Method Calculations – Roadside Basins
Rational Method Calculations – Commercial Site

CUHP

Summary of CUHP Input Parameters (Version 2.0.0)

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
200	200	100-YEAR, 1-HOUR	0.151	0.239	0.481	0.026	70.0	0.38	0.10	4.50	0.60	0.0018	0.00	0.92	0.30	69.15

Printouts for Storm Hydrographs

flow in cfs

time in minutes	200
5	0.00
10	1.52
15	27.24
20	67.49
25	146.55
30	328.44
35	370.73
40	329.23
45	280.47
50	230.57
55	190.14
60	160.43
65	136.38
70	99.45
75	75.00
80	55.52
85	42.17
90	34.47
95	29.23
100	25.91
105	23.84
110	23.00
115	22.64
120	22.58
125	15.77
130	10.13
135	6.49
140	3.91
145	2.40
150	1.27
155	0.49
160	0.07
165	0.00

Rational Method Calculations – Roadside Basins

Galloway & Company, Inc.
6162 S. Willow Dr., Ste. 320
Greenwood Village, CO 80111
Ph: (303) 770-8884

Job Name: Nine Mile Corner
Job Number: EDI18.01
Date: 11/15/19
By: J. Greenough

Enter Value User Input Cell

Nine Mile Corner

Composite Runoff Coefficient Calculations

Location: Erie
Minor Design Storm: 5
Major Design Storm: 100
Soil Type: **B**

Basin Design Data									I (%)	Runoff Coefficients			
Basin Name	I (%) =	100%	90%	90%	30%	2%							
	Design Point	$A_{Asphalt}$ (sf)	$A_{Sidewalks}$ (sf)	$A_{Roof\ Area}$ (sf)	$A_{SFHomes}$ (sf)	A_{Lscape} (sf)	A_{Total} (sf)	A_{Total} (ac)	Imp (%)	C_2	C_5	C_{10}	C_{100}
2	1	108,145	0	0	19,705	210,298	338,148	7.76	35%	0.25	0.27	0.34	0.59
3	3	59,611	6,930	0	0	40,307	106,848	2.45	62%	0.48	0.51	0.56	0.72
4	4	57,190	7,001	0	0	10,341	74,532	1.71	85%	0.70	0.72	0.75	0.83
5	5	18,651	1,416	0	0	3,206	23,273	0.53	86%	0.70	0.73	0.75	0.83
TOTAL SITE		**243,597**	**15,347**	**0**	**19,705**	**264,152**	**542,801**	**12.46**	**49.5%**	0.37	0.40	0.46	0.66

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By: J. Greenough

Enter Value — User Input Cell

Nine Mile Corner

Time of Concentration Calculations

Location: Erie
Minor Design Storm: 5
Major Design Storm: 100
Soil Type: B

Value — "Hard Coded" Value

2.00%

2.00% min. x-slope on streets
2.50% min. overland slope on lots

Defaults to t_c Urbanized Check: t_c

Sub-Basin Data				Initial Overland Time (t_i)			Travel Time (t_t) t_t=Length/(Velocity x 60)						t_c Comp	t_c Urbanized Check			t_c Final
Basin Name	Design Point	A_{Total} (ac)	C_5	Upper most Length (ft)	Slope (%)	t_i (min)	Length (ft)	Slope (%)	Type of Land Surface	C_v	Velocity (fps)	t_t (min)	Time of Conc $t_i + t_t = t_c$	t_c Urbanized Check	Total Length (ft)	(L/180)+10 (min)	Min t_c
2	1	7.76	0.27	44	*1.00%*	10.0	1502	*1.00%*	Paved areas & shallow paved swales	20	2.0	12.5	22.6	OFF	1546	18.6	22.6
3	3	2.45	0.51	64	5.09%	5.0	1323	1.36%	Grassed Waterway	15	1.7	12.6	17.6	OFF	1387	17.7	17.6
4	4	1.71	0.72	135	2.57%	5.8	441	1.26%	Paved areas & shallow paved swales	20	2.2	3.3	9.1	ON	576	13.2	9.1
5	5	0.53	0.73	20	2.00%	2.4	465	1.17%	Paved Areas & Shallow Paved Swales	20	2.2	3.6	6.0	ON	485	12.7	6.0

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Job Name: Nine Mile Corner
Job Number: EDI18.01
Date: #######
By: J. Greenough

Nine Mile Corner

Developed Storm Runoff Calculations

Design Storm : **5 Year**

Point Hour Rainfall (P_1) : **1.11**

	Direct Runoff							Total Runoff				Inlets			Pipe					Pipe/Swale Travel Time				
Basin Name	Design Point	Area (ac)	Runoff Coeff	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Total tc (min)	ΣC*A (ac)	I (in/hr)	Q (cfs)	Description / Struture / Inlet Type	Q intercepted	Q carryover	Pipe Size (in) or equivalent	Pipe Material	Slope (%)	Pipe Flow (cfs)	Approx. Max Pipe Capacity (cfs)	Length (ft)	Velocity (fps)	Travel Time (min)	Total Time (min)	Notes
2	1	7.76	0.27	22.6	2.13	2.17	4.63					...												
	2										5.73													
3	3	2.45	0.51	17.6	1.26	2.45	3.09	22.60	3.39	2.17	7.37	...												
4	4	1.71	0.72	9.1	1.24	3.39	4.20	22.60	4.63	2.17	10.07													
5	5	0.53	0.73	6.0	0.39	4.11	1.60																	

Q Minor

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Job Name: Nine Mile Corner
Job Number: EDI18.01
Date: 11/15/2019
By: J. Greenough

Nine Mile Corner

Developed Storm Runoff Calculations

Design Storm : **100 Year**

Point Hour Rainfall (P_1) : **2.68**

	Direct Runoff								Total Runoff				Inlets			Pipe					Pipe/Swale Travel Time				
Basin Name	Design Point	Area (ac)	Runoff Coeff	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Total tc (min)	ΣC*A (ac)	I (in/hr)	Q (cfs)	Description / Struture / Inlet Type	Q intercepted	Q carryover (Qco)	Pipe Size (in) or equivalent	Pipe Material	Slope (%)	Pipe Flow (cfs)	Approx.Max Pipe Capacity (cfs)	Length (ft)	Velocity (fps)	Travel Time (min)	Total Time (min)	Notes
2	1	7.76	0.59	22.6	4.58	5.24	24.02					...												
	2	4.80		5.0		10.50	4.80				28.82													
3	3	2.45	0.72	17.6	1.76	5.91	10.42	22.60	6.35	5.24	38.07	...												
4	4	1.71	0.83	9.1	1.42	8.20	11.61	22.60	7.76	5.24	45.49													
5	5	0.53	0.83	6.0	0.44	9.94	4.41																	

Rational Method Calculations – Commercial Site

Galloway & Company, Inc.
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Ph: (303) 770-8884

Job Name: Lowe's at Nine Mile
Job Number: EDI18.20
Date: 11/13/19
By: J. Greenough

Enter Value User Input Cell

Lowe's at Nine Mile Corner

Composite Runoff Coefficient Calculations

Location: Erie
Minor Design Storm: 5
Major Design Storm: 100
Soil Type: **B**

Basin Design Data									I (%)	Runoff Coefficients			
Basin Name	I (%) =	100%	90%	90%	30%	2%							
	Design Point	$A_{Asphalt}$ (sf)	$A_{Sidewalks}$ (sf)	$A_{Roof\ Area}$ (sf)	$A_{SFHomes}$ (sf)	A_{Lscape} (sf)	A_{Total} (sf)	A_{Total} (ac)	Imp (%)	C_2	C_5	C_{10}	C_{100}
102	1	39,700	0	0	0	4,673	44,373	1.02	90%	0.74	0.76	0.78	0.85
104	3	50,115	0	0	0	5,893	56,008	1.29	90%	0.74	0.76	0.78	0.85
106	5	27,275	0	0	0	3,210	30,485	0.70	90%	0.74	0.76	0.78	0.85
108	7	47,125	0	0	0	5,542	52,667	1.21	90%	0.74	0.76	0.78	0.85
110	9	30,365	0	0	0	3,572	33,937	0.78	90%	0.74	0.76	0.78	0.85
112	11	20,722	0	0	0	740	21,462	0.49	97%	0.81	0.83	0.84	0.88
114	12	33,420	0	0	0	3,938	37,358	0.86	90%	0.74	0.76	0.78	0.85
116	13	0	0	10,000	0	0	10,000	0.23	90%	0.74	0.77	0.79	0.85
118	14	14,156	11,412	0	0	10,899	36,467	0.84	68%	0.53	0.56	0.60	0.74
120	15	0	0	8,000	0	0	8,000	0.18	90%	0.74	0.77	0.79	0.85
122	16	18,531	1,747	0	0	2,152	22,430	0.51	90%	0.74	0.77	0.78	0.85
124	17	2,129	0	0	0	250	2,379	0.05	90%	0.74	0.76	0.78	0.85
126	18	3,415	0	0	0	643	4,058	0.09	84%	0.69	0.72	0.74	0.82
128	20	27,167	0	0	0	3,087	30,254	0.69	90%	0.74	0.77	0.79	0.85
130-Final	21	159,083	15,091	40,070	0	111,868	326,112	7.49	65%	0.50	0.54	0.58	0.73
132	22	38,105	117	0	0	729	38,951	0.89	98%	0.82	0.84	0.85	0.89
134	23	30,274	750	0	0	1,173	32,197	0.74	96%	0.80	0.82	0.84	0.88
136	25	18,446	1,104	0	0	688	20,238	0.46	96%	0.80	0.82	0.84	0.88
138	27	10,568	215	0	0	150	10,933	0.25	98%	0.82	0.85	0.85	0.89
140	28	12,443	1,872	0	0	3,290	17,605	0.40	81%	0.65	0.68	0.71	0.80
142	29	20,499	0	0	0	740	21,239	0.49	97%	0.81	0.83	0.84	0.88
144	32	19,891	1,258	0	0	740	21,889	0.50	96%	0.80	0.82	0.84	0.88
146	34	7,769	299	0	0	385	8,453	0.19	95%	0.79	0.82	0.83	0.87
148	35	15,864	2,704	0	0	1,578	20,146	0.46	91%	0.75	0.78	0.79	0.85
150	36	0	0	27,594	0	0	27,594	0.63	90%	0.74	0.77	0.79	0.85
152	38	12,071	1,222	0	0	0	13,293	0.31	99%	0.83	0.85	0.86	0.89
154	39	0	0	0	0	53,440	53,440	1.23	2%	0.01	0.01	0.07	0.44
156	39	0	0	0	0	24,672	24,672	0.57	2%	0.01	0.01	0.07	0.44
202-Final	40	39,616	8,834	34,082	0	59,798	142,330	3.27	56%	0.42	0.46	0.51	0.69
204	41	23,127	0	0	0	0	23,127	0.53	100%	0.84	0.86	0.87	0.90
206	42	0	0	47,766	0	0	47,766	1.10	90%	0.74	0.77	0.79	0.85

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Job Name: Lowe's at Nine Mile
Job Number: EDI18.20
Date: 11/13/19
By: J. Greenough

Enter Value User Input Cell

Lowe's at Nine Mile Corner

Composite Runoff Coefficient Calculations

Location: Erie
Minor Design Storm: 5
Major Design Storm: 100
Soil Type: **B**

Basin Design Data									I (%)	Runoff Coefficients			
Basin Name	I (%) =	100%	90%	90%	30%	2%							
	Design Point	$A_{Asphalt}$ (sf)	$A_{Sidewalks}$ (sf)	$A_{Roof\ Area}$ (sf)	$A_{SFHomes}$ (sf)	A_{Lscape} (sf)	A_{Total} (sf)	A_{Total} (ac)	Imp (%)	C_2	C_5	C_{10}	C_{100}
208	43	6,063	0	0	0	0	6,063	0.14	100%	0.84	0.86	0.87	0.90
210	44	0	0	68,693	0	0	68,693	1.58	90%	0.74	0.77	0.79	0.85
212	45	8,189	0	0	0	0	8,189	0.19	100%	0.84	0.86	0.87	0.90
213	46	4,242	0	0	0	0	4,242	0.10	100%	0.84	0.86	0.87	0.90
214	48	14,613	0	0	0	0	14,613	0.34	100%	0.84	0.86	0.87	0.90
302	49	4,828	0	0	0	0	4,828	0.11	100%	0.84	0.86	0.87	0.90
304	50	13,762	0	0	0	0	13,762	0.32	100%	0.84	0.86	0.87	0.90
130-Interim	17	0	0	0	0	326,112	326,112	7.49	2%	0.01	0.01	0.07	0.44
202-Interim	36	0	0	0	0	142,330	142,330	3.27	2%	0.01	0.01	0.07	0.44
TOTAL SITE		**773,573**	**46,625**	**236,205**	**0**	**303,850**	**1,360,253**	**31.23**	**76.0%**	0.61	0.64	0.67	0.78

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Enter Value — User Input Cell

Lowe's at Nine Mile Corner

Time of Concentration Calculations

Location: Erie
Minor Design Storm: 5
Major Design Storm: 100
Soil Type: B

2.00%

Value — "Hard Coded" Value

2.00% min. x-slope on streets
2.50% min. overland slope on lots

Defaults to t_c Urbanized Check — ***t_c***

Sub-Basin Data				Initial Overland Time (t_i)			Travel Time (t_t) t_t=Length/(Velocity x 60)						t_c Comp	t_c Urbanized Check			t_c Final
Basin Name	Design Point	A_{Total} (ac)	C_5	Upper most Length (ft)	Slope (%)	t_i (min)	Length (ft)	Slope (%)	Type of Land Surface	C_v	Velocity (fps)	t_t (min)	Time of Conc $t_i + t_t = t_c$	t_c Urbanized Check	Total Length (ft)	(L/180)+10 (min)	Min t_c
102	1	1.02	0.76	20	*2.00%*	2.2	200	*2.00%*	Paved Areas & Shallow Paved Swales	20	2.8	1.2	3.4	ON	220	11.2	5.0
104	3	1.29	0.76	20	*2.00%*	2.2	210	*2.00%*	Paved Areas & Shallow Paved Swales	20	2.8	1.2	3.4	ON	230	11.3	5.0
106	5	0.70	0.76	20	*1.25%*	2.6	160	*1.25%*	Paved Areas & Shallow Paved Swales	20	2.2	1.2	3.8	ON	180	11.0	5.0
108	7	1.21	0.76	20	*1.00%*	2.8	190	*1.00%*	Paved Areas & Shallow Paved Swales	20	2.0	1.6	4.3	ON	210	11.2	5.0
110	9	0.78	0.76	20	*1.00%*	2.8	165	*1.00%*	Paved Areas & Shallow Paved Swales	20	2.0	1.4	4.1	ON	185	11.0	5.0
112	11	0.49	0.83	20	*1.00%*	2.2	165	*1.00%*	Paved Areas & Shallow Paved Swales	20	2.0	1.4	3.6	ON	185	11.0	5.0
114	12	0.86	0.76	20	*1.50%*	2.4	180	*1.50%*	Paved Areas & Shallow Paved Swales	20	2.4	1.2	3.6	OFF	200	11.1	5.0
116	13	0.23	0.77	20	*1.00%*	2.7	180	*1.00%*	Paved Areas & Shallow Paved Swales	20	2.0	1.5	4.2	OFF	200	11.1	5.0
118	14	0.84	0.56	20	*2.50%*	3.3	50	*2.50%*	Paved Areas & Shallow Paved Swales	20	3.2	0.3	3.5	OFF	70	10.4	5.0
120	15	0.18	0.77	20	*1.00%*	2.7	150	*1.00%*	Paved Areas & Shallow Paved Swales	20	2.0	1.3	4.0	OFF	170	10.9	5.0
122	16	0.51	0.77	40	*2.50%*	2.9	100	*2.50%*	Paved Areas & Shallow Paved Swales	20	3.2	0.5	3.4	OFF	140	10.8	5.0
124	17	0.05	0.76	40	*2.00%*	3.1	150	*1.00%*	Paved Areas & Shallow Paved Swales	20	2.0	1.3	4.3	OFF	190	11.1	5.0
126	18	0.09	0.72	15	*2.00%*	2.2	150	*4.00%*	Paved Areas & Shallow Paved Swales	20	4.0	0.6	2.8	OFF	165	10.9	5.0
128	20	0.69	0.77	15	*2.00%*	1.9	150	*4.00%*	Paved Areas & Shallow Paved Swales	20	4.0	0.6	2.5	OFF	165	10.9	5.0
130-Interim	17	7.49	0.01	480	*2.50%*	32.2	50	*2.00%*	Short Pasture and Lawns	7	1.0	0.8	33.0	ON	530	12.9	***12.9***
132	22	0.89	0.84	20	*2.00%*	1.7	530	*1.00%*	Paved Areas & Shallow Paved Swales	20	2.0	4.4	6.1	ON	550	13.1	6.1
134	23	0.74	0.82	20	*2.00%*	1.8	100	*2.00%*	Paved Areas & Shallow Paved Swales	20	2.8	0.6	2.4	ON	120	10.7	5.0
136	25	0.46	0.82	20	*2.00%*	1.8	100	*2.00%*	Paved Areas & Shallow Paved Swales	20	2.8	0.6	2.4	ON	120	10.7	5.0
138	27	0.25	0.85	20	*2.00%*	1.7	100	*2.00%*	Paved Areas & Shallow Paved Swales	20	2.8	0.6	2.2	ON	120	10.7	5.0
140	28	0.40	0.68	20	*2.00%*	2.7	100	*2.00%*	Paved Areas & Shallow Paved Swales	20	2.8	0.6	3.3	ON	120	10.7	5.0
142	29	0.49	0.83	20	*1.00%*	2.2	165	*2.00%*	Paved Areas & Shallow Paved Swales	20	2.8	1.0	3.2	ON	185	11.0	5.0
144	32	0.50	0.82	20	*1.00%*	2.3	165	*2.00%*	Paved Areas & Shallow Paved Swales	20	2.8	1.0	3.2	ON	185	11.0	5.0
146	34	0.19	0.82	20	*2.00%*	1.9	100	*2.00%*	Paved Areas & Shallow Paved Swales	20	2.8	0.6	2.4	ON	120	10.7	5.0
148	35	0.46	0.78	20	*2.00%*	2.1	100	*2.00%*	Paved Areas & Shallow Paved Swales	20	2.8	0.6	2.7	ON	120	10.7	5.0
150	36	0.63	0.77	20	*2.00%*	2.2	100	*2.00%*	Paved Areas & Shallow Paved Swales	20	2.8	0.6	2.8	ON	120	10.7	5.0
152	38	0.31	0.85	20	*2.00%*	1.6	100	*2.00%*	Paved Areas & Shallow Paved Swales	20	2.8	0.6	2.2	ON	120	10.7	5.0
154	39	1.23	0.01	20	*25.00%*	3.1	150	*0.50%*	Paved Areas & Shallow Paved Swales	20	1.4	1.8	4.8	ON	170	10.9	5.0
156	39	0.57	0.01	20	*25.00%*	3.1	100	*0.50%*	Paved Areas & Shallow Paved Swales	20	1.4	1.2	4.2	ON	120	10.7	5.0
202-Interim	36	3.27	0.01	20	2.00%	7.1	465	1.17%	Short Pasture and Lawns	7	0.8	10.2	17.3	ON	485	12.7	***12.7***
204	41	0.53	0.86	20	2.00%	1.6	50	2.00%	Paved Areas & Shallow Paved Swales	20	2.8	0.3	1.9	ON	70	10.4	5.0
206	42	1.10	0.77	20	2.00%	2.2	50	2.00%	Paved Areas & Shallow Paved Swales	20	2.8	0.3	2.5	ON	70	10.4	5.0
208	43	0.14	0.86	20	2.00%	1.6	50	2.00%	Paved Areas & Shallow Paved Swales	20	2.8	0.3	1.9	ON	70	10.4	5.0
210	44	1.58	0.77	20	2.00%	2.2	50	2.00%	Paved Areas & Shallow Paved Swales	20	2.8	0.3	2.5	ON	70	10.4	5.0
212	45	0.19	0.86	20	2.00%	1.6	50	2.00%	Paved Areas & Shallow Paved Swales	20	2.8	0.3	1.9	ON	70	10.4	5.0
213	46	0.10	0.86	20	2.00%	1.6	50	2.00%	Paved Areas & Shallow Paved Swales	20	2.8	0.3	1.9	ON	70	10.4	5.0

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Job Name: Lowe's at Nine Mile Corner
Job Number: EDI18.20
Date: 11/13/19
By: J. Greenough

Enter Value — User Input Cell

Lowe's at Nine Mile Corner

Time of Concentration Calculations

Location: Erie
Minor Design Storm: 5
Major Design Storm: 100
Soil Type: B

Value — "Hard Coded" Value

2.00%

2.00% min. x-slope on streets
2.50% min. overland slope on lots

Defaults to t_c Urbanized Check: t_c

Sub-Basin Data				Initial Overland Time (t_i)			Travel Time (t_t) t_t=Length/(Velocity x 60)						t_c Comp	t_c Urbanized Check			t_c Final
Basin Name	Design Point	A_{Total} (ac)	C_5	Upper most Length (ft)	Slope (%)	t_i (min)	Length (ft)	Slope (%)	Type of Land Surface	C_v	Velocity (fps)	t_t (min)	Time of Conc $t_i + t_t = t_c$	t_c Urbanized Check	Total Length (ft)	(L/180)+10 (min)	Min t_c
214	48	0.34	0.86	20	2.00%	1.6	50	2.00%	Paved Areas & Shallow Paved Swales	20	2.8	0.3	1.9	ON	70	10.4	5.0
302	49	0.11	0.86	20	2.00%	1.6	50	2.00%	Paved Areas & Shallow Paved Swales	20	2.8	0.3	1.9	ON	70	10.4	5.0
304	50	0.32	0.86	20	2.00%	1.6	50	2.00%	Paved Areas & Shallow Paved Swales	20	2.8	0.3	1.9	ON	70	10.4	5.0
130-Final	21	7.49	0.54	20	2.00%	3.7	465	1.17%	Paved Areas & Shallow Paved Swales	20	2.2	3.6	7.3	ON	485	12.7	7.3
202-Final	40	3.27	0.46	20	2.00%	4.2	465	1.17%	Paved Areas & Shallow Paved Swales	20	2.2	3.6	7.8	ON	485	12.7	7.8

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Job Name: Lowe's at Nine Mile Corner
Job Number: EDI18.20
Date: 11/13/19
By: J. Greenough

Lowe's at Nine Mile Corner

Developed Storm Runoff Calculations

Design Storm : **5 Year**

Point Hour Rainfall (P_1) : **1.11**

	Direct Runoff							Total Runoff				Inlets			Pipe					Pipe/Swale Travel Time				
Basin Name	Design Point	Area (ac)	Runoff Coeff	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Total t_c (min)	ΣC*A (ac)	I (in/hr)	Q (cfs)	Description / Struture / Inlet Type	Q intercepted	Q carryover	Pipe Size (in) or equivalent	Pipe Material	Slope (%)	Pipe Flow (cfs)	Approx. Max Pipe Capacity (cfs)	Length (ft)	Velocity (fps)	Travel Time (min)	Total Time (min)	Notes
102	1	1.02	0.76	5.0	0.78	3.76	2.9					Stub to future lot												
104	3	1.29	0.76	5.0	0.98	3.76	3.7					Stub to future lot												
106	5	0.70	0.76	5.0	0.53	3.76	2.0					Stub to future lot												
108	7	1.21	0.76	5.0	0.92	3.76	3.5					Stub to future lot												
110	9	0.78	0.76	5.0	0.60	3.76	2.2					Stub to future lot												
112	11	0.49	0.83	5.0	0.41	3.76	1.5					Type R inlet												
114	12	0.86	0.76	5.0	0.66	3.76	2.5					Stub to future lot												
116	13	0.23	0.77	5.0	0.18	3.76	0.7					Roof drain lateral												
118	14	0.84	0.56	5.0	0.47	3.76	1.8					Type R inlet												
120	15	0.18	0.77	5.0	0.14	3.76	0.5					Roof drain lateral												
122	16	0.51	0.77	5.0	0.39	3.76	1.5					Type 13 combination inlet												
124	17	0.05	0.76	5.0	0.04	3.76	0.2					Type 13 combination inlet												
126	18	0.09	0.72	5.0	0.07	3.76	0.3					Type 13 combination inlet												
128	20	0.69	0.77	5.0	0.53	3.76	2.0					Stub to future lot												
130-Final	21	7.49	0.54	7.3	4.01	3.37	13.5					Stub to future lot												
132	22	0.89	0.84	6.1	0.75	3.56	2.7					Type R inlet												
134	23	0.74	0.82	5.0	0.61	3.76	2.3					Type R inlet												
136	25	0.46	0.82	5.0	0.38	3.76	1.4					Type R inlet												
138	27	0.25	0.85	5.0	0.21	3.76	0.8					Type R inlet												
140	28	0.40	0.68	5.0	0.27	3.76	1.0					Type R inlet												
142	29	0.49	0.83	5.0	0.40	3.76	1.5					Type R inlet												
144	32	0.50	0.82	5.0	0.41	3.76	1.6					Type R inlet												
146	34	0.19	0.82	5.0	0.16	3.76	0.6					Type R inlet												
148	35	0.46	0.78	5.0	0.36	3.76	1.4					Type R inlet												
150	36	0.63	0.77	5.0	0.49	3.76	1.8					Area drains for garden center												
152	38	0.31	0.85	5.0	0.26	3.76	1.0					Type R inlet												
154	39	1.23	0.01	5.0	0.01	3.76	0.1					E. Detention Pond												
156	39	0.57	0.01	5.0	0.01	3.76	0.0					W. Detention Pond												
202-Final	40	3.27	0.46	7.8	1.49	3.29	4.9					Stub to future lot												
204	41	0.53	0.86	5.0	0.46	3.76	1.7					Type R inlet												
206	42	1.10	0.77	5.0	0.84	3.76	3.2					Roof drain lateral												
208	43	0.14	0.86	5.0	0.12	3.76	0.5					Type R inlet												
210	44	1.58	0.77	5.0	1.21	3.76	4.6					Roof drain lateral												
212	45	0.19	0.86	5.0	0.16	3.76	0.6					Type R inlet												
213	46	0.10	0.86	5.0	0.08	3.76	0.3					Area drain for truck dock												
214	48	0.34	0.86	5.0	0.29	3.76	1.1					Type R inlet												

Q Minor

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Job Name: Lowe's at Nine Mile Corner
Job Number: EDI18.20
Date: 11/13/19
By: J. Greenough

Lowe's at Nine Mile Corner

Developed Storm Runoff Calculations

Design Storm : **5 Year**

Point Hour Rainfall (P_1) : **1.11**

	Direct Runoff							Total Runoff				Inlets			Pipe					Pipe/Swale Travel Time				
Basin Name	Design Point	Area (ac)	Runoff Coeff	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Total t_c (min)	ΣC*A (ac)	I (in/hr)	Q (cfs)	Description / Struture / inlet Type	Q intercepted	Q carryover	Pipe Size (in) or equivalent	Pipe Material	Slope (%)	Pipe Flow (cfs)	Approx.Max Pipe Capacity (cfs)	Length (ft)	Velocity (fps)	Travel Time (min)	Total Time (min)	Notes
302	49	0.11	0.86	5.0	0.10	3.76	0.4					Type R inlet												
304	50	0.32	0.86	5.0	0.27	3.76	1.0					Type R inlet												
130-Interim	17	7.49	0.01	12.9	0.09	2.70	0.2					Type D inlet												
202-Interim	36	3.27	0.01	12.7	0.04	2.72	0.1					Type D inlet												

Q Minor

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Date: 11/13/19
By: J. Greenough

Lowe's at Nine Mile Corner

Developed Storm Runoff Calculations

Design Storm : **100 Year**

Point Hour Rainfall (P_1) : **2.68**

	Direct Runoff							Total Runoff				Inlets			Pipe					Pipe/Swale Travel Time				
Basin Name	Design Point	Area (ac)	Runoff Coeff	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Total tc (min)	ΣC*A (ac)	I (in/hr)	Q (cfs)	Description / Struture / Inlet Type	Q intercepted	Q carryover	Pipe Size (in) or equivalent	Pipe Material	Slope (%)	Pipe Flow (cfs)	Approx. Max Pipe Capacity (cfs)	Length (ft)	Velocity (fps)	Travel Time (min)	Total Time (min)	Notes
102	1	1.02	0.85	5.0	0.86	9.09	7.8					Stub to future lot												
104	3	1.29	0.85	5.0	1.09	9.09	9.9					Stub to future lot												
106	5	0.70	0.85	5.0	0.59	9.09	5.4					Stub to future lot												
108	7	1.21	0.85	5.0	1.02	9.09	9.3					Stub to future lot												
110	9	0.78	0.85	5.0	0.66	9.09	6.0					Stub to future lot												
112	11	0.49	0.88	5.0	0.43	9.09	3.9					Type R inlet												
114	12	0.86	0.85	5.0	0.73	9.09	6.6					Stub to future lot												
116	13	0.23	0.85	5.0	0.19	9.09	1.8					Roof drain lateral												
118	14	0.84	0.74	5.0	0.62	9.09	5.7					Type R inlet												
120	15	0.18	0.85	5.0	0.16	9.09	1.4					Roof drain lateral												
122	16	0.51	0.85	5.0	0.44	9.09	4.0					Type 13 combination inlet												
124	17	0.05	0.85	5.0	0.05	9.09	0.4					Type 13 combination inlet												
126	18	0.09	0.82	5.0	0.08	9.09	0.7					Type 13 combination inlet												
128	20	0.69	0.85	5.0	0.59	9.09	5.4					Stub to future lot												
130-Final	16	7.49	0.73	7.3	5.47	8.13	44.4					Stub to future lot												
132	22	0.89	0.89	6.1	0.79	8.60	6.8					Type R inlet												
134	23	0.74	0.88	5.0	0.65	9.09	5.9					Type R inlet												
136	25	0.46	0.88	5.0	0.41	9.09	3.7					Type R inlet												
138	27	0.25	0.89	5.0	0.22	9.09	2.0					Type R inlet												
140	28	0.40	0.80	5.0	0.33	9.09	3.0					Type R inlet												
142	29	0.49	0.88	5.0	0.43	9.09	3.9					Type R inlet												
144	32	0.50	0.88	5.0	0.44	9.09	4.0					Type R inlet												
146	34	0.19	0.87	5.0	0.17	9.09	1.5					Type R inlet												
148	35	0.46	0.85	5.0	0.39	9.09	3.6					Type R inlet												
150	36	0.63	0.85	5.0	0.54	9.09	4.9					Area drains for garden center												
152	38	0.31	0.89	5.0	0.27	9.09	2.5					Type R inlet												
154	39	1.23	0.44	5.0	0.53	9.09	4.9					E. Detention Pond												
156	39	0.57	0.44	5.0	0.25	9.09	2.2					W. Detention Pond												
202-Final	40	3.27	0.69	7.8	2.25	7.95	17.9					Stub to future lot												
204	41	0.53	0.90	5.0	0.48	9.09	4.3					Type R inlet												
206	42	1.10	0.85	5.0	0.93	9.09	8.5					Roof drain lateral												
208	43	0.14	0.90	5.0	0.12	9.09	1.1					Type R inlet												
210	44	1.58	0.85	5.0	1.34	9.09	12.2					Roof drain lateral												
212	45	0.19	0.90	5.0	0.17	9.09	1.5					Type R inlet												
213	46	0.10	0.90	5.0	0.09	9.09	0.8					Area drain for truck dock												
214	48	0.34	0.90	5.0	0.30	9.09	2.7					Type R inlet												

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Date: 11/13/19
By: J. Greenough

Lowe's at Nine Mile Corner

Developed Storm Runoff Calculations

Design Storm : **100 Year**

Point Hour Rainfall (P_1) : **2.68**

	Direct Runoff							Total Runoff				Inlets			Pipe					Pipe/Swale Travel Time				
Basin Name	Design Point	Area (ac)	Runoff Coeff	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Total tc (min)	ΣC^*A (ac)	I (in/hr)	Q (cfs)	Description / Structure / Inlet Type	Q intercepted	Q carryover	Pipe Size (in) or equivalent	Pipe Material	Slope (%)	Pipe Flow (cfs)	Approx. Max Pipe Capacity (cfs)	Length (ft)	Velocity (fps)	Travel Time (min)	Total Time (min)	Notes
302	49	0.11	0.90	5.0	0.10	9.09	0.9					Type R inlet												
304	50	0.32	0.90	5.0	0.28	9.09	2.6					Type R inlet												
130-Interim	17	7.49	0.44	12.9	3.26	6.52	21.2					Type D inlet												
202-Interim	36	3.27	0.44	12.7	1.42	6.56	9.3					Type D inlet												

Appendix C – Hydraulic Calculations

Infrastructure Design

EPA SWMM

StormCAD Model – S. Boulder Canyon Ditch Realignment

Riprap Sizing – S. Boulder Canyon Ditch Outfall

StormCAD Model – Bypass Line

Inlet Capacity Calculations – Roadside Inlet System

Culvert Capacity Calculations – Highway 287 Channel

Grass-Lined Channel Capacity Calculations – Highway 287

Grass-Lined Channel Capacity Calculations – N. 111th Street

Riprap Sizing – Storm Sewer Bypass Outfall at Grass-Lined Channel (N. 111th Street)

Commercial Site Design

UD-Detention Calculation Spreadsheet – Commercial Site

Trickle Channel Sizing Calculation

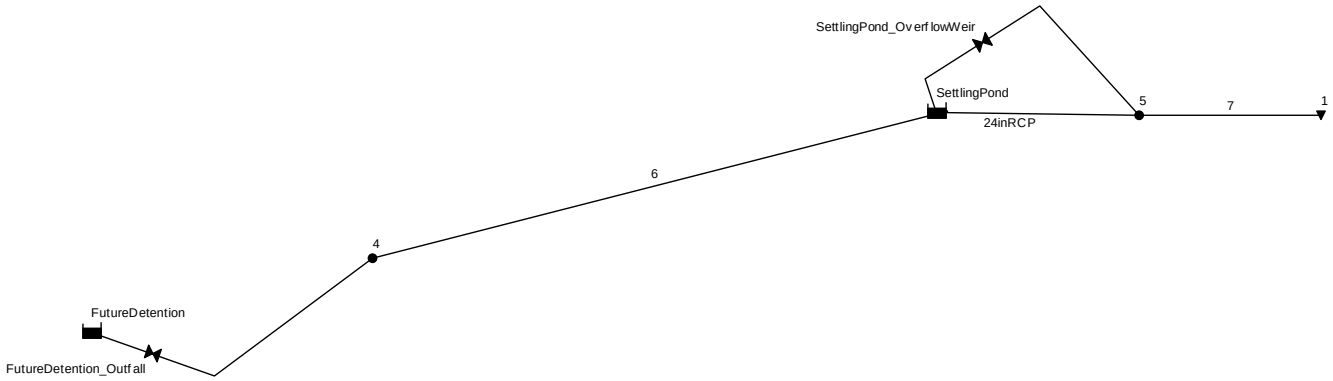
Emergency Spillway Sizing Calculation

Forebay Sizing Calculation

StormCAD Model – Commercial Site

Inlet Capacity Calculations – Commercial Site

EPA SWMM


SettlingPond_OverflowWeir
SettlingPond
5
7
1
24inRCP
6
4
FutureDetention
FutureDetention_Outfall

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

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

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... DYNWAVE
Starting Date 09/21/2016 00:00:00
Ending Date 09/22/2016 12:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 10.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.005000 ft

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	19.007	6.194
External Outflow	18.943	6.173
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.063	0.021
Continuity Error (%)	0.004	

****
Time-Step Critical Elements
****
Link 6 (18.05%)

****
Highest Flow Instability Indexes
****
Link FutureDetention_Outfall (24)

****
Routing Time Step Summary
****
Minimum Time Step   :   5.08 sec
Average Time Step   :   9.35 sec
Maximum Time Step   :   10.00 sec
Percent in Steady State   :   0.00
Average Iterations per Step :   2.00
Percent Not Converging   :   0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
4	JUNCTION	0.34	2.61	5263.11	0 01:10	2.61
5	JUNCTION	0.46	1.24	5247.14	0 03:32	1.24
1	OUTFALL	0.45	1.24	5243.14	0 03:32	1.24
SettlingPond	STORAGE	1.33	4.94	5258.54	0 03:32	4.94
FutureDetention	STORAGE	0.58	4.56	5265.06	0 01:10	4.56

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
4	JUNCTION	0.00	98.66	0 01:10	0	6.19	0.001
5	JUNCTION	0.00	29.98	0 03:32	0	6.17	0.002
1	OUTFALL	0.00	29.98	0 03:32	0	6.17	0.000
SettlingPond	STORAGE	0.00	98.66	0 01:10	0	6.19	0.006
FutureDetention	STORAGE	370.34	370.34	0 00:35	6.2	6.19	0.000

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
SettlingPond	112.252	17	0	0	490.350	74	0 03:32	29.98
FutureDetention	45.640	8	0	0	494.007	86	0 01:10	98.66

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
1	99.57	7.36	29.98	6.172
System	99.57	7.36	29.98	6.172

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
6	CONDUIT	98.66	0	01:10	9.54	0.54	0.52
7	CONDUIT	29.98	0	03:32	9.03	0.21	0.31
24inRCP	CONDUIT	29.98	0	03:32	10.17	0.95	0.89
FutureDetention_Outfall	ORIFICE	98.66	0	01:10			1.00
SettlingPond_OverflowWeir	WEIR	0.00	0	00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
6	1.00	0.07	0.00	0.00	0.00	0.00	0.00	0.93	0.00	0.00
7	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.47	0.00
24inRCP	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
24inRCP	0.01	7.48	0.01	0.01	0.01

Analysis begun on: Tue Nov 12 13:01:30 2019
Analysis ended on: Tue Nov 12 13:01:30 2019
Total elapsed time: < 1 sec

StormCAD Model – S. Boulder Canyon Ditch Realignment

South Boulder Canyon Ditch Realignment
Scenario: 100-yr

Scenario Summary Report
Scenario: 100-yr

Scenario Summary

ID	28
Label	100-yr
Notes	
Active Topology	Base Active Topology
User Data Extensions	Base User Data Extensions
Physical	Base Physical
Boundary Condition	Base Boundary Condition
Initial Settings	Base Initial Settings
Hydrology	Base Hydrology
Output	Base Output
Infiltration and Inflow	Base Infiltration and Inflow
Rainfall Runoff	Base Rainfall Runoff
Water Quality	Base Water Quality
Sanitary Loading	Base Sanitary Loading
Headloss	Base Headloss
Operational	Base Operational
Design	Base Design
System Flows	Base System Flows
SCADA	Base SCADA
Solver Calculation Options	Base Calculation Options

Calculation Options

Calculation Type	Analysis	Include Conduit Flow Travel Time in Design	True
Minimum Time of Concentration	0.083 hours	Carryover Modeling Method	As CA (Traditional)

Gravity Hydraulics

Maximum Network Traversals	5	Governing Upstream Pipe Selection Method	Pipe with Maximum QV
Flow Convergence Test	0.001	Structure Loss Mode	Hydraulic Grade
Flow Profile Method	Backwater Analysis	Save Detailed Headloss Data?	False
Number of Flow Profile Steps	5	Gravity Friction Method	Manning's
Hydraulic Grade Convergence Test	0.00 ft	Use Explicit Depth and Slope Equations?	False
Average Velocity Method	Actual Uniform Flow Velocity	Ignore Travel Time in Carrier Pipes?	False
Minimum Structure Headloss	0.00 ft	Correct for Partial Area Effects?	False

Inlets

Active Components for Combination Inlets on Grade	Grate and Curb	Neglect Gutter Cross Slope For Side Flow?	False
Active Components for Combination Inlets In Sag	Grate and Curb	Neglect Side Flow?	False

Scenario Summary Report
Scenario: 100-yr

Inlets

Pressure Hydraulics

Liquid Label	Water at 20C (68F)	Pressure Friction Method	Hazen-Williams

Headloss (AASHTO)

Expansion, Ke	0.350	Shaping Adjustment, Cs	0.500
Contraction, Kc	0.250	Non-Piped Flow Adjustment, Cn	1.300

Bend Angle vs. Bend Loss Curve

Bend Angle (degrees)	Bend Loss Coefficient, Kb
0.00	0.000
15.00	0.190
30.00	0.350
45.00	0.470
60.00	0.560
75.00	0.640
90.00	0.700

HEC-22 Energy Losses

Elevations Considered Equal Within	0.50 ft	Consider Non-Piped Plunging Flow?	False

HEC-22 Energy Losses (Second Edition)

Flat Unsubmerged Factor	1.000	Half Bench Submerged Factor	0.950
Flat Submerged Factor	1.000	Full Bench Unsubmerged Factor	0.070
Depressed Unsubmerged Factor	1.000	Full Bench Submerged Factor	0.750
Depressed Submerged Factor	1.000	Improved Bench Unsubmerged Factor	0.035
Half Bench Unsubmerged Factor	0.150	Improved Bench Submerged Factor	0.375

HEC-22 Energy Losses (Third Edition)

Flat Submerged Coefficient	-0.050	Half Bench Unsubmerged Coefficient	-0.850
Flat Unsubmerged Coefficient	-0.050	Full Bench Submerged Coefficient	-0.250
Depressed Submerged Coefficient	0.000	Full Bench Unsubmerged Coefficient	-0.930
Depressed Unsubmerged Coefficient	0.000	Improved Submerged Coefficient	-0.600

Scenario: 100-yr
Current Time Step: 0.000Hr
FlexTable: Conduit Table

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Diameter (in)	Manning's n	Slope (Calculated) (ft/ft)	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
32	CO-1	CB-1	5,257.00	IRR MH-1	5,256.94	8.0	48.0	0.013	0.008	66.00	10.11	125.42	52.6	5,260.09	5,260.09	5,260.71	5,260.69
38	CO-7	IRR MH-6	5,252.20	IRR MH-7	5,251.03	340.9	48.0	0.013	0.003	66.00	7.41	84.15	78.4	5,254.90	5,254.10	5,255.73	5,254.73
40	CO-8	IRR MH-7	5,250.93	IRR MH-8	5,249.45	435.1	48.0	0.013	0.003	66.00	7.39	83.77	78.8	5,253.72	5,252.93	5,254.49	5,253.43
55	CO-2	IRR MH-1	5,256.86	IRR MH-2	5,255.84	298.6	48.0	0.013	0.003	66.00	7.40	83.95	78.6	5,259.62	5,259.02	5,260.41	5,259.61
56	CO-3	IRR MH-2	5,255.74	IRR MH-3	5,254.73	295.0	48.0	0.013	0.003	66.00	7.41	84.04	78.5	5,258.67	5,258.19	5,259.37	5,258.70
58	CO-4	IRR MH-3	5,254.63	IRR MH-4	5,254.44	56.2	48.0	0.013	0.003	66.00	7.37	83.52	79.0	5,257.68	5,257.58	5,258.32	5,258.19
62	CO-5	IRR MH-4	5,254.34	IRR MH-5	5,253.56	226.2	48.0	0.013	0.003	66.00	7.43	84.35	78.2	5,257.11	5,256.66	5,257.90	5,257.28
63	CO-6	IRR MH-5	5,253.46	IRR MH-6	5,252.30	340.9	48.0	0.013	0.003	66.00	7.39	83.78	78.8	5,256.15	5,255.31	5,256.99	5,255.97
65	CO-14	IRR MH-8	5,249.35	IRR MH-9	5,248.55	232.1	48.0	0.013	0.003	66.00	7.43	84.32	78.3	5,252.59	5,252.24	5,253.16	5,252.70
66	CO-15	IRR MH-9	5,248.45	O-1	5,248.43	7.3	48.0	0.013	0.003	66.00	6.74	75.08	87.9	5,252.24	5,252.23	5,252.69	5,252.68

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Scenario: 100-yr
Current Time Step: 0.000Hr
FlexTable: Manhole Table

ID	Label	Elevation (Ground) (ft)	Set Rim to Ground Elevation?	Elevation (Rim) (ft)	Bolted Cover?	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)
31	IRR MH-1	5,262.27	True	5,262.27	False	5,256.94	66.00	2.76	5,259.62	5,260.09
33	IRR MH-3	5,279.74	True	5,279.74	False	5,254.73	66.00	3.05	5,257.68	5,258.19
35	IRR MH-6	5,269.93	True	5,269.93	False	5,252.30	66.00	2.70	5,254.90	5,255.31
37	IRR MH-7	5,271.22	True	5,271.22	False	5,251.03	66.00	2.79	5,253.72	5,254.10
39	IRR MH-8	5,263.75	True	5,263.75	False	5,249.45	66.00	3.24	5,252.59	5,252.93
54	IRR MH-2	5,273.52	True	5,273.52	False	5,255.84	66.00	2.93	5,258.67	5,259.02
57	IRR MH-4	5,280.64	True	5,280.64	False	5,254.44	66.00	2.77	5,257.11	5,257.58
61	IRR MH-5	5,272.13	True	5,272.13	False	5,253.56	66.00	2.69	5,256.15	5,256.66
64	IRR MH-9	5,254.27	True	5,254.27	False	5,248.55	66.00	3.79	5,252.24	5,252.24

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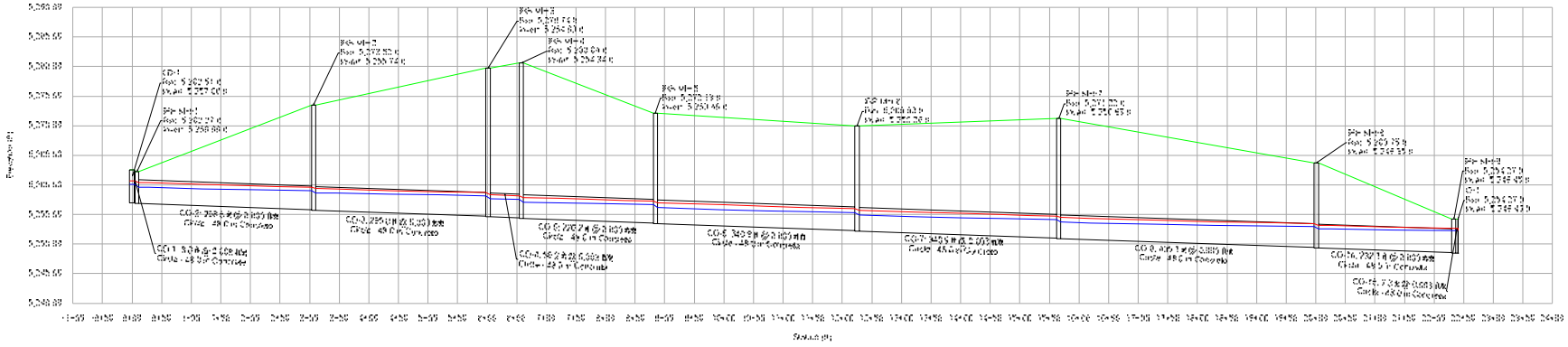
Profile Report

Engineering Profile - South Boulder Canyon Ditch Realignment - 100 Yr (Irrigation Storm.stsw)



Riprap Sizing – S. Boulder Canyon Ditch Outfall

S. Boulder Canyon Ditch - Pipe Outfall

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.00833	ft/ft
Left Side Slope	2.25	ft/ft (H:V)
Right Side Slope	1.75	ft/ft (H:V)
Discharge	66.00	ft^3/s

Results

Normal Depth	2.73	ft
Flow Area	14.92	ft^2
Wetted Perimeter	12.23	ft
Hydraulic Radius	1.22	ft
Top Width	10.92	ft
Critical Depth	2.32	ft
Critical Slope	0.01974	ft/ft
Velocity	4.42	ft/s
Velocity Head	0.30	ft
Specific Energy	3.04	ft
Froude Number	0.67	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.73	ft
Critical Depth	2.32	ft
Channel Slope	0.00833	ft/ft
Critical Slope	0.01974	ft/ft

Galloway

Date: 11-8-2019

Subject: RIPRAP SIZING – OUTFALL – S. BOULDER CANYON DITCH REALIGNMENT

$A_t = \frac{Q}{V}$ $\quad Q = 66$ cfs, $V = 4.42$ fps ⇐ AREA OF FLOW PER UDFCD EQN 9-12

$A_t = \frac{66}{4.42} = 14.93$

$\frac{Y_t}{D} = \frac{2.73}{4} = 0.683$ ⇐ TAILWATER DEPTH / CONDUIT HEIGHT

$\frac{Q}{D^{2.5}} = \frac{66}{(4)^{2.5}} = 2.07$

∴ EXPANSION FACTOR $\frac{1}{2\tan\theta} \approx 6.75$ ⇐ UDFCD FIGURE 9-35

$L_p = \left(\frac{1}{2\tan\theta}\right)\left(\frac{A_t}{Y_t} - W\right)$ ⇐ LENGTH OF PROTECTION PER UDFCD EQN 9-11

$= 6.75\left(\frac{14.93}{2.73} - 4\right) = 9.91$

∴ L_p = 10 ft

$6.75 = \frac{1}{2\tan\theta}$ ∴ $\tan\theta = 0.0741$

$T = 2(L_p \tan\theta) + W$ ⇐ WIDTH OF RIPRAP PER UDFCD EQN 9-14

$= 2(10)(0.0741) + 4$

$= 5.48$

∴ T = 5.5' + 8' EACH SIDE ⇐ 2:1 SLOPE BACK TO EG

$d_{50,min} = \left[\frac{V S^{0.17}}{4.5(G_s - 1)^{0.66}}\right]^2$ $\quad V = 4.42$ fps, $S = 0.0083$ ft/ft, $G_s = 2.5$

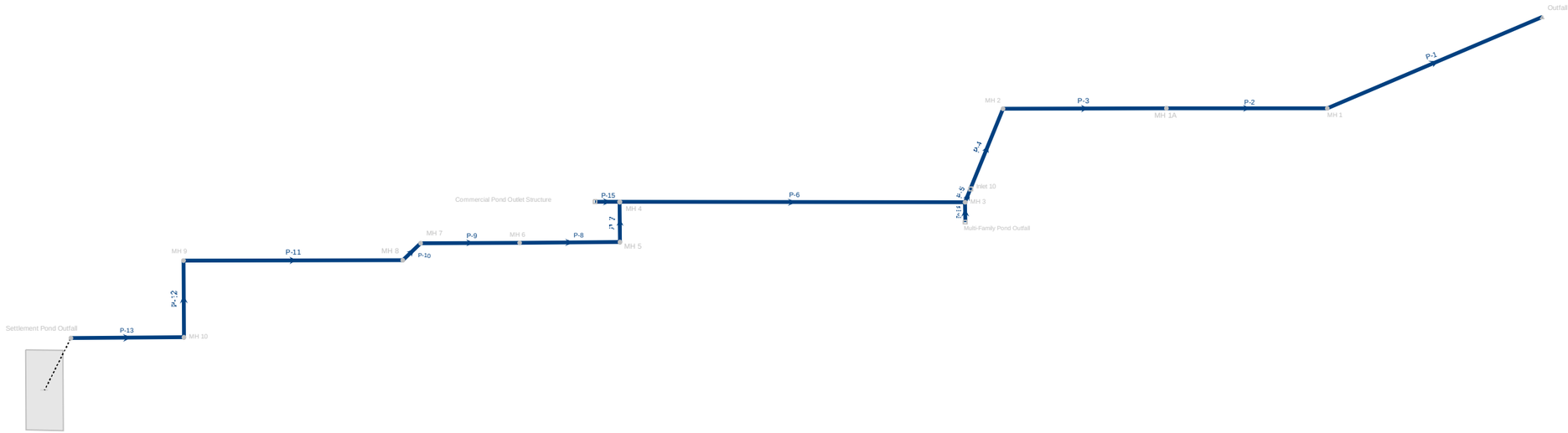
$= \left[\frac{(4.42)(0.0083)^{0.17}}{4.5(2.5-1)^{0.66}}\right]^2$

$= \left(\frac{1.96}{5.88}\right)^2 = 0.111' = 1.5''$

∴ MINIMUM RIPRAP SIZE = TYPE VL, CHOOSE TYPE L

StormCAD Model – Bypass Line

Scenario: 100-Year



Scenario Summary Report
Scenario: 100-Year

Scenario Summary

ID	1
Label	100-Year
Notes	
Active Topology	Base Active Topology
User Data Extensions	Base User Data Extensions
Physical	Base Physical
Boundary Condition	Base Boundary Condition
Initial Settings	Base Initial Settings
Hydrology	Base Hydrology
Output	Base Output
Infiltration and Inflow	Base Infiltration and Inflow
Rainfall Runoff	Base Rainfall Runoff
Water Quality	Base Water Quality
Sanitary Loading	Base Sanitary Loading
Headloss	Base Headloss
Operational	Base Operational
Design	Base Design
System Flows	Base System Flows
SCADA	Base SCADA
Solver Calculation Options	Base Calculation Options

Calculation Options

Calculation Type	Analysis	Include Conduit Flow Travel Time in Design	True
Minimum Time of Concentration	5.0 min	Carryover Modeling Method	As CA (Traditional)

Gravity Hydraulics

Maximum Network Traversals	5	Governing Upstream Pipe Selection Method	Pipe with Maximum QV
Flow Convergence Test	0.00	Structure Loss Mode	Energy Grade
Flow Profile Method	Backwater Analysis	Save Detailed Headloss Data?	False
Number of Flow Profile Steps	5	Gravity Friction Method	Manning's
Hydraulic Grade Convergence Test	0.00 ft	Use Explicit Depth and Slope Equations?	False
Average Velocity Method	Actual Uniform Flow Velocity	Ignore Travel Time in Carrier Pipes?	False
Minimum Structure Headloss	0.00 ft	Correct for Partial Area Effects?	False

Inlets

Active Components for Combination Inlets on Grade	Grate and Curb	Neglect Gutter Cross Slope For Side Flow?	False
Active Components for Combination Inlets In Sag	Grate and Curb	Neglect Side Flow?	False

Scenario Summary Report
Scenario: 100-Year

Pressure Hydraulics			
Liquid Label	Water at 20C (68F)	Pressure Friction Method	Hazen-Williams

Headloss (AASHTO)			
Expansion, Ke	0.35	Shaping Adjustment, Cs	0.50
Contraction, Kc	0.25	Non-Piped Flow Adjustment, Cn	1.30

Bend Angle vs. Bend Loss Curve

Bend Angle (degrees)	Bend Loss Coefficient, Kb
0.00	0.00
15.00	0.19
30.00	0.35
45.00	0.47
60.00	0.56
75.00	0.64
90.00	0.70

HEC-22 Energy Losses			
Elevations Considered Equal Within	0.50 ft	Consider Non-Piped Plunging Flow?	False

HEC-22 Energy Losses (Second Edition)			
Flat Unsubmerged Factor	1.00	Half Bench Submerged Factor	0.95
Flat Submerged Factor	1.00	Full Bench Unsubmerged Factor	0.07
Depressed Unsubmerged Factor	1.00	Full Bench Submerged Factor	0.75
Depressed Submerged Factor	1.00	Improved Bench Unsubmerged Factor	0.04
Half Bench Unsubmerged Factor	0.15	Improved Bench Submerged Factor	0.38

HEC-22 Energy Losses (Third Edition)			
Flat Submerged Coefficient	-0.05	Half Bench Unsubmerged Coefficient	-0.85
Flat Unsubmerged Coefficient	-0.05	Full Bench Submerged Coefficient	-0.25
Depressed Submerged Coefficient	0.00	Full Bench Unsubmerged Coefficient	-0.93
Depressed Unsubmerged Coefficient	0.00	Improved Submerged Coefficient	-0.60
Half Bench Submerged Coefficient	-0.05	Improved Unsubmerged Coefficient	-0.98

Scenario: 100-Year
Current Time Step: 0.0Hr
FlexTable: Conduit Table

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Diameter (in)	Manning's n	Slope (Calculated) (ft/ft)	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
50	P-13	Settlement Pond Outfall	5,252.20	MH 10	5,250.64	209.40	24	0.013	0.007	29.07	9.25	19.52	148.9	5,256.03	5,252.49	5,257.36	5,253.92
53	P-7	MH 5	5,240.24	MH 4	5,239.75	48.88	36	0.013	0.010	27.44	3.88	66.78	41.1	5,243.86	5,243.77	5,244.09	5,244.01
55	P-12	MH 10	5,250.44	MH 9	5,249.91	101.60	36	0.013	0.005	28.86	7.12	48.17	59.9	5,252.18	5,252.11	5,252.90	5,252.53
57	P-15	Commercial Pond Outlet Structure	5,249.65	MH 4	5,248.72	9.30	24	0.013	0.100	26.75	21.13	71.53	37.4	5,251.45	5,249.99	5,252.70	5,252.52
58	P-11	MH 9	5,249.51	MH 8	5,247.66	357.70	36	0.013	0.005	28.73	7.09	47.96	59.9	5,251.24	5,249.33	5,251.96	5,250.11
61	P-14	Multi-Family Pond Outfall	5,235.68	MH 3	5,235.56	22.62	24	0.013	0.005	12.50	3.98	16.48	75.9	5,237.74	5,237.67	5,237.98	5,237.92
64	P-1	MH 1	5,226.01	Outfall	5,224.48	174.80	48	0.013	0.009	70.21	10.81	134.38	52.2	5,228.54	5,226.55	5,229.63	5,228.33
76	P-5	MH 3	5,233.56	Inlet 10	5,233.41	8.30	48	0.013	0.018	66.34	13.94	193.09	34.4	5,236.85	5,236.89	5,237.41	5,237.39
77	P-4	Inlet 10	5,233.21	MH 2	5,231.98	153.55	48	0.013	0.008	70.75	10.48	128.56	55.0	5,235.75	5,235.64	5,236.85	5,236.18
78	P-6	MH 4	5,239.25	MH 3	5,234.56	306.69	36	0.013	0.015	54.07	12.44	82.48	65.6	5,241.64	5,236.33	5,242.89	5,238.74
112	P-10	MH 8	5,247.26	MH 7	5,246.81	86.00	36	0.013	0.005	28.26	7.09	48.24	58.6	5,248.98	5,248.46	5,249.69	5,249.24
115	P-9	MH 7	5,246.61	MH 6	5,244.14	273.81	36	0.013	0.009	28.15	8.70	63.35	44.4	5,248.33	5,245.54	5,249.03	5,246.72
116	P-8	MH 6	5,243.94	MH 5	5,240.44	391.47	36	0.013	0.009	27.86	8.65	63.06	44.2	5,245.65	5,244.04	5,246.35	5,244.28
118	P-3	MH 2	5,231.78	MH 1A	5,229.13	324.82	48	0.013	0.008	70.64	10.54	129.74	54.4	5,234.32	5,231.23	5,235.41	5,232.96
119	P-2	MH 1A	5,228.93	MH 1	5,226.21	332.17	48	0.013	0.008	70.43	10.55	129.98	54.2	5,231.47	5,229.72	5,232.56	5,230.28

Scenario: 100-Year
Current Time Step: 0.0Hr
FlexTable: Manhole Table

ID	Label	Elevation (Ground) (ft)	Set Rim to Ground Elevation?	Elevation (Rim) (ft)	Bolted Cover?	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)
31	Settlement Pond Outfall	5,254.45	True	5,254.45	False	(N/A)	29.07	2.25	5,254.45	5,254.45
33	MH 5	5,259.71	True	5,259.71	False	5,240.44	27.44	3.62	5,243.86	5,244.04
35	MH 10	5,263.75	True	5,263.75	False	5,250.64	28.86	1.74	5,252.18	5,252.75
36	MH 4	5,257.25	True	5,257.25	False	5,239.75	54.07	2.39	5,241.64	5,242.76
37	MH 8	5,262.13	True	5,262.13	False	5,247.66	28.26	1.72	5,248.98	5,249.33
38	MH 9	5,262.98	True	5,262.98	False	5,249.91	28.73	1.73	5,251.24	5,251.82
42	MH 3	5,251.77	True	5,251.77	False	5,235.56	66.34	3.29	5,236.85	5,237.36
45	MH 2	5,250.31	True	5,250.31	False	5,231.98	70.64	2.54	5,234.32	5,235.09
46	MH 1	5,234.07	True	5,234.07	False	5,226.21	70.21	2.53	5,228.54	5,229.20
111	MH 7	5,261.79	True	5,261.79	False	5,246.81	28.15	1.72	5,248.33	5,248.33
114	MH 6	5,262.39	True	5,262.39	False	5,244.14	27.86	1.71	5,245.65	5,245.65
117	MH 1A	5,242.70	True	5,242.70	False	5,229.13	70.43	2.54	5,231.47	5,231.47

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Scenario: 100-Year
Current Time Step: 0.0Hr
FlexTable: Catch Basin Table

ID	Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Capture Efficiency (Calculated) (%)	Flow (Additional Subsurface) (cfs)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
66	Commercial Pond Outlet Structure	5,252.99	5,249.65	100.0	26.75	26.75	5,251.45	5,251.45
68	Multi-Family Pond Outfall	5,252.50	5,235.68	100.0	12.50	12.50	5,237.74	5,237.74
75	Inlet 10	5,252.18	5,233.21	100.0	4.41	70.75	5,236.30	5,235.75

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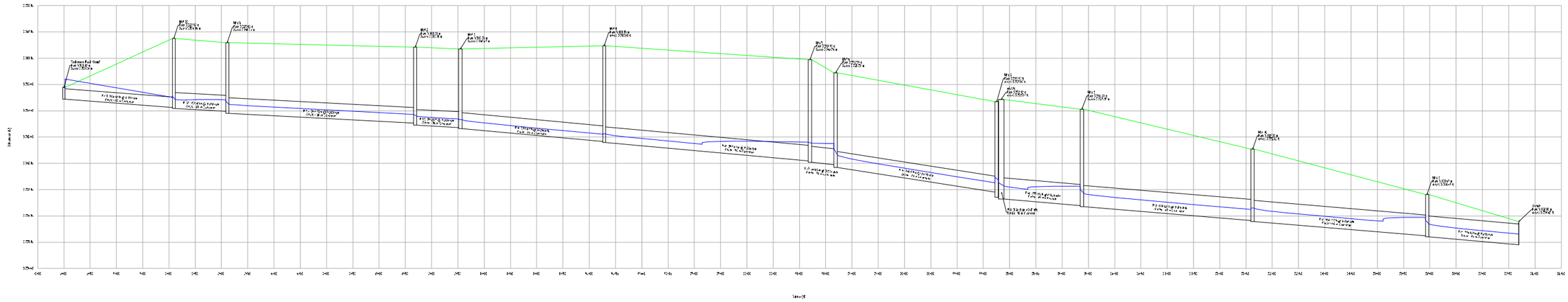
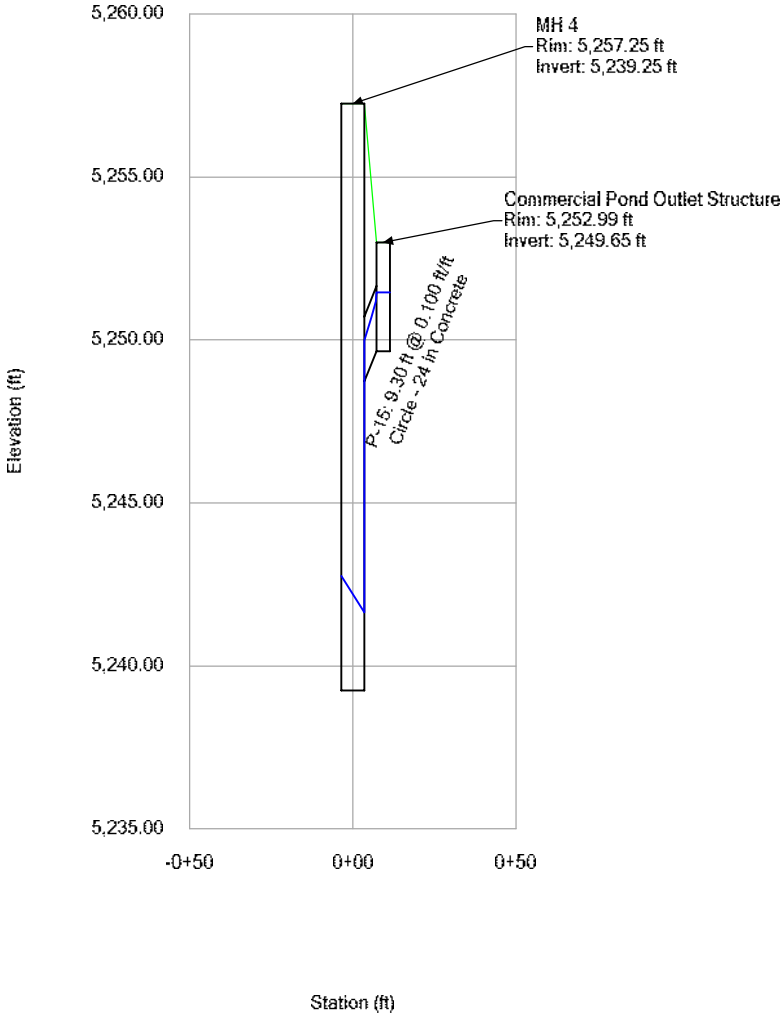
Profile Report

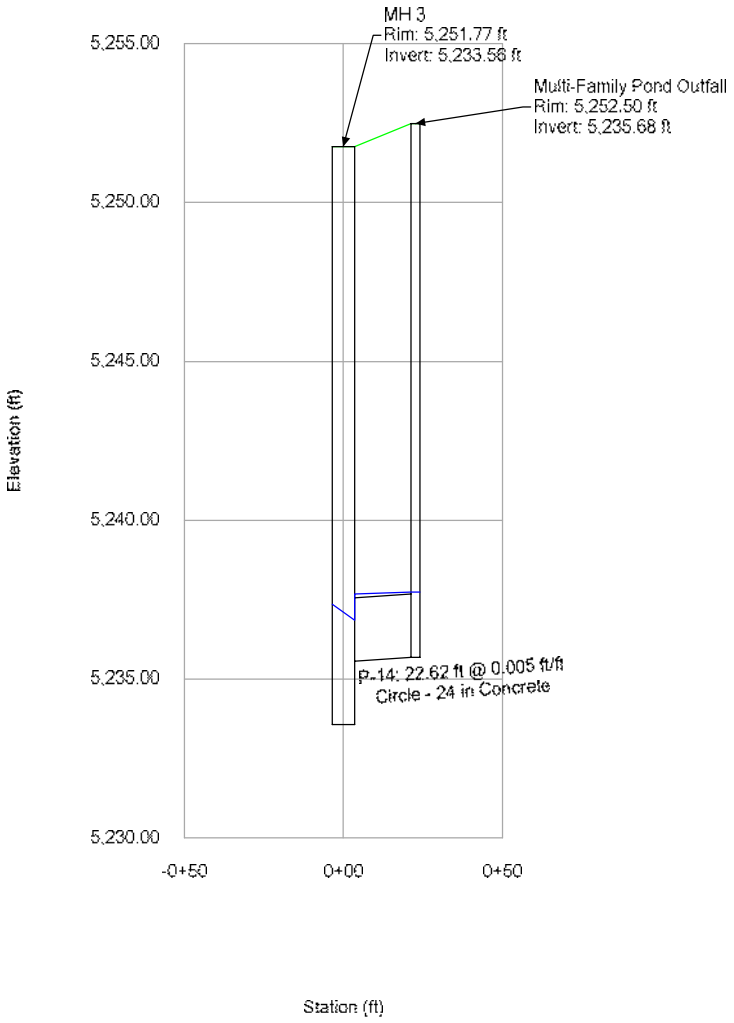
Engineering Profile - Storm Drain Outfall (Settling Pond) (EDI0018_StormCAD-Bypass Line.stsw)



Profile Report
Engineering Profile - Outfall from Detention Pond 1 (Evergreen)
(EDI0018_StormCAD-Bypass Line.stsw)



Profile Report
Engineering Profile - Outfall from Detention Pond 2 (Multi-Family)
(EDI0018_StormCAD-Bypass Line.stsw)

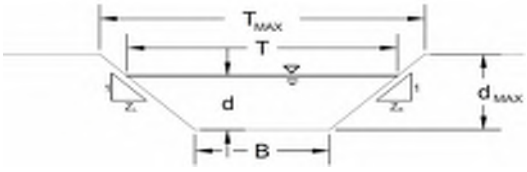


Inlet Capacity Calculations – Roadside Inlet System

AREA INLET IN A SWALE

Nine Mile Corner - Erie, CO

Inlet 11 - Design Point 3



This worksheet uses the NRCS vegetal retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.035	
Channel Invert Slope	S_O =	0.0050	ft/ft
Bottom Width	B =	3.00	ft
Left Side Slope	Z1 =	3.00	ft/ft
Right Side Slope	Z2 =	3.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- ○ Non-Cohesive
- ◉ Cohesive
- ○ Paved

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	14.50	14.50	feet
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	1.90	1.90	feet

Maximum Channel Capacity Based On Allowable Top Width

		Minor Storm	Major Storm	
Max. Allowable Top Width	T_{MAX} =	14.50	14.50	ft
Water Depth	d =	1.92	1.92	ft
Flow Area	A =	16.77	16.77	sq ft
Wetted Perimeter	P =	15.12	15.12	ft
Hydraulic Radius	R =	1.11	1.11	ft
Manning's n	n =	0.035	0.035	
Flow Velocity	V =	3.23	3.23	fps
Velocity-Depth Product	VR =	3.58	3.58	ft^2/s
Hydraulic Depth	D =	1.16	1.16	ft
Froude Number	Fr =	0.53	0.53	
Max. Flow Based On Allowable Top Width	Q_T =	54.1	54.1	cfs

Maximum Channel Capacity Based On Allowable Water Depth

		Minor Storm	Major Storm	
Max. Allowable Water Depth	d_{MAX} =	1.90	1.90	feet
Top Width	T =	14.40	14.40	feet
Flow Area	A =	16.53	16.53	square feet
Wetted Perimeter	P =	15.02	15.02	feet
Hydraulic Radius	R =	1.10	1.10	feet
Manning's n	n =	0.035	0.035	
Flow Velocity	V =	3.21	3.21	fps
Velocity-Depth Product	VR =	3.53	3.53	ft^2/s
Hydraulic Depth	D =	1.15	1.15	feet
Froude Number	Fr =	0.53	0.53	
Max. Flow Based On Allowable Water Depth	Q_d =	53.0	53.0	cfs

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	53.0	53.0	cfs
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	1.90	1.90	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	7.4	38.1	cfs
Water Depth	d =	0.74	1.63	feet
Top Width	T =	7.44	12.81	feet
Flow Area	A =	3.87	12.92	square feet
Wetted Perimeter	P =	7.69	13.34	feet
Hydraulic Radius	R =	0.50	0.97	feet
Manning's n	n =	0.035	0.035	
Flow Velocity	V =	1.90	2.95	fps
Velocity-Depth Product	VR =	0.96	2.85	ft^2/s
Hydraulic Depth	D =	0.52	1.01	feet
Froude Number	Fr =	0.47	0.52	

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Version 4.05 Released March 2017

AREA INLET IN A SWALE

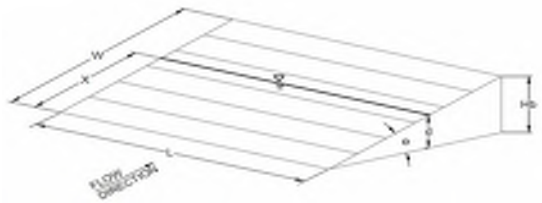
Nine Mile Corner - Erie, CO

Inlet 11 - Design Point 3

Inlet Design Information (Input)

Type of Inlet: CDOT Type D (In Series & Depressed)

Inlet Type = CDOT Type D (In Series & Depressed)



Angle of Inclined Grate (must be <= 30 degrees)	θ =	15.00	degrees
Width of Grate	W =	3.00	feet
Length of Grate	L =	6.00	feet
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	1.55	feet
Clogging Factor	C_f =	0.38	
Grate Discharge Coefficient	C_d =	0.54	
Orifice Coefficient	C_o =	0.36	
Weir Coefficient	C_w =	1.16	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	1.74	2.63	
Grate Capacity as a Weir				
Submerged Side Weir Length	X =	6.00	6.00	feet
Inclined Side Weir Flow	Q_{ws} =	12.1	30.4	cfs
Base Weir Flow	Q_{wb} =	20.0	37.1	cfs
Interception without Clogging	Q_{wi} =	44.1	98.0	cfs
Interception with Clogging	Q_{wa} =	27.5	61.2	cfs
Grate Capacity as an Orifice				
Interception without Clogging	Q_{oi} =	66.4	81.7	cfs
Interception with Clogging	Q_{oa} =	41.5	51.1	cfs
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**27.5**	**51.1**	**cfs**
	Bypassed Flow, Q_b =	**0.0**	**0.0**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	**%**

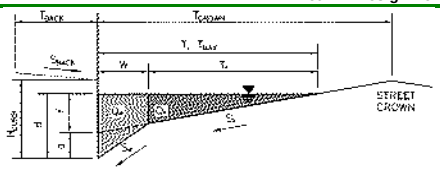
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, CO

Inlet ID: Inlet 12 - Design Point 4



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	32.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	22.0	32.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	5.28	7.68	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline	d =	6.79	9.19	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	20.0	30.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.269	0.181	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

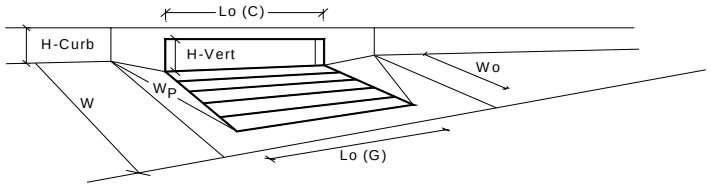
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	18.7	43.7	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	16.7	41.7	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.318	0.130	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	9.2	inches
Grate Information		MINOR	MAJOR	ì^ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.06	0.06	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	11.2	28.8	cfs
Interception with Clogging	Q_{wa} =	10.5	27.0	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	19.5	23.9	cfs
Interception with Clogging	Q_{oa} =	18.3	22.4	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	13.7	24.4	cfs
Interception with Clogging	Q_{ma} =	12.9	22.9	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**10.5**	**22.4**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	18.7	32.0	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.60	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.87	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**10.5**	**22.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.2	11.6	cfs

Culvert Capacity Calculations – Highway 287

Culvert Report

Culvert - Highway 287

Invert Elev Dn (ft)	=	5271.12
Pipe Length (ft)	=	116.10
Slope (%)	=	2.05
Invert Elev Up (ft)	=	5273.50
Rise (in)	=	24.0
Shape	=	Box
Span (in)	=	48.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Flared Wingwalls
Culvert Entrance	=	30D to 75D wingwall flares
Coeff. K,M,c,Y,k	=	0.026, 1, 0.0347, 0.81, 0.4

Embankment

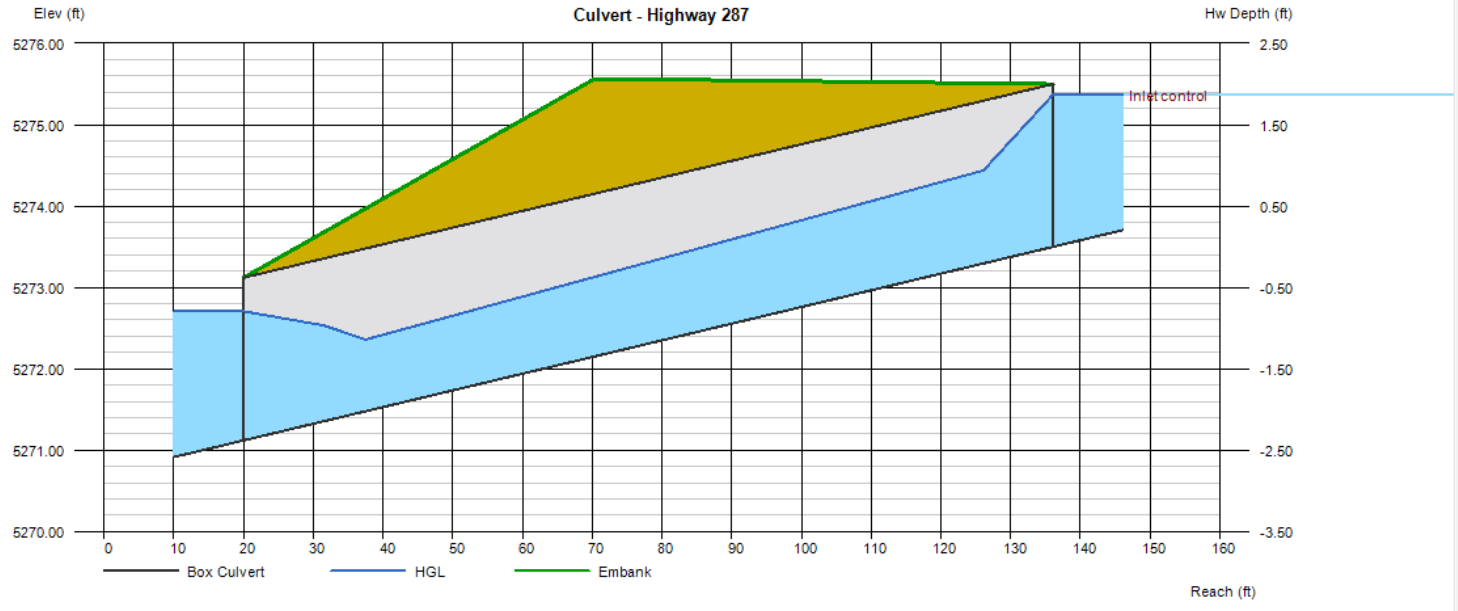
Top Elevation (ft)	=	5275.55
Top Width (ft)	=	16.00
Crest Width (ft)	=	10.00

Calculations

Qmin (cfs)	=	28.82
Qmax (cfs)	=	28.82
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	28.82
Qpipe (cfs)	=	28.82
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.54
Veloc Up (ft/s)	=	6.14
HGL Dn (ft)	=	5272.71
HGL Up (ft)	=	5274.67
Hw Elev (ft)	=	5275.37
Hw/D (ft)	=	0.94
Flow Regime	=	Inlet Control



Grass-Lined Channel Capacity Calculations – Highway 287

Grass Swale - Basin 2 - 100-Yr Runoff

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.50	%
Bottom Width	6.00	ft
Discharge	28.82	ft^3/s

Results

Normal Depth	1.57	ft
Flow Area	9.41	ft^2
Wetted Perimeter	9.14	ft
Hydraulic Radius	1.03	ft
Top Width	6.00	ft
Critical Depth	0.90	ft
Critical Slope	0.02624	ft/ft
Velocity	3.06	ft/s
Velocity Head	0.15	ft
Specific Energy	1.71	ft
Froude Number	0.43	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.57	ft
Critical Depth	0.90	ft
Channel Slope	0.50	%
Critical Slope	0.02624	ft/ft

Grass Swale - Basin 3 - 100-Yr Runoff

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.50	%
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	38.07	ft³/s

Results

Normal Depth	1.52	ft
Flow Area	13.74	ft²
Wetted Perimeter	15.50	ft
Hydraulic Radius	0.89	ft
Top Width	15.13	ft
Critical Depth	1.10	ft
Critical Slope	0.02084	ft/ft
Velocity	2.77	ft/s
Velocity Head	0.12	ft
Specific Energy	1.64	ft
Froude Number	0.51	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.52	ft
Critical Depth	1.10	ft
Channel Slope	0.50	%

Grass Swale - Basin 3 - 100-Yr Runoff

GVF Output Data

Critical Slope	0.02084	ft/ft

Grass-Lined Channel Capacity and Riprap Calculations – N. 111th Street

Ex. 111th St Channel | Nine Mile Corner & W. Parcel Developed 100-Yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.02000	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Discharge	74.99	ft^3/s

Results

Normal Depth	1.84	ft
Flow Area	13.49	ft^2
Wetted Perimeter	15.14	ft
Hydraulic Radius	0.89	ft
Top Width	14.69	ft
Critical Depth	1.85	ft
Critical Slope	0.01907	ft/ft
Velocity	5.56	ft/s
Velocity Head	0.48	ft
Specific Energy	2.32	ft
Froude Number	1.02	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.84	ft
Critical Depth	1.85	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.01907	ft/ft

Galloway

Date: 8-16-2019

Subject: RIPRAP SIZING - OUTFALL - 111TH ST. CHANNEL

$A_t = \frac{Q}{V}$ $\quad Q = 74.99$ cfs, $V = 5.56$ fps ⇐ Area of Flow per UDFCD Eqn. 9-12

$A_t = \frac{74.99}{5.56} = 13.49$

$\frac{Y_t}{D} = \frac{1.84}{4} = 0.46$ ⇐ Tailwater depth/conduit height

$\frac{Q}{D^{2.5}} = \frac{74.99}{(4)^{2.5}} = 2.34$

∴ Expansion Factor $\frac{1}{2\tan\theta} \approx 6$ ⇐ UDFCD Figure 9-35

$L_p = \left(\frac{1}{2\tan\theta}\right)\left(\frac{A_t}{Y_t} - W\right)$ ⇐ Length of protection per UDFCD Eqn. 9-11

$= 6\left(\frac{13.49}{1.84} - 4\right) = 19.99$

∴ $L_p = \underline{20\text{ ft}}$

$6 = \frac{1}{2\tan\theta} \Rightarrow \tan\theta = 0.083$

$T = 2(L_p \tan\theta) + W$ ⇐ Width of riprap per UDFCD Eqn. 9-14

$= 2(20)(0.083) + 4$

$= 7.32$ ∴ $T = 7.5' + 8'$ each side ⇐ 4:1 slope back to EG

$d_{50,min} = \left(\frac{V S^{0.17}}{4.5(G_s - 1)^{0.66}}\right)^2$ $\quad V = 5.56$ fps, $S = 0.02$ ft/ft, $G_s = 2.5$

$= \left(\frac{(5.56)(0.02)^{0.17}}{4.5(2.5-1)^{0.66}}\right)^2$

$= 0.236' = 3''$

∴ Min. riprap size = Type VL, Choose Type L

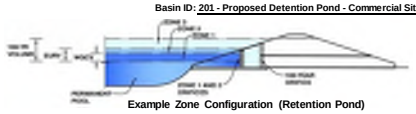
Full Spectrum Detention – Commercial Area

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Nine Mile Corner - Erie, CO

Basin ID: 201 - Proposed Detention Pond - Commercial Site



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	31.23	acres
Watershed Length =	1,435	ft
Watershed Slope =	0.023	ft/ft
Watershed Imperviousness =	76.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Erie	
Water Quality Capture Volume (WQCV) =	0.794	acre-feet
Excess Urban Runoff Volume (EURV) =	2.624	acre-feet
2-yr Runoff Volume (P1 = 0.81 in.) =	1.505	acre-feet
5-yr Runoff Volume (P1 = 1.11 in.) =	2.154	acre-feet
10-yr Runoff Volume (P1 = 1.39 in.) =	2.889	acre-feet
25-yr Runoff Volume (P1 = 1.84 in.) =	4.130	acre-feet
50-yr Runoff Volume (P1 = 2.24 in.) =	5.110	acre-feet
100-yr Runoff Volume (P1 = 2.68 in.) =	6.358	acre-feet
500-yr Runoff Volume (P1 = 3.89 in.) =	9.641	acre-feet
Approximate 2-yr Detention Volume =	1.411	acre-feet
Approximate 5-yr Detention Volume =	2.025	acre-feet
Approximate 10-yr Detention Volume =	2.715	acre-feet
Approximate 25-yr Detention Volume =	3.373	acre-feet
Approximate 50-yr Detention Volume =	3.793	acre-feet
Approximate 100-yr Detention Volume =	4.297	acre-feet

Optional User Override 1-hr Precipitation	
	inches
	inches
	inches
	inches
	inches
	inches

Stage-Storage Calculation

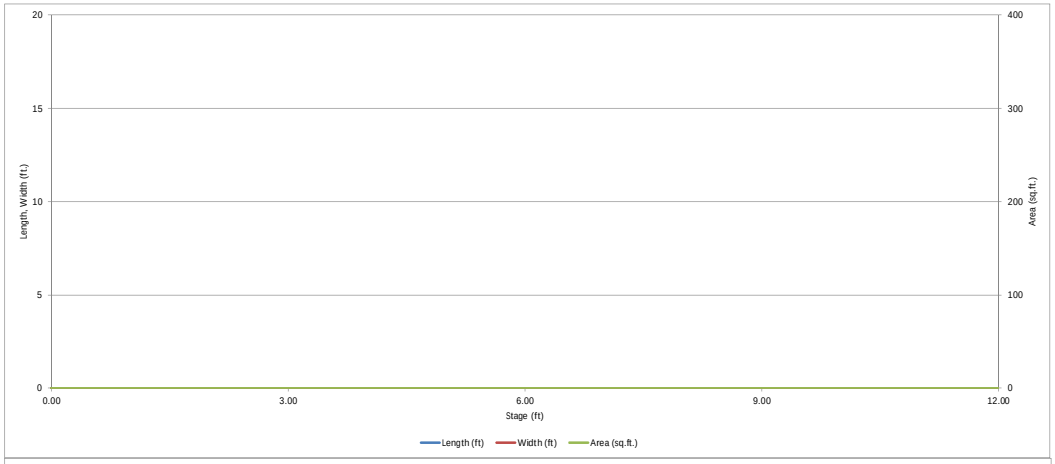
Zone 1 Volume (WQCV) =	0.794	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.830	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.673	acre-feet
Total Detention Basin Volume =	4.297	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

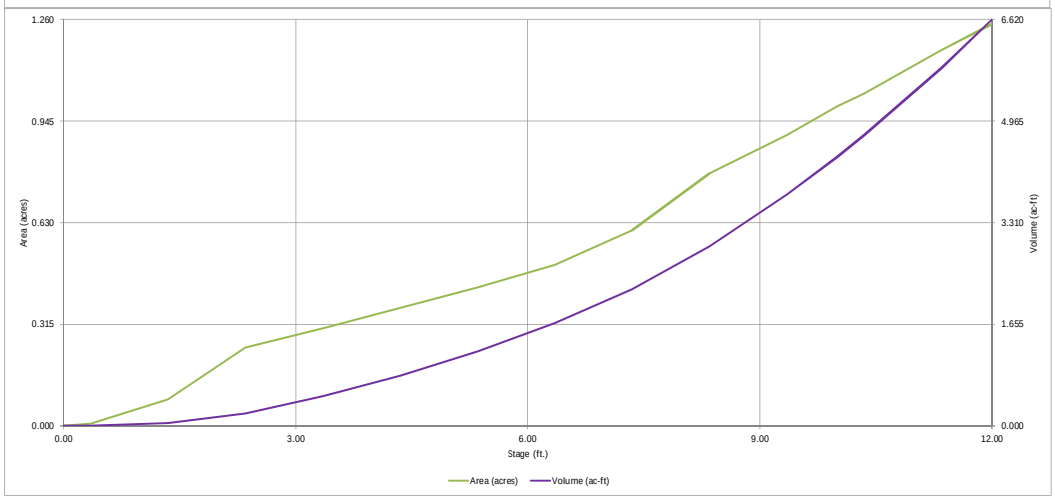
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	10	0.000		
5250	--	0.35	--	--	--	305	0.007	52	0.001
5251	--	1.35	--	--	--	3,575	0.082	1,959	0.045
5252	--	2.35	--	--	--	10,604	0.243	9,085	0.209
5253	--	3.35	--	--	--	13,195	0.303	20,984	0.482
5254	--	4.35	--	--	--	15,904	0.365	35,534	0.816
5255	--	5.35	--	--	--	18,738	0.430	52,855	1.213
5256	--	6.35	--	--	--	21,690	0.498	73,069	1.677
5257	--	7.35	--	--	--	26,414	0.606	97,121	2.230
5258	--	8.35	--	--	--	34,086	0.783	127,371	2.924
5259	--	9.35	--	--	--	39,269	0.901	164,048	3.766
5259.65 (SPWY)	--	10.00	--	--	--	43,156	0.991	190,836	4.381
5260	--	10.35	--	--	--	44,850	1.030	206,237	4.735
5261	--	11.35	--	--	--	50,781	1.166	254,053	5.832
5261.65 (TOB)	--	12.00	--	--	--	54,244	1.245	288,186	6.616

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



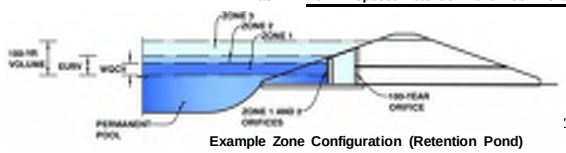


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Nine Mile Corner - Erie, CO

Basin ID: 201 - Proposed Detention Pond - Commercial Site



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.29	0.794	Orifice Plate
Zone 2 (EURV)	7.95	1.830	Circular Orifice
Zone 3 (100-year)	9.92	1.673	Weir&Pipe (Restrict)
		4.297	Total

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

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

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)

			Calculated Parameters for Plate		
Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.736E-02	ft^2
Depth at top of Zone using Orifice Plate =	4.13	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 =	2.50	sq. inches (diameter = 1-3/4 inches)	Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.38	2.75					
Orifice Area (sq. inches)	2.50	2.50	2.50					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected		Calculated Parameters for Vertical Orifice	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	4.13	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.79	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	7.09	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.50	N/A	feet
Vertical Orifice Diameter =	12.00	N/A	inches				

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

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	7.10	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	8.77	N/A	feet
Overflow Weir Front Edge Length =	2.92	N/A	feet	Over Flow Weir Slope Length =	6.88	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)	Grate Open Area / 100-yr Orifice Area =	7.79	N/A	should be ≥ 4
Horiz. Length of Weir Sides =	6.67	N/A	feet	Overflow Grate Open Area w/o Debris =	14.05	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	7.03	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

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

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.80	N/A	ft^2
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.64	N/A	feet
Restrictor Plate Height Above Pipe Invert =	13.40		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.69	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

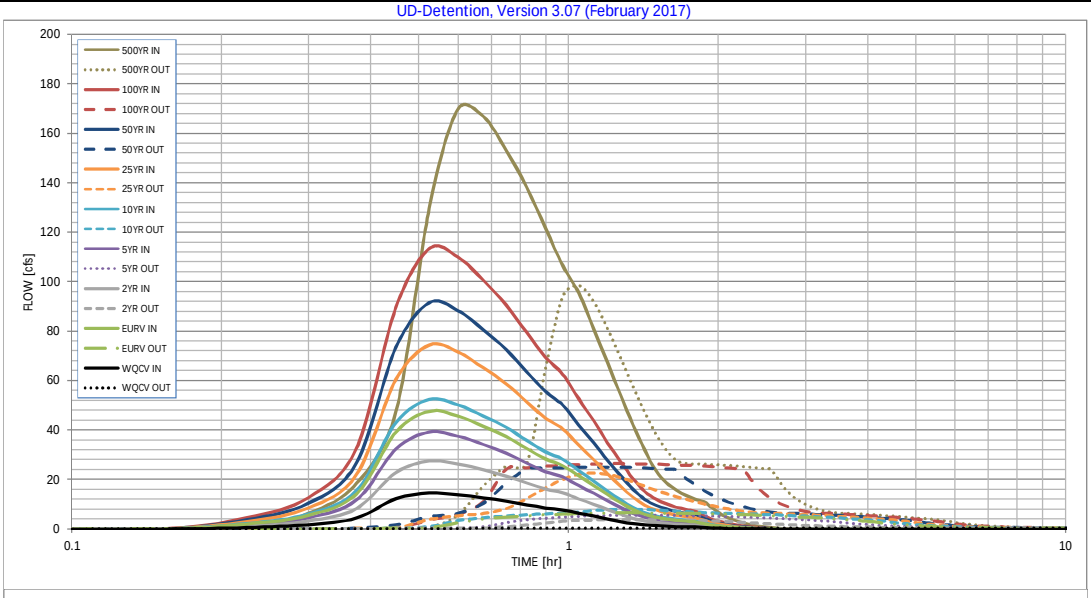
			Calculated Parameters for Spillway		
Spillway Invert Stage=	10.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.95	feet
Spillway Crest Length =	40.00	feet	Stage at Top of Freeboard =	10.95	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.11	acres
Freeboard above Max Water Surface =	0.00	feet			

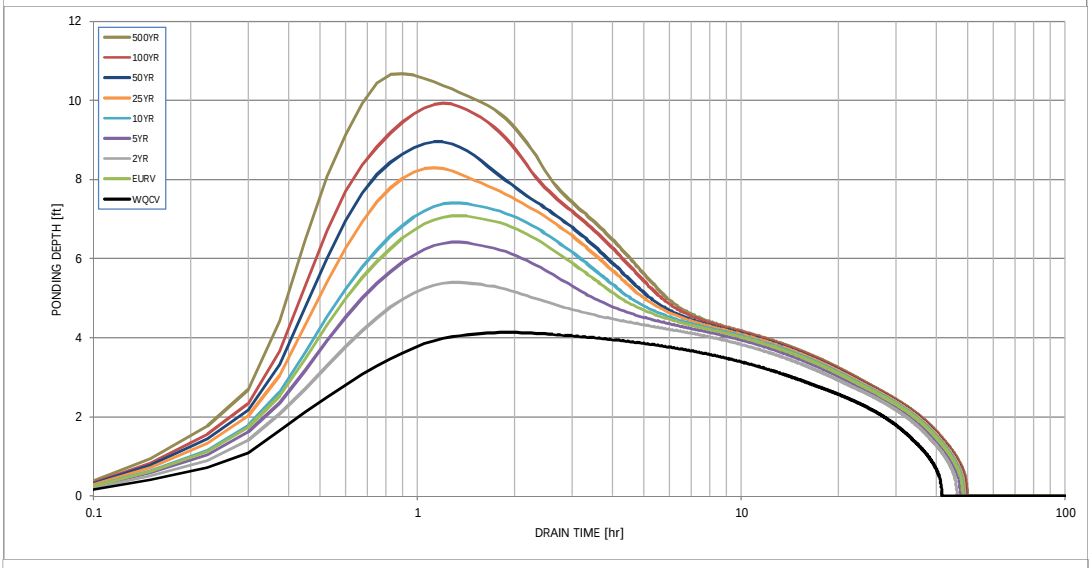
Routed Hydrograph Results

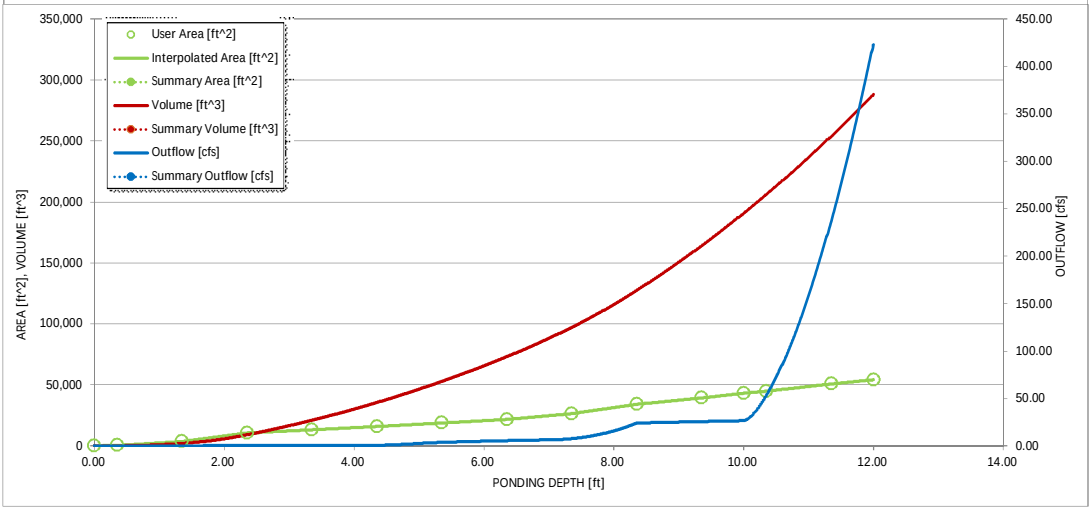
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	0.81	1.11	1.39	1.84	2.24	2.68	3.89
Calculated Runoff Volume (acre-ft) =	0.794	2.624	1.505	2.154	2.889	4.130	5.110	6.358	9.641
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.792	2.621	1.502	2.152	2.886	4.126	5.096	6.346	9.622
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.19	0.69	1.04	1.49	2.55
Predevelopment Peak Q (cfs) =	0.0	0.0	0.3	0.6	5.8	21.7	32.5	46.4	79.7
Peak Inflow Q (cfs) =	14.6	47.6	27.5	39.2	52.4	74.5	91.5	113.4	170.0
Peak Outflow Q (cfs) =	0.4	6.5	3.8	5.6	8.0	22.7	25.1	26.5	98.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	10.2	1.4	1.0	0.8	0.6	1.2
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	1.0	1.2	1.2	1.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	38	39	39	38	36	34	32	27
Time to Drain 99% of Inflow Volume (hours) =	40	44	44	44	44	43	42	41	39
Maximum Ponding Depth (ft) =	4.13	7.09	5.40	6.41	7.41	8.30	8.96	9.93	10.68
Area at Maximum Ponding Depth (acres) =	0.35	0.58	0.43	0.50	0.62	0.77	0.86	0.98	1.07
Maximum Volume Stored (acre-ft) =	0.737	2.070	1.235	1.707	2.266	2.885	3.423	4.312	5.082

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







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

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename: _____

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

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

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
4.49 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:04:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:08:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:13:28	0.64	2.03	1.19	1.68	2.22	3.09	3.73	4.49	6.29
1.112	0:17:58	1.74	5.57	3.24	4.60	6.11	8.59	10.45	12.77	18.47
	0:22:27	4.47	14.29	8.33	11.81	15.69	22.05	26.83	32.78	47.46
	0:26:56	12.28	39.23	22.88	32.42	43.05	60.46	73.52	89.77	129.73
	0:31:26	14.61	47.63	27.50	39.22	52.38	74.45	91.54	113.41	169.96
	0:35:55	13.96	45.66	26.31	37.57	50.23	71.63	88.38	110.01	166.87
	0:40:25	12.71	41.56	23.95	34.19	45.71	65.24	80.62	100.55	153.19
	0:44:54	11.36	37.37	21.48	30.71	41.12	58.77	72.66	90.66	138.23
	0:49:23	9.82	32.56	18.64	26.72	35.86	51.41	63.65	79.55	121.69
	0:53:53	8.55	28.35	16.20	23.23	31.24	44.88	55.62	69.57	106.56
	0:58:22	7.75	25.66	14.69	21.05	28.27	40.51	50.13	62.59	95.51
	1:02:52	6.41	21.43	12.22	17.56	23.62	33.95	42.11	52.74	81.01
	1:07:21	5.24	17.71	10.05	14.49	19.53	28.13	34.94	43.80	67.39
	1:11:50	4.05	13.94	7.85	11.37	15.39	22.29	27.77	34.93	54.11
	1:16:20	3.03	10.68	5.95	8.68	11.82	17.21	21.51	27.14	42.24
	1:20:49	2.19	7.91	4.35	6.40	8.76	12.86	16.13	20.42	31.98
	1:25:19	1.69	5.97	3.32	4.85	6.61	9.64	12.05	15.20	23.65
	1:29:48	1.39	4.84	2.71	3.94	5.35	7.75	9.66	12.14	18.76
	1:34:17	1.18	4.08	2.29	3.33	4.51	6.53	8.12	10.20	15.72
	1:38:47	1.03	3.56	2.00	2.90	3.93	5.68	7.06	8.85	13.60
	1:43:16	0.93	3.19	1.80	2.60	3.52	5.08	6.31	7.90	12.11
	1:47:46	0.86	2.92	1.65	2.39	3.23	4.65	5.77	7.22	11.05
	1:52:15	0.63	2.16	1.22	1.77	2.39	3.47	4.33	5.45	8.48
	1:56:44	0.46	1.57	0.89	1.28	1.74	2.51	3.13	3.94	6.11
	2:01:14	0.34	1.16	0.65	0.95	1.28	1.86	2.31	2.92	4.54
	2:05:43	0.25	0.86	0.48	0.70	0.95	1.38	1.72	2.17	3.37
	2:10:13	0.18	0.63	0.35	0.51	0.69	1.01	1.26	1.60	2.49
	2:14:42	0.13	0.45	0.25	0.36	0.50	0.73	0.91	1.15	1.80
	2:19:11	0.09	0.33	0.18	0.26	0.36	0.53	0.66	0.83	1.30
	2:23:41	0.06	0.22	0.12	0.18	0.25	0.37	0.46	0.59	0.93
	2:28:10	0.04	0.14	0.08	0.11	0.16	0.24	0.30	0.38	0.61
	2:32:40	0.02	0.08	0.04	0.06	0.09	0.14	0.17	0.22	0.37
	2:37:09	0.01	0.03	0.02	0.03	0.04	0.06	0.08	0.11	0.18
	2:41:38	0.00	0.01	0.00	0.01	0.01	0.02	0.02	0.03	0.06
	2:46:08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:59:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:04:05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:08:35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:13:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:17:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:22:03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:26:32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:31:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:44:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:48:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:53:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:57:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:02:28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:06:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:11:26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:24:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:29:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:33:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:38:23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:42:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:47:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:51:51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:56:20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:09:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:14:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:18:47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:23:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Trickle Channel - 1% of 100-Year Event

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Bottom Width	4.00	ft
Discharge	1.21	ft^3/s

Results

Normal Depth	0.14	ft
Flow Area	0.57	ft^2
Wetted Perimeter	4.29	ft
Hydraulic Radius	0.13	ft
Top Width	4.00	ft
Critical Depth	0.14	ft
Critical Slope	0.00518	ft/ft
Velocity	2.11	ft/s
Velocity Head	0.07	ft
Specific Energy	0.21	ft
Froude Number	0.98	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.14	ft
Critical Depth	0.14	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00518	ft/ft

Emergency Spillway Sizing

Project Description

Solve For	Discharge

Input Data

Headwater Elevation		5260.60	ft
Crest Elevation		5259.65	ft
Tailwater Elevation		5259.65	ft
Crest Surface Type	Gravel		
Crest Breadth		2.00	ft
Crest Length		40.00	ft

Results

Discharge	114.34	ft^3/s
Headwater Height Above Crest	0.95	ft
Tailwater Height Above Crest	0.00	ft
Weir Coefficient	3.09	US
Submergence Factor	1.00	
Adjusted Weir Coefficient	3.09	US
Flow Area	38.00	ft^2
Velocity	3.01	ft/s
Wetted Perimeter	41.90	ft
Top Width	40.00	ft

Galloway

Date: 11-9-2019

Subject: FOREBAY DESIGN

MIN. FOREBAY VOLUME = 3% OF WQCV

WQCV = 0.731 AC-FT ← UD-DETENTION SPREADSHEET

$V_{F,MIN} = (0.03)(0.731)$
$= 0.0219$ AC-FT
$= 955$ CF

MAX DEPTH = 30"

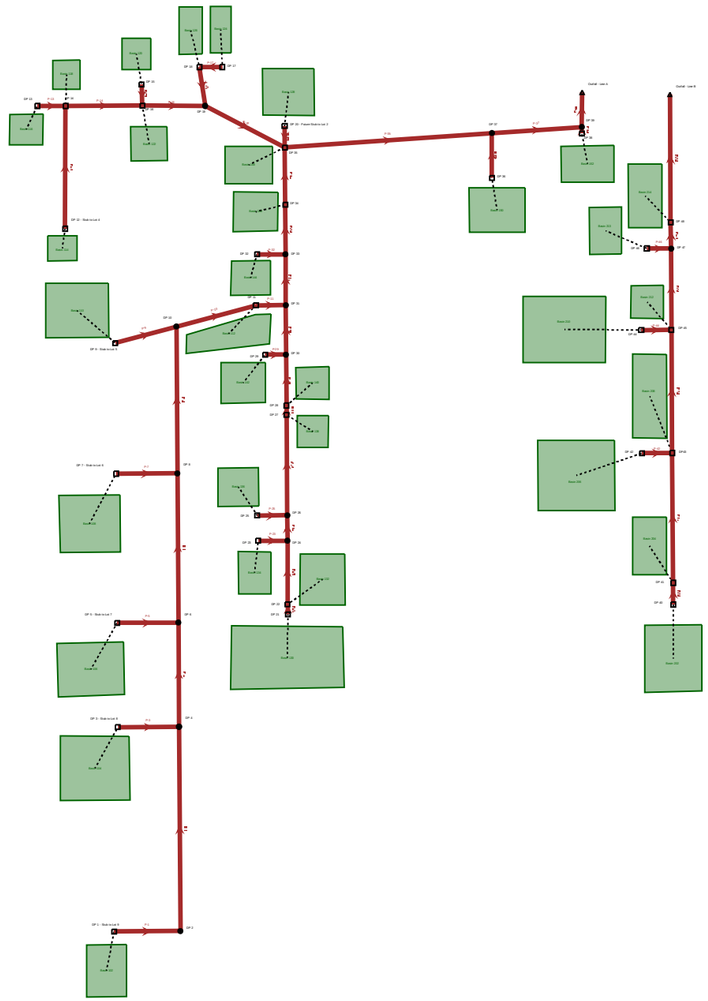
RELEASE 2% OF 100-YR PEAK DISCHARGE
W/ BERM/PIPE CONFIGURATION

$2\% \times Q_{100,PEAK} = (0.02)(100.7\ cfs)$
$= 2.01$ cfs

PER FLOWMASTER CALC 10" PVC PIPE REQUIRED

StormCAD Model – Commercial Site

Scenario: 100-Yr Runoff



Scenario Summary Report
Scenario: 100-Yr Runoff

Scenario Summary

ID	708
Label	100-Yr Runoff
Notes	
Active Topology	<I> Base Active Topology
User Data Extensions	<I> Base User Data Extensions
Physical	<I> Base Physical
Boundary Condition	<I> Base Boundary Condition
Initial Settings	<I> Base Initial Settings
Hydrology	<I> Base Hydrology
Output	<I> Base Output
Infiltration and Inflow	<I> Base Infiltration and Inflow
Rainfall Runoff	<I> Base Rainfall Runoff
Water Quality	<I> Base Water Quality
Sanitary Loading	<I> Base Sanitary Loading
Headloss	<I> Base Headloss
Operational	<I> Base Operational
Design	<I> Base Design
System Flows	100-Yr Runoff - System Flows Alternative - 1
SCADA	<I> Base SCADA
Solver Calculation Options	<I> Base Calculation Options

Calculation Options

Calculation Type	Analysis	Include Conduit Flow Travel Time in Design	True
Minimum Time of Concentration	0.083 hours	Carryover Modeling Method	As CA (Traditional)

Gravity Hydraulics

Maximum Network Traversals	5	Governing Upstream Pipe Selection Method	Pipe with Maximum QV
Flow Convergence Test	0.001	Structure Loss Mode	Hydraulic Grade
Flow Profile Method	Backwater Analysis	Save Detailed Headloss Data?	False
Number of Flow Profile Steps	5	Gravity Friction Method	Manning's
Hydraulic Grade Convergence Test	0.00 ft	Use Explicit Depth and Slope Equations?	False
Average Velocity Method	Actual Uniform Flow Velocity	Ignore Travel Time in Carrier Pipes?	False
Minimum Structure Headloss	0.00 ft	Correct for Partial Area Effects?	False

Inlets

Active Components for Combination Inlets on Grade	Grate and Curb	Neglect Gutter Cross Slope For Side Flow?	False

Scenario Summary Report
Scenario: 100-Yr Runoff

Inlets			
Active Components for Combination Inlets In Sag	Grate and Curb	Neglect Side Flow?	False

Pressure Hydraulics			
Liquid Label	Water at 20C (68F)	Pressure Friction Method	Hazen-Williams

Headloss (AASHTO)			
Expansion, Ke	0.350	Shaping Adjustment, Cs	0.500
Contraction, Kc	0.250	Non-Piped Flow Adjustment, Cn	1.300

Bend Angle vs. Bend Loss Curve

Bend Angle (degrees)	Bend Loss Coefficient, Kb
0.00	0.000
15.00	0.190
30.00	0.350
45.00	0.470
60.00	0.560
75.00	0.640
90.00	0.700

HEC-22 Energy Losses			
Elevations Considered Equal Within	0.50 ft	Consider Non-Piped Plunging Flow?	False

HEC-22 Energy Losses (Second Edition)			
Flat Unsubmerged Factor	1.000	Half Bench Submerged Factor	0.950
Flat Submerged Factor	1.000	Full Bench Unsubmerged Factor	0.070
Depressed Unsubmerged Factor	1.000	Full Bench Submerged Factor	0.750
Depressed Submerged Factor	1.000	Improved Bench Unsubmerged Factor	0.035
Half Bench Unsubmerged Factor	0.150	Improved Bench Submerged Factor	0.375

HEC-22 Energy Losses (Third Edition)			
Flat Submerged Coefficient	-0.050	Half Bench Unsubmerged Coefficient	-0.850
Flat Unsubmerged Coefficient	-0.050	Full Bench Submerged Coefficient	-0.250
Depressed Submerged Coefficient	0.000	Full Bench Unsubmerged Coefficient	-0.930

Scenario: 100-Yr Runoff
Current Time Step: 0.00Hr
FlexTable: Catchment Table

Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (min)	Flow (Total Out) (cfs)
Basin 114	DP 12 - Stub to Lot 4	0.860	0.850	5.00	6.69
Basin 116	DP 13	0.230	0.850	5.00	1.79
Basin 118	DP 14	0.840	0.740	5.00	5.69
Basin 120	DP 15	0.180	0.850	5.00	1.40
Basin 122	DP 16	0.510	0.850	5.00	3.97
Basin 202	DP 40	3.270	0.690	7.80	18.33
Basin 204	DP 41	1.290	0.850	5.00	10.04
Basin 206	DP 42	0.700	0.850	5.00	5.45
Basin 208	DP43	1.210	0.850	5.00	9.42
Basin 210	DP 44	0.780	0.850	5.00	6.07
Basin 212	DP 45	0.490	0.088	5.00	0.39
Basin 213	DP 46	0.500	0.880	5.00	4.03
Basin 214	DP 48	0.340	0.900	5.00	2.80
Basin 102	DP 1 - Stub to Lot 9	1.020	0.850	5.00	7.94
Basin 104	DP 3 - Stub to Lot 8	1.290	0.850	5.00	10.04
Basin 130	DP 21	7.490	0.730	7.30	45.43
Basin 106	DP 5 - Stub to Lot 7	0.700	0.850	5.00	5.45
Basin 108	DP 7 - Stub to Lot 6	1.210	0.850	5.00	9.42
Basin 110	DP 9 - Stub to Lot 5	0.780	0.850	5.00	6.07
Basin 112	DP 11	0.490	0.880	5.00	3.95
Basin 132	DP 22	0.890	0.890	6.10	6.93
Basin 134	DP 23	0.740	0.880	5.00	5.96
Basin 136	DP 25	0.460	0.880	5.00	3.71
Basin 128	DP 20 - Future Stub to Lot 2	0.690	0.850	5.00	5.37
Basin 124	DP 17	0.050	0.850	5.00	0.39
Basin 126	DP 18	0.090	0.820	5.00	0.68
Basin 142	DP 29	0.490	0.880	5.00	3.95
Basin 144	DP 32	0.500	0.880	5.00	4.03
Basin 146	DP 34	0.190	0.870	5.00	1.51
Basin 148	DP 35	0.460	0.850	5.00	3.58
Basin 140	DP 28	0.400	0.800	5.00	2.93
Basin 138	DP 27	0.250	0.890	5.00	2.04
Basin 150	DP 36	0.630	0.850	5.00	4.90
Basin 152	DP 38	0.310	0.890	5.00	2.53

Scenario: 100-Yr Runoff
Current Time Step: 0.000Hr
FlexTable: Catch Basin Table

ID	Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Capture Efficiency (Calculated) (%)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
672	DP 14	5,259.48	5,254.81	100.0	18.45	5,258.49	5,258.49
673	DP 16	5,258.81	5,254.11	100.0	31.69	5,257.79	5,257.79
674	DP 18	5,258.26	5,254.01	100.0	0.90	5,257.26	5,257.26
675	DP 17	5,258.25	5,254.36	100.0	0.39	5,257.26	5,257.26
676	DP 12 - Stub to Lot 4	5,261.51	5,255.71	100.0	6.69	5,258.61	5,258.61
677	DP 1 - Stub to Lot 9	5,271.37	5,259.02	100.0	7.94	5,261.34	5,261.34
678	DP 3 - Stub to Lot 8	5,267.48	5,257.69	100.0	10.04	5,261.05	5,261.05
679	DP 5 - Stub to Lot 7	5,266.13	5,256.95	100.0	5.45	5,260.72	5,260.72
680	DP 7 - Stub to Lot 6	5,265.19	5,256.06	100.0	9.42	5,260.32	5,260.32
681	DP 9 - Stub to Lot 5	5,264.18	5,255.22	100.0	6.07	5,259.16	5,259.16
682	DP 11	5,260.85	5,254.32	100.0	34.96	5,258.38	5,258.38
683	DP 28	5,261.07	5,254.68	100.0	63.49	5,258.24	5,258.24
684	DP 27	5,261.48	5,254.93	100.0	60.97	5,258.28	5,258.28
685	DP 25	5,261.33	5,257.69	100.0	3.71	5,258.48	5,258.48
686	DP 22	5,261.50	5,256.32	100.0	51.90	5,258.87	5,258.87
687	DP 21	5,261.53	5,256.56	100.0	45.39	5,258.89	5,258.89
688	DP 23	5,261.21	5,257.95	100.0	5.96	5,258.96	5,258.96
689	DP 42	5,263.56	5,253.90	100.0	5.45	5,259.41	5,259.41
690	DP 44	5,263.60	5,253.07	100.0	6.07	5,258.28	5,258.28
691	DP 40	5,263.58	5,253.44	100.0	18.33	5,258.89	5,258.89
692	DP 41	5,262.12	5,253.13	100.0	27.14	5,258.71	5,258.71
693	DP43	5,262.70	5,252.26	100.0	39.36	5,257.97	5,257.97
694	DP 45	5,262.85	5,251.42	100.0	44.25	5,256.50	5,256.50
695	DP 48	5,262.26	5,250.66	100.0	49.47	5,254.76	5,254.76
696	DP 38	5,260.79	5,255.72	100.0	2.53	5,256.35	5,256.35
697	DP 36	5,262.80	5,254.08	100.0	4.90	5,257.36	5,257.36
698	DP 34	5,260.50	5,253.24	100.0	99.54	5,257.39	5,257.39
699	DP 35	5,259.76	5,252.74	100.0	111.60	5,256.99	5,256.99
711	DP 20 - Future Stub to Lot 2	5,260.46	5,253.00	100.0	5.37	5,256.99	5,256.99
718	DP 13	5,261.46	5,255.21	100.0	3.62	5,258.61	5,258.61
720	DP 15	5,259.64	5,254.51	100.0	2.87	5,257.86	5,257.86
722	DP 29	5,261.21	5,257.02	100.0	3.95	5,258.18	5,258.18
727	DP 32	5,261.04	5,256.30	100.0	4.03	5,257.76	5,257.76
733	DP 46	5,263.73	5,252.32	100.0	4.03	5,256.38	5,256.38

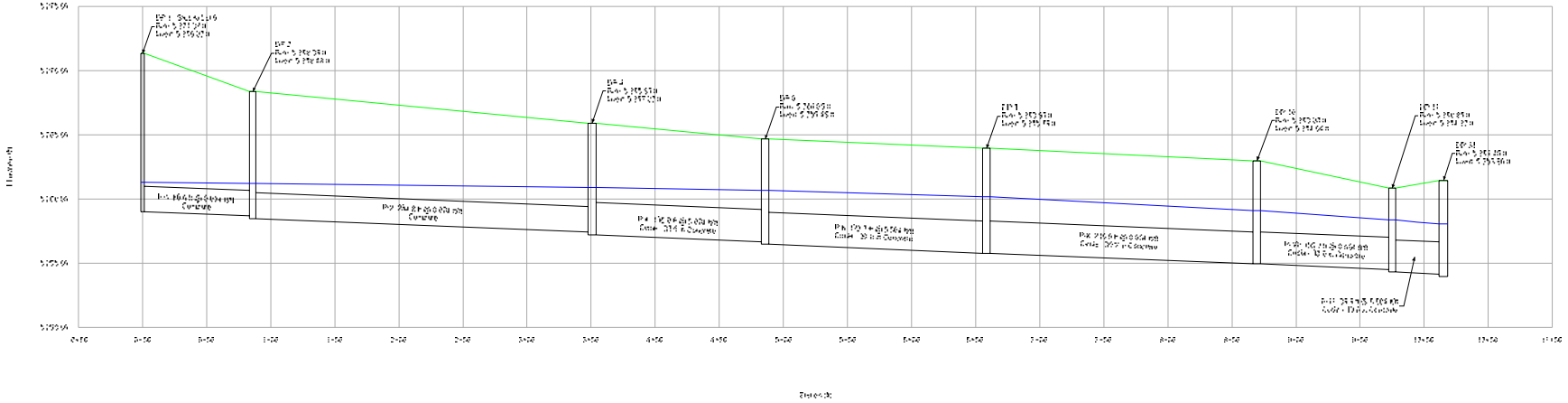
Scenario: 100-Yr Runoff
Current Time Step: 0.000Hr
FlexTable: Conduit Table

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Diameter (in)	Manning's n	Slope (Calculated) (ft/ft)	Flow (cfs)	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
606	P-43	DP43	5,252.26	DP 45	5,251.62	159.7	30.0	0.013	0.004	39.36	8.02	25.97	151.6	5,257.97	5,256.50	5,258.97	5,257.50
608	P-44	DP 44	5,253.07	DP 45	5,252.87	39.1	10.0	0.010	0.005	6.07	11.13	2.04	298.1	5,258.28	5,256.50	5,260.20	5,258.42
611	P-42	DP 42	5,253.90	DP43	5,253.71	39.3	10.0	0.010	0.005	5.45	9.99	1.98	275.0	5,259.41	5,257.97	5,260.96	5,259.52
613	P-41	DP 41	5,253.13	DP43	5,252.46	168.2	30.0	0.013	0.004	27.14	5.53	25.89	104.8	5,258.71	5,257.97	5,259.18	5,258.44
614	P-48	DP 48	5,250.66	Outfall - Line B	5,250.02	159.8	30.0	0.013	0.004	49.47	10.08	25.96	190.6	5,254.76	5,252.31	5,256.34	5,254.02
615	P-40	DP 40	5,253.44	DP 41	5,253.33	28.2	24.0	0.013	0.004	18.33	5.84	14.14	129.7	5,258.89	5,258.71	5,259.42	5,259.23
617	P-24	DP 24	5,255.85	DP 26	5,255.59	64.0	42.0	0.013	0.004	56.64	7.52	64.12	88.3	5,258.62	5,258.46	5,259.37	5,259.16
618	P-26	DP 26	5,255.39	DP 27	5,255.13	66.2	42.0	0.013	0.004	59.57	7.45	63.05	94.5	5,258.46	5,258.28	5,259.15	5,258.94
619	P-25	DP 25	5,257.69	DP 26	5,257.59	20.0	18.0	0.013	0.005	3.71	4.20	7.43	49.9	5,258.48	5,258.46	5,258.72	5,258.65
620	P-21	DP 21	5,256.56	DP 22	5,256.51	12.2	42.0	0.013	0.004	45.39	7.26	64.49	70.4	5,258.89	5,258.87	5,259.58	5,259.54
621	P-22	DP 22	5,256.32	DP 24	5,255.85	116.2	42.0	0.013	0.004	51.90	7.41	63.98	81.1	5,258.87	5,258.62	5,259.61	5,259.25
622	P-27	DP 27	5,254.93	DP 28	5,254.88	12.1	42.0	0.013	0.004	60.97	7.65	64.77	94.1	5,258.28	5,258.24	5,258.92	5,258.89
625	P-11	DP 11	5,254.32	DP 31	5,254.16	39.9	30.0	0.013	0.004	34.96	7.12	25.97	134.6	5,258.38	5,258.06	5,259.27	5,258.94
626	P-12	DP 12 - Stub to Lot 4	5,255.71	DP 14	5,255.01	139.8	24.0	0.013	0.005	6.69	2.13	16.01	41.8	5,258.61	5,258.49	5,258.68	5,258.56
627	P-10	DP 10	5,254.94	DP 11	5,254.52	105.7	30.0	0.013	0.004	32.16	6.55	25.85	124.4	5,259.11	5,258.38	5,259.86	5,259.13
628	P-34	DP 34	5,253.24	DP 35	5,252.94	74.0	48.0	0.013	0.004	99.54	7.92	91.45	108.8	5,257.39	5,256.99	5,258.49	5,258.09
629	P-38	DP 38	5,255.72	DP 39	5,255.70	4.8	18.0	0.013	0.004	2.53	3.56	6.78	37.3	5,256.35	5,256.30	5,256.55	5,256.53
631	P-23	DP 23	5,257.95	DP 24	5,257.85	20.0	18.0	0.013	0.005	5.96	4.67	7.43	80.3	5,258.96	5,258.79	5,259.30	5,259.20
632	P-39	DP 39	5,250.99	Outfall - Line A	5,250.84	36.7	54.0	0.013	0.004	114.26	8.94	125.46	91.1	5,254.79	5,254.35	5,256.34	5,256.14
633	P-14	DP 14	5,254.81	DP 16	5,254.31	100.5	24.0	0.013	0.005	18.45	5.87	15.96	115.6	5,258.49	5,257.79	5,259.05	5,258.35
638	P-8	DP 8	5,255.79	DP 10	5,254.94	210.9	30.0	0.013	0.004	27.96	5.70	26.04	107.4	5,260.20	5,259.11	5,260.76	5,259.67
639	P-9	DP 9 - Stub to Lot 5	5,255.22	DP 10	5,254.94	70.0	24.0	0.013	0.004	6.07	1.93	14.31	42.4	5,259.16	5,259.11	5,259.22	5,259.17
640	P-6	DP 6	5,256.48	DP 8	5,255.79	172.7	30.0	0.013	0.004	20.59	4.19	25.93	79.4	5,260.68	5,260.20	5,260.99	5,260.50
641	P-7	DP 7 - Stub to Lot 6	5,256.06	DP 8	5,255.79	67.9	24.0	0.013	0.004	9.42	3.00	14.26	66.0	5,260.32	5,260.20	5,260.46	5,260.34
642	P-4	DP 4	5,257.22	DP 6	5,256.68	135.0	30.0	0.013	0.004	16.29	3.32	25.94	62.8	5,260.92	5,260.68	5,261.11	5,260.87
643	P-5	DP 5 - Stub to Lot 7	5,256.95	DP 6	5,256.68	67.9	24.0	0.013	0.004	5.45	1.73	14.26	38.2	5,260.72	5,260.68	5,260.77	5,260.73
644	P-2	DP 2	5,258.48	DP 4	5,257.42	264.8	24.0	0.013	0.004	7.76	2.47	14.31	54.2	5,261.24	5,260.92	5,261.33	5,261.02
645	P-3	DP 3 - Stub to Lot 8	5,257.69	DP 4	5,257.42	67.9	24.0	0.013	0.004	10.04	3.20	14.26	70.4	5,261.05	5,260.92	5,261.21	5,261.08
646	P-1	DP 1 - Stub to Lot 9	5,259.02	DP 2	5,258.68	86.0	24.0	0.013	0.004	7.94	2.53	14.22	55.8	5,261.34	5,261.24	5,261.44	5,261.34
704	P-35	DP 35	5,252.74	DP 37	5,251.67	268.7	54.0	0.013	0.004	111.60	8.83	124.09	89.9	5,256.99	5,255.65	5,258.28	5,257.06
705	P-37	DP 37	5,251.67	DP 39	5,251.20	117.1	54.0	0.013	0.004	113.29	8.88	124.58	90.9	5,255.65	5,254.79	5,257.07	5,256.49
706	P-36	DP 36	5,254.08	DP 37	5,253.50	57.7	10.0	0.010	0.010	4.90	8.99	2.86	171.7	5,257.36	5,255.65	5,258.61	5,256.91
719	P-13	DP 13	5,255.21	DP 14	5,255.01	20.0	12.0	0.010	0.010	3.62	4.61	4.63	78.2	5,258.61	5,258.49	5,258.94	5,258.82
721	P-15	DP 15	5,254.51	DP 16	5,254.31	20.0	12.0	0.010	0.010	2.87	3.65	4.63	61.9	5,257.86	5,257.79	5,258.07	5,257.99
724	P-28	DP 28	5,254.68	DP 30	5,254.42	66.2	48.0	0.013	0.004	63.49	7.76	90.02	70.5	5,258.24	5,258.16	5,258.69	5,258.58
725	P-30	DP 30	5,254.42	DP 31	5,254.16	64.0	48.0	0.013	0.004	66.54	7.94	91.55	72.7	5,258.16	5,258.06	5,258.62	5,258.50
726	P-29	DP 29	5,257.02	DP 30	5,256.92	20.0	18.0	0.013	0.005	3.95	4.27	7.43	53.2	5,258.18	5,258.16	5,258.29	5,258.26
729	P-31	DP 31	5,253.96	DP 33	5,253.70	64.0	48.0	0.013	0.004	96.43	7.67	91.55	105.3	5,258.06	5,257.73	5,259.09	5,258.76
730	P-33	DP 33	5,253.70	DP 34	5,253.44	66.2	48.0	0.013	0.004	99.01	7.88	90.02	110.0	5,257.73	5,257.39	5,258.82	5,258.48
731	P-32	DP 32	5,256.30	DP 33	5,256.20	20.0	18.0	0.013	0.005	4.03	4.35	7.57	53.2	5,257.76	5,257.73	5,257.84	5,257.82
740	P-47	DP 47	5,251.15	DP 48	5,250.86	71.5	30.0	0.013	0.004	47.39	9.65	26.12	181.4	5,255.71	5,254.76	5,257.16	5,256.21
741	P-46	DP 46	5,252.32	DP 47	5,251.98	33.3	10.0	0.010	0.010	4.03	7.39	2.88	140.0	5,256.38	5,255.71	5,257.23	5,256.56
782	P-19	DP 19	5,253.49	DP 35	5,252.94	109.2	36.0	0.013	0.005	23.44	3.32	47.33	49.5	5,257.26	5,256.99	5,257.60	5,257.33
783	P-17	DP 17	5,254.36	DP 18	5,254.21	28.5	24.0	0.013	0.005	0.39	0.12	16.41	2.4	5,257.26	5,257.26	5,257.26	5,257.26
795	P-20	DP 20 - Future Stub to Lot 2	5,253.00	DP 35	5,252.94	12.2	24.0	0.013	0.005	5.37	1.71	15.86	33.8	5,256.99	5,256.99	5,257.04	5,257.03
796	P-18	DP 18	5,254.01	DP 19	5,253.69	64.9	30.0	0.013	0.005	0.90	0.18	28.80	3.1	5,257.26	5,257.26	5,257.26	5,257.26
797	P-16	DP 16	5,254.11	DP 19	5,253.69	83.8	30.0	0.013	0.005	31.69	6.46	29.04	109.1	5,257.79	5,257.26	5,258.47	5,257.94
798	P-45	DP 45	5,251.42	DP 47	5,251.15	67.5	30.0	0.013	0.004	44.25	9.01	25.94	170.6	5,256.50	5,255.71	5,257.76	5,256.98

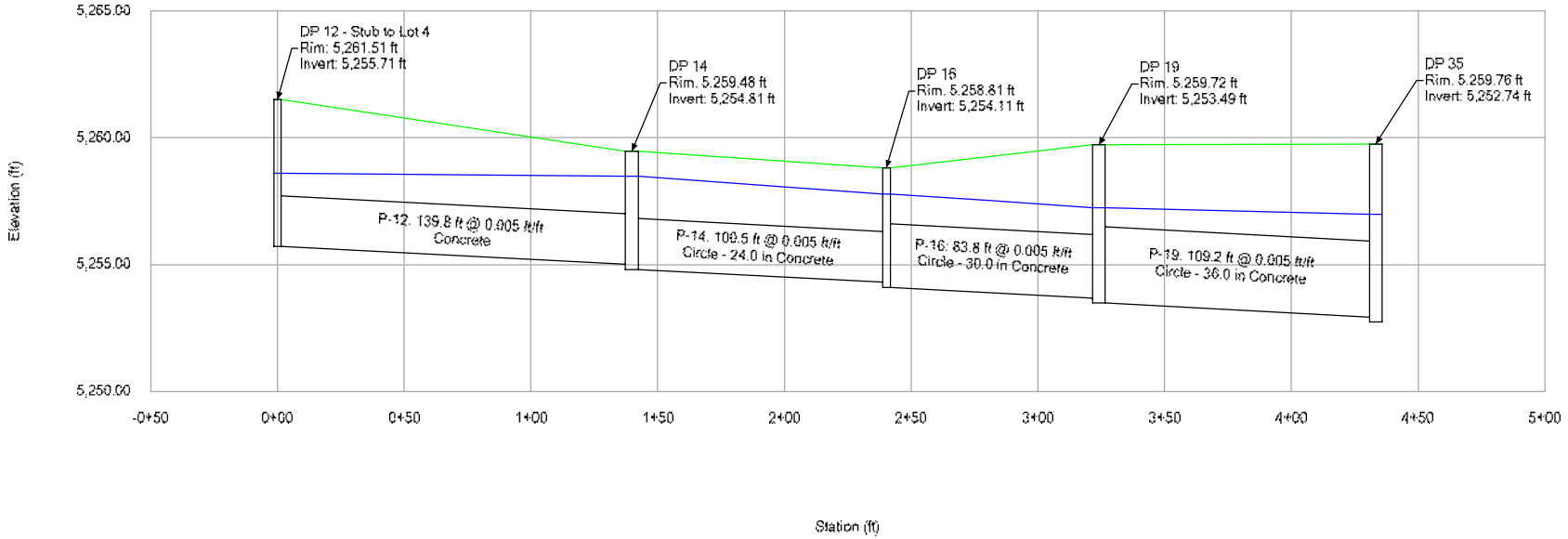
Scenario: 100-Yr Runoff
Current Time Step: 0.000Hr
FlexTable: Manhole Table

ID	Label	Elevation (Ground) (ft)	Set Rim to Ground Elevation?	Elevation (Rim) (ft)	Bolted Cover?	Elevation (Invert in 1) (ft)	Flow (Total Out) (cfs)	Depth (Out) (ft)	Hydraulic Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)
537	DP 26	5,261.60	True	5,261.60	False	5,255.59	59.57	3.07	5,258.46	5,258.46
540	DP 31	5,261.46	True	5,261.46	False	5,254.16	96.43	4.10	5,258.06	5,258.06
549	DP 24	5,261.46	True	5,261.46	False	5,255.85	56.64	2.77	5,258.62	5,258.62
550	DP 39	5,259.53	True	5,259.53	False	5,255.70	114.26	3.80	5,254.79	5,254.79
555	DP 19	5,259.72	True	5,259.72	False	5,253.69	23.44	3.77	5,257.26	5,257.26
559	DP 10	5,263.00	True	5,263.00	False	5,254.94	32.16	4.17	5,259.11	5,259.11
560	DP 8	5,263.96	True	5,263.96	False	5,255.79	27.96	4.41	5,260.20	5,260.20
561	DP 6	5,264.69	True	5,264.69	False	5,256.68	20.59	4.20	5,260.68	5,260.68
562	DP 4	5,265.93	True	5,265.93	False	5,257.42	16.29	3.70	5,260.92	5,260.92
563	DP 2	5,268.39	True	5,268.39	False	5,258.68	7.76	2.76	5,261.24	5,261.24
703	DP 37	5,261.96	True	5,261.96	False	5,251.67	113.29	3.98	5,255.65	5,255.65
723	DP 30	5,261.46	True	5,261.46	False	5,254.42	66.54	3.74	5,258.16	5,258.16
728	DP 33	5,261.33	True	5,261.33	False	5,253.70	99.01	4.03	5,257.73	5,257.73
738	DP 47	5,263.20	True	5,263.20	False	5,251.98	47.39	4.56	5,255.71	5,255.71

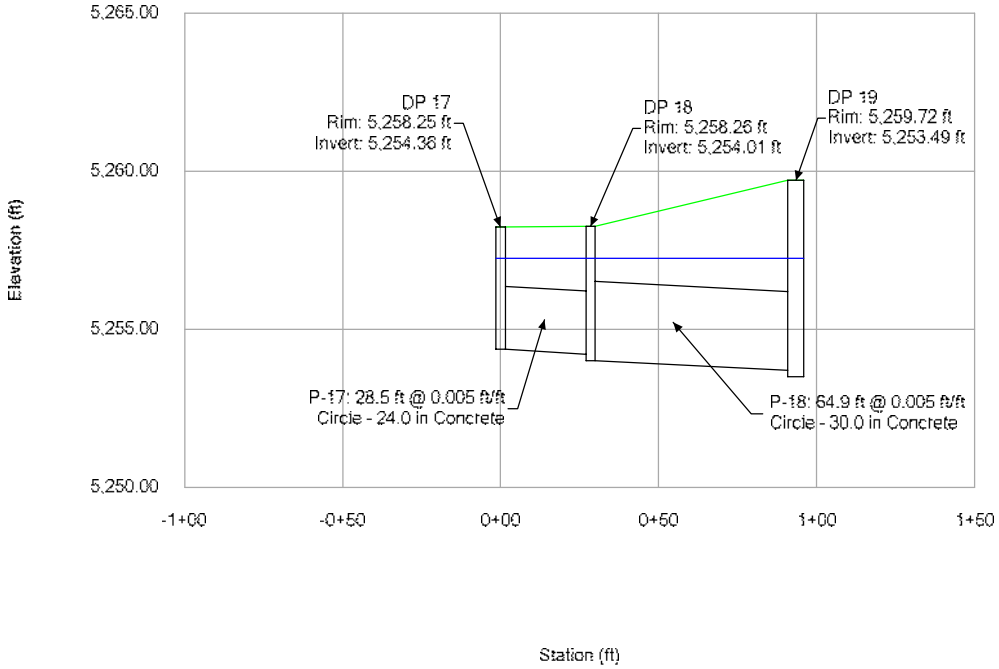
Profile Report
Engineering Profile - Storm Line A-1 (Lowes Storm.stsw)



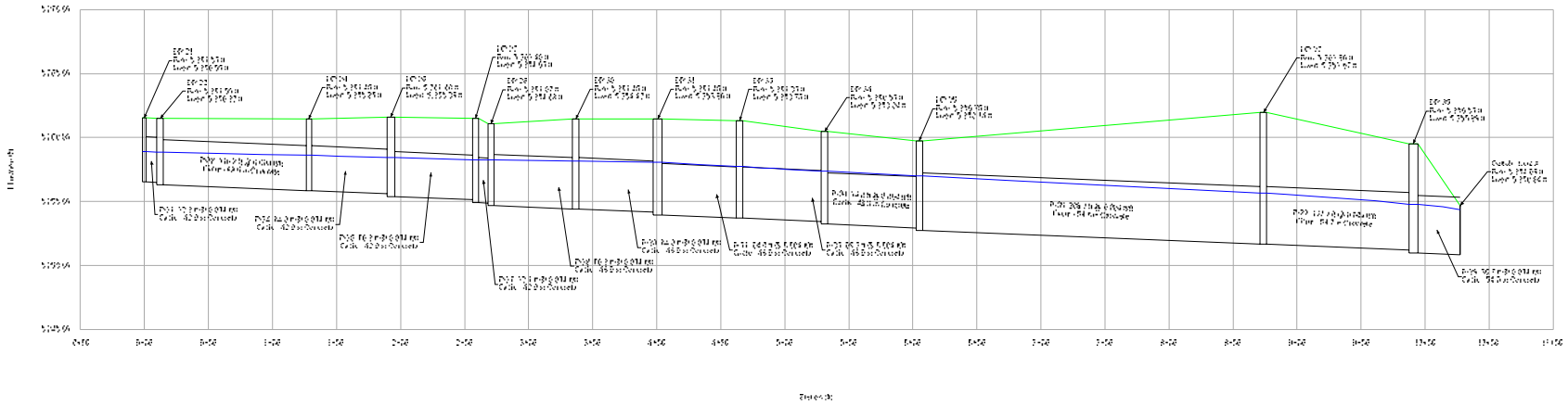
Profile Report
Engineering Profile - Storm Line A-2 (Lowes Storm.stsw)



Profile Report
Engineering Profile - Storm Line A-3 (Lowes Storm.stsw)



Profile Report
Engineering Profile - Storm Line A-4 (Lowes Storm.stsw)



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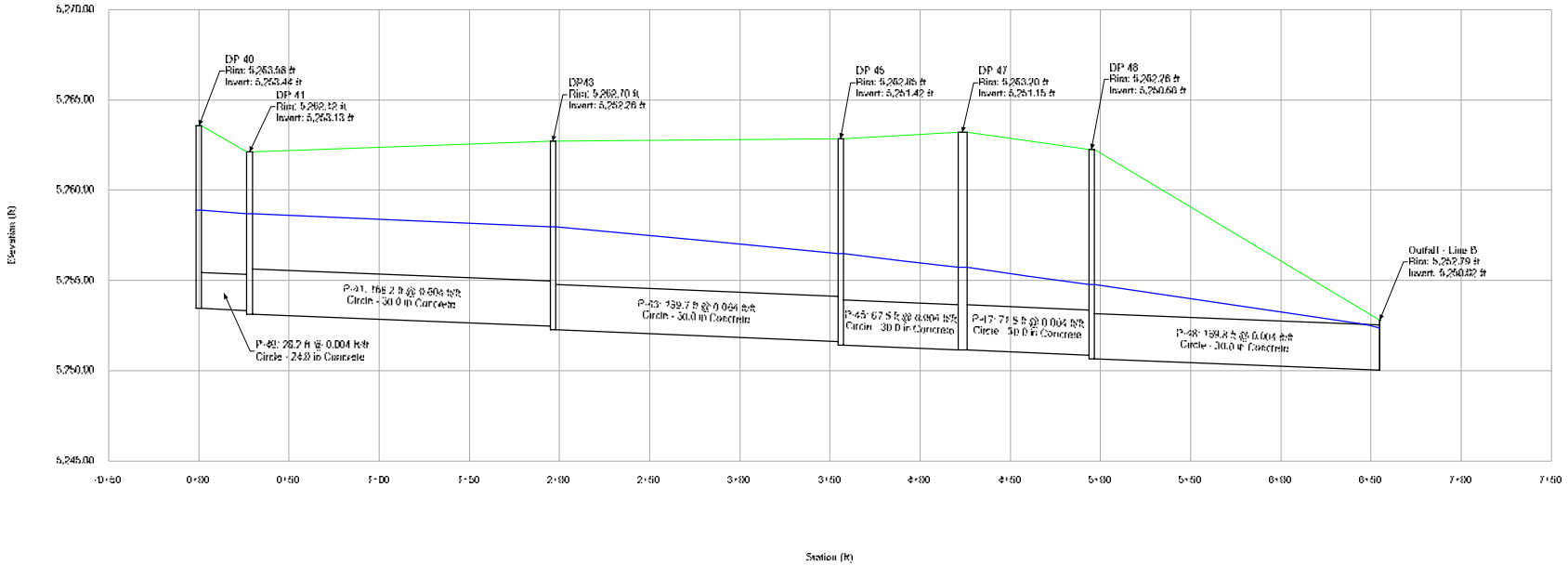
Profile Report
Engineering Profile - Storm Line B (Lowes Storm.stsw)



Inlet Capacity Calculations – Commercial Site

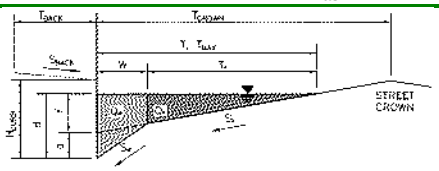
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 112 - DP 11



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	31.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.018	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	3.24	6.48	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.35	1.35	inches
Water Depth at Gutter Flowline	d =	4.59	7.83	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	13.3	28.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.352	0.169	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

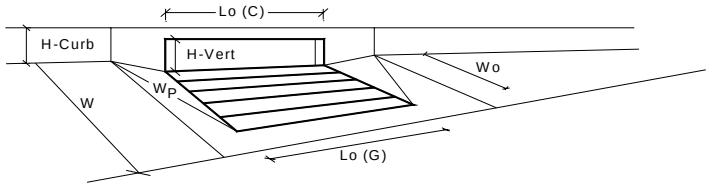
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	21.5	21.5	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	19.8	19.8	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.241	0.241	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.6	6.0	inches
Grate Information		MINOR	MAJOR	ì^ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	3.4	6.2	cfs
Interception with Clogging	Q_{wa} =	3.1	5.6	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	8.6	9.8	cfs
Interception with Clogging	Q_{oa} =	7.7	8.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	5.0	7.2	cfs
Interception with Clogging	Q_{ma} =	4.5	6.5	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**3.1**	**5.6**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	15.0	21.5	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.24	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.59	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.1**	**5.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.5	3.9	cfs

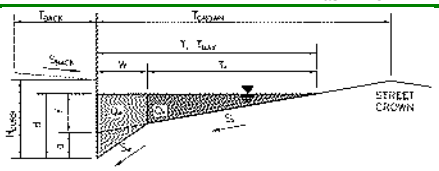
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 118 - DP 14



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	35.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.014	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	35.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	2.47	5.75	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.44	1.44	inches
Water Depth at Gutter Flowline	d =	3.90	7.19	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	13.3	33.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.381	0.151	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

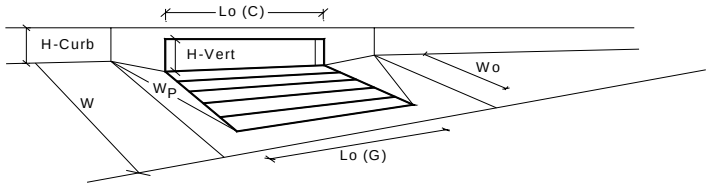
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	27.7	27.7	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	26.0	26.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.195	0.195	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.9	6.0	inches
Grate Information		MINOR	MAJOR	ĵ^ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.06	0.06	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	3.5	11.6	cfs
Interception with Clogging	Q_{wa} =	3.3	10.9	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	15.9	19.5	cfs
Interception with Clogging	Q_{oa} =	14.9	18.3	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.0	14.0	cfs
Interception with Clogging	Q_{ma} =	6.5	13.1	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**3.3**	**10.9**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	15.0	27.7	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.18	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.37	0.57	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.78	0.93	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.3**	**10.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.8	5.7	cfs

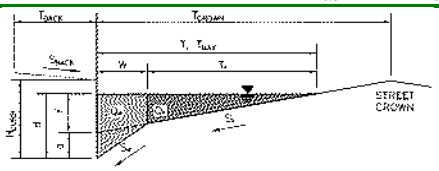
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 122 - DP 16



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	64.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.006	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	50.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

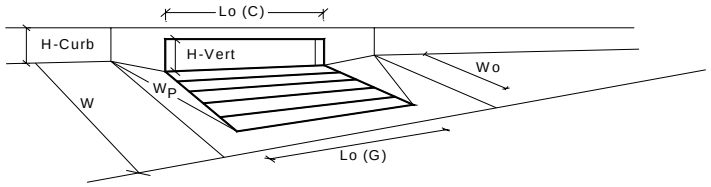
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	2.16	3.60	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.60	1.60	inches
Water Depth at Gutter Flowline	d =	3.76	5.20	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	28.3	48.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.230	0.122	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	61.1	61.1	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	59.4	59.4	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.096	0.096	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.8	5.2	inches
Grate Information		MINOR	MAJOR	ì^ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.06	0.06	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	3.1	8.0	cfs
Interception with Clogging	Q_{wa} =	2.9	7.5	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	15.7	18.2	cfs
Interception with Clogging	Q_{oa} =	14.7	17.1	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	6.5	11.3	cfs
Interception with Clogging	Q_{ma} =	6.1	10.6	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**2.9**	**7.5**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	30.0	50.0	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.17	0.29	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.35	0.49	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.76	0.88	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.9**	**7.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.5	4.0	cfs

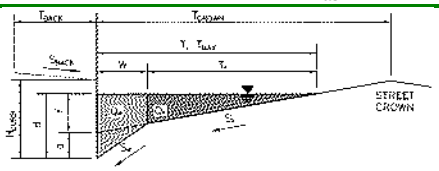
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 124 - DP 17



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	14.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.008	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.0	14.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)				check = yes

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	1.26	1.26	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.57	1.57	inches
Water Depth at Gutter Flowline	d =	2.83	2.83	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	12.3	12.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.505	0.505	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	1.1	1.1	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	1.2	1.2	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**2.3**	**2.3**	**cfs**
Flow Velocity within the Gutter Section	V =	3.1	3.1	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.7	0.7	

Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	49.3	49.3	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	47.5	47.5	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.117	0.117	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	42.1	42.1	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	23.1	23.1	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	5.6	5.6	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	28.7	28.7	cfs
Average Flow Velocity Within the Gutter Section	V =	5.6	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	2.8	2.8	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	1.00	1.00	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**28.7**	**28.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	6.00	6.00	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	3.17	3.17	inches

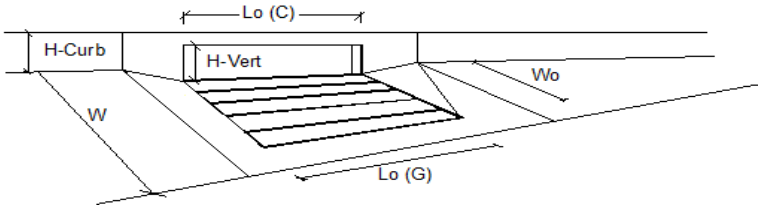
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**2.3**	**2.3**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Inlet Management*)	**Q_o =**	**0.2**	**0.4**	cfs
Water Spread Width	T =	1.4	1.9	ft
Water Depth at Flowline (outside of local depression)	d =	1.4	1.9	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	1.014	0.000	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.0	0.0	cfs
Discharge within the Gutter Section W	Q_w =	0.2	0.0	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.08	0.14	sq ft
Velocity within the Gutter Section W	V_W =	2.5	0.0	fps
Water Depth for Design Condition	d_{LOCAL} =	4.4	4.9	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.228	0.228	ft/ft
Required Length L_T to Have 100% Interception	L_T =	1.76	2.51	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	1.76	2.51	ft
Interception Capacity	Q_i =	0.2	0.4	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.00	1.00	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.10	0.10	
Effective (Unclogged) Length	L_e =	4.50	4.50	ft
Actual Interception Capacity	**Q_a =**	**0.2**	**0.4**	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.0**	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.2**	**0.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

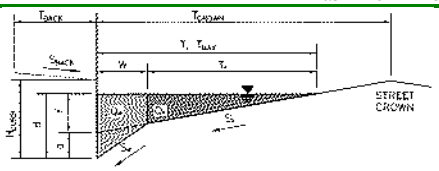
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 126 - DP 18



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	14.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.008	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.0	14.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)				check = yes

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	1.26	1.26	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.57	1.57	inches
Water Depth at Gutter Flowline	d =	2.83	2.83	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	12.3	12.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.505	0.505	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	1.1	1.1	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	1.2	1.2	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**2.3**	**2.3**	**cfs**
Flow Velocity within the Gutter Section	V =	3.1	3.1	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.7	0.7	

Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	49.3	49.3	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	47.5	47.5	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.117	0.117	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	42.1	42.1	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	23.1	23.1	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	5.6	5.6	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	28.7	28.7	cfs
Average Flow Velocity Within the Gutter Section	V =	5.6	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	2.8	2.8	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	1.00	1.00	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**28.7**	**28.7**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	6.00	6.00	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	3.17	3.17	inches

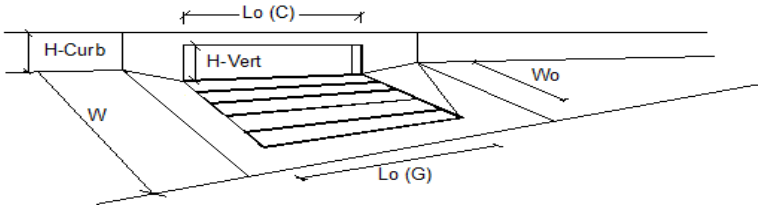
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**2.3**	**2.3**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

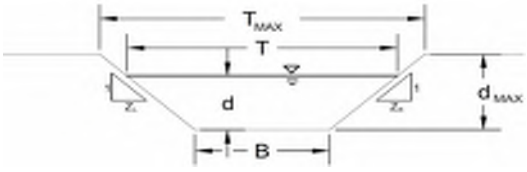


Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Inlet Management*)	**Q_o =**	**0.3**	**0.7**	cfs
Water Spread Width	T =	1.7	6.6	ft
Water Depth at Flowline (outside of local depression)	d =	1.7	2.2	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	1.006	0.865	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.0	0.1	cfs
Discharge within the Gutter Section W	Q_w =	0.3	0.6	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.12	0.19	sq ft
Velocity within the Gutter Section W	V_W =	2.6	3.2	fps
Water Depth for Design Condition	d_{LOCAL} =	4.7	5.2	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.228	0.198	ft/ft
Required Length L_T to Have 100% Interception	L_T =	2.17	3.57	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	2.17	3.57	ft
Interception Capacity	Q_i =	0.3	0.7	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.00	1.00	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.10	0.10	
Effective (Unclogged) Length	L_e =	4.50	4.50	ft
Actual Interception Capacity	**Q_a =**	**0.3**	**0.7**	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.0**	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.3**	**0.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

AREA INLET IN A SWALE

Nine Mile Corner - Erie, Colorado

Basin 130 - DP 21 (Interim)



This worksheet uses the NRCS vegetal retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E	E	
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
Channel Invert Slope	S_O =	0.0075	ft/ft
Bottom Width	B =	3.00	ft
Left Side Slope	Z1 =	4.00	ft/ft
Right Side Slope	Z2 =	4.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- ○ **Non-Cohesive**
- ◉ **Cohesive**
- ○ **Paved**

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	**T_{MAX} =**	**5.00**	**12.00**	**feet**
Max. Allowable Water Depth in Channel for Minor & Major Storm	**d_{MAX} =**	**1.00**	**2.00**	**feet**

Maximum Channel Capacity Based On Allowable Top Width

		Minor Storm	Major Storm	
Max. Allowable Top Width	**T_{MAX} =**	**5.00**	**12.00**	**ft**
Water Depth	d =	0.25	1.13	ft
Flow Area	A =	1.00	8.44	sq ft
Wetted Perimeter	P =	5.06	12.28	ft
Hydraulic Radius	R =	0.20	0.69	ft
Manning's n based on NRCS Vegetal Retardance	n =	0.081	0.029	
Flow Velocity	V =	0.54	3.45	fps
Velocity-Depth Product	VR =	0.11	2.37	ft^2/s
Hydraulic Depth	D =	0.20	0.70	ft
Froude Number	Fr =	0.21	0.72	
Max. Flow Based On Allowable Top Width	**Q_T =**	**0.5**	**29.1**	**cfs**

Maximum Channel Capacity Based On Allowable Water Depth

		Minor Storm	Major Storm	
Max. Allowable Water Depth	**d_{MAX} =**	**1.00**	**2.00**	**feet**
Top Width	T =	11.00	19.00	feet
Flow Area	A =	7.00	22.00	square feet
Wetted Perimeter	P =	11.25	19.49	feet
Hydraulic Radius	R =	0.62	1.13	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.032	0.025	
Flow Velocity	V =	2.96	5.68	fps
Velocity-Depth Product	VR =	1.84	6.41	ft^2/s
Hydraulic Depth	D =	0.64	1.16	feet
Froude Number	Fr =	0.65	0.93	
Max. Flow Based On Allowable Water Depth	**Q_d =**	**20.7**	**124.9**	**cfs**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	**Q_{allow} =**	**0.5**	**29.1**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	**d_{allow} =**	**0.25**	**1.13**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	**Q_o =**	**0.2**	**21.2**	**cfs**
Water Depth	**d =**	**0.14**	**1.01**	**feet**
Top Width	T =	4.16	11.07	feet
Flow Area	A =	0.52	7.09	square feet
Wetted Perimeter	P =	4.19	11.32	feet
Hydraulic Radius	R =	0.12	0.63	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.083	0.032	
Flow Velocity	V =	0.39	2.99	fps
Velocity-Depth Product	VR =	0.05	1.87	ft^2/s
Hydraulic Depth	D =	0.12	0.64	feet
Froude Number	Fr =	0.19	0.66	

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Version 4.05 Released March 2017

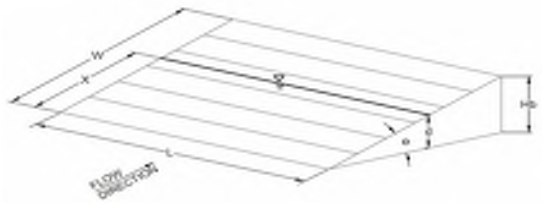
AREA INLET IN A SWALE

Nine Mile Corner - Erie, Colorado

Basin 130 - DP 21 (Interim)

Inlet Design Information (Input)

Type of Inlet: CDOT Type D (In Series) — Inlet Type = CDOT Type D (In Series)



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00		degrees
Width of Grate	W =	3.00		feet
Length of Grate	L =	6.00		feet
Open Area Ratio	A_{RATIO} =	0.70		
Height of Inclined Grate	H_B =	0.00		feet
Clogging Factor	C_f =	0.38		
Grate Discharge Coefficient	C_d =	0.78		
Orifice Coefficient	C_o =	0.52		
Weir Coefficient	C_w =	1.67		

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.14	1.01	
Grate Capacity as a Weir				
Submerged Side Weir Length	X =	6.00	6.00	feet
Inclined Side Weir Flow	Q_{ws} =	1.0	17.8	cfs
Base Weir Flow	Q_{wb} =	0.7	12.7	cfs
Interception without Clogging	Q_{wi} =	2.6	48.2	cfs
Interception with Clogging	Q_{wa} =	1.6	30.1	cfs
Grate Capacity as an Orifice				
Interception without Clogging	Q_{oi} =	20.0	52.8	cfs
Interception with Clogging	Q_{oa} =	12.5	33.0	cfs
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.6**	**30.1**	**cfs**
	Bypassed Flow, Q_b =	**0.0**	**0.0**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	**%**

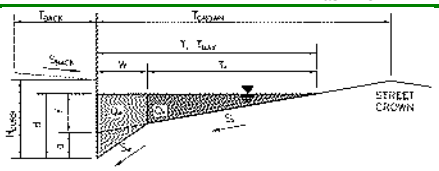
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 132 - DP 22



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	40.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	40.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	4.80	9.60	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.31	1.31	inches
Water Depth at Gutter Flowline	d =	6.11	10.91	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	18.3	38.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.255	0.123	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	19.6	19.6	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	17.8	17.8	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.261	0.261	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

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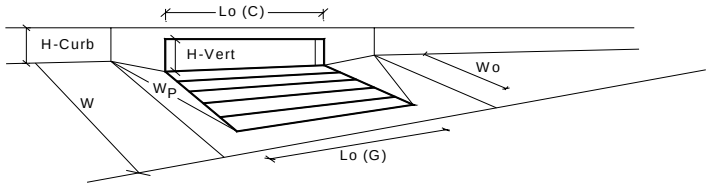


Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	ĵ^ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.06	0.06	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	11.6	11.6	cfs
Interception with Clogging	Q_{wa} =	10.9	10.9	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	19.5	19.5	cfs
Interception with Clogging	Q_{oa} =	18.3	18.3	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	14.0	14.0	cfs
Interception with Clogging	Q_{ma} =	13.1	13.1	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**10.9**	**10.9**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	19.6	19.6	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.36	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.57	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	0.93	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**10.9**	**10.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.7	6.8	cfs

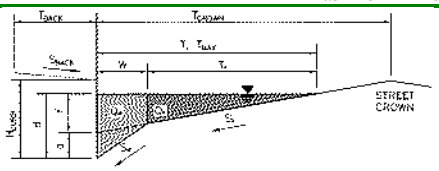
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 134 - DP 23



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	32.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.031	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	32.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	5.58	11.90	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.08	1.08	inches
Water Depth at Gutter Flowline	d =	6.66	12.98	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	13.3	30.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.313	0.147	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

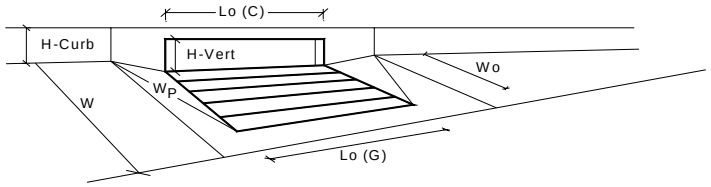
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	13.2	13.2	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	11.5	11.5	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.354	0.354	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	ì`` Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.25	1.25	
Clogging Factor for Multiple Units	Clog =	0.06	0.06	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	11.6	11.6	cfs
Interception with Clogging	Q_{wa} =	10.9	10.9	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	19.5	19.5	cfs
Interception with Clogging	Q_{oa} =	18.3	18.3	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	14.0	14.0	cfs
Interception with Clogging	Q_{ma} =	13.1	13.1	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**10.9**	**10.9**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	10.00	10.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	13.2	13.2	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.36	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.57	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	0.93	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**10.9**	**10.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.3	5.9	cfs

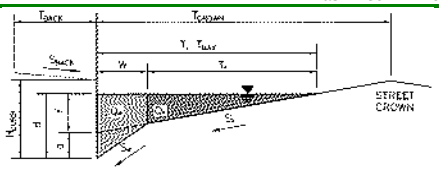
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 136 - DP 25



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	27.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.031	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	27.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	5.53	9.95	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.09	1.09	inches
Water Depth at Gutter Flowline	d =	6.61	11.03	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	13.3	25.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.314	0.175	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

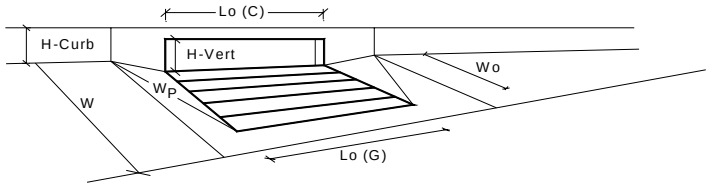
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	13.3	13.3	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	11.6	11.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.352	0.352	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	ì`` Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.2	6.2	cfs
Interception with Clogging	Q_{wa} =	5.6	5.6	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	9.8	9.8	cfs
Interception with Clogging	Q_{oa} =	8.8	8.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.2	7.2	cfs
Interception with Clogging	Q_{ma} =	6.5	6.5	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**5.6**	**5.6**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	13.3	13.3	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.36	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.6**	**5.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.4	3.7	cfs

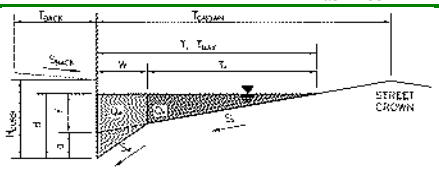
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 138 - DP 27



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	35.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.025	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	35.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	4.45	10.37	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.21	1.21	inches
Water Depth at Gutter Flowline	d =	5.66	11.58	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	13.3	33.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.327	0.138	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

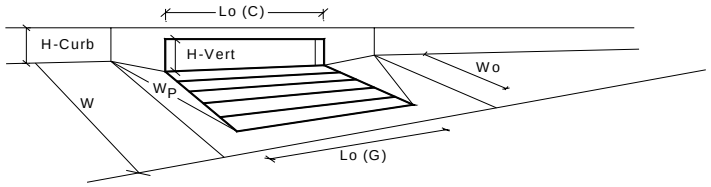
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	16.2	16.2	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	14.4	14.4	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.304	0.304	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.7	6.0	inches
Grate Information		MINOR	MAJOR	ĵ^ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	5.5	6.2	cfs
Interception with Clogging	Q_{wa} =	4.9	5.6	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	9.5	9.8	cfs
Interception with Clogging	Q_{oa} =	8.5	8.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	6.7	7.2	cfs
Interception with Clogging	Q_{ma} =	6.0	6.5	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**4.9**	**5.6**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	15.0	16.2	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.73	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.9**	**5.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.8	2.0	cfs

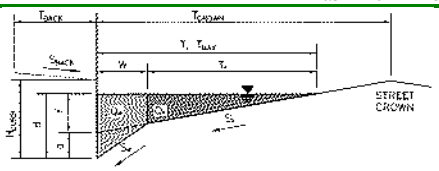
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 140 - DP 28



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.039	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	7.02	14.04	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.91	0.91	inches
Water Depth at Gutter Flowline	d =	7.93	14.95	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	13.3	28.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.302	0.154	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

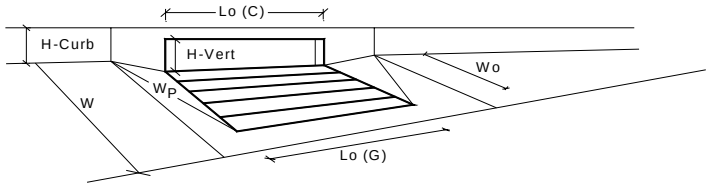
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.9	10.9	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	9.1	9.1	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.408	0.408	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	ì^ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.2	6.2	cfs
Interception with Clogging	Q_{wa} =	5.6	5.6	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	9.8	9.8	cfs
Interception with Clogging	Q_{oa} =	8.8	8.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.2	7.2	cfs
Interception with Clogging	Q_{ma} =	6.5	6.5	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**5.6**	**5.6**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	10.9	10.9	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.36	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.6**	**5.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.0	3.0	cfs

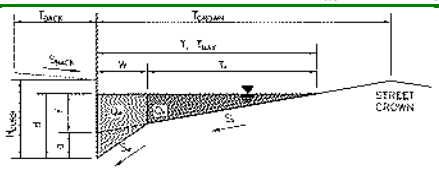
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 142 - DP 29



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	34.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.031	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	34.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	5.49	12.44	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.09	1.09	inches
Water Depth at Gutter Flowline	d =	6.58	13.53	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	13.3	32.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.314	0.139	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

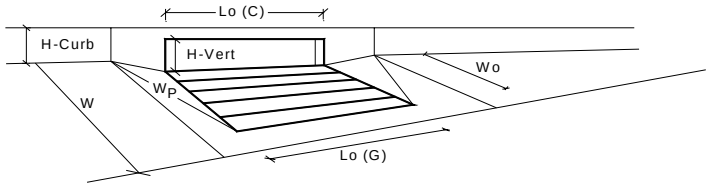
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	13.4	13.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	11.7	11.7	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.350	0.350	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	ì^ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.2	6.2	cfs
Interception with Clogging	Q_{wa} =	5.6	5.6	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	9.8	9.8	cfs
Interception with Clogging	Q_{oa} =	8.8	8.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.2	7.2	cfs
Interception with Clogging	Q_{ma} =	6.5	6.5	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**5.6**	**5.6**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	13.4	13.4	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.36	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.6**	**5.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.5	3.9	cfs

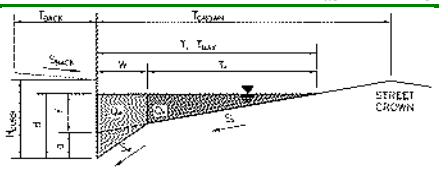
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 144 - DP 32



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	32.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.030	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	32.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	5.40	11.52	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.10	1.10	inches
Water Depth at Gutter Flowline	d =	6.50	12.62	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	13.3	30.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.315	0.148	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

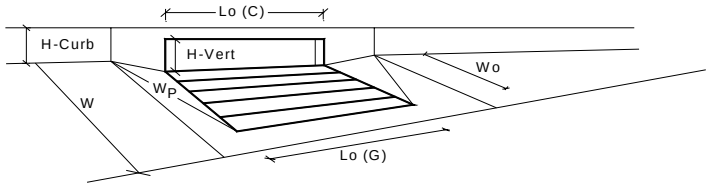
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	13.6	13.6	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	11.9	11.9	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.346	0.346	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	ĵ^ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.2	6.2	cfs
Interception with Clogging	Q_{wa} =	5.6	5.6	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	9.8	9.8	cfs
Interception with Clogging	Q_{oa} =	8.8	8.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.2	7.2	cfs
Interception with Clogging	Q_{ma} =	6.5	6.5	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**5.6**	**5.6**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	13.6	13.6	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.36	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.6**	**5.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.6	4.0	cfs

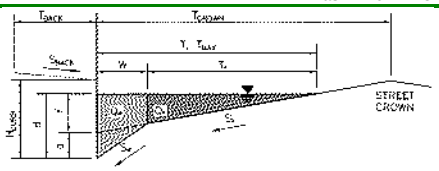
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 146 - DP 34



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	32.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.041	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	32.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	7.38	15.74	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.87	0.87	inches
Water Depth at Gutter Flowline	d =	8.25	16.62	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	13.3	30.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.300	0.143	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

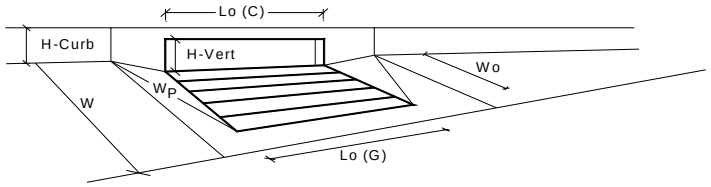
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.4	10.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	8.7	8.7	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.420	0.420	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	ì^ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.2	6.2	cfs
Interception with Clogging	Q_{wa} =	5.6	5.6	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	9.8	9.8	cfs
Interception with Clogging	Q_{oa} =	8.8	8.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.2	7.2	cfs
Interception with Clogging	Q_{ma} =	6.5	6.5	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**5.6**	**5.6**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	10.4	10.4	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.36	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.6**	**5.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.6	1.5	cfs

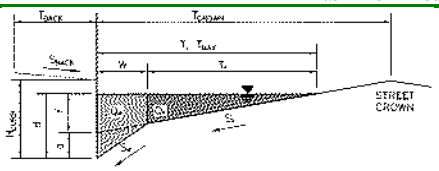
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 148 - DP 35



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	62.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.021	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	3.78	7.56	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.29	1.29	inches
Water Depth at Gutter Flowline	d =	5.07	8.85	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	13.3	28.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.339	0.165	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

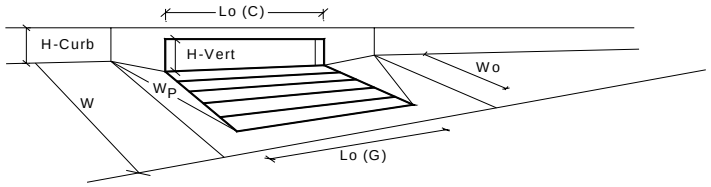
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	18.7	18.7	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	17.0	17.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.271	0.271	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.1	6.0	inches
Grate Information		MINOR	MAJOR	ì`` Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	4.3	6.2	cfs
Interception with Clogging	Q_{wa} =	3.9	5.6	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	9.0	9.8	cfs
Interception with Clogging	Q_{oa} =	8.1	8.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	5.8	7.2	cfs
Interception with Clogging	Q_{ma} =	5.2	6.5	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**3.9**	**5.6**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	15.0	18.7	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.28	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.65	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.9**	**5.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.4	3.6	cfs

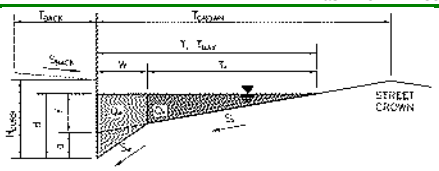
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 152 - DP 38



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	50.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.040	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	7.20	14.40	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.89	0.89	inches
Water Depth at Gutter Flowline	d =	8.09	15.29	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	13.3	28.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.301	0.153	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

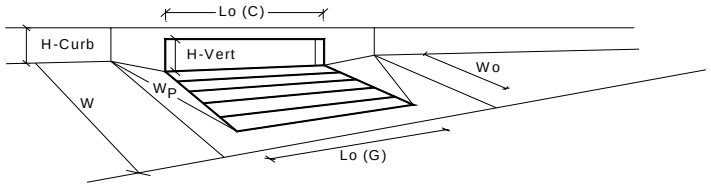
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	10.6	10.6	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	8.9	8.9	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.414	0.414	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



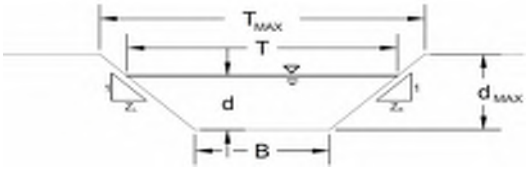
Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	ĵ^ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.2	6.2	cfs
Interception with Clogging	Q_{wa} =	5.6	5.6	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	9.8	9.8	cfs
Interception with Clogging	Q_{oa} =	8.8	8.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.2	7.2	cfs
Interception with Clogging	Q_{ma} =	6.5	6.5	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**5.6**	**5.6**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	10.6	10.6	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.36	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.6**	**5.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.0	2.5	cfs

Version 4.05 Released March 2017

AREA INLET IN A SWALE

Nine Mile Corner - Erie, Colorado

Basin 202 - DP 40 (Interim)



This worksheet uses the NRCS vegetal retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E	E	
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
Channel Invert Slope	S_O =	0.0075	ft/ft
Bottom Width	B =	3.00	ft
Left Side Slope	Z1 =	4.00	ft/ft
Right Side Slope	Z2 =	4.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- Non-Cohesive
- Cohesive
- Paved

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**5.00**	**9.00**	**feet**
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.00**	**2.00**	**feet**

Maximum Channel Capacity Based On Allowable Top Width

		Minor Storm	Major Storm	
Max. Allowable Top Width	T_{MAX} =	**5.00**	**9.00**	**ft**
Water Depth	d =	0.25	0.75	ft
Flow Area	A =	1.00	4.50	sq ft
Wetted Perimeter	P =	5.06	9.18	ft
Hydraulic Radius	R =	0.20	0.49	ft
Manning's n based on NRCS Vegetal Retardance	n =	0.081	0.036	
Flow Velocity	V =	0.54	2.23	fps
Velocity-Depth Product	VR =	0.11	1.09	ft^2/s
Hydraulic Depth	D =	0.20	0.50	ft
Froude Number	Fr =	0.21	0.56	
Max. Flow Based On Allowable Top Width	Q_T =	**0.5**	**10.0**	**cfs**

Maximum Channel Capacity Based On Allowable Water Depth

		Minor Storm	Major Storm	
Max. Allowable Water Depth	d_{MAX} =	**1.00**	**2.00**	**feet**
Top Width	T =	11.00	19.00	feet
Flow Area	A =	7.00	22.00	square feet
Wetted Perimeter	P =	11.25	19.49	feet
Hydraulic Radius	R =	0.62	1.13	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.032	0.025	
Flow Velocity	V =	2.96	5.68	fps
Velocity-Depth Product	VR =	1.84	6.41	ft^2/s
Hydraulic Depth	D =	0.64	1.16	feet
Froude Number	Fr =	0.65	0.93	
Max. Flow Based On Allowable Water Depth	Q_d =	**20.7**	**124.9**	**cfs**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**0.5**	**10.0**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.25**	**0.75**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**0.1**	**9.3**	**cfs**
Water Depth	**d =**	**0.10**	**0.73**	**feet**
Top Width	T =	3.77	8.81	feet
Flow Area	A =	0.33	4.28	square feet
Wetted Perimeter	P =	3.80	8.99	feet
Hydraulic Radius	R =	0.09	0.48	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.083	0.036	
Flow Velocity	V =	0.30	2.17	fps
Velocity-Depth Product	VR =	0.03	1.03	ft^2/s
Hydraulic Depth	D =	0.09	0.49	feet
Froude Number	Fr =	0.18	0.55	

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Version 4.05 Released March 2017

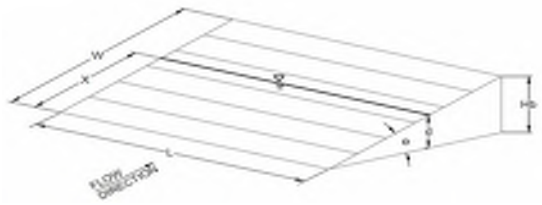
AREA INLET IN A SWALE

Nine Mile Corner - Erie, Colorado

Basin 202 - DP 40 (Interim)

Inlet Design Information (Input)

Type of Inlet: CDOT Type D (In Series) — Inlet Type = CDOT Type D (In Series)



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00		degrees
Width of Grate	W =	3.00		feet
Length of Grate	L =	6.00		feet
Open Area Ratio	A_{RATIO} =	0.70		
Height of Inclined Grate	H_B =	0.00		feet
Clogging Factor	C_f =	0.38		
Grate Discharge Coefficient	C_d =	0.78		
Orifice Coefficient	C_o =	0.52		
Weir Coefficient	C_w =	1.67		

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.10	0.73	
Grate Capacity as a Weir				
Submerged Side Weir Length	X =	6.00	6.00	feet
Inclined Side Weir Flow	Q_{ws} =	0.5	10.8	cfs
Base Weir Flow	Q_{wb} =	0.4	7.7	cfs
Interception without Clogging	Q_{wi} =	1.4	29.4	cfs
Interception with Clogging	Q_{wa} =	0.9	18.4	cfs
Grate Capacity as an Orifice				
Interception without Clogging	Q_{oi} =	16.4	44.8	cfs
Interception with Clogging	Q_{oa} =	10.2	28.0	cfs
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**0.9**	**18.4**	**cfs**
	Bypassed Flow, Q_b =	**0.0**	**0.0**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	**%**

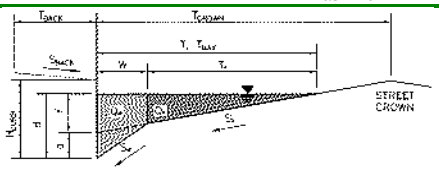
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 204 - DP 41



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	95.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.027	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	9.72	9.72	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.16	1.16	inches
Water Depth at Gutter Flowline	d =	10.88	10.88	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	28.3	28.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.160	0.160	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

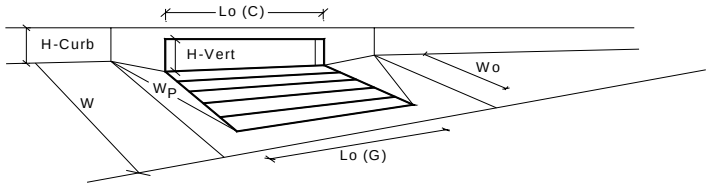
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	14.9	14.9	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	13.2	13.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.323	0.323	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	ì`^ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.36	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.6**	**5.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.7	4.3	cfs

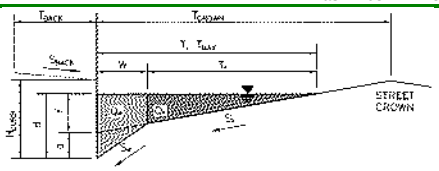
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 208 - DP 43



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	50.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.034	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	8.04	8.04	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.03	1.03	inches
Water Depth at Gutter Flowline	d =	9.07	9.07	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	18.3	18.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.233	0.233	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

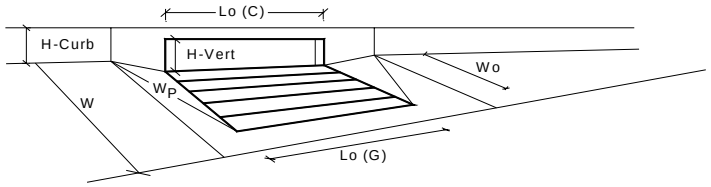
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	12.4	12.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	10.6	10.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.372	0.372	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	ì^ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.2	6.2	cfs
Interception with Clogging	Q_{wa} =	5.6	5.6	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	9.8	9.8	cfs
Interception with Clogging	Q_{oa} =	8.8	8.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.2	7.2	cfs
Interception with Clogging	Q_{ma} =	6.5	6.5	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**5.6**	**5.6**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	12.4	12.4	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.36	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.6**	**5.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.5	1.1	cfs

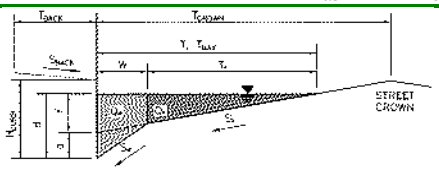
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 212 - DP 45



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	50.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.024	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	8.46	8.46	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.24	1.24	inches
Water Depth at Gutter Flowline	d =	9.70	9.70	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	28.3	28.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.162	0.162	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

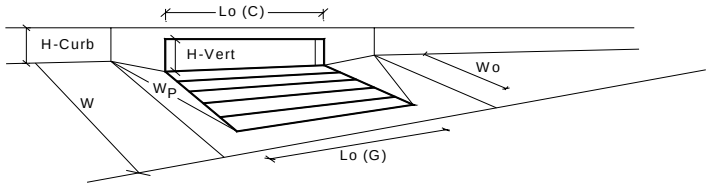
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	16.9	16.9	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	15.2	15.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.293	0.293	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	ì^ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.2	6.2	cfs
Interception with Clogging	Q_{wa} =	5.6	5.6	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	9.8	9.8	cfs
Interception with Clogging	Q_{oa} =	8.8	8.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.2	7.2	cfs
Interception with Clogging	Q_{ma} =	6.5	6.5	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**5.6**	**5.6**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	16.9	16.9	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.36	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.6**	**5.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.6	1.5	cfs

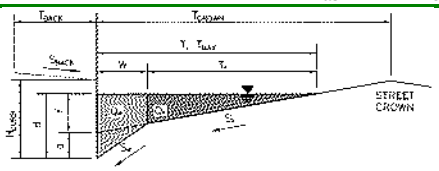
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 214 - DP 48



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	50.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.026	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	9.36	9.36	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.18	1.18	inches
Water Depth at Gutter Flowline	d =	10.54	10.54	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	28.3	28.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.160	0.160	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

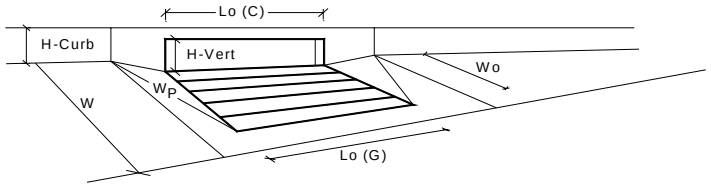
Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	15.4	15.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	13.7	13.7	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.315	0.315	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	ì`` Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.73	1.73	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	N/A	N/A	cfs
Interception with Clogging	Q_{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	N/A	N/A	cfs
Interception with Clogging	Q_{oa} =	N/A	N/A	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	N/A	N/A	cfs
Interception with Clogging	Q_{ma} =	N/A	N/A	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**N/A**	**N/A**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.10	0.10	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.2	6.2	cfs
Interception with Clogging	Q_{wa} =	5.6	5.6	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	9.8	9.8	cfs
Interception with Clogging	Q_{oa} =	8.8	8.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.2	7.2	cfs
Interception with Clogging	Q_{ma} =	6.5	6.5	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**5.6**	**5.6**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.00	5.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	15.4	15.4	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.36	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.6**	**5.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.1	2.7	cfs

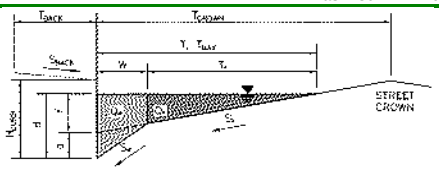
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 302 - DP 49



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	18.0	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	9.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)				check = yes

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	2.16	4.32	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	1.7	1.7	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.31	1.31	inches
Water Depth at Gutter Flowline	d =	3.47	5.63	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	7.3	16.3	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.558	0.285	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	1.4	12.4	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	1.8	4.9	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**3.3**	**17.3**	**cfs**
Flow Velocity within the Gutter Section	V =	3.6	5.4	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	1.1	2.5	

Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	7.1	19.6	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	5.3	17.8	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.678	0.261	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.6	15.8	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.6	15.8	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	1.3	5.6	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	2.0	21.4	cfs
Average Flow Velocity Within the Gutter Section	V =	3.2	5.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.8	2.8	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	1.00	0.83	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**2.0**	**17.8**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	3.00	5.68	inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =	0.00	0.05	inches

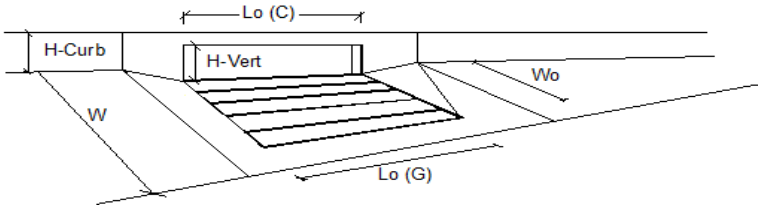
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**2.0**	**17.3**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Inlet Management*)	**Q_o =**	**0.4**	**0.9**	cfs
Water Spread Width	T =	1.9	4.6	ft
Water Depth at Flowline (outside of local depression)	d =	1.9	2.4	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.000	0.873	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.0	0.1	cfs
Discharge within the Gutter Section W	Q_w =	0.0	0.8	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.14	0.22	sq ft
Velocity within the Gutter Section W	V_W =	0.0	3.5	fps
Water Depth for Design Condition	d_{LOCAL} =	4.9	5.4	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.078	0.201	ft/ft
Required Length L_T to Have 100% Interception	L_T =	4.10	4.02	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	4.10	4.02	ft
Interception Capacity	Q_i =	0.4	0.9	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.00	1.00	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.10	0.10	
Effective (Unclogged) Length	L_e =	4.50	4.50	ft
Actual Interception Capacity	**Q_a =**	**0.4**	**0.9**	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.0**	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.4**	**0.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

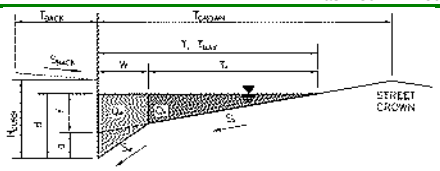
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Nine Mile Corner - Erie, Colorado

Inlet ID: Basin 304 - DP 50



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	28.5	ft
Gutter Width	W =	1.73	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	28.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)				check = yes

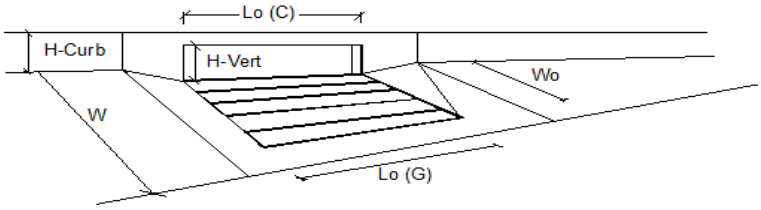
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**2.0**	**17.8**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from Sheet *Inlet Management*)	**Q_o =**	**1.0**	**2.6**	cfs
Water Spread Width	T =	4.9	8.1	ft
Water Depth at Flowline (outside of local depression)	d =	2.5	3.3	inches
Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E_o =	0.848	0.611	
Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	0.2	1.0	cfs
Discharge within the Gutter Section W	Q_w =	0.8	1.6	cfs
Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A_W =	0.23	0.34	sq ft
Velocity within the Gutter Section W	V_W =	3.7	4.6	fps
Water Depth for Design Condition	d_{LOCAL} =	5.5	6.3	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	N/A	N/A	
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Interception Capacity	Q_i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V_o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R_f =	N/A	N/A	
Interception Rate of Side Flow	R_x =	N/A	N/A	
Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	cfs
Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**N/A**	**N/A**	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S_e =	0.196	0.147	ft/ft
Required Length L_T to Have 100% Interception	L_T =	4.30	7.99	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	4.30	5.00	ft
Interception Capacity	Q_i =	1.0	2.2	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.00	1.00	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.10	0.10	
Effective (Unclogged) Length	L_e =	4.50	4.50	ft
Actual Interception Capacity	**Q_a =**	**1.0**	**2.0**	cfs
Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**0.0**	**0.6**	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.0**	**2.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**77**	**%**

Appendix D – Supporting Documentation

Love & Associates, Inc. Report
RESPEC Consulting & Services Report
Olsson Associates Memo and Design Plans

Love & Associates, Inc
Erie Outfall Systems Planning
Preliminary Design Erie and Adjacent Boulder and Weld County Areas
May 2001

BULLHEAD GULCH/PRINCE TRIBUTARY

BULLHEAD GULCH OFFSITE
SEE FIGURE: 3

COAL CREEK TRIBUTARIES

COAL CREEK OFFSITE
SEE FIGURE: 3

SCALE: 1"=1500'

MATCHLINE SEE FIGURE 2b

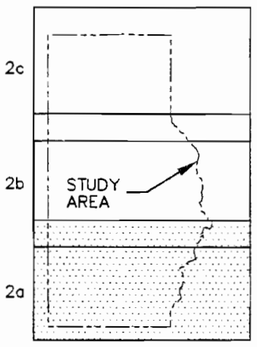
NORTH 107TH STREET
NORTH 111TH STREET
NORTH 119TH STREET
NORTHEAST LINE ROAD
WELD COUNTY
BOULDER CO.
COAL CREEK
ARAPAHOE RD.
BASELINE ROAD

STUDY AREA BOUNDARY

LEGEND

- CATCHMENT I.D. — 800 / 80.5 CATCHMENT ACRE
- WATERSHED DIVIDE
- CATCHMENT BOUNDARY
- MINOR CATCHMENT BOUNDARY
- OUTFALL FLOW PATH
- STUDY AREA BOUNDARY
- DETENTION AREA — 2000
- UDSWM CHANNEL/PIPE ELEMENT — 2000
- OFFSITE CATCHMENT — 800 / SWMM CATCHMENT SOURCE
- DESIGN POINT/NODE — 902

SHEET INDEX



DATE: MAY 22, 2000
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Love & Associates, Inc. water resource consultants 841 Front Street Louisville, Colorado 80027-1849 Phone: 303-673-9795 Fax: 303-673-9796	DESIGNED: RJP DRAWN: DM CHECKED: DJL DATE: 5-00	TOWN OF ERIE URBAN DRAINAGE AND FLOOD CONTROL DISTRICT	ERIE AND ADJACENT AREAS OUTFALL SYSTEMS PLANNING	CATCHMENT DELINEATION AND SWMM ELEMENTS IN THE STUDY AREA	Figure 2a Page II - 3

Table 9. Design Point Flood Peaks, Future Percent Imperviousness (cont'd)

Coal Creek Tributaries Future Percent Imperviousness (con.)

525	27	91	130	172	324	398	132	43
526	5	21	34	69	197	355	183	45
528	4	12	19	24	45	57	36	15
529	27	97	147	194	364	442	314	46
530	20	78	155	240	580	717	464	47
531	27	97	181	276	674	843	561	46
532	34	116	198	300	731	924	625	46
534	31	106	156	202	355	423	95	78
536	39	134	199	258	456	543	126	78
538	75	254	378	499	1033	1295	778	53
917	72	225	345	480	1041	1310	857	53
918	13	42	63	84	165	206	120	30
539	20	64	97	128	239	290	120	49
919	32	103	154	204	376	454	177	56
920	6	20	32	41	73	85	34	29
540	15	47	70	93	180	223	88	42
541	26	90	142	197	408	494	270	43
921	32	108	170	237	490	598	338	41
922	1	2	3	4	10	15	30	2
923	1	3	4	5	10	15	48	2
924	1	3	5	7	13	18	59	2

Bullhead Gulch/Prince Tributary Future Percent Imperviousness

UDSWM Design Point	Peak Discharge (cfs) Flood Event						Cumulative Area (ac)	Cumulative Percent Impervious
	0.4-in	2-yr	5-yr	10-yr	50-yr	100-yr		
300	17	63	96	131	277	356	152	27
302	6	23	32	43	91	115	43	30
303	37	139	207	283	585	745	334	27
305	47	167	254	347	728	921	408	30
306	19	68	180	303	754	976	533	24
308	38	101	216	344	1038	1389	815	28
310	16	59	88	115	219	265	77	47
311	54	156	267	424	1203	1613	957	31
312	84	281	438	604	1465	1971	1290	33
313	90	300	464	636	1547	2080	1401	33
315	112	381	591	810	1774	2379	1615	34
320	1	2	11	30	118	165	122	2
321	1	5	15	40	166	237	222	2
322	110	486	1146	1747	3211	3967	281	3
323	108	474	1117	1706	3170	3925	368	6
317	201	690	1526	2341	4740	5998	1983	29
318	208	704	1556	2387	4837	6123	2136	29
319	206	699	1539	2365	4813	6097	2200	28
940	189	670	1470	2259	4631	5878	2300	27

Table 9. Design Point Flood Peaks, Future Percent Imperviousness (cont'd)

Boulder Creek Tributaries Future Percent Imperviousness

UDSWM Design Pnt.	Peak Discharge (cfs) 0.4-in	2-yr	5-yr	10-yr	50-yr	100-yr	Cumulative Area (ac)	Cumulative % Impervious
950	1	2	9	24	88	123	94	2
700	0	1	3	7	30	45	51	2
951	0	2	10	23	80	113	103	2
952	2	8	15	31	104	143	104	6
701	0	1	3	7	29	40	26	2
953	2	10	19	41	151	210	142	6
954	0	1	5	12	39	54	46	2
702	0	2	4	9	34	48	25	5
703	2	6	18	39	134	189	155	5
955	1	4	18	41	131	182	231	4
956	4	15	28	51	156	208	95	13
704	5	19	33	52	133	172	66	20
957	6	22	39	64	171	224	95	17
705	15	46	66	87	165	203	67	47
706	49	149	218	290	558	691	249	43
707	34	117	174	234	462	574	198	41
708	75	238	360	492	1019	1276	572	39
709	55	168	272	396	913	1178	719	35
710	52	162	267	394	913	1191	795	32
958	51	161	270	401	931	1216	840	30
959	1	4	11	21	57	76	52	9
750	0	13	318	581	1178	1455	1638	2
712	1	13	305	569	1196	1494	1774	2
713	3	16	332	629	1364	1717	2044	2
714	6	23	337	630	1375	1736	2121	3
960	5	20	332	622	1364	1726	2168	3
715	10	35	50	64	120	147	50	37
716	21	66	97	128	248	307	139	36
717	19	62	99	142	313	394	219	29
961	15	49	86	130	295	379	248	26
718	5	20	36	59	167	222	104	14
719	5	20	37	64	188	250	145	11
962	4	14	40	79	246	327	250	7
963	0	1	5	11	39	56	80	2
720	1	3	17	36	116	157	80	4
721	4	15	31	65	212	289	168	7
964	2	9	35	73	222	302	220	6
965	0	2	12	27	93	133	122	2
966	1	3	5	7	14	21	58	2
967	0	1	1	2	7	11	16	2
722	0	2	18	39	124	171	130	2
968	0	3	24	51	159	220	176	2
969	0	1	6	13	35	48	42	2
999	0	1	8	18	54	77	73	2

RESPEC Consulting & Services
Town of Erie Outfall Systems Plan (West of Coal Creek)
January 2014

Prince Tributary

Prince Tributary is a right bank tributary of Boulder Creek, Outfall 940. Bullhead Gulch is an offsite watershed that enters the west side of the study area. The interaction between Prince Tributary and Bullhead Gulch varies with the amount of flow carried by each drainageway. It is possible for flows in Prince Tributary to enter Bullhead Gulch and continue on down to outfall at Boulder Creek. It is also possible for flows in Prince Tributary to bypass the junction with Bullhead Gulch and be conveyed to an irrigation pond on the right bank of Boulder Creek just upstream of the confluence of Bullhead Gulch and Boulder Creek. For the purposes of this plan, Prince Tributary is considered to flow to the irrigation pond. There is currently no formal outfall from the irrigation pond to Boulder Creek.

Prince Tributary originates just to the east of Prince Lake #2, at the outlet of the detention pond located in the Arapahoe Ridge Filing 1 development. A portion of the City of Lafayette contributes to the Prince Tributary drainage.

From the Arapahoe Ridge development, Prince Tributary flows north through the planned Flatiron Meadows development, located south of Erie Parkway and east of N. 111th Street within the Town of Erie. Prince Tributary leaves the Town of Erie and enters unincorporated Boulder County and the Brownsville subdivision. Several properties within the Prince Tributary watershed are located within unincorporated Boulder County and are zoned as open space. A FEMA 100-year floodplain is designated for Prince Tributary. Prince Tributary was divided into six unique reaches for analysis.

Reach 1 – Boulder Creek to Jasper Road

Reach 1 is located in unincorporated Boulder County and is zoned entirely as open space. The Boulder and Weld County Ditch traverses west to east through the reach. A defined channel for Prince Tributary does not exist north of the Boulder and Weld County Ditch. This reach of Prince Tributary has a FEMA designated 100-year floodplain.

Reach 2 – Jasper Road to the Union Pacific Railroad

Reach 2 is also located in unincorporated Boulder County. A linear low flow channel exists from the Union Pacific Railroad downstream to Jasper Road. Downstream of Jasper Road, low flows from Prince Tributary are inadvertently intercepted by the Boulder and Weld County Ditch. This reach of Prince Tributary has a FEMA designated 100-year floodplain.

Jasper Road Crossing

Channel Downstream of Jasper Road

Reach 3 – Union Pacific Railroad to 320' upstream of Flatiron Drive

Reach 3 is located in unincorporated Boulder County and is comprised entirely of the Brownsville subdivision. The upstream limit of Reach 3 is the boundary between Boulder County and the Town of Erie. A defined low flow channel exists for Prince Tributary through this entire reach.

Channel Upstream of Flatiron Drive

Channel Upstream of Dobbins Run

Box culverts convey the drainage through two road crossings, Flatiron Drive and Dobbins Run

Dobbins Run Crossing

Flatiron Drive Crossing

The Lower Boulder Ditch traverses west to east through the reach. A 36" steel culvert conveys Prince Tributary beneath the Lower Boulder Ditch. This reach of Prince Tributary has a FEMA designated 100-year floodplain. Several residential structures are located within the 100-year floodplain.

Reach 4 – 320' upstream of Flatiron Drive to Erie Parkway

Low Flow Channel

Reach 4 is located in the Town of Erie. A defined low flow channel exists for Prince Tributary through the entire reach. Parcels located along the drainageway are zoned Rural Residential. A few large lot residential properties are currently located along the reach. An area of zoned open space is located just to the west of Prince Tributary. This reach of Prince Tributary has a FEMA designated 100-year floodplain.

Reach 5 –Erie Parkway to Walker Street (Arapahoe Ridge Subdivision)

Reach 5 is located in the Town of Erie. The reach is entirely undeveloped and is the future location of the Flatiron Meadows development. At the time of this report, initial overlot grading had begun in the northeast portion of the Flatiron Meadows development. Based on aerial photography, it appears a defined low flow channel exists for Prince Tributary through the reach. This reach of Prince Tributary has a FEMA designated 100-year floodplain.

Undeveloped Drainageway

New Development

Reach 6 –Walker Street (Arapahoe Ridge Subdivision) to Arapahoe Road (City of Lafayette boundary)

Reach 6 is located in the Town of Erie and extends to the boundary with the City of Lafayette at Arapahoe Road. The outfall alignment is located between Filings 1 and 2 of the Arapahoe Ridge subdivision.

A preliminary channel design was developed for this reach to convey stormwater flows north from Arapahoe Road along N. 111th Street to a point at the southwest corner of Prince Lake No. 2, which is located in unincorporated Boulder County. Prince Lake No. 2 is owned by Boulder County and is used for irrigation water supply.

Prince Lake No.2

3.0 HYDROLOGIC ANALYSIS

3.1 OVERVIEW

A detailed hydrologic analysis was performed for the study area to determine peak discharges for the 2-, 5-, 10-, 25-, 50- and 100-year storm frequencies for existing and future development conditions. The latest version of the CUHP computer program, CUHP 2005, Version 1.3.3, was used to generate storm runoff hydrographs for the individual subbasins. EPA SWMM, Version 5.0.022, was used to route the hydrographs through the watershed. The UDFCD computer program CUHP/SWMM Converter, Version 1.3.2.36493, was used to convert previous versions of UDSWM to the current version. This baseline hydrologic analysis updates the hydrologic analysis from the 2001 OSP.

3.2 UDSWM CONVERSION

RESPEC, in conjunction with the project sponsors, recommended that the effort used to develop the 2001 OSP hydrology be utilized, after review and QA/QC check. In order to utilize the 2001 OSP analysis, it was first necessary to convert the model files to the current versions of CUHP and SWMM. This was done with CUHP/SWMM Converter, Version 1.3.2.36493. RESPEC performed a thorough check of the converted input files to verify validity of the data.

The 2001 OSP hydrologic analysis utilized UDSWM to develop subbasin hydrographs and route them through the watershed to their outfall locations. CUHP was not used to develop the subbasin hydrographs in the 2001 OSP. CUHP was used to calibrate the UDSWM model based on five subbasins within the study area. Therefore, a new CUHP model was developed to generate the subbasin hydrographs based on the UDSWM model input. New CUHP input variables, not required by UDSWM, were also developed, including subbasin length and distance to subbasin centroid. All other SWMM input was left unchanged for the conversion process.

EPA SWMM requires invert elevations for each node. UDSWM only requires a starting elevation and channel slopes from one node the next. In order to convert UDSWM to EPA SWMM, a starting outfall elevation must be assigned during the conversion process. The remaining node elevations are assigned automatically by the converter program based on this outfall elevation and the conduit slopes of the UDSWM model (EPA SWMM terminology includes pipes and open channels as conduits). However, this method can result in erroneous node elevations, especially in the upper portions of the watershed. It was found that the 2001 OSP node elevations, once converted to EPA SWMM, were generally higher than actual elevations. Therefore, node elevations were revised for each node in the EPA SWMM model based on the 2-foot topographic mapping.

Once the 2001 OSP models were converted, differences were observed in the results. A detailed review was conducted to determine the source of differences between the 2001 OSP produced using the older software versions and the results from the converted models. The 2001 OSP did not include a separate CUHP model; therefore it was not possible to compare the results for each individual subbasin. Peak flows were compared at all design points along the outfalls.

The updated CUHP/SWMM results were mixed, with some design points having lower peak flows than the 2001 OSP, and some higher. A complete summary of the conversion results is included in Table 3-2 at the end of this section.

It was found that several irregularly shaped, single basin outfalls produced results significantly different than the 2001 OSP. These subbasins were compared to other subbasins with similar imperviousness by plotting the subbasin peak runoff versus subbasin area. However, no pattern emerged from this comparison. The discrepancies were attributed to the effects of model calculation changes between the software versions, UDSWM and CUHP.

3.3 CALIBRATION

Some of the improvements recommended in the 2001 OSP have been implemented throughout the study area, including regional detention ponds and channel improvements. These improvements were designed based upon the 2001 hydrologic analysis. Therefore, to avoid discrepancies in study area hydrology due solely to revisions in software, an effort was made to calibrate the updated hydrologic models. Following the calibration process, the hydrologic model would be updated with physical changes in the watershed, including additional regional detention ponds built since the 2001 OSP, revised land use assumptions, and corresponding subbasin impervious values to create the baseline hydrologic analysis.

The calibration process was aimed at adjusting the revised 100-year peak discharges to within 10% of the effective peak discharges from the 2001 OSP. This was done by adjusting the Cp coefficient in CUHP. Through discussions with the project sponsors, it was determined that three subbasins required calibration, Subbasins 212, 440, and 487. Calibration of these subbasins was required to reduce 100-year peak flows at design points 310, 511, and 539, respectively.

Peak flows at design points that were significantly less than 2001 results were analyzed for errors, but were not calibrated up to meet the 2001 peak flows. Several small outfalls with peak flow differences greater than +10% were left uncalibrated based on several factors including: the subbasins are located entirely in planned open space, single subbasin outfalls with no proposed improvements, and peak flow discrepancies due to an irregular basin shape.

The calibrated hydrologic model was then updated with additional regional detention ponds built since the 2001 OSP, revised land use assumptions, and corresponding subbasin imperviousness to create the baseline hydrologic analysis. This is summarized in the flowing sections.

Table 4-1
Existing Drainage Facilities

Street Name	Location	Street Classification	Structure	Outfall	Existing Capacity Culvert Only (cfs)	Existing Capacity Culvert Only (return period)	Existing Capacity with Allowable Overtopping (cfs)	Existing Capacity with Allowable Overtopping (return period)
Coal Creek Outfalls								
Flagg Drive	Just south of Baseline Road	Collector	43" x 68" HERCP	Drainageway 2 South	151	-	308	-
Baseline Road	Just east of County Line Road	Arterial	24" CMP	Drainageway 2 South	23	-	23	-
Briggs Street	700' north of Erie Parkway	Collector	6' x 10' RCBC	Briggs Street	615	100 yr	772	100 yr
County Line Road	Just north of Baseline Road	Arterial	30" CMP	Drainageway 2 South	34	< 2 yr	34	< 2 yr
County Line Road	740' north of Baseline Road	Arterial	18" RCP	Drainageway 2 North	16	-	16	-
County Line Road	620' north of Arapahoe Road	Arterial	18" RCP	Erie Farms 1	16	< 2 yr	16	< 2 yr
County Line Road	440' south of Austin Avenue	Arterial	35" x 107" RCBC[1]	Erie Commons 1	200	-	200	-
County Line Road	3,500' north of Erie Parkway	Arterial	3' x 10' RCBC x2	Briggs Street	516	100 yr	516	100 yr
N. 119th Street	Just north of Baseline Road	Arterial	18" CMP	Drainageway 2 South	11	-	11	-
N. 119th Street	250' north of Baseline Road	Arterial	24" RCP	Drainageway 2 South	29	< 2 yr	29	< 2 yr
N. 119th Street	1,650' north of Baseline Road	Arterial	24" RCP	Drainageway 2 North	29	10 yr	29	10 yr
N. 119th Street	2,240' south of Arapahoe Road	Arterial	24" RCP	Drainageway 1	29	2 yr	29	2 yr
N. 119th Street	Just north of Arapahoe Road	Arterial	19" x 30" HERCP	Erie Farms 1	26	10 yr	26	10 yr
N. 119th Street	1,700' north of Arapahoe Road	Arterial	18" RCP	Erie Farms 1	16	2 yr	16	2 yr
N. 119th Street	3,950' north of Arapahoe Road	Arterial	24" RCP	Erie Commons 2	33	-	33	-
N. 111th Street	1,030' north of Baseline Road	Collector	29" x 42" CMP Arch x4	Drainageway 2 South	194	< 2 yr	352	2 yr
Meller Street	480' south of Telleen Avenue	Collector	48" RCP	Briggs Street	166	-	324	-
U.S. Highway 287	900' north of Baseline Road	Freeway	36" RCP[1]	Drainageway 2 South	116	< 2 yr	116	< 2 yr
Prince Tributary Outfall								
Erie Parkway	470' east of N. 111th Street	Arterial	42" x 66" CMP Arch	Prince Tributary	132	< 2 yr	132	< 2 yr
Flatiron Drive	1,340' east of N. 109th Street	Local	41" x 82" RCBC	Prince Tributary	242	2 yr	677	5 yr
Lower Boulder Ditch	1,300' east of N. 109th Street	Ditch Crossing	36" Steel Culvert	Prince Tributary	51	-	N/A	-
Dobbins Run	930' east of N. 109th Street	Local	25" x 72" RCBC	Prince Tributary	92	-	527	-
Union Pacific Railroad	680' east of N. 109th Street	Railroad Crossing	24" x 150" RCBC	Prince Tributary	277	< 2 yr	277	< 2 yr
Jasper Road	1,000' east of N. 109th Street	Arterial	20" x 80" Opening	Prince Tributary	72	< 2 yr	72	< 2 yr
U.S. Highway 287	640' south of Arapahoe Road	Freeway	4' x 6' RCBC	Prince Tributary	281	-	281	-
Isabelle Road	Just east of U.S. Highway 287	Arterial	24" RCP[1]	Prince Tributary	33	2 yr	33	2 yr
Boulder Creek Outfalls								
Kenosha Road	1,020' east of N. 119th Street	Arterial	4' x 6' RCBC[1]	Baily Kenosha Ponds	194	10 yr	194	10 yr
Jasper Road	Just east of U.S. Highway 287	Arterial	24" CMP[1]	N. 109th Street	23	10 yr	23	10 yr
U.S. Highway 287	1,450' north of Lookout Road	Freeway	5' x 11' RCBC x2[1]	Crystal Views	1174	50 yr	1174	50 yr

[1] Approximate Size

Table 5-1
Alternative Pre-Screening Matrix

Coal Creek Outfalls		Drainageway 2 South		Drainageway 2 North	Drainageway 1		Arapahoe Road		Erie Farms 1		Erie Farms 2	Gold Run
Alternative Category	**Description**	*Reach 1*	*Reach 2*	*Reach 1*	*Reach 1*	*Reach 2*	*Reach 1*	*Reach 2*	*Reach 1*	*Reach 2*	*Reach 1*	*Reach 1*
1. 100-Year Storm Conveyance Without Regional Detention	Channel, storm sewer, and/or road crossing improvements to convey 100-year storm event	✓	✓	✓	✓		✓		✓			✓
2. Regional Detention with 100-Year Storm Conveyance	Regional detention facilities in combination with stormwater improvements to convey 100-year storm event	✓	✓		✓		✓		✓			✓
3. Optimization of Stormwater Facilities, Convey Minor Storm	Improvements to existing stormwater facilities to convey the largest storm event possible	✓	✓	✓								
4. Channel Stability	Improvements to address channel instability issues including channel bank erosion and sediment deposition											
5. Water Quality - Excess Urban Runoff Volume (EURV)	Provide the Excess Urban Runoff Volume (EURV) only		✓		✓		✓		✓			✓
6. Non-Structural Measures	Acquisition of flood-prone properties, flood proofing existing structures											
7. No Improvements Recommended	Maintenance Only					✓		✓		✓	✓	

Coal Creek Outfalls		Erie Commons 1	Erie Commons 2	Briggs Street					Old Town	Erie Village	Kenosha Farms
Alternative Category	**Description**	*Reach 1*	*Reach 1*	*Reach 1*	*Reach 2*	*Reach 3*	*Reach 4*	*Reach 5*	*Reach 1*	*Reach 1*	*Reach 1*
1. 100-Year Storm Conveyance Without Regional Detention	Channel, storm sewer, and/or road crossing improvements to convey 100-year storm event					✓			✓		
2. Regional Detention with 100-Year Storm Conveyance	Regional detention facilities in combination with stormwater improvements to convey 100-year storm event	✓	✓	✓							
3. Optimization of Stormwater Facilities, Convey Minor Storm	Improvements to existing stormwater facilities to convey the largest storm event possible								✓		
4. Channel Stability	Improvements to address channel instability issues including channel bank erosion and sediment deposition										
5. Water Quality - Excess Urban Runoff Volume (EURV)	Provide the Excess Urban Runoff Volume (EURV) only										
6. Non-Structural Measures	Acquisition of flood-prone properties, flood proofing existing structures								✓		
7. No Improvements Recommended	Maintenance Only				✓		✓	✓		✓	✓

Prince Tributary		Prince Tributary					
Alternative Category	**Description**	*Reach 1*	*Reach 2*	*Reach 3*	*Reach 4*	*Reach 5*	*Reach 6*
1. 100-Year Storm Conveyance Without Regional Detention	Channel, storm sewer, and/or road crossing improvements to convey 100-year storm event			✓	✓	✓	✓
2. Regional Detention with 100-Year Storm Conveyance	Regional detention facilities in combination with stormwater improvements to convey 100-year storm event			✓	✓	✓	
3. Optimization of Stormwater Facilities, Convey Minor Storm	Improvements to existing stormwater facilities to convey the largest storm event possible	✓	✓	✓			✓
4. Channel Stability	Improvements to address channel instability issues including channel bank erosion and sediment deposition						
5. Water Quality - Excess Urban Runoff Volume (EURV)	Provide the Excess Urban Runoff Volume (EURV) only						
6. Non-Structural Measures	Acquisition of flood-prone properties, flood proofing existing structures			✓			
7. No Improvements Recommended	Maintenance Only	✓	✓				

Reach 6 –Walker Street (Arapahoe Ridge Subdivision) to Arapahoe Road (City of Lafayette boundary)

A preliminary channel design was completed in 2006 for this reach of Prince Tributary. The preliminary design consists of three primary elements: conveyance of 350 cfs along the west side of N. 111th Street upstream of detention pond 1025 (located in Arapahoe Ridge Filing 2), conveyance of 525 cfs through the Schofield Farm property and into Prince Lake #2, and conveyance of a 0.4-inch storm along the east side of N. 111th Street downstream of detention pond 1025. The design flow rates are approximately equal to the 10-year event. Peak discharges from the updated hydrologic analysis are relatively the same for this reach of Prince Tributary as in the 2001 OSP. The channel improvements are scheduled to be constructed in 2014.

1. 100-Year Storm Conveyance without Regional Detention

   Conveyance of the 100-year event along N. 111th Street is not feasible due to limited space.

3. Optimization of Stormwater Facilities and Conveyance of the Minor Storm Event

   The preliminary channel design completed in 2006 for this reach of Prince Tributary was designed for approximately the 10-year event.

Prince Tributary - Reach 6 - Alternative 3

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts						
Box Culvert Pipe						
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)			
8	4	1	120	L.F.	$736.17	$88,340.40
8	4	1	35	L.F.	$736.17	$25,765.95
8	4	1	20	L.F.	$736.17	$14,723.40
Headwall and Toewalls						
Individual Box Span (ft)	No. of Barrels	Total Span (ft)				
8	1	10.00	2	EA	$796.75	$1,593.50
8	1	10.00	2	EA	$796.75	$1,593.50
8	1	10.00	2	EA	$796.75	$1,593.50
Wingwalls (includes wingwalls on either side of chan nel and concrete apron)						
Individual Box Span (ft)	Box Rise (ft)	No. of Barrels				
8	4	1	2	EA	$7,420.37	$14,840.74
8	4	1	2	EA	$7,420.37	$14,840.74
8	4	1	2	EA	$7,420.37	$14,840.74
Hydraulic Structures						
Sloping Drop Structures						
Height (ft)	Bottom Width (ft)	Yn (ft)				
3	9	3	4	EA	$46,445.30	$185,781.20
3	4	5	2	EA	$61,763.36	$123,526.72
4	4	5	1	EA	$66,142.56	$66,142.56
Channel Improvements						
Excavation, Low Range			7180	C.Y.	$12.00	$86,160.00
Soil Riprap, Type VL			4350	C.Y.	$56.00	$243,600.00

Master Plan Capital Improvement Cost Summary			
Capital Improvement Costs			
Pipe Culverts and Storm Drains			$0.00
Concrete Box Culverts			$178,132.00
Hydraulic Structures			$375,450.00
Channel Improvements			$329,760.00
Detention/Water Quality Facilities			$0.00
Removals			$0.00
Landscaping and Maintenance Improvements			$0.00
Special Items (User Defined)			$0.00
Subtotal Capital Improvement Costs			$883,342.00
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$44,167.00
Traffic Control	$10,000.00	L.S.	$10,000.00
Utility Coordination/Relocation	$20,000.00	L.S.	$20,000.00
Stormwater Management/Erosion Control	5%		$44,167.00
Subtotal Additional Capital Improvement Costs			$118,334.00
Land Acquisition Costs			
ROW/Easements			$0.00
Subtotal Land Acquisition Costs			$0.00
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$150,251.00
Legal/Administrative	5%		$50,084.00
Contract Admin/Construction Management	10%		$100,168.00
Contingency	25%		$250,419.00
Subtotal Other Costs			$550,922.00
Total Capital Improvement Costs			$1,552,598.00

Reach 6 –Walker Street (Arapahoe Ridge Subdivision) to Arapahoe Road (City of Lafayette boundary)

A preliminary channel design was completed in 2006 for this reach of Prince Tributary. The preliminary design consists of three primary elements: conveyance of 350 cfs along the west side of N. 111th Street upstream of detention pond 1025 (located in Arapahoe Ridge Filing 2), conveyance of 525 cfs through the Schofield Farm property and into Prince Lake #2, and conveyance of a 0.4-inch storm along the east side of N. 111th Street downstream of detention pond 1025. The design flow rates are approximately equal to the 10-year event. Peak discharges from the updated hydrologic analysis are relatively the same for this reach of Prince Tributary as in the 2001 OSP. The channel improvements are scheduled to be constructed in 2014.

The preliminary design completed in 2006 for this reach was reviewed as part of this study and found to meet the intent of the outfall systems plan and updated hydrologic analysis. The recommended plan for this reach is the preliminary design completed in 2006.

3. Optimization of Stormwater Facilities and Conveyance of the Minor Storm Event

The recommended plan is the preliminary design completed in 2006 and was designed for approximately the 10-year event.

Prince Tributary – Reach 6 – Recommended Plan

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts						
Box Culvert Pipe						
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)			
8	4	1	120	L.F.	$736.17	$88,340.40
8	4	1	35	L.F.	$736.17	$25,765.95
8	4	1	20	L.F.	$736.17	$14,723.40
Headwall and Toewalls						
Individual Box Span (ft)	No. of Barrels	Total Span (ft)				
8	1	10.00	2	EA	$796.75	$1,593.50
8	1	10.00	2	EA	$796.75	$1,593.50
8	1	10.00	2	EA	$796.75	$1,593.50
Wingwalls (includes wingwalls on either side of channel and concrete apron)						
Individual Box Span (ft)	Box Rise (ft)	No. of Barrels				
8	4	1	2	EA	$7,420.37	$14,840.74
8	4	1	2	EA	$7,420.37	$14,840.74
8	4	1	2	EA	$7,420.37	$14,840.74
Hydraulic Structures						
Sloping Drop Structures						
Height (ft)	Bottom Width (ft)	Yn (ft)				
3	9	3	4	EA	$46,445.30	$185,781.20
3	4	5	2	EA	$61,763.36	$123,526.72
4	4	5	1	EA	$66,142.56	$66,142.56
Channel Improvements						
Excavation, Low Range			7180	C.Y.	$12.00	$86,160.00
Soil Riprap, Type VL			4350	C.Y.	$56.00	$243,600.00

Master Plan Capital Improvement Cost Summary			
Capital Improvement Costs			
Pipe Culverts and Storm Drains			$0.00
Concrete Box Culverts			$178,132.00
Hydraulic Structures			$375,450.00
Channel Improvements			$329,760.00
Detention/Water Quality Facilities			$0.00
Removals			$0.00
Landscaping and Maintenance Improvements			$0.00
Special Items (User Defined)			$0.00
Subtotal Capital Improvement Costs			**$883,342.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$44,167.00
Traffic Control	$10,000.00	L.S.	$10,000.00
Utility Coordination/Relocation	$20,000.00	L.S.	$20,000.00
Stormwater Management/Erosion Control	5%		$44,167.00
Subtotal Additional Capital Improvement Costs			**$118,334.00**
Land Acquisition Costs			
ROW/Easements			$0.00
Subtotal Land Acquisition Costs			**$0.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$150,251.00
Legal/Administrative	5%		$50,084.00
Contract Admin/Construction Management	10%		$100,168.00
Contingency	25%		$250,419.00
Subtotal Other Costs			**$550,922.00**
Total Capital Improvement Costs			**$1,552,598.00**

Master Plan Operation and Maintenance Cost Summary					
Description		Quantity	Unit	Unit Cost	Total Annual Cost
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs		175	L.F.	$1.50	$788.00
Manhole and Inlet Maintenance (e.g. sediment & debris removal, structural repairs, etc.)			EA		$0.00
Hydraulic Structure Maintenance (e.g. debris removal, erosion, structural repairs, etc.)			EA		$0.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)		2730	L.F.	$1.50	$12,285.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal,		0	ACRE	$1,500.00	$0.00
Mowing (e.g. channels, ponds, etc.)			ACRE		$0.00
Trail Maintenance (e.g. structural repairs, crusher fines, etc.)			L.F.		$0.00
	<-----User Defined Items				$0.00
	<-----User Defined Items				$0.00
	<-----User Defined Items				$0.00
Total Annual Operation and Maintenance Cost					**$13,073.00**
Effective Interest Rate					3.50%
Total Operation and Maintenance Costs Over 50 Years					**$306,635.00**

Prince Tributary – Reach 5 – Conceptual Design Plan

DESCRIPTION			QUANTITY	UNIT	UNIT COST	TOTAL COST
Concrete Box Culverts						
Box Culvert Pipe						
Individual Box Span (ft)	Box Height (ft)	No. of Barrels	Length (ft)			
5	8	2	185	L.F.	$1,420.32	$262,759.00
Headwall and Toewalls						
Individual Box Span (ft)	No. of Barrels	Total Span (ft)				
5	2	13.00	1	EA	$900.09	$900.00
Wingwalls (includes wingwalls on either side of channel and concrete apron)						
Individual Box Span (ft)	Box Rise (ft)	No. of Barrels				
5	8	2	1	EA	$16,355.30	$16,355.30
Detention/Water Quality Facilities						
Detention (Complete-in-Place)						
Detention Facility 1 (Complete-in-Place)			38	AC-FT	$46,400.00	$1,763,200.00
Special Items (User Defined)						
Prince Lake #2 - Excavation, High Range	<----User Defined Items		2545	C.Y	$32.00	$81,440.00
Prince Lake #2 - Soil Riprap, Type M	<----User Defined Items		44	C.Y	$71.00	$3,124.00

Master Plan Capital Improvement Cost Summary			
Capital Improvement Costs			
Pipe Culverts and Storm Drains			$0.00
Concrete Box Culverts			$280,014.00
Hydraulic Structures			$0.00
Channel Improvements			$0.00
Detention/Water Quality Facilities			$1,763,200.00
Removals			$0.00
Landscaping and Maintenance Improvements			$0.00
Special Items (User Defined)			$84,564.00
Subtotal Capital Improvement Costs			**$2,127,778.00**
Additional Capital Improvement Costs			
Dewatering		L.S.	$0.00
Mobilization	5%		$106,389.00
Traffic Control	$10,000.00	L.S.	$10,000.00
Utility Coordination/Relocation	$10,000.00	L.S.	$10,000.00
Stormwater Management/Erosion Control	5%		$106,389.00
Subtotal Additional Capital Improvement Costs			**$232,778.00**
Land Acquisition Costs			
ROW/Easements			$0.00
Subtotal Land Acquisition Costs			**$0.00**
Other Costs (percentage of Capital Improvement Costs)			
Engineering	15%		$354,083.00
Legal/Administrative	5%		$118,028.00
Contract Admin/Construction Management	10%		$236,056.00
Contingency	25%		$590,139.00
Subtotal Other Costs			**$1,298,306.00**
Total Capital Improvement Costs			**$3,658,862.00**

Master Plan Operation and Maintenance Cost Summary				
Description	Quantity	Unit	Unit Cost	Total Annual Cost
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs	185	L.F.	$1.00	$555.00
Detention/WQ Maintenance (e.g. sediment & debris removal, mucking out, tree & weed removal,	15.64	ACRE	$1,530.00	$71,788.00
Total Annual Operation and Maintenance Cost				**$72,343.00**
Effective Interest Rate				3.50%
Total Operation and Maintenance Costs Over 50 Years				**$1,696,850.00**

PRINCE TRIBUTARY – REACH 6

Walker Street (Arapahoe Ridge Subdivision) to Arapahoe Road (City of Lafayette boundary)

Reach Description

Reach 6 is located in the Town of Erie and extends to the boundary with the City of Lafayette at Arapahoe Road. The outfall alignment is located between Filings 1 and 2 of the Arapahoe Ridge subdivision. A preliminary channel design was developed for this reach to convey stormwater flows north from Arapahoe Road along N. 111th Street to a point at the southwest corner of Prince Lake No. 2, which is located in unincorporated Boulder County. Prince Lake No. 2 is owned by Boulder County and is used for irrigation water supply.

Problem Identification

- Insufficient channel capacity

Conceptual Design Plan Improvements

Optimization of Stormwater Facilities and Conveyance of the Minor Storm Event

The Conceptual Design Plan for this reach is a preliminary design completed in 2006. The preliminary design consists of three primary elements: conveyance of 350 cfs along the west side of N. 111th Street upstream of detention pond 1025 (located in Arapahoe Ridge Filing 2), conveyance of 525 cfs through the Schofield Farm property and into Prince Lake #2, and conveyance of a 0.4-inch storm along the east side of N. 111th Street downstream of detention pond 1025. The design flow rates are approximately equal to the 10-year event. Peak discharges from the updated hydrologic analysis are relatively the same for this reach of Prince Tributary as in the 2001 OSP. The preliminary design was reviewed as part of this study and found to meet the intent of the outfall systems plan and updated hydrologic analysis. The channel improvements are scheduled to be constructed in 2014. A cost estimate was prepared and included with the 2006 preliminary channel design. The design consultant's opinion of probable cost for the proposed channel improvements is $1,737,941. This cost estimate has been included in the Conceptual Design Plan Cost Estimate Summary Table ES-3 and Table 7-1. An operation and maintenance cost estimate is provided below.

Master Plan Operation and Maintenance Cost Summary				
Description	Quantity	Unit	Unit Cost	Total Annual Cost
Culvert Maintenance (e.g. sediment & debris removal, erosion at entrance/exit, structural repairs	169	L.F.	$1.00	$507.00
Channel Maintenance (e.g. sediment & debris removal, erosion, tree & weed removal, etc.)	2885	L.F.	$2.00	$17,310.00
Total Annual Operation and Maintenance Cost				**$17,817.00**
Effective Interest Rate				3.50%
Total Operation and Maintenance Costs Over 50 Years				**$417,909.00**

CLICK HERE TO VIEW REACH 6 MAP NO PROFILE AVAILABLE

Table B-2
Peak Flow Summary

Prince Tributary			Peak Discharge (cfs) - Existing Development						Peak Discharge (cfs) - Future Development					
SWMM Node	Location Description	Drainage Area (acres)	2-Year	5-Year	10-Year	25-Year	50-year	100-Year	2-Year	5-Year	10-Year	25-Year	50-year	100-Year
300		152	7	38	59	126	170	218	39	98	129	220	283	346
302		43	27	54	67	99	124	145	27	54	68	100	125	145
303	Arapahoe Road	334	79	192	246	399	509	618	92	228	298	504	623	744
305		408	73	180	233	388	499	613	89	223	292	490	601	740
1025		408	73	194	260	446	559	676	89	247	328	548	662	804
306		533	74	223	307	541	679	838	91	274	373	620	782	961
308		780	118	301	392	690	861	1,096	145	361	466	779	980	1,245
310		77	14	52	70	123	158	194	14	52	70	123	159	194
311		920	119	342	445	798	1,005	1,279	154	402	527	893	1,130	1,437
312	Erie Parkway	1,256	119	389	524	926	1,201	1,557	186	511	634	1,075	1,396	1,792
313		1,303	124	420	558	982	1,280	1,662	197	531	672	1,137	1,481	1,903
315	Flatiron Drive	1,539	146	469	620	1,078	1,419	1,849	219	574	725	1,239	1,631	2,106
320		122	1	28	43	94	126	158	1	28	43	94	126	158
321	Erie Parkway	222	2	50	74	168	227	290	2	50	74	168	227	290
322		281	83	346	630	1,138	1,455	1,925	490	1,184	1,779	2,676	3,274	4,036
323		368	83	348	637	1,157	1,486	1,961	482	1,177	1,780	2,696	3,302	4,079
317	Lower Boulder Ditch	1,907	180	675	1,160	2,102	2,801	3,672	687	1,746	2,494	3,918	4,909	6,145
318	UPRR	2,081	183	692	1,182	2,146	2,868	3,763	690	1,764	2,524	3,979	5,001	6,271
319	Boulder & Weld Co Ditch	2,145	182	686	1,179	2,149	2,877	3,780	684	1,758	2,525	3,985	5,015	6,295
940		2,245	182	668	1,171	2,149	2,885	3,792	661	1,744	2,511	3,976	5,010	6,296

Table B-3
Runoff Volume Summary

Prince Tributary			Runoff Volume (acre-ft) - Existing Development						Runoff Volume (acre-ft) - Future Development					
SWMM Node	Location Description	Drainage Area (acres)	2-Year	5-Year	10-Year	25-Year	50-year	100-Year	2-Year	5-Year	10-Year	25-Year	50-year	100-Year
300		152	1.0	4.4	6.6	12.4	16.7	21.3	3.7	8.1	10.6	16.2	20.6	25.0
302		43	1.5	2.9	3.6	5.1	6.3	7.5	1.5	2.9	3.6	5.1	6.3	7.5
303	Arapahoe Road	334	5.6	14.2	19.5	31.6	41.0	50.7	8.3	17.9	23.5	35.4	45.0	54.6
305		408	5.7	14.4	19.7	31.8	41.2	51.0	8.5	18.2	23.7	35.7	45.2	54.8
1025		408	6.3	17.2	23.7	38.4	49.8	61.7	9.1	20.9	27.7	42.2	53.9	65.5
306		533	6.6	19.8	28.0	47.6	62.6	78.4	9.4	23.5	32.0	51.6	66.8	82.3
308		780	10.1	29.3	41.8	70.8	93.0	116.0	13.9	35.0	47.7	76.6	98.9	121.7
310		77	0.7	2.5	3.7	6.4	8.5	10.7	0.8	2.6	3.7	6.5	8.5	10.8
311		920	11.1	33.6	48.2	82.3	108.2	135.3	16.4	41.2	56.2	89.9	116.1	142.8
312	Erie Parkway	1,256	11.7	40.5	60.3	108.2	143.5	181.0	22.7	56.7	78.0	124.6	160.6	197.4
313		1,303	13.3	45.1	67.3	120.0	158.7	199.8	24.3	61.8	84.9	136.3	175.8	216.1
315	Flatiron Drive	1,539	16.3	53.2	78.5	137.5	181.9	228.2	27.4	70.0	96.1	153.9	199.0	244.5
320		122	0.1	2.2	3.9	8.4	11.6	15.3	0.1	2.2	3.9	8.4	11.6	15.3
321	Erie Parkway	222	0.2	4.1	7.1	15.5	21.3	28.0	0.2	4.1	7.1	15.5	21.3	28.0
322		281	19.2	68.6	112.4	202.9	234.3	302.7	70.8	157.5	227.7	341.9	412.4	502.1
323		368	19.7	71.4	116.8	210.5	244.6	315.8	72.2	161.4	233.1	350.9	423.8	516.3
317	Lower Boulder Ditch	1,907	36.9	125.9	196.8	350.0	428.7	546.5	100.7	233.3	331.4	507.8	626.1	764.4
318	UPRR	2,081	38.2	131.3	204.9	364.6	448.0	571.0	102.4	239.0	339.7	522.5	645.6	789.0
319	Boulder & Weld Co Ditch	2,145	38.3	133.4	207.9	370.1	455.4	580.3	103.6	242.0	343.8	529.2	654.2	799.7
940	Boulder Creek	2,245	38.6	137.8	214.2	380.3	468.7	596.8	104.9	247.0	350.7	539.7	667.8	816.6

LEGEND

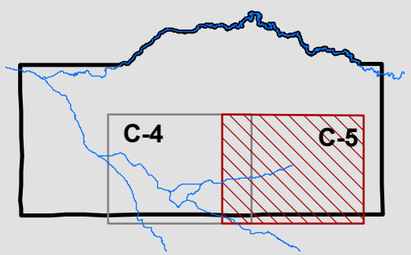
- Study Area Boundary
- Erie Planning Area Boundary
- Town of Erie
- City of Lafayette
- 100-Year Floodplain (FIS)
- Existing Detention Ponds
- Outfall Alignment
  (Outfall Name)

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

DRAINAGE PROBLEM AREAS

- Undersized/No Road Crossing
- Insufficient Channel Capacity
- Channel Degradation/Erosion
- Structures in 100yr Floodplain

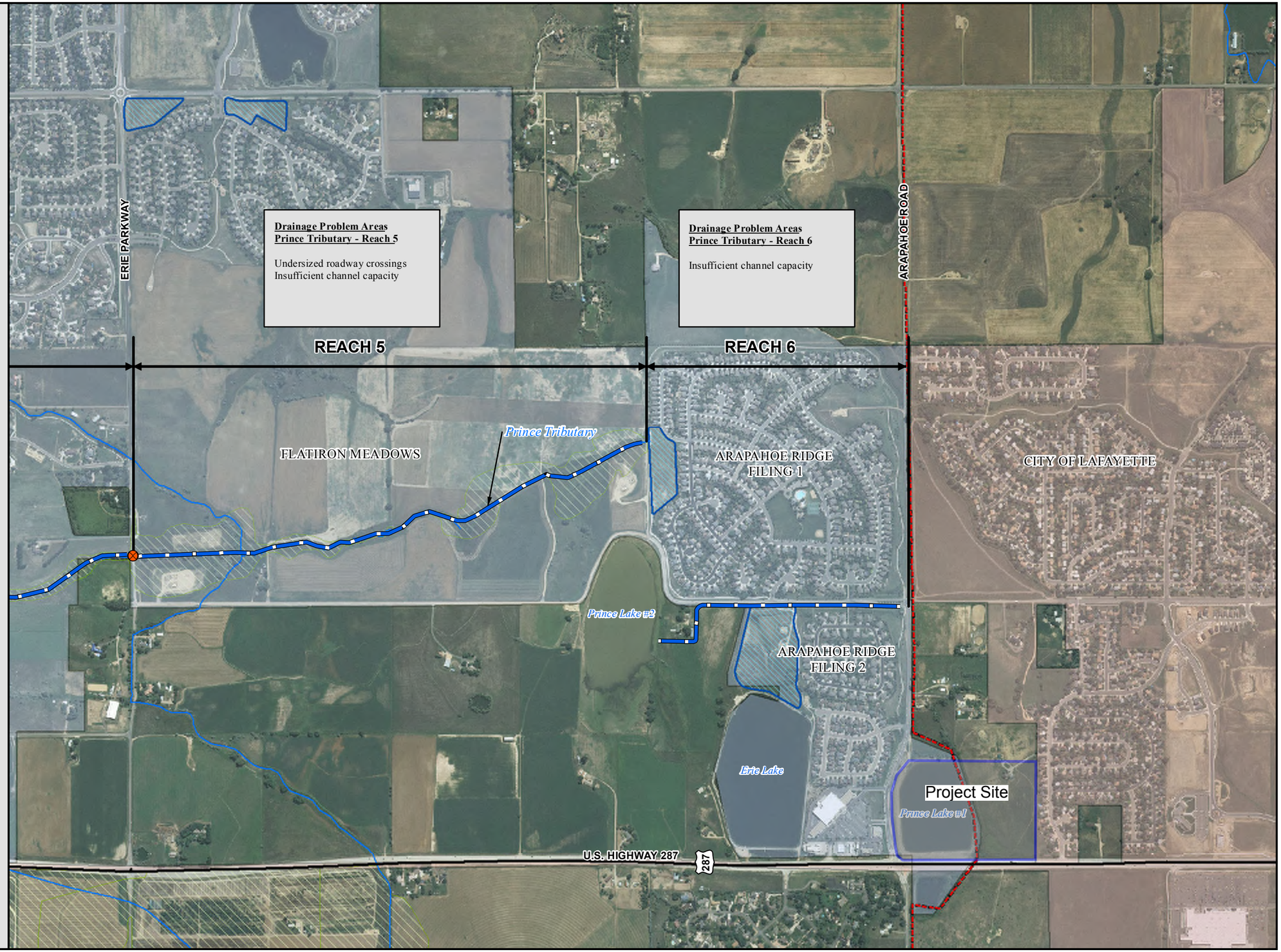
KEY MAP



N E S W

0 500 1,000 2,000 Feet

1 " = 1,000 FT



M:\2234\GIS\2234 ALTERNATIVES.MXD - 3/1/13 - NRT

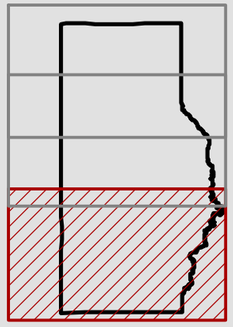
WRC ENGINEERING, INC. 950 SOUTH CHERRY STREET, SUITE 404 DENVER, COLORADO 80246 PHONE: 303-757-8513 FAX: 303-758-3208	TOWN OF ERIE - CITY OF LAFAYETTE - BOULDER COUNTY URBAN DRAINAGE AND FLOOD CONTROL DISTRICT	TOWN OF ERIE OUTFALL SYSTEMS PLAN (WEST OF COAL CREEK)	DRAINAGE PROBLEM AREAS PRINCE TRIBUTARY	FIGURE C-5

LEGEND

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

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

KEY MAP



N
W E
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0 750 1,500 3,000 Feet

1 " = 1,500 FT

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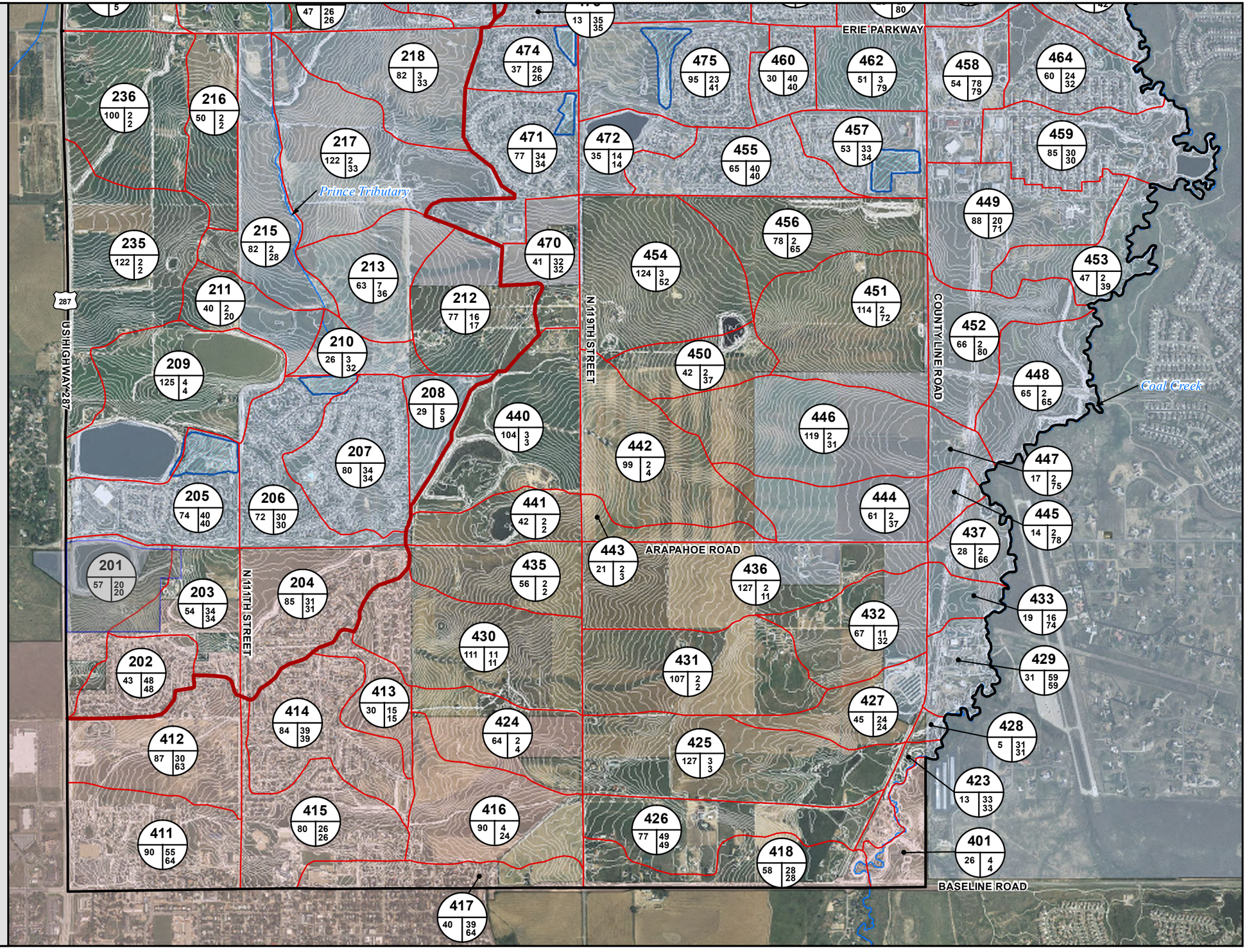


WRC ENGINEERING, INC.
950 SOUTH CHERRY STREET, SUITE 404
DENVER, COLORADO 80246
PHONE: 303-757-8513
FAX: 303-758-3208

TOWN OF ERIE
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

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

SUBBASIN MAP

FIGURE
B-2

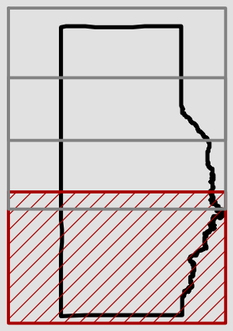
LEGEND

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

SWMM Elements

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

KEY MAP



N
W E
S

0 750 1,500 3,000 Feet

1 " = 1,500 FT

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

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TOWN OF ERIE
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

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

SWMM ROUTING MAP

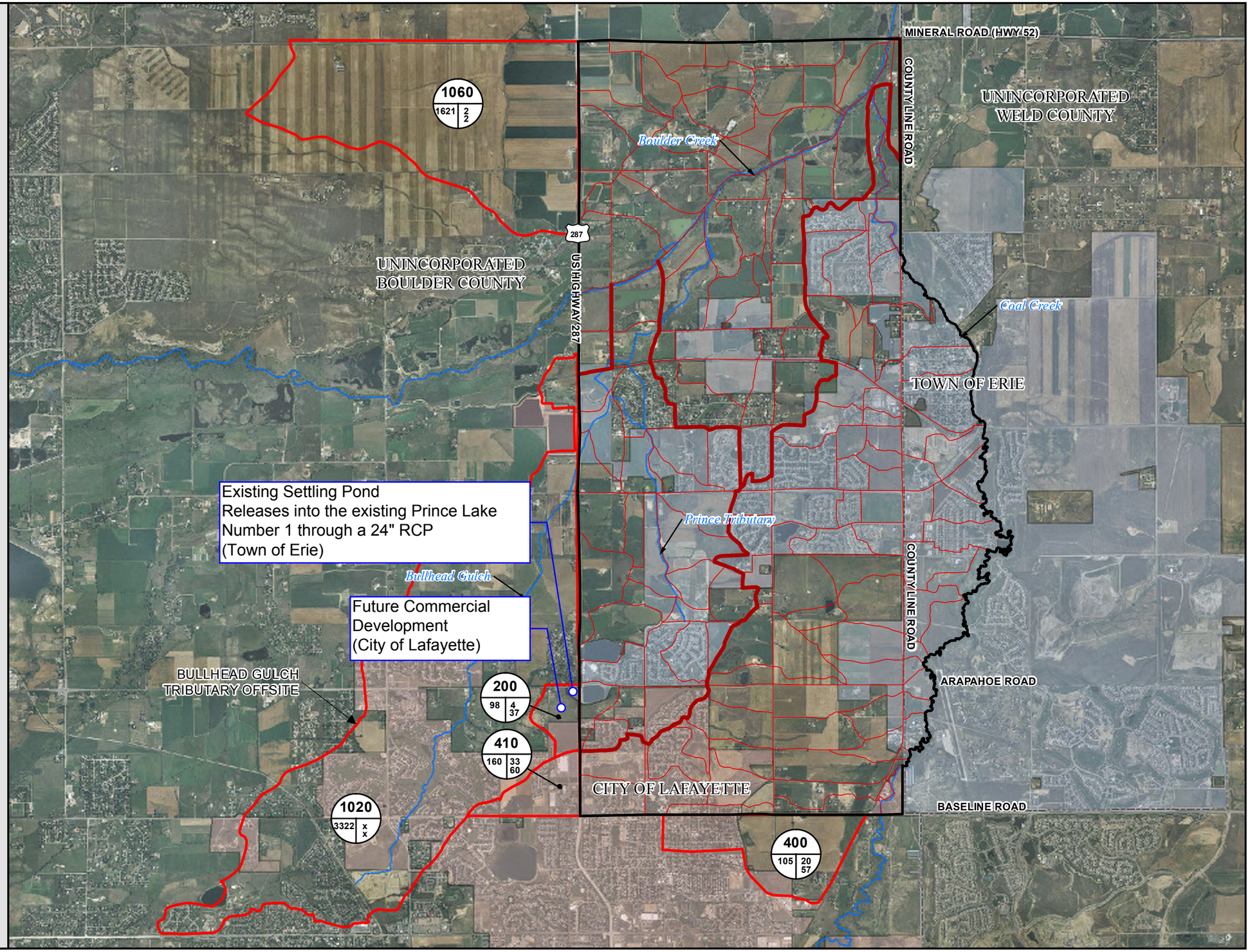
FIGURE
B-6

LEGEND

- Study Area Boundary
- Town of Erie
- City of Lafayette
- Offsite Subbasin Boundary
- Subbasin Boundary
- Major Watershed Boundary

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

Note: Hydrographs for offsite subbasins taken from 2001 Outfall Systems Plan study for input to updated baseline hydrologic analysis



N
W E
S

0 2,000 4,000 8,000 Feet

1 " = 4,000 FT

M:\2234\GIS\2234 OFFSITE MAP B-5.MXD - 12/12/12 - NRT

WRC ENGINEERING, INC.
950 SOUTH CHERRY STREET, SUITE 404
DENVER, COLORADO 80246
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TOWN OF ERIE
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

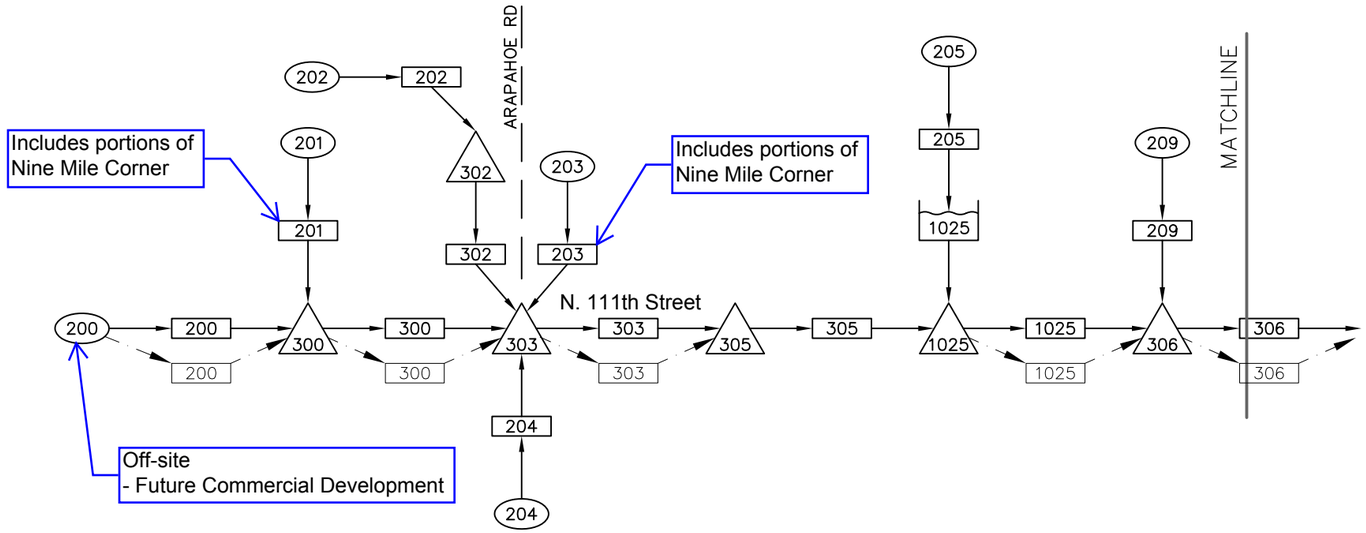
TOWN OF ERIE OUTFALL SYSTEMS PLAN
(WEST OF COAL CREEK)

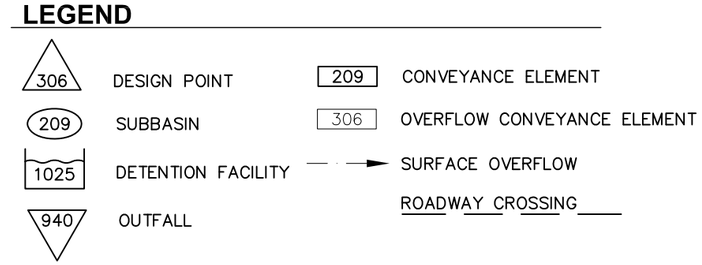
OFFSITE SUBBASIN MAP

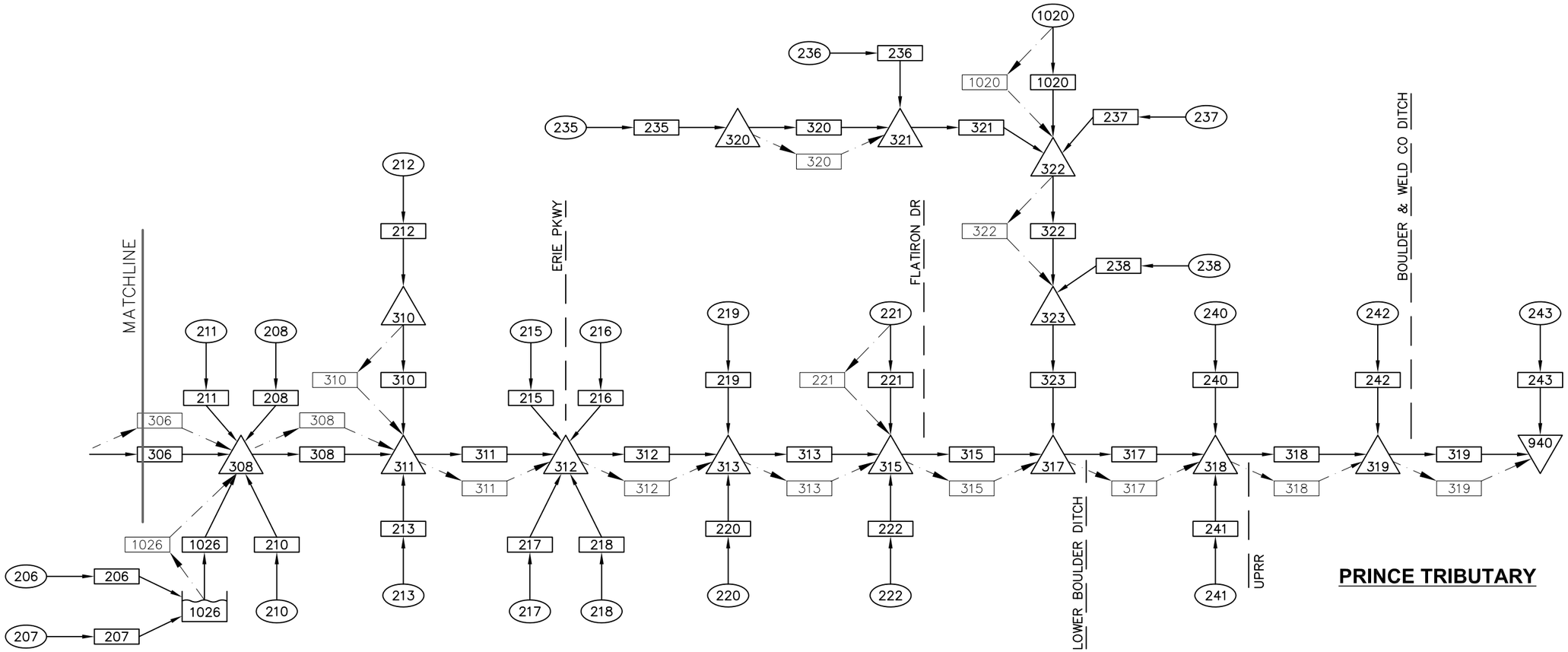
FIGURE B-5

Table B-1
CUHP Input

Subbasin	Area (mi^2)	Distance to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness		Depression Storage		Horton's Infiltration Parameters		
					Existing Land Use	Future Land Use	Pervious	Impervious	Initial Rate (in/hr)	Decay Coefficient (1/sec)	Final Rate (in/hr)
200	0.151	0.239	0.481	0.026	4.0	37.3	0.38	0.10	4.50	0.0018	0.60
201	0.089	0.244	0.690	0.015	19.5	19.5	0.38	0.10	4.50	0.0018	0.60
202	0.067	0.186	0.502	0.017	47.9	48.1	0.38	0.10	4.50	0.0018	0.60
203	0.084	0.212	0.487	0.029	34.0	34.0	0.38	0.10	4.50	0.0018	0.60
204	0.133	0.177	0.439	0.019	31.2	31.2	0.38	0.10	4.50	0.0018	0.60
205	0.115	0.276	0.621	0.016	39.5	39.5	0.38	0.10	4.50	0.0018	0.60
206	0.112	0.437	0.709	0.013	30.4	30.4	0.38	0.10	4.50	0.0018	0.60
207	0.125	0.325	0.554	0.017	33.7	33.7	0.38	0.10	4.50	0.0018	0.60
208	0.045	0.139	0.379	0.014	4.6	8.9	0.38	0.10	4.50	0.0018	0.60
209	0.195	0.290	0.684	0.019	4.1	4.3	0.38	0.10	4.50	0.0018	0.60
210	0.041	0.162	0.402	0.020	3.3	32.4	0.38	0.10	4.47	0.0018	0.60
211	0.063	0.229	0.441	0.011	2.0	19.8	0.38	0.10	4.50	0.0018	0.60
212	0.120	0.184	0.398	0.022	16.4	16.7	0.38	0.10	4.39	0.0018	0.59
213	0.098	0.237	0.485	0.019	7.4	35.5	0.38	0.10	4.30	0.0018	0.59
215	0.127	0.489	0.862	0.015	2.1	27.6	0.38	0.10	4.50	0.0018	0.60
216	0.078	0.298	0.582	0.020	2.1	2.4	0.38	0.10	4.50	0.0018	0.60
217	0.191	0.466	0.924	0.020	2.5	32.9	0.38	0.10	4.34	0.0018	0.59
218	0.128	0.396	0.639	0.028	2.7	32.8	0.38	0.10	3.78	0.0018	0.55
219	0.110	0.343	0.579	0.013	18.1	18.1	0.38	0.10	4.50	0.0018	0.60
220	0.074	0.310	0.715	0.027	25.7	25.7	0.38	0.10	4.33	0.0018	0.59
221	0.117	0.188	0.494	0.020	28.1	28.1	0.38	0.10	3.66	0.0018	0.54
222	0.143	0.336	0.659	0.024	25.0	25.0	0.38	0.10	4.21	0.0018	0.58
235	0.191	0.378	0.877	0.027	2.0	2.0	0.38	0.10	4.50	0.0018	0.60
236	0.156	0.289	0.636	0.024	2.1	2.1	0.38	0.10	4.48	0.0018	0.60
237	0.092	0.358	0.767	0.017	5.4	5.4	0.38	0.10	4.30	0.0018	0.59
238	0.137	0.427	0.817	0.018	10.2	10.2	0.38	0.10	4.44	0.0018	0.60
240	0.077	0.330	0.582	0.009	3.4	3.4	0.38	0.10	4.50	0.0018	0.60
241	0.196	0.352	0.630	0.015	17.4	17.5	0.38	0.10	4.50	0.0018	0.60
242	0.100	0.174	0.443	0.007	2.9	16.1	0.38	0.10	4.26	0.0018	0.58
243	0.156	0.362	0.552	0.007	4.1	4.3	0.38	0.10	3.00	0.0018	0.50
401	0.041	0.243	0.391	0.017	4.2	4.2	0.38	0.10	3.05	0.0018	0.51
410	0.249	0.492	1.123	0.008	33.0	60.0	0.38	0.10	4.14	0.0018	0.58
411	0.140	0.308	0.586	0.022	55.4	64.0	0.38	0.10	3.55	0.0018	0.54
412	0.136	0.337	0.610	0.023	29.7	63.2	0.38	0.10	4.00	0.0018	0.57
413	0.046	0.298	0.580	0.022	14.7	14.7	0.38	0.10	4.50	0.0018	0.60
414	0.131	0.419	0.673	0.022	39.2	39.2	0.38	0.10	4.50	0.0018	0.60
415	0.125	0.286	0.585	0.023	26.0	26.0	0.38	0.10	4.10	0.0018	0.57
416	0.140	0.283	0.662	0.018	4.1	24.1	0.38	0.10	4.48	0.0018	0.60
417	0.063	0.424	0.842	0.021	38.8	63.9	0.38	0.10	4.19	0.0018	0.58
418	0.091	0.391	0.904	0.014	28.1	28.1	0.38	0.10	4.03	0.0018	0.57
423	0.020	0.235	0.434	0.011	32.9	32.9	0.38	0.10	3.74	0.0018	0.55







PRINCE TRIBUTARY

WRC ENGINEERING, INC.
950 SOUTH CHERRY STREET
SUITE 404
DENVER, COLORADO 80246
PHONE NO: (303) 757-8513
FAX NO: (303) 758-3208

DESIGNED NRT
DRAWN JHN
CHECKED NRT
DATE 1/29/13
AS-BUILT

NO.	BY	DATE	REVISION DESCRIPTION
.	.	.	.

TOWN OF ERIE
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

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

SWMM SCHEMATIC
PRINCE TRIBUTARY

PROJECT NUMBER
2234

FIGURE B-13

2234\DWG\SWMM SCHEMATIC.DWG, PRINCE TRIBUTARY - 1/29/13 - JHN

Olsson Associates
Erie Reach BP20 Preliminary Design
February 2006

OLSSON ASSOCIATES
ENGINEERS • PLANNERS • SCIENTISTS • SURVEYORS
143 Union Blvd. Suite 700 Lakewood, CO 80228 720-962-6072

MEMO

Date: February 14, 2006

To: Wendi Palmer, Town of Erie
Laura Kroeger, UDFCD

From: Deb Ohlinger

Re: Erie Reach BP20 Preliminary Design

Introduction

This memorandum summarizes an evaluation of the existing conditions and presents the preliminary design of Reach BP20 improvements. A progress meeting was held on December 15, 2005, during which design alternatives were discussed. After receiving direction from the project sponsors, OA proceeded with a preliminary design of the improvements. The preliminary design consists of three primary elements: conveyance of 350 cubic feet per second (cfs) along the west side of North 111th Street upstream of the Detention Basin 1025, conveyance of 525 cfs through the Schofield Farm property and into Prince Lake No. 2, and conveyance of a 0.4-inch storm along the east side of North 111th Street downstream of Detention Basin 1025.

Hydrology

Discharges for the 2-, 5-, 10-, 50-, and 100-year and 0.4-inch storm events were obtained from Table 9 of *Erie Outfall Systems Planning, Preliminary Design: Erie and Adjacent Boulder and Weld County Areas* (OSP), prepared by Love and Associates and dated May 2001. Table 1 shows the OSP peak discharges at three locations for the future (developed) condition. Also included are the cumulative watershed areas at the design points. Design point 303 is located at North 111th Street and Arapahoe Road; design point 305 is located downstream of detention basin 1025; and design point 306 is located near the discharge of Prince Lake No. 2.

Table 1. OSP Peak Discharges at Select Locations along Reach BP20

Design Points	0.4-inch cfs	2-year cfs	5-year cfs	10-year cfs	50-year cfs	100-year cfs	Cumulative Area Acres
303	37	139	207	283	585	745	334
305	47	167	254	347	728	921	408
306	19	68	180	303	754	976	533

Existing Conditions Evaluation

A topographic survey of the site was completed in October 2005. The existing conditions were then evaluated at six locations to determine the capacity of the existing road, ditches, and right-

of-way. Figures 1A and 1B show the existing survey with project stationing. The reach between Stations 25+00 and 41+50 was evaluated to determine the available capacity between the fences on both sides of North 111th Street, as compared to the 100-year storm. The 100-year discharge at these locations is 745 cfs. The water surface elevations were set at the fence line or high points within the right-of-way and are shown in the cross sections in Figure 2. The estimated capacities are presented in Table 2.

Table 2. Estimated Capacity at Select Locations

Location	Available Capacity, cfs	Depth of Flow at Crown, ft
Station 26+00	446	0.4
Station 30+00	170	0.1
Station 36+00	356	0.0
Station 38+00	664	0.9

On the east side of North 111th Street, the reach between Stations 10+00 and 25+00 was evaluated with comparison to the 0.4-inch storm presented in the OSP. The peak discharge for this storm along this reach would be 47 cfs. The flow area for this reach was considered to be between the edge of pavement and the right-of-way south and east of North 111th Street, as shown in the cross sections in Figure 2. Table 3 shows the estimated capacities.

Table 3. Estimated Capacity at Select Locations

Location	Available Capacity, cfs
Station 14+00	7
Station 19+00	48

Preliminary Channel Design

Channel along North 111th Street

At the December 2005 meeting, it was decided that OA would develop alternatives to convey 350 cfs south of Station 27+00 and 525 cfs north of Station 27+00 while maintaining a 12-foot wide travel lane clear of water. This flow rate is approximately equal to the 10-year discharge at OSP design point 305. The existing 42-inch diameter pipe on the east side of North 111th Street was evaluated to estimate its capacity, since it carries a portion of the target 350 cfs. The pipe has capacity to carry approximately 168 cfs, however, the flow that can enter the pipe is limited at the upstream end. The pipe entrance was evaluated to determine the quantity of water that could enter the culvert. It was estimated that 75 cfs could enter the culvert. Due to limited available headwater depth, there is no opportunity to improve the pipe inlet.

Channel geometries were estimated for the design discharge of 350 cfs, minus the 75 cfs that is carried in the existing 42-inch pipe. The design criteria were longitudinal slope of 0.6%, 3:1 channel side slopes, maximum depth of five feet, maximum velocity of 7 feet per second, and maximum Froude number of 0.8. Channels with depths of three and four feet were developed at Stations 26+00, 30+00, 36+00, and 38+00. To reduce conflicts with utilities, the three-foot-deep channel is recommended. Table 4 shows the channel geometries.

Table 4. Channel Geometry Stations 24+50 to 41+00

	Station 24+50 to 27+00	Station 27+00 to 41+00
Design discharge, cfs	350	275
Bottom width, ft	12	9
Top width (minimum), ft	30	27
Depth of flow, ft	3	3

The channel would require grade stabilization, and it should be noted that the channel would be deeper and wider downstream of the grade control structures. Approximately six grade control structures, ranging in height from 1 to 3 feet, would be needed. Figures 1A and 1B show the estimated extents of the proposed channel grading. Figure 2 shows the channel superimposed on the existing cross sections at Stations 26+00, 30+00, 36+00, and 38+00. Figure 2 also shows the existing utilities, for which the depths of some were estimated. 8-foot high by 4-foot wide box culverts would be needed at three road crossings. Discharge from the existing 42-inch pipe would outlet into the channel around Station 26+50. A diversion structure to divert up to 47 cfs to the east side of North 111th Street would be constructed near Station 24+70.

Adjustments to the water and gas utilities may be needed. Potholing is recommended to verify the depth and location of the utilities. Discussions with the utility owners will be needed to determine their requirements to relocate the utilities and whether relocation will be needed.

Channel through Schofield Farm Property

Two scenarios for conveying the design discharge through the Schofield Farm Property were investigated. One scenario was a large, swale-like channel that could potentially be farmed. During the December 2005 progress meeting, this scenario was discussed. It was determined that it could be difficult to maintain irrigation across the swale, that different crops and growth stages would impact the conveyance capacity, flow velocities and erosion potential of the swale, and that over time, the swale could be modified due to farming practices.

The second scenario, a trapezoidal channel located along the farmstead property line that would convey 525 cfs, and have a depth of five feet, was developed. The resulting channel has a bottom width of 4 feet, and side slopes of 3:1. The top width would range from approximately 40 to 80 feet. The proposed alignment is shown in Figure 1A. Access could be provided across the channel between the farmstead and the fields via a low-water crossing. Two or three 24-inch diameter pipes could be installed under the crossing to convey low flows.

Conveyance of 0.4-inch Storm Downstream of Schofield Farm

A portion of the reach intended to convey the 0.4-inch storm east and south of North 111th Street around Prince Lake No. 2 has enough capacity to do so, based on the existing conditions geometry at Station 19+00. Farther downstream, at Station 14+00, the capacity is approximately 7 cfs. In order to convey the 0.4-inch storm discharge of 47 cfs, a triangular channel approximately two feet deep, with 3 to 1 sideslopes and a top width of 12 feet would be required.

The channel improvements needed to convey the 0.4-inch storm could conflict with the Erie Lake Raw Water Line. A storm sewer alternative or adjustment of the raw water line design should be considered. For an estimated slope of 2.0%, a 30-inch diameter pipe would be required to convey the 0.4-inch storm. Adjustments to the raw water line may also be needed to

accommodate a storm sewer. OA recommends that the location of the raw water line be staked in the field so that the project sponsors can review the water line location with respect to the existing street and trail and proposed drainage improvements.

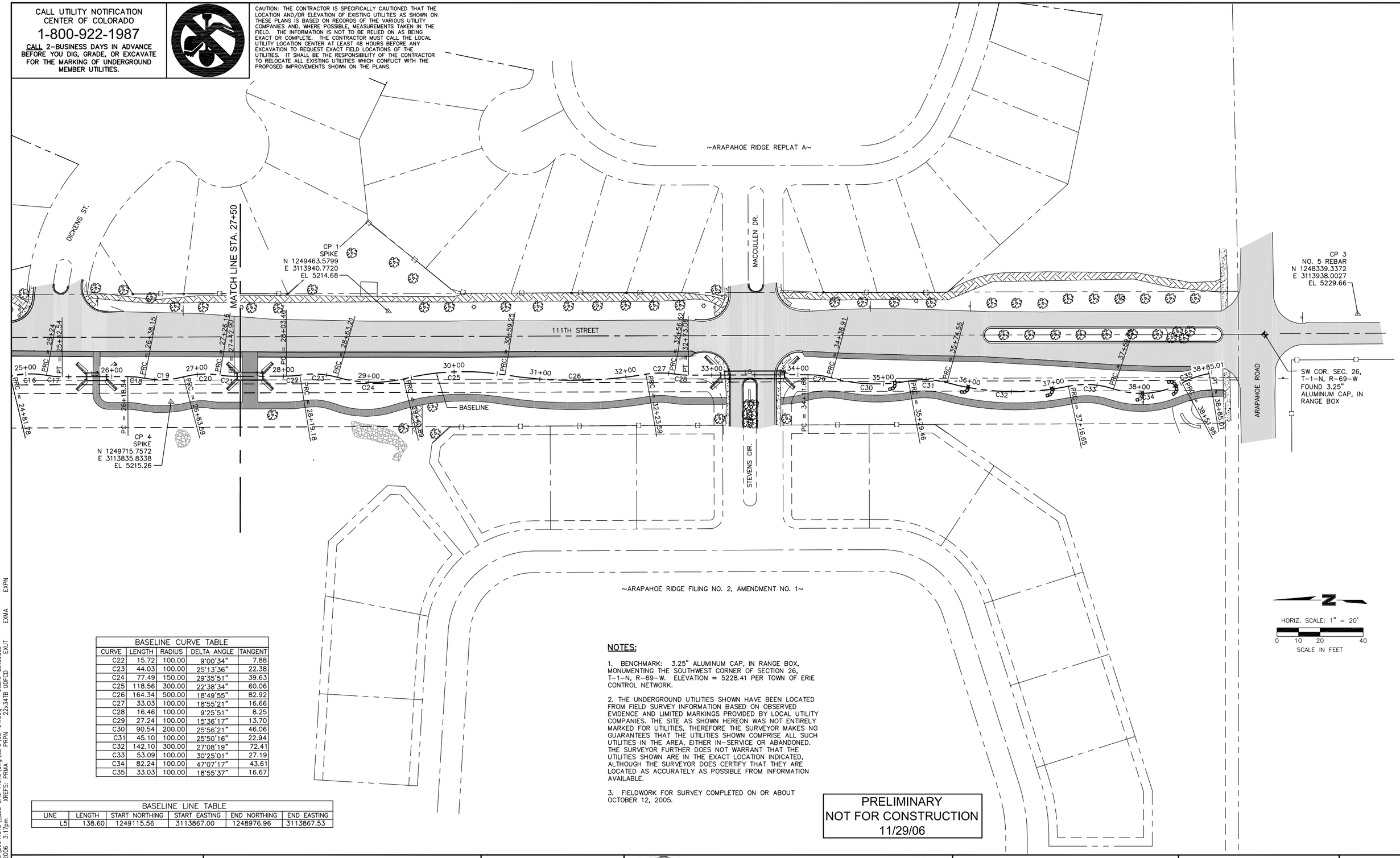
The *Preliminary Drainage Report for Meadow Sweet Farms, Erie Colorado,* dated May 13, 2005, shows Pond 1027 at the outlet of Prince Lake No 2, north and east of the curved portion of North 111th Street. It also shows a swale (designated D-D in the report) that collects local drainage and crosses under North 111th Street in a 12-foot by 4-foot box culvert. Discharge from the 0.4-inch storm could be conveyed to either proposed structure.

CALL UTILITY NOTIFICATION CENTER OF COLORADO

1-800-922-1987

CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

CAUTION: THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES AND, WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE LOCAL UTILITY LOCATION CENTER AT LEAST 48 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATIONS OF THE UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.



BASELINE CURVE TABLE				
CURVE	LENGTH	RADIUS	DELTA ANGLE	TANGENT
C22	15.72	100.00	9°00'34"	7.88
C23	44.03	100.00	25°13'36"	22.38
C24	77.49	150.00	29°35'51"	39.63
C25	118.56	300.00	22°38'34"	60.06
C26	164.34	500.00	18°49'55"	82.92
C27	33.03	100.00	18°55'21"	16.66
C28	16.46	100.00	9°25'51"	8.25
C29	27.24	100.00	15°36'17"	13.70
C30	90.54	200.00	25°56'21"	46.06
C31	45.10	100.00	25°50'16"	22.94
C32	142.10	300.00	27°08'19"	72.41
C33	53.09	100.00	30°25'01"	27.19
C34	82.24	100.00	47°07'17"	43.61
C35	33.03	100.00	18°55'37"	16.67

BASELINE LINE TABLE					
LINE	LENGTH	START NORTHING	START EASTING	END NORTHING	END EASTING
L5	138.60	1249115.56	3113867.00	1248976.96	3113867.53

NOTES:

1. BENCHMARK: 3.25" ALUMINUM CAP, IN RANGE BOX, MONUMENTING THE SOUTHWEST CORNER OF SECTION 26, T-1-N, R-69-W. ELEVATION = 5228.41 PER TOWN OF ERIE CONTROL NETWORK.

2. THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION BASED ON OBSERVED EVIDENCE AND LIMITED MARKINGS PROVIDED BY LOCAL UTILITY COMPANIES. THE SITE AS SHOWN HEREON WAS NOT ENTIRELY MARKED FOR UTILITIES, THEREFORE THE SURVEYOR MAKES NO GUARANTEES THAT THE UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN-SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED, ALTHOUGH THE SURVEYOR DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE.

3. FIELDWORK FOR SURVEY COMPLETED ON OR ABOUT OCTOBER 12, 2005.

PRELIMINARY
NOT FOR CONSTRUCTION
11/29/06

GROUND CONTROL SURVEY BY: OLSSON ASSOCIATES
AERIAL PHOTOGRAPHY BY: N/A
TOPOGRAPHIC MAPPING BY: OLSSON ASSOCIATES
CONTOUR INTERVAL: 1 FOOT

OLSSON ASSOCIATES
143 Union Boulevard
Suite 700
Lakewood, CO 80228-1825
TEL 720.962.6072
FAX 720.962.6195

DESIGNED	DS	DATE	11.29.06
DRAWN	DS	DATE	11.29.06
CHECKED	DK	DATE	11.29.06
REVISED		DATE	
AS-BUILT		DATE	

URBAN DRAINAGE & FLOOD CONTROL DISTRICT
TOWN OF ERIE

IMPROVEMENTS TO ERIE REACH BP20

SITE/PROJECT CONTROL PLAN STA. 27+50 TO 38+85.01

G4

DWG: F:\Projects\20041318_LDD Erie 4131B\dwg\CD's\G3-G4.dwg USER: dskuodas
DATE: Nov 29, 2006 3:17pm XREFS: PRNA PRPN 22x34TB UDFCD EXUT EXMA EXPN

~ARAPAHOE RIDGE REPLAT A~

DICKENS ST.

MATCH LINE STA. 27+50

111TH STREET

MACCULLEN DR.

STEVENS CIR.

ARAPAHOE ROAD

~ARAPAHOE RIDGE FILING NO. 2, AMENDMENT NO. 1~

EROSION CONTROL LEGEND

SF	SILT FENCE
SBB	STRAW BALE BARRIER
VTC	VEHICLE TRACKING CONTROL
RCD	ROCK CHECK DAM
CWA	CONCRETE WASHOUT AREA

HORIZ. SCALE: 1" = 20'

0 10 20 40

SCALE IN FEET

PRELIMINARY
NOT FOR CONSTRUCTION
11/29/06

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2–BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

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GROUND CONTROL SURVEY BY: OLSSON ASSOCIATES
AERIAL PHOTOGRAPHY BY: N/A
TOPOGRAPHIC MAPPING BY: OLSSON ASSOCIATES
CONTOUR INTERVAL: 1 FOOT

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DESIGNED	DS	DATE	11.29.06
DRAWN	DS	DATE	11.29.06
CHECKED	DK	DATE	11.29.06
REVISED		DATE	
AS–BUILT		DATE	

URBAN DRAINAGE & FLOOD CONTROL DISTRICT
TOWN OF ERIE

IMPROVEMENTS TO ERIE REACH BP20

EROSION CONTROL STA. 27+50 TO 38+85.01

EC2

DWG: F:\Projects\20041318_LDD Erie 4131B\dwg\CD's\EC1-EC3.dwg USER: dskuodas
DATE: Nov 29, 2006 3:16pm XREFS: PRMA PRPN 22x34TB UDFCD EXUT EXMA EXPN EXTO 50 SCALE PRTO 50 SCALE PRUT

~ARAPAHOE RIDGE REPLAT A~

DICKENS ST.

MATCH LINE STA. 27+50

111TH STREET

MACCULLEN DR.

STEVENS CIR.

ARAPAHOE ROAD

25+00

30+00

35+00

38+85.01

TYPICAL

~ARAPAHOE RIDGE FILING NO. 2, AMENDMENT NO. 1~

SITE PREPARATION/DEMO LEGEND

1. REMOVE EXISTING PIPE
2. REMOVE EXISTING FENCE TO THE FIRST POST
3. REMOVE AND STOCKPILE EXISTING RIPRAP
4. REMOVE EXISTING TREE
5. REMOVE EXISTING TRAIL
6. REMOVE EXISTING CONCRETE STRUCTURE
7. REMOVE EXISTING FLARED END SECTION
8. SAWCUT AND REMOVE EXISTING PAVEMENT
9. SAWCUT AND REMOVE EXISTING CURB & GUTTER
10. SAWCUT AND REMOVE EXISTING SIDEWALK
11. PLUG & ABANDON EXISTING PIPE
12. REMOVE EXISTING WATER LINE
13. REMOVE EXISTING GAS LINE
14. REMOVE, STOCKPILE, & RESET EXISTING SIGN

NOTE:

1. ALL EXISTING TREES SHOWN AS REMAINING ARE TO BE PROTECTED DURING CONSTRUCTION. TEMPORARY FENCE SHALL BE INSTALLED AROUND TREES TO REMAIN THAT ARE WITHIN THE CONSTRUCTION LIMITS. DIAMETER OF LIMITS SHALL EQUAL THE DRIP LINE.

PRELIMINARY
NOT FOR CONSTRUCTION
11/29/06

HORIZ. SCALE: 1" = 20'
0 10 20 40
SCALE IN FEET

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2–BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

CAUTION: THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES AND, WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE LOCAL UTILITY LOCATION CENTER AT LEAST 48 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATIONS OF THE UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.

GROUND CONTROL SURVEY BY: OLSSON ASSOCIATES
AERIAL PHOTOGRAPHY BY: N/A
TOPOGRAPHIC MAPPING BY: OLSSON ASSOCIATES
CONTOUR INTERVAL: 1 FOOT

OLSSON ASSOCIATES
143 Union Boulevard
Suite 700
Lakewood, CO 80228-1825
TEL 720.962.6072
FAX 720.962.6195

DESIGNED	DS	DATE	11.29.06
DRAWN	DS	DATE	11.29.06
CHECKED	DK	DATE	11.29.06
REVISED		DATE	
AS–BUILT		DATE	

URBAN DRAINAGE & FLOOD CONTROL DISTRICT
TOWN OF ERIE

IMPROVEMENTS TO ERIE REACH BP20

SITE PREPARATION/ DEMOLITION PLAN STA. 27+50 TO 38+85.01

SP2

DWG: F:\Projects\20041318_LDD Erie 41318\dwg\CD's\SP1-SP2.dwg USER: dskuodas
DATE: Nov 29, 2006 3:21pm XREFS: 22x34TB UDFCD EXUT EXMA EXPN EXTO 50 SCALE

CLC Final Drainage Study for Arapahoe Ridge Filing No. 3

FINAL DRAINAGE STUDY

ARAPAHOE RIDGE

FILING NO. 3

Prepared By:

CLC Associates Inc.
8480 East Orchard Road
Suite 2000
Englewood, CO 80111
Contact: Jerry W. Davidson, P.E.
(303) 770-5600

Prepared For:

ALBERTA DEVELOPMENT PARTNERS, LLC
1208 Quail Street
Lakewood, Colorado 80215
(303) 234-0273

Job No. 98.032

December 30, 1998

FINAL DRAINAGE STUDY

ARAPAHOE RIDGE
FILING NO. 3

I. GENERAL LOCATION AND DESCRIPTION

This drainage study is being prepared as part of the Development Plan submittal process for the Arapahoe Ridge project proposed in the Town of Erie, Colorado. The development is to be located at the northeast corner of Arapahoe Road and U.S. Highway 287 on approximately 14.4 acres. The site is within the southeast quarter of Section 27, Township 1 North, Range 69 West of the 6th P.M.

The site is bounded on the north by Erie Lake, on the east by vacant land currently planned for residential use, the south by Arapahoe Road and Prince Lake No. 1, and to the west by U.S. 287. The 14.4 acre site is currently undeveloped. Ground cover consists of native vegetation including grasses, weeds, bushes, and a few trees. Land adjacent to highway 287 and the irrigation channel is presently bare ground due to construction activities. A low area exists on the north end of the site, which is susceptible to wetland conditions. On-site soils are identified as Ascalon sandy loam on the SCS survey map of Boulder County. Site topography slopes mildly to the north at 1 to 3%.

II. DRAINAGE BASINS AND SUB-BASINS

On-site and off-site drainage basins are characterized by the Ascalon sandy loam soils. The site is not within the 100-year floodplain; however, the low area described above is subject to standing water and is encumbered by a flooding easement. Historically, runoff from the site and off-site from the south (Basin IN1 on the attached drainage map) flows to the north to the low area.

Developed basins are shown on the drainage plan. Basins labeled with a "IN" represent areas collected into the storm sewer by inlet or flared end section. Basins labeled "R" represent rooftops. Basins labeled "U" represent areas which are un-captured by the storm sewer system.

IN1 drainage basin to Inlet 1
IN2 drainage basin to Inlet 2
IN3 drainage basin to Inlet 3
IN4 drainage basin to Inlet 4
IN5 drainage basin to Inlet 5
IN6 drainage basin to Inlet 6
IN7 drainage basin to Inlet 7
IN8 drainage basin to Inlet 8
IN9 drainage basin to Inlet 9
IN10 drainage basin to Inlet 10

IN11 drainage basin to Inlet 11
R1-R4 rooftop areas piped to storm sewer
U1 un-captured runoff to the irrigation ditch

III. DRAINAGE DESIGN CRITERIA

The criteria used for this report is the Boulder County Storm Drainage Criteria Manual, and the Urban Drainage criteria manuals. Detention is required. Detention is provided at an off-site pond to the east. Volume requirements are being studied by others. Runoff is computed using the Rational Method (Q=CIA). Analysis is performed for the 5-year and 100-year rainfall events.

IV. DRAINAGE FACILITY DESIGN

Proposed drainage improvements are designed to minimize adverse impacts to adjacent properties. Runoff from the off-site basin to the south is intercepted in the road-side ditch by a flared end section. Runoff from parking lots and landscaped areas is collected in inlets. Roof runoff is collected at downspout locations and piped directly into the storm sewer. Inlets are sized to intercept the 100 year runoff and the storm sewer system is designed to convey the 100 year runoff with pressure flow.

Contained in the Appendix are the hydrologic calculations for computing runoff for each sub-basin. Storm sewer capacities are based upon pressurized flow with an "n" equal to 0.013 for reinforced concrete pipe (RCP). Also included in the Appendix are the hydrologic and hydraulic calculations for the 5-year and 100-year design storms.

V. EROSION CONTROL

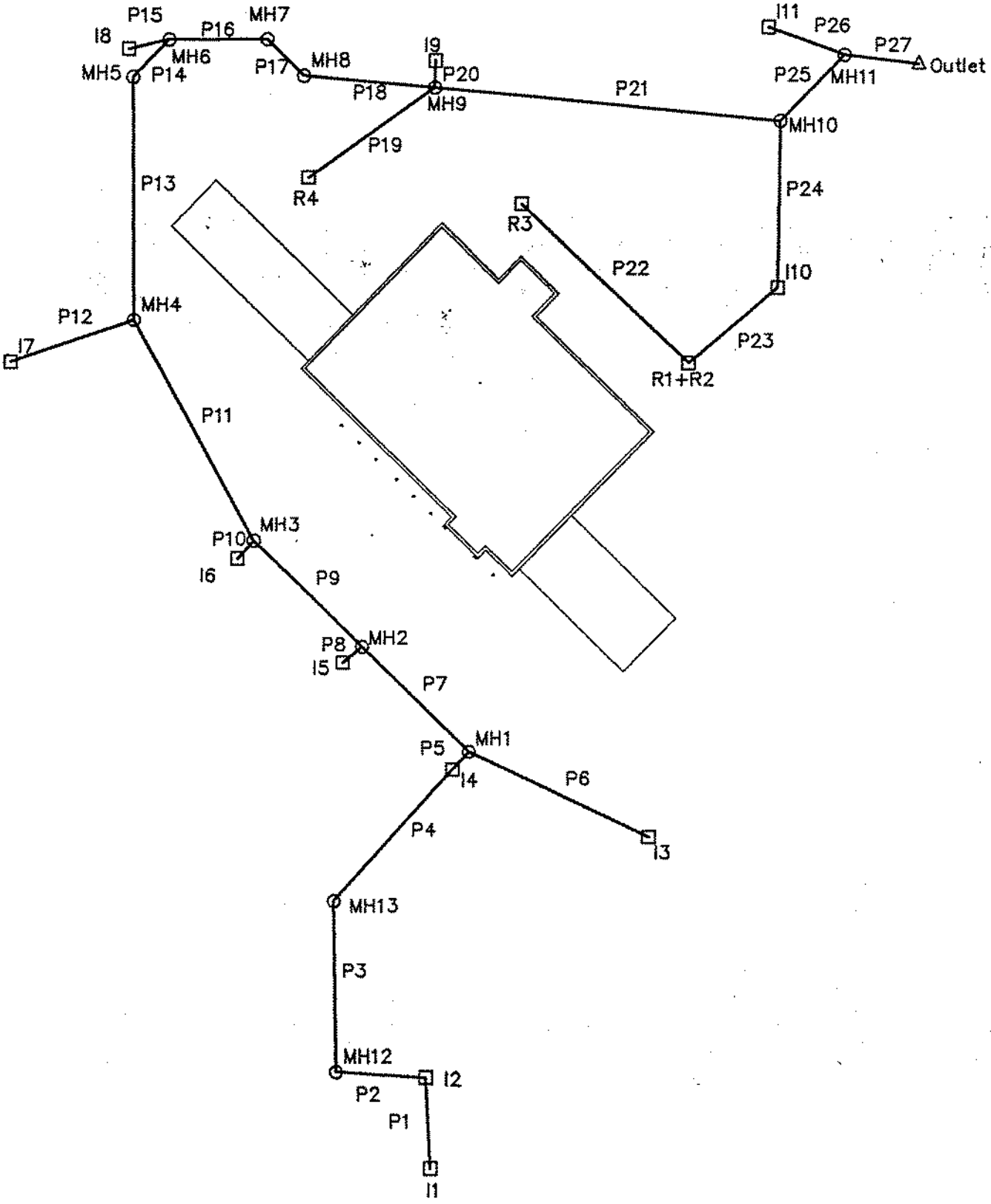
During construction, erosion control measure will be implemented using Best Management Practices. These measures will include, but not be limited to:

- silt fences/hay bale barriers
- mud tracking barriers at site entrances
- inlet sediment barriers
- revegetation
- wetting of the site to prevent wind related erosion

Contained in the construction plans is a sheet detailing the erosion control measures.

STORM SEWER SCHEMATIC

NOT TO SCALE



Arapahoe Ridge Storm Sewer

Pipe Label	Inlet	Section Size	Length (ft)	Average Velocity (ft/s)	Slope (ft/ft)	Discharge (cfs)	Inlet C Coeff	Inlet CA (acres)	Inlet Discharge	Inlet TC (min)	Total CA (acres) (cfs)	System Tc (min)	Intensity (in\hr)	Downstream HGL (ft)	Upstream HGL (ft)
P1	Inlet 1	24 inch	71.00	3.80	0.0050	9.14	0.75	0.97	9.14	5.00	0.97	5.00	9.40	47.62	47.67
P2	Inlet 2	24 inch	34.00	6.63	0.0100	17.13	0.93	0.86	8.13	5.00	1.84	5.31	9.31	47.04	47.29
P3		24 inch	183.00	8.05	0.0150	17.05	N/A	N/A	N/A	N/A	1.84	5.40	9.27	43.63	46.75
P4		24 inch	86.00	6.03	0.0319	16.72	N/A	N/A	N/A	N/A	1.84	5.78	9.09	41.65	43.77
P5	Inlet 4	24 inch	10.00	9.58	0.1500	29.62	0.93	1.46	13.72	5.00	3.30	6.01	8.99	40.99	41.21
P6	Inlet 3	30 inch	159.00	4.89	0.0081	23.80	0.87	2.53	23.80	5.00	2.53	5.00	9.40	40.99	41.53
P7		36 inch	120.00	7.40	0.0100	52.32	N/A	N/A	N/A	N/A	5.83	6.03	8.97	40.04	40.78
P8	Inlet 5	15 inch	10.00	11.63	0.2500	14.16	0.93	1.51	14.16	5.00	1.51	5.00	9.40	40.04	40.53
P9		36 inch	120.00	9.18	0.0050	64.89	N/A	N/A	N/A	N/A	7.34	6.30	8.84	38.58	39.71
P10	Inlet 6	15 inch	10.00	11.35	0.2500	13.81	0.93	1.47	13.81	5.00	1.47	5.00	9.40	38.58	39.04
P11		42 inch	200.00	8.00	0.0050	76.96	N/A	N/A	N/A	N/A	8.80	6.52	8.75	37.16	38.33
P12	Inlet 7	18 inch	32.00	8.78	0.1975	15.21	0.93	1.62	15.21	5.00	1.62	5.00	9.40	37.16	41.08
P13		48 inch	192.00	7.08	0.0050	89.00	N/A	N/A	N/A	N/A	10.42	6.94	8.54	36.22	36.96
P14		48 inch	41.00	6.90	0.0050	86.72	N/A	N/A	N/A	N/A	10.42	7.39	8.32	35.85	36.00
P15	Inlet 8	15 inch	23.00	5.14	0.0200	2.71	0.93	0.29	2.71	5.00	0.29	5.00	9.40	40.53	41.16
P16		48 inch	77.00	7.05	0.0050	88.61	N/A	N/A	N/A	N/A	10.71	7.49	8.27	35.33	35.62
P17		48 inch	41.00	6.99	0.0049	87.88	N/A	N/A	N/A	N/A	10.71	7.67	8.21	34.95	35.10
P18		48 inch	105.00	6.96	0.0050	87.50	N/A	N/A	N/A	N/A	10.71	7.77	8.17	34.33	34.72
P19	Roof 4	12 inch	123.00	6.95	0.0734	2.12	0.90	0.23	2.12	5.00	0.23	5.00	9.40	34.73	44.07
P20	Inlet 9	15 inch	5.00	5.44	0.0200	4.28	0.93	0.46	4.28	5.00	0.46	5.00	9.40	40.41	40.64
P21		48 inch	277.00	7.32	0.0050	92.02	N/A	N/A	N/A	N/A	11.39	8.02	8.08	33.15	34.29
P22	Roof 3	18 inch	183.00	3.47	0.0050	4.23	0.90	0.45	4.23	5.00	0.45	5.00	9.40	42.90	43.31
P23	Roof 1+2	18 inch	93.00	8.28	0.0191	12.14	0.90	0.89	8.37	5.00	1.34	5.88	9.06	40.85	42.90
P24	Inlet 10	18 inch	131.00	10.24	0.0500	18.10	0.93	0.68	6.38	5.00	2.02	6.07	8.96	33.15	37.04
P25		48 inch	63.00	8.38	0.0060	105.27	N/A	N/A	N/A	N/A	13.41	8.65	7.85	32.49	32.83
P26	Inlet 11	12 inch	64.00	5.99	0.0156	5.07	0.35	0.54	5.07	5.00	0.54	5.00	9.40	32.49	33.11
P27		48 inch	50.00	8.66	0.0050	108.87	N/A	N/A	N/A	N/A	13.95	8.77	7.80	31.85	32.14

Harris Kocher Smith
Phase III Drainage Report for Outlook Nine Mile
November 8, 2019

PHASE III DRAINAGE REPORT

FOR

OUTLOOK NINE MILE
ERIE, COLORADO

November 8, 2019

Prepared for:

Evergreen
Development | Services | Investments

1873 S. Bellaire Street, Suite 1200
Denver, Colorado 80222
Phone: 303-757-0401

Prepared by:

HKS HARRIS KOCHER SMITH

Michael Moore, P.E.
1120 Lincoln Street, Suite 1000
Denver, CO 80203
Ph.: 303-623-6300, Fax: 303-623-6311

Harris Kocher Smith Project No.: 160602

Basin OS-3 (0.72 acres) consists of walk, landscaping, and EDB. All runoff originating in basin OS-3 will surface drain to the EDB where it will combine with all upstream runoff from the Site. Peak runoff during the initial and major storm events are 0.15 cfs and 2.5 cfs, respectively.

Basin OS-2 (0.02 acres) consists of the small portion of private drive between the most downstream inlet in the private storm sewer system and the northern property boundary. Runoff originating in this basin totals 0.2 cfs and 0.6 cfs in the initial and major storm events, respectively. The major and minor storm event runoff escaping the Site undetained into Arapahoe Road right of way is subtracted from the total allowable detention pond release. These flows ultimately collect at a downstream inlet to the east of the private drive entrance in Arapahoe Road.

Basin OS-1 (0.11 acres) consists of landscaping only. Runoff originating in this basin totals negligible and 0.4 cfs in the initial and major storm events, respectively. The major and minor storm event runoff escaping the Site undetained to the east is subtracted from the total allowable detention pond release.

The proposed EDB will outfall into a proposed storm sewer outfall location being designed by others as part of the PD. Controlled, detained runoff release will be conveyed from the outlet structure of the EDB to an outfall manhole along the northern property boundary of the Site. An overflow weir along the northern edge of the EDB will safely convey flows during outlet clogging or storms in excess of the 100-year event to Arapahoe Road right of way.

Due to the available footprint for the EDB, retaining walls were used to achieve adequate detention volume.

Design Storm Event	WSEL (feet)	Volume Provided CF	Volume Provided Acre-Feet	Release Rate (CFS)
WQCV	5242.78	13,250	0.304	40-Hour drain time
EURV	5245.53	37,813	0.868	12-32-Hour drain time*
100-Year	5247.03	64,211	1.474	10.2

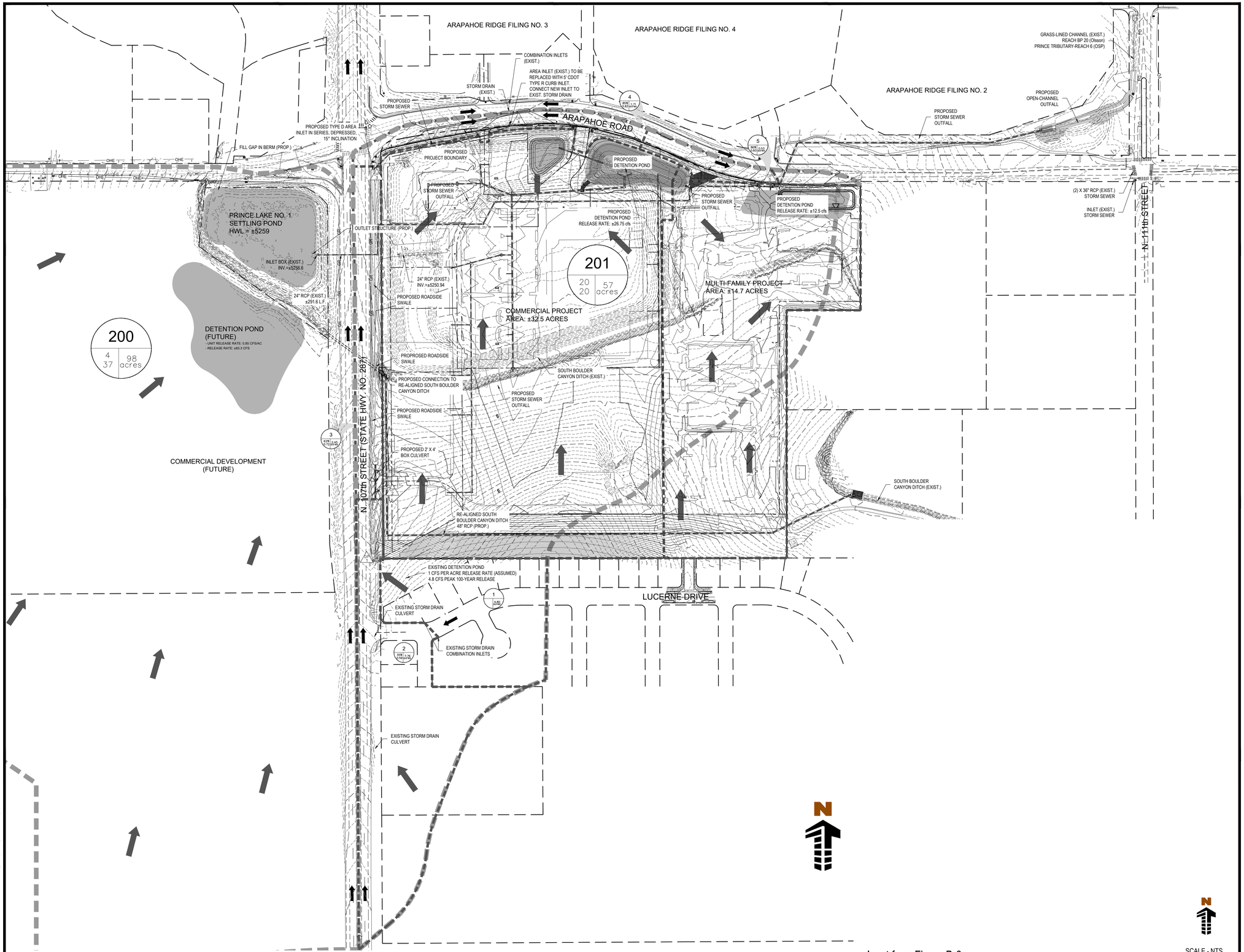
*Independent of the WQCV

The EDB provides a micropool within the outlet box to and provides an adequate surcharge depth separate from the WQCV and EURV volumes. The EURV will be discharged through an orifice plate on the outlet box in standard conformance with the USDCM. Above the EURV water surface elevation, the outlet box will allow stormwater to flow into the outlet structure and discharge directly to the outlet pipe. The release will be controlled to the maximum allowable 10.3 cfs (13.23 acres * 0.85 cfs/acre – 1.0 cfs undetained release) via restrictor plate bolted over the outlet pipe designed to release 10.2 cfs with an accumulated head corresponding to the 100-year water surface elevation shown above.

Per Erie Standards, there is one foot of provided freeboard between the 100-year water surface elevation and the top of the berm. The weir has been designed to

Appendix E – Drainage Maps

DR01 – Nine Mile Corner Subdivision
DR02 – Commercial Site



FINAL DRAINAGE PLAN
NINE MILE CORNER | ERIE, CO

SCALE - 1" = 150'

Inset from Figure B-6
Town of Erie Outfall Systems Plan (West ofCoal Creek)
RESPEC Consulting & Services, January 2014

N

SCALE - NTS

Galloway
Planning. Architecture. Engineering.
6162 S Willow Drive, Suite 320, Greenwood Village, CO 80111
303.770.8884 O
www.gallowayUS.com

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THESE PLANS ARE AN INSTRUMENT OF SERVICE AND ARE THE PROPERTY OF GALLOWAY, AND MAY NOT BE DUPLICATED, DISCLOSED, OR REPRODUCED WITHOUT THE WRITTEN CONSENT OF THE ARCHITECT. COPYRIGHTS AND INFRINGEMENTS WILL BE ENFORCED AND PROSECUTED.

LEGEND:

- PROPOSED MAJOR CONTOUR (4900)
- PROPOSED MINOR CONTOUR (35)
- EXISTING MAJOR CONTOUR (4900)
- EXISTING MINOR CONTOUR
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PROPOSED STORM INLET
- PROPOSED RIGHT-OF-WAY
- FUTURE RIGHT-OF-WAY
- PROPOSED LOTLINE
- FUTURE LOTLINE
- EASEMENT LINE

DRAINAGE SYMBOLS:

200 (SUBBASIN ID)
0.20 / 0.50 (5-YEAR / 100-YEAR RUNOFF COEFFICIENT)
98 acres (SUBBASIN AREA (ACRES))

- C9 — DESIGN POINT
- OSP SWMM SUBBASIN BOUNDARY
- PROJECT SPECIFIC SUBBASIN BOUNDARY
- OVERLAND FLOW DIRECTION (I.E., LANDSCAPING)
- DIRECT FLOW DIRECTION - FUTURE (I.E., PAVEMENT, CURB AND GUTTER)

NOTES:

1. DETENTION POND FOOTPRINT (PROPOSED CONDITION) — 100-YEAR

Project No:	
Drawn By:	HHF
Checked By:	HHF

05/17/2017

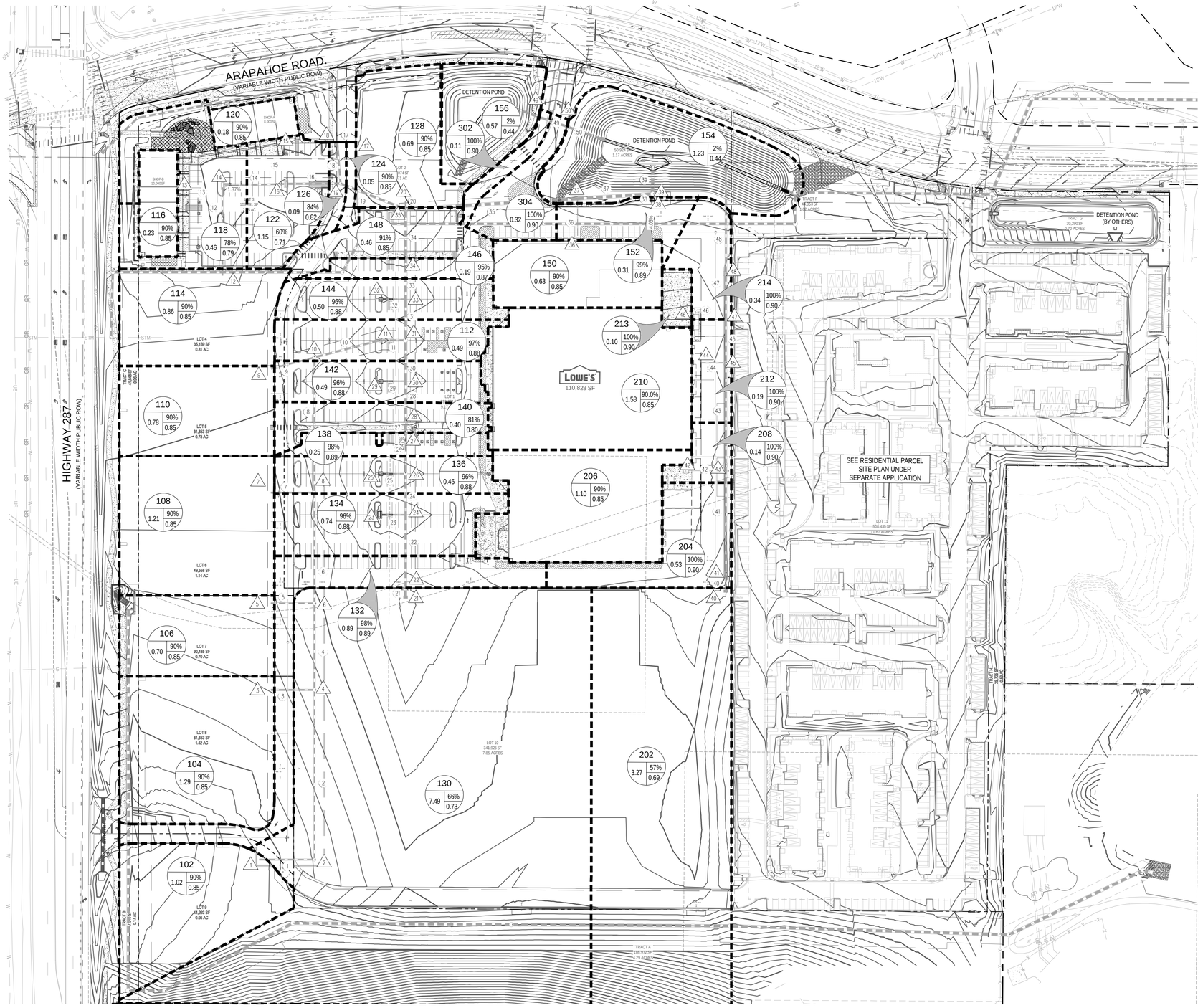
NINE MILE CORNER
ERIE, COLORADO
N. 107th Street and Arapahoe Road

DR01 | 1 of 1

W:\Engineer Development\CO_Erie 670000016 - Nine Mile Corner_SW\Admin\Civil\CAD\3-Plan\DR01A_Drainage Plan.dwg - Admin (Drawing) - 2016-04-18

NINE MILE CORNER - SITE PLAN CONSTRUCTION DOCUMENTS

A PORTION OF NE 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST AND THE
SOUTHEAST QUARTER OF SECTION 27, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE OF THE
6TH PRINCIPLE MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, COLORADO



DRAINAGE LEGEND

- 5575 — EXISTING MAJOR CONTOUR
- 5574 — EXISTING MINOR CONTOUR
- 75 — PROPOSED MAJOR CONTOUR
- 74 — PROPOSED MINOR CONTOUR
- STS — EXISTING STORM SEWER
- PROPOSED STORM SEWER
- MAJOR BASIN BOUNDARY LINE
- FLOW ARROW
- DESIGN POINT
- 1 — PIPE LABEL
- 102 — BASIN DESIGNATION
- 0.00 — COMPOSITE PERCENT IMPERVIOUS
- 0.00% — PEAK 100-YEAR RUNOFF COEFFICIENT
- 0.00 — BASIN AREA IN ACRES

REVISIONS

◇ PRE-BID SET ISSUE DATE △ POST BID SET ISSUE DATE

DATE	DESCRIPTION

Evergreen Development | Services | Investments

Galloway
6162 S. Willow Drive, Suite 320
Greenwood Village, CO 80111
303.770.8884
gallowayus.com

LOWE'S HOME CENTERS, LLC
1000 Lowes Boulevard
Mooresville, NC 28117

704.758.1000 (V)

THIS DRAWING IS THE PROPERTY OF LOWE'S HOME CENTERS, LLC ANY USE OR REPRODUCTION IN WHOLE OR PART IS PROHIBITED WITHOUT THE EXPRESSED WRITTEN CONSENT OF LOWE'S HOME CENTERS, LLC COPYRIGHT 2013 ALL RIGHTS RESERVED

LOWE'S

SITE PLAN CONSTRUCTION DOCUMENTS
DRAINAGE PLAN

LOWE'S OF:
ERIE, COLORADO

PROJECT No: ED0000018.20 | DRAWN BY: | CHECKED BY:

CRITERIA ISSUE DATE:	10.11.19
PERMIT SET ISSUE DATE:	
CONSTRUCTION SET ISSUE DATE:	

DRAWING NUMBER:

DR02

BOULDER COUNTY TREASURER

Certificate of Taxes Due

Account Number R0084551
Parcel 146534100005
Assessed To

TOWN OF ERIE
PO BOX 98
ERIE, CO 80516-0098

Certificate Number 2015-14174
Order Number 70471321A
Vendor ID 10

LAND TITLE GUARANTEE COMPANY
5975 GREENWOOD PLAZA BLVD
STE 200
GREENWOOD VILLAGE, CO 80111

Legal Description

PRINCE RESERVOIR #2 & TR 4101 LESS TO HWY PER DEEDS 532304 & 536539 & 1759789 BCR 34-1N-69
TOTAL 17.13 ACS M/L

Situs Address

0 HWY 287 ERIE 80026 ERIE

Year	Tax	Interest	Fees	Payments	Balance
Grand Total Due as of 10/19/2015					**$0.00**

Tax Billed at 2014 Rates for Tax Area 001398 - 102.678000

Authority	Mill Levy	Amount
COUNTY	24.7940000	$0.00
BOULDER VALLEY RE2	47.5690000	$0.00
CITY OF ERIE	17.3640000	$0.00
URBAN DRAIN & FLOOD CTRL GE	0.6320000*	$0.00
MOUNTAIN VIEW FIRE DIST	11.7470000	$0.00
HIGH PLAINS LIBRARY DISTRIC	3.2670000	$0.00
Taxes Billed 2014	105.3730000	$0.00

* Credit Levy

Values	Actual	Assessed
9149 - political subd-exempt	$90,800	$26,332
Total	$90,800	$26,332

FEE FOR THIS CERTIFICATE: $10.00

This certificate does not include land or improvements assessed under a separate account number, personal property taxes, transfer tax or misc. tax collected on behalf of other entities, special or local improvement district assessments or mobile homes, unless specifically mentioned.

All Tax Lien Sale amounts are subject to change due to endorsement of current taxes by the lienholder or to advertising and distraint warrant fees. Changes may occur and the Treasurer's Office will need to be contacted prior to remittance. **TAX LIEN SALE REDEMPTION AMOUNTS MUST BE PAID BY CASH OR CASHIERS CHECK.**

Special taxing districts and the boundaries of such districts may be on file with the Board of County Commissioners, the County Clerk, or the County Assessor.

I, the undersigned, do hereby certify that the entire amount of taxes due upon the above described parcels of real property and all outstanding sales for unpaid taxes as shown by the records in my office from which the same may still be redeemed with the amount required for redemption are as noted herein. In witness whereof, I have hereunto set my hand and seal.

PAUL WEISSMANN
BOULDER COUNTY TREASURER
PO BOX 471
BOULDER, CO 80306-0471
(303) 441-3520

BOULDER COUNTY TREASURER ★ SEAL ★ STATE OF COLORADO

BOULDER COUNTY TREASURER

Certificate of Taxes Due

Account Number R0084551	Certificate Number 2019-13551
Parcel 146534100005	Order Number 70471321
Assessed To	Vendor ID 10
TOWN OF ERIE PO BOX 98 ERIE, CO 80516-0098	LAND TITLE GUARANTEE COMPANY 5975 GREENWOOD PLAZA BLVD STE 200 GREENWOOD VILLAGE, CO 80111

Legal Description

PRINCE RESERVOIR #2 & TR 4101 LESS TO HWY PER DEEDS 532304 & 536539 & 1759789 BCR 34-1N-69 TOTAL 17.13 ACS M/L

Situs Address

0 HWY 287 ERIE 80026

Year	Tax	Interest	Fees	Payments	Balance
Grand Total Due as of 11/08/2019					**$0.00**

Tax Billed at 2018 Rates for Tax Area 004195 - 004195

Authority	Mill Levy	Amount
COUNTY	24.0260000*	$0.00
BOULDER VALLEY RE2	48.9670000	$0.00
CITY OF ERIE	15.0900000	$0.00
URBAN DRAIN & FLOOD CTRL GE	0.7260000*	$0.00
MOUNTAIN VIEW FIRE DIST	16.2470000	$0.00
HIGH PLAINS LIBRARY DISTRIC	3.2520000	$0.00
Taxes Billed 2018	108.3080000	$0.00

* Credit Levy

Values	Actual	Assessed
9149 - political subd-exempt	$90,800	$26,332
Total	$90,800	$26,332

FEE FOR THIS CERTIFICATE: $10.00

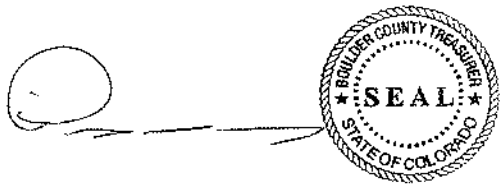
This certificate does not include land or improvements assessed under a separate account number, personal property taxes, transfer tax or misc. tax collected on behalf of other entities, special or local improvement district assessments or mobile homes, unless specifically mentioned.

All Tax Lien Sale amounts are subject to change due to endorsement of current taxes by the lienholder or to advertising and distraint warrant fees. Changes may occur and the Treasurer's Office will need to be contacted prior to remittance. **TAX LIEN SALE REDEMPTION AMOUNTS MUST BE PAID BY CASH OR CASHIERS CHECK.**

Special taxing districts and the boundaries of such districts may be on file with the Board of County Commissioners, the County Clerk, or the County Assessor.

I, the undersigned, do hereby certify that the entire amount of taxes due upon the above described parcels of real property and all outstanding sales for unpaid taxes as shown by the records in my office from which the same may still be redeemed with the amount required for redemption are as noted herein. In witness whereof, I have hereunto set my hand and seal.

PAUL WEISSMANN
BOULDER COUNTY TREASURER
PO BOX 471
BOULDER, CO 80306-0471
(303) 441-3520



BOULDER COUNTY TREASURER

Certificate of Taxes Due

Account Number R0606745	Certificate Number 2019-13549
Parcel 146534100015	Order Number 70471321
Assessed To	Vendor ID 10
TOWN OF ERIE URBAN RENEWAL AUTHORITY PO BOX 750 ERIE, CO 80516	LAND TITLE GUARANTEE COMPANY 5975 GREENWOOD PLAZA BLVD STE 200 GREENWOOD VILLAGE, CO 80111

Legal Description

TR 4109 5.01 AC M/L 34-1N-69

Situs Address

10960 ARAPAHOE RD ERIE 80026

Year	Tax	Interest	Fees	Payments	Balance
Grand Total Due as of 11/08/2019					**$0.00**

Tax Billed at 2018 Rates for Tax Area 001410 - 001410

Authority	Mill Levy	Amount
COUNTY	24.0260000*	$0.00
BOULDER VALLEY RE2	48.9670000	$0.00
CITY OF ERIE	15.0900000	$0.00
URBAN DRAIN & FLOOD CTRL GE	0.7260000*	$0.00
MOUNTAIN VIEW FIRE DIST	16.2470000	$0.00
Taxes Billed 2018	105.0560000	$0.00

* Credit Levy

Values	Actual	Assessed
9141 - towns	$283,000	$82,070
9241 - towns	$0	$0
Total	$283,000	$82,070

FEE FOR THIS CERTIFICATE: $10.00

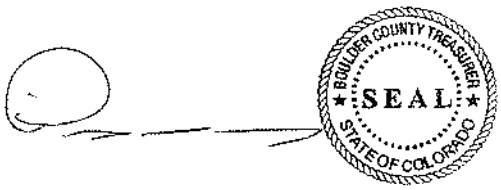
This certificate does not include land or improvements assessed under a separate account number, personal property taxes, transfer tax or misc. tax collected on behalf of other entities, special or local improvement district assessments or mobile homes, unless specifically mentioned.

All Tax Lien Sale amounts are subject to change due to endorsement of current taxes by the lienholder or to advertising and distraint warrant fees. Changes may occur and the Treasurer's Office will need to be contacted prior to remittance. **TAX LIEN SALE REDEMPTION AMOUNTS MUST BE PAID BY CASH OR CASHIERS CHECK.**

Special taxing districts and the boundaries of such districts may be on file with the Board of County Commissioners, the County Clerk, or the County Assessor.

I, the undersigned, do hereby certify that the entire amount of taxes due upon the above described parcels of real property and all outstanding sales for unpaid taxes as shown by the records in my office from which the same may still be redeemed with the amount required for redemption are as noted herein. In witness whereof, I have hereunto set my hand and seal.

PAUL WEISSMANN
BOULDER COUNTY TREASURER
PO BOX 471
BOULDER, CO 80306-0471
(303) 441-3520



BOULDER COUNTY TREASURER

Certificate of Taxes Due

Account Number R0606746	Certificate Number 2019-13550
Parcel 146534100016	Order Number 70471321
Assessed To	Vendor ID 10
TOWN OF ERIE URBAN RENEWAL AUTHORITY PO BOX 750 ERIE, CO 80516	LAND TITLE GUARANTEE COMPANY 5975 GREENWOOD PLAZA BLVD STE 200 GREENWOOD VILLAGE, CO 80111

Legal Description

TR 4100 1.05 AC M/L 34-1N-69

Situs Address

10960 ARAPAHOE RD ERIE 80026

Year	Tax	Interest	Fees	Payments	Balance
Grand Total Due as of 11/08/2019					**$0.00**

Tax Billed at 2018 Rates for Tax Area 001410 - 001410

Authority	Mill Levy	Amount
COUNTY	24.0260000*	$0.00
BOULDER VALLEY RE2	48.9670000	$0.00
CITY OF ERIE	15.0900000	$0.00
URBAN DRAIN & FLOOD CTRL GE	0.7260000*	$0.00
MOUNTAIN VIEW FIRE DIST	16.2470000	$0.00
Taxes Billed 2018	105.0560000	$0.00

* Credit Levy

Values	Actual	Assessed
9141 - towns	$56,800	$16,472
Total	$56,800	$16,472

FEE FOR THIS CERTIFICATE: $10.00

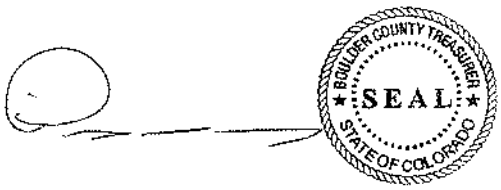
This certificate does not include land or improvements assessed under a separate account number, personal property taxes, transfer tax or misc. tax collected on behalf of other entities, special or local improvement district assessments or mobile homes, unless specifically mentioned.

All Tax Lien Sale amounts are subject to change due to endorsement of current taxes by the lienholder or to advertising and distraint warrant fees. Changes may occur and the Treasurer's Office will need to be contacted prior to remittance. **TAX LIEN SALE REDEMPTION AMOUNTS MUST BE PAID BY CASH OR CASHIERS CHECK.**

Special taxing districts and the boundaries of such districts may be on file with the Board of County Commissioners, the County Clerk, or the County Assessor.

I, the undersigned, do hereby certify that the entire amount of taxes due upon the above described parcels of real property and all outstanding sales for unpaid taxes as shown by the records in my office from which the same may still be redeemed with the amount required for redemption are as noted herein. In witness whereof, I have hereunto set my hand and seal.

PAUL WEISSMANN
BOULDER COUNTY TREASURER
PO BOX 471
BOULDER, CO 80306-0471
(303) 441-3520



BOULDER COUNTY TREASURER

Certificate of Taxes Due

Account Number R0021598	Certificate Number 2019-13554
Parcel 146534100006	Order Number
Assessed To	Vendor ID 10
TOWN OF ERIE URBAN RENEWAL AUTHORITY 645 HOLBROOK ST ERIE, CO 80516	LAND TITLE GUARANTEE COMPANY 5975 GREENWOOD PLAZA BLVD STE 200 GREENWOOD VILLAGE, CO 80111

Legal Description

PARCEL OF LAND IN NW1/4 NE1/4 34-1N-69 LESS 0.083 ACS M/L IN NWLY CORNER TO STATE DEPT OF HWYS /REC# 543786 & LESS WLY PT TO HWY /REC# 1678309 3/97

Situs Address

504 W LUCERNE DR ERIE 80026

Year	Tax	Interest	Fees	Payments	Balance
Grand Total Due as of 11/08/2019					**$0.00**

Tax Billed at 2018 Rates for Tax Area 001410 - 001410

Authority	Mill Levy	Amount
COUNTY	24.0260000*	$0.00
BOULDER VALLEY RE2	48.9670000	$0.00
CITY OF ERIE	15.0900000	$0.00
URBAN DRAIN & FLOOD CTRL GE	0.7260000*	$0.00
MOUNTAIN VIEW FIRE DIST	16.2470000	$0.00
Taxes Billed 2018	105.0560000	$0.00

* Credit Levy

Values	Actual	Assessed
9140 - exempt political sub res land	$528,100	$38,023
9240 - exempt political sub res improvements	$242,298	$17,445
Total	$770,398	$55,468

FEE FOR THIS CERTIFICATE: $10.00

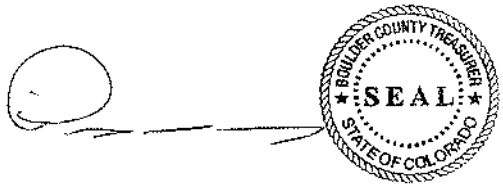
This certificate does not include land or improvements assessed under a separate account number, personal property taxes, transfer tax or misc. tax collected on behalf of other entities, special or local improvement district assessments or mobile homes, unless specifically mentioned.

All Tax Lien Sale amounts are subject to change due to endorsement of current taxes by the lienholder or to advertising and distraint warrant fees. Changes may occur and the Treasurer's Office will need to be contacted prior to remittance. **TAX LIEN SALE REDEMPTION AMOUNTS MUST BE PAID BY CASH OR CASHIERS CHECK.**

Special taxing districts and the boundaries of such districts may be on file with the Board of County Commissioners, the County Clerk, or the County Assessor.

I, the undersigned, do hereby certify that the entire amount of taxes due upon the above described parcels of real property and all outstanding sales for unpaid taxes as shown by the records in my office from which the same may still be redeemed with the amount required for redemption are as noted herein. In witness whereof, I have hereunto set my hand and seal.

PAUL WEISSMANN
BOULDER COUNTY TREASURER
PO BOX 471
BOULDER, CO 80306-0471
(303) 441-3520



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: **ABZ70471321-15** Date: **11/08/2019**

Property Address: **VACANT LAND AT HWY 287 AND ARAPAHOE, ERIE, CO 80516**

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

For Closing Assistance	Closer's Assistant	For Title Assistance
Colin Snody 3033 EAST FIRST AVENUE, SUITE 600 DENVER, CO 80206 (303) 331-6234 (Work) (303) 393-3806 (Work Fax) csnody@ltgc.com Contact License: CO271428 Company License: CO44565	Nathaniel Bukowski 3033 EAST FIRST AVENUE, SUITE 600 DENVER, CO 80206 (303) 331-6221 (Work) (303) 393-3886 (Work Fax) nbukowski@ltgc.com Company License: CO44565	KIM ZIMMERMAN 5975 GREENWOOD PLAZA BLVD GREENWOOD VILLAGE, CO 80111 (720) 406-2083 (Work) (303) 393-4919 (Work Fax) kzimmerman@ltgc.com

EVERGREEN DEVCO
Attention: TYLER CARLSON
1873 S BELLAIRE ST. #1106
DENVER, CO 80222
(303) 757-0462 (Work)
tcarlson@evgre.com
Delivered via: Electronic Mail

BROWNSTEIN HYATT FARBER & SCHRECK PC
Attention: JUDITH CLOUTIER
410 17TH ST 22ND FL
DENVER, CO 80202
(970) 221-6275 (Cell)
(303) 223-1100 (Work)
(303) 223-1111 (Work Fax)
jcloutier@bhfs.com
Delivered via: Electronic Mail

EVERGREEN DEVELOPMENT
Attention: DEREK LIS
1873 S. BELLAIRE ST., SUITE 1200
Denver, CO 80222
(602) 808-8600 (Work)
dlis@evgre.com
Delivered via: Electronic Mail

BROWNSTEIN HYATT FARBER & SCHRECK PC
Attention: CATHERINE A HILDRETH
410 17TH ST 22ND FL
DENVER, CO 80202
(303) 253-4044 (Cell)
(303) 223-1263 (Work)
(303) 223-1111 (Work Fax)
childreth@bhfs.com
Delivered via: Electronic Mail

EVERGREEN DEVELOPMENT
Attention: LAURA ORTIZ
1873 S. BELLAIRE ST., #1106
Denver, CO 80222
lortiz@evgre.com
Delivered via: Electronic Mail

BROWNSTEIN HYATT FARBER & SCHRECK PC
Attention: JEAN HARRISON
410 17TH ST 22ND FL
DENVER, CO 80202
(303) 223-1100 (Work)
jharrison@bhfs.com
Delivered via: Electronic Mail

TOWN OF ERIE
Attention: MALCOLM FLEMING
mfleming@erieco.gov
Delivered via: Electronic Mail

LAND TITLE GUARANTEE COMPANY
Attention: MINDY HUMPHREY
3033 EAST FIRST AVENUE SUITE 600
DENVER, CO 80206
(303) 618-6569 (Cell)
(303) 331-6274 (Work)
(303) 393-4912 (Work Fax)
mhumphrey@ltgc.com
Delivered via: Electronic Mail

DAVIS GRAHAM & STUBBS
Attention: J CHRISTOPHER KINSMAN
1550 17TH ST #500
DENVER, CO 80202
(720) 299-6585 (Cell)
(303) 892-7311 (Work)
(303) 893-1379 (Work Fax)
chris.kinsman@dgslaw.com

JUMPS LAW LLC
Attention: STEPHANIE M REED
2579 W MAIN ST #201
LITTLETON, CO 80120
(303) 586-4219 (Work)
(720) 643-2997 (Work Fax)
sreed@jumpslaw.com
Delivered via: Electronic Mail

DAVIS GRAHAM & STUBBS
Attention: TIM CANNON
1550 17TH ST #500
Denver, CO 80202
(303) 892-7428 (Work)
tim.canon@dgslaw.com
Delivered via: Electronic Mail

JUMPS LAW LLC
Attention: BRIAN JUMPS
2579 W MAIN ST #201
LITTLETON, CO 80120
(303) 586-1855 (Work)
(720) 643-2997 (Work Fax)
bjumps@jumpslaw.com
Delivered via: Electronic Mail

Land Title Guarantee Company
Estimate of Title Fees

Order Number: **ABZ70471321-15** Date: **11/08/2019**

Property Address: **VACANT LAND AT HWY 287 AND ARAPAHOE, ERIE, CO 80516**

Parties: **EVERGREEN DEVCO, INC., A CALIFORNIA CORPORATION**

TOWN OF ERIE URBAN RENEWAL AUTHORITY, AS TO PARCELS A AND B
THE TOWN OF ERIE, WELD COUNTY, STATE OF COLORADO, A MUNICIPAL CORPORATION, AS TO PARCEL C

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	$8,152.00
Endorsement ALTA 35.3-06	$1,000.00
Deletion of Standard Exception(s)	$100.00
Tax Certificate 4 tax accounts for 2018	$104.00
	Total $9,356.00
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:

Boulder county recorded 11/02/1956 at book 1028 page 471

Boulder county recorded 04/29/1968 under reception no. 877395

Boulder county recorded 01/17/2012 under reception no. 3196450

Boulder county recorded 03/01/2012 under reception no. 3206319

Boulder county recorded 01/16/2013 under reception no. 3282584

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule A

Order Number: ABZ70471321-15

Property Address:

VACANT LAND AT HWY 287 AND ARAPAHOE, ERIE, CO 80516

1. **Effective Date:**

   11/04/2019 at 5:00 P.M.

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

   "ALTA" Owner's Policy 06-17-06 $10,000,000.00
   Proposed Insured:
   EVERGREEN DEVCO, INC., A CALIFORNIA CORPORATION

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:**

   TOWN OF ERIE URBAN RENEWAL AUTHORITY, AS TO PARCELS A AND B
   THE TOWN OF ERIE, WELD COUNTY, STATE OF COLORADO, A MUNICIPAL CORPORATION, AS TO PARCEL C

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

   PARCEL A:

   PART OF THE NORTH HALF NORTHEAST QUARTER OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN, DESCRIBED AS FOLLOWS:

   BEGINNING AT THE SOUTHWEST CORNER OF THE NORTH HALF NORTHEAST QUARTER FROM WHENCE THE NORTHWEST CORNER OF SAID NORTH HALF NORTHEAST QUARTER BEARS NORTH 00°04'00" EAST; THENCE SOUTH 89°48'30" EAST ALONG THE SOUTH LINE OF SAID NORTH HALF NORTHEAST QUARTER, A DISTANCE OF 1434.83 FEET; THENCE NORTH 00°14'20" EAST, 845.98 FEET TO THE SOUTH LINE OF THAT PROPERTY CONVEYED BY FLOYD E. HARRIS AND NEVADIA HARRIS TO LEONARD L. LANHAM AND NINA E. LANHAM, RECORDED MAY 15, 1968 ON FILM 635 AT RECEPTION NO. **879012**; THENCE NORTH 89°41'50" WEST ALONG SAID SOUTH LINE, A DISTANCE OF 366.57 FEET TO A POINT ON THE EAST LINE OF THAT PROPERTY CONVEYED BY DEED FROM FLOYD EUGENE HARRIS AND NEVADIA HARRIS TO THE TOWN OF ERIE, A MUNICIPAL CORPORATION, RECORDED APRIL 29, 1968 IN FILM 633 AT RECEPTION NO. **877395**; THENCE SOUTH 00°58'00" WEST ALONG SAID EAST LINE, 31.12 FEET TO THE CENTERLINE OF THE SOUTH BOULDER CANYON IRRIGATION DITCH; THENCE TRAVERSING ALONG THE CENTERLINE OF SAID DITCH AND THE SOUTH LINE OF PROPERTY DESCRIBED ON FILM 633 AT RECEPTION NO. **877395**, THE FOLLOWING COURSES AND DISTANCES:
   SOUTH 71°36'00" WEST, 508.65 FEET;
   THENCE SOUTH 73°48'00" WEST, 241.52 FEET;
   THENCE NORTH 89°40'00" WEST, 140.82 FEET;
   THENCE NORTH 77°42'00" WEST, 114.23 FEET;
   THENCE NORTH 62°24'00" WEST, 118.52 FEET TO A POINT ON THE WEST LINE OF THE NORTH HALF NORTHEAST QUARTER OF SAID SECTION 34;
   SAID POINT BEING ALSO THE SOUTHWEST CORNER OF THAT PROPERTY DESCRIBED ON FILM 633 AT RECEPTION NO. **877395**; THENCE SOUTH 00°04'00" WEST ALONG SAID WEST LINE OF THE NORTH HALF NORTHEAST QUARTER, A DISTANCE OF 675.12 FEET TO THE TRUE POINT OF BEGINNING,

EXCEPTING THEREFROM THAT PORTION DESCRIBED IN DEED RECORDED APRIL 15, 1983 AT RECEPTION NO. 543786, AND IN DEED RECORDED FEBRUARY 20, 1997 ON FILM NO. 2187 AT RECEPTION NO. 1678309,
COUNTY OF BOULDER, STATE OF COLORADO.

PARCEL B:

A PORTION OF THE NORTH 1/2 OF THE NORTHEAST 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN, DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE NORTH LINE OF SAID NORTHEAST 1/4, 20 FEET WEST OF THE NORTHEAST CORNER OF THE NORTHWEST 1/4 OF THE NORTHEAST 1/4; THENCE NORTH 89°41'50" WEST ALONG SAID NORTH LINE, 230.64 FEET; THENCE SOUTH 00°58' WEST, 469.96 FEET; THENCE SOUTH 89°41'50" EAST, 618.52; THENCE NORTH 00°14'20" EAST, 469.93 FEET TO THE NORTH LINE OF SAID NORTHEAST 1/4; THENCE NORTH 89°41'50" WEST, ALONG SAID NORTH LINE TO THE TRUE POINT OF BEGINNING;
EXCEPTING THEREFROM THAT PORTION CONVEYED TO THE COUNTY OF BOULDER BY THE DEED RECORDED NOVEMBER 29, 1913 IN BOOK 381 AT PAGE 127,

COUNTY OF BOULDER, STATE OF COLORADO.

PARCEL C:

PARCEL I:

A PART OF THE NORTHWEST 1/4 OF THE NORTHEAST 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF BOULDER, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED AS FOLLOWS:
BEGINNING AT THE NORTH 1/4 CORNER OF SAID SECTION; THENCE SOUTH 0°09' WEST 642.7 FEET; THENCE SOUTH 69°45' EAST 211.4 FEET; THENCE NORTH 85° EAST 195 FEET; THENCE NORTH 71°53' EAST 718 FEET; THENCE NORTH 24°20' EAST 539 FEET TO A POINT ON THE NORTH LINE OF SAID SECTION, 20 FEET WEST OF THE NORTHEAST CORNER OF SAID NORTHWEST 1/4 OF THE NORTHEAST 1/4; THENCE WEST ALONG SAID NORTH LINE OF SAID SECTION TO THE PLACE OF BEGINNING;

EXCEPTING THEREFROM THAT PORTION CONVEYED TO THE COUNTY OF BOULDER BY THE DEED RECORDED NOVEMBER 29, 1913 IN BOOK 381 AT PAGE 127;
AND EXCEPT THAT PORTION DESCRIBED IN DEED RECORDED APRIL 29, 1968 UNDER RECEPTION NO. 877396;
AND EXCEPT THAT PORTION CONVEYED TO THE STATE DEPARTMENT OF HIGHWAYS, DIVISION OF HIGHWAYS, STATE OF COLORADO, BY THE DEED RECORDED FEBRUARY 8, 1983 UNDER RECEPTION NO. 532304;
AND EXCEPT THAT PORTION CONVEYED TO THE DEPARTMENT OF TRANSPORTATION, STATE OF COLORADO BY THE DEED RECORDED JANUARY 2, 1998 UNDER RECEPTION NO. 1759789.

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule A

Order Number: ABZ70471321-15

PARCEL II:

A PORTION OF THE NORTHWEST 1/4 OF THE NORTHEAST 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF BOULDER, STATE OF COLORADO, DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTH QUARTER CORNER OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN, THENCE SOUTH 0°09' WEST, 642.7 FEET; THENCE SOUTH 69°45' EAST, 2.59 FEET TO A POINT ON THE WEST LINE OF THE NORTHEAST QUARTER OF SAID SECTION 34, THE TRUE POINT OF BEGINNING; THENCE SOUTH 69°45' EAST, 208.81 FEET; THENCE NORTH 85°0' EAST, 195.00 FEET; THENCE NORTH 71°53' EAST, 718.00 FEET; THENCE SOUTH 0°58' WEST, 31.12 FEET TO A POINT ON THE CENTERLINE OF THE SOUTH BOULDER CANYON DITCH; THENCE WESTERLY, ALONG THE SAID DITCH CENTERLINE AS FOLLOWS: SOUTH 71°36' WEST, 508.65 FEET; SOUTH 73°48' WEST, 241.52 FEET; NORTH 89°40' WEST, 140.82 FEET; NORTH 77°42' WEST, 114.23 FEET; NORTH 62°24' WEST, 118.52 FEET TO A POINT ON THE WEST LINE OF THE NORTHEAST QUARTER OF SAID SECTION 34; THENCE NORTH 0°04' WEST, ALONG THE SAID WEST LINE OF THE NORTHEAST QUARTER, 11.00 FEET TO THE TRUE POINT OF BEGINNING;

EXCEPTING THEREFROM THAT PORTION CONVEYED TO THE STATE DEPARTMENT OF HIGHWAYS DIVISION OF HIGHWAYS, STATE OF COLORADO BY DEED RECORDED FEBRUARY 8, 1983 UNDER RECEPTION NO. **532304**.

PARCEL III:

THAT PORTION OF THE SOUTHWEST 1/4 OF THE SOUTHEAST 1/4 OF SECTION 27, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF BOULDER, STATE OF COLORADO, LYING SOUTH OF THE COUNTY ROAD AS DESCRIBED IN DEED RECORDED NOVEMBER 29, 1913 IN BOOK 381 AT PAGE **127**;

EXCEPTING THEREFROM THAT PORTION CONVEYED TO THE STATE DEPARTMENT OF HIGHWAYS, DIVISION OF HIGHWAYS, STATE OF COLORADO, BY THE DEED RECORDED FEBRUARY 8, 1983 UNDER RECEPTION NO. **532304**.

NOTE: THE FINAL POLICY DOES NOT IN ANY WAY GUARANTEE OR INSURE THE DIMENSIONS OF THE ABOVE DESCRIBED LAND, THE LEGAL DESCRIPTION IS DERIVED FROM THE CHAIN OF TITLE AND ONLY AN ACCURATE SURVEY CAN DETERMINE THE DIMENSIONS.

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ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B-1

(Requirements)

Order Number: ABZ70471321-15

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. ORDINANCE AUTHORIZING THE SALE OF SUBJECT PROPERTY AND THE EXECUTION OF NECESSARY DOCUMENTS BY THE TOWN OF ERIE AND TOWN OF ERIE URBAN RENEWAL AUTHORITY.
2. WARRANTY DEED FROM TOWN OF ERIE URBAN RENEWAL AUTHORITY AND THE TOWN OF ERIE TO EVERGREEN DEVCO, INC., A CALIFORNIA CORPORATION CONVEYING SUBJECT PROPERTY.
3. ORDER OF DISMISSAL ISSUED BY THE CLERK OF THE DISTRICT COURT IN AND FOR THE COUNTY OF BOULDER OF CIVIL ACTION NO. 2016CV30791 ENTITLED THE CITY OF LAFAYETTE, PLAINTIFF (S), VS. TOWN OF ERIE URBAN RENEWAL AUTHORITY ET AL., DEFENDANT (S). NOTICE OF LIS PENDENS RECORDED JULY 19, 2016, UNDER RECEPTION NO. **03531289**.
4. PROVIDE THIS COMPANY WITH A FINAL COPY OF THE NINE MILE CORNER SITE PLAN APPROVED BY THE TOWN OF ERIE.

   2 PAGES OF A DRAFT COPY OF SAID SITE PLAN DATED MARCH 3, 2017 HAS BEEN RECEIVED.

   NOTE: REQUIREMENT IS NECESSARY TO ISSUE THE ALTA 35.3 ENDORSEMENT AS TO EXCEPTIONS 8,10,11,12 AND 13. ADDITIONAL REQUIREMENTS AND/OR EXCEPTIONS MAY BE MADE AFTER THE REVIEW OF SAID PLAN.
5. FOR CONSIDERATION OF ANY ENDORSEMENT COVERING ANY OIL AND GAS MINERAL RESERVATIONS OR OIL AND GAS LEASES, THE COMPANY AND ITS UNDERWRITER REQUIRES (1) DULY EXECUTED AND ACKNOWLEDGED RELINQUISHMENTS, TERMINATIONS, AND/OR SURFACE USE WAIVER AGREEMENTS, SPECIFIC TO THE SUBJECT PROPERTY, BY ALL CURRENT OWNERS OF SAID MINERAL INTERESTS OR LEASE INTERESTS.

   NOTE: SATISFACTORY MINERAL INTEREST REPORT BY J.L. OBOURN, JR & CO. DATED DECEMBER 1, 2107 HAS BEEN RECEIVED BY THE COMPANY.

   NOTE: THE COMPANY AND ITS UNDERWRITER RESERVE THE RIGHT TO ADD ADDITIONAL REQUIREMENTS OR EXCEPTIONS UPON REVIEW OF SAID DOCUMENTATION.

   NOTE: THE ABOVE REQUIREMENT IS NECESSARY TO CONSIDER COVERAGE FOR ANY OF THE FOLLOWING EXCEPTIONS: 14, 26, 27, 28, 30, 31, 32, 33, 34, 35, 36, 37 AND 44. NOTICE REQUIREMENTS IN EXCEPTIONS 40, 41 AND 42 ARE NOT MINERAL INTERESTS AND WILL REMAIN ON TITLE.
6. RECORD TERMINATION OF DEED RESERVATION, BY THE TOWN OF ERIE, FOR THAT EASEMENT RESERVED IN DEED RECORDED APRIL 29, 1968 UNDER RECEPTION NO. **877396**.

   NOTE: SAID REQUIREMENT IS NECESSARY FOR DELETION OF EXCEPTION #18. AN ACCEPTABLE DRAFT COPY HAS BEEN PROVIDED TO THE COMPANY.
7. (THIS ITEM WAS INTENTIONALLY DELETED)

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B-1

(Requirements)

Order Number: ABZ70471321-15

The following are the requirements to be complied with:

8. PROVIDE A CERTIFIED RENT ROLL FOR SUBJECT PROPERTY, OR, IN THE ALTERNATIVE, PROVIDE CONFIRMATION ON SELLER'S FINAL AFFIDAVIT THAT THERE ARE NO EXISTING UNRECORDED LEASES OR TENANCIES ON SUBJECT PROPERTY. SAID REQUIREMENT IS NECESSARY TO EITHER MODIFY OR DELETE EXCEPTION NO. 47.
9. PROVIDE LAND TITLE GUARANTEE COMPANY WITH A FINAL SIGNED/STAMPED ALTA/NSPS LAND TITLE SURVEY OF SUBJECT PROPERTY. UPON REVIEW, ADDITIONAL REQUIREMENTS AND/OR EXCEPTIONS MAY BE NECESSARY.

   SAID SURVEY MUST BE CERTIFIED TO LAND TITLE GUARANTEE COMPANY AND OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY.

   NOTE: SURVEY BY GALLOWAY DATED DECEMBER 9, 2016, PROJECT NO. ED1000018 IS INCOMPLETE AS TO THE LEGAL DESCRIPTIONS AND AS TO MEASUREMENTS BETWEEN THE PARCELS HEREIN. IN ADDITION THE COMPANY HAS BEEN PROVIDED WITH 2 DIFFERENT VERSIONS OF "SHEET 2 OF 2".

   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.

   NOTE: 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 TOWN OF ERIE URBAN RENEWAL AUTHORITY, AS TO PARCELS A AND B THE TOWN OF ERIE, WELD COUNTY, STATE OF COLORADO, A MUNICIPAL CORPORATION, AS TO PARCEL C.
   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 EVERGREEN DEVCO, INC., A CALIFORNIA CORPORATION.

   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 CURRENT TAXES DUE TAXES, ITEM 6 WILL BE AMENDED TO READ:

   TAXES AND ASSESSMENTS FOR THE YEAR OF CLOSING AND SUBSEQUENT YEARS, A LIEN NOT YET DUE AND PAYABLE.

   NOTE: ITEM NOS. 7(A) AND 7(B) OF THE STANDARD EXCEPTIONS ARE HEREBY DELETED.

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B-1

(Requirements)

Order Number: ABZ70471321-15

The following are the requirements to be complied with:

TAX ACCOUNT INFORMATION:

FOR 2018: R0606745; R0606746; R0084551; R0021598

FOR 2019: R0606745; R0606746; R0611670; R0611671; R0611672; R0611673

NOTE: THE ISSUANCE OF THE POLICIES AND/OR ENDORSEMENTS REFERENCED IN THIS COMMITMENT ARE SUBJECT TO THE APPROVAL OF THE UNDERWRITER OF SAID POLICIES AND/OR ENDORSEMENTS. THIS COMMITMENT MAY BE REVISED AS REQUIRED BY THE UNDERWRITER TO ISSUE THE POLICIES AND/OR ENDORSEMENTS REQUESTED. THIS NOTE WILL BE DELETED UPON THE RECEIPT OF SAID APPROVAL.

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B-2

(Exceptions)

Order Number: ABZ70471321-15

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 COAL THAT MAY BE UNDERNEATH THE SURFACE OF THE LAND HEREIN DESCRIBED, ALSO SUCH RIGHT OF WAY AND OTHER GROUNDS AS MAY BE NECESSARY FOR THE PROPER WORKING OF ANY COAL MINES THAT MAY BE DEVELOPED UPON SAID PREMISES AND FOR THE TRANSPORTATION OF THE COAL FROM THE SAME, AS RESERVED UNTO THE UNION PACIFIC RAILWAY COMPANY IN THE DEED RECORDED JUNE 11, 1891 IN BOOK 138 AT PAGE **469**, AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN.

   (AFFECTS PARCEL C (III))
9. (THIS ITEM WAS INTENTIONALLY DELETED)
10. ALL COAL THAT MAY BE UNDERNEATH THE SURFACE OF THE LAND, AND THE EXCLUSIVE RIGHT TO PROSPECT, SINK SHAFT OR SHAFTS AND MINE FOR THE SAME; ALSO RESERVING SUCH RIGHT OF WAY AND OTHER GROUNDS AS MAY BE NECESSARY FOR THE PROPER WORKING OF ANY COAL MINE THAT MAY BE DEVELOPED UPON SAID PREMISES AND FOR THE TRANSPORTATION OF COAL FROM THE SAME, AS RESERVED UNTO THE COLORADO MORTGAGE AND INVESTMENT CO., LTD., A CORPORATION ORGANIZED AND EXISTING UNDER THE LAWS OF GREAT BRITAIN AND IRELAND; ANDREW WHITTON; JAMES GUTHRIE; AND ALEXANDER GOURLAY IN THE DEED RECORDED OCTOBER 18, 1901 IN BOOK 249 AT PAGE **209**, AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN.

    NOTE: MINERAL DEED RECORDED FEBRUARY 27, 1907 IN BOOK 296 AT PAGE **299**.

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B-2

(Exceptions)

Order Number: ABZ70471321-15

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:

NOTE: MINERAL DEED RECORDED SEPTEMBER 11, 1929 IN BOOK 566 AT PAGE **360**.

(AFFECTS PARCELS A AND B)

11. ALL COAL OR OTHER MINERALS THAT MAY BE UNDERNEATH THE SURFACE OF THE LAND; AND THE EXCLUSIVE RIGHT TO PROSPECT, SINK SHAFT OR SHAFTS, AND MINE FOR THE SAME, AS RESERVED UNTO THE COLORADO MORTGAGE & INVESTMENT COMPANY, LIMITED, A CORPORATION ORGANIZED AND EXISTING UNDER THE LAWS OF GREAT BRITAIN AND IRELAND; ANDREW WHITTON; JAMES GUTHRIE; AND ALEXANDER GOURLEY IN THE DEED RECORDED JANUARY 21, 1904 IN BOOK 251 AT PAGE **460**, AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN.

    (AFFECTS PARCELS B AND C(I))

12. AN UNDIVIDED ONE-HALF INTEREST IN THE COAL AND OTHER MINERALS LYING UNDERNEATH THE SURFACE OF THE LAND AS CONVEYED TO GEORGE MURRAY, EDWARD E. HOLMES AND ALFRED N. GOSSETT BY THE DEED RECORDED FEBRUARY 27, 1907 IN BOOK 296 AT PAGE **299**.

    (AFFECTS PARCELS A, B AND C(II))

13. ALL COAL AND OTHER MINERALS UNDERNEATH THE SURFACE OF THE LAND, AND THE EXCLUSIVE RIGHT TO PROSPECT, SINK SHAFT OR SHAFTS, AND MINE FOR THE SAME; ALSO RESERVING SUCH RIGHT OF WAY AND OTHER GROUNDS AS MAY BE NECESSARY FOR THE PROPER WORKING OF ANY COAL OR OTHER MINE OR MINES THAT MAY BE DEVELOPED UPON SAID PREMISES AND FOR THE TRANSPORTATION OF THE PRODUCTS THEREFROM, AND FOR SUCH SURFACE AREA SO REQUIRED, AS RESERVED UNTO THE COLORADO MORTGAGE AND INVESTMENT COMPANY, LIMITED, A CORPORATION ORGANIZED AND EXISTING UNDER THE LAWS OF GREAT BRITAIN AND IRELAND; ANDREW WHITTON; JAMES GUTHRIE; AND ALEXANDER GOURLAY IN THE DEED RECORDED JANUARY 15, 1910 IN BOOK 340 AT PAGE **259**, AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN.

    (AFFECTS A, B AND C(II))

14. AN UNDIVIDED 2½% INTEREST IN AND TO ALL THE OIL AND GAS IN AND UNDER AND THAT MAY BE PRODUCED FROM THE LAND, AS CONVEYED TO ROY R. CARPENTER BY THE DEED RECORDED JULY 22, 1924 IN BOOK 511 AT PAGE **168**, AND ANY AND ALL ASSIGNMENTS THEREOF OR INTERESTS THEREIN.

    (AFFECTS ALL PARCELS)

15. (THIS ITEM WAS INTENTIONALLY DELETED)

16. ANY RIGHTS OR INTERESTS OF THIRD PARTIES WHICH EXIST OR ARE CLAIMED TO EXIST IN AND OVER THE PRESENT AND PAST BED, BANKS OR WATERS OF SOUTH BOULDER CANYON DITCH, SAID DITCH BEING REFERRED TO IN THE LEGAL DESCRIPTION CONTAINED IN DEED RECORDED APRIL 29, 1968 UNDER RECEPTION NO. **877395** AND DEED RECORDED MAY 21, 1969 UNDER RECEPTION NO. **913694**.

    (AFFECTS PARCELS A, AND C(II))

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B-2

(Exceptions)

Order Number: ABZ70471321-15

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:

17. ANY CHANGES IN AREA DUE TO THE RELOCATION OR MOVEMENT OF SOUTH BOULDER CANYON DITCH, SAID DITCH BEING DESCRIBED IN THE LEGAL DESCRIPTION CONTAINED IN DEED RECORDED APRIL 29, 1968 UNDER RECEPTION NO. **877395** AND DEED RECORDED MAY 21, 1969 UNDER RECEPTION NO. **913694**.

    (AFFECTS PARCELS A AND C(II))

18. AN EASEMENT FOR ROADWAY AND FOR THE MAINTENANCE AND REPAIR OF RESERVOIR, AS RESERVED UNTO THE TOWN OF ERIE IN THE DEED RECORDED APRIL 29, 1968 UNDER RECEPTION NO. **877396**.

    NOTE: THE ABOVE EXCEPTION WILL BE DELETED UPON RECORDATION OF A RELEASE OR TERMINATION AS SET FORTH IN THE REQUIREMENT #6 HEREIN.

    (AFFECTS PARCEL B)

19. EASEMENT GRANTED TO PUBLIC SERVICE COMPANY OF COLORADO, FOR NATURAL GAS FACILITIES, AND INCIDENTAL PURPOSES, BY INSTRUMENT RECORDED AUGUST 04, 1981, UNDER RECEPTION NO. **457820**.

    (AFFECTS PARCEL A)

20. (THIS ITEM WAS INTENTIONALLY DELETED)

21. (THIS ITEM WAS INTENTIONALLY DELETED)

22. RIGHT OF WAY EASEMENT FOR PIPELINE, AND INCIDENTAL PURPOSES, AS GRANTED TO CDM PIPELINE COMPANY, INC., A COLORADO CORPORATION IN INSTRUMENT RECORDED JULY 16, 1984 UNDER RECEPTION NO. **634026**, AND CORRECTION AND AMENDMENT OF PIPELINE RIGHT-OF-WAY GRANT RECORDED OCTOBER 15, 1984 UNDER RECEPTION NO. **652036**.

    PIPELINE SURVEY MAP RECORDED SEPTEMBER 28, 1984 UNDER RECEPTION NO. **649253**.

    (AFFECTS PARCEL A)

23. (ITEM INTENTIONALLY DELETED)

24. ANY TAX, LIEN, FEE, OR ASSESSMENT BY REASON OF INCLUSION OF SUBJECT PROPERTY IN THE LONGMONT FIRE PROTECTION DISTRICT, AS EVIDENCED BY INSTRUMENT RECORDED APRIL 29, 1985, UNDER RECEPTION NO. **685397** AND MODIFIED ORDER OF INCLUSION RECORDED SEPTEMBER 3, 1985 UNDER RECEPTION NO. **710155**.

    (AFFECTS ALL PARCELS)

25. (THIS ITEM WAS INTENTIONALLY DELETED)

26. OIL AND GAS LEASE BETWEEN ROY N. AUSTIN, LESSOR, AND O.D. PRESLEY, LESSEE, RECORDED MAY 06, 1985 UNDER RECEPTION NO. **686626**, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.

    NOTE: AFFIDAVIT OF PRODUCTION RECORDED JULY 30, 1985 UNDER RECEPTION NO. **702639**. REVISED AFFIDAVIT OF PRODUCTION RECORDED APRIL 21, 1986 UNDER RECEPTION NO. **754068** AND RECORDED JUNE 12, 1986 UNDER RECEPTION NO. **766082**.

    (AFFECTS ALL PARCELS)

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B-2

(Exceptions)

Order Number: ABZ70471321-15

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. OIL AND GAS LEASE BETWEEN JANE KUEHNER, MARY F. DEHAAN, MICHAEL R. SHELTON, MARK L. SHELTON, BRUCE D. CARPENTER, JEAN K. CARPENTER, GLENN C. CARPENTER AND SARAH A. CARPENTER, LESSORS, AND O.D. PRESLEY, LESSEE, RECORDED AUGUST 06, 1985 UNDER RECEPTION NO. **703693**, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.

    NOTE: REVISED AFFIDAVIT OF PRODUCTION RECORDED APRIL 21, 1986 UNDER RECEPTION NO. **754068** AND RECORDED JUNE 12, 1986 UNDER RECEPTION NO. **766082**.

    NOTE: RATIFICATIONS OF OIL AND GAS LEASE RECORDED JUNE 12, 1986 UNDER RECEPTION NOS. **766084**, **766085** AND **766086**.

    (AFFECTS ALL PARCELS)

28. OIL AND GAS LEASE BETWEEN CLAUDE JONES AND ALINE JONES, LESSORS, AND O.D. PRESLEY, LESSEE, RECORDED AUGUST 06, 1985 UNDER RECEPTION NO. **703694**, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.

    NOTE: REVISED AFFIDAVIT OF PRODUCTION RECORDED APRIL 21, 1986 UNDER RECEPTION NO. **754068** AND RECORDED JUNE 12, 1986 UNDER RECEPTION NO. **766082**.

    (AFFECTS ALL PARCELS)

29. (THIS ITEM WAS INTENTIONALLY DELETED)

30. OIL AND GAS LEASE BETWEEN WINNIFRED H. EWALT, LESSOR, AND O.D. PRESLEY, LESSEE, RECORDED OCTOBER 08, 1985 UNDER RECEPTION NO. **717948**, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.

    NOTE: REVISED AFFIDAVIT OF PRODUCTION RECORDED APRIL 21, 1986 UNDER RECEPTION NO. **754068** AND RECORDED JUNE 12, 1986 UNDER RECEPTION NO. **766082**.

    NOTE: RATIFICATION OF OIL AND GAS LEASE RECORDED JUNE 12, 1986 UNDER RECEPTION NO. **766083**.

    (AFFECTS ALL PARCELS)

31. OIL AND GAS LEASE BETWEEN JAY P. WALKER, LESSOR, AND O.D. PRESLEY, LESSEE, RECORDED JULY 09, 1986 UNDER RECEPTION NO. **772253**, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.

    (AFFECTS ALL PARCELS)

32. MINERAL DEED RECORDED MARCH 5, 1992 UNDER RECEPTION NO. **1165768**.

    (AFFECTS SE 1/4 OF SECTION 27 AND THE N 1/2 OF THE NE 1/4 OF SECTION 34)

33. OIL AND GAS LEASE BETWEEN PAUL K. LASNIK, LESSOR, AND MARTIN EXPLORATION MANAGEMENT COMPANY, LESSEE, RECORDED MARCH 17, 1992 UNDER RECEPTION NO. **1168168**, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.

    (AFFECTS ALL PARCELS)

34. OIL AND GAS LEASE BETWEEN HELEN M. MASTRIONA AND FRANK M. MASTRIONA, LESSORS, AND MARTIN EXPLORATION MANAGEMENT COMPANY, LESSEE, RECORDED MARCH 24, 1992 UNDER RECEPTION NO. **1169721**, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B-2

(Exceptions)

Order Number: ABZ70471321-15

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:

(AFFECTS ALL PARCELS)

35. OIL AND GAS LEASE BETWEEN DOROTHY J. BLACKBURN AND JOSEPH BLACKBURN, LESSORS, AND MARTIN EXPLORATION MANAGEMENT COMPANY, LESSEE, RECORDED MARCH 24, 1992 UNDER RECEPTION NO. **1169722**, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.

    (AFFECTS ALL PARCELS)

36. OIL AND GAS LEASE BETWEEN DOLORES T. FORBIS AND DERL D. FORBIS, LESSORS, AND MARTIN EXPLORATION MANAGEMENT COMPANY, LESSEE, RECORDED MARCH 30, 1992 UNDER RECEPTION NO. **1171195**, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.

    (AFFECTS ALL PARCELS)

37. OIL AND GAS LEASE BETWEEN MARTIN EXPLORATION MANAGEMENT COMPANY, LESSOR, AND BASIN EXPLORATION INCORPORATED, LESSEE, RECORDED NOVEMBER 08, 1993 UNDER RECEPTION NO. **1358710**, AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.

    NOTE: NOTICE OF OIL AND GAS INTERESTS AND SURFACE USE IN CONNECTION WITH THE ABOVE LEASE RECORDED JANUARY 23, 2001 UNDER RECEPTION NO. **2112332**.

    (AFFECTS ALL PARCELS)

38. RESOLUTION #94-25, PERTAINING TO ANNEXATION, RECORDED NOVEMBER 9, 1994 UNDER RECEPTION NO. **1477392** AND MAP IN CONNECTION THEREWITH RECORDED NOVEMBER 9, 1994 UNDER RECEPTION NO. **1477393**.

    (AFFECTS PARCEL C (I, II & III) AND A PORTION OF PARCEL B)

39. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN NELSON AGREEMENT REGARDING USE OF PUBLIC STREET RECORDED JULY 24, 1998 UNDER RECEPTION NO. **1827415**.

    (AFFECTS PARCEL A)

40. REQUEST FOR NOTIFICATION OF SURFACE DEVELOPMENT AS EVIDENCED BY INSTRUMENT RECORDED MAY 17, 2002 UNDER RECEPTION NO. **2288464**.

    (AFFECTS PARCEL C(III))

41. REQUEST FOR NOTIFICATION OF SURFACE DEVELOPMENT AS EVIDENCED BY INSTRUMENT RECORDED OCTOBER 23, 2007 UNDER RECEPTION NO. **2890878**.

    (AFFECTS PARCEL C(III))

42. REQUEST FOR NOTIFICATION OF SURFACE DEVELOPMENT AS EVIDENCED BY INSTRUMENT RECORDED DECEMBER 21, 2007 UNDER RECEPTION NO. **2900941**.

    (AFFECTS PARCEL C(III))

43. (THIS ITEM WAS INTENTIONALLY DELETED)

44. OIL AND GAS LEASE BETWEEN NOBLE ENERGY, INC., A DELAWARE CORPORATION AND EXTRACTION OIL & GAS, LLC, A DELAWARE LIMITED LIABILITY COMPANY, RECORDED MARCH 11, 2015 UNDER RECEPTION NO. **3432573** AND ANY AND ALL ASSIGNMENTS THEREOF, OR INTEREST THEREIN.

ALTA COMMITMENT

Old Republic National Title Insurance Company

Schedule B-2

(Exceptions)

Order Number: ABZ70471321-15

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:

(AFFECTS PARCEL C (III))

45. RESOLUTION #05-2015, PERTAINING TO ANNEXATION, RECORDED APRIL 21, 2015 UNDER RECEPTION NO. **3440934** AND MAP IN CONNECTION THEREWITH RECORDED APRIL 21, 2015 UNDER RECEPTION NO. **3440932**.

46. RESOLUTION #06-2015, PERTAINING TO ZONING, RECORDED APRIL 21, 2015 UNDER RECEPTION NO. **3440935** AND MAP IN CONNECTION THEREWITH RECORDED APRIL 21, 2015 UNDER RECEPTION NO. **3440933**.

(ITEMS 45-46 AFFECT PARCEL A AND A PORTION OF PARCEL B)

47. EXISTING UNRECORDED LEASES AND TENANCIES, IF ANY.

48. ANY AND ALL RIGHTS OF THE BOULDER CANYON DITCH COMPANY RELATING TO BOULDER CANYON DITCH, WHICH TRAVERSES PARCELS A, B AND C-II OF SUBJECT PROPERTY, INCLUDING BUT NOT LIMITED TO DITCH MAINTENANCE AND ACCESS RIGHTS TO LANDS ADJOINING THE DITCH, APPROXIMATE LOCATION OF WHICH DITCH IS DISCLOSED BY ALTA/NSPS LAND TITLE SURVEY BY GALLOWAY, DATED DECEMBER 9, 2016, LAST REVISED _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _, JOB NO. ED1000018..

49. ANY FACTS, RIGHTS, INTERESTS OR CLAIMS WHICH MAY EXIST OR ARISE BY REASON OF THE FOLLOWING FACTS SHOWN ON ALTA/NSPS LAND TITLE SURVEY DATED DECEMBER 09, 2016, LAST REVISED _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _, PREPARED BY GALLOWAY, JOB #ED1000018
SAID DOCUMENT STORED AS OUR ESI **33770381**

A. FENCES ARE NOT ENTIRELY COINCIDENT WITH BOUNDARY LINES.

B. PORTION OF ARAPAHOE ROAD ENCROACHES ONTO PARCEL C-III OF SUBJECT PROPERTY.

C. WELL SITE MAY BE LOCATED OUTSIDE OF GRANTED OPERATION AREA.

D. GAS LINE TRAVERSES PARCELS A AND B WITHOUT BENEFIT OF A RECORDED EASEMENT.

50. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN APPROVED NINE MILE CORNER PD-DEVELOPMENT PLAN RECORDED SEPTEMBER 26, 2017 UNDER RECEPTION NO. **03616633**, AND ORDINANCE NO. 16-2017 IN CONNECTION THEREWITH RECORDED SEPTEMBER.26, 2017 UNDER RECEPTION NO. 03616632.

51. TERMS, CONDITIONS, PROVISIONS, BURDENS, OBLIGATIONS AND EASEMENTS AS SET FORTH AND GRANTED IN DEED OF CONSERVATION EASEMENT IN GROSS RECORDED OCTOBER 18, 2019 UNDER RECEPTION NO. **03743529**.

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 your 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 obtain either 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 may share your Personal Information with affiliated contractors or service providers who provide services in the course of our business, but only to the extent necessary for these providers to perform their services and to provide these services to you as may be required by your transaction.
- 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 STATED ABOVE OR 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.

<

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

AMERICAN LAND TITLE ASSOCIATION ALTA COMMITMENT FORM Adopted Copyright 2006-2019 American Land Title Association. All rights reserved.

03597106 06/12/2017 03:24 PM
RF: $38.00 DF: $0.00 Page: 1 of 6
Electronically recorded in Boulder County Colorado. Recorded as received.

When recorded return to:
Brownstein Hyatt Farber Schreck, LLP
Attn: Carolynne White, Esq.
410 Seventeenth Street, Suite 2200
Denver, CO 80202

RELINQUISHMENT AND QUITCLAIM

THIS RELINQUISHMENT AND QUITCLAIM ("Relinquishment") is effective this 16th day of May, 2017, by and among KERR-MCGEE OIL & GAS ONSHORE LP ("Kerr-McGee") with an address of 1099 18th Street, Suite 1800, Denver, Colorado 80202, and the Town of Erie, a Colorado municipal corporation, with an address of 645 Holbrook Street, Erie Colorado 80516, ("GRANTEE").

W I T N E S S E T H:

RECITALS

1. The lands which are the subject of this Relinquishment ("Subject Lands") are a portion of the land legally described in Exhibit A ("Parcel C") attached hereto, and the Subject Lands are depicted within the hashed section of Parcel C shown on the survey attached as Exhibit B.

2. Kerr-McGee holds the leasehold rights to the minerals that underlie the Subject Lands pursuant to that Oil and Gas Lease originally granted to Continental Gas Company from Earl Geoffrey Morris, and recorded on April 10, 1981 at Reception No. 441586 in the real property records of Boulder County, Colorado, which is hereinafter referred to as the "Lease". The Subject Lands constitute all of the land within Parcel C subject to the Lease.

3. This Relinquishment is specific to surface entry rights of Kerr-McGee's and its affiliates with respect to the Subject Lands.

RELINQUISHMENT AND QUITCLAIM

NOW THEREFORE, Kerr-McGee for and in consideration of the sum of TEN DOLLARS ($10.00) and other good and valuable consideration to them paid, the receipt of which is hereby acknowledged, have RELINQUISHED and forever QUITCLAIMED, and by these presents do RELINQUISH and forever QUITCLAIM unto GRANTEE, its grantees, successors and assigns, with respect to the Subject Lands only, Kerr-McGee's right to enter

upon the surface of the Subject Lands to explore for and remove underlying minerals, including, without limitation, all rights to drill, mine, explore, operate, produce, store or remove any energy resources on or over the surface of the Subject Lands, provided, however, it expressly understood that the title of Kerr-McGee to the Lease shall be in no way affected and that Kerr-McGee and any lessee, licensee, Kerr-McGee successor or assign of either of them shall have the right to remove the minerals from the Subject Lands by directional or horizontal drilling and by subterranean entries or by means of operations conducted on the surface of other lands or otherwise by any means or methods suitable to, their lessees, licensees, successors and assigns. Kerr-McGee shall have the right to remove the minerals from the Subject Lands, but without entering upon or using the surface of the Subject Lands, and in such manner as not to damage the surface of the Subject Lands and any improvements now or hereafter constructed thereon or to interfere with the use thereof by GRANTEE, its grantees, successors and assigns.

Kerr-McGee's relinquishment and quitclaim herein provided shall in no way affect the leasehold or mineral rights of any other lessee in the Subject Lands (that is not affiliated with Kerr-McGee), licensee or their successors or assigns, and specifically does not affect or limit such other lessee or licensee (that is not affiliated with Kerr-McGee) right to enter upon and use the surface of the Subject Lands, such rights being specifically retained by those other parties.

This Relinquishment is made subject to the specific understanding that all of the terms, conditions, provisions and reservations contained in the Lease and not heretofore relinquished shall continue in full force and effect with respect to all lands conveyed thereby and not covered by this Relinquishment, and it is further specifically understood that all the terms, conditions, provisions and reservations contained in that Lease and not relinquished hereunder shall continue in full force and effect with respect to the Subject Lands

[*Signatures on the following page*]

IN WITNESS WHEREOF, Kerr-McGee has executed this Relinquishment and on the dates set forth in the acknowledgments, to be effective on the date first written above.

KERR-MCGEE OIL & GAS ONSHORE LP

By: _____
Name: Lindsay Jaffe
Its: Agent and Attorney-in-fact

ACKNOWLEDGEMENT

STATE OF COLORADO)
) ss.
COUNTY OF DENVER)

The foregoing instrument was acknowledged before me this 1st day of May, 2017, by Lindsay Jaffee, as Agent and Attorney-in-fact for KERR-MCGEE OIL & GAS ONSHORE LP.

ANTHONY T RADER
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20164046156
COMMISSION EXPIRES DEC. 6, 2020

Witness my hand and official seal.

_____
Notary Public

Exhibit A

Parcel C Legal Description

PARCEL C:

PARCEL I:

A PART OF THE NORTHWEST 1/4 OF THE NORTHEAST 1/4 OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF BOULDER, STATE OF COLORADO, MORE PARTICULARLY DESCRIBED AS FOLLOWS:
BEGINNING AT THE NORTH 1/4 CORNER OF SAID SECTION; THENCE SOUTH 0°09' WEST 642.7 FEET; THENCE SOUTH 69°45' EAST 211.4 FEET; THENCE NORTH 85° EAST 195 FEET; THENCE NORTH 71°53' EAST 718 FEET; THENCE NORTH 24°20' EAST 539 FEET TO A POINT ON THE NORTH LINE OF SAID SECTION, 20 FEET WEST OF THE NORTHEAST CORNER OF SAID NORTHWEST 1/4 OF THE NORTHEAST 1/4; THENCE WEST ALONG SAID NORTH LINE OF SAID SECTION TO THE PLACE OF BEGINNING;

EXCEPTING THEREFROM THAT PORTION CONVEYED TO THE COUNTY OF BOULDER BY THE DEED RECORDED NOVEMBER 29, 1913 IN BOOK 381 AT PAGE 127;
AND EXCEPT THAT PORTION DESCRIBED IN DEED RECORDED APRIL 29, 1968 UNDER RECEPTION NO. 877396;
AND EXCEPT THAT PORTION CONVEYED TO THE STATE DEPARTMENT OF HIGHWAYS, DIVISION OF HIGHWAYS, STATE OF COLORADO, BY THE DEED RECORDED FEBRUARY 8, 1983 UNDER RECEPTION NO. 532304;
AND EXCEPT THAT PORTION CONVEYED TO THE DEPARTMENT OF TRANSPORTATION, STATE OF COLORADO BY THE DEED RECORDED JANUARY 2, 1998 UNDER RECEPTION NO. 1759789.

Exhibit B

ALTA/NSPS LAND TITLE SURVEY

PORTION OF THE NORTHEAST QUARTER OF SECTION 34, TOWNSHIP 1 NORTH, RANGE 69 WEST AND THE SOUTHEAST QUARTER OF SECTION 27, TOWNSHIP 1 NORTH, RANGE 69 WEST OF THE 6TH PRINCIPAL MERIDIAN,
TOWN OF ERIE, COUNTY OF BOULDER, STATE OF COLORADO.

TITLE COMMITMENT/REPORT INFORMATION

LEGAL DESCRIPTION (PER TITLE COMMITMENT)

GENERAL NOTES

AREAS OF CONCERN

ZONING INFORMATION

SURVEY CERTIFICATE

Galloway

ALTA/NSPS LAND TITLE SURVEY
EVERGREEN DEVCO INC
TOWN OF ERIE PARCELS
TOWN OF ERIE, COUNTY OF BOULDER, COLORADO

ALTA/NSPS LAND TITLE SURVEY

1 OF 2

Page B-1

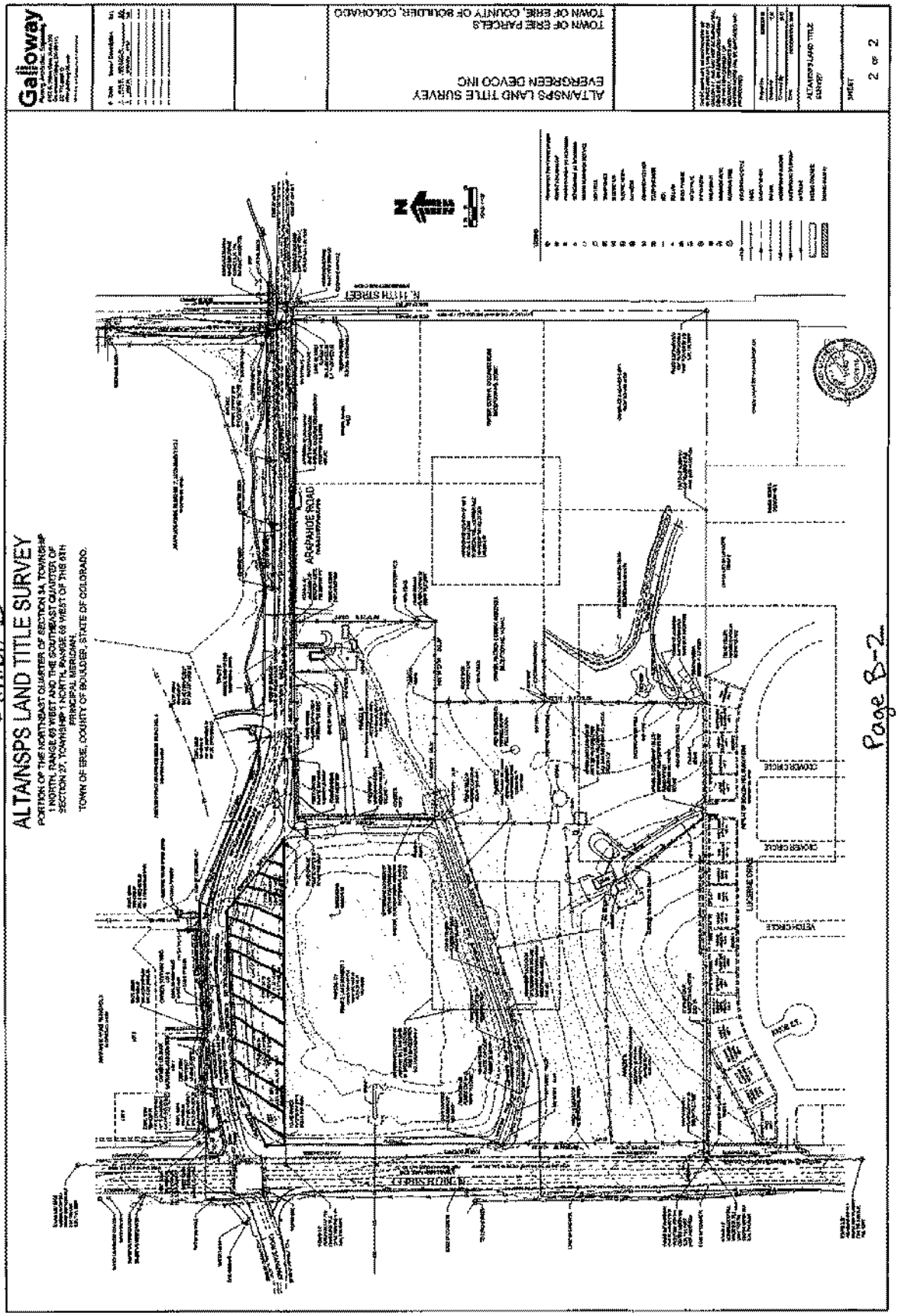

Exhibit B

Page B-2

Referral Agencies for:
SP-001117-2019: Nine Mile Corner Site Plan
October 3, 2019

Staff has determined that the Nine Mile Corner Site Plan submittal is sufficiently complete to send out for referral comments once the redlined changes listed in the User Guide are complete. After you have made the revisions, please submit the following to Planning & Development:

Paper Copies:

- 1 copy of the new and updated materials bound and labeled for Planning to update the binder and application materials already submitted. Provide 11x17 plans for the notebook.
- 1 new copy of the complete updated submittal in a tabbed binder labeled for Public view. Provide 11x17 plans in this binder.
- 4 copies of all plan sets bound in 24"x36" rolls and individually labeled/ready for delivery to Planning, Engineering, Economic Development and Parks & Recreation. *Plan sets should be complete, rolled and labeled for each individual department.*

Digital Copies:

- A PDF format of the complete submittal materials on 24 USB flash drives with file names consistent with the Town's Users Guide. Please include a hyperlinked copy of the title work. The Town will provide the mailing envelope, address labels and postage for delivery of the flash drives. The flash drives will be distributed to the follow referral agencies: Galloway - to provide

  1. Town of Erie (5/File) - (Planning, Engineering, Stormwater, Building, Economic Development)
  2. Mountain View Fire Protection District
  3. Merrick & Company Drainage & Utiltiy
  4. Partners In Energy
  5. Felsburg Holt & Ullevig
  6. CDOT (Region 4)
  7. RTD
  8. Arapahoe Ridge HOA

- For any oil and gas interests associated with the property, provide a flash drive for each of the appropriate mineral rights owners and lease holders. Your resubmittal must include a list of all of the entities that you would like the Town to send the flash drive to, from the list below. Add any additional entities that may not be listed that are associated with the minerals and provide the name and mailing address to the Town. The Town will provide the mailing envelope, address labels and postage for delivery of the flash drives.

Oil & Gas: **Anadarko Petroleum Corp.**
Anadarko Land Corp.

Attn: Jake Billadeau
1099 18th Street, Suite 1800
Denver, CO 80202-1918

Crestone Peak Resources (formerly EnCana)
Attn: Bob Bresnahan — Ph: 303-774-3982
10188 East I-25 Frontage Road — (C) 720-369-0432
Firestone, CO 80504

Extraction Oil & Gas, LLC
Attn: Chandler Newhall — 720-557-8300
370 17th St., Suite 5300
Denver, CO 80202

Patina Oil & Gas
Attn: David Siple — Ph: (303) 389-3600
1625 Broadway, Suite 2000
Denver, CO 80202-4720

Kerr-McGee Oil & Gas Onshore LP
Attn: Jake Billadeau
1099 18th Street, Suite 1800
Denver, CO 80202-1918

Kerr-McGee Gathering LLC
Attn: Jake Billadeau
1099 18th Street, Suite 1800
Denver, CO 80202-1918

Petroleum Development Corporation
3801 Carson Avenue
Evans, CO 80620-2505

Champlin Petroleum Co.
Use Anadarko Petroleum Corp.

Pan American Petroleum Co.
Use Anadarko Petroleum Corp.

Noble Energy Production, Inc.
Attn: P. David Padgett — Ph: (303) 228-4054
1625 Broadway, #2000
Denver, CO 80202-4725

Patina/Noble Energy

100 Glenbourough, Ste. 100
Houston, TX 77067

Petrogulf Corporation
600 Grant Street, Suite 850
Denver, CO 80203

K.P Kauffman Company, Inc.
c/o Jost Energy Law
Attn: Kelsey Wazalensky
1481 17th Street, Suite 370
Denver, CO 80202

Dearman East Notifications for Oil & Gas:
Ronald J. Snow
McGloin, Davenport, Severson and Snow, P.C.
1600 Stout Street, Suite 1600
Denver, Colorado 80202-3103
Direct Line: (720) 536-3560
Main Line: (303) 863-9800
Fax: (303) 571-1600
E-mail: rons@mdsslaw.com
Web: www.mdsslaw.com

HS Gathering, LLC &
Panhandle Eastern Pipeline Co.:
Send Referrals to:
Kerr-McGee Gathering
Mike Brotzman Ph: (970)515-1136
501 N. Division Blvd.
Platteville, CO 80651
E-mail: mike.brotzman@anadarko.com

Referrals for Erie Gateway South :
CO Bank
Nancy Morford, Minerals Director Ph: (316) 290-2000
PO Box 2940
Wichita, KS 67201-2940

Referrals for Nine Mile Corner:

CDM Oil & Gas
Estate of Kal Zeff
950 S. Cherry St., Suite 1100
Denver, CO 80246

Vessels
1050 17th Street, Suite 2000
Denver, CO 80265

SITE PLAN REVIEW

User's Guide

For: Site Plan – Planning Commission;
Site Plan – Administrative;
Site Plan Minor Amendment;
Site Plan Major Amendment

NOTE: FOR DETAILED PROCEDURES, REFER TO CHAPTER 7 OF THE UNIFIED DEVELOPMENT CODE

SP-001117-2019
Nine Mile

Town of Erie
Planning & Development – Planning Division
645 Holbrook Street
PO Box 750
Erie, Colorado 80516

This document is available on our web site. Go to www.erieco.gov
Click on Departments>Planning & Development>Planning Division>User's Guides>Site Plan Review

08/09/2019

of the following forms of security: (1) irrevocable Letter of Credit; or (2) cashier's check. This security shall be in an amount equal to the cost of the unfinished work, plus 15% and shall be submitted prior to the issuance of a Certificate of Occupancy. The security will be held by the Town and released when the work is deemed complete by the Planning & Development Director and/or the Public Works Director.

Prior to the issuance of the Certificate of Occupancy, the applicant shall submit a completed application for "Request for Release of C.O."

Approval Criteria

Site Plans may be approved upon finding that the application meets all of the following criteria.

1. The Site Plan is consistent with the Town of Erie Comprehensive Master Plan;

2. The Site Plan is consistent with any previously approved subdivision plat, planned development, or any other precedent plan or land use approval as applicable;

3. The Site Plan complies with all applicable development and design standards set forth in the Municipal Code Title 10 - UDC, including but not limited to the provisions in Chapter 2, *Zoning Districts*, Chapter 3, *Use Regulations*, Chapter 4, *Dimensional Requirements*, and Chapter 6, *Development and Design Standards*;

4. Any significant adverse impacts reasonably anticipated to result from the use will be mitigated or offset to the maximum extent practicable; and

5. The development proposed on the Site Plan and its general location is or will be compatible with the character of surrounding land uses.

Submittal Requirements

One copy of the following information shall be submitted to Planning & Development – Planning Division, unless waived by the Planning & Development Director in order to perform a completeness review. All information shall be submitted in a three ring binder with dividers and all 24" x 36" exhibits shall be folded to fit into pockets within the binder. All 24" x 36" exhibits shall be reduced to 11" x 17" in size and included with the submission. **Applications will not be accepted for review unless all information is present.**

1. Completed application.
2. Application fee.
3. Written narrative, describing the proposed development which at a minimum provides the following information:
    a. General project concept and purpose of the request;
    b. Discuss how the proposed development is in compliance with the five approval criteria of the Municipal Code Title 10 - UDC for Site Plan review;
    c. Discuss how the proposed building architecture provides visual interest consistent with the community's identity, character and scale. Explain how building facades and rooflines are articulated to reduce the mass, scale, uniform and monolithic appearances of large buildings. Describe how architectural features, patterns and details provide visual interest at the scale of the pedestrian;

d. Provide a development schedule indicating the approximate date when construction of the proposed development, and when applicable, phases of the proposed development can be expected to begin and be completed;

e. Provide general business related data including the total number of employees, the square footage of building(s), lot area, and total project value (*building and site development costs excluding land value*); Derek - to look and reference the plat. Derek and Laura to discuss value.

f. If residential units are proposed, the number of units and how they are being integrated into the proposed development;

g. A brief description regarding the location, function and ownership/maintenance of public and private open space, parks, trails, common areas, common buildings; and

h. A brief description regarding the status of mineral rights and the substance of any existing or proposed covenants, special conditions, grants of easements, or other restrictions applying to the proposed subdivision.

4. Proof of ownership that includes an updated or current title insurance policy or title commitment issued no more than thirty days prior to the date of application. Derek

5. Copy of an ALTA/ACSM Land Title Survey, for the entire property of the proposal. Derek

6. NA A notarized letter of authorization from the landowner(s) permitting a representative to process the application, when the landowner is not the applicant.

7. Copies of any special agreements, oil/gas surface use agreements, conveyances, restrictions, or covenants that will govern the use and/or maintenance of the proposed development. Derek

8. A colored rendering of the elevations including product/material information. The product/material information shall include a color swatch.

9. A full scale paper copy of the recorded final plat for which the Site Plan is proposed or a full scale certified boundary survey if the proposed Site Plan is on unplatted property.

10. Site Plan exhibits: The Site Plan exhibits shall be defined as a set of detailed plans/sheets with associated information containing at a minimum a:

a. Cover Sheet
b. Site Plan
c. Landscape Plan
d. Utility Plan
e. Grading/Drainage Plan
f. Photometric Plan
g. Building Elevations – Scaled and dimensioned. Derek and Lowes, G3

All exhibits shall be prepared as follows and accurately display the following information:

i. All exhibits shall be prepared on 24" x 36" paper at a scale not to exceed 1" = 40'. If a proposal requires multiple sheets, a composite, on 24" x 36" paper, shall be provided that delineates the boundaries and identifies each sheet number. A one inch margin on all sheets shall be left blank on all sides; Galloway

- A title block shall be placed at the top/center of the exhibits along the long dimension of each sheet. The name of the proposed Site Plan shall be based upon the legal description within a subdivision or the street address when not located in a subdivision and shall also include the general aliquot legal description with county, the total acreage and project file number; Galloway

EXAMPLE: (Insert Subdivision Name, Aliquot Description, Proposed Acres/Lots/Tracts and Project Number. See example below)

For Site Plans, the title block shall be formatted as follows:

ERIE VALLEY FILING NO. 1, LOT 1
A PORTION OF THE N ½ OF SECTION 18, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, COLORADO
4 ACRES
SITE PLAN - SP__-___ SP-001117-2019

For Special Review Use Site Plans, the title block shall be formatted as follows:

ERIE VALLEY FILING NO. 1, LOT 1
A PORTION OF THE N ½ OF SECTION 18, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN, TOWN OF ERIE, COUNTY OF WELD, COLORADO
SRU AREA - 2 ACRES - TOTAL AREA 4 ACRES
SPECIAL REVIEW USE SITE PLAN - US__-___

- A block in the lower right hand corner shall include the following: the preparation date and revision date chronology; a north arrow designated as true north; a written and graphic scale; and the number of the sheet and total number of sheets;
- For subdivided land, label all boundary lines with bearings, distances and curve data as shown on the final plat;
- For unsubdivided land, label all boundary lines with bearings, distances and curve data as shown on a certified boundary survey prepared by or under the supervision of a registered professional land surveyor licensed with the State of Colorado; and
- When a development is proposed to be phased, show phase lines and provide the following note on each exhibit:

Galloway - add note

FOR ALL FUTURE PHASES, THE APPLICANT SHALL SUBMIT A REVISED SITE PLAN FOR THE PHASE FOR WHICH A PERMIT IS REQUESTED, AND SHALL RECEIVE APPROVAL FROM THE TOWN OF ERIE PRIOR TO ISSUANCE OF A BUILDING PERMIT.

a. Provide a Cover Sheet with the following information:

- A scaled vicinity map that depicts the area around the proposal within a 1-mile radius;
- A Sheet Index;
- A Site Plan Approval Certificate;

SITE PLAN APPROVAL CERTIFICATE

THIS SITE PLAN HAS BEEN REVIEWED AND FOUND TO BE COMPLETE AND IN ACCORDANCE WITH APPLICABLE TOWN OF ERIE REGULATIONS.

_____ _____
Director of Planning & Development Date

_____ _____
Planning Commission Chair (if applicable) 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.

_____ _____
(owner signature) *(owner name printed)*

Acknowledged before me this _____ day of _____, 20___.

by _____ as _____.

Witness my hand and official seal

_____ (seal)
Notary Public

My commission expires: _____

- ☐ Provide a Site Data summary chart based on the following example:

SITE DATA SUMMARY CHART Zone District ____		
ITEM	SQUARE FOOTAGE	% OF GROSS SITE
GROSS SITE AREA	20,000	100.0
• Building Footprint • Parking/Roads (including planted interior parking islands)	7,500 800	37.5 4.0
HARDSCAPE TOTAL	8,300	41.5
• Planted area (excluding planted interior parking islands) • Existing Vegetation • Trails and sidewalks	4,500 6,200 1,000	22.5 31.0 5.0
LANDSCAPE TOTAL	11,700	58.5
ITEM	DESCRIPTION	
BUILDING SIZE: 2 Stories • Retail • Office		5,000 sq/ft 10,000 sq/ft
TOTAL		15,000 sq/ft
PARKING • Total Required (office 1/300 sq/ft & retail 1/300 sq/ft) • Provided (including handicap) • Handicap Provided		50 60 2

- ☐ Identify the street address(es) of each building in a summary chart, if unknown, the address(es) will be assigned through the referral process and shall be added prior to approval; Town needs to provide through referral process

- ☐ A written legal description for subdivided property or a written metes and bounds description of the site's boundary for unsubdivided property;

- ☑ An area for general notes; and Galloway to add

- ☐ Name and address information for the applicant, developer, registered engineer or surveyor preparing the exhibits, and other applicable consultants.

b. Provide a Site Plan containing the following information:

- ☑ Locate and dimension all public and private streets, walks and trail, rights-of-way and points of access on or adjacent to the proposed site with surface materials noted; Galloway to add

- ☐ Delineate major drainage ways affecting the site and any 100-year floodplain on or adjacent to the site;

- ☐ Depict existing subdivision lots lines or metes and bound property lines and rights-of-way within 100' of the proposed development. Said information for adjacent properties shall be screened back;

- Identify the land use and zone district information of all adjacent land. When an adjacent property is not within the Town's boundary, the respective jurisdiction and zone district and land use information of said jurisdiction shall be identified; Galloway to add

- Locate and dimension all existing and proposed easements, including avigation easements, on and adjacent to the site; Galloway to add

- ☐ Locate and dimension required off-street parking and loading areas, drive aisles, private drives/streets. Identify all required handicap spaces and required van accessible spaces. See Chapter 6, *Development and Design Standards* of the Municipal Code Title 10 - UDC for minimum off-street parking and loading requirements;

- Label and dimension all existing and proposed structures. All existing buildings shall be delineated in detail. All proposed buildings shall be shown such that they fully conform to the actual architectural drawings to be used for construction purposes. Show points of ingress and egress, include setback dimensions from lot lines, and indicate structures to be removed; and Galloway to add

- Show location and approximate dimensions of all existing and proposed signs. Signs and the locations of signs shown on the Site Plan are not approved by the Site Plan review process. Galloway to add, look at signage package. Just for Lowes and Shops/

Galloway to add and look into what else we need to do.

G3 will now take lead on detailing the patio area in between the buildings. Review sign program for Nine-Mile wall sign. Galloway to detail what the wall looks like.

Need seat cubes and seat walls that are more permanent vs. movable benches.

Can still have table and chairs, string lights bollards, pedestrian lightings.

Not pavers, but different colors of concrete banding and different textures (non-slick)

Need this in resubmittal

Minimum bike racks (east and west ends)

Include screenwalls behind shops on site plan

- Provide a separate Landscape Plan. See Chapter 6, *Development and Design Standards* of the Municipal Code Title 10 - UDC for minimum landscaping requirements and standards. The Landscape Plan at a minimum, shall contain the following information at the same scale as the Site Plan and Grading Plan:

- Locate and dimension pedestrian walkways indicating surface, color, texture/finish material;

- Locate and dimension parking islands, right-of-way medians, and other landscape islands;

- Locate all above ground distribution and individual utility boxes, HVAC equipment, etc. indicating how screening requirements in Municipal Code Title 10 – UDC Chapter 6 are being met;

- Locate and dimension landscape elements including fences, walls, berms, border edge treatments, signage, and site lighting;

- N/A Locate and dimension recreational/playground equipment, fall zones and resilient fall surface materials, etc. Include manufacturer, model number and color selected;

- Locate all site amenities/structures such as seating, shelters, bicycle racks, trash receptacles/enclosures, water fountains, mailbox kiosks, and restrooms, etc. Include manufacturer, model number and color selected. Provide manufacturer catalog information for all such amenities/structures;

- N/A Locate, dimension, and identify significant natural vegetative areas, specimen trees, and landscape features to be preserved or improved;

- ☐ Provide scaled architectural details of landscape elements and structures indicating manufacturer's product information and colors;

- ☐ Plant materials shall be drawn at approximately three-fourths of mature size;

- ☐ Planted areas shall be identified by name, size and quantity of material to be used. Hardscape materials shall be noted and described;
- ☐ Provide the square footage of each planted area and area to be maintained in a natural state;
- ☐ Provide planting details, including typical methods of planting, minimum required mulch materials and depths, underlayments, etc;
- ☐ Provide proposed (final) grades, including berms, as screened back solid lines;
- ☐ Locate Sight Distance Triangles on this plan in accordance with the standards outlined in the Municipal Code Title 10 - UDC;
- ☐ Label all streets, rights-of-way, and points of access on or adjacent to the proposed development. Note off-street parking and loading areas;
- ☐ Show location and approximate dimensions of all existing and proposed signs. Signs and the locations of signs shown on the Landscape Plan are not approved by the Site Plan review process;
- ☐ Provide note(s) indicating the source of irrigation water and type of irrigation used. Evidence of water/irrigation rights shall be provided if the source is other than the Town of Erie;
- ☐ The following note shall be located on the Landscape Plan:

> IF TRANSFORMERS, GROUND MOUNTED HVAC EQUIPMENT, UTILITY PEDESTALS, ETC. ARE NOT SHOWN ON THE SITE IMPROVEMENT PLAN, ADDITIONAL LANDSCAPING/SCREENING MAY BE REQUIRED BASED UPON FIELD CONDITIONS DISCOVERED VIA THE SITE INSPECTION BY STAFF, MADE PRIOR TO THE ISSUANCE OF THE CERTIFICATE OF OCCUPANCY, OR FINAL INSPECTION AS APPLICABLE.

- ☐ Provide a landscape legend in the following format and with the following note:

SYM BOL	QUAN TITY	BOTANICAL NAME	COMMON NAME	SIZE	NOTES
WC	6	Catalpa erubescens	Western Catalpa	2.5" caliper	Ball and burlap; mulch with min. 4" pole peelings
BS	7	Picea ponderosa	Ponderosa Pine	8' height	Ball and burlap; mulch with min. 4" pole peelings
RB	10	Berberis thunbergi Atropurpurea	Red Leaf Barberry	5 gallon	24" height
-	300 sq/ft	-	Pole Peeling Mulch	4" in depth	Locate in all shrub beds and under all trees

NOTE: IN THE EVENT OF A DISCREPENCY BETWEEN THE PAN GRAPHIC AND THE LANDSCAPE LEGEND, THE PLANT MATERIAL QUANTITY AS DETERMINED BY THE PLAN GRAPHIC SHALL TAKE PRECEDENCE.

Galloway to add

- Provide the following maintenance chart and statement:

LANDSCAPING SHALL BE PLANTED AND MAINTAINED IN A NEAT, CLEAN AND HEALTHY CONDITION BY THE OWNER. THIS SHALL INCLUDE PROPER PRUNING, MOWING AND AERATION OF LAWNS, REPLACEMENT OF MULCH, WEEDING, REMOVAL OF LITTER AND THE REGULAR WATERING OF ALL PLANTINGS. IRRIGATION SHALL BE MAINTAINED TO MAXIMIZE WATER CONSUMPTION. SHOULD ANY PLANT MATERIAL DIE, THE OWNER, SUCCESSOR, OR ASSIGNS SHALL BE RESPONSIBLE FOR THE REPLACEMENT OF PLANT(S) WITHIN ONE PLANTING SEASON. REPLACEMENT OF PLANT MATERIALS SHALL OCCUR AT THE FOLLOWING RATE.

TYPE	PLANT REPLACEMENT WITHIN	
	1 YEAR	2+ YEARS
Tree – Deciduous	Increase caliper by 1"	Increase caliper by 1.5"
Tree – Coniferous	Increase height by 1.5'	Increase height by 2'
Shrub	Replace with plants of at least ½ mature size	Replace with plants of at least ½ mature size

d. Provide a separate Utility Plan showing the location of all existing and proposed utilities and the following information:

- Indicate line size and purpose;
- Indicate manholes, clean-outs, inlets, outlets, and outfalls; and
- Indicate the location of all fire hydrants, if none exist on-site, note the approximate distance and direction of the closest hydrant adjacent to the site.
- Locate all above ground distribution and individual utility boxes, HVAC equipment, etc. indicating how screening requirements in Municipal Code Title 10 – UDC Chapter 6 are being met;

e. Provide a separate Grading/Drainage Plan showing existing (dashed lines) and proposed (solid lines) contours at two-foot intervals with the following additional information:

- Low and high points shall be labeled;
- Identify areas of cut/fill; Galloway to add
- Flow directions shall be shown with arrows →;
- Detention/retention and water quality storm sewer infrastructure with any required easements shall be shown and labeled;
- Top of wall and bottom of wall elevations shall be labeled at 20-foot intervals along all retaining walls regardless of height; and Galloway - reference by others
- When applicable, Sub-surface Hazards Plan identifying geological hazards and undermined and/or subsidence areas.

f. Provide a separate Photometric Plan depicting all exterior lighting and the following information:

- All proposed and existing fixtures shall be depicted in plan view;

- The height of all fixtures shall be noted;
- Location of lighting attached to structure shall be depicted in plan view; and
- Elevation type details or "cut sheets" with manufacturer's product information identifying the lens type, wattage, color of fixture, etc.

g. Provide a separate Building Elevation exhibit with the following information:

- Plans shall be prepared at a scale of ¼" = 1'-0" or another approved scale which allow for maximum clarity of the proposal;
- All building features including articulated planes shall be labeled and dimensioned;
- All building materials and finishes shall be labeled with manufacturers' colors and numbers to correspond to the products/materials board;
- All building lighting shall be labeled;
- When applicable, the roof plane, behind the wall, shall be shown as dashed lines;
- When roof-top mechanical equipment, heating, ventilation, and air conditioning (HVAC) is proposed, it shall be shown as dashed lines behind all walls. All roof-top mechanical equipment shall be fully screened;
- When HVAC and other mechanical equipment are proposed as ground/wall mounted units, it shall be shown as dashed lines. All ground/wall mounted mechanical equipment shall be fully screened; and
- The following note shall be located on all Building Elevation exhibits:

> THE BUILDING ELEVATIONS SHOWN AND APPROVED HEREON ARE INTENDED TO DEMONSTRATE HOW ALL HVAC AND OTHER MECHANICAL EQUIPMENT SHALL BE SCREENED ACCORDING TO TOWN OF ERIE, UNIFIED DEVELOPMENT CODE REQUIREMENTS. IT IS THE APPLICANTS RESPONSIBILITY TO ENSURE THAT THIS APPROVED SCREENING OCCURS IN THE FIELD AS DEMONSTRATED BY THESE PLANS, REGARDLESS OF CURB REQUIREMENTS, MECHANICAL PLAN CHANGES, OR OTHER CIRCUMSTANCES. FAILURE TO PROVIDE APPROVED SCREENING MAY RESULT IN DELAY OF FINAL INSPECTIONS AND/OR ISSUANCE OF A CERTIFICATE OF OCCUPANCY.

11. Additional graphic aids ***may be*** requested such as, building floor plans, elevation/sectional drawings, perspective drawings, axonometric drawings, 3-dimensional models, and color photo/video simulations when the impacts of a proposal warrant such information.

12. Development Reports/Studies/Plans: The following development reports, studies and plans shall be prepared to adequately portray the physical characteristics of the property.

a. A Phase III Drainage Report and Plan prepared by a registered professional engineer showing the final proposed drainage system, design details and calculations.

b. A Final Erosion Control Study and Plan prepared in accordance with the Town's clearing, grading and land disturbance standards.

Conformance letter provided

c. A Final Grading Plan prepared in accordance with the Town of Erie Standards and Specifications for Design and Construction of Public Improvements.

d. For applications with public roads, Final Road Construction Plans prepared in accordance with the Town of Erie Standards and Specifications for Design and Construction of Public Improvements.

e. For applications requiring parks, open space or trails that meet Town dedication requirements, Final Landscape Construction Plans prepared in accordance with the Town of Erie Standards and Specifications for Design and Construction of Public Improvements, Municipal Code Title 10 - UDC, and Town of Erie Parks and Trails Master Plan.

f. A Geological Report may be required detailing the geological characteristics of the site prepared by a registered engineer, including any potential natural or man-made hazards which would have a significant influence on the proposed development and a determination of what effect such factors would have and proposed corrective or protective measures.

g. A Traffic Impact Study or narrative may be required detailing the transportation network establishing the availability and adequacy of the system consistent with the Town of Erie's *Comprehensive Master Plan* and *Transportation Plan*..

13. Any additional information or referral documents as required by the Planning & Development Director, in order to thoroughly review the impacts of the proposed development.

- Drainage Conformance Letter included.
- Sign Package We already provided, but won't be included in next submittal as it will be part of PD Amendment.

Print Form

TOWN OF ERIE
Community Development Department – Planning Division
645 Holbrook Street – PO Box 750 – Erie, CO 80516
Tel: 303.926.2770 – Fax: 303.926.2706 – Web: www.erieco.gov

LAND USE APPLICATION

Please fill in this form completely. Incomplete applications will not be processed.

STAFF USE ONLY		
FILE NAME:		
FILE NO:	DATE SUBMITTED:	FEES PAID:

PROJECT/BUSINESS NAME: NINE-MILE CORNER

PROJECT ADDRESS: SE CORNER OF HIGHWAY 287 & ARAPAHOE ROAD

PROJECT DESCRIPTION: 47 ACRE MIXED-USE PROPERTY, PLANNED TO BE DIVIDED INTO 34 ACRES OF COMMERCIAL RETAIL ON THE WEST SIDE AND 13 ACRES OF MULTI-FAMILY RESIDENTIAL ON THE EAST SIDE. MANY OF THE TRACTS CREATED WITH THIS PLAT WILL BE OWNED AND MAINTAINED BY (FUTURE) NINE MILE METRO DISTRICT.

LEGAL DESCRIPTION *(attach legal description if Metes & Bounds)*

Subdivision Name: NINE MILE

Filing #: 1 Lot #: 1-10 Block #: 1-2 Section: 34 Township: 1N Range: 69W

OWNER *(attach separate sheets if multiple)*

Name/Company: TOWN OF ERIE URBAN RENEWAL AUTHOR
Contact Person: BEN PRATT
Address: 645 HOLBROOK STREET
City/State/Zip: ERIE, CO 80516
Phone: 303-926-2769 Fax: 303-926-2706
E-mail: BPRATT@ERIECO.GOV

AUTHORIZED REPRESENTATIVE

Company/Firm: EVERGREEN-287 & ARAPAHOE, L.L.C.
Contact Person: LAURA ORTIZ
Address: 2390 EAST CAMELBACK ROAD, SUITE 411
City/State/Zip: PHOENIX, AZ 85016
Phone: 602-808-8600 Fax: 602-567-7092
E-mail: LORTIZ@EVGRE.COM

MINERAL RIGHTS OWNER *(attach separate sheets if multiple)*

Name/Company: SEE ALTA/TITLE COMMITMENT
Address:
City/State/Zip:

MINERAL LEASE HOLDER *(attach separate sheets if multiple)*

Name/Company: SEE ALTA/TITLE COMMITMENT
Address:
City/State/Zip:

LAND-USE & SUMMARY INFORMATION

Present Zoning: RURAL/AGRICULTURAL
Proposed Zoning: COMMERCIAL/RETAIL & HIGH DENSITY RES.
Gross Acreage: 47 ACRES
Gross Site Density (du/ac): N/A - COMM; 21 du/ac -RESIDENT
Lots/Units Proposed: N/A
Gross Floor Area: TBD

SERVICE PROVIDERS

Electric: XCEL ENERGY
Metro District: NINE MILE METRO DISTRICT (FUTURE)
Water *(if other than Town)*: TOWN OF ERIE
Gas: XCEL ENERGY
Fire District: TOWN OF ERIE
Sewer *(if other than Town)*: TOWN OF ERIE

PAGE TWO MUST BE SIGNED AND NOTARIZED

DEVELOPMENT REVIEW FEES

ANNEXATION		SUBDIVISION	
☐ Major (10+ acres)	$ 4000.00	☐ Sketch Plan	$ 1000.00 + 10.00 per lot
☐ Minor (less than 10 acres)	$ 2000.00	☐ Preliminary Plat	$ 2000.00 + 40.00 per lot
☐ Deannexation	$ 1000.00	☑ Final Plat	$ 2000.00 + 20.00 per lot
COMPREHENSIVE PLAN AMENDMENT		☐ Minor Subdivision Plat	$ 2000.00
☐ Major	$ 3000.00	☐ Minor Amendment Plat	$ 1000.00 + 10.00 per lot
☐ Minor	$ 1200.00	☐ Road Vacation (constructed)	$ 1000.00
ZONING/REZONING		☐ Road Vacation (paper)	$ 100.00
☐ Rezoning	$ 1700.00 + 10.00 per acre	**SITE PLAN**	
☐ PUD Rezoning	$ 1700.00 + 10.00 per acre	☐ Residential	$ 1400.00 + 10.00 per unit
☐ PUD Amendment	$ 1700.00 + 10.00 per acre	☑ Non-Resi. (>10,000 sq. ft.)	$ 2200.00
☑ Major PD Amendment	$ 3700.00 + 10.00 per acre	☐ Non-Resi. (>2,000 sq. ft.)	$ 1000.00
☐ Minor PD Amendment	$ 500.00	☐ Non-Resi. (<2,000 sq. ft.)	$ 200.00
SPECIAL REVIEW USE		☐ Amendment (major)	$ 1100.00
☐ Major	$ 1000.00	☐ Amendment (minor)	$ 350.00
☐ Minor	$ 400.00	**VARIANCE**	$ 600.00
☐ Oil & Gas	$ 1200.00	**SERVICE PLAN**	$ 10,000.00

*All fees **include** both Town of Erie Planning & Engineering review. These fees **do not include** referral agency review fees, outside consultant review fees, or review fees incurred by consultants acting on behalf of staff. See Town of Erie Municipal Code, Title 2-10-5 for all COMMUNITY DEVELOPMENT FEES.*

The undersigned is fully aware of the request/proposal being made and the actions being initiated on the referenced property. The undersigned understand that the application must be found to be complete by the Town of Erie before the request can officially be accepted and the development review process initiated. The undersigned is aware that the applicant is fully responsible for all reasonable costs associated with the review of the application/request being made to the Town of Erie. Pursuant to Chapter 7 (Section 7.2.B.5) of the Unified Development Code (UDC) of the Town of Erie, applicants shall pay all costs billed by the Town for legal, engineering and planning costs incurred by staff, including consultants acting on behalf of staff, necessary for project review. By this acknowledgement, the undersigned hereby certify that the above information is true and correct.

Owner: Benjamin C. Pratt Date: 9/26/19

Owner: Date:

Applicant: Date:

STATE OF COLORADO)
) ss.
County of Weld)

The foregoing instrument was acknowledged before me this 26th day of September, 2019, by Benjamin C. Pratt.

My commission expires: 11-14-2022
Witness my hand and official seal.

Jessica K
Notary Public

JESSICA ANNE KOENIG
Notary Public
State of Colorado
Notary ID # 20144044046
My Commission Expires 11-14-2022