PHASE III DRAINAGE REPORT
FOR
VILLAGE COOPERATIVE OF ERIE AT VISTA RIDGE

November 1, 2024

Prepared For:
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Project No. 16162.00

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ENGINEER'S STATEMENT

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

_____

James P. Fitzmorris, Registered Professional Engineer
Colorado Professional Engineer No. 28211
For and on behalf of JR Engineering, LLC

TOWN ACCEPTANCE

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

Accepted by: _____ _____
Deputy Public Works Director Date

INTRODUCTION

This *Phase III Drainage Report for Village Cooperative of Erie at Vista Ridge* has been prepared for Real Estate Equities Development, LLC for the Vista Ridge multi-family development. The Village Cooperative of Erie at Vista Ridge will be formally referred to as Village Cooperative throughout this report. This site consists of multi-family age-restricted living facility and storm sewer infrastructure. The drainage design for the site has been previously designed assuming commercial uses and the proposed design is multi-family age-restricted living.

I. GENERAL LOCATION AND DESCRIPTION

Location

The Village Cooperative site is located within Section 32, Township 1 North, Range 68 West of the 6th Principal Meridian, Town of Erie, State of Colorado. It is bounded on the south by Village Vista Drive, on the north by Tract 21 of the Vista Ridge Master Final Plat, on the west by The Goddard School of Erie, and to the east by Mountain View Boulevard. Village Cooperative is located entirely within the Coal Creek drainage basin. See the vicinity map in **Appendix A**.

Description of Property

The site is currently undeveloped and the planned land use includes medium density multi-family living. The proposed development includes a full build-out of the multi-family facility and associated infrastructure. The site consists of 3.14 acres. The Village Cooperative site makes up 71% of the total basin area for existing basin D1 from the *Goddard School at Vista Ridge Development Drainage Report and Erosion Control Plan* by Park Engineering Consultants with the Goddard school comprising the remaining acreage to the west of the site. The existing land is proposed as medium density multi-family. The Drainage Conformance Letter including drainage maps are included in **Appendix D.**

Local site constraints include the existing drainage and structural facilities such as the existing detention Pond A-2 location and steep slopes across the development.

Existing Conditions

The existing Village Cooperative site is undeveloped and has been overlot graded in the past. The site has been stabilized with native grasses and has remained undeveloped since then. According to information from the USDA's Natural Resource Conservation Service, soils on the site are predominately clay loams and midway-shingles which are hydrologic soil groups C/D. Soils belonging to Hydrologic Soil Group C/D have a low infiltration rate (high runoff potential) when thoroughly wet. There are no known irrigation canals or ditch facilities located within the site or approximately 100 feet of the site resulting in no groundwater conflicts. The NRCS soils maps are provided in **Appendix A**.

Referenced Studies

There are multiple referenced studies for this site and each one is included in the attached references in **Appendix D**. There are two main reports that were utilized and they are described below.

The *Phase II Drainage Study for Vista Ridge Development Filing No. 11 Lot 1, Block 1* by CLC Associates, Inc, dated January 2007 was utilized for the existing basin flows to the south of the proposed site and for the hydraulic analysis of the existing storm sewer system where our site ties in. However, this report received from the Town is incomplete since the drainage map was missing to compare the provided

hydrologic calculations against. It appears a second submittal of this report was made on 06/25/2007 based on the drainage map that is referenced into the Goddard School Drainage Report. We received the original hydrologic calculations dated 1/18/2007 but no map was provided with these calculations. Due to this, we had to recreate the drainage calculations for the 06/25/2007 drainage map using the 1/18/2007 original hydrologic calculations C-values and impervious values. There also appears to be basin delineation changes between the original January 2007 submittal and the 06/25/2007 submittal and therefore we could not use the 1/18/2007 original hydrologic calculations with the 06/25/2007 map. The recreated drainage calculations based on the 06/25/2007 CLC map are included in **Appendix D.**

The *Goddard School at Vista Ridge Development Drainage Report and Erosion Control Plan* by Park Engineering, revised July 2008 was utilized for the existing basin flows to the west of our proposed site. This report is included in **Appendix D.**

II. DRAINAGE BASINS

Major Basin Description

The Village Cooperative development is located entirely within the Coal Creek drainage basin, which is a tributary of Boulder Creek. The site is located approximately 9,500 feet to the east of Coal Creek. Runoff from the site will discharge to the west to existing detention pond (Pond A-2), and ultimately outfall to Coal Creek.

The project area lies within Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Map Panel Number 08013C0444J with a Revision Date of December 18, 2012. Based on the FIRM Map Panel, the site does not lie within a regulated floodplain and falls within Zone X. This zone designates an area, which has been determined to be outside of the 0.2% annual chance floodplain. The FEMA FIRM is included in **Appendix A**.

The Site's existing topography slopes from the southeast corner towards the northwest corner at approximately 4%. There are no known existing drainage or storage facilities on the Site. The Site drains west to the existing detention pond (Pond A-2) west of the Goddard School Site,

The Site is contained within Basin D1 from the *Vista Ridge Development Filing No. 11, Lot 1, Lot 2, Block 1, and Tract A* Drainage Map by CLC Associates, Inc., dated 06/25/2007 and shows a master planned imperviousness of 95%. The final composite imperviousness for the proposed Village Cooperative development is roughly 50%, and therefore in accordance with the *Vista Ridge Development Filing No. 11, Lot 1, Lot 2, Block 1, and Tract A* Drainage Map by CLC Associates, Inc. Percent imperviousness calculations for the site are included in **Appendix B.**

On-Site Sub-Basin Description

The proposed on-site composite percent impervious value for the Village Cooperative development is 47.7%. The majority of the sub-basins within the development are to be captured and routed to the existing storm sewer system in Village Vista Drive and are proposed to outfall to existing detention Pond A-2.

On-site basin RPA2 is less than 1 acre and will be comprised mostly of lawns, open space, and landscaping. This basin will qualify for the MS4 exemption from the WQCV Standard, wherein 100% of the applicable development site is captured except for up to 20 percent of the site not to exceed one acre.

Basin RPA1 consists of 0.11 acres and will flow over grassland/landscaping until it reaches Vista Village Drive where it will flow west to be captured by an existing 10-foot Type R sump inlet and outfall into Pond

A-2. The existing 10-foot Type R sump inlet has been analyzed and has the capacity for the additional flow added by RPA1 combined with the Goddard School runoff and the Basin C2 runoff from the 06/25/2007 CLC drainage map. Values for the existing inlet flows have been pulled from the *Goddard School at Vista Ridge Development Drainage Report & Erosion Control Plan*, prepared by Park Engineering Consultants, revised July 2016 and added to the proposed flows from Basin RPA1 to analyze the existing inlet capacity. The table below shows the existing and proposed flows for the existing 10-foot Type R sump inlet in Village Vista Drive.

Table 1: Ex Vs Prop Flows at the Existing 10' Type R Sump Inlet in Village Vista Drive

	MINOR FLOW IN GUTTER (CFS)	MAJOR FLOW IN GUTTER (CFS)
EX Analysis (From The *Goddard School at Vista Ridge Development Drainage Report & Erosion Control Plan)*	3.65	8.05
Proposed Analysis (EX Analysis Flows + Basin RPA1 Flows)	4.2	10.7
EX 10' Type R Sump Inlet Capacity	9.2	14.0

RPA2 consists of 0.75 acres of undeveloped/open space and existing topography. The existing topography for this basin will be overlot graded and consists of 4:1 slopes, retaining walls, and grass areas. Runoff generated by this basin will continue to flow north-northwest as it historically has.

Sub-basins with the R designation (R1 through R9) are located on the rooftop of the multifamily complex in the middle of the site. All of the R sub-basins drain to roof drains that outfall into small, 8 inch or 12 inch, PVC pipes surrounding the building. From there the runoff is piped into the proposed storm sewer for the development where it ultimately outfalls into existing detention Pond A-2

Sub-basin A1Z is an existing basin and consists of 0.06 acres along the eastern boundary of the Site within the existing ROW. This basin is comprised of existing roadway and sidewalk that drains north as it historically has to Pond A-1. No modifications are proposed to the existing basin or basin grading.

Sub-basins A1, A2, and A3 are located all around the proposed multi-family development. Flows from these basins are captured by roadway sump inlets and an area inlet at the end of the proposed swale in the northeast corner of the proposed site. Runoff captured by these inlets is routed through the proposed storm sewer system and ultimately outfalls into existing detention Pond A-2.

See the On-Site Basin Summary Table below.

Table 2: On-Site Basin Summary Table

BASIN SUMMARY TABLE							
Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	0.41	54%	0.48	0.71	5.0	0.8	2.6
A2	0.71	58%	0.51	0.72	6.1	1.3	4.5
A3	0.26	10%	0.11	0.52	6.7	0.1	1.2
A1Z	0.06	100%	0.86	0.89	5.0	0.2	0.5
R1	0.02	90%	0.77	0.85	5.0	0.0	0.1
R2	0.12	90%	0.77	0.85	5.0	0.3	0.9
R3	0.02	90%	0.77	0.85	5.0	0.1	0.2
R4	0.27	90%	0.77	0.85	5.5	0.8	2.0
R5	0.27	90%	0.77	0.85	5.5	0.8	2.0
R6	0.02	90%	0.77	0.85	5.0	0.0	0.1
R7	0.05	90%	0.77	0.85	5.0	0.2	0.4
R8	0.05	90%	0.77	0.85	5.0	0.2	0.4
R9	0.02	90%	0.77	0.85	5.0	0.0	0.1
RPA1	0.11	2%	0.05	0.49	12.0	0.0	0.3
RPA2	0.75	3%	0.06	0.50	9.1	0.2	2.8

Off-Site Sub-Basin Description

There are no existing off-site basins draining onto the proposed Village Cooperative Site.

III. DRAINAGE DESIGN CRITERIA

Development Criteria Reference and Constraints

Storm drainage analysis and design criteria for this project were taken from the Town of Erie "Standards and Specifications for Design and Construction of Public Improvements" (Standards and Specifications) and the "Urban Storm Drainage Criteria Manual" by Mile High Flood District (USDCM). No deviations from the Town of Erie criteria are proposed within this study.

Hydrologic Criteria

All hydrologic data was obtained from the Town of Erie "Standards and Specifications for Design and Construction of Public Improvements" and the "Urban Storm Drainage Criteria Manual" (USDCM).

On-site storm sewer improvements are designed using the Rational Method and calculations are based on the 5-year (minor) storm event and the 100-year (major) storm event. One-hour point rainfall depth values used for the 5-year and 100-year storm events are 1.11 inches and 2.68 inches, respectively. These values were taken directly from Table 800-2 in the Town of Erie Standards and Specifications for Storm Drainage Facilities. See table 800-2 in the reference section located in **Appendix D**.

Standard Forms SF-2 and SF-3 were used to determine the runoff from the minor and major storms on this site. Runoff coefficients are determined based on data for Type C/D soils from the USDCM. Basin percent impervious values are calculated based on proposed future land use and from data from the USDCM. Times of concentration are developed using Equations 6-3 and 6-4 in Chapter 6 of the USDCM.

The most recent version of MHFD-Inlet (version 5.03, August 2023) was utilized in order to size the inlets for the Village Cooperative site as well as analyze the existing 10-foot Type R sump inlet in Village Vista

Drive. The discharges at the inlets are based on Rational Method results and bypass flows are routed with sub-basin discharges to the receiving design points.

All hydrologic calculations are included in **Appendix B** of this report.

Hydraulic Criteria

Bentley's StormCAD was utilized to verify the storm sewer sizing and to calculate the hydraulic and energy grade lines for the system. The 5-year and 100-year storms were modeled. Flows were obtained from the Rational Method and input into StormCAD. Head loss coefficients at junctions utilize values taken from the Bentley StormCAD V8i user manual Table 8-6: Typical Headloss Coefficients and Mile High Flood District Recommended values and methods. Pipes were designed to be in accordance with the Town of Erie's criteria with respect to size, slope, capacity, velocity, and HGL/EGL elevations. The Manning's *n* value for concrete storm sewer is 0.013 and PVC is 0.011. The hydraulic grade lines for the existing Pond A-2 that were used in the StormCAD design were taken from the Phase III Drainage report.

Criteria for street flow was taken directly from the Town of Erie Standards and Specifications for Storm Drainage Facilities. The allowable pavement encroachment and depth of flow for the initial and major storm runoff, as well as the allowable cross street flow are given in Tables 800-7, 800-8, and 800-9. These tables can be found in the reference section of this report, located in **Appendix D**.

IV. DRAINAGE FACILITY DESIGN

General Concept

The drainage plan for Village Cooperative follows the patterns established in the *Town of Erie Outfall Systems Plan (West of Coal Creek),* dated January 2014. Onsite runoff will discharge through proposed storm sewer to the existing detention Pond A-2 to the west of the site and ultimately discharge to Coal Creek.

Specific Details

The criteria set forth in the Town of Erie "Standards and Specifications for Design and Construction of Public Improvements" and the "Urban Storm Drainage Criteria Manual" has been met with the proposed design. Minimum and maximum requirements with respect to manhole spacing along with storm sewer sizes have all been met. Additionally, velocities for pipe flow are greater than the minimum 2 feet/second, and do not surcharge the pipes in the minor storm event. For the 100-year storm, velocities are less than the maximum 18 feet/second and HGLs meet criteria of being 1-foot below the finished grade. Under proposed conditions, stormwater from the roof will drain via roof drains to the proposed storm drain system with inlets, which will convey runoff to the existing Pond A-2.

Existing Storm Sewer

As previously mentioned, the proposed storm sewer system will tie-into the existing storm sewer in Village Vista Drive. The existing storm sewer system from the tie-in point (DP D1.1) to the manhole at DP C2.2 outfall will need to be lowered in order for the proposed site to gravity drain to the existing pond. Existing upstream off-site flows have been added to the proposed storm sewer hydraulic analysis to ensure the proposed storm sewer system has enough capacity to handle the added flows from the proposed site and is in conformance with HGL criteria. However, as previously mentioned the record documents that we received from the Town were incomplete. The routed existing flows in the existing storm sewer system within Vista Village Drive were needed in order to route them together with our on-site flows where we tie

into the existing storm sewer. The report which analyzed the area to the south of the site was the *Phase II Drainage Study for Vista Ridge Development Filing No. 11 Lot 1, Block 1* by CLC Associates, Inc, dated January 2007. In our original records request to the city we received an incomplete version of this report i.e. it was only report text with no appendix calculations. After multiple attempts to request the full report (with calculations and maps), we received another incomplete report that included the calculations but no drainage map. What we were left to work with was a drainage map dated 06/25/2007 (second submittal) by CLC Associates titled *Vista Ridge Development Filing No. 11, Lot 1, Lot 2, Block 1, and Tract A* and the drainage report titled *Phase II Drainage Study for Vista Ridge Development Filing No. 11 Lot 1, Block 1* by CLC Associates, Inc, dated January 2007 and this drainage report had appendix calculations dated 01/18/2007 but no drainage map was included. After comparing the 06/25/2007 drainage map with the 01/18/2007 Phase II drainage report calculations, it is evident that the calculations are outdated and do not match the 06/25/2007 map i.e. the basins changed. Due the discrepancy between the map and calculations, we had to recreate rational drainage calculations based on the 06/25/2007 map in order to get routed flows in the existing pipe network within Village Vista Drive. The recreated drainage calculations are included in **Appendix D**.

Existing Detention/Water Quality Pond

As previously mentioned, the existing detention/water quality pond (Pond A-2) has been designed and accepted by the Town of Erie to meet Town Requirements and is designed to accept all flows from the proposed site. Pond A-2 will treat 76% of the proposed development for the site. Basin RPA2 is the only basin that is not treated in Pond A-2. The Basin RPA2 flows will sheet flow to the north, as it historically has. The master plan design for the detention pond assumed a 95% impervious for the Village Cooperative site while the proposed developed condition is closer to 50% impervious. Therefore, the initial design parameters for Pond A-2 are still appropriate and the system will continue to function as intended in the approved subdivision drainage report.

There is a vertical datum difference between the as-built and our surveyed elevations. The as-built benchmark used NGVD29 whereas our survey used a NAVD88 benchmark. A vertical datum shift of +2.14 feet was applied to the as-built elevations. The conversion was obtained by subtracting the top of outlet structure elevations from the as-built plans to our surveyed top of outlet structure elevation. The NOAA NCAT tool was utilized to obtain a vertical datum conversion, but after comparing against the as-built vs surveyed elevations, it was decided that this was not to be used in favor of the 2.14-foot conversion instead. See **Appendix C**.

Based on the current survey of the pond, the pond bottom is set to an elevation of approximately 5,203.93 (NAVD88) which is the top of outlet structure grate and the lowest point on the top of slope near the spillway is at an elevation 5,210.98 (NAVD88). A stage-storage calculation was performed to verify that the master planned 3.7 ac-ft of volume is held below an elevation of 5,210.98 (NAVD88). Based on the surveyed contours, the pond contains the required 3.7 acre-feet at an elevation of 5,210.95 (NAVD88). The Pond A-2 stage-storage volume check calculation is shown in **Appendix C** along with a stage-storage comparison table, which shows as-built NGVD29 elevations compared to surveyed NAVD88 elevations.

Based on the July 9, 2003 as-built plans by Hurst & Associates, the as-built 100-yr water surface elevation is at 5,209.18 (NGVD29). This is 0.91 feet above the as-built spillway elevation of 5,208.27 (NGVD29). Therefore, it is evident that zero freeboard was provided in the pond and, as designed and constructed, the pond would discharge over the spillway in the 100-yr. Based on the surveyed contours, the 100-yr WSEL is at 5,210.95 (NAVD88), which provides 0.03’ of freeboard to the lowest point on the top of pond near the

spillway. The spillway shown on the as-built plans was either not constructed, removed, or is completely buried since our survey team was not able to obtain concrete crest wall elevation shots.

The riprap for southerly storm sewer outfall into the Pond is damaged and undercut. The riprap outfall is being eroded and undercut due to supercritical flow discharging out of the existing 42" RCP. The flow experiences a 9.5-foot drop since the invert elevation of the existing FES outfall is 5,212.52 (NAVD88) and the existing pond bottom elevation is at approximately 5,203.00 (NAVD88). JR proposes that the existing FES is to be replaced with an 8-foot drop manhole and a 40 linear foot run of 42" RCP with an FES and riprap to be installed on the downstream end. The drop manhole will function as an energy dissipation structure to bring the supercritical flow down to a subcritical flow regime and the riprap will help protect the pond bottom from erosion. See **Appendix C** for riprap calculations and storm plans for the plan and profile views of the DP03 line.

JR proposes that the outlet structure be cleaned and maintained by removing trash and debris from within a 20-foot radius. The outlet structure 2-inch PVC orifice and trash grate must be cleared of debris so the orifice can function as designed. The pond bottom within the 20-foot radius shall be cleared and regraded such that the elevation of the pond bottom is at approximately 5,203.00 (NAVD88) or 5,201.00 (NGVD29). The 2-inch PVC orifice was designed to have an invert of 5,201.00 (NGVD29), but was not as-built verified by Hurst & Associates in 2003.

Existing Basin

An existing portion of the site, sub-basin A1Z will not be modified and will drain as it historically has to existing detention Pond A-1, which is located off-site to the east of the proposed site across Mountain View Boulevard. This basin is composed of the eastern portion of the site including area within the ROW for Mountain View Blvd. No modifications to the basin A1Z have been made in the proposed condition.

V. SUMMARY

The purpose of this report is to present the storm drainage conveyance and detention accommodations associated with the proposed Village Cooperative at Vista Ridge in Erie, Colorado. The design proposed in this report complies with the Town of Erie's Standards and Specifications for Design and Construction of Public Improvements, the approved drainage studies for Vista Ridge, and in general conformance with the Mile High Flood District's Urban Storm Drainage Criteria Manual.

The implementation of the drainage concepts presented within this report is intended to provide proper conveyance and attenuation of stormwater discharges, in accordance with Erie and Colorado state laws, with no adverse impacts to downstream infrastructure with respect to quality, quantity, or timing of stormwater discharges from the proposed development.

VI. REFERENCES

1. Urban Storm Drainage Criteria Manual (Volumes 1, 2, and 3); Mile High Flood District, January 2016 and latest revisions.
2. Standards and Specifications for Design and Construction of Public Improvements; Town of Erie, Colorado, January 2019.
3. Drainage Conformance Letter for Vista Ridge Filing No. 11 Replat A; Scott, Cox & Associates, Inc, February 29, 2008
4. Drainage Conformance Letter for Vista Ridge Filing No. 11; Scott, Cox & Associates, Inc, May 6, 2008
5. Town of Erie Outfall Systems Plan (West of Coal Creek); RESPEC Consulting and Services, January 2014.
6. Goddard School at Vista Ridge Drainage Report & Erosion Control Plan; Park Engineering Consultants, revised July 2008.
7. Phase II Drainage Study for Vista Ridge Development filing No. 11, Lot 1, Block ; CLC Associates Inc., January 2007
8. Drainage Map; CLC Associates Inc., June 2007.
9. Pond As-Builts; Hurst & Associates, August 2003.

APPENDIX A

FIGURES


VILLAGE COOPERATIVE OF ERIE
AT VISTA RIDGE
Legend
Weld Co Rd 4
Vista Pkwy
Mountain View Blvd
Skyline Dr
Sheridan Pkwy
Vista Pkwy
Sunset Dr
Bonanza Dr
SITE
E Baseline Rd
Lowell Blvd
Indian Peaks Pkwy
Sheridan Pkwy
Google Earth
N
3000 ft

National Flood Hazard Layer FIRMette

FEMA

105°1'28"W 40°0'20"N

105°0'50"W 39°59'53"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 — Cross Sections with 1% Annual Chance
- 17.5 — Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/1/2023 at 4:43 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

United States Department of Agriculture

NRCS

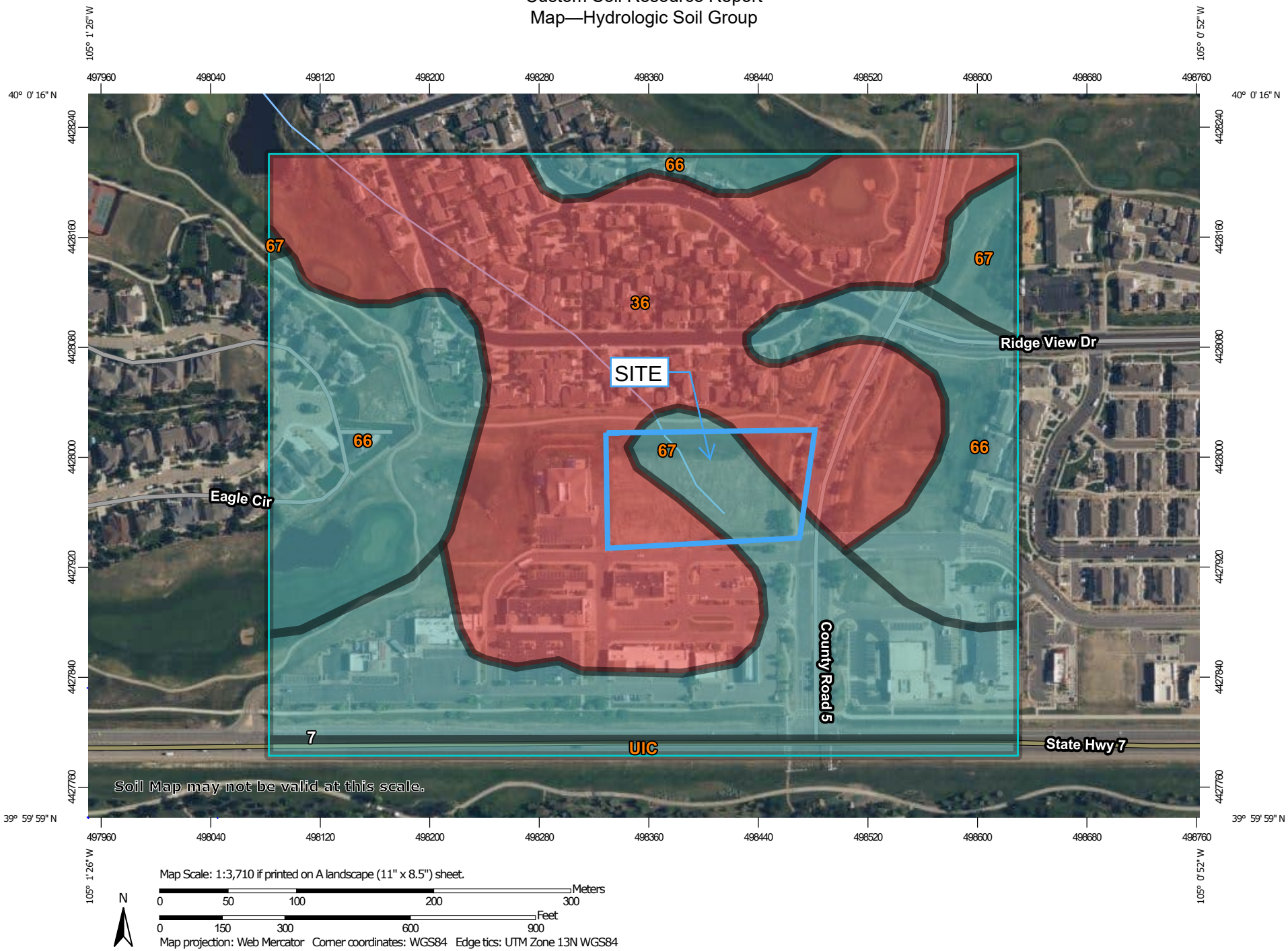
Natural Resources Conservation Service

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

Custom Soil Resource Report for Adams County Area, Parts of Adams and Denver Counties, Colorado; and Weld County, Colorado, Southern Part

November 3, 2023

Map—Hydrologic Soil Group



Map Scale: 1:3,710 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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 scales ranging from 1:20,000 to 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Adams County Area, Parts of Adams and Denver Counties, Colorado
Survey Area Data: Version 20, Aug 24, 2023

Soil Survey Area: Weld County, Colorado, Southern Part
Survey Area Data: Version 22, Aug 24, 2023

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
ReD	Renohill loam, 3 to 9 percent slopes	D	1.0	0.7%
UlC	Ulm loam, 3 to 5 percent slopes	C	29.3	21.6%
Subtotals for Soil Survey Area			**30.2**	**22.3%**
Totals for Area of Interest			**135.6**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
36	Midway-Shingle complex, 5 to 20 percent slopes	D	39.1	28.8%
56	Renohill clay loam, 0 to 3 percent slopes	D	0.0	0.0%
66	Ulm clay loam, 0 to 3 percent slopes	C	35.6	26.2%
67	Ulm clay loam, 3 to 5 percent slopes	C	30.7	22.6%
Subtotals for Soil Survey Area			**105.4**	**77.7%**
Totals for Area of Interest			**135.6**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX B

HYDROLOGIC CALCULATIONS

EXISTING RATIONAL CALCS

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Vista Ridge
Location: Erie

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: EWA
Checked By:
Date: 11/17/23

Basin ID	Total Area (ac)	Basins Total Weighted % Imp.	Hydrologic Soil Group			Hydrologic Soil Group			Minor Coefficients			Major Coefficients			Basins Total Weighted C_5	Basins Total Weighted C_{100}
			Area A (ac)	Area B (ac)	Area C/D (ac)	% A (ac)	% B (ac)	% C/D (ac)	$C_{5,A}$	$C_{5,B}$	$C_{5,C/D}$	$C_{100,A}$	$C_{100,B}$	$C_{100,C/D}$		
A1Z	0.06	100.0%	0.00	0.00	0.06	0%	0%	100%	0.86	0.86	0.86	0.89	0.90	0.89	0.86	0.89
EX1	2.18	2.0%	0.00	0.00	2.18	0%	0%	100%	0.01	0.01	0.05	0.13	0.44	0.49	0.05	0.49
EX2	0.90	2.0%	0.00	0.00	0.90	0%	0%	100%	0.01	0.01	0.05	0.13	0.44	0.49	0.05	0.49
TOTAL	**3.14**	**3.9%**	**0.00**	**0.00**	**3.14**	**0%**	**0%**	**100%**	**---**	**---**	**---**	**---**	**---**	**---**	**0.07**	**0.50**

Table 6-4. Runoff coefficient equations based on NRCS soil group and storm return period

NRCS Soil Group	Storm Return Period						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
A	$C_A = 0.84i^{1.302}$	$C_A = 0.86i^{1.276}$	$C_A = 0.87i^{1.232}$	$C_A = 0.84i^{1.124}$	$C_A = 0.85i+0.025$	$C_A = 0.78i+0.110$	$C_A = 0.65i+0.254$
B	$C_B = 0.84i^{1.169}$	$C_B = 0.86i^{1.088}$	$C_B = 0.81i+0.057$	$C_B = 0.63i+0.249$	$C_B = 0.56i+0.328$	$C_B = 0.47i+0.426$	$C_B = 0.37i+0.536$
C/D	$C_{C/D} = 0.83i^{1.122}$	$C_{C/D} = 0.82i+0.035$	$C_{C/D} = 0.74i+0.132$	$C_{C/D} = 0.56i+0.319$	$C_{C/D} = 0.49i+0.393$	$C_{C/D} = 0.41i+0.484$	$C_{C/D} = 0.32i+0.588$

Where:

i = % imperviousness (expressed as a decimal)

C_A = Runoff coefficient for Natural Resources Conservation Service (NRCS) HSG A soils

C_B = Runoff coefficient for NRCS HSG B soils

$C_{C/D}$ = Runoff coefficient for NRCS HSG C and D soils.

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Vista Ridge
Location: Erie

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: EWA
Checked By:
Date: 11/17/23

Basin ID	Total Area (ac)	Paved Roads/Sidewalks			Roofs			Lawns/Open Space			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
A1Z	0.06	100%	0.06	100.0%	90%	0.00	0.0%	2%	0.00	0.0%	100.0%
EX1	2.18	100%	0.00	0.0%	90%	0.00	0.0%	2%	2.18	2.0%	2.0%
EX2	0.90	100%	0.00	0.0%	90%	0.00	0.0%	2%	0.90	2.0%	2.0%
TOTAL	**3.14**										**3.9%**

EXISTING RATIONAL CALCS

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Vista Ridge
Location: Erie

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: EWA
Checked By:
Date: 11/17/23

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
A1Z	0.06	C/D	100%	0.86	0.89	0	1.0%	0.0	100	2.8%	20.0	3.3	0.5	0.5	100.0	9.4	5.0
EX1	2.18	C/D	0.02	0.05	0.49	118	3.8%	13.3	581	4.0%	7.0	1.4	6.9	20.2	699.0	30.9	20.2
EX2	0.90	C/D	0.02	0.05	0.49	50	4.0%	8.5	378	2.0%	7.0	1.0	6.4	14.8	428.0	30.5	14.8

NOTES:

$$t_c = t_i + t_t$$ Equation 6-2

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

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

Where:

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

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

Where:

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

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

Where:

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

Table 6-2. NRCS Conveyance factors, K

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

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

EXISTING RATIONAL CALCS

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Vista Ridge
Location: Erie
Design Storm: 100-Year

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: EWA
Checked By:
Date: 11/17/23

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
		A1Z	0.06	0.89	5.0	0.05	9.09	0.5															UNMODIFIED EXISTING BASIN A1Z OUTFLOW AS HISTORICALLY HAS TO POND A-1
		EX1	2.18	0.49	20.2	1.07	5.24	5.6															EXISTING BASIN COMPRISED OF THE NORTHERN PORTION OF THE SITE
		EX2	0.90	0.49	14.8	0.44	6.11	2.7															EXISTING BASIN COMPRISED OF THE SOUTHWESTERN PORTION OF THE SITE
																							0 0

EXISTING RATIONAL CALCS

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Vista Ridge
Location: Erie
Design Storm: 5-Year

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: EWA
Checked By:
Date: 11/17/23

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
		A1Z	0.06	0.86	5.0	0.05	3.76	0.2															UNMODIFIED EXISTING BASIN A1Z OUTFLOW AS HISTORICALLY HAS TO POND A-1
		EX1	2.18	0.05	20.2	0.11	2.17	0.2															EXISTING BASIN COMPRISED OF THE NORTHERN PORTION OF THE SITE
		EX2	0.90	0.05	14.8	0.05	2.53	0.1															EXISTING BASIN COMPRISED OF THE SOUTHWESTERN PORTION OF THE SITE

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Village Cooperative Erie
Location: Erie

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: AHC
Checked By:
Date: 9/5/24

Basin ID	Total Area (ac)	Paved Roads/Sidewalks			Roofs			Lawns/Open Space/Landscaping			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
A1	0.41	100%	0.22	53.3%	90%	0.00	0.0%	2%	0.19	0.9%	54.3%
A2	0.71	100%	0.41	57.4%	90%	0.00	0.0%	2%	0.30	0.9%	58.2%
A3	0.26	100%	0.02	7.7%	90%	0.00	0.0%	2%	0.24	1.8%	9.5%
A1Z	0.06	100%	0.06	100.0%	90%	0.00	0.0%	2%	0.00	0.0%	100.0%
R1	0.02	100%	0.00	0.0%	90%	0.02	90.0%	2%	0.00	0.0%	90.0%
R2	0.12	100%	0.00	0.0%	90%	0.12	90.0%	2%	0.00	0.0%	90.0%
R3	0.02	100%	0.00	0.0%	90%	0.02	90.0%	2%	0.00	0.0%	90.0%
R4	0.27	100%	0.00	0.0%	90%	0.27	90.0%	2%	0.00	0.0%	90.0%
R5	0.27	100%	0.00	0.0%	90%	0.27	90.0%	2%	0.00	0.0%	90.0%
R6	0.02	100%	0.00	0.0%	90%	0.02	90.0%	2%	0.00	0.0%	90.0%
R7	0.05	100%	0.00	0.0%	90%	0.05	90.0%	2%	0.00	0.0%	90.0%
R8	0.05	100%	0.00	0.0%	90%	0.05	90.0%	2%	0.00	0.0%	90.0%
R9	0.02	100%	0.00	0.0%	90%	0.02	90.0%	2%	0.00	0.0%	90.0%
RPA1	0.11	100%	0.00	0.0%	90%	0.00	0.0%	2%	0.11	2.0%	2.0%
RPA2	0.75	100%	0.01	1.3%	90%	0.00	0.0%	2%	0.74	2.0%	3.3%
TOTAL	3.14										47.7%

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Village Cooperative Erie
Location: Erie

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: AHC
Checked By:
Date: 9/5/24

Basin ID	Total Area (ac)	Basins Total Weighted % Imp.	Hydrologic Soil Group			Hydrologic Soil Group			Minor Coefficients			Major Coefficients			Basins Total Weighted C_5	Basins Total Weighted C_{100}
			Area A (ac)	Area B (ac)	Area C/D (ac)	% A (ac)	% B (ac)	% C/D (ac)	$C_{5,A}$	$C_{5,B}$	$C_{5,C/D}$	$C_{100,A}$	$C_{100,B}$	$C_{100,C/D}$		
A1	0.41	54.3%	0.00	0.00	0.41	0%	0%	100%	0.39	0.44	0.48	0.53	0.68	0.71	0.48	0.71
A2	0.71	58.2%	0.00	0.00	0.71	0%	0%	100%	0.43	0.48	0.51	0.56	0.70	0.72	0.51	0.72
A3	0.26	9.5%	0.00	0.00	0.26	0%	0%	100%	0.04	0.07	0.11	0.18	0.47	0.52	0.11	0.52
A1Z	0.06	100.0%	0.00	0.00	0.06	0%	0%	100%	0.86	0.86	0.86	0.89	0.90	0.89	0.86	0.89
R1	0.02	90.0%	0.00	0.00	0.02	0%	0%	100%	0.75	0.77	0.77	0.81	0.85	0.85	0.77	0.85
R2	0.12	90.0%	0.00	0.00	0.12	0%	0%	100%	0.75	0.77	0.77	0.81	0.85	0.85	0.77	0.85
R3	0.02	90.0%	0.00	0.00	0.02	0%	0%	100%	0.75	0.77	0.77	0.81	0.85	0.85	0.77	0.85
R4	0.27	90.0%	0.00	0.00	0.27	0%	0%	100%	0.75	0.77	0.77	0.81	0.85	0.85	0.77	0.85
R5	0.27	90.0%	0.00	0.00	0.27	0%	0%	100%	0.75	0.77	0.77	0.81	0.85	0.85	0.77	0.85
R6	0.02	90.0%	0.00	0.00	0.02	0%	0%	100%	0.75	0.77	0.77	0.81	0.85	0.85	0.77	0.85
R7	0.05	90.0%	0.00	0.00	0.05	0%	0%	100%	0.75	0.77	0.77	0.81	0.85	0.85	0.77	0.85
R8	0.05	90.0%	0.00	0.00	0.05	0%	0%	100%	0.75	0.77	0.77	0.81	0.85	0.85	0.77	0.85
R9	0.02	90.0%	0.00	0.00	0.02	0%	0%	100%	0.75	0.77	0.77	0.81	0.85	0.85	0.77	0.85
RPA1	0.11	2.0%	0.00	0.00	0.11	0%	0%	100%	0.01	0.01	0.05	0.13	0.44	0.49	0.05	0.49
RPA2	0.75	3.3%	0.00	0.00	0.75	0%	0%	100%	0.01	0.02	0.06	0.14	0.44	0.50	0.06	0.50
TOTAL	3.14	47.7%	0.00	0.00	3.14	0%	0%	100%	---	---	---	---	---	---	0.43	0.68

Table 6-4. Runoff coefficient equations based on NRCS soil group and storm return period

NRCS Soil Group	Storm Return Period						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
A	$C_A = 0.84i^{1.302}$	$C_A = 0.86i^{1.276}$	$C_A = 0.87i^{1.232}$	$C_A = 0.84i^{1.124}$	$C_A = 0.85i+0.025$	$C_A = 0.78i+0.110$	$C_A = 0.65i+0.254$
B	$C_B = 0.84i^{1.169}$	$C_B = 0.86i^{1.088}$	$C_B = 0.81i+0.057$	$C_B = 0.63i+0.249$	$C_B = 0.56i+0.328$	$C_B = 0.47i+0.426$	$C_B = 0.37i+0.536$
C/D	$C_{C/D} = 0.83i^{1.122}$	$C_{C/D} = 0.82i+0.035$	$C_{C/D} = 0.74i+0.132$	$C_{C/D} = 0.56i+0.319$	$C_{C/D} = 0.49i+0.393$	$C_{C/D} = 0.41i+0.484$	$C_{C/D} = 0.32i+0.588$

Where:

i = % imperviousness (expressed as a decimal)

C_A = Runoff coefficient for Natural Resources Conservation Service (NRCS) HSG A soils

C_B = Runoff coefficient for NRCS HSG B soils

$C_{C/D}$ = Runoff coefficient for NRCS HSG C and D soils.

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Village Cooperative Erie
Location: Erie

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: AHC
Checked By:
Date: 9/5/24

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
A1	0.41	C/D	54%	0.48	0.71	70	16.0%	3.8	220	2.0%	20.0	2.8	1.3	5.0	290.0	18.3	5.0
A2	0.71	C/D	58%	0.51	0.72	20	2.0%	3.8	275	1.0%	20.0	2.0	2.3	6.1	295.0	18.8	6.1
A3	0.26	C/D	10%	0.11	0.52	25	13.0%	3.8	240	4.0%	7.0	1.4	2.9	6.7	265.0	26.3	6.7
A1Z	0.06	C/D	100%	0.86	0.89	0	1.0%	0.0	100	2.8%	20.0	3.3	0.5	0.5	100.0	9.4	5.0
R1	0.02	C/D	90%	0.77	0.85	10	1.0%	1.9	50	1.0%	20.0	2.0	0.4	2.3	60.0	11.1	5.0
R2	0.12	C/D	90%	0.77	0.85	30	1.0%	3.2	155	1.0%	20.0	2.0	1.3	4.5	185.0	11.9	5.0
R3	0.02	C/D	90%	0.77	0.85	10	1.0%	1.9	50	1.0%	20.0	2.0	0.4	2.3	60.0	11.1	5.0
R4	0.27	C/D	90%	0.77	0.85	40	1.0%	3.7	210	1.0%	20.0	2.0	1.8	5.5	250.0	12.3	5.5
R5	0.27	C/D	90%	0.77	0.85	40	1.0%	3.7	210	1.0%	20.0	2.0	1.8	5.5	250.0	12.3	5.5
R6	0.02	C/D	90%	0.77	0.85	10	1.0%	1.9	50	1.0%	20.0	2.0	0.4	2.3	60.0	11.1	5.0
R7	0.05	C/D	90%	0.77	0.85	30	1.0%	3.2	65	1.0%	20.0	2.0	0.5	3.8	95.0	11.2	5.0
R8	0.05	C/D	90%	0.77	0.85	30	1.0%	3.2	65	1.0%	20.0	2.0	0.5	3.8	95.0	11.2	5.0
R9	0.02	C/D	90%	0.77	0.85	10	1.0%	1.9	50	1.0%	20.0	2.0	0.4	2.3	60.0	11.1	5.0
RPA1	0.11	C/D	2%	0.05	0.49	75	5.0%	9.6	340	1.5%	20.0	2.4	2.3	12.0	415.0	30.6	12.0
RPA2	0.75	C/D	3%	0.06	0.50	35	29.0%	3.6	400	3.0%	7.0	1.2	5.5	9.1	435.0	29.5	9.1

NOTES:

$$t_c = t_i + t_t \quad \text{Equation 6-2}$$

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

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

Where:

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

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

Where:

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

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

Where:

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

Table 6-2. NRCS Conveyance factors, K

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

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

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Village Cooperative Erie
Location: Erie
Design Storm: 5-Year

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: AHC
Checked By:
Date: 9/5/24

		DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
		A1Z	0.06	0.86	5.0	0.05	3.76	0.2															UNMODIFIED EXISTING BASIN A1Z OUTFALLS HISTORICALLY TO EX POND A-1
	2.4	R8	0.05	0.77	5.0	0.04	3.76	0.2															TOTAL FLOW FROM BASIN R8 CAPTURED BY ROOF DRAIN PIPED TO DP 2.4
		R9	0.02	0.77	5.0	0.01	3.76	0.04															TOTAL FLOW FROM BASIN R9 CAPTURED BY ROOF DRAIN PIPED TO DP 2.3
	2.3								5.0	0.05	3.76	0.2											COMBINED FLOW OF DP 2.4 AND BASIN R9
		R5	0.27	0.77	5.5	0.21	3.67	0.8															TOTAL FLOW FROM BASIN R5 CAPTURED BY ROOF DRAIN PIPED TO DP 2.2
	2.2								5.5	0.26	3.67	1.0											COMBINED FLOW OF DP 2.3 AND BASIN R5
	2.1	A2	0.71	0.51	6.1	0.37	3.57	1.3															TOTAL FLOW FROM BASIN A2 (SOUTH OF BUILDING) FLOW CAPTURED BY PROPOSED 5' TYPE R INLET IN SUMP AT DP 2.1
	2								6.1	0.63	3.57	2.2											COMBINED FLOW FROM DP 2.2 AND DP 2.1
	1.9	R7	0.05	0.77	5.0	0.04	3.76	0.2															TOTAL FLOW FROM BASIN R7 CAPTURED BY ROOF DRAIN PIPED TO DP 1.9
	1.8	A3	0.26	0.11	6.7	0.03	3.46	0.1															TOTAL FLOW FROM BASIN A3 (EAST OF BUILDING) SWALED TO PROPOSED TYPE C INLET AT DP 1.8
	1.7								6.7	0.07	3.46	0.2											COMBINED FLOW FROM DP 1.8 AND 1.9
		R6	0.02	0.77	5.0	0.01	3.76	0.04															TOTAL FLOW FROM BASIN R6 CAPTURED BY ROOF DRAIN PIPED TO DP 1.6
	1.6								6.7	0.08	3.46	0.3											COMBINED FLOW FROM DP 1.7 AND BASIN R6
		R4	0.27	0.77	5.5	0.21	3.67	0.8															TOTAL FLOW FROM BASIN R4 CAPTURED BY ROOF DRAIN PIPED TO DP 1.5
	1.5								6.7	0.29	3.46	1.0											COMBINED FLOW OF DP 1.6 AND BASIN R4
		R1	0.02	0.77	5.0	0.01	3.76	0.04															TOTAL FLOW FROM BASIN R1 CAPTURED BY ROOF DRAIN PIPED TO DP 1.4
	1.4								6.7	0.30	3.46	1.0											COMBINED FLOW FROM DP 1.5 AND BASIN R1
	1.3	R3	0.02	0.77	5.0	0.02	3.76	0.1															TOTAL FLOW FROM BASIN R3 CAPTURED BY ROOF DRAIN PIPED TO DP 1.3
		R2	0.12	0.77	5.0	0.09	3.76	0.3															TOTAL FLOW FROM BASIN R2 CAPTURED BY ROOF DRAIN PIPED TO DP 1.2
	1.2								6.7	0.41	3.46	1.4											COMBINED FLOW FROM DP 1.3, DP 1.4, AND BASIN R2
	1.1	A1	0.41	0.48	5.0	0.20	3.76	0.8															TOTAL FLOW FROM BASIN A1 (WEST OF BUILDING) FLOW CAPTURED BY PROPOSED 5' TYPE R SUMP INLET AT DP 1.1
	1.0								6.7	0.61	3.46	2.1											COMBINED PIPED FLOW OF DP 1.1 AND DP 1.2 PIPED TO DP 1

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Village Cooperative Erie
Location: Erie
Design Storm: 5-Year

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: AHC
Checked By:
Date: 9/5/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	1								6.7	1.24	3.46	4.3											COMBINED PIPED FLOW OF DP 1.0 AND DP 2 OUTFALLS TO EX POND A-2
	C2	RPA1	0.11	0.05	12.0	0.01	2.79	0.03															RUNOFF FROM THIS BASIN WILL FLOW INTO VILLAGE VISTA DRIVE FLOW CAPTURED BY EX 10' TYPE R SUMP INLET AT DP C2
	3	RPA2	0.75	0.06	9.1	0.05	3.11	0.2															RUNOFF FROM THIS OPEN SPACE GRASSLAND BASIN WILL FLOW TO THE NORTH END OF THE SITE. ROUTED IN EX SWALE TO EXISTING POND A-2
	A4.1								*6.3*	*2.15*	*3.53*	*7.6*	*From recreated EX drainage calcs*										*Routed EX flows from the recreated drainage calcs using the 06/25/2007* *CLC Drainage Map*
	D1.1								6.7	3.39	3.46	11.7											Routed EX flows from recreated drainage calcs DP A4.1 Combined with DP 1 flows
	B5.1								*5.7*	*2.40*	*3.63*	*8.7*	*From recreated EX drainage calcs*										*Routed EX flows from the recreated drainage calcs using the 06/25/2007* *CLC Drainage Map*
	B5.2								6.7	5.79	3.46	20.0											Routed EX flows from recreated drainage calcs DP B5.1 Combined with DP D1.1 flows
	3G	*G-S*	*0.38*	*0.87*	*5.0*	*0.33*	*3.76*	*1.2*					*Basin G-S and DP 3 (renamed 3G) from the Goddard School Report*										*Direct basin flow from Basin G-S in the Goddard School Drainage Report* *Routed to EX inlet at DP C2*
	C2	*C2*	*1.35*	*0.87*	*5.0*	*1.17*	*3.76*	*4.4*	12.0	1.51	2.79	4.2	*Basin C2 is off-site Basin C2 in recreated EX drainage calcs*										Routed EX flows from recreated drainage calcs DP C2 Combined with Basin RPA1 flows
	C1	*C1*	*2.59*	*0.87*	*9.6*	*2.25*	*3.05*	*6.9*					*Basin C1 is off-site Basin C1 in recreated EX drainage calcs*										*Routed EX flows from the recreated drainage calcs using the 06/25/2007* *CLC Drainage Map*
	C2.1								12.0	3.76	2.79	10.5											Routed EX flows from recreated drainage calcs DP C1 Combined with DP C2 flows
	C2.2								12.0	9.55	2.79	26.6											Routed combined flows for DP C2.1 & DP B5.2
	C2.3								12.0	9.55	2.79	26.6											Total discharge into EX Pond A2

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Village Cooperative Erie
Location: Erie
Design Storm: 100-Year

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: AHC
Checked By:
Date: 9/5/24

		DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
		A1Z	0.06	0.89	5.0	0.06	9.09	0.5															UNMODIFIED EXISTING BASIN A1Z OUTFALLS HISTORICALLY TO EX POND A-1
	2.4	R8	0.05	0.85	5.0	0.04	9.09	0.4															TOTAL FLOW FROM BASIN R8 CAPTURED BY ROOF DRAIN PIPED TO DP 2.4
		R9	0.02	0.85	5.0	0.01	9.09	0.09															TOTAL FLOW FROM BASIN R9 CAPTURED BY ROOF DRAIN PIPED TO DP 2.3
	2.3								5.0	0.05	9.09	0.5											COMBINED FLOW OF DP 2.4 AND BASIN R9
		R5	0.27	0.85	5.5	0.23	8.87	2.0															TOTAL FLOW FROM BASIN R5 CAPTURED BY ROOF DRAIN PIPED TO DP 2.2
	2.2								5.5	0.28	8.87	2.5											COMBINED FLOW OF DP 2.3 AND BASIN R5
	2.1	A2	0.71	0.72	6.1	0.52	8.61	4.5															TOTAL FLOW FROM BASIN A2 (SOUTH OF BUILDING) FLOW CAPTURED BY PROPOSED 5' TYPE R INLET IN SUMP AT DP 2.1
	2								6.1	0.80	8.61	6.9											COMBINED FLOW FROM DP 2.2 AND DP 2.1
	1.9	R7	0.05	0.85	5.0	0.04	9.09	0.4															TOTAL FLOW FROM BASIN R7 CAPTURED BY ROOF DRAIN PIPED TO DP 1.9
	1.8	A3	0.26	0.52	6.7	0.14	8.36	1.2															TOTAL FLOW FROM BASIN A3 (EAST OF BUILDING) SWALED TO PROPOSED TYPE C INLET AT DP 1.8
	1.7								6.7	0.18	8.36	1.5											COMBINED FLOW FROM DP 1.8 AND 1.9
		R6	0.02	0.85	5.0	0.01	9.09	0.09															TOTAL FLOW FROM BASIN R6 CAPTURED BY ROOF DRAIN PIPED TO DP 1.6
	1.6								6.7	0.19	8.36	1.6											COMBINED FLOW FROM DP 1.7 AND BASIN R6
		R4	0.27	0.85	5.5	0.23	8.87	2.0															TOTAL FLOW FROM BASIN R4 CAPTURED BY ROOF DRAIN PIPED TO DP 1.5
	1.5								6.7	0.42	8.36	3.5											COMBINED FLOW OF DP 1.6 AND BASIN R4
		R1	0.02	0.85	5.0	0.01	9.09	0.09															TOTAL FLOW FROM BASIN R1 CAPTURED BY ROOF DRAIN PIPED TO DP 1.4
	1.4								6.7	0.43	8.36	3.6											COMBINED FLOW FROM DP 1.5 AND BASIN R1
	1.3	R3	0.02	0.85	5.0	0.02	9.09	0.2															TOTAL FLOW FROM BASIN R3 CAPTURED BY ROOF DRAIN PIPED TO DP 1.3
		R2	0.12	0.85	5.0	0.10	9.09	0.9															TOTAL FLOW FROM BASIN R2 CAPTURED BY ROOF DRAIN PIPED TO DP 1.2
	1.2								6.7	0.55	8.36	4.6											COMBINED FLOW FROM DP 1.3, DP 1.4, AND BASIN R2
	1.1	A1	0.41	0.71	5.0	0.29	9.07	2.6															TOTAL FLOW FROM BASIN A1 (WEST OF BUILDING) FLOW CAPTURED BY PROPOSED 5' TYPE R SUMP INLET AT DP 1.1
	1.0								6.7	0.84	8.36	7.0											COMBINED PIPED FLOW OF DP 1.1 AND DP 1.2 PIPED TO DP 1

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Village Cooperative Erie
Location: Erie
Design Storm: 100-Year

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: AHC
Checked By:
Date: 9/5/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	1								6.7	1.64	8.36	13.7											COMBINED PIPED FLOW OF DP 1.0 AND DP 2 OUTFALLS TO EX POND A-2
	C2	RPA1	0.11	0.49	12.0	0.05	6.74	0.34															RUNOFF FROM THIS BASIN WILL FLOW INTO VILLAGE VISTA DRIVE FLOW CAPTURED BY EX 10' TYPE R SUMP INLET AT DP C2
	3	RPA2	0.75	0.50	9.1	0.37	7.50	2.8															RUNOFF FROM THIS OPEN SPACE GRASSLAND BASIN WILL FLOW TO THE NORTH END OF THE SITE. ROUTED IN EX SWALE TO EXISTING POND A-2
	A4.1								*6.3*	*2.20*	*8.53*	*18.8*	*From recreated EX drainage calcs*										*Routed EX flows from the recreated drainage calcs using the 06/25/2007* *CLC Drainage Map*
	D1.1								6.7	3.84	8.36	32.1											Routed EX flows from recreated drainage calcs DP A4.1 Combined with DP 1 flows
	B5.1								*5.7*	*2.45*	*8.77*	*21.5*	*From recreated EX drainage calcs*										*Routed EX flows from the recreated drainage calcs using the 06/25/2007* *CLC Drainage Map*
	B5.2								6.7	6.29	8.36	52.6											Routed EX flows from recreated drainage calcs DP B5.1 Combined with DP D1.1 flows
	3G	*G-S*	*0.38*	*0.89*	*5.0*	*0.34*	*9.09*	*3.1*					*Basin G-S and DP 3 (renamed 3G) from the Goddard School Report*										*Direct basin flow from Basin G-S in the Goddard School Drainage Report* *Routed to EX inlet at DP C2*
	C2	*C2*	*1.35*	*0.89*	*5.0*	*1.20*	*9.09*	*10.9*	12.0	1.59	6.74	10.7	*Basin C2 is off-site Basin C2 in recreated EX drainage calcs*										Routed EX flows from recreated drainage calcs DP C2 Combined with Basin RPA1 flows
	C1	*C1*	*2.59*	*0.89*	*9.6*	*2.31*	*7.37*	*17.0*					*Basin C1 is off-site Basin C1 in recreated EX drainage calcs*										*Routed EX flows from the recreated drainage calcs using the 06/25/2007* *CLC Drainage Map*
	C2.1								12.0	3.90	6.74	26.3											Routed EX flows from recreated drainage calcs DP C1 Combined with DP C2 flows
	C2.2								12.0	10.19	6.74	68.7											Routed combined flows for DP C2.1 & DP B5.2
	C2.3								12.0	10.19	6.74	68.7											Total discharge into EX Pond A2

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

APPENDIX C

HYDRAULIC CALCULATIONS

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP 2.1	DP 1.1	DP 1.8	EX INLET (DP C2)
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	AREA	STREET
Hydraulic Condition	In Sump	In Sump	Swale	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type C (Depressed)	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{known} (cfs)	1.3	0.8	0.1	4.2
Major Q_{known} (cfs)	4.5	2.6	1.2	10.7

Bypass (Carry-Over) Flow from Upstream — Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)				
Percent Impervious				
NRCS Soil Type				

Watershed Profile

Overland Slope (ft/ft)				
Overland Length (ft)				
Channel Slope (ft/ft)				
Channel Length (ft)				

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)				
One-Hour Precipitation, P_1 (inches)				

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)				
One-Hour Precipitation, P_1 (inches)				

CALCULATED OUTPUT

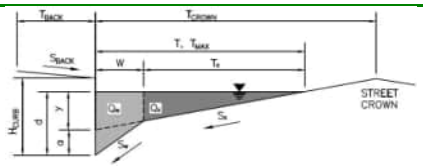
Minor Total Design Peak Flow, Q (cfs)	1.3	0.8	0.1	4.2
Major Total Design Peak Flow, Q (cfs)	4.5	2.6	1.2	10.7
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	0.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	0.0	N/A

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: VILLAGE COOPERATIVE OF ERIE

Inlet ID: DP 2.1



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
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 =	1.50	ft
Street Transverse Slope	S_X =	0.010	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.010	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} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	35.0	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 (T * S_x * 12)	y =	4.20	4.20	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	0.2	0.2	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.00	0.00	inches
Water Depth at Gutter Flowline (y + a)	d =	4.20	4.20	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	33.5	33.5	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.110	0.110	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	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} =	50.0	50.0	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	48.5	48.5	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.078	0.078	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (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 =	SUMP	SUMP	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 Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	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

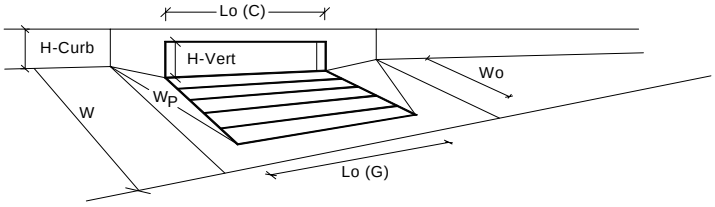
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



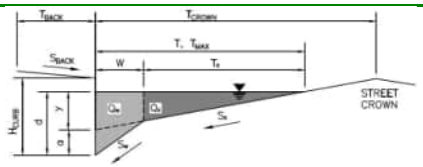
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.2	4.2	inches
Grate Information		MINOR	MAJOR	☐ 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
Open Area 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	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.50	1.50	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} =	0.34	0.34	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	4.8	4.8	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	1.3	4.5	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: VILLAGE COOPERATIVE OF ERIE

Inlet ID: DP 1.1



Gutter Geometry:

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} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	1.50	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 =	0.080	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} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	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 (T * S_x * 12)	y =	7.49	7.49	inches
Vertical Depth between Gutter Lip and Gutter Flowline (W * S_w * 12)	d_C =	1.4	1.4	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	0.97	0.97	inches
Water Depth at Gutter Flowline (y + a)	d =	8.46	8.46	inches
Allowable Spread for Discharge outside the Gutter Section (T - W)	T_X =	22.5	22.5	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.173	0.173	
Discharge outside the Gutter Section, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (Q_T - Q_X - Q_{BACK})	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} =	16.1	16.1	ft
Theoretical Spread for Discharge outside the Gutter Section (T - W)	$T_{X\,TH}$ =	14.6	14.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 7-7)	E_O =	0.260	0.260	
Theoretical Discharge outside the Gutter Section, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section (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 =	SUMP	SUMP	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 Safety Factor for Minor/Major Storm depth reduction, d ≥ 6"	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

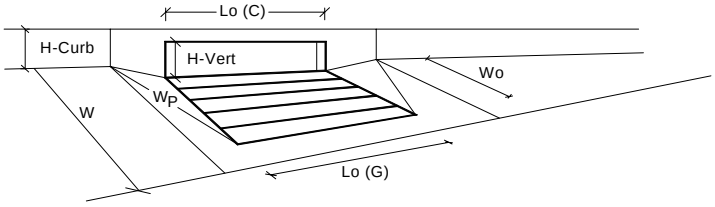
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

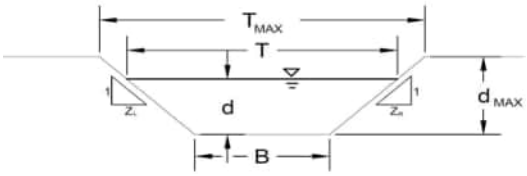


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☑ 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
Open Area 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	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.50	1.50	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} =	0.38	0.38	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	5.8	5.8	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.8	2.6	cfs

AREA INLET IN A SWALE

VILLAGE COOPERATIVE OF ERIE

DP 1.8



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses 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 =	0.030	
Channel Invert Slope	S_O =	0.0400	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	4.00	ft/ft
Right Side Sloe	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	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	6.00	6.00	ft
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	0.50	0.50	ft

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	3.9	3.9	cfs
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	0.50	0.50	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	0.1	1.2	cfs
Water Depth	d =	0.13	0.32	ft

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'

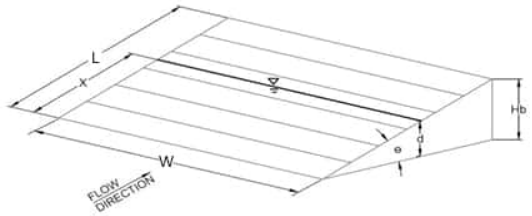
AREA INLET IN A SWALE

VILLAGE COOPERATIVE OF ERIE

DP 1.8

Inlet Design Information (Input)

Type of Inlet	CDOT Type C (Depressed)	Inlet Type =	CDOT Type C (Depressed)	
Angle of Inclined Grade (must be <= 30 degrees)		θ =	0.00	degrees
Width of Grade		W =	3.00	ft
Length of Grade		L =	3.00	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grade		H_B =	0.00	ft
Clogging Factor		C_f =	0.50	
Grade Discharge Coefficient		C_d =	0.84	
Orifice Coefficient		C_o =	0.56	
Weir Coefficient		C_w =	1.81	



		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	1.13	1.32	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	15.1	16.4	cfs
Bypassed Flow	Q_b =	0.0	0.0	cfs
Capture Percentage = Qa/Qo	C% =	100	100	%

Warning 04: Froude No. exceeds USDCM Volume I recommendation.

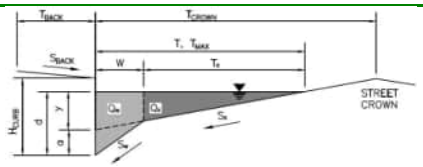
MHFD-Inlet, Version 5.03 (August 2023)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: VILLAGE COOPERATIVE OF ERIE

Inlet ID: EX INLET (DP C2)



Gutter Geometry:

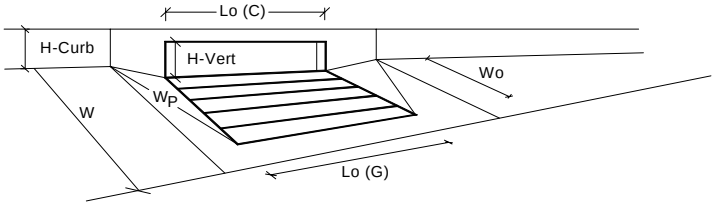
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	10.0	ft
Gutter Width	W =	1.50	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} =	10.0	10.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.2	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	Q_{allow} =	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



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	7.2	inches
Grate Information		MINOR	MAJOR	☑ 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
Open Area 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) =	10.00	10.00	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	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.50	1.50	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} =	0.38	0.48	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	9.2	14.0	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	4.2	10.7	cfs

Worksheet for Swale A-A Velocity Check

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.080	
Channel Slope	0.100	ft/ft
Left Side Slope	5.000	H:V
Right Side Slope	5.000	H:V
Discharge	1.20	cfs

Results		
Normal Depth	4.3	in
Flow Area	0.6	ft²
Wetted Perimeter	3.7	ft
Hydraulic Radius	2.1	in
Top Width	3.60	ft
Critical Depth	3.9	in
Critical Slope	0.176	ft/ft
Velocity	1.85	ft/s
Velocity Head	0.05	ft
Specific Energy	0.41	ft
Froude Number	0.768	
Flow Type	Subcritical	

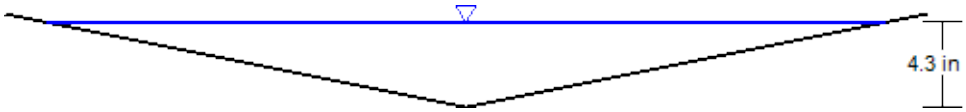
GVF Input Data		
Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

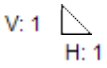
GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	4.3	in
Critical Depth	3.9	in
Channel Slope	0.100	ft/ft
Critical Slope	0.176	ft/ft

Cross Section for Swale A-A Velocity Check

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.080
Channel Slope	0.100 ft/ft
Normal Depth	4.3 in
Left Side Slope	5.000 H:V
Right Side Slope	5.000 H:V
Discharge	1.20 cfs





Worksheet for Swale A-A Capacity Check

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.045	
Channel Slope	0.030	ft/ft
Left Side Slope	5.000	H:V
Right Side Slope	5.000	H:V
Discharge	1.20	cfs

Results		
Normal Depth	4.4	in
Flow Area	0.7	ft²
Wetted Perimeter	3.7	ft
Hydraulic Radius	2.1	in
Top Width	3.64	ft
Critical Depth	3.9	in
Critical Slope	0.056	ft/ft
Velocity	1.81	ft/s
Velocity Head	0.05	ft
Specific Energy	0.41	ft
Froude Number	0.749	
Flow Type	Subcritical	

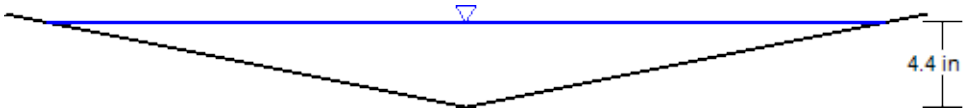
GVF Input Data		
Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

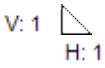
GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	4.4	in
Critical Depth	3.9	in
Channel Slope	0.030	ft/ft
Critical Slope	0.056	ft/ft

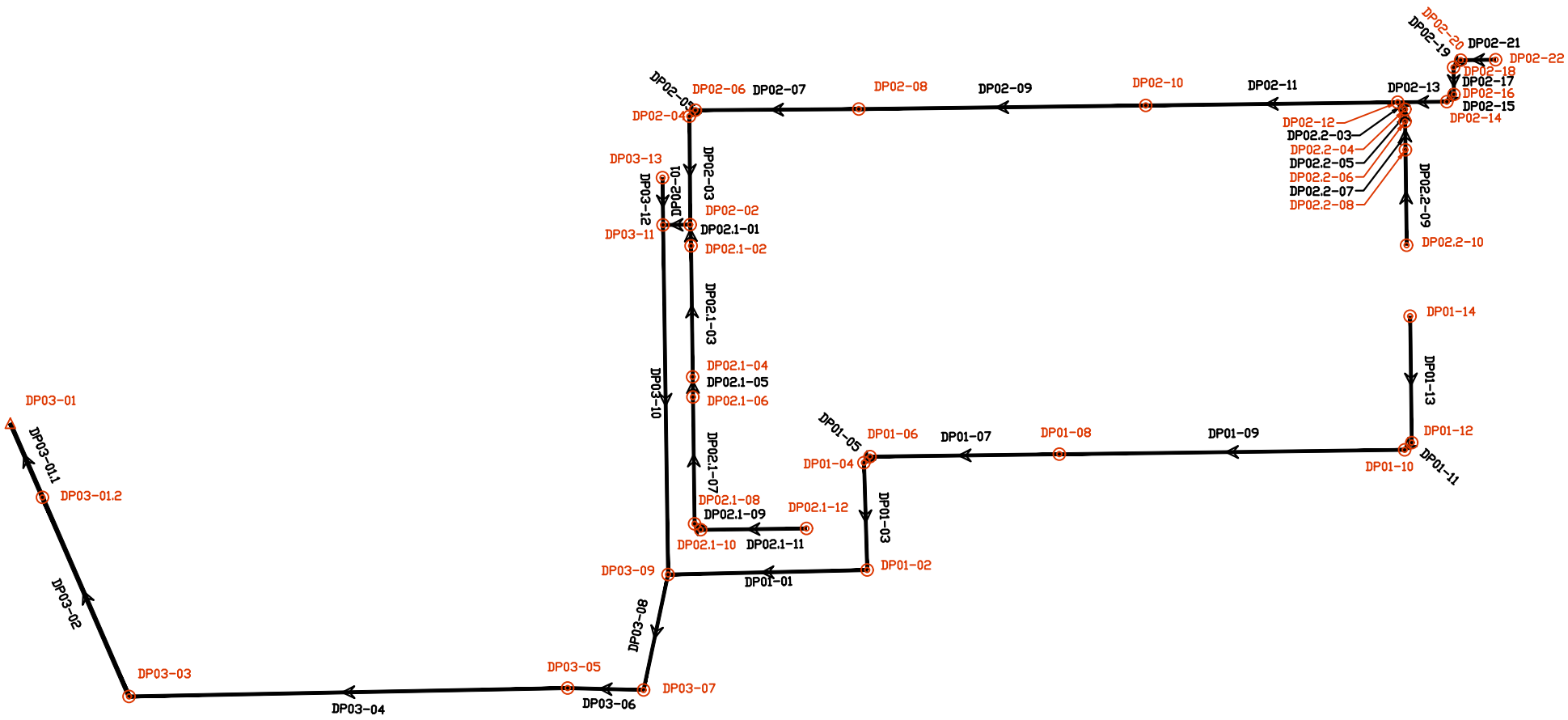
Cross Section for Swale A-A Capacity Check

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.045
Channel Slope	0.030 ft/ft
Normal Depth	4.4 in
Left Side Slope	5.000 H:V
Right Side Slope	5.000 H:V
Discharge	1.20 cfs







STORMCAD SCHEMATIC
VILLAGE COOPERATIVE ERIE
JOB NO. 16162.00
10/31/24
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

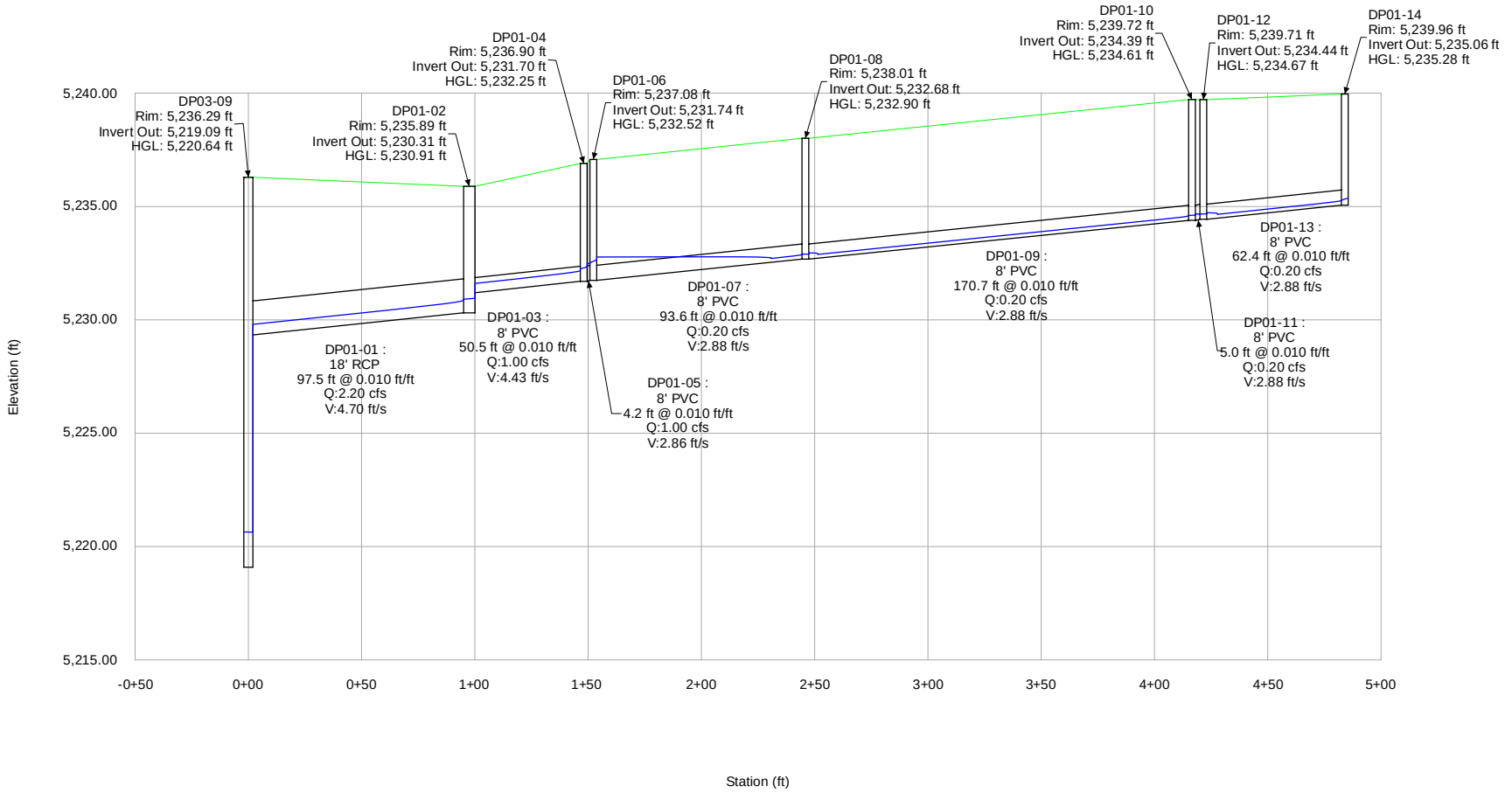
Scenario: 5 YEAR
Current Time Step: 0.000 h
FlexTable: Conduit Table

Upstream Structure	Label	Flow (cfs)	Diameter (in)	Length (Unified) (ft)	Slope (Calculated) (ft/ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Velocity (ft/s)	Manning's n
DP03-13	DP03-12	0.80	12.0	24.4	0.029	5,227.00	5,226.30	5,227.37	5,226.55	5,227.51	5,226.99	5.33	0.013
DP03-11	DP03-10	2.10	24.0	172.2	0.011	5,221.41	5,219.50	5,221.91	5,220.68	5,222.09	5,220.69	4.67	0.013
DP03-09	DP03-08	4.30	30.0	57.7	0.008	5,219.29	5,218.83	5,220.63	5,220.64	5,220.67	5,220.66	5.00	0.013
DP03-07	DP03-06	11.70	30.0	37.5	0.007	5,218.63	5,218.35	5,220.30	5,220.31	5,220.47	5,220.43	6.47	0.013
DP03-05	DP03-04	20.00	36.0	216.8	0.007	5,218.15	5,216.67	5,219.58	5,218.91	5,220.14	5,219.09	7.17	0.013
DP03-03	DP03-02	26.60	42.0	107.2	0.034	5,216.47	5,212.80	5,218.06	5,213.72	5,218.67	5,216.43	13.72	0.013
DP03-01.2	DP03-01.1	26.60	42.0	40.0	0.005	5,205.56	5,205.36	5,207.15	5,206.85	5,207.76	5,207.57	6.86	0.013
DP02.2-08	DP02.2-07	0.20	8.0	47.1	0.080	5,235.09	5,231.32	5,235.30	5,231.60	5,235.37	5,231.63	6.01	0.011
DP02.2-06	DP02.2-05	0.20	8.0	14.0	0.497	5,231.32	5,224.36	5,231.53	5,224.64	5,231.60	5,224.67	11.40	0.011
DP02.2-04	DP02.2-03	0.20	8.0	6.0	0.025	5,224.36	5,224.21	5,224.57	5,224.50	5,224.64	5,224.53	3.99	0.011
DP02.2-02	DP02.2-01	0.20	8.0	5.0	0.034	5,224.21	5,224.04	5,224.42	5,224.18	5,224.49	5,224.41	4.45	0.011
DP02.1-12	DP02.1-11	0.10	8.0	52.3	0.010	5,234.24	5,233.72	5,234.39	5,233.92	5,234.44	5,233.94	2.36	0.011
DP02.1-10	DP02.1-09	0.10	8.0	4.2	0.010	5,233.72	5,233.68	5,233.86	5,233.88	5,233.91	5,233.90	2.36	0.011
DP02.1-08	DP02.1-07	0.10	8.0	62.6	0.010	5,233.68	5,233.05	5,233.82	5,233.24	5,233.87	5,233.26	2.36	0.011
DP02.1-06	DP02.1-05	0.10	8.0	10.0	0.010	5,233.05	5,232.95	5,233.19	5,233.14	5,233.25	5,233.16	2.36	0.011
DP02.1-04	DP02.1-03	0.10	8.0	65.6	0.170	5,232.95	5,221.76	5,233.09	5,222.47	5,233.15	5,222.47	6.37	0.011
DP02.1-02	DP02.1-01	0.10	8.0	10.0	0.008	5,221.76	5,221.68	5,222.47	5,222.46	5,222.47	5,222.47	0.29	0.011
DP02-22	DP02-21	0.10	15.0	17.3	0.005	5,224.02	5,223.94	5,224.14	5,224.11	5,224.18	5,224.12	1.66	0.011
DP02-20	DP02-19	0.10	15.0	5.0	0.006	5,223.94	5,223.91	5,224.07	5,224.08	5,224.10	5,224.09	1.81	0.011
DP02-18	DP02-17	0.10	15.0	13.3	0.004	5,223.91	5,223.85	5,224.03	5,223.99	5,224.07	5,224.02	1.64	0.011
DP02-16	DP02-15	0.10	15.0	5.0	0.006	5,223.85	5,223.82	5,223.99	5,224.00	5,224.02	5,224.01	1.81	0.011
DP02-14	DP02-13	0.10	15.0	24.3	0.005	5,223.82	5,223.70	5,224.00	5,224.00	5,224.01	5,224.00	1.70	0.011
DP02-12	DP02-11	0.30	15.0	124.5	0.005	5,223.70	5,223.08	5,223.91	5,223.36	5,223.99	5,223.39	2.36	0.011
DP02-10	DP02-09	0.30	15.0	141.9	0.005	5,223.08	5,222.37	5,223.29	5,223.03	5,223.37	5,223.04	2.37	0.011
DP02-08	DP02-07	1.00	15.0	81.0	0.005	5,222.37	5,221.96	5,222.76	5,222.57	5,222.91	5,222.61	3.38	0.011
DP02-06	DP02-05	1.00	15.0	4.2	0.005	5,221.96	5,221.94	5,222.51	5,222.52	5,222.57	5,222.56	3.29	0.011
DP02-04	DP02-03	1.00	15.0	54.0	0.005	5,221.94	5,221.68	5,222.44	5,222.45	5,222.52	5,222.48	3.32	0.011
DP02-02	DP02-01	1.40	15.0	13.4	0.005	5,221.68	5,221.61	5,222.15	5,222.15	5,222.32	5,222.24	3.75	0.011
DP01-14	DP01-13	0.20	8.0	62.4	0.010	5,235.06	5,234.44	5,235.27	5,234.73	5,235.34	5,234.75	2.88	0.011
DP01-12	DP01-11	0.20	8.0	5.0	0.010	5,234.44	5,234.39	5,234.65	5,234.68	5,234.72	5,234.70	2.88	0.011
DP01-10	DP01-09	0.20	8.0	170.7	0.010	5,234.39	5,232.68	5,234.59	5,232.96	5,234.67	5,232.98	2.88	0.011
DP01-08	DP01-07	0.20	8.0	93.6	0.010	5,232.68	5,231.74	5,232.88	5,232.77	5,232.96	5,232.78	2.88	0.011
DP01-06	DP01-05	1.00	8.0	4.2	0.010	5,231.74	5,231.70	5,232.50	5,232.48	5,232.62	5,232.60	2.86	0.011
DP01-04	DP01-03	1.00	8.0	50.5	0.010	5,231.70	5,231.20	5,232.18	5,231.61	5,232.40	5,231.91	4.43	0.011
DP01-02	DP01-01	2.20	18.0	97.5	0.010	5,230.31	5,229.34	5,230.87	5,229.80	5,231.08	5,230.15	4.70	0.013

5-YR

Profile Report

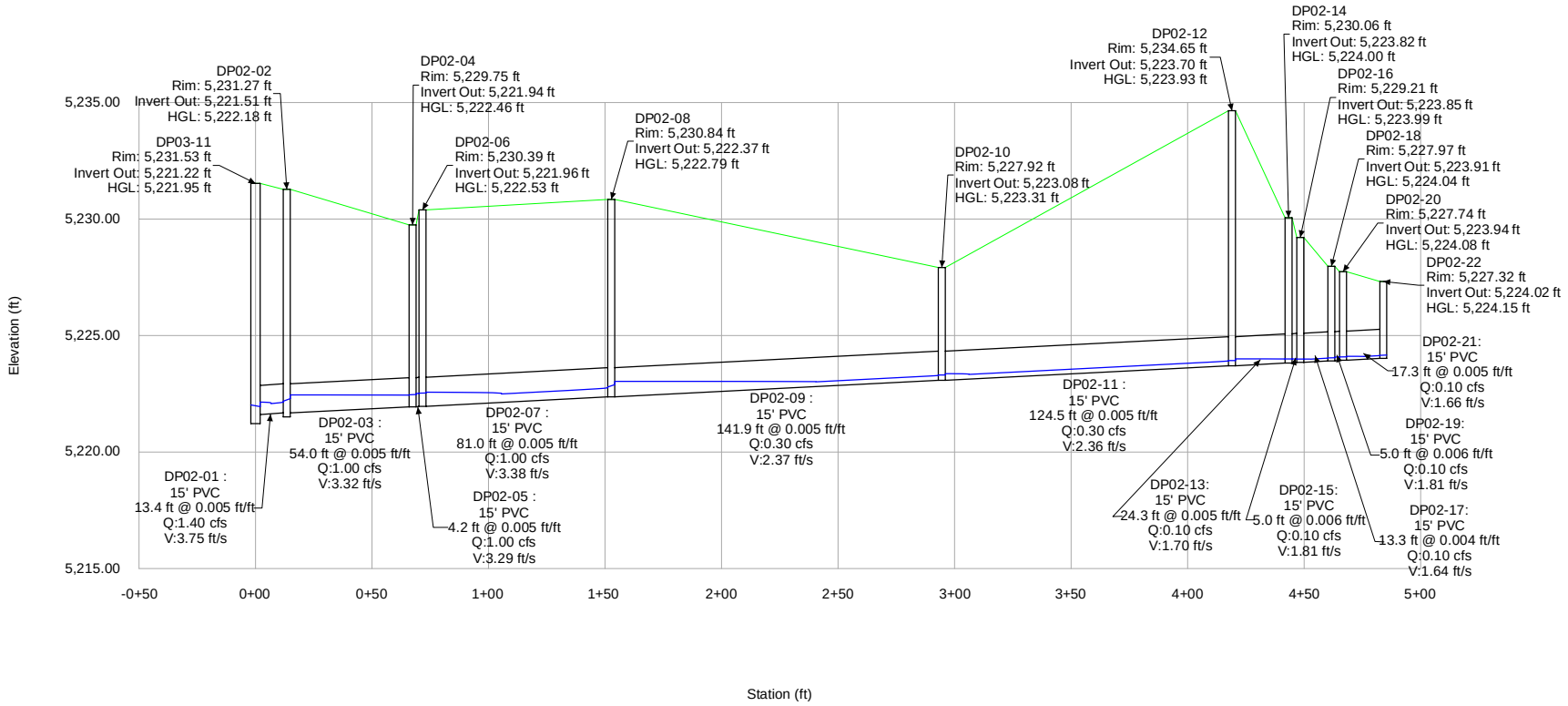
Engineering Profile - DP01 (1616200 Village Cooperative Erie.stsw)



5-YR

Profile Report

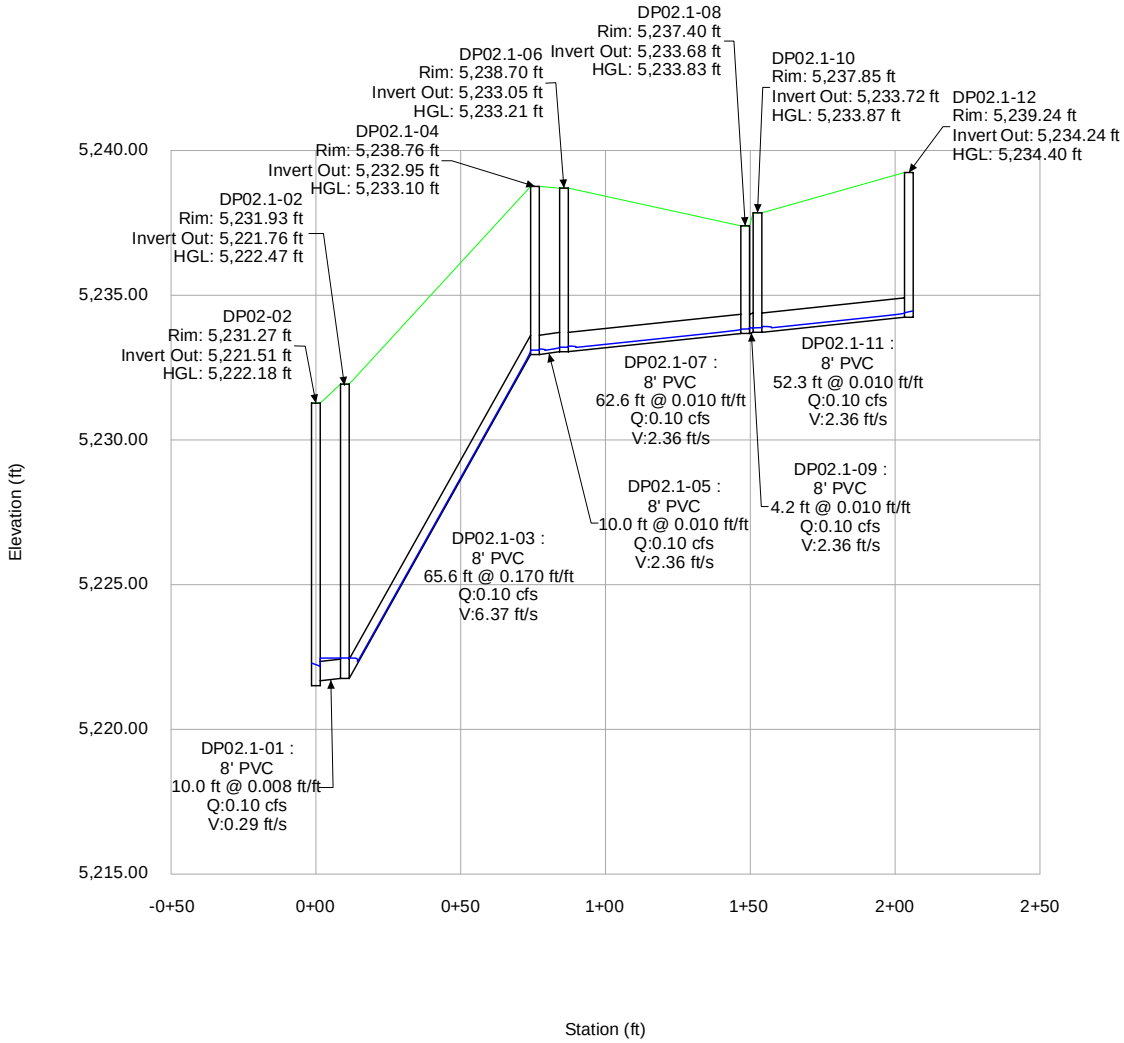
Engineering Profile - DP02 (1616200 Village Cooperative Erie.stsw)



5-YR

Profile Report

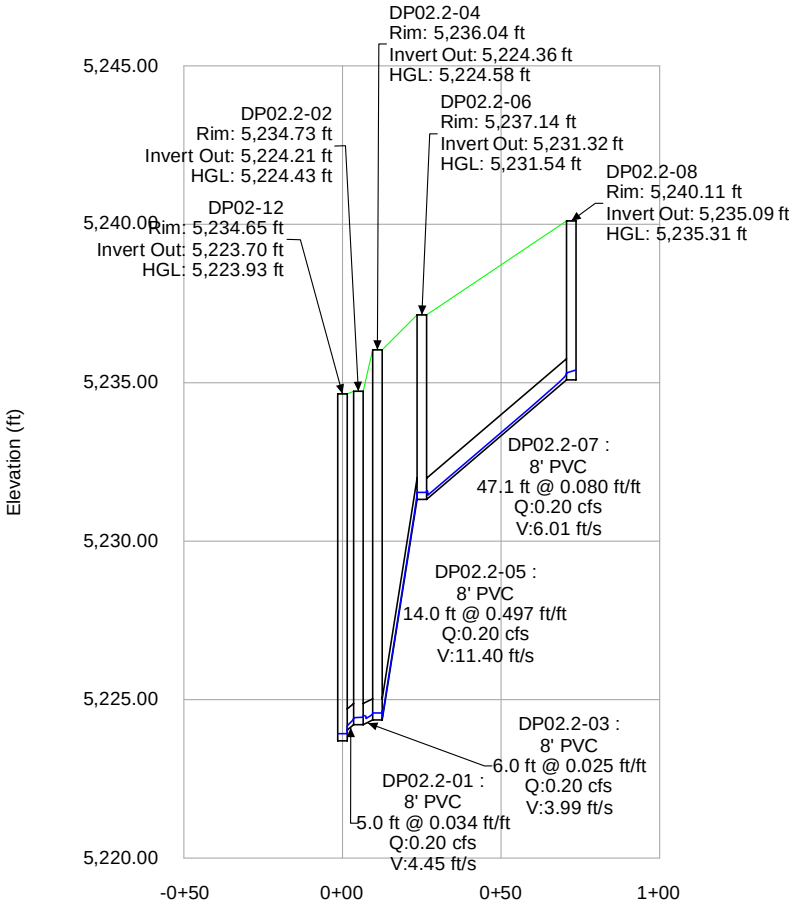
Engineering Profile - DP02.1 (1616200 Village Cooperative Erie.stsw)



5-YR

Profile Report

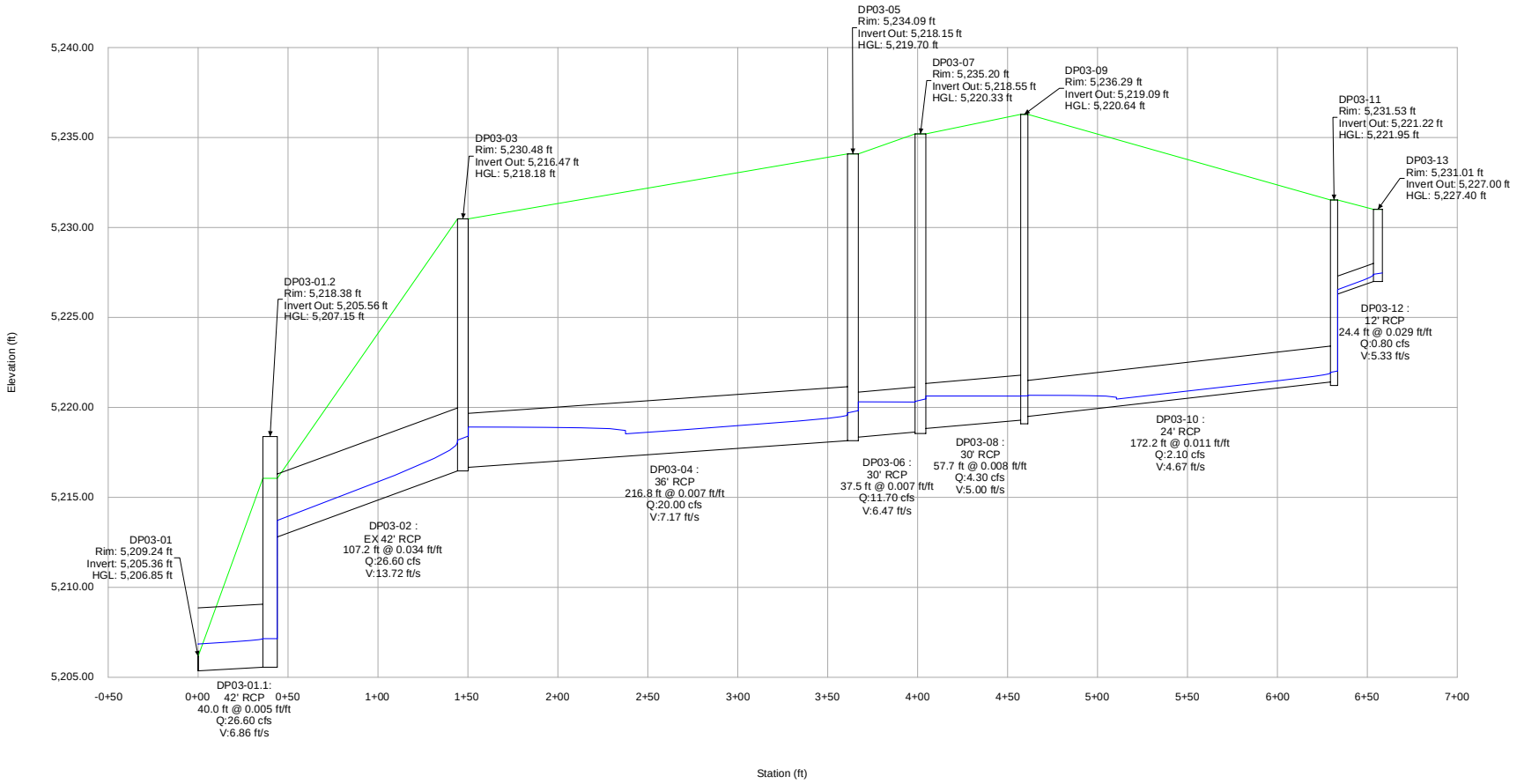
Engineering Profile - DP02.2 (1616200 Village Cooperative Erie.stsw)



5-YR

Profile Report

Engineering Profile - DP03 (1616200 Village Cooperative Erie.stsw)



Scenario: 100 YEAR
Current Time Step: 0.000 h
FlexTable: Conduit Table

Upstream Structure	Label	Flow (cfs)	Diameter (in)	Length (Unified) (ft)	Slope (Calculated) (ft/ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Velocity (ft/s)	Manning's n
DP03-13	DP03-12	2.60	12.0	24.4	0.029	5,227.00	5,226.30	5,227.69	5,226.78	5,228.00	5,227.54	7.40	0.013
DP03-11	DP03-10	7.00	24.0	172.2	0.011	5,221.41	5,219.50	5,225.00	5,224.84	5,225.08	5,224.92	2.23	0.013
DP03-09	DP03-08	13.70	30.0	57.7	0.008	5,219.29	5,218.83	5,224.72	5,224.65	5,224.84	5,224.77	2.79	0.013
DP03-07	DP03-06	32.10	30.0	37.5	0.007	5,218.63	5,218.35	5,223.45	5,223.22	5,224.12	5,223.89	6.54	0.013
DP03-05	DP03-04	52.60	36.0	216.8	0.007	5,218.15	5,216.67	5,222.42	5,221.07	5,223.28	5,221.93	7.44	0.013
DP03-03	DP03-02	68.70	42.0	107.2	0.034	5,216.47	5,212.80	5,219.07	5,214.40	5,220.32	5,218.39	17.89	0.013
DP03-01.2	DP03-01.1	68.70	42.0	40.0	0.005	5,205.56	5,205.36	5,208.29	5,207.96	5,209.42	5,209.21	8.42	0.013
DP02.2-08	DP02.2-07	0.40	8.0	47.1	0.080	5,235.09	5,231.32	5,235.38	5,231.72	5,235.50	5,231.77	7.38	0.011
DP02.2-06	DP02.2-05	0.40	8.0	14.0	0.497	5,231.32	5,224.36	5,231.61	5,226.31	5,231.73	5,226.33	14.04	0.011
DP02.2-04	DP02.2-03	0.40	8.0	6.0	0.025	5,224.36	5,224.21	5,226.30	5,226.29	5,226.32	5,226.31	1.15	0.011
DP02.2-02	DP02.2-01	0.40	8.0	5.0	0.034	5,224.21	5,224.04	5,226.28	5,226.27	5,226.30	5,226.29	1.15	0.011
DP02.1-12	DP02.1-11	0.20	8.0	52.3	0.010	5,234.24	5,233.72	5,234.45	5,234.01	5,234.52	5,234.04	2.88	0.011
DP02.1-10	DP02.1-09	0.20	8.0	4.2	0.010	5,233.72	5,233.68	5,233.95	5,233.97	5,234.01	5,233.99	2.88	0.011
DP02.1-08	DP02.1-07	0.20	8.0	62.6	0.010	5,233.68	5,233.05	5,233.88	5,233.33	5,233.96	5,233.36	2.88	0.011
DP02.1-06	DP02.1-05	0.20	8.0	10.0	0.010	5,233.05	5,232.95	5,233.26	5,233.23	5,233.33	5,233.26	2.88	0.011
DP02.1-04	DP02.1-03	0.20	8.0	65.6	0.170	5,232.95	5,221.76	5,233.16	5,225.46	5,233.23	5,225.46	7.85	0.011
DP02.1-02	DP02.1-01	0.20	8.0	10.0	0.008	5,221.76	5,221.68	5,225.46	5,225.45	5,225.46	5,225.46	0.57	0.011
DP02-22	DP02-21	1.20	15.0	17.3	0.005	5,224.02	5,223.94	5,226.32	5,226.31	5,226.33	5,226.33	0.98	0.011
DP02-20	DP02-19	1.20	15.0	5.0	0.006	5,223.94	5,223.91	5,226.30	5,226.30	5,226.31	5,226.31	0.98	0.011
DP02-18	DP02-17	1.20	15.0	13.3	0.004	5,223.91	5,223.85	5,226.29	5,226.28	5,226.30	5,226.30	0.98	0.011
DP02-16	DP02-15	1.20	15.0	5.0	0.006	5,223.85	5,223.82	5,226.28	5,226.28	5,226.30	5,226.30	0.98	0.011
DP02-14	DP02-13	1.20	15.0	24.3	0.005	5,223.82	5,223.70	5,226.28	5,226.27	5,226.30	5,226.29	0.98	0.011
DP02-12	DP02-11	1.60	15.0	124.5	0.005	5,223.70	5,223.08	5,226.25	5,226.20	5,226.28	5,226.22	1.30	0.011
DP02-10	DP02-09	1.60	15.0	141.9	0.005	5,223.08	5,222.37	5,226.18	5,226.12	5,226.21	5,226.15	1.30	0.011
DP02-08	DP02-07	3.50	15.0	81.0	0.005	5,222.37	5,221.96	5,225.93	5,225.76	5,226.06	5,225.89	2.85	0.011
DP02-06	DP02-05	3.60	15.0	4.2	0.005	5,221.96	5,221.94	5,225.63	5,225.62	5,225.76	5,225.75	2.93	0.011
DP02-04	DP02-03	3.60	15.0	54.0	0.005	5,221.94	5,221.68	5,225.50	5,225.38	5,225.63	5,225.51	2.93	0.011
DP02-02	DP02-01	4.60	15.0	13.4	0.005	5,221.68	5,221.61	5,225.05	5,225.00	5,225.26	5,225.22	3.75	0.011
DP01-14	DP01-13	0.40	8.0	62.4	0.010	5,235.06	5,234.44	5,235.99	5,235.94	5,236.01	5,235.96	1.15	0.011
DP01-12	DP01-11	0.40	8.0	5.0	0.010	5,234.44	5,234.39	5,235.92	5,235.92	5,235.94	5,235.94	1.15	0.011
DP01-10	DP01-09	0.40	8.0	170.7	0.010	5,234.39	5,232.68	5,235.90	5,235.76	5,235.92	5,235.78	1.15	0.011
DP01-08	DP01-07	0.50	8.0	93.6	0.010	5,232.68	5,231.74	5,235.73	5,235.62	5,235.77	5,235.65	1.43	0.011
DP01-06	DP01-05	2.50	8.0	4.2	0.010	5,231.74	5,231.70	5,234.28	5,234.15	5,235.08	5,234.95	7.16	0.011
DP01-04	DP01-03	2.50	8.0	50.5	0.010	5,231.70	5,231.20	5,233.40	5,231.84	5,234.20	5,232.59	7.16	0.011
DP01-02	DP01-01	6.90	18.0	97.5	0.010	5,230.31	5,229.34	5,231.33	5,230.22	5,231.78	5,230.85	6.34	0.013

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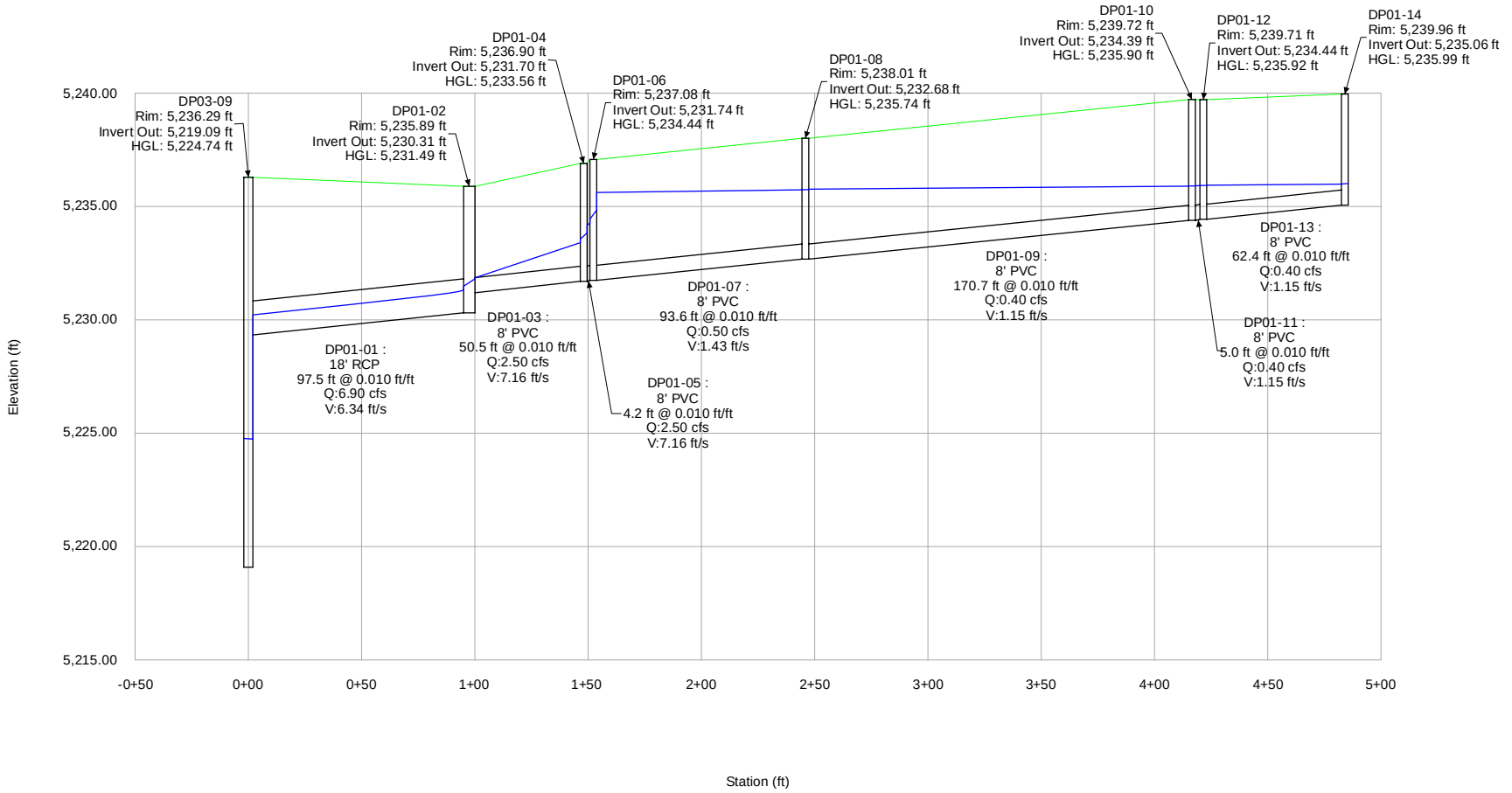
100-YR

Profile Report

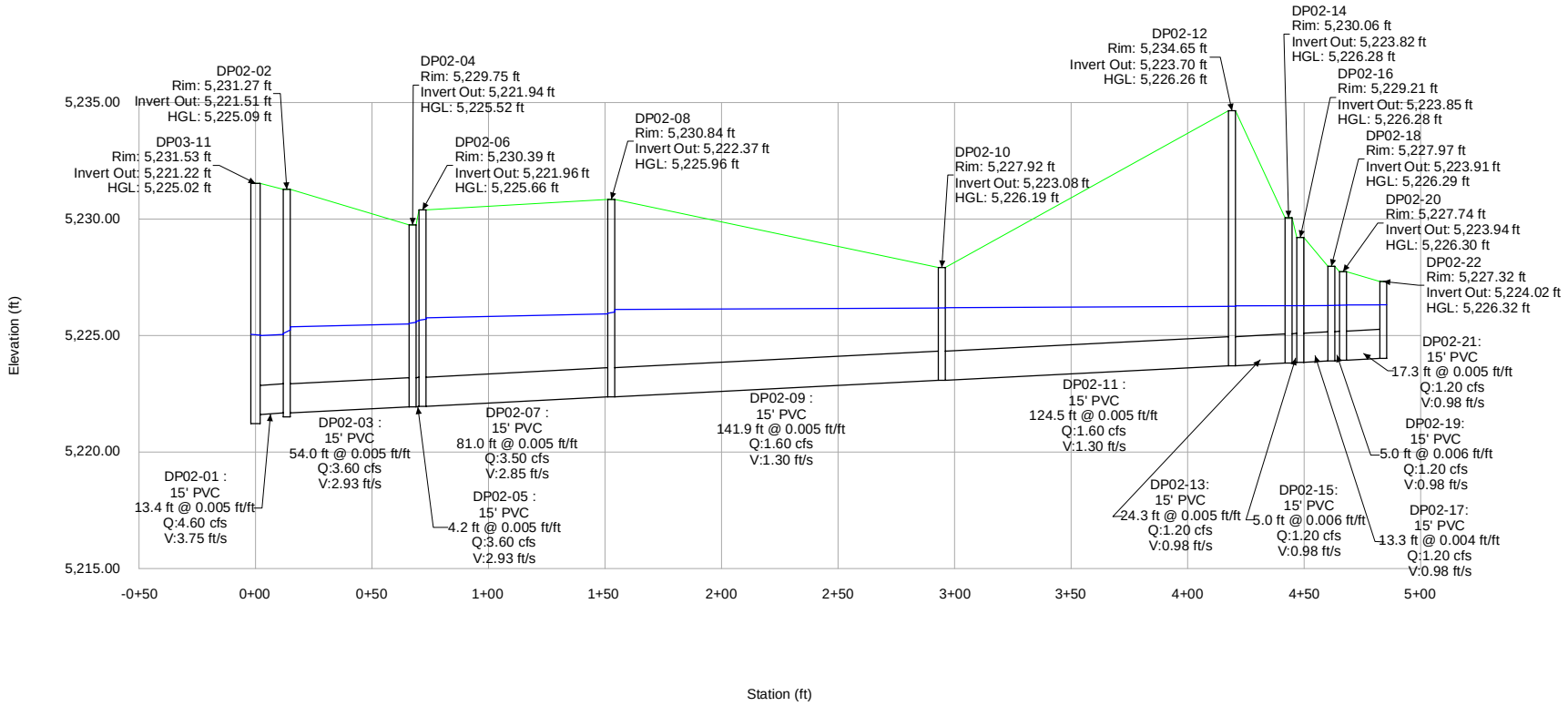
Engineering Profile - DP01 (1616200 Village Cooperative Erie.stsw)



100-YR

Profile Report

Engineering Profile - DP02 (1616200 Village Cooperative Erie.stsw)



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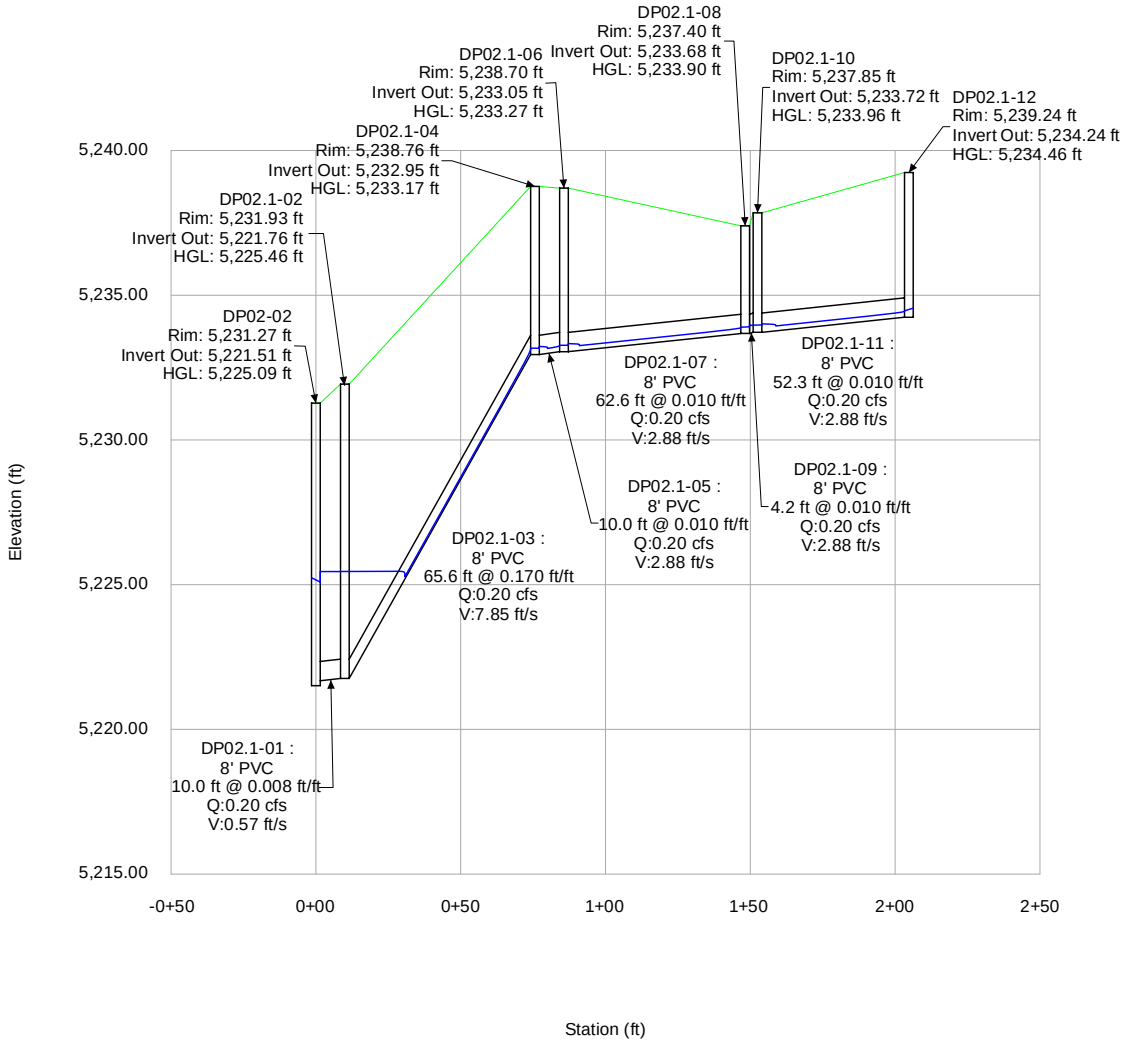
Profile Report

Engineering Profile - DP02.1 (1616200 Village Cooperative Erie.stsw)



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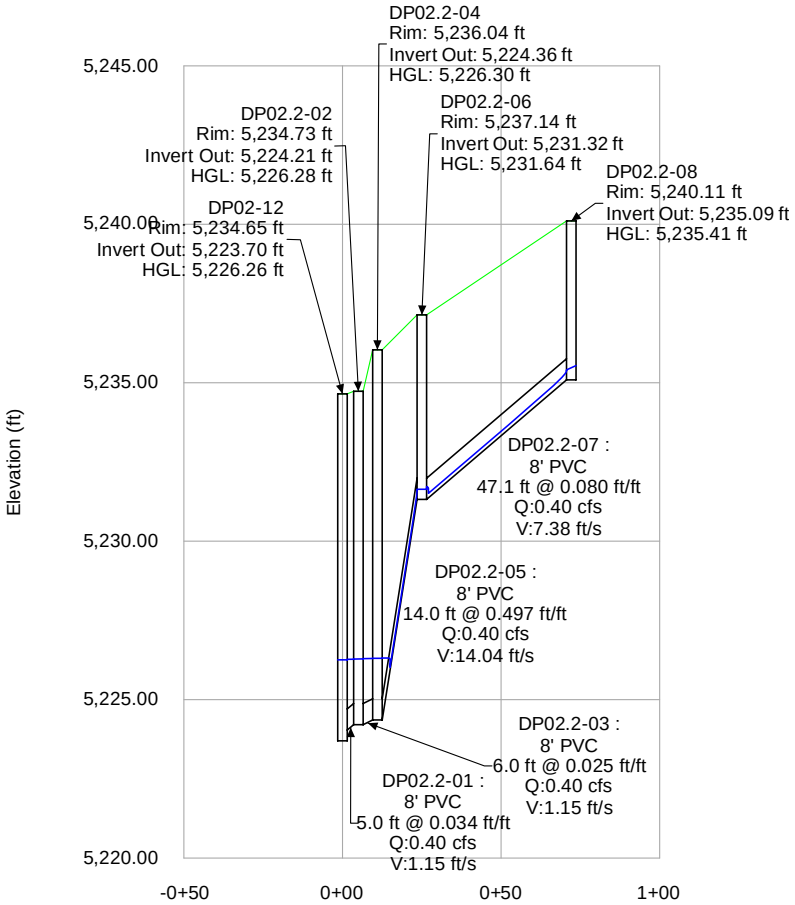
Profile Report

Engineering Profile - DP02.2 (1616200 Village Cooperative Erie.stsw)



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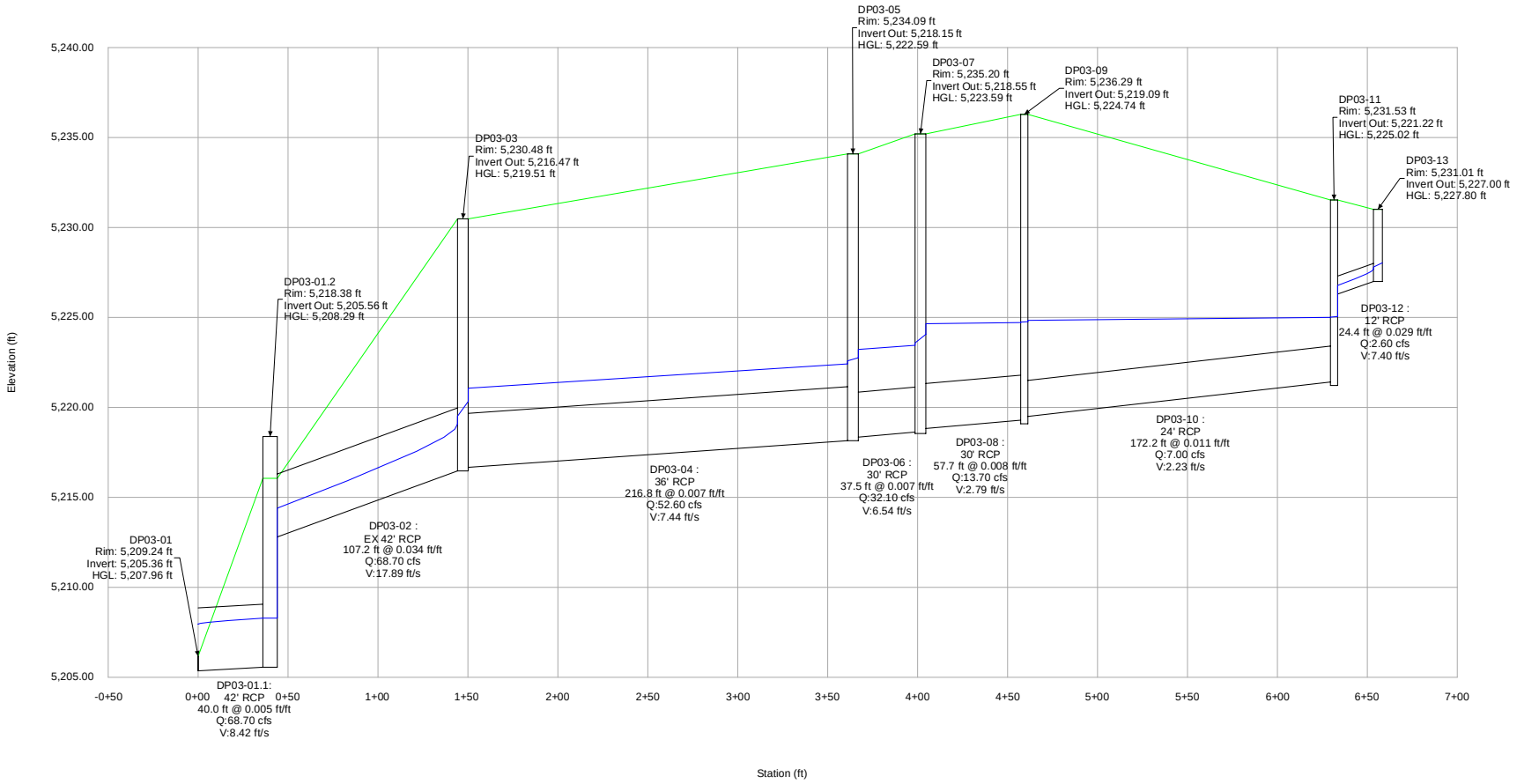
Profile Report

Engineering Profile - DP03 (1616200 Village Cooperative Erie.stsw)



Pond Volume Check
Existing Detention Pond A2

Subdivision EX Pond A2 Volume Check
Location Erie

Project Name: Village Cooperative Erie
Project No. 16162.00
By: AHC
Checked By:
Date: 10/30/2024

Existing Pond A-2 Based on Surveyed Contours									
Stage	Surveyed Elevation (NAVD88)	Surface Area (square feet)	Surface Area (acres)	Lower Surface + Upper Surface (square feet)	Average Surface Area (square feet)	Depth (feet)	Volume (cubic feet)	Cumulative Volume (cubic feet)	Cumulative Volume (acre feet)
0.00	5203.93	11,485	0.26	11,485	5,742	0.00	0	0	0.00
0.21	5204.14	12,790	0.29	24,275	12,137	0.21	2,549	2,549	0.06
1.21	5205.14	16,561	0.38	29,351	14,675	1.00	14,675	17,224	0.40
2.21	5206.14	19,441	0.45	36,002	18,001	1.00	18,001	35,225	0.81
3.21	5207.14	22,151	0.51	41,592	20,796	1.00	20,796	56,021	1.29
4.21	5208.14	24,858	0.57	47,008	23,504	1.00	23,504	79,525	1.83
6.00	5209.14	27,635	0.63	52,493	26,247	1.00	26,247	105,772	2.43
6.21	5210.14	30,534	0.70	58,169	29,085	1.00	29,085	134,856	3.10
7.02	5210.95	32,871	0.75	63,405	31,703	0.81	25,679	160,535	3.69
7.21	5211.14	33,420	0.77	66,291	33,145	0.19	6,298	166,833	3.83
Master Plan report requires 3.7 ac-ft be contained in the 100-yr which is contained at an elevation of 5210.95.									

Surveyed vs As-Built Elevations Summary

Top of Outlet Structure Grate Elevation=	5,203.93	(Surveyed 08-02-2024)	
7/9/2003 As-Built Top of Outlet Structure Grate Elevation=	5,201.79		
Assumed NGVD29 to NAVD88 Datum Conversion (feet)=	2.14	(=5203.93-5201.79)	
Lowest Point on Top of Slope Around the Spillway Area*=	5,210.98	(Surveyed 08-02-2024)	
7/9/2003 As-Built Spillway Crest Elevation (Lowest Point On Spillway)=	5,208.27	(IMPORTANT: The 2003 as-builts show that the spillway elev of 5208.27 is below the 100YR WSEL of 5209.18. i.e NO FREEBOARD WAS PROVIDED)	
Pond Stage Zero Elevation (Top of Outlet Structure)=	5,203.93	(Surveyed 08-02-2024)	
7/9/2003 As-Built Pond Stage Zero Elevation (Top of Outlet Structure)=	5,201.79		
Total 100 YR Depth of Pond Based on Survey=	7.05	Feet	(=5210.98-5203.93)
Total 100 YR Depth of Pond Based on 7/9/2003 As-Built=	6.48	Feet	(=5208.27-5201.79)

*Based on survey photos, the concrete spillway shown on the 7/9/2003 As-Builts by Hurst & Associates either doesn't exist or is completely buried

NOTE: Based on comparing the elevations shown on the 7/9/2003 As-Builts by Hurst & Associates to our surveyed elevations, there appears to be a vertical datum shift

Pond Volume Check
Existing Detention Pond A2

Subdivision EX Pond A2 Volume Check
Location Erie

Project Name: Village Cooperative Erie
Project No. 16162.00
By: AHC
Checked By:
Date: 10/30/2024

Existing Pond A-2 Stage-Storage Table (As-Built VS. Surveyed)

Stage	As-Built Elevation (NGVD29)	Assumed Datum Conversion Factor (feet)	Converted As-Built Elevation (NAVD88)	As-Built Surface Area (square feet)	As-Built Surface Area (acres)	Surveyed Surface Area (square feet)	Surveyed Surface Area (acres)	As-Built Lower Surface + Upper Surface (square feet)	As-Built Average Surface Area (square feet)	Surveyed Lower Surface + Upper Surface (square feet)	Surveyed Average Surface Area (square feet)	As-Built Depth (feet)	As-Built Volume (cubic feet)	Surveyed Depth (feet)	Surveyed Volume (cubic feet)	As-Built Cumulative Volume (cubic feet)	As-Built Cumulative Volume (acre feet)	Surveyed Cumulative Volume (cubic feet)	Surveyed Cumulative Volume (acre feet)
0.00	5201.79	+2.14	5203.93	12,632	0.29	11,485	0.26	12,632	6,316	11,485	5,742	0.00	0	0.00	0	0	0.00	0	0.00
0.21	5202.00	+2.14	5204.14	13,068	0.30	12,790	0.29	25,700	12,850	24,275	12,137	0.21	2,699	0.21	2,549	2,699	0.06	2,549	0.06
1.21	5203.00	+2.14	5205.14	15,682	0.36	16,561	0.38	28,750	14,375	29,351	14,675	1.00	14,375	1.00	14,675	17,073	0.39	17,224	0.40
2.21	5204.00	+2.14	5206.14	17,860	0.41	19,441	0.45	33,541	16,771	36,002	18,001	1.00	16,771	1.00	18,001	33,844	0.78	35,225	0.81
3.21	5205.00	+2.14	5207.14	20,038	0.46	22,151	0.51	37,897	18,949	41,592	20,796	1.00	18,949	1.00	20,796	52,793	1.21	56,021	1.29
4.21	5206.00	+2.14	5208.14	22,651	0.52	24,858	0.57	42,689	21,344	47,008	23,504	1.00	21,344	1.00	23,504	74,137	1.70	79,525	1.83
6.00	5207.00	+2.14	5209.14	25,265	0.58	27,635	0.63	47,916	23,958	52,493	26,247	1.00	23,958	1.00	26,247	98,095	2.25	105,772	2.43
6.21	5208.00	+2.14	5210.14	28,314	0.65	30,534	0.70	53,579	26,789	58,169	29,085	1.00	26,789	1.00	29,085	124,884	2.87	134,856	3.10
7.21	5209.00	+2.14	5211.14	31,363	0.72	33,420	0.77	59,677	29,839	63,954	31,977	1.00	29,839	1.00	31,977	154,723	3.55	166,833	3.83
7.39	5209.18	+2.14	5211.32	31,912	0.73	33,936	0.78	63,275	31,638	67,356	33,678	0.18	5,695	0.18	6,062	160,418	3.68	172,895	3.97
8.21	5210.00	+2.14	5212.14	34,412	0.79	n/a	n/a	66,324	33,162	n/a	n/a	0.82	27,193	n/a	n/a	187,611	4.31	n/a	n/a

Master Plan report requires 3.7 ac-ft be contained in the 100-yr which was provided in the as-builts at an elevation of 5209.18. This is 0.91' above the constructed spillway elevation i.e. no freeboard was provided based on as-builts
Based on the surveyed contours, the required 3.7 acre-feet is contained in the surveyed contours at an elevation of 5210.95

NOTES: *Based on survey photos, the concrete spillway shown on the 7/9/2003 As-Builts by Hurst & Associates either doesn't exist or is completely buried

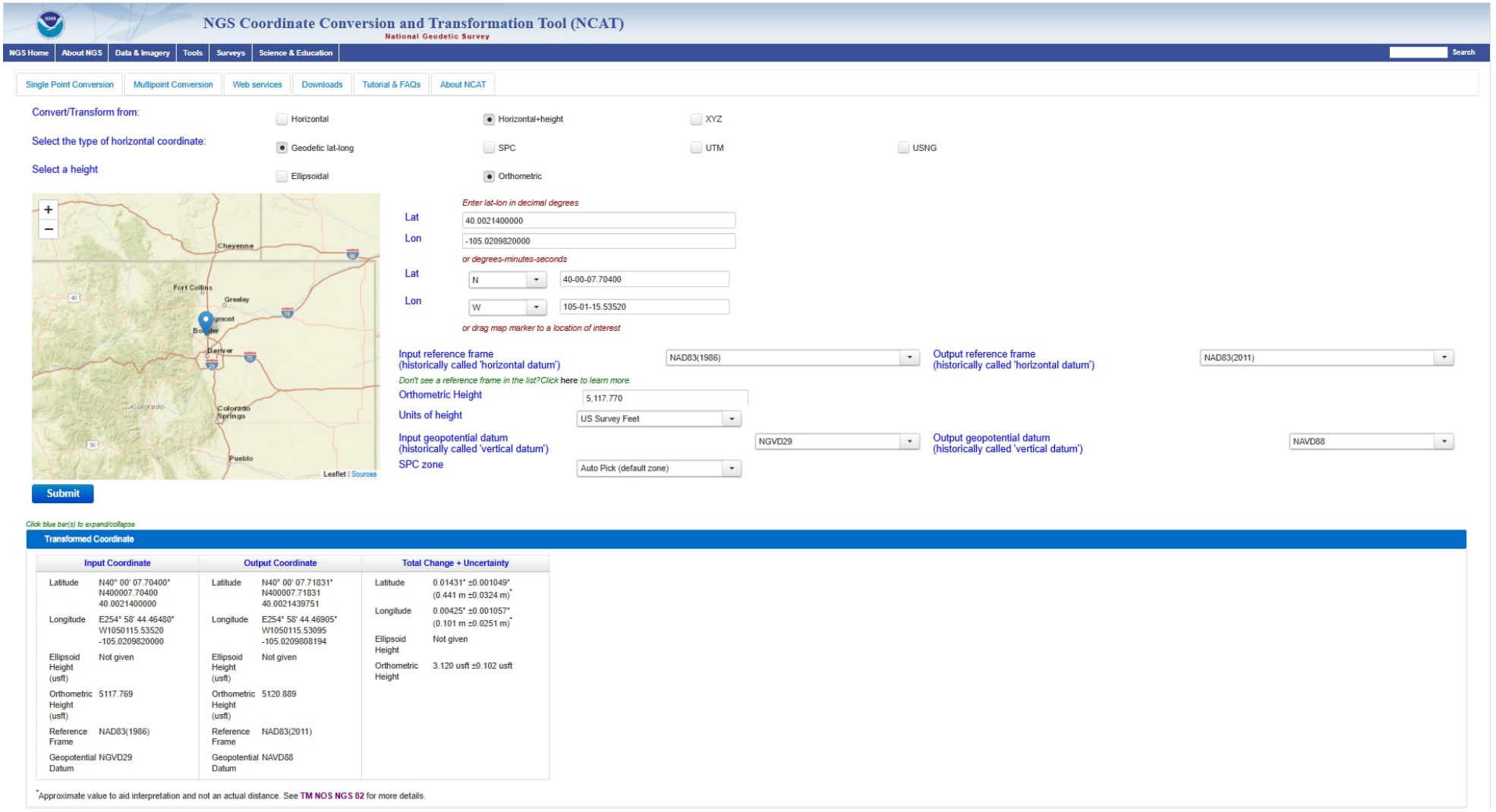
Based on comparing the elevations shown on the 7/9/2003 As-Builts by Hurst & Associates to our surveyed elevations, there appears to be a vertical datum shift

Surveyed vs As-Built Elevations Summary

Top of Outlet Structure Grate Elevation=	5,203.93	(Surveyed 08-02-2024)	
7/9/2003 As-Built Top of Outlet Structure Grate Elevation=	5,201.79		
Assumed NGVD29 to NAVD88 Datum Conversion (feet)=	2.14	(=5203.93-5201.79)	
Lowest Point on Top of Slope Around the Spillway Area*=	5,210.98	(Surveyed 08-02-2024)	
7/9/2003 As-Built Spillway Crest Elevation (Lowest Point On Spillway)=	5,208.27	(IMPORTANT: The 2003 as-builts show that the spillway elev of 5208.27 is 0.91' below the 100YR WSEL of 5209.18. i.e NO FREEBOARD WAS PROVIDED)	
Pond Stage Zero Elevation (Top of Outlet Structure)=	5,203.93	(Surveyed 08-02-2024)	
7/9/2003 As-Built Pond Stage Zero Elevation (Top of Outlet Structure)=	5,201.79		
Total 100 YR Depth of Pond Based on Survey=	7.05	Feet	(=5210.98-5203.93)
Total 100 YR Depth of Pond Based on 7/9/2003 As-Built=	6.48	Feet	(=5208.27-5201.79)

NCAT Datum Converison Tool

For Reference Only



Note: The 3.12’ conversion is unrealistic based on comparing the as-built vs surveyed elevations. Used 2.14’ conversion instead

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Village Cooperative Erie
Location: Erie

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: AHC
Checked By:
Date: 10/31/24

	STORM DRAIN SYSTEM			
	DESIGN POINT	DESIGN POINT	DESIGN POINT	Notes
Q_{100} (cfs):	68.7			Flows are the greater of proposed vs. future
Conduit	Pipe			
D_c, Pipe Diameter (in):	42			
W, Box Width (ft):	N/A			
H, Box Height (ft):	N/A			
Y_t, Tailwater Depth (ft):	5.60	(=100YR WSEL)		If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	1.60			
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	3.00			
Supercritical?	No			
Y_n, Normal Depth (ft) [Supercritical]:	0.00			
D_a, H_a (in) [Supercritical]:	N/A			$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A			
Riprap d_{50} (in) [Subcritical]:	1.65			
Required Riprap Size:	L			Fig. 9-38 or Fig. 9-36
d_{50} (in):	9			
Expansion Factor, $1/(2\tan\theta)$:	6.67			Read from Fig. 9-35 or 9-36
θ:	0.07			
Erosive Soils?	Yes			
Area of Flow, A_t (ft^2):	13.74			$A_t=Q/V$
Length of Protection, L_p (ft):	-7.0			L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	10.5			Min L=3D or 3H
Max Length (ft)	35.0			Max L=10D or 10H
Min Bottom Width, T (ft):	2.5			$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	10.5			
Design Width (ft)	2.5			
Riprap Depth (in)	18			Depth=2(d_{50})
Type II Bedding Depth (in)*	6			*Not used if Soil Riprap
Cutoff Wall	No			
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

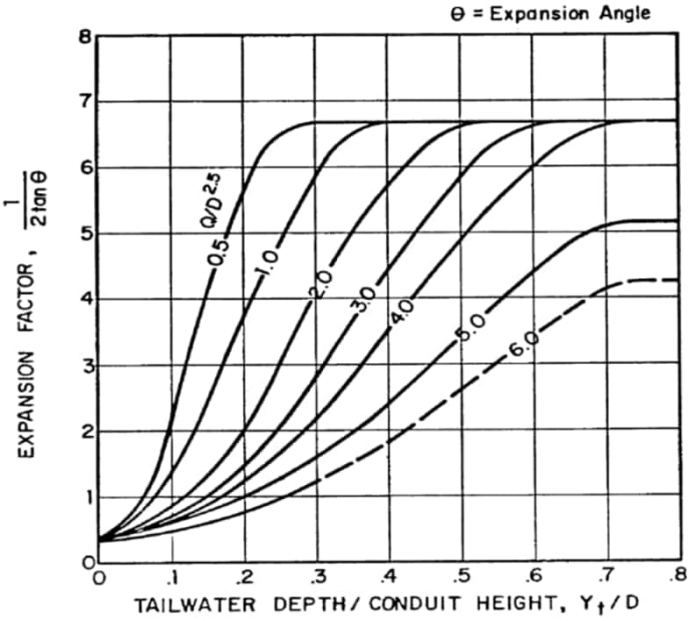


Figure 9-35. Expansion factor for circular conduits

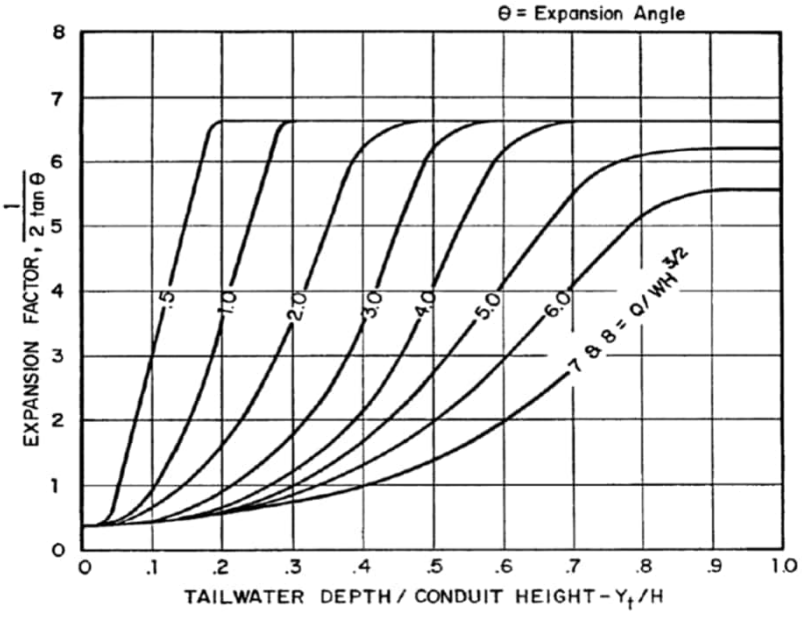


Figure 9-36. Expansion factor for rectangular conduits

APPENDIX D
REFERENCE MATERIAL

813.03 Runoff Computations, Colorado Urban Hydrograph Procedure (CUHP)

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

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

Design Storm	Rainfall Depth (in.)
2-Year	0.81
5-Year	1.11
10-Year	1.39
25-Year	1.84
50-Year	2.24
100-Year	2.68
500-Year	3.89

The hydrograph from the CUHP program must be routed through any proposed conveyance facility using the Storm Water Management Model (SWMM) or a similar method approved by the Town Engineer.

813.04 Runoff Computations, Rational Method

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

813.05 Runoff Coefficients

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

TABLE 800-7
ALLOWABLE PAVEMENT ENCROACHMENT AND DEPTH OF FLOW FOR INITIAL STORM RUNOFF

Street Classification	Maximum Encroachment*
Local	No curb overtopping; flow may spread to crown of street.
Collector	No curb overtopping; flow spread must leave the equivalent of one 10-foot driving lane clear of water.
Arterials	No curb overtopping; flow spread must leave the equivalent of two 10-foot driving lanes clear of water - one lane in each direction.
Freeways	No encroachment is allowed on any traffic lane.

* Where no curbing exists, encroachment will not extend past property lines.

The storm sewer system will commence at the point where the maximum allowable encroachment occurs.

C. In relation to street capacity for major storm, the allowable depth of flow and inundated area for the major design storm will not exceed the limitations set forth in Table 800-8:

TABLE 800-8
ALLOWABLE DEPTH OF FLOW AND INUNDATED AREA FOR MAJOR STORM RUNOFF

Street Classification	Allowable Depth and Inundated Areas
Local & Collector	Residential dwellings and public, commercial, and industrial buildings shall be no less than 12 inches above the 100-year flood at the ground line or lowest water entry of the building. The depth of water over the gutter flow line must not exceed 12 inches.
Arterial & Freeway	Residential dwellings and public, commercial, and industrial buildings must be no less than 12 inches above the 100-year flood at the ground line or lowest water entry of the building. The depth of water must not exceed the street crown to allow operation of emergency vehicles. The depth of water over gutter flow line must not exceed twelve (12).inches

D. Cross street flow: Cross street flow will occur by one of the following methods. One method is runoff which has been flowing in a gutter and then flows across the street to the opposite gutter or inlet. The second case is flow from some external source, such as a drainageway or conduit, which will flow across the crown of the street when the conduit capacity is exceeded. Allowable Cross Street Flow is set forth in Table 800 –9.

TABLE 800-9
ALLOWABLE CROSS STREET FLOW

Street Classification	Initial Storm Flow	Major Storm Flow
Local	6 inches of depth in crosspan.	12 inches of depth above gutter flow line.
Collector	Where cross-pans allowed, depth of flow must not exceed 6 inches.	12 inches of depth above gutter flow line.
Arterial/Freeway	None.	No cross flow.

815.03 Storm Sewers and Storm Inlets

Except as subsequently modified, the design of storm sewers and inlets shall conform to the criteria set forth in the Urban Storm Drainage Criteria Manual. Both the initial and major storm events shall be considered to size the storm sewer system. Storm sewers and inlets shall be of sufficient capacity to adequately carry the expected runoff from the initial design storm, minimum. There are conditions when the storm sewer system needs to be sized to convey flows greater than the initial design storm (and as much as the major storm event). The storm sewer system and subsequent storm inlets will commence at all locations where the allowable street capacity is exceeded or wherever ponding of water is likely to occur. No bubblers will be allowed. The minimum allowable pipe size to be used in storm sewers and laterals will be as listed in Table 800-10:

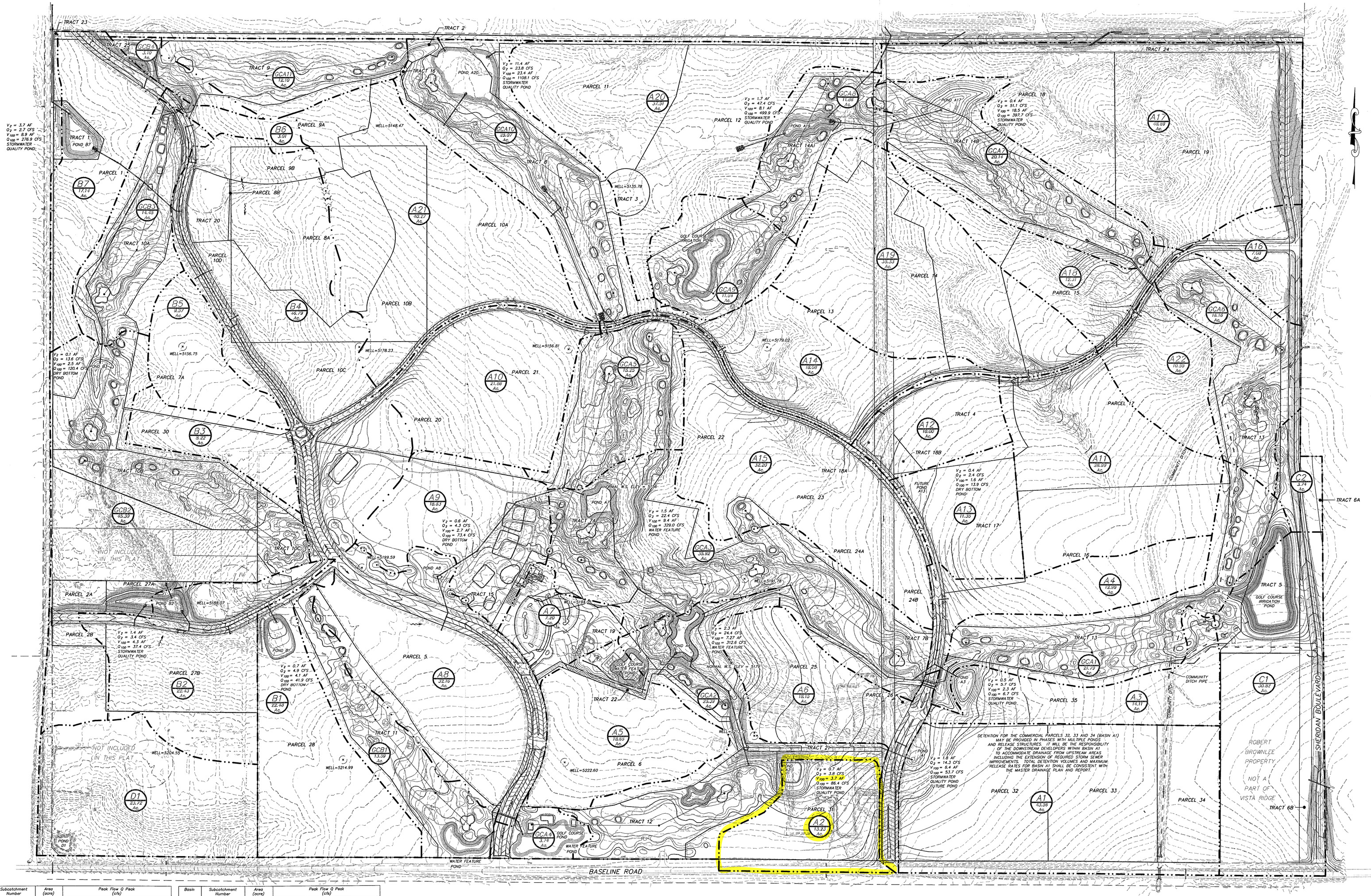
TABLE 800-10
MINIMUM ALLOWABLE PIPE SIZE

Type of Conduit	Min. Inside Pipe Dia.
Main Trunk Sewer	18"
Short Laterals	15"

Storm sewer grade shall be such that a minimum cover is maintained to withstand AASHTO HS-20 loading on the pipe. The minimum cover depends upon the pipe size, type and class, and soil bedding condition, but shall not be less the 18 inches for reinforced concrete pipe (RCP) and 24 inches for high density polyethylene (HDPE), when allowed by the Town Engineer, at any point along the pipe.

Arch pipes will be allowed where design conditions dictate, provided that the minimum cross-sectional areas will not be less than the equivalent pipe size specified above. All storm sewer conduits shall be of sufficient structural strength to withstand an H-20 design load.

The maximum allowable distance between manholes or other suitable appurtenances for cleanouts shall not exceed those listed in Table 800-11:



Basin	Subcatchment Number	Area (acre)	Peak Flow Q Peak (cfs)		
			2 Year	10 Year	100 Year
A1	101	43.56	79.0	134.0	223.0
A2	102	13.23	23.0	39.0	66.0
A3	103	14.11	25.0	42.0	70.0
A4	104	12.99	8.0	22.0	47.0
A5	105	18.65	12.0	33.0	69.0
A6	106	18.15	16.0	38.0	76.0
A7	107	7.2	9.0	18.0	33.0
A8	108	32.16	22.0	60.0	124.0
A9	109	18.63	2.0	16.0	44.0
A10	110	21.86	19.0	47.0	92.0
A11	111	28.99	20.0	54.0	111.0
A12	112	10	1.0	7.0	19.0
A13	113	11.35	14.0	29.0	52.0
A14	114	16.08	12.0	32.0	67.0
A15	115	32.2	29.0	70.0	138.0
A16	116	3.43	2.0	6.0	13.0
A17	117	53.16	38.0	103.0	213.0
A18	118	12.31	8.0	21.0	44.0
A19	119	35.33	24.0	67.0	137.0
A20	120	37.31	26.0	71.0	147.0
A21	121	40.27	28.0	77.0	158.0
A22	122	10.55	7.0	18.0	37.0
GCA1	501	21.79	2.0	16.0	44.0
GCA2	502	25.39	2.0	20.0	54.0
GCA3	503	35.92	3.0	26.0	70.0
GCA4	504	3.74	0.0	4.0	10.0

Basin	Subcatchment Number	Area (acre)	Peak Flow Q Peak (cfs)		
			2 Year	10 Year	100 Year
GCA5	505	15.25	1.0	11.0	33.0
GCA6	506	16.16	1.0	12.0	34.0
GCA7	507	20.14	2.0	15.0	42.0
GCA8	508	11.86	1.0	9.0	26.0
GCA9	509	11.84	1.0	9.0	26.0
GCA10	510	25.07	2.0	19.0	51.0
GCA11	511	12.1	2.0	9.0	23.0
B1	201	22.48	29.0	58.0	105.0
B2	202	22.43	20.0	48.0	94.0
B3	203	8.22	12.0	22.0	39.0
B4	204	46.79	26.0	70.0	147.0
B5	205	9.57	6.0	16.0	34.0
B6	206	3.61	5.0	6.0	12.0
B7	207	17.14	11.0	30.0	63.0
GCB1	601	13.59	1.0	8.0	22.0
GCB2	602	45.39	4.0	37.0	100.0
GCB3	603	14.45	1.0	12.0	33.0
GCB4	604	3.1	0.0	4.0	10.0
C1	301	30.82	3.0	19.0	51.0
C2	302	3.74	2.0	6.0	13.0
D1	401	23.72	2.0	15.0	43.0
O-A1	901	130.9	10.0	104.0	281.0
O-A2	902	42.88	3.0	27.0	74.0
O-A3	903	53.46	4.0	39.0	106.0
O-A4	904	32.1	3.0	27.0	74.0

VISTA RIDGE MASTER DRAINAGE PLAN

SCALE: HOR. 1"=200' VERT. N/A
DESIGN/APPR. JJ
DRAWN BY ROC
DATE 9/21/01
FILE G:\21423\423-GRADING
SHEET 1 OF 1

HURST & ASSOCIATES, INC
CONSULTING ENGINEERS
6950 Proof East Circle, Suite 106
Boulder, Colorado 80301 (303) 449-9115

SCOTT, COX & ASSOCIATES, INC. consulting engineers • surveyors

February 29, 2008

Mr. R. Martin Ostholthoff
Senior Planner
Town of Erie
645 Holbrook Street
P.O. Box 750
Erie, Colorado 80516

Reference: Drainage Conformance Letter
Lots 1 and 2 – Vista Ridge Filing No. 11 Replat A – Erie, Colorado
Scott, Cox & Associates Project Number 08143C

Dear Mr. Ostholthoff:

This conformance letter is submitted as the final analysis of the existing and proposed conditions for the two (2) new commercial buildings located in Lots 1 and 2, Block 1 of the Vista Ridge Filing No. 11 Replat A Subdivision in the Town of Erie, Colorado. The site is located in the SE1/4 of Section 32, Township 1N, Range 68W of the 6th Principal Meridian in the Town of Erie, Weld County, State of Colorado. The site is bounded by an existing detention pond in Tract 12 of the Vista Ridge Subdivision to the north, by existing commercial buildings to the east, by State Highway 7 to the south, and open space to the west.

This report is being prepared to accompany the Site Review and Minor Subdivision applications for the project. The purpose of this conformance letter is to address specific drainage issues related to the proposed site changes. This study meets the requirements set forth in the Town of Erie Design and Development Standards.

The 2.59 acre site was currently undeveloped with native ground covering the entire site. Overlot grading on this site was completed during the Fall of 2007 based on the previously approved Filing No. 11 site development plans. Existing drainage patterns are shown on the Preliminary Grading and Drainage Plan that is included with this report. The site currently slopes from the south to the north at grades ranging from 2.0% to 25%.

There is currently one offsite basin that contributes runoff to the project site. Runoff within Basin OS1 enters the site from the south and the State Highway 7 right-of-way. Flows will be directed to the proposed storm sewer located at the north side of the site.

The Preliminary Grading and Drainage Plan shows the proposed site plan, on-site grading and overland flow directions. Under the proposed conditions, storm water will be conveyed to the north via overland, channel, and gutter flow to the proposed inlets located near the north side of the site. From there, runoff will be routed to the existing regional detention pond (Pond A-2) via the existing storm sewer, ultimately discharging into Coal Creek.

The roof drainage will be collected in a roof drain system which will convey runoff to the proposed inlets. Proposed drainage patterns are shown on the Preliminary Grading and Drainage Plan that is included with this report.

Existing and proposed runoff calculations have been enclosed with this report and are listed in Table No. 1.

TABLE 1
RUNOFF CALCULATIONS SUMMARY

Drainage Basin		Area (acres)	5-year Peak Runoff (cfs)	10-year Peak Runoff (cfs)	100-year Peak Runoff (cfs)
Historic					
Basin H		2.59	1.36	2.78	8.55
	Total:	2.59	1.36	2.78	8.55
Proposed					
Basin A		2.59	6.53	8.57	14.33
	Total:	2.59	6.53	8.57	14.33
Offsite					
Basin OS1		0.86	2.37	3.10	5.78

In the approved Drainage Map for Vista Ridge Filing No. 11, prepared by CLC Associates, Inc. revised June 25, 2007, a detention pond (Pond A-2) located at the northwest corner of the site was designed to mitigate the increase in runoff from this portion of the proposed subdivision. This pond was designated to contain 122,620 cubic yards of storage capacity. The proposed site was contained in Basin C1 and was designed to accommodate a 100-year discharge of 16.40 cfs at a 100-yr runoff coefficient of C=0.89. The 100-yr discharge for the proposed site is 14.33 and the 100-year runoff coefficient is C=0.79. In accordance with the drainage report, proposed runoff from the developed portion of the site, Basin A and OS1, will be directed to the existing detention Pond A-2.

The previous studies have been designed to accommodate the developed runoff from the proposed site as a portion of the allowable release rate from the site and draining into the existing pond. Therefore no onsite detention storage is required.

Should you have any questions or comments regarding this letter kindly give me a call.

Sincerely,

SCOTT, COX & ASSOCIATES, INC.

Donald P. Ash, P.E.
Chief Civil Engineer

Enclosures

TABLE 800-3
RUNOFF COEFFICIENTS (C) FOR RATIONAL METHOD

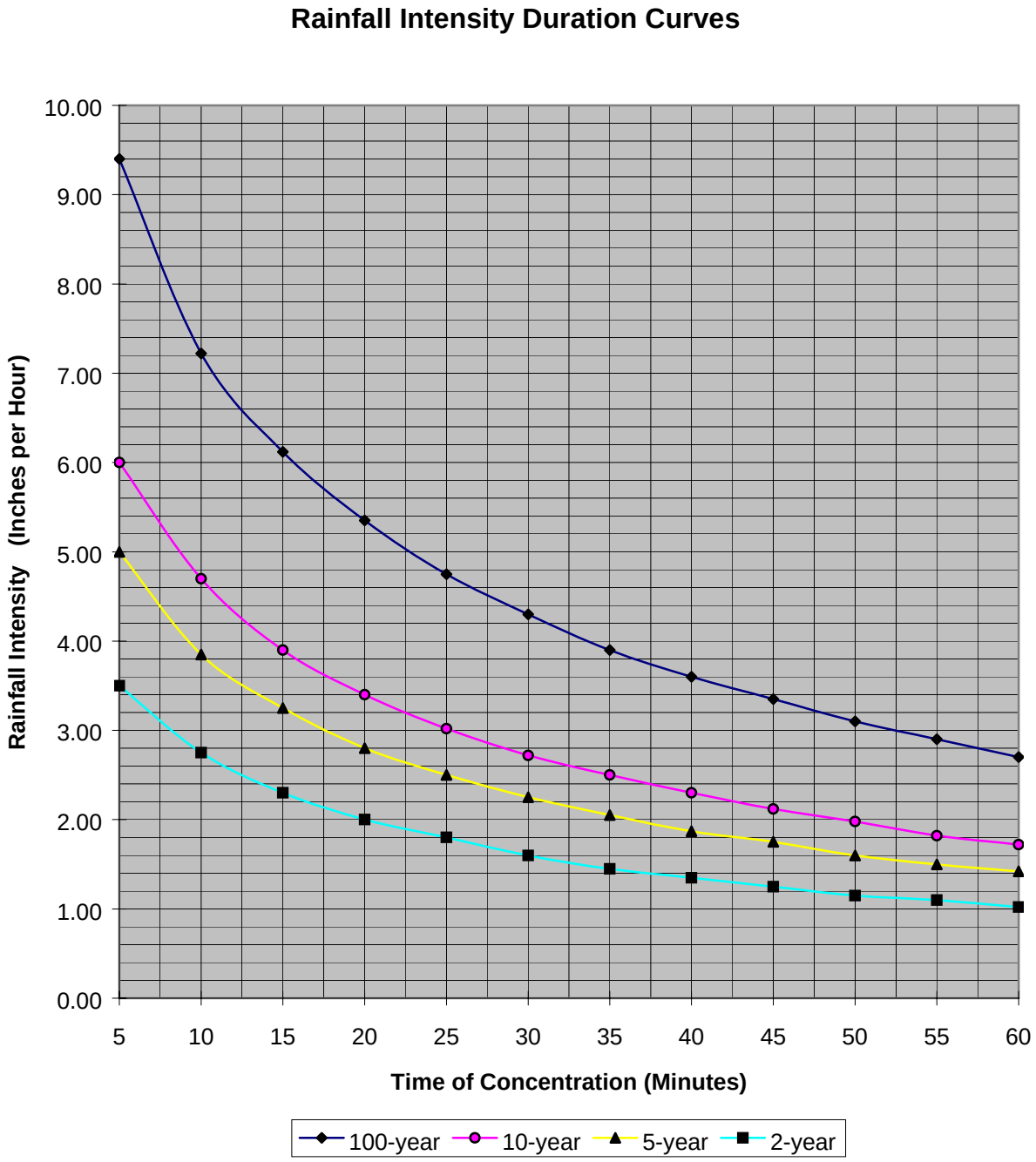
		FREQUENCY			
LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	2	5	10	100
Business					
Commercial Areas	95	.87	.87	.88	.89
Neighborhood Areas	70	.60	.65	.70	.80
Residential					
Single-Family	*	.40	.45	.50	.60
Multi-Unit (detached)	50	.45	.50	.60	.70
Multi-Unit (attached)	70	.60	.65	.70	.80
1/2 Acre Lot or Larger	*	.30	.35	.40	.60
Apartments	70	.65	.70	.70	.80
Industrial					
Light Areas	80	.71	.72	.76	.82
Heavy Areas	90	.80	.80	.85	.90
Parks, Cemeteries	7	.10	.18	.25	.45
Playgrounds	13	.15	.20	.30	.50
Schools	50	.45	.50	.60	.70
Railroad Yard Areas	20	.20	.25	.35	.45
Undeveloped Areas					
Historic Flow Analysis	2	(See "Lawns")			
Greenbelts, Agricultural					
Offsite Flow Analysis					
(when land use not defined)	45	.43	.47	.55	.65
Streets					
Paved	100	.87	.88	.90	.93
Gravel	40	.40	.45	.50	.60
Drives and Walks	96	.87	.87	.88	.89
Roofs	90	.80	.85	.90	.90
Lawns, Sandy Soil	0	.00	.01	.05	.20
Lawns, Clay Soil	0	.05	.15	.25	.50

Note: These Rational Formula coefficients may not be valid for large basins.

* Refer to Urban Storm Drainage Criteria Manual for percent impervious values.

813.06 Rainfall Intensities

The rainfall intensities to be used in the computation of runoff using the Rational Method shall be obtained from the Rainfall Intensity Duration Curves for the Town of Erie, included in these STANDARDS AND SPECIFICATIONS.



814.00 Detention

814.01 General

On site detention is required for all new development, expansion, and redevelopment. The required minimum detention volume and maximum release rates at these volumes for the 10-year and 100-year storms shall be determined in accordance with the procedure and data set forth in this criteria.

SCOTT, COX & ASSOCIATES, INC.
consulting engineers - surveyors

PROJECT #: 08143C
DATE: 2/22/2008
BY: DPA

EXISTING, BASIN H

2 YEAR WEIGHTED RUNOFF COEFFICIENT

SURFACE	AREA	C	
DRIVES AND WALKS	0.00	0.87	
ROOF	0.00	0.80	
LANDSCAPE	2.59	0.05	
TOTAL AREA	2.59	**0.05**	= WEIGHTED C

5 YEAR WEIGHTED RUNOFF COEFFICIENT

SURFACE	AREA	C	
DRIVES AND WALKS	0.00	0.87	
ROOF	0.00	0.85	
LANDSCAPE	2.59	0.15	
TOTAL AREA	2.59	**0.15**	= WEIGHTED C

10 YEAR WEIGHTED RUNOFF COEFFICIENT

SURFACE	AREA	C	
DRIVES AND WALKS	0.00	0.88	
ROOF	0.00	0.90	
LANDSCAPE	2.59	0.25	
TOTAL AREA	2.59	**0.25**	= WEIGHTED C

100 YEAR WEIGHTED RUNOFF COEFFICIENT

SURFACE	AREA	C	
DRIVES AND WALKS	0.00	0.89	
ROOF	0.00	0.90	
LANDSCAPE	2.59	0.50	
TOTAL AREA	2.59	**0.50**	= WEIGHTED C

PERCENT IMPERVIOUS 5.00

SCOTT, COX & ASSOCIATES INC.
consulting engineers - surveyors

PROJECT NO.: 08143C
DATE: 2/22/2008
BY: DPA

STORM RUNOFF HYDROLOGY
Rational Method

Condition: HISTORIC
Land Use: UNDEVELOPED
Basin Area (A) = 2.59 acres

Basin Identification: BASIN H
Design Frequencies: 2, 5, 10 & 100 year
Comments:

Runoff Coefficients (C) =

2 year	5 year	10 year	100 year
0.05	0.15	0.25	0.50

Given

Overland flow length (Lo)	425	feet (500 feet maximum)
Overland flow slope (S)	3.0	%
Channel travel length (Lc)	0.0	feet
Channel velocity (V)	2.0	feet/second

Ti, Initial time of Concentration:

Urban Basin

Ti = 1.8*(1.1-C5)*(Lo^0.5)/(S^0.333) (intial design pt.) Ti = 24.5 min.

Ti minimum for Urban Basins = 5 min.

Greater of Calculated Ti and 5 minutes Ti = 24.5 min.

Urban Basin

Ti = (Lo/180) + 10 min. (initial design pt.) Ti = 12.4 min.

Tt, Travel time of Flow:

Urban and Non-Urban Basins

Travel time, Tt = Lc/V(fps)*60 sec./min. Tt = 0.0 min.

Tc, Time of Concentration (Tc = Ti + Tt)

Non-Urban Tc = 24.5 min.
Urban Tc = 12.4 min.

Intensity (I) From Rainfall Intensity Duration Curves
Town of Erie Standards and Specifications - Section 800 - Storm Drainage Facilities

2 year	5 year	10 year	100 year
2.50	3.50	4.30	6.60

Peak Flow (Q) = C*I*A (cfs)

2 year	5 year	10 year	100 year
0.32	1.36	2.78	8.55

SCOTT, COX & ASSOCIATES, INC.
consulting engineers - surveyors

PROJECT #: 08143C
DATE: 2/22/2008
BY: DPA

PROPOSED, BASIN A

2 YEAR WEIGHTED RUNOFF COEFFICIENT

SURFACE	AREA	C	
DRIVES AND WALKS	1.63	0.87	
ROOF	0.28	0.80	
LANDSCAPE	0.67	0.05	
TOTAL AREA	2.59	**0.65**	= WEIGHTED C

5 YEAR WEIGHTED RUNOFF COEFFICIENT

SURFACE	AREA	C	
DRIVES AND WALKS	1.63	0.87	
ROOF	0.28	0.85	
LANDSCAPE	0.67	0.15	
TOTAL AREA	2.59	**0.68**	= WEIGHTED C

10 YEAR WEIGHTED RUNOFF COEFFICIENT

SURFACE	AREA	C	
DRIVES AND WALKS	1.63	0.88	
ROOF	0.28	0.90	
LANDSCAPE	0.67	0.25	
TOTAL AREA	2.59	**0.72**	= WEIGHTED C

100 YEAR WEIGHTED RUNOFF COEFFICIENT

SURFACE	AREA	C	
DRIVES AND WALKS	1.63	0.89	
ROOF	0.28	0.90	
LANDSCAPE	0.67	0.50	
TOTAL AREA	2.59	**0.79**	= WEIGHTED C

PERCENT IMPERVIOUS 66.62

SCOTT, COX & ASSOCIATES INC.
consulting engineers - surveyors

PROJECT NO.: 08143C
DATE: 2/22/2008
BY: DPA

STORM RUNOFF HYDROLOGY
Rational Method

Condition: PROPOSED
Land Use: COMMERCIAL
Basin Area (A) = 2.59 acres

Basin Identification: BASIN A
Design Frequencies: 2, 5, 10 & 100 year
Comments:

Runoff Coefficients (C) =

2 year	5 year	10 year	100 year
0.65	0.68	0.72	0.79

Given

Overland flow length (Lo)	260	feet (500 feet maximum)
Overland flow slope (S)	2.0	%
Channel travel length (Lc)	410.0	feet
Channel velocity (V)	7.0	feet/second

Ti, Initial time of Concentration:

Urban Basin

Ti = 1.8*(1.1-C5)*(Lo^0.5)/(S^0.333) (intial design pt.) Ti = 9.7 min.

Ti minimum for Urban Basins = 5 min.

Greater of Calculated Ti and 5 minutes Ti = 9.7 min.

Urban Basin

Ti = (Lo/180) + 10 min. (initial design pt.) Ti = 11.4 min.

Tt, Travel time of Flow:

Urban and Non-Urban Basins

Travel time, Tt = Lc/V(fps)*60 sec./min. Tt = 1.0 min.

Tc, Time of Concentration (Tc = Ti + Tt)

Non-Urban Tc = 10.6 min.
Urban Tc = 10.6 min.

Intensity (I) From Rainfall Intensity Duration Curves
Town of Erie Standards and Specifications - Section 800 - Storm Drainage Facilities

2 year	5 year	10 year	100 year
2.70	3.70	4.60	7.00

Peak Flow (Q) = C*I*A (cfs)

2 year	5 year	10 year	100 year
4.55	6.53	8.57	14.33

SCOTT, COX & ASSOCIATES, INC.
consulting engineers - surveyors

PROJECT #: 08143C
DATE: 2/22/2008
BY: DPA

OFF SITE, BASIN OS1

2 YEAR WEIGHTED RUNOFF COEFFICIENT

SURFACE	AREA	C	
DRIVES AND WALKS	0.48	0.87	
ROOF	0.00	0.80	
LANDSCAPE	0.38	0.05	
TOTAL AREA	0.86	**0.51**	= WEIGHTED C

5 YEAR WEIGHTED RUNOFF COEFFICIENT

SURFACE	AREA	C	
DRIVES AND WALKS	0.48	0.87	
ROOF	0.00	0.85	
LANDSCAPE	0.38	0.15	
TOTAL AREA	0.86	**0.55**	= WEIGHTED C

10 YEAR WEIGHTED RUNOFF COEFFICIENT

SURFACE	AREA	C	
DRIVES AND WALKS	0.48	0.88	
ROOF	0.00	0.90	
LANDSCAPE	0.38	0.25	
TOTAL AREA	0.86	**0.60**	= WEIGHTED C

100 YEAR WEIGHTED RUNOFF COEFFICIENT

SURFACE	AREA	C	
DRIVES AND WALKS	0.48	0.89	
ROOF	0.00	0.90	
LANDSCAPE	0.38	0.50	
TOTAL AREA	0.86	**0.72**	= WEIGHTED C

PERCENT IMPERVIOUS 52.67

SCOTT, COX & ASSOCIATES INC.
consulting engineers - surveyors

PROJECT NO.: 08143C
DATE: 2/22/2008
BY: DPA

STORM RUNOFF HYDROLOGY
Rational Method

Condition: PROPOSED
Land Use: COMMERCIAL
Basin Area (A) = 0.86 acres

Basin Identification: BASIN OS1
Design Frequencies: 2, 5, 10 & 100 year
Comments:

Runoff Coefficients (C) =

2 year	5 year	10 year	100 year
0.51	0.55	0.60	0.72

Given

Overland flow length (Lo)	80	feet (500 feet maximum)
Overland flow slope (S)	5.0	%
Channel travel length (Lc)	0.0	feet
Channel velocity (V)	2.0	feet/second

Ti, Initial time of Concentration:

Urban Basin

Ti = 1.8*(1.1-C5)*(Lo^0.5)/(S^0.333) (intial design pt.) Ti = 5.1 min.

Ti minimum for Urban Basins = 5 min.

Greater of Calculated Ti and 5 minutes Ti = 5.1 min.

Urban Basin

Ti = (Lo/180) + 10 min. (initial design pt.) Ti = 10.4 min.

Tt, Travel time of Flow:

Urban and Non-Urban Basins

Travel time, Tt = Lc/V(fps)*60 sec./min. Tt = 0.0 min.

Tc, Time of Concentration (Tc = Ti + Tt)

Non-Urban Tc = 5.1 min.
Urban Tc = 5.1 min.

Intensity (I) From Rainfall Intensity Duration Curves
Town of Erie Standards and Specifications - Section 800 - Storm Drainage Facilities

2 year	5 year	10 year	100 year
3.50	5.00	6.00	9.40

Peak Flow (Q) = C*I*A (cfs)

2 year	5 year	10 year	100 year
1.53	2.37	3.10	5.78

LEGEND

LOTS AND BOUNDARIES
PROPERTY LINE

STREETS
PROPOSED CURB AND GUTTER
EXISTING CURB AND GUTTER
PROPOSED SIDEWALK
EXISTING SIDEWALK

GRADING
PROPOSED RETAINING WALL
EXISTING MINOR CONTOUR
EXISTING MAJOR CONTOUR
PROPOSED MINOR CONTOUR
PROPOSED MAJOR CONTOUR
PROPOSED FLOW DIRECTION

STORM DRAIN
PROPOSED STORM SEWER W/ PIPE SIZE, MANHOLE & INLET

F6 (0.32 | 0.80)
DRAINAGE BASIN DESIGNATION
100YR RUNOFF COEFFICIENT
AREA IN ACRES

BASIN SUMMARY TABLE

BASIN	BASIN AREA (ACRES)	RUNOFF 5-YEAR (CFS)	RUNOFF 100-YEAR (CFS)
A1	1.33	5.43	10.40
A2	0.58	2.54	4.88
A3	0.39	1.63	3.13
A4	0.17	0.71	1.43
B1	0.47	2.05	3.94
B1.1	0.57	2.46	4.74
B2	0.73	3.04	5.83
B3	0.51	2.17	4.13
B4	0.21	0.90	1.77
B5	0.26	0.89	2.14
C1	2.59	9.03	16.40
C2	1.35	4.70	11.31
D1	4.43	15.42	28.01

DETENTION POND SUMMARY TABLE

	WQCV	10-YR	10-YR + WQCV	100-YR	100-YR + WQCV
VOLUME REQUIRED (CU. FT.)	25,251	52,493	77,745	97,369	122,620
VOLUME PROVIDED (CU. FT.)	25,251	52,493	**77,745**	97,369	**122,620**
WATER SURFACE ELEVATION	5202.83		**5205.59**		**5207.39**

BENCHMARK

THE NORTH QUARTER CORNER OF SECTION 32 BEING A 3.5" ALUMINUM CAP STAMPED PLS 14108, 1994. ELEVATION 5117.77 (NGVD 29).

NOTE – BENCHMARK VERIFICATION: CONTRACTOR SHALL USE BENCHMARKS AND DATUMS SHOWN HEREON TO SET PROJECT BENCHMARK(S), BY RUNNING A LEVEL LOOP BETWEEN AT LEAST TWO BENCHMARKS, AND SHALL PROVIDE SURVEY NOTES OF SUCH TO PROJECT ENGINEER PRIOR TO COMMENCING CONSTRUCTION.

NORTH
40 0 20 40

GENERAL NOTES

1. THIS PLAN IS INTENDED TO BE USED AS A REFERENCE IN CONJUNCTION WITH THE FINAL DRAINAGE REPORT. DO NOT USE THIS PLAN FOR CONSTRUCTION.
2. ALL STORM SEWER CONSTRUCTION (ie PIPE LINE, INLETS, MANHOLES) SHALL BE IN ACCORDANCE WITH TOWN OF ERIE STANDARDS AND SPECIFICATIONS
3. THE CONTRACTOR SHALL PHASE GRADING ACTIVITIES TO LIMIT THE POSSIBILITY OF EROSION

TRACT 21 VISTA RIDGE
TEMPORARY DIVERSION SWALE
EXISTING DETENTION POND A-2
TRACT 12 VISTA RIDGE
LOT 5, BLOCK 1
LOT 1, BLOCK 1
FFE=5234.00
LOT 2, BLOCK 1
FFE=5235.25
LOT 3, BLOCK 1
LOT 4, BLOCK 1
LOT 6, BLOCK 1
TRACT A
MOUNTAIN VIEW BLVD.
COLORADO STATE HIGHWAY 7
12" ROOF DRAIN
5' TYPE R INLET
3' TYPE C INLET
10' TYPE R INLET
15" RCP
18" RCP
21" RCP
24" RCP
30" RCP
36" RCP
18" RCP STM (PRIVATE)
24" RCP STM (PRIVATE)
30" RCP STM (PRIVATE)
BSTUB

THIS DRAWING IS INTENDED
FOR REFERENCE ONLY
NOT TO BE USED FOR CONSTRUCTION

CLC ASSOCIATES
8480 E. ORCHARD RD.
SUITE 3000
GREENWOOD VILLAGE
COLORADO 80111
P 303 770 8800
F 303 770 9349
CLCASSOC.COM
ARCHITECTURE
ENGINEERING PLANNING
LANDSCAPE ARCHITECTURE
LAND SURVEYING

DRAINAGE MAP

VISTA RIDGE DEVELOPMENT
FILING NO. 11, LOT 1, LOT 2, BLOCK 1 AND TRACT A

COLORADO HIGHWAY 7 & MOUNTAIN VIEW BLVD.
ERIE, COLORADO

DATE	DESCRIPTION
05/15/07	1ST SUBMITTAL
06/25/07	2ND SUBMITTAL

DRAINAGE MAP

PROJECT #: 06.0053
DRAWN BY: CH
DESIGNED BY: JHB
CHECKED BY: RV

DR 1

SCOTT, COX & ASSOCIATES, INC. consulting engineers • surveyors

May 6, 2008

Mr. R. Martin Ostholthoff
Town of Erie
645 Holbrook Street
P.O. Box 750
Erie, Colorado 80516

Reference: Drainage Conformance Letter
Lot 5 Minor Subdivision – Vista Ridge Filing No. 11 – Erie, Colorado
Scott, Cox & Associates Project Number 08143C

Dear Mr. Ostholthoff:

This conformance letter is submitted as the final analysis of the existing and proposed conditions for the three (3) new commercial buildings located in Lot 5, Block 1 of the Vista Ridge Filing No. 11 Subdivision in the Town of Erie, Colorado. The site is located in the SE1/4 of Section 32, Township 1N, Range 68W of the 6th Principal Meridian in the Town of Erie, Weld County, State of Colorado. The site is bounded by an existing detention pond in Tract 12 of the Vista Ridge Subdivision to the north, by existing commercial buildings to the east, by State Highway 7 to the south, and open space to the west.

This report is being prepared to accompany the Minor Subdivision application for the project. The purpose of this conformance letter is to address specific drainage issues related to the proposed site changes. This study meets the requirements set forth in the Town of Erie Design and Development Standards.

The 4.43 acre site was currently undeveloped with native ground covering the entire site. Overlot grading on this site was completed during the Fall of 2007 based on the previously approved Filing No. 11 site development plans. The site currently slopes from the south to the north at grades ranging from 2.0% to 25%.

Under the proposed conditions, storm water will be conveyed to the north via overland, channel, and gutter flow to the proposed inlets located near the north side of the site. From there, runoff will be routed to the existing regional detention pond (Pond A-2) via the existing storm sewer, ultimately discharging into Coal Creek. The roof drainage will be collected in a roof drain system which will convey runoff to the proposed inlets.

Existing and proposed runoff calculations have been enclosed with this report and are listed in Table No. 1.

TABLE 1
RUNOFF CALCULATIONS SUMMARY

Drainage Basin		Area (acres)	5-year Peak Runoff (cfs)	10-year Peak Runoff (cfs)	100-year Peak Runoff (cfs)
Historic					
Basin H		4.43	2.13	4.43	13.51
	Total:	4.43	2.13	4.43	13.51
Proposed					
Basin D		4.43	8.35	10.85	19.49
	Total:	4.43	8.35	10.85	19.49

In the approved Phase III Drainage Study for Vista Ridge Filing No. 11, prepared by CLC Associates, Inc. revised May 2007, a detention pond (Pond A-2) located at the northwest corner of the site was designed to mitigate the increase in runoff from this portion of the proposed subdivision. CLC determined the existing detention pond volume was 122,620 cubic feet (CF) at a 100-year water surface elevation (WSEL) of 5207.39. The total detention pond volume provided was 170,204 CF at a WSEL of 5209.00. The proposed site was contained in Basin D1 and was designed to accommodate a 100-year discharge of 24.77 cfs at a 100-yr runoff coefficient of C=0.89. The 100-yr discharge for the proposed site is 19.49 and the 100-year runoff coefficient is C=0.80. In accordance with the drainage report, proposed runoff from the developed portion of the site, Basin D, will be directed to the existing detention Pond A-2.

The previous studies have been designed to accommodate the developed runoff from the proposed site as a portion of the allowable release rate from the site and draining into the existing pond. Therefore no onsite detention storage is required.

Should you have any questions or comments regarding this letter kindly give me a call.

Sincerely,

SCOTT, COX & ASSOCIATES, INC.

Donald P. Ash, P.E.
Chief Civil Engineer

Enclosures

TABLE 800-3
RUNOFF COEFFICIENTS (C) FOR RATIONAL METHOD

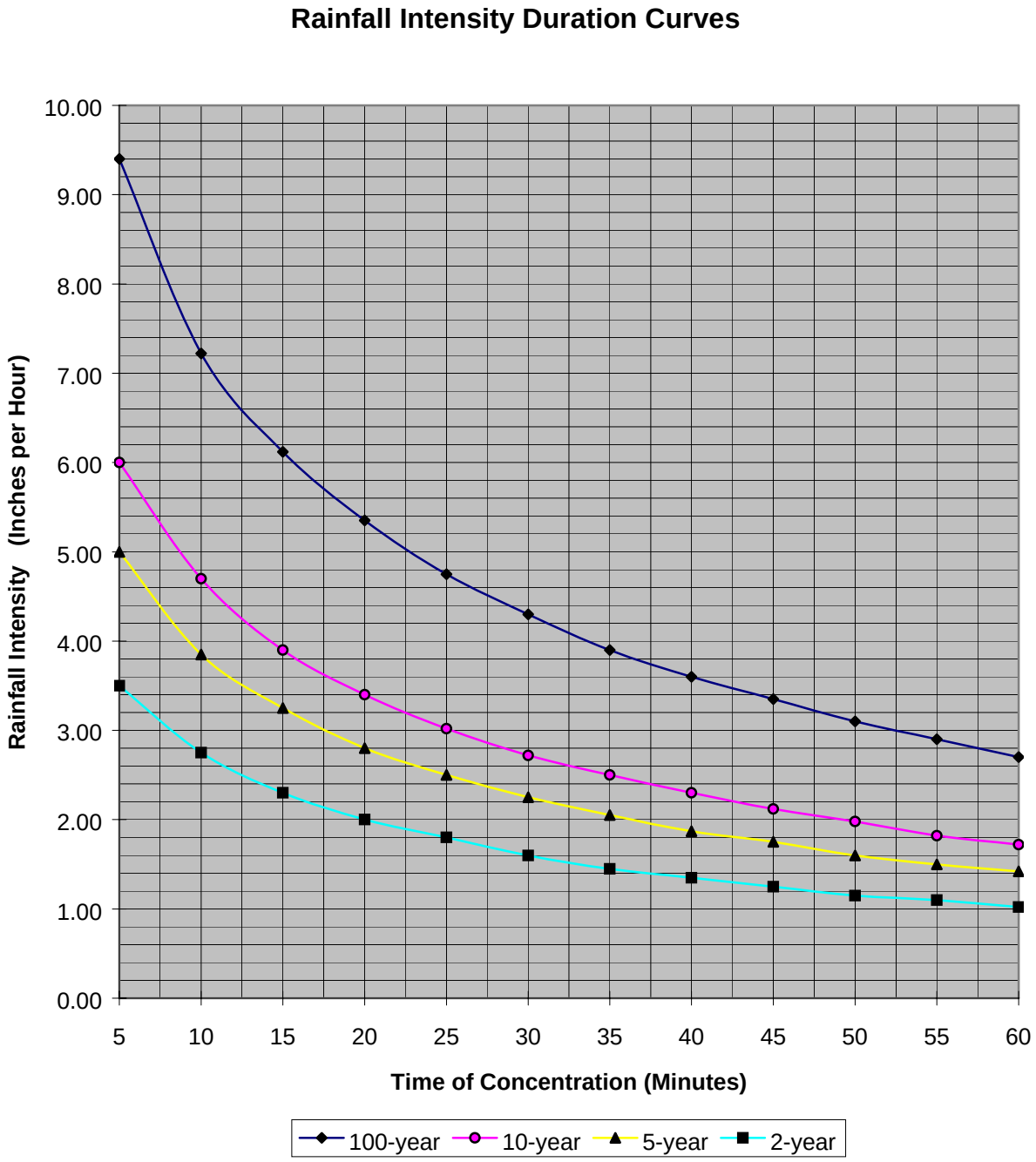
		FREQUENCY			
LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	2	5	10	100
Business					
Commercial Areas	95	.87	.87	.88	.89
Neighborhood Areas	70	.60	.65	.70	.80
Residential					
Single-Family	*	.40	.45	.50	.60
Multi-Unit (detached)	50	.45	.50	.60	.70
Multi-Unit (attached)	70	.60	.65	.70	.80
1/2 Acre Lot or Larger	*	.30	.35	.40	.60
Apartments	70	.65	.70	.70	.80
Industrial					
Light Areas	80	.71	.72	.76	.82
Heavy Areas	90	.80	.80	.85	.90
Parks, Cemeteries	7	.10	.18	.25	.45
Playgrounds	13	.15	.20	.30	.50
Schools	50	.45	.50	.60	.70
Railroad Yard Areas	20	.20	.25	.35	.45
Undeveloped Areas					
Historic Flow Analysis	2	(See "Lawns")			
Greenbelts, Agricultural					
Offsite Flow Analysis					
(when land use not defined)	45	.43	.47	.55	.65
Streets					
Paved	100	.87	.88	.90	.93
Gravel	40	.40	.45	.50	.60
Drives and Walks	96	.87	.87	.88	.89
Roofs	90	.80	.85	.90	.90
Lawns, Sandy Soil	0	.00	.01	.05	.20
Lawns, Clay Soil	0	.05	.15	.25	.50

Note: These Rational Formula coefficients may not be valid for large basins.

* Refer to Urban Storm Drainage Criteria Manual for percent impervious values.

813.06 Rainfall Intensities

The rainfall intensities to be used in the computation of runoff using the Rational Method shall be obtained from the Rainfall Intensity Duration Curves for the Town of Erie, included in these STANDARDS AND SPECIFICATIONS.



814.00 Detention

814.01 General

On site detention is required for all new development, expansion, and redevelopment. The required minimum detention volume and maximum release rates at these volumes for the 10-year and 100-year storms shall be determined in accordance with the procedure and data set forth in this criteria.

SCOTT, COX & ASSOCIATES INC.
consulting engineers - surveyors

PROJECT NO.: 08143C
DATE: 5/6/2008
BY: DPA

STORM RUNOFF HYDROLOGY
Rational Method

Condition: HISTORIC
Land Use: UNDEVELOPED
Basin Area (A) = 4.43 acres

Basin Identification: BASIN H
Design Frequencies: 2, 5, 10 & 100 year
Comments:

Runoff Coefficients (C) =

2 year	5 year	10 year	100 year
0.05	0.15	0.25	0.50

Town of Erie Table 800-3

Given

Overland flow length (Lo)	250	feet (500 feet maximum)
Overland flow slope (S)	6.8	%
Channel travel length (Lc)	475.0	feet
Channel velocity (V)	3.0	feet/second

Ti, Initial time of Concentration:

Urban Basin

Ti = 1.8*(1.1-C5)*(Lo^0.5)/(S^0.333) (intial design pt.) Ti = 14.3 min.

Ti minimum for Urban Basins = 5 min.

Greater of Calculated Ti and 5 minutes Ti = 14.3 min.

Urban Basin

Ti = (Lo/180) + 10 min. (initial design pt.) Ti = 11.4 min.

Tt, Travel time of Flow:

Urban and Non-Urban Basins

Travel time, Tt = Lc/V(fps)*60 sec./min. Tt = 2.6 min.

Tc, Time of Concentration (Tc = Ti + Tt)

Non-Urban Tc = 16.9 min.
Urban Tc = 14.0 min.

Intensity (I) From Rainfall Intensity Duration Curves
Town of Erie Standards and Specifications - Section 800 - Storm Drainage Facilities

2 year	5 year	10 year	100 year
2.30	3.20	4.00	6.10

Peak Flow (Q) = C*I*A (cfs)

2 year	5 year	10 year	100 year
0.51	2.13	4.43	13.51

SCOTT, COX & ASSOCIATES INC.
consulting engineers - surveyors

PROJECT NO.: 08143C
DATE: 5/6/2008
BY: DPA

STORM RUNOFF HYDROLOGY
Rational Method

Condition: PROPOSED
Land Use: COMMERCIAL
Basin Area (A) = 4.43 acres

Basin Identification: BASIN D
Design Frequencies: 2, 5, 10 & 100 year
Comments:

Runoff Coefficients (C) =

2 year	5 year	10 year	100 year
0.60	0.65	0.70	0.80

Town of Erie Table 800-3
Business Neighborhood Area

Given

Overland flow length (Lo)	250	feet (500 feet maximum)
Overland flow slope (S)	4.4	%
Channel travel length (Lc)	600.0	feet
Channel velocity (V)	1.1	feet/second

Ti, Initial time of Concentration:

Urban Basin

Ti = 1.8*(1.1-C5)*(Lo^0.5)/(S^0.333) (intial design pt.) Ti = 7.8 min.

Ti minimum for Urban Basins = 5 min.

Greater of Calculated Ti and 5 minutes Ti = 7.8 min.

Urban Basin

Ti = (Lo/180) + 10 min. (initial design pt.) Ti = 11.4 min.

Tt, Travel time of Flow:

Urban and Non-Urban Basins

Travel time, Tt = Lc/V(fps)*60 sec./min. Tt = 9.1 min.

Tc, Time of Concentration (Tc = Ti + Tt)

Non-Urban Tc = 16.9 min.
Urban Tc = 16.9 min.

Intensity (I) From Rainfall Intensity Duration Curves
Town of Erie Standards and Specifications - Section 800 - Storm Drainage Facilities

2 year	5 year	10 year	100 year
2.10	2.90	3.50	5.50

Peak Flow (Q) = C*I*A (cfs)

2 year	5 year	10 year	100 year
5.58	8.35	10.85	19.49

LEGEND

LOTS AND BOUNDARIES
PROPERTY LINE

STREETS
PROPOSED CURB AND GUTTER
EXISTING CURB AND GUTTER
PROPOSED SIDEWALK
EXISTING SIDEWALK

GRADING
PROPOSED RETAINING WALL
EXISTING MINOR CONTOUR
EXISTING MAJOR CONTOUR
PROPOSED MINOR CONTOUR
PROPOSED MAJOR CONTOUR
PROPOSED FLOW DIRECTION

STORM DRAIN
PROPOSED STORM SEWER W/ PIPE SIZE, MANHOLE & INLET

F6 (0.32 | 0.80)
DRAINAGE BASIN DESIGNATION
100YR RUNOFF COEFFICIENT
AREA IN ACRES

BASIN SUMMARY TABLE

BASIN	BASIN AREA (ACRES)	RUNOFF 5-YEAR (CFS)	RUNOFF 100-YEAR (CFS)
A1	1.33	5.43	10.40
A2	0.58	2.54	4.88
A3	0.39	1.63	3.13
A4	0.17	0.71	1.43
B1	0.47	2.05	3.94
B1.1	0.57	2.46	4.74
B2	0.73	3.04	5.83
B3	0.51	2.17	4.13
B4	0.21	0.90	1.77
B5	0.26	0.89	2.14
C1	2.59	9.03	16.40
C2	1.35	4.70	11.31
D1	4.43	15.42	28.01

DETENTION POND SUMMARY TABLE

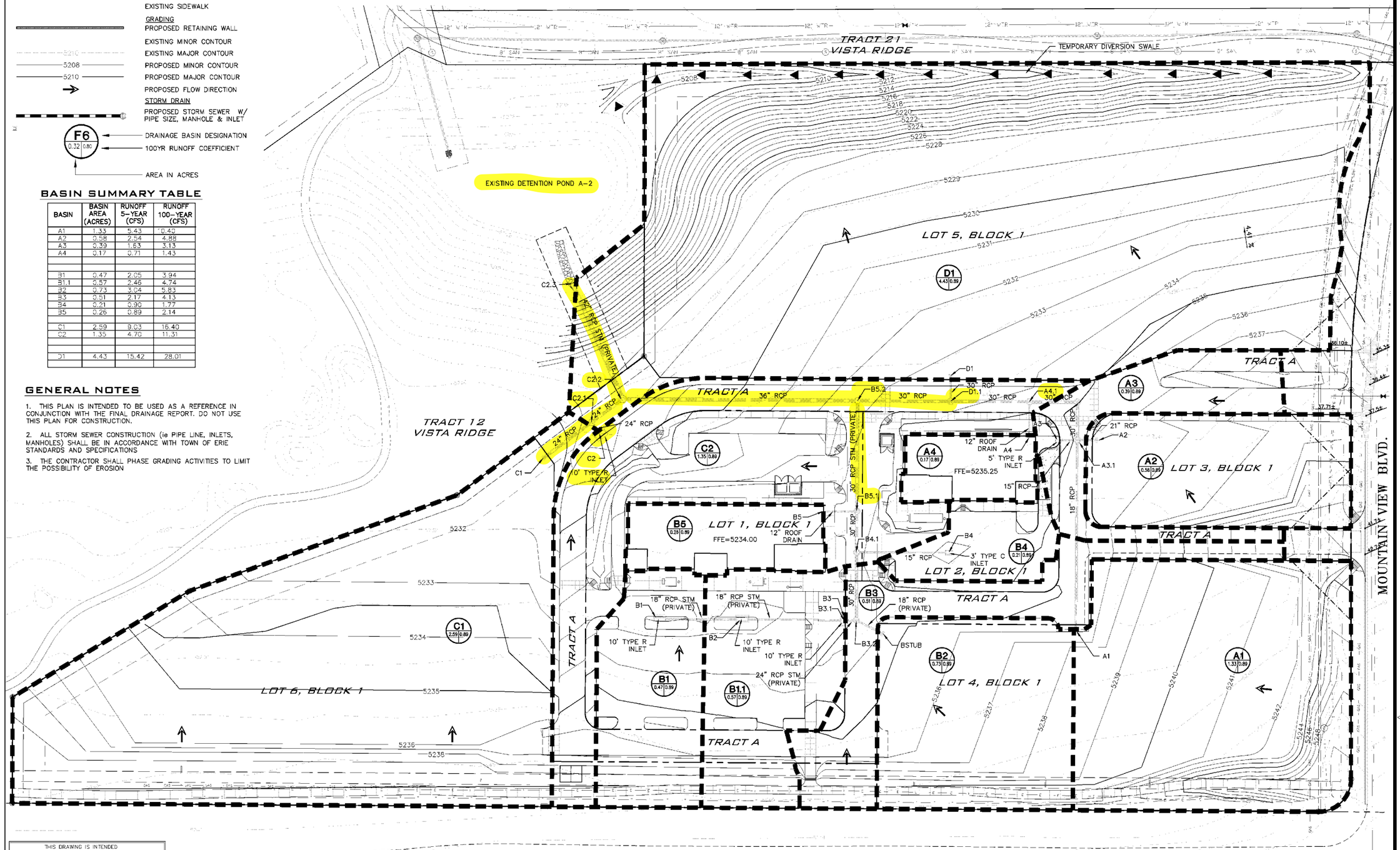
	WQCV	10-YR	10-YR + WQCV	100-YR	100-YR + WQCV
VOLUME REQUIRED (CU. FT.)	25,251	52,493	77,745	97,369	122,620
VOLUME PROVIDED (CU. FT.)	25,251	52,493	**77,745**	97,369	**122,620**
WATER SURFACE ELEVATION	5202.83		**5205.59**		**5207.39**

BENCHMARK

THE NORTH QUARTER CORNER OF SECTION 32 BEING A 3.5" ALUMINUM CAP STAMPED PLS 14108, 1994. ELEVATION 5117.77 (NGVD 29).

NOTE – BENCHMARK VERIFICATION: CONTRACTOR SHALL USE BENCHMARKS AND DATUMS SHOWN HEREON TO SET PROJECT BENCHMARK(S), BY RUNNING A LEVEL LOOP BETWEEN AT LEAST TWO BENCHMARKS, AND SHALL PROVIDE SURVEY NOTES OF SUCH TO PROJECT ENGINEER PRIOR TO COMMENCING CONSTRUCTION.

NORTH
40 0 20 40



GENERAL NOTES

1. THIS PLAN IS INTENDED TO BE USED AS A REFERENCE IN CONJUNCTION WITH THE FINAL DRAINAGE REPORT. DO NOT USE THIS PLAN FOR CONSTRUCTION.
2. ALL STORM SEWER CONSTRUCTION (ie PIPE LINE, INLETS, MANHOLES) SHALL BE IN ACCORDANCE WITH TOWN OF ERIE STANDARDS AND SPECIFICATIONS
3. THE CONTRACTOR SHALL PHASE GRADING ACTIVITIES TO LIMIT THE POSSIBILITY OF EROSION

THIS DRAWING IS INTENDED
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CLC ASSOCIATES
8480 E. ORCHARD RD.
SUITE 3000
GREENWOOD VILLAGE
COLORADO 80111
P 303 770 8800
F 303 770 8349
CLCASSOC.COM

ARCHITECTURE
ENGINEERING PLANNING
LANDSCAPE ARCHITECTURE
LAND SURVEYING

DRAINAGE MAP

VISTA RIDGE DEVELOPMENT
FILING NO. 11, LOT 1, LOT 2, BLOCK 1 AND TRACT A

COLORADO HIGHWAY 7 & MOUNTAIN VIEW BLVD.
ERIE, COLORADO

DATE	DESCRIPTION
05/15/07	1ST SUBMITTAL
06/25/07	2ND SUBMITTAL

DRAINAGE MAP

PROJECT #: 06.0053
DRAWN BY: CH
DESIGNED BY: JHB
CHECKED BY: RV

DR 1

PARK ENGINEERING
CONSULTANTS

Goddard School
at Vista Ridge Development
Drainage Report
& Erosion Control Plan

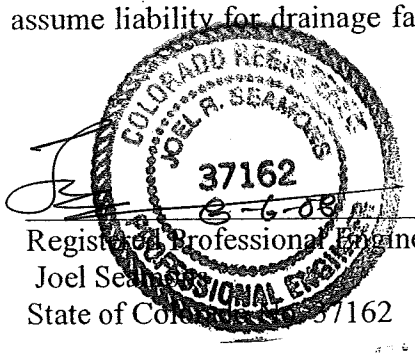
April 2008
Revised July 2008

By
Park Engineering
420 21st Ave, Suite 101
Longmont, CO 80501

420 21st Ave. Suite 101 • Longmont, CO 80501 • (303) 651-6626 • FAX (303) 651-0331
E-mail don@parkengineering.net

Standards Statement

"I hereby affirm that this report and plan for the final drainage design & erosion control plan of Lot 5-A & Tract B, Block 1, Filing 11 of the Vista Ridge Development, was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Erie Standards and Specifications for Design and Construction of Public Improvements for the owners thereof. I understand that the Town of Erie does not and will not assume liability for drainage facilities design by others."



Registered Professional Engineer
Joel Sea[illegible]
State of Co[illegible]7162

Table of Contents

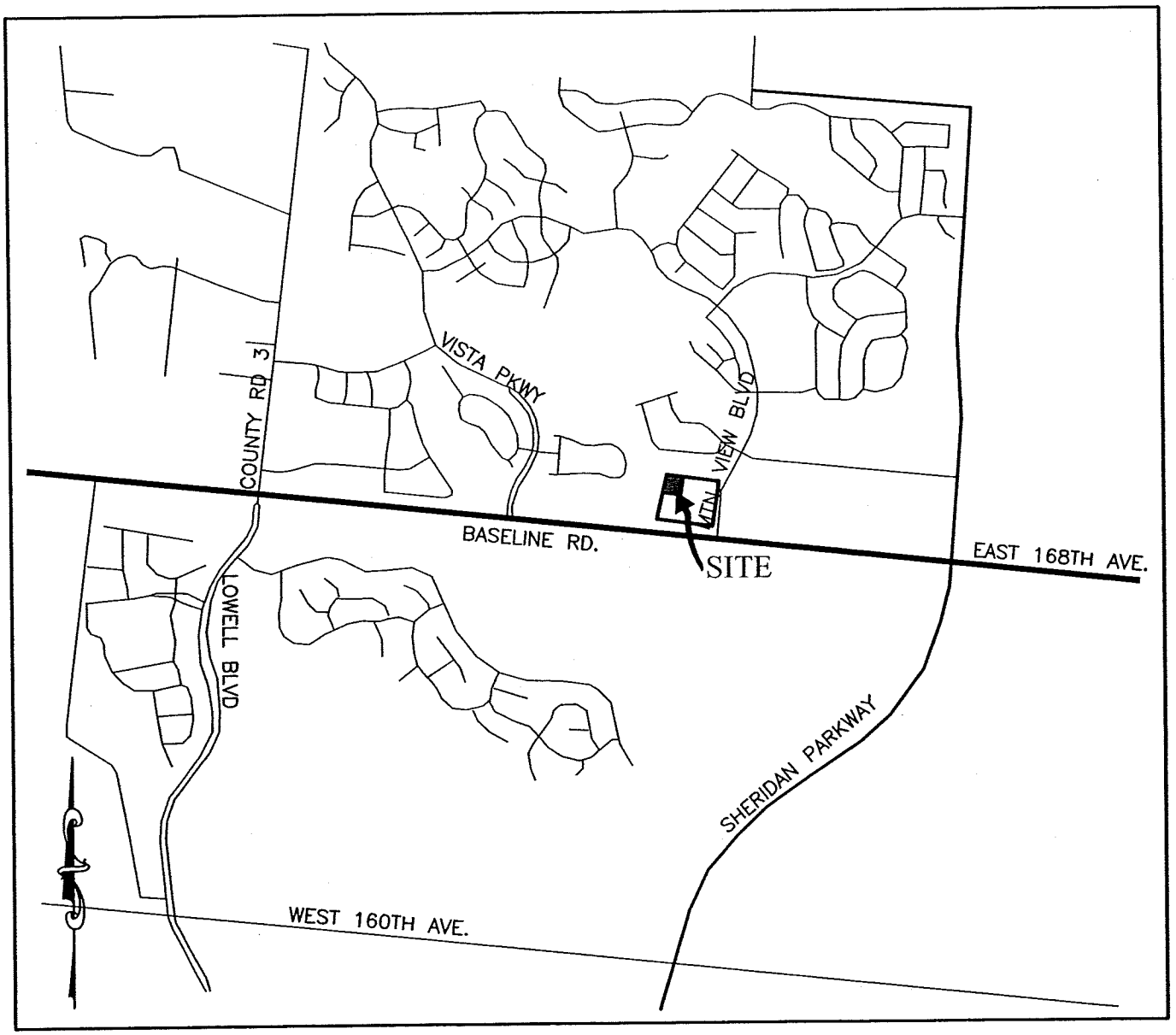
Section 1 - General Location and Description

1.1 Project Description and Location

The proposed location for the new Goddard School site is bounded on the south by State Highway 7, on the east by vacant land (further east is Mountain View Boulevard), on the north by commercial (golf course) and on the west by a regional detention pond. The site is Vista Ridge Filing No. 11, Lot 5-A & Tract B, Block 1 located in the southeast ¼ of Section 32, Township 1 North, Range 68 West, of the 6th Principal Meridian in the state of Colorado. See next page for vicinity map.

1.2 Soil Description

The soils on site are described by Terracon in their report as bores 5 & 6 for the building and P3 for the parking area. The site has been filled with import that is a sandy lean clay with claystone fragments. Groundwater was not found in any of these 3 bores.



VICINITY MAP

N.T.S.

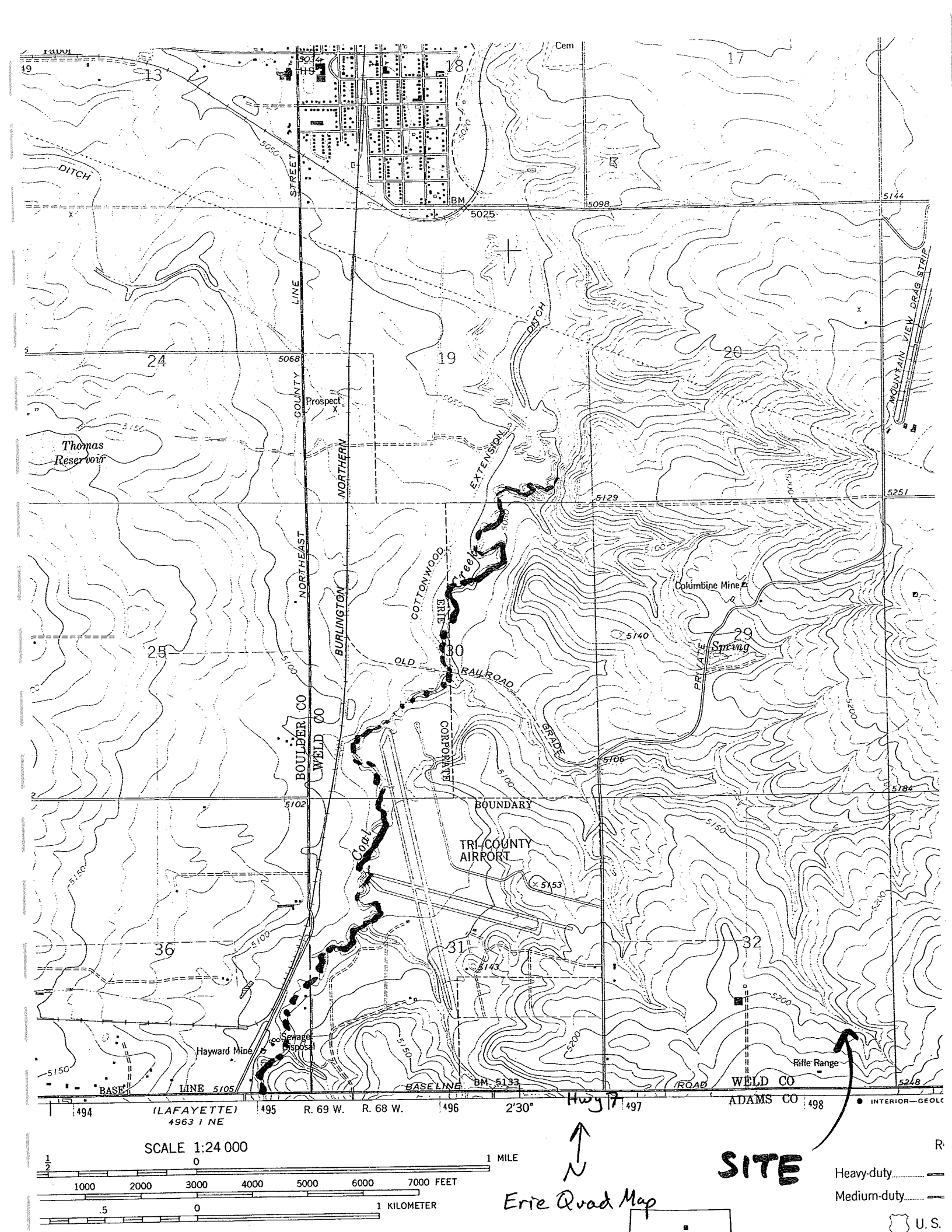
Section 2 - Drainage Basin and Sub-Basins

2.1 Main Basin Description

The drainage of the site and the area around it is flowing to the northwest. The area will eventually empty into Coal Creek. See next page of a copy of the overall topography taken from the Erie Quad of the USGS mapping.

2.2 Sub-basin Descriptions

There are three main sub-basins that contribute runoff flows. Runoff from a portion of the north side of the site will sheet flow to the north as originally mapped in CLC master drainage report (see Basin D1). The west portion of the site will sheet flow directly into Pond A-2. The south half of the site will drain directly into the private access road to the south (into Basin C2). Calculations have been completed (see Appendix) showing the minor and major storm flow in this access drive. All sub-basins will flow into Pond A-2.


Cem
17
18
13
DITCH
STREET
5050
BM
5025
5098
5144
LINE
DITCH
MOUNTAIN VIEW DRAG STRIP
24
5068
19
20
COUNTY
Prospect
5050
Thomas Reservoir
NORTHERN
EXTENSION
5129
5251
NORTHEAST
BURLINGTON
COTTONWOOD
Creek
ERIE
Columbine Mine
5140
29
25
30
OLD
RAILROAD
Spring
PRIVATE
BOULDER CO
WELD CO
CORPORATE
GRADE
5106
5184
5102
BOUNDARY
Coal
TRI-COUNTY AIRPORT
5153
36
31
32
5143
Hayward Mine
Sewage Disposal
Rifle Range
BASE LINE
5105
BM 5133
ROAD
WELD CO
5248
494
(LAFAYETTE)
4963 I NE
495
R. 69 W.
R. 68 W.
496
2'30"
Hwy 7
497
ADAMS CO
498
INTERIOR—GEOLO
SCALE 1:24 000
1 MILE
1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
N
SITE
Erie Quad Map
Heavy-duty
Medium-duty
U.S.

Section 3 - Design Criteria

3.1 Hydrologic Criteria

Because each of the sites is less than 160-acres in size, the rational method was used to estimate the 100-year discharge for the structure under consideration. The 100-year IDF curves from Page 800-8 of the Town's Standards were used to develop rainfall intensities for the calculated time of concentration. Runoff coefficients were taken from Table 800-3, while the drainage areas were estimated using topography and boundary information provided by Scott Cox & Associates. All of this information is in compliance with the overall master drainage plan done by CLC.

3.2 Hydraulic Criteria

Hydraulic analysis was done on the 18" wide concrete curb cut at the southwest portion of the parking lot (design point 3, or DP3) and in the north flowline of Vista Village Drive to the existing inlet. Mannings equation was used in both instances through a software from Haestad Methods, Inc. called FlowMaster.

3.3 Detention Requirements

An existing regional detention pond is being utilized for this project. It is located directly west of this site. No additional runoff is being proposed than what was shown in the master drainage plan (included in the map pocket). Hurst & Associates has completed an as-built for the pond in July 2003. This study is accepted by the town and overrides the CLC calculations shown on the master plan. Both the master plan (CLC) and the pond asbuilt (H&A) are included in the map pocket of this report

Section 4 - Drainage Facility Design

4.1 General Concept

The developed site for the school consists of rooftop, playground area, a parking area to the south, and a green space buffer on the north and west sides of the building. The site is divided into three sub-basins.

4.2 Sub-basin G-W

This sub-basin represents the west portion of the Goddard School site, consisting of 0.38 acres of grasses and playground area. It will directly discharge into the existing detention pond located at DP1 (on the west property line).

4.3 Sub-basin G-N

The north 0.39 acres of land of the site is sub-basin G-N. It also consists of grasses and playground area with one quarter of the roof draining to this area. It will sheet flow to the north and collect in the temporary diversion swale located north of the property (DP2). This swale conveys the flow directly into Pond A-2.

4.4 Sub-basin G-S

This sub-basin represents the southern parking lot and the south half of the building (representing 0.38 acres). It will sheet flow to the south and west through roof drain curb cut in the sidewalk, 2' concrete trickle pan, a 18" curb and catch gutter, a 18" wide concrete curb cut, and finally in the north flowline of Vista Village Drive until it enters the existing 10' Type "R" inlet. The existing storm pipe from this inlet conveys the flow to Pond A-2.

Section 5 - Erosion Control Measures

5.1 Site Characteristics

The majority of the site drains at a slope of 1-2% away from the building. There are 4:1 slopes on the north and west sides around the proposed retaining walls. The only areas of concentrated flow over grass on the site are the two roof drain outlets to the west of the building and one to the north. These pipes daylight past the lower retaining wall in all three cases.

5.2 Erosion Control Measures

It is proposed to installed Type 'L' riprap at these three locations past the lower retaining wall (see previous paragraph). Also, silt fencing is being proposed on all 4 sides of the site with special silt fencing provided by ERTECT Environmental on the north and west property lines. A 100' long vehicle tracking pad will be installed at the south entry. It is also proposed to install curb opening inlet protection for the existing 10' Type "R" inlet in Vista Village Drive and installing curb socks along the Drive itself as shown on the plan. Straw bales will be installed on the east and north side of the site at the inverts of the proposed swale areas.

A concrete washout ("CW") area is to be located east of the site for concrete trucks to clean their machines. The contractor shall remove concrete waste as needed from this designated area. Also, any excess spoils from the site (sod, fill) shall be deposited in an area north of the concrete washout labeled as the stockpile ("SP") area. This area will be circumvented on three sides with silt fencing.

Contractor is to follow Section 300 in the Town's Standards and Specifications and adhere to the notes found in the last section of the Appendix.

Section 6 - Conclusion

This study has been prepared in accordance with Town of Erie "Standards and Specifications" and the "Urban Storm Drainage Criteria Manual"

The results of this study indicate that the proposed development will conform to the Town of Erie's requirements and will safely convey runoff from the site with no adverse effects or impacts on the surrounding developments. The existing detention pond located to the west of the site will provide the required delay of flow during peak stormwater flow periods.

Section 7 - References

Terracon. February 20, 2008. Proposed Commercial Development. Goddard School – Building No. 3. Vista Ridge Phase II. State Highway 7 & Mountain View Boulevard. Erie, Colorado. Terracon Project No. 25085009C.

Hurst & Associates, Inc. July 9, 2003 Vista Ridge, Pond A2 Detail Sheet, As-Builts.

CLC. May 2007 (Revised June 22, 2007). Phase III Drainage Study for Vista Ridge Development Filing No. 11, Lot 1, Block 1, Erie, Colorado. CLC Job No. 06.0053.

Urban Drainage and Flood Control District (UDFCD). 2001. Drainage Criteria Manual, Volumes 1-3. June.

Town of Erie. Standards and Specifications for Design and Construction of Public Improvements. (online)

Appendix

Hydrologic Calculations

TABLE 800-3
RUNOFF COEFFICIENTS (C) FOR RATIONAL METHOD

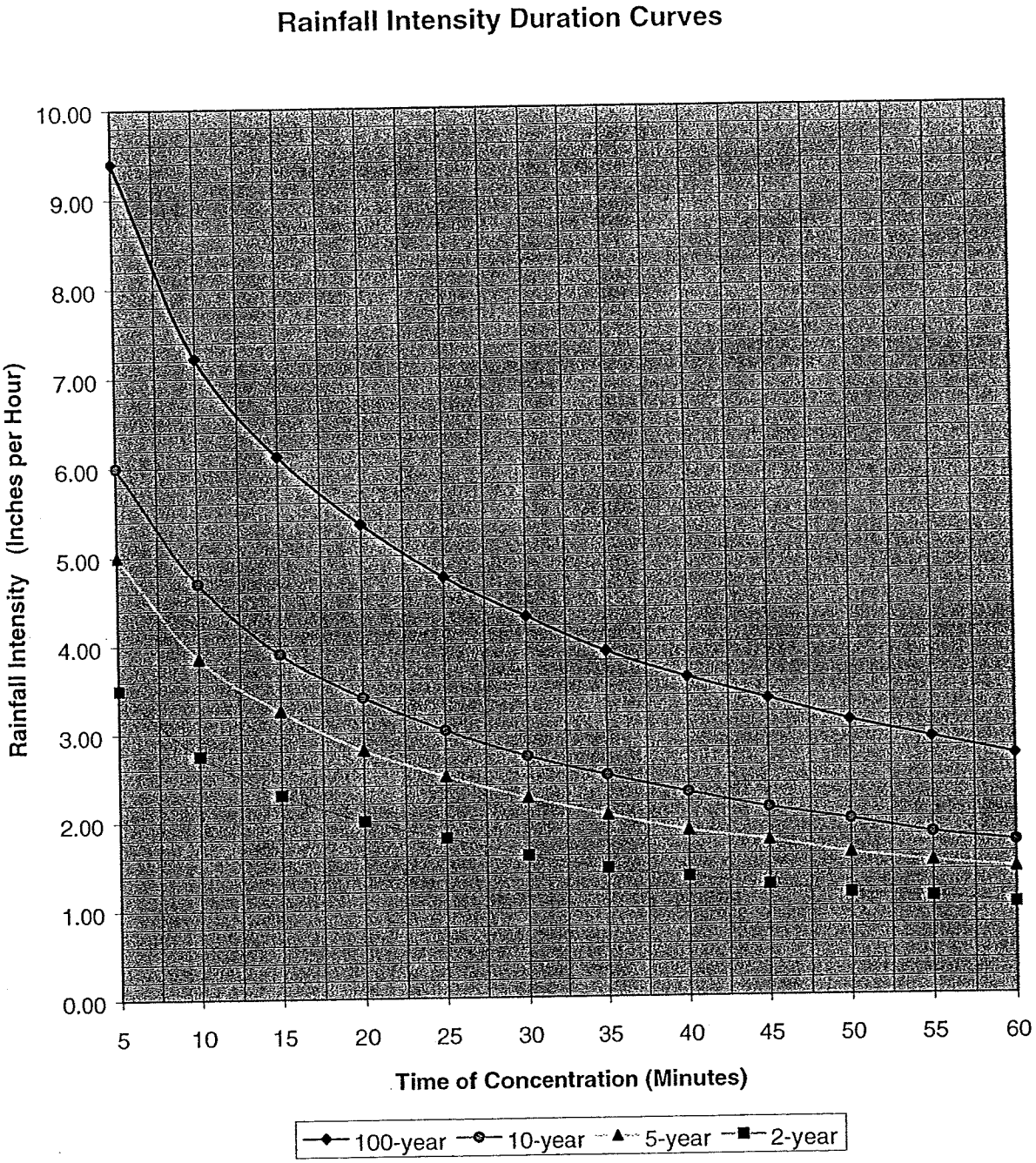
LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	FREQUENCY 2	5	10	100
Business					
Commercial Areas	95	.87	.87	.88	.89
Neighborhood Areas	70	.60	.65	.70	.80
Residential					
Single-Family	*	.40	.45	.50	.60
Multi-Unit (detached)	50	.45	.50	.60	.70
Multi-Unit (attached)	70	.60	.65	.70	.80
1/2 Acre Lot or Larger	*	.30	.35	.40	.60
Apartments	70	.65	.70	.70	.80
Industrial					
Light Areas	80	.71	.72	.76	.82
Heavy Areas	90	.80	.80	.85	.90
Parks, Cemeteries	7	.10	.18	.25	.45
Playgrounds	13	.15	.20	.30	.50
Schools	50	.45	.50	.60	.70
Railroad Yard Areas	20	.20	.25	.35	.45
Undeveloped Areas					
Historic Flow Analysis	2	(See "Lawns")			
Greenbelts, Agricultural					
Offsite Flow Analysis					
(when land use not defined)	45	.43	.47	.55	.65
Streets					
Paved	100	.87	.88	.90	.93
Gravel	40	.40	.45	.50	.60
Drives and Walks	96	.87	.87	.88	.89
Roofs	90	.80	.85	.90	.90
Lawns, Sandy Soil	0	.00	.01	.05	.20
Lawns, Clay Soil	0	.05	.15	.25	.50

Note: These Rational Formula coefficients may not be valid for large basins.

* Refer to Urban Storm Drainage Criteria Manual for percent impervious values.

813.06 Rainfall Intensities

The rainfall intensities to be used in the computation of runoff using the Rational Method shall be obtained from the Rainfall Intensity Duration Curves for the Town of Erie, included in these STANDARDS AND SPECIFICATIONS.



814.00 Detention

814.01 General

On site detention is required for all new development, expansion, and redevelopment. The required minimum detention volume and maximum release rates at these volumes for the 10-year and 100-year storms shall be determined in accordance with the procedure and data set forth in this criteria.

Runoff

Goddard School @ Vista Ridge

SUB-BASIN DATA			INITIAL/TIME (T_i)			TRAVEL TIME (T_t)				T_c CHECK			T_c	5-yr event			100-yr event			
BASIN	AREA	C_5	LENG.	SLOPE	T_i	LENG.	SLOPE	VEL.	T_t	COMP T_c	TOTAL	T_c =	MIN	C	I	Q	C	I	Q	DESIGN
	(Ac)		(ft)	(%)	(min)	(ft)	(%)	(fps)	(min)	(min)	LENGTH (ft)	(L/180)+10	(min)		in/hr	cfs		in/hr	cfs	POINT
													5.0	0.87	5.0	1.7	0.89	9.4	3.2	1
G-W	0.38	0.87											5.0	0.87	5.0	1.7	0.89	9.4	3.3	2
G-N	0.39	0.87											5.0	0.87	5.0	1.7	0.89	9.4	3.2	3
G-S	0.38	0.87																		

Hydraulic Calculations

PARK ENGINEERING CONSULTANTS
420 21st Avenue Suite 101
LONGMONT, COLORADO 80501
(303) 651-6626 FAX (303) 651-0331

JOB Goddard School 485-1
SHEET NO. _____ OF _____
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE Gutter Flow analysis

Basin G1 (south 1/2 of school)

5yr storm
$C_5 = 0.87$ (commercial)

$t_c < 5$ min

$I_5 = 5.0$

$A = 0.38$

$Q_5 = (0.87)(5.0)(0.38) = 1.65$ cfs

100yr storm
$C_{100} = 0.89$

$t_c < 5$ min

$I_{100} = 9.4$

$A = 3.8$ 3.18

$Q_{100} = 3.18$ cfs

Portion of C2 coming from the E (see Master Drainage Plan)

$A_E = 0.58$ AC

1.35 AC $= 43.1\%$

$Q_{5,E} = (4.7\text{ cfs})(.431)$

$= 2.0$ cfs

$Q_{100,E} = (11.31\text{ cfs})(.431)$

$= 4.87$ cfs

Total Q in gutter = 3.65 cfs

Total Q in gutter = 8.05 cfs

Existing flowrates at the EX 10' Type R Sump Inlet

Conc. curb chase in SW corner of parking area (DP3)
Worksheet for Rectangular Channel

Project Description	
Worksheet	Conc curb chase in SW corner of parkin
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.013	
Channel Slope	010000	ft/ft
Bottom Width	1.50	ft
Discharge	3.20	cfs

Results		
Depth	0.44	ft
Flow Area	0.7	ft²
Wetted Perim	2.38	ft
Top Width	1.50	ft
Critical Depth	0.52	ft
Critical Slope	0.006184	ft/ft
Velocity	4.86	ft/s
Velocity Head	0.37	ft
Specific Ener	0.81	ft
Froude Numb	1.29	
Flow Type	Supercritical	

Mr. David Mayeda
37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Minor storm event in private road
Worksheet for Gutter Section

This Inlet is assumed to be the EX 10' Type R sump inlet in Village Vista Drive which outfalls to EX Pond A-2

Project Description	
Worksheet	minor flow in private road flow
Type	Gutter Section
Solve For	Spread

Input Data		
Channel Slope	015000	ft/ft
Discharge	3.65	cfs
Gutter Width	1.50	ft
Gutter Cross Slo	0.083	ft/ft
Road Cross Slop	0.020	ft/ft
Mannings Coeffic	0.016	

Results		
Spread	10.29	ft
Flow Area	1.1	ft²
Depth	0.30	ft
Gutter Depress	1.1	in
Velocity	3.23	ft/s

(14.7' of drive lane remains)

Major storm event in private road
Worksheet for Gutter Section

This Inlet is assumed to be the EX 10' Type R sump inlet in Village Vista Drive which outfalls to EX Pond A-2

Project Description	
Worksheet	major flow in private road flow
Type	Gutter Section
Solve For	Spread

Input Data		
Channel Slope	015000	ft/ft
Discharge	8.05	cfs
Gutter Width	1.50	ft
Gutter Cross Slo	0.083	ft/ft
Road Cross Slop	0.020	ft/ft
Mannings Coeffic	0.016	

Results		
Spread	14.20	ft
Flow Area	2.1	ft²
Depth	0.38	ft
Gutter Depress	1.1	in
Velocity	3.86	ft/s

(10.8' of drive lane remains)

Town of Erie Grading Notes

GENERAL NOTES – GRADING

1. NO GRADING SHALL COMMENCE WITHOUT OBTAINING A **GRADING AND STORMWATER QUALITY PERMIT** FROM THE TOWN OF ERIE. A PRE-GRADE MEETING AT THE SITE IS REQUIRED BEFORE THE START OF GRADING WITH THE FOLLOWING PEOPLE PRESENT: OWNER, GRADING CONTRACTOR, DESIGN CIVIL ENGINEER, SOILS ENGINEER, TOWN OF ERIE ENGINEERING STAFF, AND UTILITY COMPANY REPRESENTATIVES. A TWENTY-FOUR (24) HOUR NOTICE IS REQUIRED.

2. ALL CONSTRUCTION ACTIVITIES THAT DISTURBS ONE OR MORE ACRES OF LAND, AS WELL AS ACTIVITIES THAT DISTURB LESS THAN ONE ACRE OF LAND, BUT IS PART OF A LARGER COMMON PLAN OF DEVELOPMENT, MUST COMPLY WITH BOTH LOCAL AND STATE REGULATIONS REGARDING STORMWATER DRAINAGE ON CONSTRUCTION SITES. OWNERS OR CONTRACTORS MUST OBTAIN A **COLORADO STORMWATER DISCHARGE PERMIT FOR CONSTRUCTION ACTIVITIES**, FROM THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT (CDPHE).

   A. MAINTAIN A COPY OF THE SWMP ONSITE AT ALL TIMES. THE APPROVED SWMP MUST BE MAINTAINED AND MADE AVAILABLE TO MUNICIPAL INSPECTORS UPON REQUEST.

   B. INSTALL AND MAINTAIN EROSION, SEDIMENT, AND MATERIALS MANAGEMENT CONTROL BMPS AS SPECIFIED IN THE SWMP.

   C. INSPECT ALL BMPS AT LEAST EVERY FOURTEEN (14) DAYS AND WITHIN TWENTY FOUR (24) HOURS AFTER ANY PRECIPITATION OR SNOWMELT EVENT THAT CAUSES SURFACE RUNOFF.

   D. MAINTAIN INSPECTION AND MAINTENANCE RECORDS OF BMPS ONSITE WITH THE SWMP.

   E. BASED ON INSPECTIONS PERFORMED BY THE OWNER OR BY TOWN PERSONNEL, MODIFICATIONS TO THE SWMP WILL BE NECESSARY IF AT ANY TIME THE SPECIFIED BMPS DO NOT MEET THE OBJECTIVES OF THIS CHAPTER. IN THIS CASE, THE OWNER SHALL MEET WITH TOWN PERSONNEL TO DETERMINE THE APPROPRIATE MODIFICATIONS. ALL MODIFICATIONS SHALL BE COMPLETED WITHIN SEVEN (7) DAYS OF THE REFERENCED INSPECTION, AND SHALL BE RECORDED ON THE OWNER'S COPY OF THE SWMP.

   F. THE OPERATOR SHALL AMEND THE PLAN WHENEVER THERE IS A SIGNIFICANT CHANGE IN DESIGN, CONSTRUCTION, OPERATION, OR MAINTENANCE, WHICH HAS A SIGNIFICANT EFFECT ON THE POTENTIAL FOR DISCHARGE OF POLLUTANTS TO THE RECEIVING

WATERS, OR IF THE SWMP PROVES TO BE INEFFECTIVE IN ACHIEVING THE GENERAL OBJECTIVES OF CONTROLLING POLLUTANTS IN STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES.

G. INSTALLATION AND MAINTENANCE OF BMPS SHALL BE SUPERVISED BY PERSONNEL CERTIFIED IN EROSION AND SEDIMENT CONTROL.

3. ALL SITE GRADING (EXCAVATION, EMBANKMENT, AND COMPACTION) SHALL CONFORM TO THE RECOMMENDATIONS OF THE LATEST SOILS INVESTIGATION FOR THIS PROPERTY AND SHALL FURTHER BE IN CONFORMANCE WITH THE TOWN OF ERIE "STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS", LATEST EDITION.

4. ALL GRADING AND FILLING OPERATIONS SHALL BE OBSERVED, INSPECTED AND TESTED BY A LICENSED SOILS ENGINEER, ALL TEST RESULT SHALL BE SUBMITTED TO THE TOWN OF ERIE ENGINEERING STAFF.

5. CONTOURS AND SPOT ELEVATIONS SHOWN ARE ONLY CONTROLS AND THE PROFILES THEY FORM SHALL BE SMOOTH AND CONTINUOUS.

6. NATURAL VEGETATION SHALL BE RETAINED AND PROTECTED WHEREVER POSSIBLE. EXPOSURE OF SOIL TO EROSION BY REMOVAL OR DISTURBANCE OF VEGETATION SHALL BE LIMITED TO THE AREA REQUIRED FOR IMMEDIATE CONSTRUCTION OPERATION AND FOR THE SHORTEST PRACTICAL PERIOD OF TIME. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO AVOID ANY DAMAGE TO EXISTING FOLIAGE THAT LIES IN THE PROJECT AREA UNLESS DESIGNATED FOR REMOVAL AND SHALL BE LIABLE FOR SUCH DAMAGE AT HIS/HER EXPENSE.

7. TOPSOIL SHALL BE STOCKPILED TO THE EXTENT PRACTICABLE ON THE SITE FOR USE ON AREAS TO BE REVEGATATED. ANY AND ALL STOCKPILES SHALL BE LOCATED AND PROTECTED FROM EROSIVE ELEMENTS.

8. TEMPORARY VEGETATION SHALL BE INSTALLED ON ALL DISTURBED AREAS WHERE PERMANENT SURFACE IMPROVEMENTS ARE NOT SCHEDULED FOR IMMEDIATE INSTALLATION. SEEDING WILL BE DONE ACROSS THE SLOPE FOLLOWING THE CONTOURS. VEGETATION SHALL BE A VIGOROUS, DROUGHT TOLERANT NATIVE SPECIES MIX. PROJECT SCHEDULING SHOULD TAKE ADVANTAGE OF SPRING OR FALL PLANTING SEASONS FOR NATURAL GERMINATION. SEEDED AREAS SHALL BE IRRIGATED IF CONDITIONS SO MERIT.

9. AT ALL TIMES, THE PROPERTY SHALL BE MAINTAINED AND/OR WATERED TO PREVENT WIND-CAUSED EROSION. EARTHWORK OPERATIONS SHALL BE DISCONTINUED WHEN FUGITIVE DUST SIGNIFICANTLY IMPACTS ADJACENT PROPERTY. IF EARTHWORK IS COMPLETE OR DISCONTINUED AND DUST FROM THE SITE CONTINUES TO CREATE PROBLEMS, THE OWNER/DEVELOPER SHALL IMMEDIATELY INSTITUTE MITIGATIVE MEASURES AND SHALL CORRECT DAMAGE TO ADJACENT PROPERTY.

10. TEMPORARY SILT FENCES SHALL BE INSTALLED ALONG ALL BOUNDARIES OF THE CONSTRUCTION LIMITS AS SHOWN ON THE APPROVED EROSION CONTROL PLAN. IN ADDITION, THE TOWN OF ERIE MAY REQUIRE AN ADDITIONAL TEMPORARY SILT FENCE IF FIELD CONDITIONS SO MERIT THEM.

11. THE OWNER/DEVELOPER SHALL PROVIDE ANY ADDITIONAL DUST ABATEMENT AND EROSION CONTROL MEASURES DEEMED NECESSARY BY THE TOWN OF ERIE SHOULD CONDITIONS MERIT THEM.

12. DURING CONSTRUCTION THE FILL AREAS WILL BE WETTED FOR COMPACTION AND THE HAUL ROUTES AND CUT AREAS WILL BE MAINTAINED WITH WATER TO REDUCE WIND EROSION.

13. FILL SLOPES SHALL BE COMPACTED BY MEANS OF SHEEPSFOOT COMPACTOR OR OTHER SUITABLE EQUIPMENT. COMPACTING SHALL CONTINUE UNTIL SLOPES ARE STABLE AND THERE IS NOT AN APPRECIABLE AMOUNT OF LOOSE SOIL ON THE SLOPES.

14. TEMPORARY CUT/FILL SLOPES SHALL NOT BE STEEPER THAN 2:1 (2H:1V). PERMANENT SLOPES SHALL NOT BE STEEOER THAN 4:1 (4H:1V) IN AREAS TO BE SEEDED OR SODDED.

15. DEPTH OF MOISTURE-DENSITY CONTROL SHALL BE FULL DEPTH ON ALL EMBANKMENT AND SIX (6) INCHES ON THE BASE OF CUTS AND FILLS.

16. OUTLET SIDES OF ALL PIPES SHALL BE GRADED TO DRAIN AND SHALL HAVE SUFFICIENT EROSION PROTECTION.

17. THE PERMITTEE OR HIS AGENT SHALL NOTIFY THE TOWN OF ERIE ENGINEERING STAFF WHEN THE GRADING OPERATION IS READY FOR EACH OF THE FOLLOWING INSPECTIONS:

    A. INITIAL INSPECTION WHEN THE PERMITTEE IS READY TO BEGIN WORK, BUT NOT LESS THAN TWO (2) DAYS BEFORE ANY GRADING OR GRUBBING IS STARTED.

B. TOWN OF ERIE INSPECTION AFTER THE NATURAL GROUND OR BEDROCK IS EXPOSED AND PREPARED TO RECEIVE FILL, BUT BEFORE FILL IS PLACED.

C. EXCAVATION INSPECTION AFTER THE EXCAVATION IS STARTED BUT BEFORE THE VERTICAL DEPTH OF THE EXCAVATION EXCEEDS TEN (10) FEET.

D. FILL INSPECTION AFTER THE FILL PLACEMENT IS STARTED, BUT BEFORE THE FILL EXCEEDS TEN (10) FEET.

E. DRAINAGE DEVICE INSPECTION AFTER FORMING OF TERRACE DRAINS, DOWNDRAINS, OR AFTER PLACEMENT OF PIPE BUT BEFORE ANY CONCRETE OR FILL MATERIAL IS PLACED.

F. FINAL INSPECTION WHEN ALL WORK INCLUDING INSTALLATION OF ALL DRAINAGE STRUCTURES AND OTHER PROTECTIVE DEVICES HAS BEEN COMPLETED AND THE AS-GRADED PLAN, PROFESSIONAL VERIFICATIONS AND REQUIRED REPORTS HAVE BEEN SUBMITTED.

18. SOILS IN THE AREA OF THE PROPOSED STRUCTURE SHALL BE CUT TO THE PROPOSED GRADE, AND THE SURFACE SHALL BE SCARIFIED TO A MINIMUM DEPTH OF ONE (1) FOOT, MOISTURE CONDITIONED AND PROOF ROLLED TO A MINIMUM OF 95% RELATIVE COMPACTION, UNLESS OTHERWISE PROVIDED FOR IN THE SOILS REPORT.

19. AREAS OF CONTINUOUS FOOTINGS SHALL BE UNDERCUT AND COMPACTED TO 95% RELATIVE COMPACTION AT A DEPTH EQUAL TO THE WIDTH OF THE FOOTING, UNLESS OTHERWISE PROVIDED FOR IN THE SOILS REPORT.

FINAL CONSTRUCTION DRAWINGS-GODDARD SCHOOL

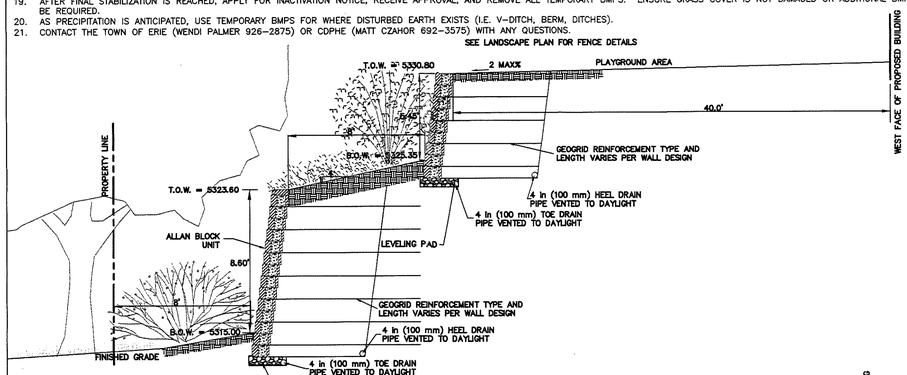
VISTA RIDGE FILING NO. 11, BLOCK 1, LOT 5A AND TRACT B

A PORTION OF THE SE ¼ OF SECTION 32, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH PRINCIPAL MERIDIAN
TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO
1.196 ACRES

STORMWATER MANAGEMENT PLAN GENERAL NOTES:

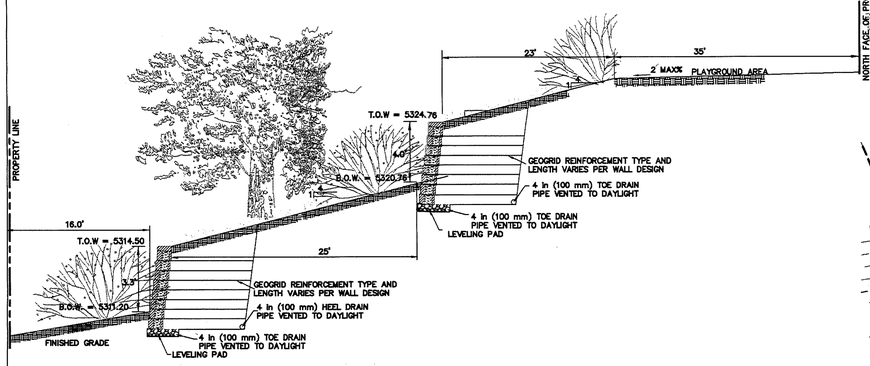
1. THE CONTRACTOR AND/OR AUTHORIZED AGENTS SHALL REMOVE ALL SEDIMENT, MUD, CONSTRUCTION DEBRIS, OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO OR, ACCUMULATE IN, THE FLOW LINES AND PUBLIC RIGHTS OF WAYS OF THE CITY AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION PROJECT. SAID REMOVAL SHALL BE CONDUCTED IN A TIMELY MANNER.
2. THESE CONSTRUCTION ACTIVITIES OF THE STORMWATER MANAGEMENT PLAN ARE SUBMITTED AS PART OF AN APPLICATION FOR A STORMWATER PERMIT FOR CONSTRUCTION ACTIVITIES FILED WITH THE TOWN OF ERIE. ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT FUNCTION AS INTENDED. THE REQUIREMENTS OF THIS PLAN SHALL BE THE OBLIGATION OF THE PERMIT HOLDER UNTIL SUCH TIME AS THE PLAN IS PROPERLY COMPLETED AND THE PERMIT IS RELEASED.
3. THE CONTRACTOR SHALL PREVENT SEDIMENT, DEBRIS AND ALL OTHER POLLUTANTS FROM ENTERING THE STORM SEWER SYSTEM OR RECEIVING WATER DURING ALL DEMOLITION, EXCAVATION, TRENCHING, BORING, GRADING OR OTHER CONSTRUCTION OPERATIONS THAT ARE PART OF THIS PROJECT. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR REMEDIATION OF ANY ADVERSE IMPACTS TO ADJACENT WATERWAYS, WETLANDS, ETC., RESULTING FROM WORK DONE AS PART OF THIS PROJECT.
4. THE CONTRACTOR SHALL LOCATE, INSTALL, AND MAINTAIN ALL EROSION CONTROL AND WATER QUALITY "BEST MANAGEMENT PRACTICES" AS INDICATED IN THE APPROVED STORMWATER MANAGEMENT PLAN.
5. THE DEVELOPER, GENERAL CONTRACTOR, GRADING CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL ENSURE THAT ALL LOADS OF CUT AND FILL MATERIAL IMPORTED TO OR EXPORTED FROM THIS SITE SHALL BE PROPERLY COVERED TO PREVENT LOSS OF THE MATERIAL DURING TRANSPORT ON PUBLIC RIGHTS OF WAY.
6. SOILS THAT WILL BE STOCKPILED FOR MORE THAN 30 DAYS SHALL BE PROTECTED FROM WIND AND WATER EROSION WITHIN 14 DAYS OF STOCKPILE CONSTRUCTION. IF STOCKPILES ARE LOCATED WITHIN 100 FEET OF A DRAINAGEWAY, ADDITIONAL SEDIMENT CONTROLS SUCH AS TEMPORARY DIKES OR SILT FENCE SHALL BE REQUIRED.
7. APPROVED EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES SHALL BE MAINTAINED AND KEPT IN GOOD REPAIR OF THE DURATION OF THIS PROJECT. ACCUMULATED SEDIMENT AND DEBRIS SHALL BE REMOVED FROM A BMP WHEN THE SEDIMENT OR DEBRIS ADVERSELY IMPACTS THE FUNCTIONING OF THE BMP.
8. MODIFICATION/TERMINATION OF A STORMWATER DISCHARGE PERMIT FOR CONSTRUCTION ACTIVITY BY THE DEVELOPER, CONTRACTOR OR THEIR AUTHORIZED AGENTS SHALL REQUIRE TIMELY NOTIFICATION OF AND APPROVAL FROM THE TOWN OF ERIE.
9. CONTAINMENT IS REQUIRED FOR ANY CHEMICAL/FUEL BROUGHT ON SITE.
10. REPORT ILLICIT DISCHARGES (CHEM., OIL, WASTE, DIRT, ETC) TO THE TOWN OF ERIE. NO REPORT ASSUMES THERE HAVE BEEN NO ILLICIT DISCHARGES
11. HAVE COPY OF SIGNED PERMIT WITH THE FACILITY & ON SITE.
12. INSPECTION OF THE SITE REQUIRED EVERY 14 DAYS AND AFTER SNOWMELT AND RAIN.
13. NO DIRT RAMPS OR ROCK RAMPS SHALL BE USED TO GET OVER CURB. THIS WILL ADD TO THE POLLUTANTS ENTERING THE STORM SEWER SYSTEM.
14. ENSURE WHEN BUILDING/SITE IS WASHED WITH CHEMICALS THAT IT IS COLLECTED AND DISPOSED OF PROPERLY.
15. THE WASTE GENERATED FROM THE CONCRETE WASH AREA MUST BE COLLECTED AND DISPOSED OF PROPERLY.
16. RUN HEAVY MACHINERY ALONG THE CONTOUR (NOT UP OR DOWNHILL) UNLESS THE TRACTS CREATE GROOVES PERPENDICULAR TO THE SLOPE OF THE HILL.
17. BEFORE SEEDING, ENSURE THAT THE GROUND ISN'T OVER COMPACTED (CONSTRUCTION ROADWAY, ETC.)
18. FINAL STABILIZATION IS REACHED WHEN ALL SOIL DISTURBING ACTIVITIES AT THE SITE HAVE BEEN COMPLETED, AND UNIFORM VEGETATIVE COVER HAS BEEN ESTABLISHED WITH A DENSITY OF AT LEAST 70 PERCENT OF PRE-DISTURBANCE LEVELS, OR EQUIVALENT PERMANENT, PHYSICAL EROSION REDUCTION METHODS HAVE BEEN EMPLOYED.
19. AFTER FINAL STABILIZATION IS REACHED, APPLY FOR INACTIVATION NOTICE, RECEIVE APPROVAL, AND REMOVE ALL TEMPORARY BMPS. ENSURE GRASS COVER IS NOT DAMAGED OR ADDITIONAL BMPS WILL BE REQUIRED.
20. AS PRECIPITATION IS ANTICIPATED, USE TEMPORARY BMPS FOR WHERE DISTURBED EARTH EXISTS (I.E. V-DITCH, BERM, DITCHES).
21. CONTACT THE TOWN OF ERIE (WENDI PALMER 926-2875) OR CDPHE (MATT CZAHOR 692-3575) WITH ANY QUESTIONS.

SEE LANDSCAPE PLAN FOR FENCE DETAILS



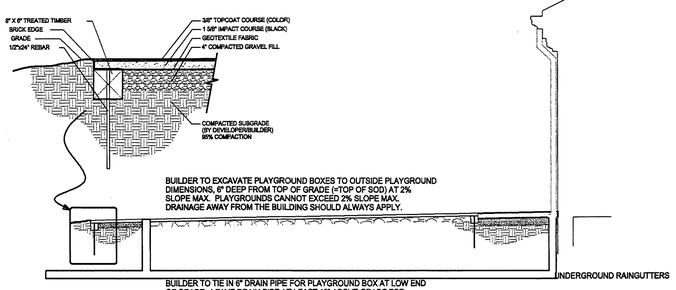
RETAINING WALL SECTION A-A

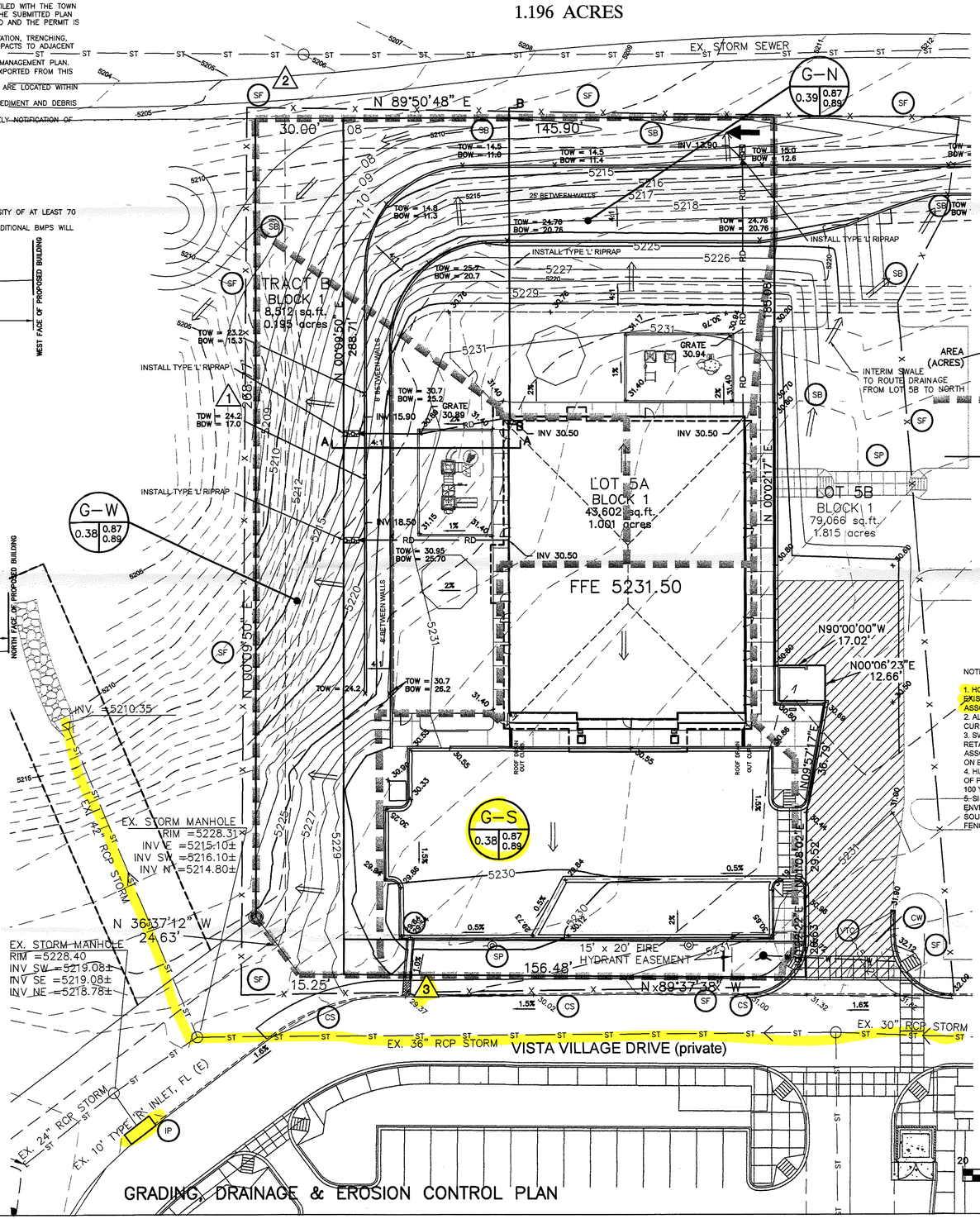
NOT TO SCALE



RETAINING WALL SECTION B-B

NOT TO SCALE





DRAINAGE LEGEND

- G-S / 0.38 / 0.87 / 0.89 — BASIN OR SUB-BASIN
- C VALUE 5-YR STORM
- C VALUE 100-YR STORM
- 1 — DESIGN POINT
- AREA (ACRES)
- BASIN LIMIT
- 0.5% — RUNOFF FLOW DIRECTION & SLOPE
- EXTENTS OF SILT FENCE
- SF — SILT FENCE
- VTC — VEHICLE TRACKING
- IP — INLET PROTECTION
- CW — CONCRETE WASHOUT
- CS — CURB SOCK
- SP — STOCK PILE
- SB — STRAW BALE BARRIER

NOTES:

1. HORIZONTAL AND VERTICAL CONTROL (INCLUDING EXISTING TOPOGRAPHY) PROVIDED BY SCOTT COX & ASSOCIATES.
2. ALL PROPOSED POINT ELEVATIONS ALONG THE CURB ARE TO FLOWLINE.
3. SWALE DESIGN NORTH OF THE SITE AND THE RETAINING WALL DESIGN IS DONE BY SCOTT COX & ASSOCIATES. PARK ENGINEERING IS NOT SIGNING ON BEHALF OF THESE DESIGN ELEMENTS.
4. HURST & ASSOCIATES COMPLETED THE ASBUILT OF POND A-2 IN JULY 2003. THEY CALCULATED THE 100 YR WSEL TO BE 5209.16
5. SILT FENCE WILL BE PROVIDED BY ERTECT ENVIRONMENTAL ON THE NORTH AND WEST SIDES. SOUTH AND EAST FENCE WILL BE GENERIC SILT FENCE TO TOWN OF ERIE STANDARDS.

CAHEN ARCHITECTURAL GROUP P.C.
7535 East Hampden Avenue
Suite 425
Denver, Colorado 80231
(303) 743-0002

CAHEN ARCHITECTURAL GROUP P.C.

Final Construction Drawings - Goddard School

Lot 5A AND Tract B - VISTA RIDGE DEVELOPMENT

FALARDEAU PROPERTY MANAGEMENT, LLC

THE VILLAGE AT VISTA RIDGE

GRADING, DRAINAGE & EROSION CONTROL PLAN

DATE	08-05-08
PROJ NO.	485-1
DRAWN	JRS
CHECKED	DWP
ISSUED/REVISED	DATE
DRAWING TITLE	GRADING, DRAINAGE, & EROSION CONTROL

Refer to Sheet 10 for Plan and Profile of Intrasite Stormline A-8

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

VICINITY MAP
SCALE: 1"=2000'

BY COMPARING THESE ORIGINAL DESIGNED ELEVATIONS, IT IS EVIDENT THAT THE 100YR WSEL WAS DESIGNED TO BE 0.77' ABOVE THE SPILLWAY CREST

2" PVC ORIFICE WASN'T AS-BUILT VERIFIED

AS-BUILT TOP OF STRUCTURE = 5201.79 (NGVD29)

AS-BUILT 100YR WSEL = 5209.18 (NGVD29)

BY COMPARING THESE ELEVATIONS, IT IS EVIDENT THAT THE 100YR WSEL IS 0.91' ABOVE THE SPILLWAY CREST

LOWEST AS-BUILT POINT ON SPILLWAY = 5208.27 (NGVD29)

POND A2 OUTFALL STRUCTURE
PLAN VIEW

SECTION A-A

SECTION B-B

POND A2 SPILLWAY CREST WALL

As-Built Volumes Pond A2

	ELEV.	CONTOUR AREA (AC)	INCREMENTAL VOLUME (AC-FT)	AS-BUILT VOLUME (AC-FT)	DESIGN VOLUME (AC-FT)
POND BOTTOM	5201.79	0.29		0	
	5202.00	0.30	0.06	0.06	0.00
	5203.00	0.36	0.33	0.39	0.35
	5204.00	0.41	0.38	0.77	0.75
	5205.00	0.46	0.44	1.21	1.21
	5206.00	0.52	0.49	1.70	1.74
	5207.00	0.58	0.55	2.25	2.34
	5208.00	0.65	0.62	2.87	3.00
	5209.00	0.72	0.68	3.55	3.74
	5210.00	0.79	0.76	4.31	4.55

LEGEND
- Manhole
- Thrust Block
- Water Valve
- Fire Hydrant
- Plug
- Proposed Waterline
- Existing Waterline
- Proposed Sewerline
- Existing Sewerline
- Proposed Stormline
- Existing Stormline
- W — Water Service
- S — Sewer Service
- 10' Type 'R' Inlet
- 5' Type 'R' Inlet
- Existing Contours
- Proposed Grading

ALL UTILITIES ARE PROPOSED UNLESS OTHERWISE NOTED

▲ AS-BUILT BY HURST & ASSOCIATES, INC. 7/9/03

72 HOURS BEFORE YOU DIG CALL THE UTILITY NOTIFICATION CENTER OF COLORADO (U.N.C.C.) 1-800-922-1987
GAS, ELECTRIC, TELEPHONE, CATV AND PANHANDLE EASTERN PIPELINE LOCATIONS

VISTA RIDGE
Pond A2 Detail Sheet
As-Builts

HURST & ASSOCIATES, INC.
CONSULTING ENGINEERS
4999 Pearl East Circle, Suite 106
Boulder, Colorado 80301 (303) 449-8105

SCALE HOR. 1"=20' VERT. N/A
DESIGN/APPR. TRL
DRAWN BY DB
DATE 3/13/02
FILE G:\21423\Stl Const\POND ASBUILTS\PondA2 SHEET 27 OF 34

LEGEND

LOTS AND BOUNDARIES
PROPERTY LINE

STREETS
PROPOSED CURB AND GUTTER
EXISTING CURB AND GUTTER
PROPOSED SIDEWALK
EXISTING SIDEWALK

GRADING
PROPOSED RETAINING WALL
EXISTING MINOR CONTOUR
EXISTING MAJOR CONTOUR
PROPOSED MINOR CONTOUR
PROPOSED MAJOR CONTOUR
PROPOSED FLOW DIRECTION

STORM DRAIN
PROPOSED STORM SEWER W/ PIPE SIZE, MANHOLE & INLET

F6 (0.32 | 0.80)
DRAINAGE BASIN DESIGNATION
100YR RUNOFF COEFFICIENT
AREA IN ACRES

BASIN SUMMARY TABLE

BASIN	BASIN AREA (ACRES)	RUNOFF 5-YEAR (CFS)	RUNOFF 100-YEAR (CFS)
A1	1.33	5.43	10.40
A2	0.58	2.54	4.88
A3	0.39	1.63	3.13
A4	0.17	0.71	1.43
B1	0.47	2.05	3.94
B1.1	0.57	2.46	4.74
B2	0.73	3.04	5.83
B3	0.51	2.17	4.13
B4	0.21	0.90	1.77
B5	0.26	0.89	2.14
C1	2.59	9.03	16.40
C2	1.35	4.70	11.31
D1	4.43	15.42	28.01

GENERAL NOTES

1. THIS PLAN IS INTENDED TO BE USED AS A REFERENCE IN CONJUNCTION WITH THE FINAL DRAINAGE REPORT. DO NOT USE THIS PLAN FOR CONSTRUCTION.
2. ALL STORM SEWER CONSTRUCTION (ie PIPE LINE, INLETS, MANHOLES) SHALL BE IN ACCORDANCE WITH TOWN OF ERIE STANDARDS AND SPECIFICATIONS
3. THE CONTRACTOR SHALL PHASE GRADING ACTIVITIES TO LIMIT THE POSSIBILITY OF EROSION

DETENTION POND SUMMARY TABLE

	WQCV	5-YR	10-YR + WQCV	100-YR	100-YR + WQCV
VOLUME REQUIRED (CU. FT.)	25,251	52,493	77,745	97,369	122,620
VOLUME PROVIDED (CU. FT.)	25,251	52,493	**77,745**	97,369	122,620
WATER SURFACE ELEVATION	5202.83		**5205.59**		**5207.39**

Hurst & Associates did as-builts July 03

BENCHMARK

THE NORTH QUARTER CORNER OF SECTION 32 BEING A 3.5" ALUMINUM CAP STAMPED PLS 14108, 1994. ELEVATION 5117.77 (NGVD 29).

NOTE – BENCHMARK VERIFICATION: CONTRACTOR SHALL USE BENCHMARKS AND DATUMS SHOWN HEREON TO SET PROJECT BENCHMARK(S), BY RUNNING A LEVEL LOOP BETWEEN AT LEAST TWO BENCHMARKS, AND SHALL PROVIDE SURVEY NOTES OF SUCH TO PROJECT ENGINEER PRIOR TO COMMENCING CONSTRUCTION.

NORTH
40 0 20 40

EXISTING DETENTION POND A-2
TRACT 21 VISTA RIDGE
TEMPORARY DIVERSION SWALE
TRACT 12 VISTA RIDGE
LOT 5, BLOCK 1
LOT 1, BLOCK 1
FFE=5234.00
LOT 2, BLOCK 1
FFE=5235.25
LOT 3, BLOCK 1
LOT 4, BLOCK 1
LOT 6, BLOCK 1
TRACT A
MOUNTAIN VIEW BLVD.
COLORADO STATE HIGHWAY 7

THIS DRAWING IS INTENDED
FOR REFERENCE ONLY
NOT TO BE USED FOR CONSTRUCTION

CLC ASSOCIATES
8480 E. ORCHARD RD. SUITE 2000
GREENWOOD VILLAGE
COLORADO 80111
P 303 770 5600
F 303 770 2349
CLASSGC.COM
ARCHITECTURE
ENGINEERING PLANNING
LANDSCAPE ARCHITECTURE
LAND SURVEYING

DRAINAGE MAP

VISTA RIDGE DEVELOPMENT FILING NO. 11, LOT 1, LOT 2, BLOCK 1 AND TRACT A

COLORADO HIGHWAY 7 & MOUNTAIN VIEW BLVD.
ERIE, COLORADO

DATE	DESCRIPTION
05/15/07	1ST SUBMITTAL
06/25/07	2ND SUBMITTAL

DRAINAGE MAP

PROJECT #:06.0053
DRAWN BY: CH
DESIGNED BY: JHG
CHECKED BY: RV

DR1

Reference the map on the previous sheet to support the folowing "recreated" drainage calcs

Recreated Drainage Calcs from 06/25/2007 CLC Map

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	EX Q_5 (cfs)	Δ (cfs)	Q_{100} (cfs)	EX Q_{100} (cfs)	Δ (cfs)
A1	1.33	95%	0.87	0.89	6.3	4.09	5.43	-1.34	10.07	10.40	-0.33
A2	0.58	95%	0.87	0.89	5.0	1.88	2.54	-0.66	4.73	4.88	-0.15
A3	0.39	95%	0.87	0.89	5.0	1.28	1.63	-0.35	3.18	3.13	0.05
A4	0.17	95%	0.87	0.89	5.0	0.56	0.71	-0.15	1.36	1.43	-0.07
B1	0.47	95%	0.87	0.89	5.0	1.54	2.05	-0.51	3.82	3.94	-0.12
B1.1	0.57	95%	0.87	0.89	5.0	1.88	2.46	-0.58	4.64	4.74	-0.10
B2	0.73	95%	0.87	0.89	5.7	2.32	3.04	-0.72	5.70	5.83	-0.13
B3	0.51	95%	0.87	0.89	5.0	1.65	2.17	-0.52	4.09	4.13	-0.04
B4	0.21	95%	0.87	0.89	5.0	0.68	0.90	-0.22	1.73	1.77	-0.04
B5	0.26	95%	0.87	0.89	5.0	0.86	0.89	-0.03	2.09	2.14	-0.05
C1	2.59	95%	0.87	0.89	9.6	6.86	9.03	-2.17	17.02	16.40	0.62
C2	1.35	95%	0.87	0.89	5.0	4.40	4.70	-0.30	10.91	11.31	-0.40
D1	4.43	95%	0.87	0.89	12.6	10.51	15.42	-4.91	25.96	28.01	-2.05

NOTES:

SHADED COLUMNS REPRESENT THE BASIN FLOWS SHOWN ON THE 06/25/2007 CLC DRAINAGE MAP.

THE DRAINAGE CALCS HAVE BEEN RECREATED USING THAT MAP TO OBTAIN ROUTED EX FLOWS IN THE EX STORM SEWER IN VILLAGE VISTA DR

C VALUES AND % IMP VALUES WERE TAKEN FROM THE "PHASE II DRAINAGE STUDY FOR VISTA RIDGE DEVELOPMENT FILING NO. 11, LOT 1, BLOCK 1"

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Recreated Drainage Calcs from 06/25/2007 CLC Map
Location: Erie

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: AHC
Checked By:
Date: 9/5/24

Basin ID	Total Area (ac)	Paved Roads/Sidewalks			Roofs			Lawns/Open Space/Landscaping			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
A1	1.33	Assumed 95% Impervious For All Sub-Basins Basin Area and Impervious values taken from the January 2007 "Phase II Drainage Study for Vista Ridge Development Filing No. 11, Lot 1, Block 1" Drainage Report by CLC Associates, Inc.									95.0%
A2	0.58										95.0%
A3	0.39										95.0%
A4	0.17										95.0%
B1	0.47										95.0%
B1.1	0.57										95.0%
B2	0.73										95.0%
B3	0.51										95.0%
B4	0.21										95.0%
B5	0.26										95.0%
C1	2.59										95.0%
C2	1.35										95.0%
D1	4.43										95.0%
TOTAL	13.59										95.0%

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Recreated Drainage Calcs from 06/25/2007 CLC Map
Location: Erie

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: AHC
Checked By:
Date: 9/5/24

Basin ID	Total Area (ac)	Basins Total Weighted % Imp.	Hydrologic Soil Group			Hydrologic Soil Group			Minor Coefficients			Major Coefficients			Basins Total Weighted C_5	Basins Total Weighted C_{100}
			Area A (ac)	Area B (ac)	Area C/D (ac)	% A (ac)	% B (ac)	% C/D (ac)	$C_{5,A}$	$C_{5,B}$	$C_{5,C/D}$	$C_{100,A}$	$C_{100,B}$	$C_{100,C/D}$		
A1	1.33	95.0%													0.87	0.89
A2	0.58	95.0%													0.87	0.89
A3	0.39	95.0%													0.87	0.89
A4	0.17	95.0%													0.87	0.89
B1	0.47	95.0%													0.87	0.89
B1.1	0.57	95.0%													0.87	0.89
B2	0.73	95.0%													0.87	0.89
B3	0.51	95.0%													0.87	0.89
B4	0.21	95.0%													0.87	0.89
B5	0.26	95.0%													0.87	0.89
C1	2.59	95.0%													0.87	0.89
C2	1.35	95.0%													0.87	0.89
D1	4.43	95.0%													0.87	0.89
TOTAL	13.59	95.0%													0.87	0.89

Assumed 0.87 and 0.89 for 5-YR and 100-YR C-Values, Respectively

Basin runoff coefficients taken from the January 2007
"Phase II Drainage Study for Vista Ridge Development Filing No. 11, Lot 1, Block 1"
Drainage Report by CLC Associates, Inc.

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Recreated Drainage Calcs from 06/25/2007 CLC Map
Location: Erie

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: AHC
Checked By:
Date: 9/5/24

SUB-BASIN DATA					INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
A1	1.33	95%	0.87	0.89	150	1.9%	4.1	185	2.0%	10.0	1.4	2.2	6.3	335.0	10.8	6.3
A2	0.58	95%	0.87	0.89	160	4.0%	3.3	100	1.0%	10.0	1.0	1.7	5.0	260.0	10.6	5.0
A3	0.39	95%	0.87	0.89	12	2.0%	1.1	280	2.5%	10.0	1.6	3.0	4.1	292.0	11.2	5.0
A4	0.17	95%	0.87	0.89	60	2.0%	2.6	110	2.0%	20.0	2.8	0.6	3.2	170.0	10.4	5.0
B1	0.47	95%	0.87	0.89	100	4.0%	2.6	120	4.5%	15.0	3.2	0.6	3.3	220.0	10.3	5.0
B1.1	0.57	95%	0.87	0.89	100	4.0%	2.6	120	4.5%	15.0	3.2	0.6	3.3	220.0	10.3	5.0
B2	0.73	95%	0.87	0.89	165	2.0%	4.2	185	2.0%	15.0	2.1	1.5	5.7	350.0	10.8	5.7
B3	0.51	95%	0.87	0.89	12	2.0%	1.1	450	2.0%	20.0	2.8	2.7	3.8	462.0	12.2	5.0
B4	0.21	95%	0.87	0.89	40	3.0%	1.8	50	3.0%	20.0	3.5	0.2	2.1	90.0	10.1	5.0
B5	0.26	95%	0.87	0.89	60	2.0%	2.6	175	2.0%	20.0	2.8	1.0	3.6	235.0	10.8	5.0
C1	2.59	95%	0.87	0.89	250	2.0%	5.2	370	2.0%	10.0	1.4	4.4	9.6	620.0	11.8	9.6
C2	1.35	95%	0.87	0.89	100	4.0%	2.6	270	2.8%	15.0	2.5	1.8	4.4	370.0	11.1	5.0
D1	4.43	95%	0.87	0.89	250	4.4%	4.0	600	2.7%	7.0	1.1	8.8	12.8	850.0	12.6	12.6

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Recreated Drainage Calcs from 06/25/2007 CLC Map
Location: Erie
Design Storm: 5-Year

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: AHC
Checked By:
Date: 9/5/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	A1	A1	1.33	0.87	6.3	1.16	3.53	4.1															BASIN A1 FLOWS ROUTE TO THE INLET AT DP A1
	A2	A2	0.58	0.87	5.0	0.50	3.76	1.9															BASIN A2 FLOWS ROUTE TO THE INLET AT DP A2
	A3	A3	0.39	0.87	5.0	0.34	3.76	1.3															BASIN A3 FLOWS ROUTE TO THE INLET AT DP A3
	A3.1								6.3	2.00	3.53	7.1											COMBINED FLOW FROM BASINS A1, A2, & A3
		A4	0.17	0.87	5.0	0.15	3.76	0.6															BASIN A4 FLOWS ROUTE TO THE INLET AT DP A4
	A4.1								6.3	2.15	3.53	7.6											COMBINED FLOW FROM BASIN A4 AND DP A3.1
	B1	B1	0.47	0.87	5.0	0.41	3.76	1.5															BASIN B1 FLOWS ROUTE TO THE INLET AT DP B1
	B2	B1.1	0.57	0.87	5.0	0.50	3.76	1.9	5.0	0.91	3.76	3.4											BASIN B1.1 FLOWS ROUTE TO THE INLET AT DP B2
	B3	B3	0.51	0.87	5.0	0.44	3.76	1.7															BASIN B3 FLOWS ROUTE TO THE INLET AT DP B3
	B3.1								5.0	1.35	3.76	5.1											COMBINED FLOW FROM BASINS B1, B1.1, & B3
	BSTUB	B2	0.73	0.87	5.7	0.64	3.63	2.3															BASIN B2 FLOWS ROUTE TO THE INLET AT DP BSTUB
	B3.2								5.7	1.99	3.63	7.2											COMBINED FLOW FROM BASIN B2 & DP 3.1
		B4	0.21	0.87	5.0	0.18	3.76	0.7															BASIN B4 FLOWS ROUTE TO THE INLET AT DP B4
	B4.1								5.7	2.17	3.63	7.9											COMBINED FLOW FROM BASIN B4 & DP 3.2
		B5	0.26	0.87	5.0	0.23	3.76	0.9															BASIN B5 FLOWS ROUTE TO THE INLET AT DP B5
	B5.1								5.7	2.40	3.63	8.7											COMBINED FLOW FROM BASIN B5 & DP 4.1
	B5.2								6.3	4.55	3.53	16.1											COMBINED FLOW FROM DP A4.1 & DP B5.1
	C1	C1	2.59	0.87	9.6	2.25	3.05	6.9															BASIN C1 FLOWS ROUTE TO THE INLET AT DP C1
	C2	C2	1.35	0.87	5.0	1.17	3.76	4.4															BASIN C2 FLOWS ROUTE TO THE INLET AT DP C2
	C2.1								9.6	3.42	3.05	10.4											COMBINED FLOW FROM BASINS C1 & C2

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Recreated Drainage Calcs from 06/25/2007 CLC Map
Location: Erie
Design Storm: 5-Year

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: AHC
Checked By:
Date: 9/5/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	C2.2								9.6	7.97	3.05	24.3											COMBINED FLOW FROM DP C2.1 & DP B5.2
	C2.3								9.6	7.97	3.05	24.3											TOTAL DISCHARGE INTO POND A2
	D1	D1	4.43	0.87	12.6	3.85	2.73	10.5															BASIN D1 FLOWS ROUTE TO THE SWALE AT NORTH SIDE OF THE SITE

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Recreated Drainage Calcs from 06/25/2007 CLC Map
Location: Erie
Design Storm: 100-Year

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: AHC
Checked By:
Date: 9/5/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	A1	A1	1.33	0.89	6.3	1.18	8.53	10.1															BASIN A1 FLOWS ROUTE TO THE INLET AT DP A1
	A2	A2	0.58	0.89	5.0	0.52	9.09	4.7															BASIN A2 FLOWS ROUTE TO THE INLET AT DP A2
	A3	A3	0.39	0.89	5.0	0.35	9.09	3.2															BASIN A3 FLOWS ROUTE TO THE INLET AT DP A3
	A3.1								6.3	2.05	8.53	17.5											COMBINED FLOW FROM BASINS A1, A2, & A3
		A4	0.17	0.89	5.0	0.15	9.09	1.4															BASIN A4 FLOWS ROUTE TO THE INLET AT DP A4
	A4.1								6.3	2.20	8.53	18.8											COMBINED FLOW FROM BASIN A4 AND DP A3.1
	B1	B1	0.47	0.89	5.0	0.42	9.09	3.8															BASIN B1 FLOWS ROUTE TO THE INLET AT DP B1
	B2	B1.1	0.57	0.89	5.0	0.51	9.09	4.6	5.0	0.93	9.09	8.5											BASIN B1.1 FLOWS ROUTE TO THE INLET AT DP B2
	B3	B3	0.51	0.89	5.0	0.45	9.09	4.1															BASIN B3 FLOWS ROUTE TO THE INLET AT DP B3
	B3.1								5.0	1.38	9.09	12.5											COMBINED FLOW FROM BASINS B1, B1.1, & B3
	BSTUB	B2	0.73	0.89	5.7	0.65	8.77	5.7															BASIN B2 FLOWS ROUTE TO THE INLET AT DP BSTUB
	B3.2								5.7	2.03	8.77	17.8											COMBINED FLOW FROM BASIN B2 & DP 3.1
		B4	0.21	0.89	5.0	0.19	9.09	1.7															BASIN B4 FLOWS ROUTE TO THE INLET AT DP B4
	B4.1								5.7	2.22	8.77	19.5											COMBINED FLOW FROM BASIN B4 & DP 3.2
		B5	0.26	0.89	5.0	0.23	9.09	2.1															BASIN B5 FLOWS ROUTE TO THE INLET AT DP B5
	B5.1								5.7	2.45	8.77	21.5											COMBINED FLOW FROM BASIN B5 & DP 4.1
	B5.2								6.3	4.65	8.53	39.7											COMBINED FLOW FROM DP A4.1 & DP B5.1
	C1	C1	2.59	0.89	9.6	2.31	7.37	17.0															BASIN C1 FLOWS ROUTE TO THE INLET AT DP C1
	C2	C2	1.35	0.89	5.0	1.20	9.09	10.9															BASIN C2 FLOWS ROUTE TO THE INLET AT DP C2
	C2.1								9.6	3.51	7.37	25.9											COMBINED FLOW FROM BASINS C1 & C2

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Recreated Drainage Calcs from 06/25/2007 CLC Map
Location: Erie
Design Storm: 100-Year

Project Name: Vista Ridge
Project No.: 16162.00
Calculated By: AHC
Checked By:
Date: 9/5/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	C2.2								9.6	8.16	7.37	60.1											COMBINED FLOW FROM DP C2.1 & DP B5.2
	C2.3								9.6	8.16	7.37	60.1											TOTAL DISCHARGE INTO POND A2
	D1	D1	4.43	0.89	12.6	3.94	6.59	26.0															BASIN D1 FLOWS ROUTE TO THE SWALE AT NORTH SIDE OF THE SITE

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

PHASE II DRAINAGE STUDY FOR
VISTA RIDGE DEVELOPMENT
FILING NO. 11, LOT 1, BLOCK 1
ERIE, COLORADO

PHASE II DRAINAGE STUDY FOR VISTA RIDGE DEVELOPMENT FILING NO. 11, LOT 1, BLOCK 1 ERIE, COLORADO

January 2007

Prepared for:

Right Sky Properties LLC
8493 Baseline Rd
Boulder, CO 80303

Prepared by:

CLC Associates, Inc.
8480 E. Orchard Rd, #2000
Greenwood Village, CO 80111

(CLC Job No. 06.0053)

PHASE II DRAINAGE STUDY FOR
VISTA RIDGE DEVELOPMENT
FILING NO. 11, LOT 1, BLOCK 1
ERIE, COLORADO

TABLE OF CONTENTS

PHASE II DRAINAGE STUDY FOR VISTA RIDGE DEVELOPMENT FILING NO. 11, LOT 1, BLOCK 1

ERIE, COLORADO

This report presents the preliminary design analysis for the drainage and permanent sedimentation control facilities for Vista Ridge Filing No. 11, Lot 1, Block 1. Vista Ridge Filing No. 11, Lot 1, Block 1 is located within Parcel 31 of the Vista Ridge Development. Parcel 31 of the Vista Ridge Development is a proposed retail/commercial park located at the northwest corner of Mountain View Boulevard and Colorado State Highway 7. The entire proposed Vista Ridge Development consists of 900 acres of mixed use development including residential, commercial and a golf course community. Parcel 31 will be developed in phases. Phase I, as depicted on the preliminary drainage map, includes the construction of Lot 1and Tract A and over lot grading for Lots 2, 3, 4 and 5. The scope of the report covers all aspects of storm water collection, conveyance, and detention necessary to comply with the Standards and Specifications for Design and Construction of Public Improvements for Erie, Colorado.

I. GERERAL LOCATION AND DESCRIPTION

A. LOCATION

Vista Ridge Filing No. 11 is located in the northwest quadrant of Mountain View Boulevard and Colorado State Highway 7. The project site is in the Southeast ¼ of Section 32, Township 1 North, Range 68 West of the 6th P.M., Town of Erie, County of Weld, State of Colorado. Current access to the site is from 72nd Avenue and Sheridan Boulevard.

B. DESCRIPTION OF PROPERTY

Phase 1 of Vista Ridge Filing No. 11 consists of 13.64 acres +/-. The area of final construction includes Lot 1 and Tract A and consists of 3.07 acres +/-. The existing land is undeveloped native grassland with a general slope of 2 to 3 percent from southeast to northwest.

II. DRAINAGE BASINS

A. MAJOR BASIN DESCRIPTIONS

Major drainageway planning for the Vista Ridge Development, is presented in the Vista Ridge Golf Course Development Master Drainage Report with Appendix A, B, & C prepared by Hurst & Associates, Inc., revised July 30, 2001 (Vista Ridge Master Drainage Report). Vista Ridge Filing No. 11 is located entirely within Basin A2 of the master drainage report; see Appendix C for excerpts from this report.

The Vista Ridge Master Drainage Report contains the location and proposed development information pertaining to Parcel 31 as required for a Preliminary Drainage Report. The report also contains historic drainage information such as descriptions of the overall basin, drainage patterns through the property, and outfalls downstream from the property. The report lists design criteria including references, hydrologic, and hydraulic criteria. The general concept of the drainage plan is described in the report which includes the capture of

surface runoff by inlets, conveyance of the design flows in an underground storm sewer system and detention and water quality requirements in the downstream existing detention facility, Pond A2. The specific details include only the extension of the stubs and installation of inlets to capture surface runoff from the paved areas in accordance with listed criteria.

III. DRAINAGE DESIGN CRITERIA

A. DESIGN METHODS

The proposed drainage systems are designed based on initial and major storm provisions. The proposed development consists of commercial use, therefore, the 5-year storm will be used for the initial storm and the 100-year storm will be used for the major storm.

The objective of the drainage system for the initial storm is to minimize inconvenience, to protect against recurring minor damage, to reduce rising maintenance costs, and to create an orderly drainage system.

The objective of the drainage system for the major storm is to minimize substantial property damage or loss of life and will be directed and accepted by the Director of Public Works.

B. HYDROLOGIC CRITERIA

The Rational Method was used to size storm sewers and determine runoff rates from unsewered areas. The procedures explained in the Urban Storm Drainage Criteria Manual were followed for all runoff calculations. All hydrologic calculations are included in Appendix A. The runoff coefficients used for the site were:

Land Use	C2	C5	C10	C100	IMP%
Roof	0.80	0.85	0.90	0.90	90
Concrete Drive/Walk	0.87	0.87	0.88	0.89	96
Landscaped Areas/Parks	0.10	0.18	0.25	0.45	7
Paved Street	0.87	0.88	0.90	0.93	100
Multi-family	0.60	0.65	0.70	0.80	70
Commercial	0.87	0.87	0.88	0.89	95
Gravel	0.40	0.45	0.50	0.60	40

The rainfall intensities used in the computation of runoff using the Rational Method were obtained from the Rainfall Intensity Duration Curves for the Town of Erie. A copy of the figure is included in Appendix C.

PHASE II DRAINAGE STUDY FOR
VISTA RIDGE DEVELOPMENT
FILING NO. 11, LOT 1, BLOCK 1
ERIE, COLORADO

D. HYDRAULIC CRITERIA

The sizes of the proposed storm sewers were determined based on a capacity analysis. All of the proposed storm sewers were sized to convey the full 100-year runoff volumes. Storm sewer hydraulic calculations were calculated using the Manning's equation with a roughness coefficient of n = 0.013. A minimum slope of 0.50% was assumed for initial sewer sizing and a minimum diameter of 15-inches was used. A copy of the storm sewer sizing table that was used to determine pipe sizes is included in Appendix B.

E. DETENTION

The detention requirement for this site is satisfied by the existing detention pond located adjacent to the northwest corner of the site. The existing detention pond, Detention Pond A2, was designed and constructed with Vista Ridge Master Drainage Report. Detention Pond A2 was designed and constructed to adequately detain the 100-year storm for Parcel 31. Water quality and allowable release rate requirements for the proposed site are also satisfied by existing Detention Pond A2.

IV. DRAINAGE FACILITY DESIGN

A. GENERAL CONCEPT

Rainfall runoff will collect against curbs and at low points throughout the development and be conveyed to the underground storm drain system. The proposed storm sewer improvements are sized adequately to convey the 100-year storm to the existing detention pond where water quality and detention for the site are performed. The proposed drainage improvements are in conformance with the Vista Ridge Master Drainage Report. Refer to the Drainage Map located in the back of the report for the storm sewer layout and sizes. Storm sewer sizing calculation

The sum of Basin areas on the 06/25/2007 CLC drainage map is 13.59 acres. The sum of Basin areas shown herein with these calcs is 13.77 acres.

B. SPECIFIC DETAIL

The area of proposed construction and overlot grading is divided into five drainage basins: A, B, C, D and E. The five drainage basins are divided into 14 sub-basins that are individually described by basin below.

BASIN A

The sum of Basin A areas on the 06/25/2007 CLC drainage map is 2.47 acres.

Basin A consists of portions of Lot 2, Lot 3, Lot 4 and Tract A covering a total area of approximately 2.75 acres. Basin A is divided into sub-basins A1, A2, A3, A4 and A5.

Sub-basin A1is located in the southeast corner of the site and consists of approximately 1.19 acres of proposed overlot grading. Sub-basin A1 is part of Lot 3 and will be developed as

Should be part of Lot 4 based on the 06/25/2007 CLC drainage map.

Basin A1 area on the 06/25/2007 CLC drainage map is 1.33 acres.

retail/commercial in the future. Runoff for Sub-basin A1 generally flows in a northwest direction to the proposed 24-inch storm sewer at design point A1.

Sub-basin A2 is located in the center of the site and consists of approximately 0.02 acres of proposed commercial/retail development. Sub-basin A1 is part of Lot 2 and includes the drive-thru area for the building in Lot 2. Runoff for Sub-basin A2 flows to the proposed 5-foot inlet at Design Point A2 where it enters the proposed 12-inch storm sewer. The flows from Sub-basins A1 and A2 combine at Design Point A2.1 and discharge to the north in the proposed 24-inch storm sewer.

Sub-basin A3 is located on the east side of the site and consists of approximately 0.87 acres of proposed overlot grading. Sub-basin A3 is part of Lot 2 and will be developed as retail/commercial in the future. Runoff for Sub-basin A3 generally flows in a northwest direction to the proposed 21-inch storm sewer at design point A3. The flows from Sub-basin A3 combine with the flows from Sub-basins A1 and A2 at Design Point A3.1 and discharge to the north in the proposed 24-inch storm sewer.

Sub-basin A4 is located near the center of the site and consists of approximately 0.17 acres of proposed commercial/retail development. Sub-basin A4 is part of Lot 2 and includes the entire roof of the proposed building. Runoff for Sub-basin A4 flows to northeast corner of the building where the roof drain system will convey the flows to the proposed 12-inch storm sewer. The flows in the 12-inch storm sewer combine with flows from Sub-basins A1, A2 and A3 at Design Point A4 and discharge west in the proposed 30-inch storm sewer.

Sub-basin A5 is located near the center of the site and consists of approximately 0.49 acres of proposed private drive and commercial/retail development. Sub-basin A4 is part of Tract A and Lot 2 and includes roadway, sidewalks and landscaping. Runoff for Sub-basin A5 is captured in the curb and gutters of the roadways and conveyed north and west to the 5-foot proposed inlet at Design Point A5 where it enters the proposed 15-inch storm sewer. The flows in the 15-inch storm sewer combine with flows from Sub-basins A1, A2, A3 and A4 at design point A5.1 and discharge west in the proposed 30-inch storm sewer.

BASIN B

Basin B consists of portions of Lot 1, Lot 2, Lot 4 and Tract A covering a total area of approximately 2.97 acres. Basin B is divided into sub-basins B1, B2, B3, B4, B5 and B6.

Sub-basin B1 is located on the south side of the site and consists of approximately 0.70 acres of proposed private drive and commercial/retail development. Sub-basin B1 is part of Tract A and Lot 1 and includes roadway, parking lot, sidewalks and landscaping. Runoff for Sub-basin B1 sheet flows towards the center of the Sub-basin to the 5-foot proposed Type 'R' inlet at Design Point B1 where it enters the proposed 18-inch storm sewer and flows west.

Basin A2 area on the 06/25/2007 CLC drainage map is 0.58 acres.

Basin A3 area on the 06/25/2007 CLC drainage map is 0.39 acres.

Basin A4 area on the 06/25/2007 CLC drainage map is 0.17 acres. These seem to match

There is no Basin A5 on the 06/25/2007 CLC drainage map.

The sum of Basin B areas on the 06/25/2007 CLC drainage map is 2.75 acres.

Basin B1 area on the 06/25/2007 CLC drainage map is 0.47 acres.

The 06/25/2007 CLC drainage map calls out a Basin B1.1, which is not shown here

Basin B2 area on the 06/25/2007 CLC drainage map is 0.73 acres.

Basin B3 area on the 06/25/2007 CLC drainage map is 0.51 acres.

Sub-basin B2 is located on the south side of the site and consists of approximately 0.82 acres of proposed overlot grading. Sub-basin B2 is part of Lot 4 and will be developed as retail/commercial in the future. Runoff for Sub-basin B2 generally flows in a northwest direction to the proposed 18-inch storm sewer at design point B2.

Sub-basin B3 is located on the south side of the site and consists of approximately 0.93 acres of proposed private drive and commercial/retail development. Sub-basin B1 is part of Tract A and Lot 1 and includes roadway, parking lot, sidewalks and landscaping. Runoff from the west side of the basin sheet flows towards the center of the Sub-basin to the 5-foot proposed Type 'R' inlet at Design Point B3. Runoff from the east side of the sub-basin is captured in the curb and gutter of the roadways and conveyed west to the 5-foot proposed Type 'R' inlet at Design Point B3. Flows from sub-basins B1, B2 and B3 combine at Design Point B3 and discharge to the northeast in the proposed 36-inch storm sewer.

Basin B4 area on the 06/25/2007 CLC drainage map is 0.21 acres.

Sub-basin B4 is located near the center of the site and consists of approximately 0.14 acres of proposed commercial/retail development. Sub-basin B4 is part of Lot 2 and includes parking lot, sidewalks and landscaping. Runoff for Sub-basin B4 sheet flows towards the center of the sub-basin to the 3-foot proposed area inlet at Design Point B4 where it enters the proposed 12-inch storm sewer and flows west.

Sub-basin B5 is located near the center of the site and consists of approximately 0.12 acres of proposed commercial/retail development. Sub-basin B5 is part of Lot 2 and includes parking lot, sidewalks and landscaping. Runoff for Sub-basin B4 sheet flows towards the center of the sub-basin to the 3-foot proposed area inlet at Design Point B5 where it combines with runoff from Sub-basin B4 and discharges west in the proposed 12-inch storm sewer.

Basin B5 area on the 06/25/2007 CLC drainage map is 0.26 acres.

There is no Basin B6 on the 06/25/2007 CLC drainage map.

Sub-basin B6 is located near the center of the site and consists of approximately 0.26 acres of proposed commercial/retail development. Sub-basin B6 is part of Lot 1 and includes the entire roof of the proposed building. Runoff for Sub-basin B6 flows to north side of the building where the roof drain system conveys the flows to the proposed 12-inch storm sewer. The flows in the 12-inch storm sewer combine with flows from Basin A and the rest of Basin B at Design Point B6 and discharge west in the proposed 36-inch storm sewer.

BASIN C

The sum of Basin C areas on the 06/25/2007 CLC drainage map is 3.94 acres.

Basin C consists of portions of Lot 1, Lot 2, Lot 5 and Tract A covering a total area of approximately 3.64 acres. Basin C is divided into sub-basins C1 and C2.

Basin C2 area on the 06/25/2007 CLC drainage map is 1.35 acres.

Sub-basin C1 is located in the southwest corner of the site and consists of approximately 2.59 acres of overlot grading. Sub-basin C1 encompasses all of Lot 6 and will be developed as retail/commercial in the future. Runoff for Sub-basin A1 generally flows in a northeast direction to the proposed 30-inch storm sewer at design point C1.

Basin C1 area on the 06/25/2007 CLC drainage map is 2.59 acres. These seem to match

Sub-basin C2 is located near the center of the site and consists of approximately 1.04 acres of proposed private drive and commercial/retail development. Sub-basin C2 is part of Tract

A, Lot 1 and Lot 2 and includes roadway, parking lot, sidewalks and landscaping. Runoff from the southwest side of the basin sheet flows to the roadway, is captured by the roadway curb and gutter, and is conveyed to the north to the 5-foot proposed Type 'R' inlet at Design Point C2. Runoff from the east side of the basin is captured in the curb and gutter of the parking lot and roadways and is conveyed west to the 5-foot proposed Type 'R' inlet at Design Point C2. Flows from sub-basin C2 combine with flows from sub-basin C1 at Design Point C2 and discharge to the northeast in the proposed 30-inch storm sewer. Flows from Basin C combine with flows from basins A and B at design point C2.2 and discharge to the northwest in the proposed 42-inch storm sewer. The proposed 42-inch storm sewer outfalls to the existing detention pond at design point C2.3.

Basin D1 area on the 06/25/2007 CLC drainage map is 4.43 acres. These seem to match

BASIN D1

Basin D1 is located on the north side of the site and consists of approximately 4.43 acres of overlot grading. Basin D1 encompasses all of Lot 5 and will be developed as retail/commercial in the future. Runoff from Basin D1 generally flows in a northeast direction and will be captured by a temporary diversion swale until Lot 5 is fully developed. The temporary diversion swale flows west along the north boundary of Lot 5 and outfalls into the existing detention pond. A permanent storm sewer outfall from Lot 5 to the existing detention pond will be designed and constructed with the Lot 5 improvements.

V. SUMMARY

A. COMPLIANCE

The design and installation of all facilities shall be in compliance with the provisions of the Standards and Specifications for Design and Construction of Public Improvements for Erie, Colorado and the Urban Drainage and Flood Control District's Drainage Criteria Manuals as referenced therein.

B. DRAINAGE CONCEPT

Inlets will be installed such that the total volume and depth of rainfall runoff at any given location will not be hazardous either to property of individuals. Storm drains will provide adequate conveyance to the detention facilities where site release will be throttled to levels commensurate to the historic condition. Concept and certification is limited to events of 100-year return period or lesser magnitude and does not ensure against all possibilities that could cause local failures and would be outside of the design engineers' control.

VI. REFERENCES

- Vista Ridge Golf Course Development Master Drainage Report with Appendix A, B, & C. Prepared by Hurst & Associates, Inc., revised July 30, 2001.
- Urban Drainage and Flood Control District "Drainage Criteria Manual" Volumes I and II, June 2001.
- USDA Soil Conservation Service "Soil Survey of Golden Area, Colorado" October 1980.

Appendix A
Hydrologic Calculations

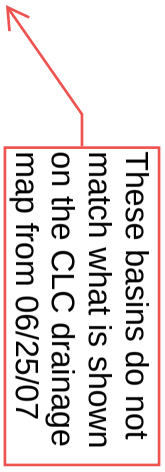
Basin Summary

Vista Ridge Filing No. 11

Job Number: 06-0053

Calculated By: BAS
Checked By: CMJ
Date: 1/18/2007

Basin Designation	Design Pt Designation	Area (SF)	Area (Acres)	Tc (Min)	Composite C(5Yr)	I - 5Yr (in/hr)	Q - 5Yr (CFS)	Composite C (100 Yr)	I - 100 Yr (in/hr)	Q- 100Yr (CFS)	C100*A	C5*A
A1	A1	51,999	1.19	6.3	0.87	4.8	4.99	0.89	9.1	9.62	1.06	1.04
A2	A2	949	0.02	5.0	0.87	5.4	0.10	0.89	10.1	0.20	0.02	0.02
A3	A3	37,897	0.87	6.0	0.87	4.9	3.73	0.89	9.3	7.18	0.77	0.76
A4	A4	7,455	0.17	5.0	0.87	5.4	0.80	0.89	10.1	1.54	0.15	0.15
A5	A5	21,354	0.49	5.3	0.87	5.2	2.24	0.89	9.8	4.30	0.44	0.43
B1	B1	30,631	0.70	5.0	0.87	5.4	3.30	0.89	10.1	6.34	0.63	0.61
B2	B2	35,744	0.82	5.7	0.87	5.1	3.61	0.89	9.5	6.94	0.73	0.71
B3	B3	40,533	0.93	5.0	0.87	5.4	4.37	0.89	10.1	8.39	0.83	0.81
B4	B4	6,229	0.14	5.0	0.87	5.4	0.67	0.89	10.1	1.29	0.13	0.12
B5	B5	5,254	0.12	5.0	0.87	5.4	0.57	0.89	10.1	1.09	0.11	0.10
B6	B6	11,162	0.26	5.0	0.87	5.4	1.20	0.89	10.1	2.31	0.23	0.22
C1	C1	113,037	2.59	9.4	0.87	3.9	8.83	0.89	7.4	17.13	2.31	2.26
C2	C2	45,468	1.04	5.0	0.87	5.4	4.90	0.89	10.1	9.41	0.93	0.91
D1	D1	193,061	4.43	13.2	0.87	3.3	12.69	0.89	6.3	24.77	3.94	3.86



Weighted Runoff Coefficients

Vista Ridge Filing No. 11

Job Number: 06-0053

Calculated By: BAS
Checked By: CMJ
Date: 1/18/2007

Proposed	C2	C5	C10	C100	IMP%
Roof	0.80	0.85	0.90	0.90	90
Concrete Drive/Walk	0.87	0.87	0.88	0.89	96
Landscaping	0.10	0.18	0.25	0.45	7
Paved Street	0.87	0.88	0.90	0.93	100
Multi-family	0.60	0.65	0.70	0.80	70
Commercial	0.87	0.87	0.88	0.89	95
Gravel	0.40	0.45	0.50	0.60	40

		Land Use (Acres)							Weighted Runoff Coefficient					
Basin	Total Area	Total Area (acres)	Roof	Concrete Drive/Walk	Landscape	Paved Street	Multi-family	Com-mercial	Gravel	C2	C5	C10	C100	%Imp
A1	51,999	1.19	0.00	0.00	0.00	0.00	0.00	1.19	0.00	0.87	0.87	0.88	0.89	95.0
A2	949	0.02	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.87	0.87	0.88	0.89	95.0
A3	37,897	0.87	0.00	0.00	0.00	0.00	0.00	0.87	0.00	0.87	0.87	0.88	0.89	95.0
A4	7,455	0.17	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.87	0.87	0.88	0.89	95.0
A5	21,354	0.49	0.00	0.00	0.00	0.00	0.00	0.49	0.00	0.87	0.87	0.88	0.89	95.0
B1	30,631	0.70	0.00	0.00	0.00	0.00	0.00	0.70	0.00	0.87	0.87	0.88	0.89	95.0
B2	35,744	0.82	0.00	0.00	0.00	0.00	0.00	0.82	0.00	0.87	0.87	0.88	0.89	95.0
B3	40,533	0.93	0.00	0.00	0.00	0.00	0.00	0.93	0.00	0.87	0.87	0.88	0.89	95.0
B4	6,229	0.14	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.87	0.87	0.88	0.89	95.0
B5	5,254	0.12	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.87	0.87	0.88	0.89	95.0
B6	11,162	0.26	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.87	0.87	0.88	0.89	95.0
C1	113,037	2.59	0.00	0.00	0.00	0.00	0.00	2.59	0.00	0.87	0.87	0.88	0.89	95.0
C2	45,468	1.04	0.00	0.00	0.00	0.00	0.00	1.04	0.00	0.87	0.87	0.88	0.89	95.0
D1	193,061	4.43	0.00	0.00	0.00	0.00	0.00	4.43	0.00	0.87	0.87	0.88	0.89	95.0

Time of Concentration

Vista Ridge Filing No. 11

Job Number: 06-0053

Calculated By: BAS
Checked By: CMJ
Date: 1/18/2007

Basin Designation	Sub-Basin Data C5	Sub-Basin Area (Acres)	Initial/ Overland Time Time (Ti) Length (Ft)	Slope (%)	Ti (Min)	Travel Time (Sh. Conc./Gutter) Time (Tt) Length (Ft)	Slope (%)	Vel (FPS)	Tt (Min)	Tc Check Urbanized Basin Comp. Tc	Tot Len (Ft)	Tc (Max)	Final Tc (Min)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
A1	0.87	1.19	150	2.0	4.09	183	2.0	1.4	2.18	6.27	333	11.9	6.3
A2	0.87	0.02	12	0.5	1.84	40	0.5	1.5	0.44	2.28	52	10.3	5.0
A3	0.87	0.87	145	2.5	3.74	216	2.5	1.6	2.25	5.99	361	12.0	6.0
A4	0.87	0.17	60	2.0	2.59	110	2.0	2.9	0.63	3.22	170	10.9	5.0
A5	0.87	0.49	70.0	2.0	2.80	300	1.0	2.0	2.50	5.30	370	12.1	5.3
B1	0.87	0.70	100.0	4.0	2.65	120	4.5	3.5	0.57	3.23	220	11.2	5.0
B2	0.87	0.82	165.0	2.0	4.29	185	2.0	2.2	1.40	5.70	350	11.9	5.7
B3	0.87	0.93	115.0	2.5	3.33	250	2.5	2.9	1.44	4.76	365	12.0	5.0
B4	0.87	0.14	40.0	3.0	1.85	50	3.0	3.5	0.24	2.09	90	10.5	5.0
B5	0.87	0.12	30.0	3.0	1.60	50	3.0	3.5	0.24	1.84	80	10.4	5.0
B6	0.87	0.26	60.0	2.0	2.59	175	2.0	2.9	1.01	3.59	235	11.3	5.0
C1	0.87	2.59	250.0	2.0	5.29	370	2.0	1.5	4.11	9.40	620	13.4	9.4
C2	0.87	1.04	100.0	4.0	2.65	270	2.8	2.8	1.61	4.26	370	12.1	5.0
D1	0.87	4.43	250.0	4.4	4.06	600	2.7	1.1	9.09	13.16	850	14.7	13.2

Runoff Calculations - 100-year Storm

Vista Ridge Filing No. 11

Job Number: 06-0053

Calculated By: BAS
Checked By: CMJ
Date: 1/18/2007

Runoff Calculations (Rational Method) - Direct Runoff

Design Point	Direct Runoff							Total Runoff				Travel Time			Remarks
	Area Designations	Area (Acres)	Runoff Coeff	Tc (min)	CA (AC)	I (in/hr)	Q (cfs)	Tc (min)	Total CA (AC)	I (in/hr)	Q (cfs)	Length (ft)	Velocity (fps)	Tt (min)	
A1	A1	1.19	0.89	6.3	1.06	8.8	9.35	6.3	1.06	8.8	9.35	138	10.00	0.23	Pipe flow
A2	A2	0.02	0.89	5.0	0.02	9.4	0.18	5.0	0.02	9.4	0.18	26	10.00	0.04	Pipe flow
A2.1	A1+A2							5.0	1.08	9.4	10.17	26	10.0	0.04	Pipe flow
A3	A3	0.87	0.89	6.0	0.77	9.0	6.97	6.0	0.77	9.0	6.97	14	10.0	0.02	Pipe flow
A3.1	A2.1+A3							5.1	1.86	9.4	17.45	90	10.0	0.15	Pipe flow
A4	A4	0.17	0.89	5.0	0.15	9.4	1.43	5.0	0.15	9.4	1.43	36	10.0	0.06	Pipe flow
A4.1	A4+A3.1							5.1	2.01	9.4	18.88	73	10.0	0.12	Pipe flow
A5	A5	0.49	0.89	5.3	0.44	9.3	4.06	5.3	0.44	9.3	4.06	21	10.0	0.04	Pipe flow
A5.1	A4+A5							5.2	2.44	9.4	22.98	86	10.0	0.14	Pipe flow
B1	B1	0.70	0.89	5.0	0.63	9.4	5.88	5.0	0.63	9.4	5.88	147	10.0	0.25	Pipe flow
B2	B2	0.82	0.89	5.7	0.73	9.0	6.57	5.7	0.73	9.0	6.57	42	10.0	0.07	Pipe flow
B3	B3+B1+B2	0.93	0.89	5.0	0.83	9.4	7.78	5.4	2.18	9.1	19.88	79	10.0	0.13	Pipe flow
B4	B4	0.14	0.89	5.0	0.13	9.4	1.20	5.0	0.13	9.4	1.20	71	10.0	0.12	Pipe flow
B5	B4+B5	0.12	0.89	5.0	0.11	9.4	1.01	5.1	0.23	9.4	2.21	59	10.0	0.10	Pipe flow
B5.1	B3+B5							5.5	2.42	9.1	22.01	131	10.0	0.22	Pipe flow
B6	B6	0.26	0.89	5.0	0.23	9.4	2.14	5.7	0.23	9.0	2.05	36	10.0	0.06	Pipe flow
B6.1	B6+B5.1							5.7	2.65	9.0	23.82	102	10.0	0.17	Pipe flow
B6.2	B6.1+A5.2							5.9	5.09	9.0	45.83	216	10.0	0.36	Pipe flow
C1	C1	2.59	0.89	9.4	2.31	7.1	16.40	9.4	2.31	7.1	16.40	56	10.0	0.09	Pipe flow
C2	C2	1.04	0.89	5.0	0.93	9.4	8.73	5.0	0.93	9.4	8.73	10	10.0	0.02	Pipe flow
C2.1	C2.1+C2							9.5	3.24	7.1	22.99	36	10.0	0.06	Pipe flow
C2.2	C2.2+B6							9.5	8.33	7.1	59.14	117	10.0	0.20	Pipe flow
D1		4.43	0.89	13.2	3.94	6.3	24.85								

Runoff Calculations - 5-year Storm

Vista Ridge Filing No. 11

Job Number: 06-0053

Calculated By: BAS
Checked By: CMJ
Date: 1/18/2007

Runoff Calculations (Rational Method) - Direct Runoff

Design Point	Direct Runoff							Total Runoff				Travel Time			Remarks
	Area Designations	Area (Acres)	Runoff Coeff	Tc (min)	CA (AC)	I (in/hr)	Q (cfs)	Tc (min)	Total CA (AC)	I (in/hr)	Q (cfs)	Length (ft)	Velocity (fps)	Tt (min)	
A1	A1	1.19	0.87	6.3	1.04	4.7	4.88	6.3	1.04	4.7	4.88	138	10.00	0.23	Pipe flow
A2	A2	0.02	0.87	5.0	0.02	5.0	0.09	5.0	0.02	5.0	0.09	26	10.00	0.04	Pipe flow
A2.1	A1+A2							5.0	1.06	5.0	5.29	26	10.0	0.04	Pipe flow
A3	A3	0.87	0.87	6.0	0.76	4.8	3.63	6.0	0.76	4.8	3.63	14	10.0	0.02	Pipe flow
A3.1	A2.1							5.1	1.81	5.0	9.07	162	10.0	0.27	Pipe flow
A4	A4	0.17	0.87	5.0	0.15	5.0	0.74	5.0	0.15	5.0	0.74	121	10.0	0.20	Pipe flow
A5	A5	0.49	0.87	5.3	0.43	4.9	2.09	5.3	0.43	4.9	2.09	21	10.0	0.04	Pipe flow
A5.1	A4+A5							5.4	2.39	4.9	11.71	86	10.0	0.14	Pipe flow
B1	B1	0.70	0.87	5.0	0.61	5.0	3.06	5.0	0.61	5.0	3.06	147	10.0	0.25	Pipe flow
B2	B2	0.82	0.87	5.7	0.71	4.8	3.43	5.7	0.71	4.8	3.43	42	10.0	0.07	Pipe flow
B3	B3+B1+B2	0.93	0.87	5.0	0.81	5.0	4.05	5.5	3.72	4.9	18.21	79	10.0	0.13	Pipe flow
B4	B4	0.14	0.87	5.0	0.12	5.0	0.62	5.0	0.12	5.0	0.62	71	10.0	0.12	Pipe flow
B5	B4+B5	0.12	0.87	5.0	0.10	5.0	0.52	5.6	0.23	4.9	1.12	59	10.0	0.10	Pipe flow
B5.1	B3+B5							5.6	4.75	4.9	23.30	131	10.0	0.22	Pipe flow
B6	B6+B5.1+A5.1	0.26	0.87	5.0	0.22	5.0	1.11	5.8	4.98	4.8	23.89	216	10.0	0.36	Pipe flow
C1	C1	2.59	0.87	9.4	2.26	4.0	9.03	9.4	2.26	4.0	9.03	56	10.0	0.09	Pipe flow
C2	C2	1.04	0.87	5.0	0.91	5.0	4.54	5.0	0.91	5.0	4.54	10	10.0	0.02	Pipe flow
C2.1	C2.1+C1							9.5	3.17	4.0	12.66	36	10.0	0.06	Pipe flow
C2.2	C2.2+B6							9.5	8.14	4.0	32.57	117	10.0	0.20	Pipe flow
D1		4.43	0.87	13.2	3.86	3.3	12.69								

Appendix B
Hydraulic Calculations

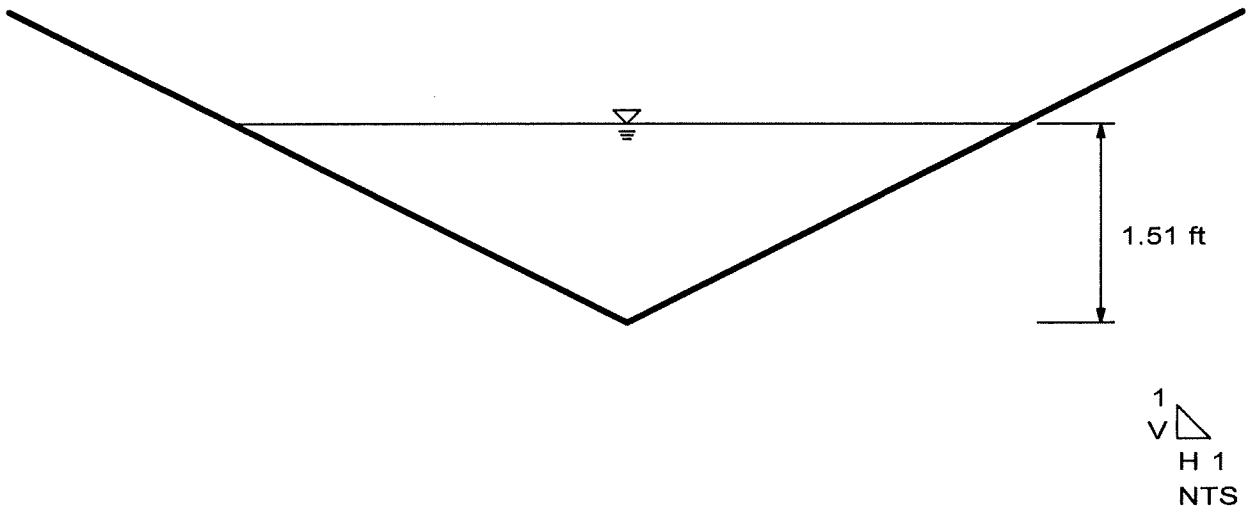
Pipe Capacity at 0.5% Slope

0.50 percent			mannings					
Pipe Diameter (in)	Pipe Area (sf)	Hyd Radius (ft)	0.013	C1	Slope (%)	Slope (ft/ft)	S^0.5 (ft/ft)	Qfull (cfs)
12	0.785	0.250	0.013	35.64	0.500	0.005	0.071	2.52
15	1.227	0.313	0.013	64.62	0.500	0.005	0.071	4.57
18	1.767	0.375	0.013	105.08	0.500	0.005	0.071	7.43
21	2.405	0.438	0.013	158.50	0.500	0.005	0.071	11.21
24	3.142	0.500	0.013	226.30	0.500	0.005	0.071	16.00
27	3.976	0.563	0.013	309.81	0.500	0.005	0.071	21.91
30	4.909	0.625	0.013	410.31	0.500	0.005	0.071	29.01
33	5.940	0.688	0.013	529.04	0.500	0.005	0.071	37.41
36	7.069	0.750	0.013	667.21	0.500	0.005	0.071	47.18
42	9.621	0.875	0.013	1006.44	0.500	0.005	0.071	71.17
48	12.566	1.001	0.013	1436.92	0.500	0.005	0.071	101.61
54	15.904	1.126	0.013	1967.15	0.500	0.005	0.071	139.10
60	19.635	1.251	0.013	2605.30	0.500	0.005	0.071	184.22
66	23.758	1.376	0.013	3359.22	0.500	0.005	0.071	237.53
72	28.274	1.501	0.013	4236.51	0.500	0.005	0.071	299.57
78	33.183	1.626	0.013	5244.54	0.500	0.005	0.071	370.84
84	38.484	1.751	0.013	6390.47	0.500	0.005	0.071	451.87
90	44.179	1.876	0.013	7681.30	0.500	0.005	0.071	543.15

Temp Diversion Dike (Basin O1)
Cross Section for Triangular Channel

Project Description	
Project File	j:\2006\06-0053 village at vista ridge\civil\drng\diversio.fm2
Worksheet	Temporary Diversion Dike (Basin O1)
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.030	
Channel Slope	0.020000	ft/ft
Depth	1.51	ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Discharge	24.50	cfs

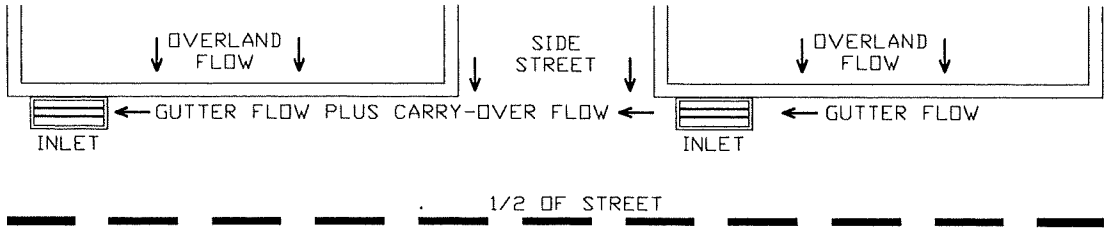


DESIGN PEAK FLOW FOR ONE-HALF OF STREET BY THE RATIONAL METHOD

Vista Ridge 06-0053

Inlet A5

Design Flow = Gutter Flow + Carry-over Flow



Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street, plus flow bypassing upstream subcatchments):
*** If you entered a value here, skip the rest of this sheet and proceed to sheet Q-Allow)**

	Minor Storm	Major Storm	
*Q =	2.09	4.06	cfs

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site: (Check One Box Only)

Site is Urban:	X
Site Is Non-Urban:	

	Slope (ft/ft)	Length (ft)
Overland Flow =		
Gutter Flow =		

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.00	0.00	cfs

Analysis of Flow Time (Time of Concentration) for a Catchment:

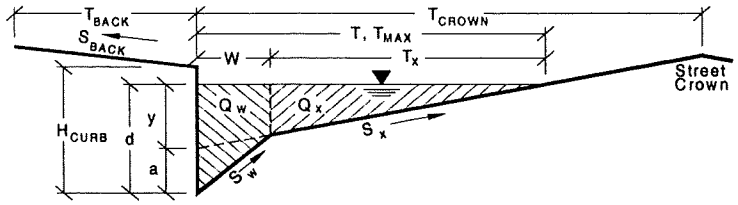
	Minor Storm	Major Storm	
Calculated Design Storm Runoff Coefficient, C =	N/A	N/A	
Calculated 5-yr. Runoff Coefficient, C5 =	N/A	N/A	
Overland Flow Velocity, V_O =	N/A	N/A	fps
Gutter Flow Velocity, V_G =	N/A	N/A	fps
Overland Flow Time, t_O =	N/A	N/A	minutes
Gutter Flow Time, t_G =	N/A	N/A	minutes
Calculated Time of Concentration, T_c =	N/A	N/A	minutes
Time of Concentration by Regional Formula, T_c =	N/A	N/A	minutes
Recommended T_c =	N/A	N/A	minutes
Time of Concentration Selected by User, T_c =	N/A	N/A	**minutes**
Design Rainfall Intensity, I =	N/A	N/A	inch/hr
Calculated Local Peak Flow, Q_p =	N/A	N/A	cfs
Total Design Peak Flow, Q =	2.09	4.06	**cfs**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Major & Minor Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Vista Ridge 06-0053

Inlet ID: Inlet A5



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.0200	ft. vert. / ft. horiz
Manning's Roughness Behind Curb	n_{BACK} =	0.0200	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Depression	a =	3.00	inches
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.0200	ft. vert. / ft. horiz
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.0000	ft. vert. / ft. horiz
Manning's Roughness for Street Section	n_{STREET} =	0.0150	

		Minor Storm	Major Storm	
Max. Allowable Water Spread for Minor & Major Storm	T_{MAX} =	11.0	11.0	ft
Max. Allowable Depth at Gutter Flow Line for Minor & Major Storm	d_{MAX} =	6.00	6.00	inches
Allow Flow Depth at Street Crown (leave blank for no)				X = yes

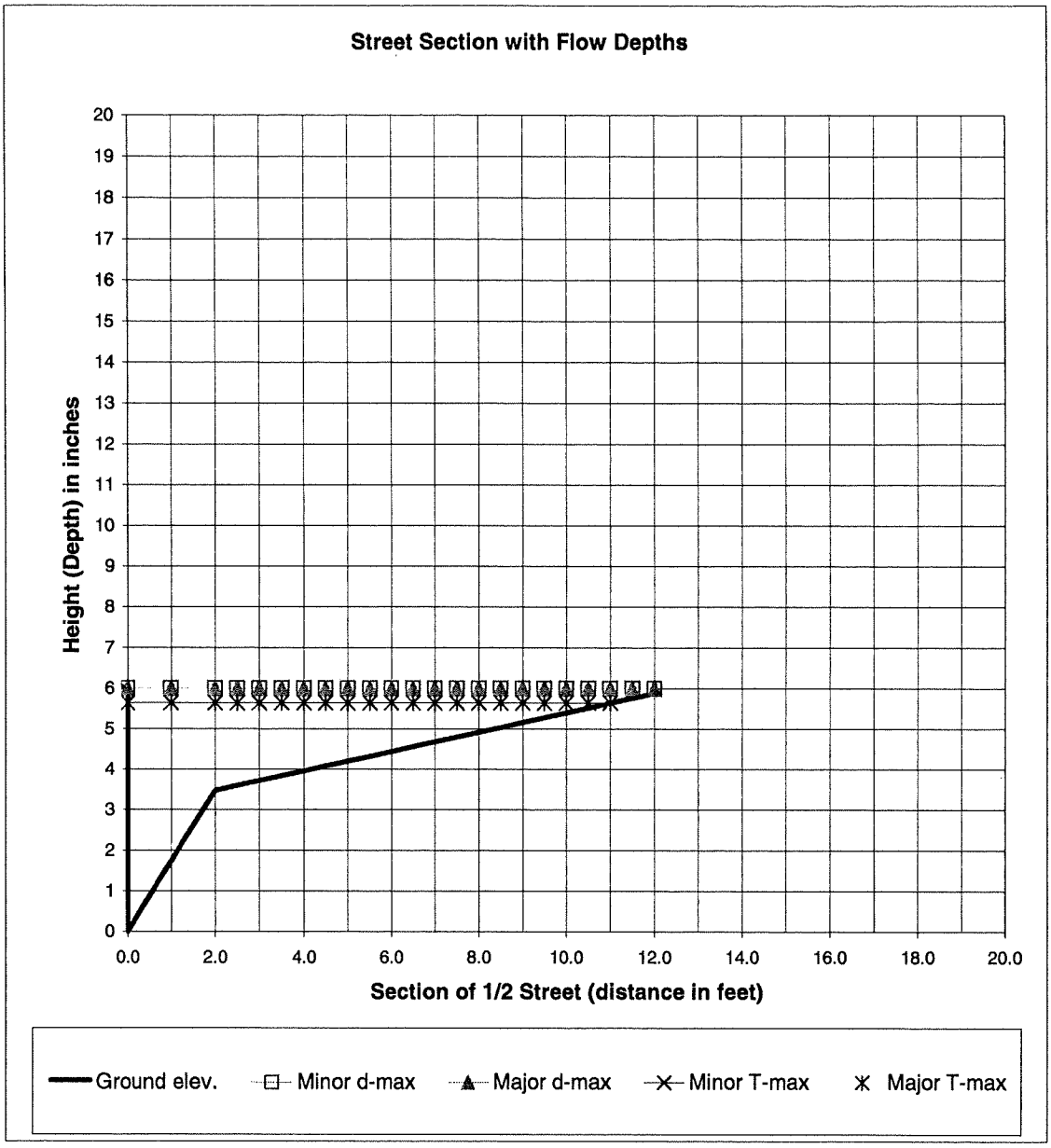
Maximum Gutter Capacity Based On Allowable Water Spread		Minor Storm	Major Storm	
Gutter Cross Slope (Eq. ST-8)	S_W =	0.1450	0.1450	ft/ft
Water Depth without Gutter Depression (Eq. ST-2)	y =	2.64	2.64	inches
Water Depth with a Gutter Depression	d =	5.64	5.64	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	9.0	9.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.622	0.622	
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 Water 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 Gutter Capacity Based on Allowable Gutter Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	12.5	12.5	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X TH}$ =	10.5	10.5	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.557	0.557	
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	**Q =**	**0.0**	**0.0**	**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	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allow. Gutter 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

Max. Allowable Gutter Capacity Based on Minimum of Q_T or Q_d		Minor Storm	Major Storm	
	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

MINOR STORM max. allowable capacity OK - greater than flow given on sheet 'Q-Peak'

MAJOR STORM max. allowable capacity OK - greater than flow given on sheet 'Q-Peak'



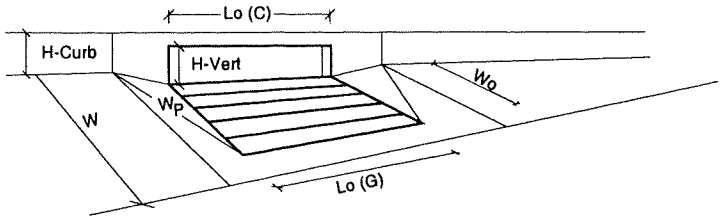
$$Q_x = \frac{0.56}{n} S_x^{5/3} S_L^{1/2} T_x^{8/3} \qquad E_o = \frac{1}{1 + \frac{S_w / S_x}{\left[1 + \frac{S_w / S_x}{(T/W) - 1}\right]^{8/3} - 1}}$$

$$Q = \frac{Q_x}{1 - E_o}; \; Q_w = Q - Q_x$$

INLET IN A SUMP OR SAG LOCATION

Project = Vista Ridge 06-0053

Inlet ID = Inlet A5



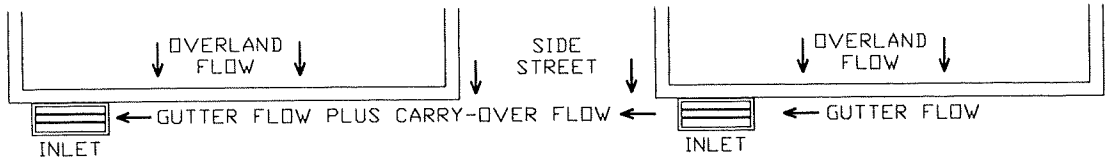
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Grate Information		MINOR	MAJOR	
Length of a Unit 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 3.00)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.67)	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} =	5.95	5.95	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.4	63.4	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) =	0.20	0.20	
Curb Opening Weir Coefficient (typical value 2.30-3.00)	C_w (C) =	2.30	2.30	
Curb Opening Orifice Coefficient (typical value 0.67)	C_o (C) =	0.67	0.67	
Resulting Gutter Flow Depth for Grate Inlet Capacity in a Sump		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate as a Weir				
Flow Depth at Local Depression without Clogging (0 cfs grate, 2.09 cfs curb)	d_{wi} =	N/A	N/A	inches
This Row Used for Combination Inlets Only	$d_{curb\text{-}un}$ =	N/A	N/A	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 2.09 cfs curb)	d_{ws} =	N/A	N/A	inches
This Row Used for Combination Inlets Only	$d_{curb\text{-}cl}$ =	N/A	N/A	inches
Grate as an Orifice		MINOR	MAJOR	
Flow Depth at Local Depression without Clogging (0 cfs grate, 2.09 cfs curb)	d_{oi} =	N/A	N/A	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 2.09 cfs curb)	d_{os} =	N/A	N/A	inches
Resulting Gutter Flow Depth Outside of Local Depression	$d_{a\text{-}Grate}$ =	N/A	N/A	**inches**
Resulting Gutter Flow Depth for Curb Opening Inlet Capacity in a Sump		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.20	0.20	
Curb as a Weir, Grate as an Orifice		MINOR	MAJOR	
Flow Depth at Local Depression without Clogging (0 cfs grate, 2.09 cfs curb)	d_{wi} =	2.68	4.18	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 2.09 cfs curb)	d_{ws} =	2.91	4.53	inches
Curb as an Orifice, Grate as an Orifice		MINOR	MAJOR	
Flow Depth at Local Depression without Clogging (0 cfs grate, 2.09 cfs curb)	d_{oi} =	2.95	3.77	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 2.09 cfs curb)	d_{os} =	3.12	4.40	inches
Resulting Gutter Flow Depth Outside of Local Depression	$d_{a\text{-}Curb}$ =	0.12	1.53	**inches**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.0	5.0	feet
Total Inlet Interception Capacity (Design Discharge from *Q-Peak*)	Q_a =	2.1	4.1	cfs
Resultant Gutter Flow Depth (based on sheet *Q-Allow* geometry)	d =	0.12	1.53	**inches**
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	0.1	0.9	**feet**
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.00	0.00	**inches**

DESIGN PEAK FLOW FOR ONE-HALF OF STREET BY THE RATIONAL METHOD

Vista Ridge 06-0053

Inlet B1

Design Flow = Gutter Flow + Carry-over Flow



Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street, plus flow bypassing upstream subcatchments):
*** If you entered a value here, skip the rest of this sheet and proceed to sheet Q-Allow)**

	Minor Storm	Major Storm	
*Q =	3.06	5.88	cfs

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site: (Check One Box Only)	
Site is Urban:	X
Site Is Non-Urban:	

	Slope (ft/ft)	Length (ft)
Overland Flow =		
Gutter Flow =		

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.00	0.00	**cfs**

Analysis of Flow Time (Time of Concentration) for a Catchment:

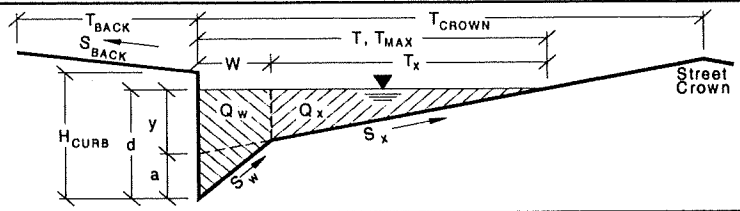
	Minor Storm	Major Storm	
Calculated Design Storm Runoff Coefficient, C =	N/A	N/A	
Calculated 5-yr. Runoff Coefficient, C5 =	N/A	N/A	
Overland Flow Velocity, V_O =	N/A	N/A	fps
Gutter Flow Velocity, V_G =	N/A	N/A	fps
Overland Flow Time, t_O =	N/A	N/A	minutes
Gutter Flow Time, t_G =	N/A	N/A	minutes
Calculated Time of Concentration, T_c =	N/A	N/A	minutes
Time of Concentration by Regional Formula, T_c =	N/A	N/A	minutes
Recommended T_c =	N/A	N/A	minutes
Time of Concentration Selected by User, T_c =	**N/A**	**N/A**	**minutes**
Design Rainfall Intensity, I =	N/A	N/A	inch/hr
Calculated Local Peak Flow, Q_p =	N/A	N/A	cfs
Total Design Peak Flow, Q =	**3.06**	**5.88**	**cfs**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Major & Minor Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Vista Ridge 06-0053

Inlet ID: Inlet B1



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.0200	ft. vert. / ft. horiz
Manning's Roughness Behind Curb	n_{BACK} =	0.0200	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Depression	a =	3.00	inches
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.0200	ft. vert. / ft. horiz
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.0000	ft. vert. / ft. horiz
Manning's Roughness for Street Section	n_{STREET} =	0.0150	

		Minor Storm	Major Storm	
Max. Allowable Water Spread for Minor & Major Storm	T_{MAX} =	11.0	11.0	ft
Max. Allowable Depth at Gutter Flow Line for Minor & Major Storm	d_{MAX} =	6.00	6.00	inches
Allow Flow Depth at Street Crown (leave blank for no)				X = yes

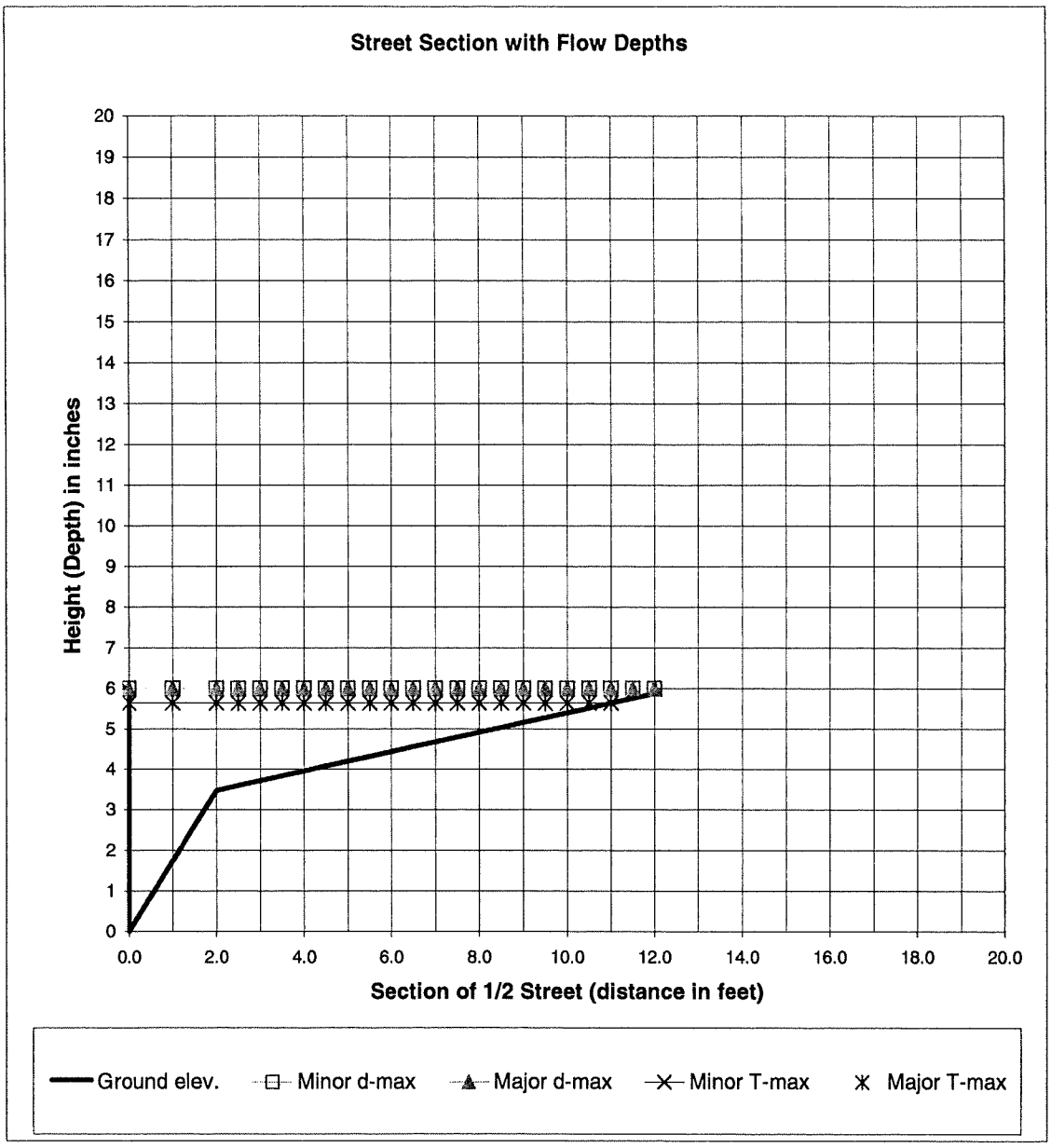
Maximum Gutter Capacity Based On Allowable Water Spread		Minor Storm	Major Storm	
Gutter Cross Slope (Eq. ST-8)	S_W =	0.1450	0.1450	ft/ft
Water Depth without Gutter Depression (Eq. ST-2)	y =	2.64	2.64	inches
Water Depth with a Gutter Depression	d =	5.64	5.64	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	9.0	9.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.622	0.622	
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 Water 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 Gutter Capacity Based on Allowable Gutter Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	12.5	12.5	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	10.5	10.5	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.557	0.557	
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	**Q =**	**0.0**	**0.0**	**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	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allow. Gutter 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	
Max. Allowable Gutter Capacity Based on Minimum of Q_T or Q_d	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

MINOR STORM max. allowable capacity OK - greater than flow given on sheet 'Q-Peak'

MAJOR STORM max. allowable capacity OK - greater than flow given on sheet 'Q-Peak'



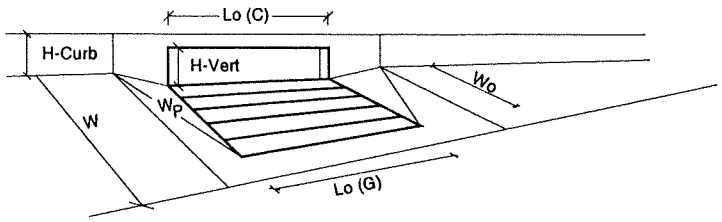
$$Q_x = \frac{0.56}{n} S_x^{5/3} S_L^{1/2} T_x^{8/3} \qquad E_o = \frac{1}{1 + \frac{S_w / S_x}{\left[1 + \frac{S_w / S_x}{(T/W) - 1}\right]^{8/3} - 1}}$$

$$Q = \frac{Q_x}{1 - E_o}; \; Q_w = Q - Q_x$$

INLET IN A SUMP OR SAG LOCATION

Project = Vista Ridge 06-0053

Inlet ID = Inlet B1



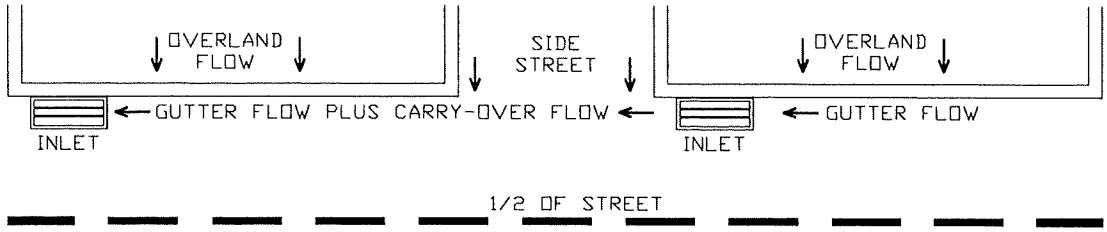
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Grate Information		MINOR	MAJOR	
Length of a Unit 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 3.00)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.67)	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} =	5.95	5.95	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.4	63.4	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) =	0.20	0.20	
Curb Opening Weir Coefficient (typical value 2.30-3.00)	C_w (C) =	2.30	2.30	
Curb Opening Orifice Coefficient (typical value 0.67)	C_o (C) =	0.67	0.67	
Resulting Gutter Flow Depth for Grate Inlet Capacity in a Sump		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate as a Weir				
Flow Depth at Local Depression without Clogging (0 cfs grate, 3.06 cfs curb)	d_{wi} =	N/A	N/A	inches
This Row Used for Combination Inlets Only	$d_{curb\text{-}un}$ =	N/A	N/A	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 3.06 cfs curb)	d_{wa} =	N/A	N/A	inches
This Row Used for Combination Inlets Only	$d_{curb\text{-}cl}$ =	N/A	N/A	inches
Grate as an Orifice		MINOR	MAJOR	
Flow Depth at Local Depression without Clogging (0 cfs grate, 3.06 cfs curb)	d_{oi} =	N/A	N/A	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 3.06 cfs curb)	d_{oa} =	N/A	N/A	inches
Resulting Gutter Flow Depth Outside of Local Depression	$d_{a\text{-}Grate}$ =	N/A	N/A	inches
Resulting Gutter Flow Depth for Curb Opening Inlet Capacity in a Sump		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.20	0.20	
Curb as a Weir, Grate as an Orifice		MINOR	MAJOR	
Flow Depth at Local Depression without Clogging (0 cfs grate, 3.06 cfs curb)	d_{wi} =	3.46	5.35	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 3.06 cfs curb)	d_{wa} =	3.76	5.80	inches
Curb as an Orifice, Grate as an Orifice		MINOR	MAJOR	
Flow Depth at Local Depression without Clogging (0 cfs grate, 3.06 cfs curb)	d_{oi} =	3.29	5.00	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 3.06 cfs curb)	d_{oa} =	3.65	6.31	inches
Resulting Gutter Flow Depth Outside of Local Depression	$d_{a\text{-}Curb}$ =	0.76	3.31	inches
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.0	5.0	feet
Total Inlet Interception Capacity (Design Discharge from *Q-Peak*)	Q_a =	3.1	5.9	cfs
Resultant Gutter Flow Depth (based on sheet *Q-Allow* geometry)	d =	0.76	3.31	inches
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	0.4	1.9	feet
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.00	0.00	inches

DESIGN PEAK FLOW FOR ONE-HALF OF STREET BY THE RATIONAL METHOD

Vista Ridge 06-0053

Inlet B3

Design Flow = Gutter Flow + Carry-over Flow



Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street, plus flow bypassing upstream subcatchments):
*** If you entered a value here, skip the rest of this sheet and proceed to sheet Q-Allow)**

	Minor Storm	Major Storm	
*Q =	3.97	7.55	cfs

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site: (Check One Box Only)	
Site is Urban:	X
Site Is Non-Urban:	

	Slope (ft/ft)	Length (ft)
Overland Flow =		
Gutter Flow =		

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.00	0.00	cfs

Analysis of Flow Time (Time of Concentration) for a Catchment:

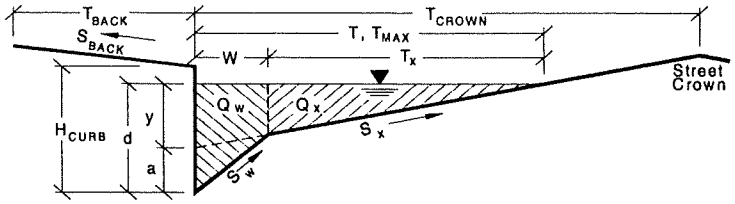
	Minor Storm	Major Storm	
Calculated Design Storm Runoff Coefficient, C =	N/A	N/A	
Calculated 5-yr. Runoff Coefficient, C5 =	N/A	N/A	
Overland Flow Velocity, V_O =	N/A	N/A	fps
Gutter Flow Velocity, V_G =	N/A	N/A	fps
Overland Flow Time, t_O =	N/A	N/A	minutes
Gutter Flow Time, t_G =	N/A	N/A	minutes
Calculated Time of Concentration, T_c =	N/A	N/A	minutes
Time of Concentration by Regional Formula, T_c =	N/A	N/A	minutes
Recommended T_c =	N/A	N/A	minutes
Time of Concentration Selected by User, T_c =	N/A	N/A	**minutes**
Design Rainfall Intensity, I =	N/A	N/A	inch/hr
Calculated Local Peak Flow, Q_p =	N/A	N/A	cfs
Total Design Peak Flow, Q =	3.97	7.55	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Major & Minor Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Vista Ridge 06-0053

Inlet ID: Inlet B3



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.0200	ft. vert. / ft. horiz
Manning's Roughness Behind Curb	n_{BACK} =	0.0200	
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 Depression	a =	3.00	inches
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.0200	ft. vert. / ft. horiz
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.0000	ft. vert. / ft. horiz
Manning's Roughness for Street Section	n_{STREET} =	0.0150	

		Minor Storm	Major Storm	
Max. Allowable Water Spread for Minor & Major Storm	T_{MAX} =	11.0	11.0	ft
Max. Allowable Depth at Gutter Flow Line for Minor & Major Storm	d_{MAX} =	6.00	6.00	inches
Allow Flow Depth at Street Crown (leave blank for no)				X = yes

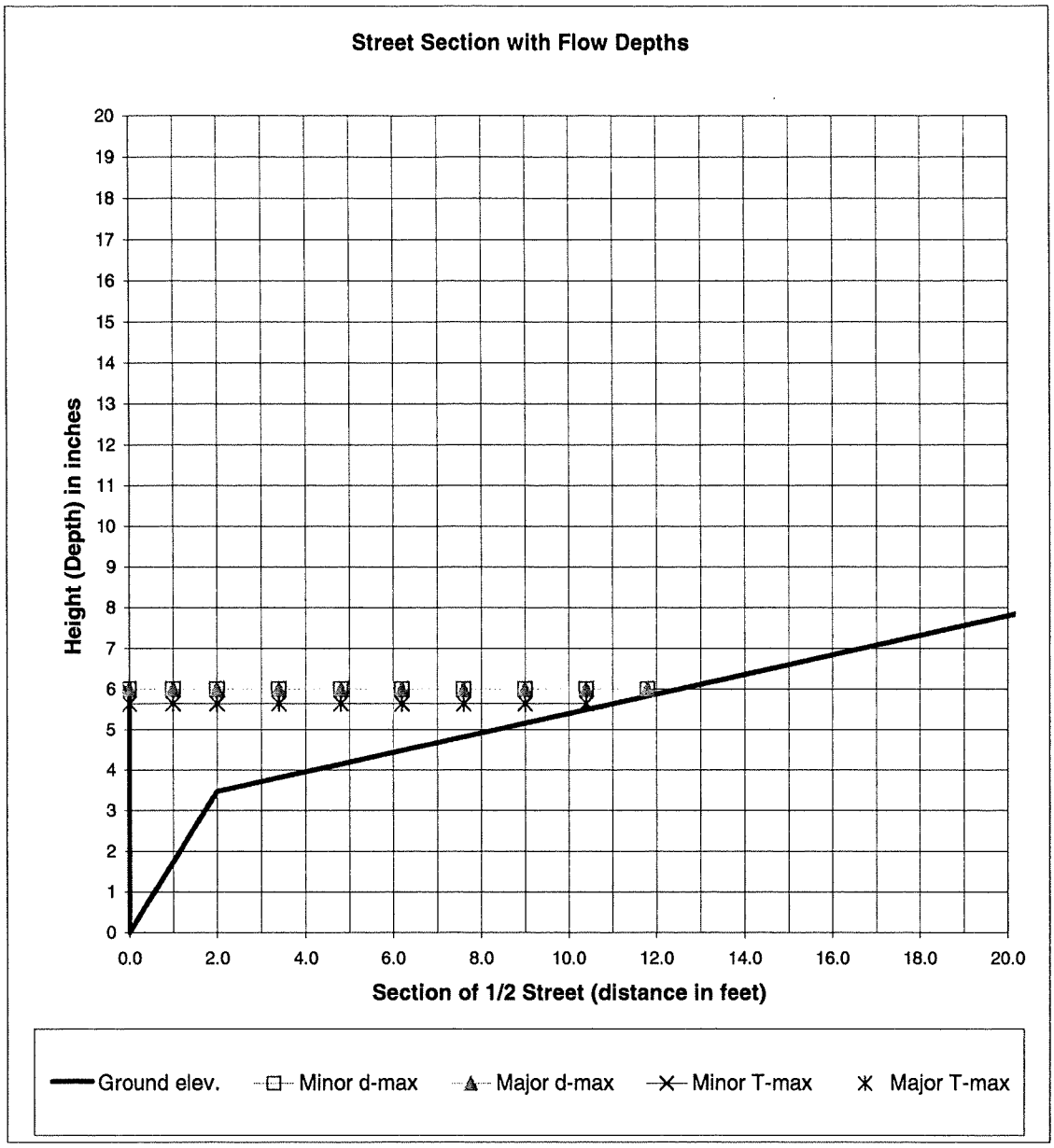
Maximum Gutter Capacity Based On Allowable Water Spread		Minor Storm	Major Storm	
Gutter Cross Slope (Eq. ST-8)	S_W =	0.1450	0.1450	ft/ft
Water Depth without Gutter Depression (Eq. ST-2)	y =	2.64	2.64	inches
Water Depth with a Gutter Depression	d =	5.64	5.64	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	9.0	9.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.622	0.622	
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 Water 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 Gutter Capacity Based on Allowable Gutter Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	12.5	12.5	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	10.5	10.5	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.557	0.557	
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	**Q =**	**0.0**	**0.0**	**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	
Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \geq 6$") Storm	R =	SUMP	SUMP	
Max Flow Based on Allow. Gutter 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

Max. Allowable Gutter Capacity Based on Minimum of Q_T or Q_d		Minor Storm	Major Storm	
	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

MINOR STORM max. allowable capacity OK - greater than flow given on sheet 'Q-Peak'

MAJOR STORM max. allowable capacity OK - greater than flow given on sheet 'Q-Peak'



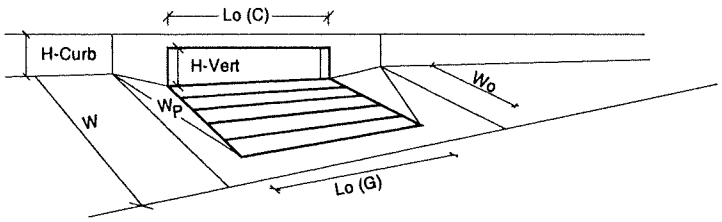
$$Q_x = \frac{0.56}{n} S_x^{5/3} S_L^{1/2} T_x^{8/3} \qquad E_o = \frac{1}{1 + \frac{S_w / S_x}{\left[1 + \frac{S_w / S_x}{(T/W) - 1}\right]^{8/3} - 1}}$$

$$Q = \frac{Q_x}{1 - E_o}; \; Q_w = Q - Q_x$$

INLET IN A SUMP OR SAG LOCATION

Project = Vista Ridge 06-0053

Inlet ID = Inlet B3



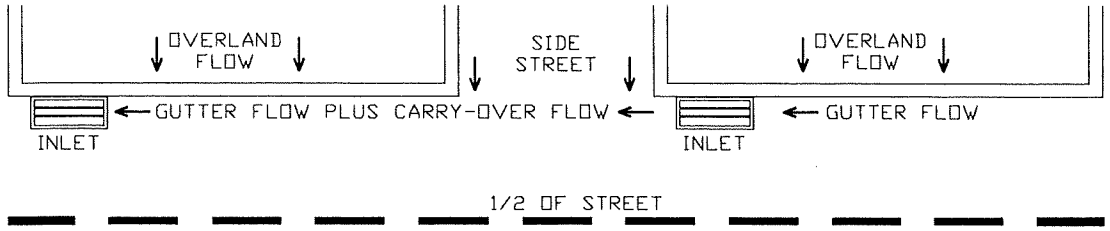
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Grate Information		MINOR	MAJOR	
Length of a Unit 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 3.00)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.67)	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} =	5.95	5.95	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.4	63.4	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) =	0.20	0.20	
Curb Opening Weir Coefficient (typical value 2.30-3.00)	C_w (C) =	2.30	2.30	
Curb Opening Orifice Coefficient (typical value 0.67)	C_o (C) =	0.67	0.67	
Resulting Gutter Flow Depth for Grate Inlet Capacity in a Sump		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate as a Weir				
Flow Depth at Local Depression without Clogging (0 cfs grate, 3.97 cfs curb)	d_{wi} =	N/A	N/A	inches
This Row Used for Combination Inlets Only	$d_{curb\text{-}un}$ =	N/A	N/A	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 3.97 cfs curb)	d_{wa} =	N/A	N/A	inches
This Row Used for Combination Inlets Only	$d_{curb\text{-}cl}$ =	N/A	N/A	inches
Grate as an Orifice		MINOR	MAJOR	
Flow Depth at Local Depression without Clogging (0 cfs grate, 3.97 cfs curb)	d_{oi} =	N/A	N/A	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 3.97 cfs curb)	d_{oa} =	N/A	N/A	inches
Resulting Gutter Flow Depth Outside of Local Depression	$d_{a\text{-}Grate}$ =	N/A	N/A	Inches
Resulting Gutter Flow Depth for Curb Opening Inlet Capacity in a Sump		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.20	0.20	
Curb as a Weir, Grate as an Orifice		MINOR	MAJOR	
Flow Depth at Local Depression without Clogging (0 cfs grate, 3.97 cfs curb)	d_{wi} =	4.11	6.31	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 3.97 cfs curb)	d_{wa} =	4.47	6.86	inches
Curb as an Orifice, Grate as an Orifice		MINOR	MAJOR	
Flow Depth at Local Depression without Clogging (0 cfs grate, 3.97 cfs curb)	d_{oi} =	3.72	6.51	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 3.97 cfs curb)	d_{oa} =	4.32	8.68	inches
Resulting Gutter Flow Depth Outside of Local Depression	$d_{a\text{-}Curb}$ =	1.47	5.68	Inches
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.0	5.0	feet
Total Inlet Interception Capacity (Design Discharge from *Q-Peak*)	Q_a =	4.0	7.6	cfs
Resultant Gutter Flow Depth (based on sheet *Q-Allow* geometry)	d =	1.47	5.68	Inches
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	0.8	11.2	feet
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.00	0.00	Inches

DESIGN PEAK FLOW FOR ONE-HALF OF STREET BY THE RATIONAL METHOD

Vista Ridge 06-0053

Inlet C2

Design Flow = Gutter Flow + Carry-over Flow



Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street, plus flow bypassing upstream subcatchments):
*** If you entered a value here, skip the rest of this sheet and proceed to sheet Q-Allow)**

	Minor Storm	Major Storm	
*Q =	4.54	8.73	cfs

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site: (Check One Box Only)	
Site is Urban:	X
Site Is Non-Urban:	

	Slope (ft/ft)	Length (ft)
Overland Flow =		
Gutter Flow =		

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.00	0.00	cfs

Analysis of Flow Time (Time of Concentration) for a Catchment:

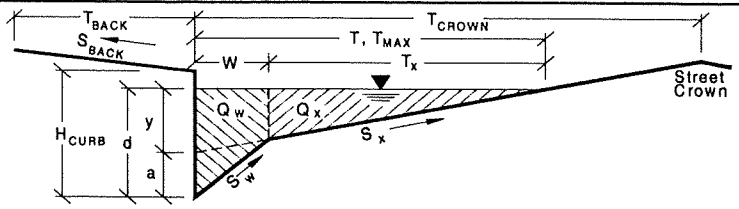
	Minor Storm	Major Storm	
Calculated Design Storm Runoff Coefficient, C =	N/A	N/A	
Calculated 5-yr. Runoff Coefficient, C5 =	N/A	N/A	
Overland Flow Velocity, V_O =	N/A	N/A	fps
Gutter Flow Velocity, V_G =	N/A	N/A	fps
Overland Flow Time, t_O =	N/A	N/A	minutes
Gutter Flow Time, t_G =	N/A	N/A	minutes
Calculated Time of Concentration, T_c =	N/A	N/A	minutes
Time of Concentration by Regional Formula, T_c =	N/A	N/A	minutes
Recommended T_c =	N/A	N/A	minutes
Time of Concentration Selected by User, T_c =	N/A	N/A	**minutes**
Design Rainfall Intensity, I =	N/A	N/A	inch/hr
Calculated Local Peak Flow, Q_p =	N/A	N/A	cfs
Total Design Peak Flow, Q =	4.54	8.73	**cfs**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Major & Minor Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Vista Ridge 06-0053

Inlet ID: Inlet C2



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.0200	ft. vert. / ft. horiz
Manning's Roughness Behind Curb	n_{BACK} =	0.0200	
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 Depression	a =	3.00	inches
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.0200	ft. vert. / ft. horiz
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.0000	ft. vert. / ft. horiz
Manning's Roughness for Street Section	n_{STREET} =	0.0150	

		Minor Storm	Major Storm	
Max. Allowable Water Spread for Minor & Major Storm	T_{MAX} =	11.0	11.0	ft
Max. Allowable Depth at Gutter Flow Line for Minor & Major Storm	d_{MAX} =	6.00	6.00	inches
Allow Flow Depth at Street Crown (leave blank for no)				X = yes

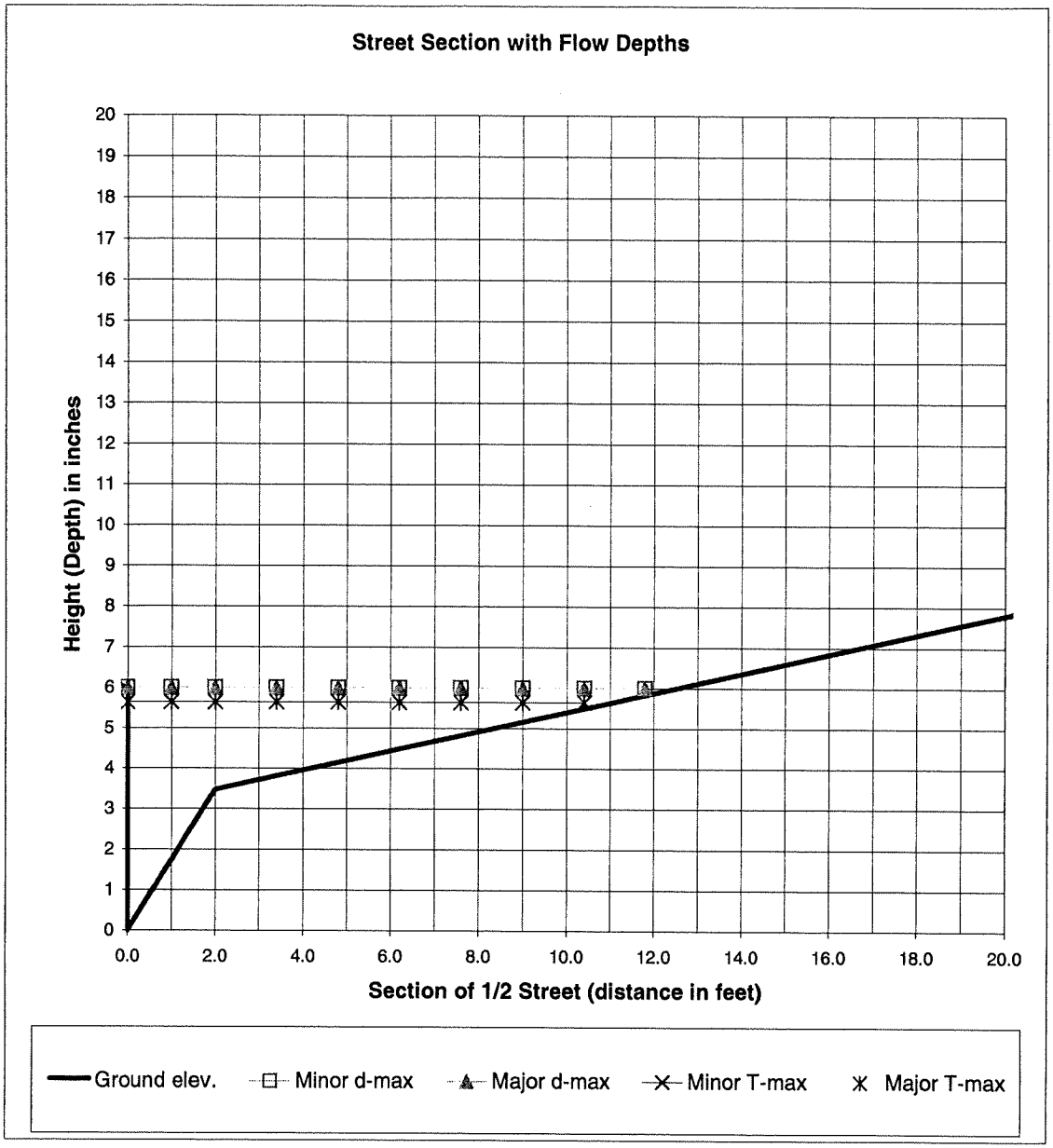
Maximum Gutter Capacity Based On Allowable Water Spread		Minor Storm	Major Storm	
Gutter Cross Slope (Eq. ST-8)	S_W =	0.1450	0.1450	ft/ft
Water Depth without Gutter Depression (Eq. ST-2)	y =	2.64	2.64	inches
Water Depth with a Gutter Depression	d =	5.64	5.64	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	9.0	9.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.622	0.622	
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 Water 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 Gutter Capacity Based on Allowable Gutter Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	12.5	12.5	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	10.5	10.5	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.557	0.557	
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	**Q =**	**0.0**	**0.0**	**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	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allow. Gutter 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

Max. Allowable Gutter Capacity Based on Minimum of Q_T or Q_d		Minor Storm	Major Storm	
	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

MINOR STORM max. allowable capacity OK - greater than flow given on sheet 'Q-Peak'

MAJOR STORM max. allowable capacity OK - greater than flow given on sheet 'Q-Peak'



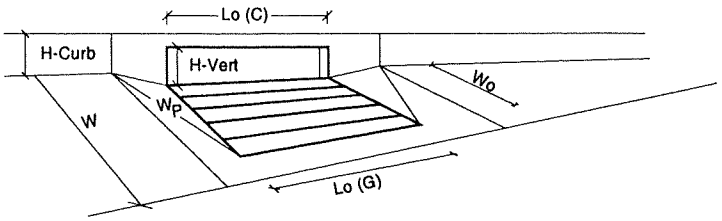
$$Q_x = \frac{0.56}{n} S_x^{5/3} S_L^{1/2} T_x^{8/3} \qquad E_o = \frac{1}{1 + \frac{S_w / S_x}{\left[1 + \frac{S_w / S_x}{(T/W) - 1}\right]^{8/3} - 1}}$$

$$Q = \frac{Q_x}{1 - E_o}; \; Q_w = Q - Q_x$$

INLET IN A SUMP OR SAG LOCATION

Project = Vista Ridge 06-0053

Inlet ID = Inlet C2



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Grate Information		MINOR	MAJOR	
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 3.00)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.67)	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} =	5.95	5.95	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.4	63.4	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) =	0.20	0.20	
Curb Opening Weir Coefficient (typical value 2.30-3.00)	C_w (C) =	2.30	2.30	
Curb Opening Orifice Coefficient (typical value 0.67)	C_o (C) =	0.67	0.67	
Resulting Gutter Flow Depth for Grate Inlet Capacity in a Sump		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate as a Weir				
Flow Depth at Local Depression without Clogging (0 cfs grate, 4.54 cfs curb)	d_{wi} =	N/A	N/A	inches
This Row Used for Combination Inlets Only	$d_{curb\text{-}un}$ =	N/A	N/A	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 4.54 cfs curb)	d_{wa} =	N/A	N/A	inches
This Row Used for Combination Inlets Only	$d_{curb\text{-}cl}$ =	N/A	N/A	inches
Grate as an Orifice		MINOR	MAJOR	
Flow Depth at Local Depression without Clogging (0 cfs grate, 4.54 cfs curb)	d_{oi} =	N/A	N/A	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 4.54 cfs curb)	d_{oa} =	N/A	N/A	inches
Resulting Gutter Flow Depth Outside of Local Depression	$d_{a\text{-}Grate}$ =	N/A	N/A	inches
Resulting Gutter Flow Depth for Curb Opening Inlet Capacity in a Sump		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.20	0.20	
Curb as a Weir, Grate as an Orifice		MINOR	MAJOR	
Flow Depth at Local Depression without Clogging (0 cfs grate, 4.54 cfs curb)	d_{wi} =	4.50	6.96	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 4.54 cfs curb)	d_{wa} =	4.88	7.55	inches
Curb as an Orifice, Grate as an Orifice		MINOR	MAJOR	
Flow Depth at Local Depression without Clogging (0 cfs grate, 4.54 cfs curb)	d_{oi} =	4.05	7.81	inches
Flow Depth at Local Depression with Clogging (0 cfs grate, 4.54 cfs curb)	d_{oa} =	4.84	10.70	inches
Resulting Gutter Flow Depth Outside of Local Depression	$d_{a\text{-}Curb}$ =	1.88	7.70	inches
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	5.0	5.0	feet
Total Inlet Interception Capacity (Design Discharge from *Q-Peak*)	Q_a =	4.5	8.7	cfs
Resultant Gutter Flow Depth (based on sheet *Q-Allow* geometry)	d =	1.88	7.70	inches
Resultant Street Flow Spread (based on sheet *Q-Allow* geometry)	T =	1.1	19.6	feet
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.00	0.00	inches

Appendix C
Reference Material

VISTA RIDGE
GOLF COURSE DEVELOPMENT
MASTER DRAINAGE REPORT
APPENDIX D,E,F,&G

Prepared For:
Vista Ridge Development, LLC
1333 W. 120th Avenue
Suite 100
Westminster, CO 80234

Prepared By:
Hurst & Associates, Inc.
4999 Pearl East Circle
Suite 106
Boulder, CO 80301

Job Number 2142-03
February 15, 2001
Revised March 13, 2001
Revised July 30, 2001

VISTA RIDGE
GOLF COURSE DEVELOPMENT
MASTER DRAINAGE REPORT
WITH APPENDIX A, B, & C

Prepared For:
Vista Ridge Development, LLC
1333 W. 120th Avenue
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Prepared By:
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Suite 106
Boulder, CO 80301

Job Number 2142-03
February 15, 2001
Revised March 13, 2001
Revised July 30, 2001

VISTA RIDGE
GOLF COURSE DEVELOPMENT
MASTER DRAINAGE REPORT
ADDENDUM

Prepared For:
Vista Ridge Development, LLC
1333 W. 120th Avenue
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Prepared By:
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4999 Pearl East Circle
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Boulder, CO 80301

Job Number 2142-03
June 20, 2001
Revised August 8, 2001
Revised August 28, 2001

TABLE OF CONTENTS

INTRODUCTION/ GENERAL LOCATION

Vista Ridge is a proposed 896 acre mixed use residential, commercial and golf course community located within Section 32 and 33, Township 1 South, Range 68 West. (See Figure 1.) The majority of the proposed development is within the Coal Creek Drainage Basin and slopes from southeast to northwest at an average slope of 2.5%. There are three well defined drainage tributaries that combine into one near the northwest corner of the proposed development. This tributary outfalls directly into Coal Creek approximately 3000 feet northwest of Vista Ridge. The Community Ditch, an irrigation ditch owned and operated by Farmers Reservoir and Irrigation Company (FRICO), extends approximately 4000 linear feet through the southeast corner of the development. The ditch will be piped and will not carry storm runoff from The Vista Ridge Development. The land is generally undeveloped native grassland with a small number of isolated buildings and a shooting range.

VISTA RIDGE MASTER DRAINAGE DESIGN

Vista Ridge is platted into large tracts for golf course, schools, parks, commercial and residential development. As a part of this master plat, this master drainage report has been prepared to accommodate developed storm runoff from each of the proposed development tracts. The plan consists of storm sewers, swales, streets and detention facilities to reduce developed storm runoff to historical storm peak flows. The historical and developed storm runoff were determined using C.U.H.P. (Colorado Urban Hydrograph Procedure). (See **Appendices D, E, F, & G.**) Hydrographs for each drainage basin were developed and routed through storm sewers, streets, swales and detention ponds to the existing drainage tributaries north of Vista Ridge. The peak release rates from Vista Ridge are reduced to historical or less to protect downstream facilities. (See *Basin Peak Flow*

Summary.) Storm sewer connections and drainage corridors have been provided for each development tract. The overall drainage facilities are presented in shown on the *Master Drainage Plan* in the map pocket.

DETENTION POND FACILITIES

Detention pond facilities are located within the development tracts and the golf course. The pond sizes and release rates have been determined by a comprehensive computer model developed by Haestad Methods called Pondpack 7.5. The detailed pond modeling results are shown in **Appendices A, B, & C**. The *Pond Summary Table* shows volumes, release rates and stage storage information for each pond.

DRAINAGE FACILITY DESIGN

Vista Ridge is a master planned golf course community with large tracts platted for golf course, commercial, recreation and residential development. The purpose of this master drainage plan is to develop a drainage concept and propose drainage facilities necessary for each tract to be developed by various builders and developers. This will insure development continuity and protect properties downstream of Vista Ridge.

The golf course is generally located within the existing drainage corridors. Minor storm events (2-5 year) will be conveyed through the golf course by storm sewer. Storm sewer connection points will be provided to each tract and the arterial/collector streets. The major storm event (100 year) will be conveyed through the golf course corridors with wide grass lined swales and through the developed tracts within streets and swales. The swale hydraulic characteristics (velocity, depth, peak flows, and stage/storage) are shown in **Appendices A, B, & C**.

Storm water detention will be provided primarily within the golf course except for the

commercial areas and a few isolated residential parcels. Three of the detention ponds (A5,A6 and A7) are designed with permanent pool elevations and used for golf course water hazards. The volume above the permanent pool shall be used for stormwater detention. Other detention facilities shall be designed with wetland bottoms to improve the stormwater discharge water quality.

Approximately 259 acres of offsite tributary drainage are incorporated into the Vista Ridge drainage facility design. The storm sewer system, channels and detention ponds are designed to accommodate offsite historical storm runoff.

Construction plans will be provided showing details necessary for construction of the drainage facilities presented in this report.

HYDROLOGIC/HYDRAULIC ANALYSIS

Hydrographs for each basin have been developed using the Urban Drainage and Flood Control C.U.H.P. computer program (see appendices). Hydrographs for basins less than 90 acres were modified by inputting a time of concentration (Tc) to provide more accurate results. These hydrographs are used as inflow hydrographs in the comprehensive stormwater routing computer model. This model routs stormwater through the storm sewer, swales and detention ponds to develop outflow hydrographs to be used in the hydraulic design in addition to verifying historical release rates. Stormwater routing is provided for the 2, 10, and 100 year storm events and the drainage facility design has been integrated into the golf course design.

STORM WATER QUALITY

Storm water quality facilities are designed in accordance with the best management practices presented in the *Urban Drainage and Flood Control District Manual*. These detention facilities have been designed to incorporate wetland bottoms with longer detention times to establish wetlands

and capture sediment to enhance storm water quality.

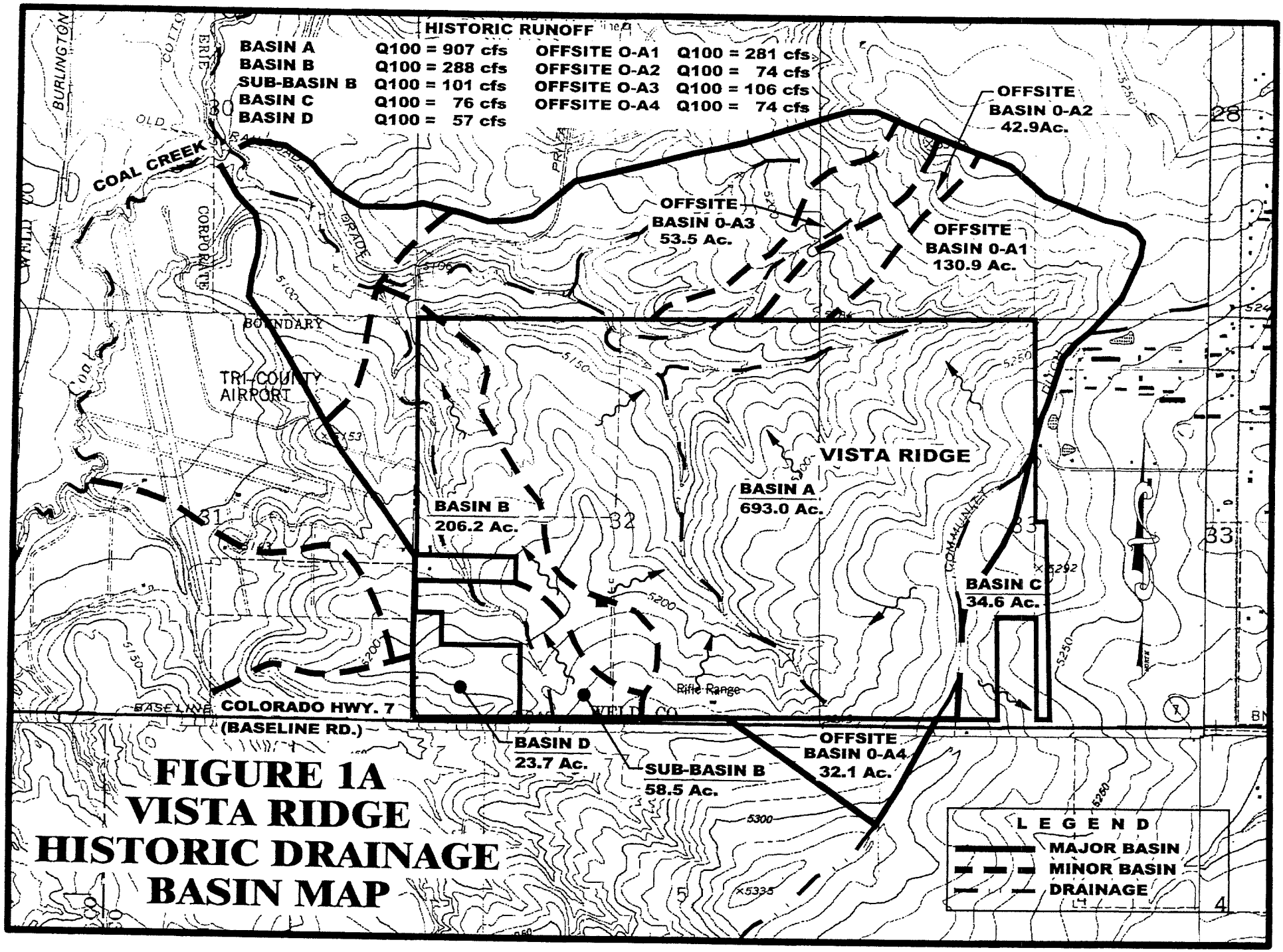


FIGURE 1A
VISTA RIDGE
HISTORIC DRAINAGE BASIN MAP

Vista Ridge Golf Course Development
Pond Summary

Job. 2142-03

30-Jul-01

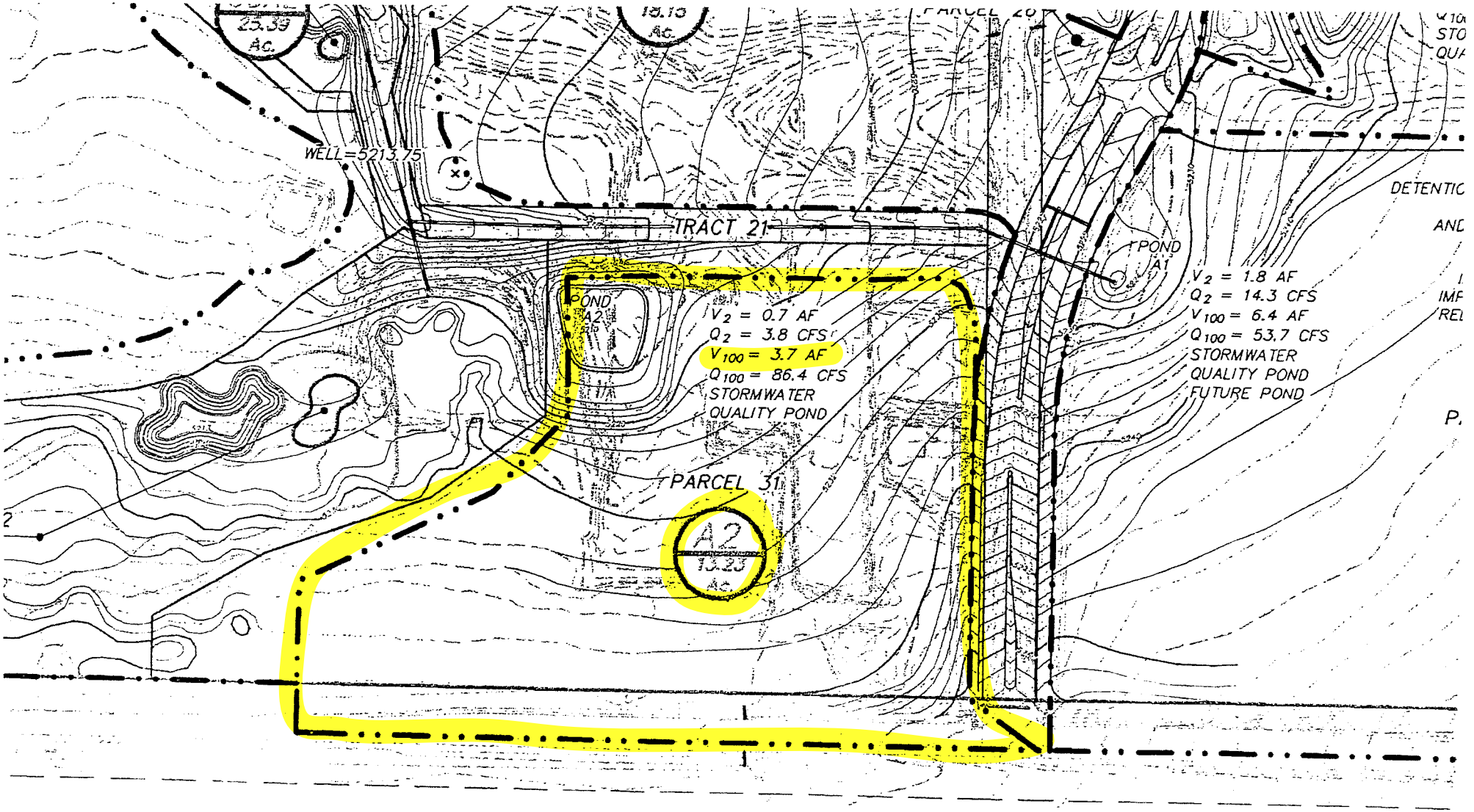
Pond	Spillway Elevation	2 Year Pond Results				10 Year Pond Results				100 Year Pond Results			
		Peak Flows (cfs)		Max.	Volume	Peak Flows (cfs)		Max.	Volume	Peak Flows (cfs)		Max.	Volume
		Qin	Qout	W.S.E.L.	Ac.Ft.	Qin	Qout	W.S.E.L.	Ac.Ft.	Qin	Qout	W.S.E.L.	Ac.Ft.
A1	5224.5	79.0	14.3	5220.34	1.75	134.0	14.8	5222.84	3.82	223.0	53.7	5225.13	6.35
A2	5208.2	25.0	3.8	5203.84	0.68	66.0	4.6	5207.69	2.78	137.0	86.4	5208.97	3.71
A3	5233.0	25.0	5.7	5229.42	0.54	42.0	6.1	5230.71	1.14	70.0	6.7	5232.75	2.34
A6	5182.5	58.3	24.4	5180.72	2.32	130.1	59.8	5182.18	4.76	330.5	312.6	5183.51	7.27
A7	5161.0	24.5	22.4	5157.47	1.51	75.9	61.4	5158.96	3.46	374.1	329.0	5162.06	9.36
A8	5194.5	22.0	4.3	5192.53	0.59	60.0	9.0	5194.59	1.96	124.0	73.4	5195.33	2.67
A13	5234.5	14.0	2.4	5231.58	0.37	29.0	2.7	5233.17	0.91	52.0	13.9	5234.77	1.60
A17	5166.5	59.0	51.1	5153.99	0.44	248.9	72.4	5162.32	7.41	621.6	397.7	5167.39	18.47
A19	5148.0	87.9	47.4	5142.29	1.74	178.0	80.7	5148.05	6.50	514.2	499.9	5149.26	8.08
A20	5119.5	124.1	23.8	5117.09	11.39	398.4	217.2	5119.68	19.24	1124.0	1108.1	5120.67	23.44
B1	5195.0	29.0	4.9	5191.22	0.67	65.0	5.8	5193.79	2.53	118.9	41.9	5195.44	4.08
B2	5179.0	24.5	3.4	5176.13	1.36	49.1	8.9	5177.18	2.23	94.2	37.4	5179.22	4.32
B3	5133.0	14.0	13.6	5127.00	0.05	57.2	31.3	5130.71	0.81	136.4	120.4	5133.69	2.48
B7	5105.0	58.3	2.7	5100.80	3.65	150.8	83.2	5102.81	5.69	313.8	276.9	5105.38	8.86

Vista Ridge Golf Course Development
Summary of CUHP Results - Developed Basins

Job: 2142-00

30-Jul-03

Basin	Subcatchment Number	Area (acres)	Peak Flow Q peak (cfs)		
			2 Year	10 Year	100 Year
A1	101	43.56	79.0	[illegible]4.0	223.0
A2	102	13.23	23.0	39.0	66.0
A3	103	14.11	25.0	42.0	70.0
A4	104	12.99	8.0	22.0	47.0
A5	105	18.65	12.0	33.0	69.0
A6	106	18.15	16.0	38.0	76.0
A7	107	7.2	9.0	18.0	33.0
A8	108	32.16	22.0	60.0	124.0
A9	109	18.63	2.0	16.0	44.0
A10	110	21.86	19.0	47.0	92.0
A11	111	28.99	20.0	54.0	111.0
A12	112	10	1.0	7.0	19.0
A13	113	11.35	14.0	29.0	52.0
A14	114	18.08	12.0	32.0	67.0
A15	115	32.2	29.0	70.0	138.0
A16	116	3.43	2.0	6.0	13.0
A17	117	53.16	38.0	103.0	213.0
A18	118	12.31	8.0	21.0	44.0
A19	119	35.33	24.0	67.0	137.0
A20	120	37.51	26.0	71.0	147.0
A21	121	40.27	28.0	77.0	158.0
A22	122	10.55	7.0	18.0	37.0
GCA1	501	21.79	2.0	16.0	44.0
GCA2	502	25.39	2.0	20.0	54.0
GCA3	503	35.92	3.0	26.0	70.0
GCA4	504	3.74	0.0	4.0	10.0
GCA5	505	15.25	1.0	11.0	30.0
GCA6	506	16.16	1.0	12.0	34.0
GCA7	507	20.14	2.0	15.0	42.0
GCA8	508	11.86	1.0	9.0	26.0
GCA9	509	11.84	1.0	9.0	26.0
GCA10	510	25.07	2.0	19.0	51.0
GCA11	511	12.1	2.0	9.0	23.0
B1	201	22.48	29.0	58.0	105.0
B2	202	22.43	20.0	48.0	94.0
B3	203	8.22	12.0	22.0	39.0
B4	204	46.79	26.0	70.0	147.0
B5	205	9.57	6.0	16.0	34.0
B6	206	3.01	2.0	6.0	12.0
B7	207	17.14	11.0	30.0	63.0
GCB1	601	13.59	1.0	8.0	22.0
GCB2	602	45.39	4.0	37.0	100.0
GCB3	603	14.45	1.0	12.0	33.0
GCB4	604	3.1	0.0	4.0	10.0
C1	301	30.82	3.0	19.0	51.0
C2	302	3.74	2.0	6.0	13.0
D1	401	23.72	2.0	15.0	43.0
O-A1	901	130.9	10.0	104.0	281.0
O-A2	902	42.88	3.0	27.0	74.0
O-A3	903	53.46	4.0	39.0	106.0
O-A4	904	32.1	3.0	[illegible].0	74.0


25.39 AC.
18.13 AC.
WELL=5213.75
TRACT 21
POND A2
V_2 = 0.7 AF
Q_2 = 3.8 CFS
V_{100} = 3.7 AF
Q_{100} = 86.4 CFS
STORMWATER QUALITY POND
POND A1
V_2 = 1.8 AF
Q_2 = 14.3 CFS
V_{100} = 6.4 AF
Q_{100} = 53.7 CFS
STORMWATER QUALITY POND FUTURE POND
PARCEL 31
A2
AC.
DETENTIC
AND

Vista Ridge Golf Course Development
Drainage Basin A
As-Built Pond No. A2
Stage-Storage-Discharge Relationship

12-Jan-06

Job 2142-03

Stage (ft)	Surface Area (ac)	Cummulative Volume (ac-ft)	Calculated Pipe Flow (cfs)		Pipe Discharge (cfs)	Weir Spillway Outflow (cfs)	Total Pond Discharge (cfs)
			Inlet Control	Outlet Control			
5202.00	0.30	0.00	0.0	23.6	0.0	0.0	0.0
5202.50	0.33	0.16	3.3	24.3	3.3	0.0	3.3
5203.00	0.36	0.33	3.5	25.0	3.5	0.0	3.5
5203.50	0.38	0.51	3.6	25.7	3.6	0.0	3.6
5204.00	0.41	0.71	3.8	26.3	3.8	0.0	3.8
5204.50	0.44	0.92	3.9	26.9	3.9	0.0	3.9
5205.00	0.47	1.15	4.0	27.6	4.0	0.0	4.0
5205.50	0.49	1.39	4.1	28.2	4.1	0.0	4.1
5206.00	0.52	1.64	4.3	28.8	4.3	0.0	4.3
5206.50	0.55	1.91	4.4	29.4	4.4	0.0	4.4
5207.00	0.59	2.19	4.5	29.9	4.5	0.0	4.5
5207.50	0.62	2.49	4.6	30.5	4.6	0.0	4.6
5208.00	0.65	2.81	4.7	31.0	4.7	0.0	4.7
5208.50	0.69	3.14	4.8	31.6	4.8	19.7	24.6
5209.00	0.72	3.50	5.0	32.1	5.0	85.9	90.8
5209.50	0.76	3.86	5.1	32.6	5.1	177.9	182.9
5210.00	0.79	4.25	5.2	33.2	5.2	289.8	295.0

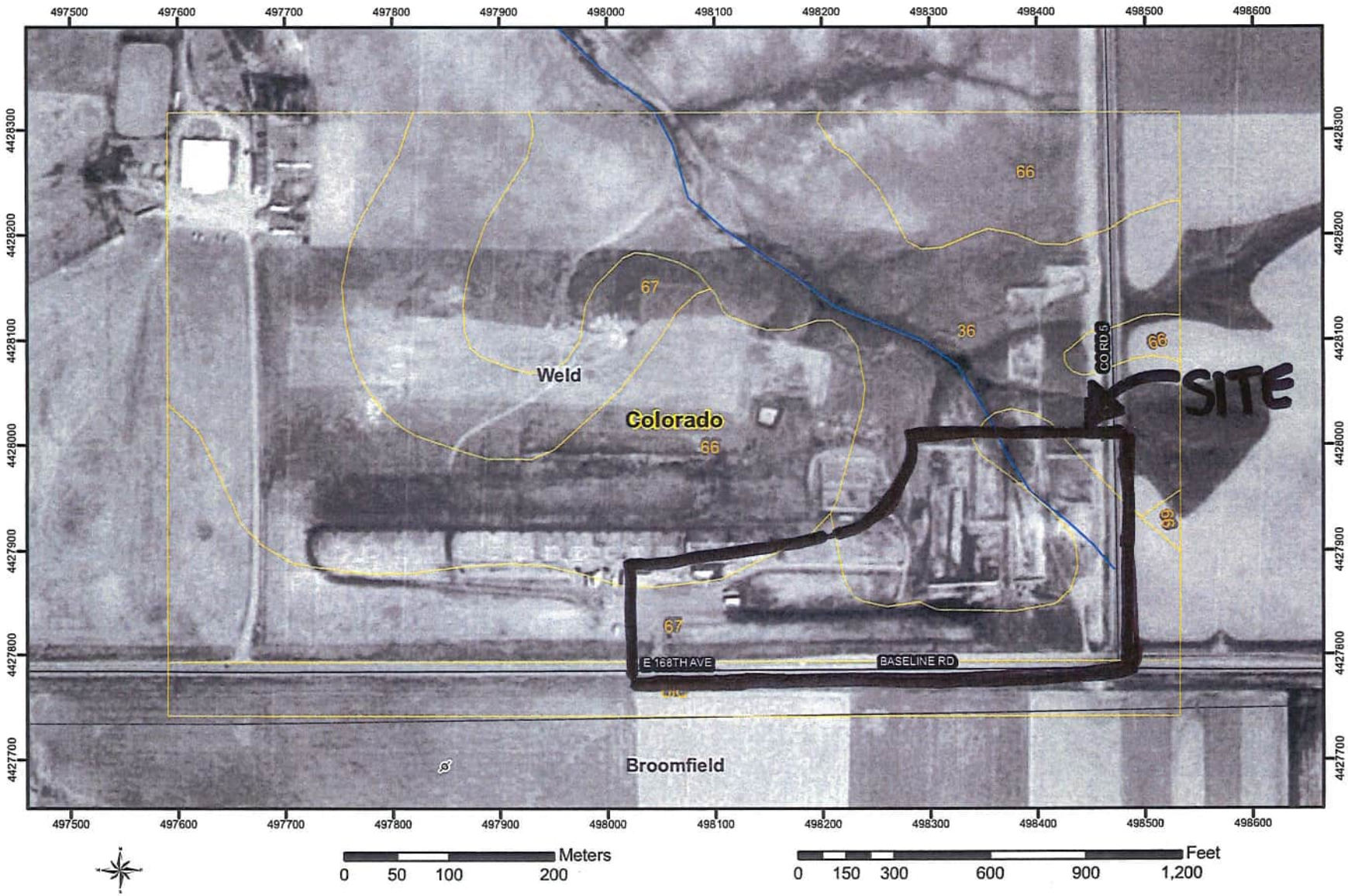
Outflow Pipe Diameter (in.)..... 18
Cross Section Pipe Area (Sq. In.)..... 254.47
Discharge Coefficient..... 0.6
Outflow Pipe Invert Elevation - up..... 5196.50
Outflow Pipe Invert Elevation - down..... 5193.80
Outflow Pipe Length (ft)..... 108

Outflow Pipe Diameter (ft.)..... 1.50
Cross Section Pipe Area (Sq. Ft)..... 1.77
Area of Pipe Not Restricted(Sq.Ft.).. 0.30
Orifice Invert Elevation..... 5196.50

Weir Length (ft)..... 40
Weir Coefficient..... 3.0
Weir Elevation..... 5208.2
Top of Freeboard Elevation..... 5210.0

SOIL SURVEY OF ADAMS COUNTY AREA, PARTS OF ADAMS AND DENVER COUNTIES, COLORADO; WELD COUNTY, COLORADO, SOUTHERN PART

VISTA RIDGE - SOIL SURVEY



VISTA RIDGE - SOIL SURVEY

MAP LEGEND

- Soil Map Units
- Cities
- Detailed Counties
- Detailed States
- Interstate Highways
- Roads
- Rails
- Water
- Hydrography
- Oceans
- Escarpment, bedrock
- Escarpment, non-bedrock
- Gulley
- Levee
- Slope
- Blowout
- Borrow Pit
- Clay Spot
- Depression, closed
- Eroded Spot
- Gravel Pit
- Gravelly Spot
- Gulley
- Lava Flow
- Landfill
- Marsh or Swamp
- Miscellaneous Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Slide or Slip
- Sinkhole
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Perennial Water
- Wet Spot

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov

Coordinate System: UTM Zone 13

Soil Survey Area: Adams County Area, Parts of Adams and Denver Counties, Colorado
Spatial Version of Data: 2
Soil Map Compilation Scale: 1:20000

Soil Survey Area: Weld County, Colorado, Southern Part
Spatial Version of Data: 2
Soil Map Compilation Scale: 1:24000

Map comprised of aerial images photographed on these dates:
1993

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

Map Unit Legend Summary

Adams County Area, Parts of Adams and Denver Counties, Colorado

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
UlC	Ulm loam, 3 to 5 percent slopes	12.4	9.1

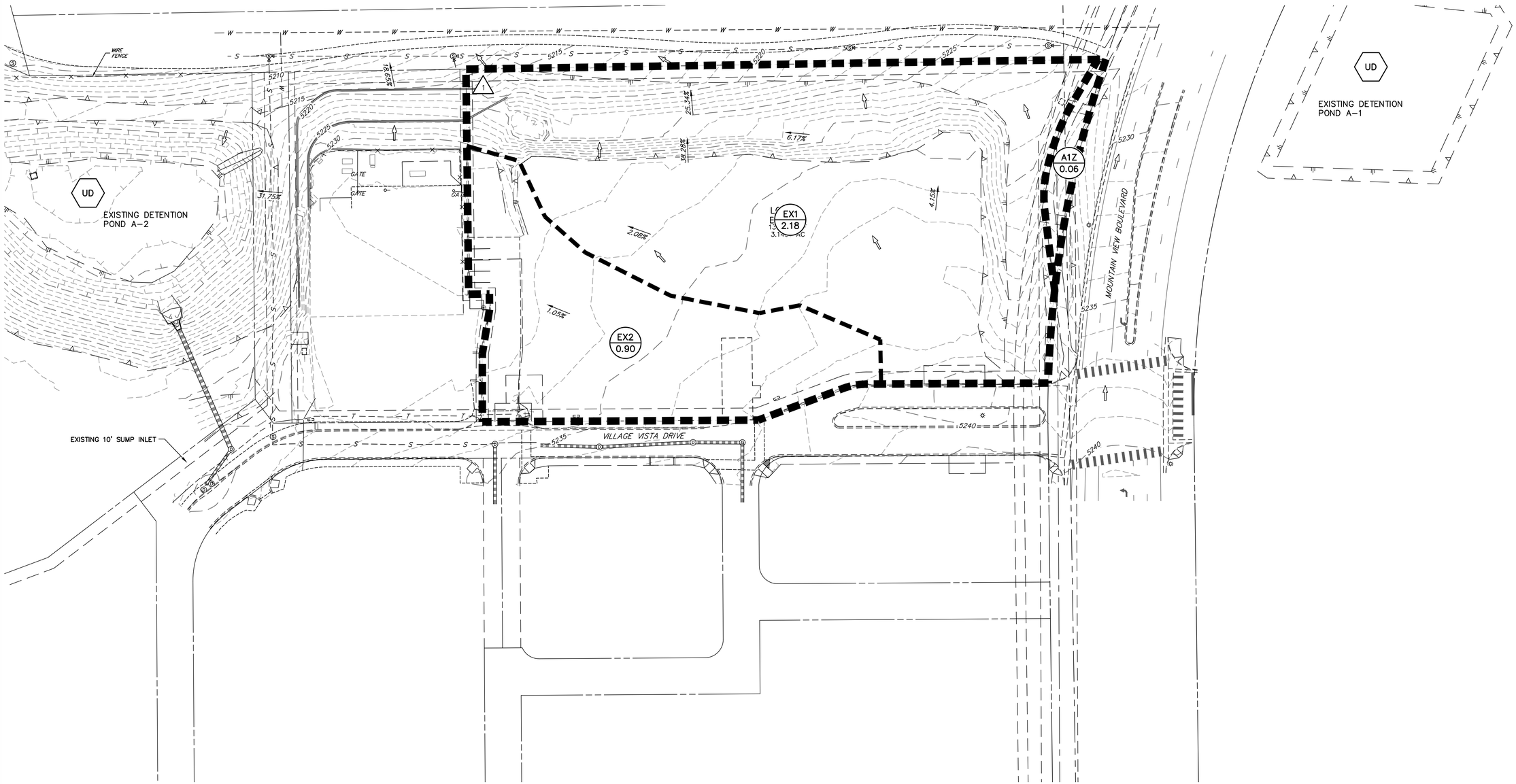
Weld County, Colorado, Southern Part

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
36	Midway-Shingle complex, 5 to 20 percent slopes	38.9	28.4
66	Ulm clay loam, 0 to 3 percent slopes	47.8	34.8
67	Ulm clay loam, 3 to 5 percent slopes	38.1	27.7

APPENDIX E
DRAINAGE MAP

VILLAGE COOPERATIVE OF ERIE IN VISTA RIDGE

PHASE III EXISTING DRAINAGE MAP



LEGEND

- UD — EXISTING STORMWATER POND
- I1 / 0.17 — EXISTING DRAINAGE BASIN
- EXISTING MAJOR DRAINAGE BASIN BOUNDARY
- EXISTING MINOR DRAINAGE BASIN BOUNDARY
- EXISTING DRAINAGE ARROW
- 1 — DESIGN POINT

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1Z	0.06	100%	0.86	0.89	5.0	0.2	0.5
EX1	2.18	2%	0.05	0.49	20.2	0.2	5.6
EX2	0.90	2%	0.05	0.49	14.8	0.1	2.7

N

40 20 0 40 80

ORIGINAL SCALE: 1" = 40'

Know what's **below.** **Call** before you dig.

PHASE III DRAINAGE MAP
VILLAGE COOPERATIVE OF ERIE
JOB NO. 16162.00
11/01/2024
SHEET 12 OF 12

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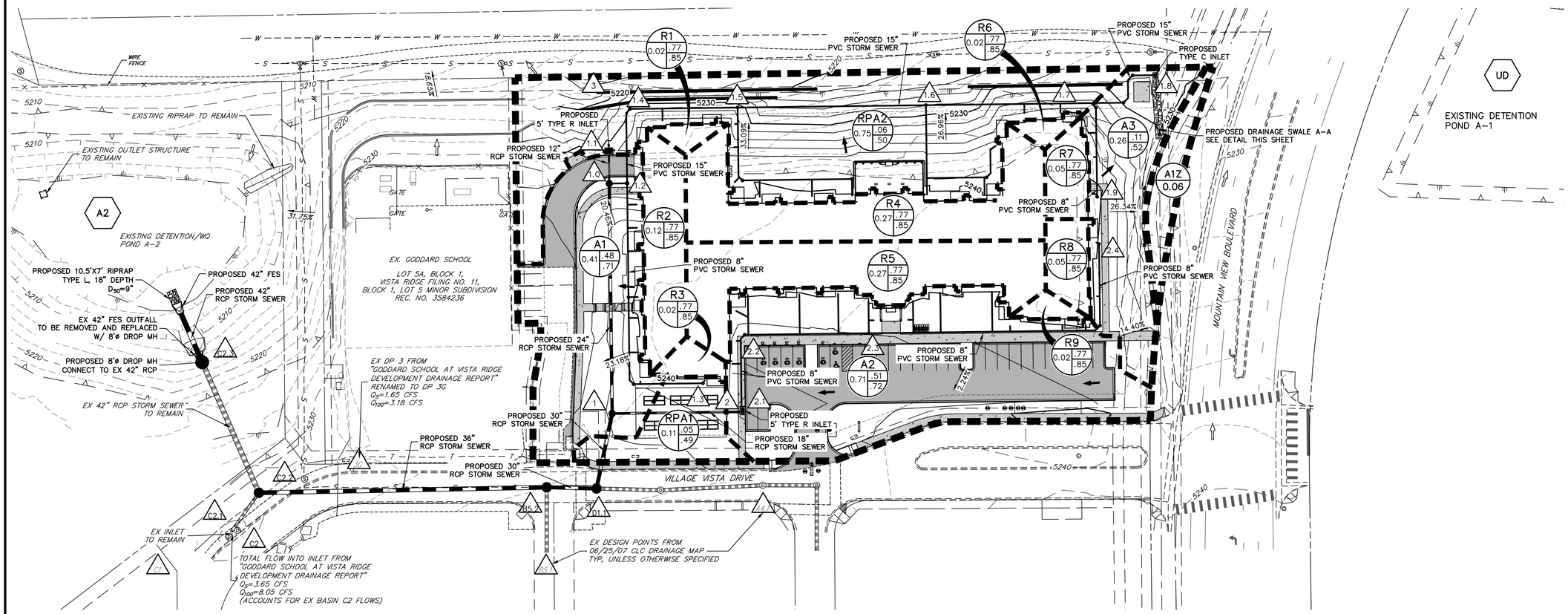
VILLAGE COOPERATIVE OF ERIE IN VISTA RIDGE

PHASE III DRAINAGE MAP

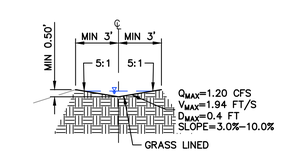


BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	0.41	54%	0.48	0.71	5.0	0.8	2.6
A2	0.71	58%	0.51	0.72	6.1	1.3	4.5
A3	0.26	10%	0.11	0.52	6.7	0.1	1.2
A1Z	0.06	100%	0.86	0.89	5.0	0.2	0.5
R1	0.02	90%	0.77	0.85	5.0	0.0	0.1
R2	0.12	90%	0.77	0.85	5.0	0.3	0.9
R3	0.02	90%	0.77	0.85	5.0	0.1	0.2
R4	0.27	90%	0.77	0.85	5.5	0.8	2.0
R5	0.27	90%	0.77	0.85	5.5	0.8	2.0
R6	0.02	90%	0.77	0.85	5.0	0.0	0.1
R7	0.05	90%	0.77	0.85	5.0	0.2	0.4
R8	0.05	90%	0.77	0.85	5.0	0.2	0.4
R9	0.02	90%	0.77	0.85	5.0	0.0	0.1
RPA1	0.11	2%	0.05	0.49	12.0	0.0	0.3
RPA2	0.75	3%	0.06	0.50	9.1	0.2	2.8

LEGEND

- UD — EXISTING STORMWATER POND
- A1 (.37 / .67 / .79) — DRAINAGE BASIN; AREA (AC); MINOR COEFFICIENT; MAJOR COEFFICIENT
- I1 / 0.17 — EXISTING DRAINAGE BASIN
- 1 — DESIGN POINT
- MAJOR DRAINAGE BASIN BOUNDARY
- MINOR DRAINAGE BASIN BOUNDARY
- PROPOSED DRAINAGE ARROW
- EXISTING DRAINAGE ARROW



SWALE A-A SECTION
TYPICAL DETAIL
SCALE:1"=5'

ORIGINAL SCALE: 1" = 40'

Know what's **below.** **Call** before you dig.

PHASE III DRAINAGE MAP
VILLAGE COOPERATIVE OF ERIE
JOB NO. 16162.00
11/01/2024
SHEET 11 OF 11

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Fort Collins 970-491-9888 • www.jrengineering.com

UTILITY STUDY
FOR
VILLAGE COOPERATIVE OF ERIE AT VISTA RIDGE

Prepared For:
The Village Cooperative of Erie
1303 Corporate Center Drive
Eagan, MN 55121
Contact: Joe Moosbrugger

Prepared By:
JR ENGINEERING, LLC
7200 S Alton Way, Suite C400
Centennial, Colorado 80112
(303) 740-9393
Contact: James Fitzmorris, PE

November 1st, 2024

Project No. 16162.00

TABLE OF CONTENTS

APPENDICES

ENGINEER'S CERTIFICATION

I hereby certify that this Utility Study for the design of Village Cooperative of Erie at Vista Ridge was prepared by me (or under my direct supervision) in accordance with the provisions of the *Town of Erie Standards and Specifications for Design and Construction* for the owners thereof. I understand that the Town of Erie does not and will not assume liability for utility facilities designed by others, including the designs presented in this report.

_____

James P. Fitzmorris, Registered Professional Engineer
Colorado Professional Engineer No. 28211
For and on behalf of JR Engineering, LLC

TOWN ACCEPTANCE

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

Accepted by: _____ _____
Deputy Public Works Director Date

GENERAL LOCATION AND DESCRIPTION

This Utility Study has been prepared for Real Estate Equities Development, LLC for the Village Cooperative of Erie residential development. The proposed site includes senior housing, parking, storm infrastructure, waterline infrastructure, and sanitary sewer infrastructure.

LOCATION

The Village Cooperative of Erie site is located within the Vista Ridge development in the Town of Erie. The site borders Village Vista Drive to the north, Mountain View Boulevard to the west, and is located in the south east quarter of Section 32, Township 1 North, Range 68 West of the 6th Principal Meridian, Town of Erie, County of Weld, State of Colorado. A vicinity map has been provided within Appendix A.

SITE DESCRIPTION

The site's total area is 3.14 acres and is undeveloped. The site is proposed as a multi-family senior living community with 64 units. The proposed site includes 10 one-bedroom units and 54 two-bedroom units.

SANITARY SEWER

CRITERIA EXAMPLE CALCULATIONS

Sanitary sewer design for this site shall conform to the design criteria set forth by the Town of Erie "Standards and Specifications for Design and Construction of Public Improvements"[1]. The Town of Erie will provide sanitary sewer collection and treatment for this site. All of the sanitary mains shall be constructed within the public and private roadways. Any line within a private street will have a utility easement dedicated for maintenance. The entire site drains to one sanitary service line on the north side of the property to an existing 8" sanitary main line between the proposed site and the Latitude neighborhood of Vista Ridge. The site is within the South Coal Creek basin as shown in the Wastewater Collection System Master Plan by Merrick and Company, August 2020, as shown within Appendix D.

Section 700 of the "Standards and Specifications for Design and Construction of Public Improvements" by the Town of Erie was used to calculate the average daily and peak sanitary sewage flows. From these guidelines, the flows were calculated using the following assumptions:

Average Residential Daily Load: 90 gallons/capita/day
Average Commercial Daily Load: 1,000 gallons/acre/day
Minimum residential population density or household density: 2.89 people per dwelling unit
Peaking Factor: The following equation is used to calculate the peak flows.
$PF=2.6*Q_{Max\ Day}^{-0.16}$
Where $Q_{Max\ Day}$= maximum daily flows in CFS (Entered in as total average daily flow)
PF= the average flow in MGD, and where $2.0 \leq PF \leq 4.0$

DESIGN CALCULATIONS

The Village Cooperative of Erie is proposed as one sanitary basin with one outfall point, as shown in the "Sanitary Map" in Appendix B. The calculations presented in Appendix B show the results of a Manning's equation analysis for the run within the proposed basin. The loading calculations were based on a total building capita count which was determined as 184.96 capita based on the proposed 10 one-bedroom units and 54 two-bedroom units. The capita per building calculations are shown in Table 1. The calculations presented within Appendix B also take into account a 10% contingency factor to account for infiltration and inflow. A Manning's roughness coefficient of 0.012 was used and the peak flow was run for the sanitary service line into the existing sanitary sewer. The minimum pipe slope for the 8" service line is 0.4% based on Town criteria. The proposed minimum slope of 5.0% for the sanitary service line was used in the presented calculations. The proposed sanitary line did not drop below 2 ft/s during peak conditions. (See Appendix B)

Table 1.

Number of One-Bedroom Units	Number of Two-Bedroom Units	Total Dwelling Units	Total Building Capita
10	54	64	184.96

Section 700 of the Town of Erie's Engineering Standards and Specifications "2023- Section 700- Sanitary Sewer Facilities" states that sewers less than twelve (12) inches in diameter shall have a maximum flow depth of fifty percent (50%) of the pipe diameter and a minimum velocity of two (2) feet per second for peak design flow. The proposed design fulfills these requirements with a flow depth of 27.82% of the pipe diameter and velocity of 4.67 ft/s for peak design flow, therefore complying with the Town of Erie's criteria.

Merrick and Company's Wastewater Collection System Master Plan originally defined the site as community commercial which they defined as 4 equivalent residential units. The site is now proposed as a high density residential site as it falls within 12-20 dwelling units per acre. Merrick defined high density residential units as 16 equivalent residential units. The revision to land use for the site explains why the waste water loading value is larger than when it was originally planned to be commercial use. Table 2 compares the proposed loading and the original loading.

Table 2.

	Residential Flow Rate (gal/cap/day)	Building Capita	Commercial Flow Rate (gal/acre/day)	Acres	Total Average Daily Flow (GPD)
Proposed Residential Land Use	90	118	N/A	N/A	10,620
Previously Proposed Commercial Land Use	N/A	N/A	1,000	3.14	3,140

WATER DISTRIBUTION SYSTEM

CRITERIA

Potable water will be supplied to the Village Cooperative site by the Town of Erie. The site falls within water pressure Zone 4B. A potable water map for the proposed site is given in Appendix C. The site proposes two 8" water mains that connect to the existing 8" waterline on Village Vista Drive on the south side of the property.

Waterlines will be laid within the Village Cooperative private and public roadways. Any water mains located within a private street or outside of public R.O.W. shall have an appropriate easement dedicated for maintenance. The water system has been designed according to the details and specifications stated in the Town of Erie's manual, Engineering Standards and Specifications "2023- Section 600 Water Facilities". Using these specifications, the water distribution system was designed using the following criteria:

*Peak Hour Demand = Max Daily Demand x Peak Hour Factor**
*Peak Hour Factor = 2 for Residential and Commercial

Land Type	Avg. Demand	Max. Day Demand	Peak Hour Demand
Residential	140 GPCD	1,000 gpd/SFE	2,000 gpd/SFE
Commercial	N/A	3,000 gpd/acre	6,000 gpd/acre

JR Engineering assumes 1 person per bedroom per dwelling unit.

DESIGN CALCULATIONS

Using the criteria given in the Town of Erie's manual, the water demand for the site as a proposed residential site and the demands for the site as a previously proposed commercial site were found in Table 3.

Table 3.

	Proposed Water Demand (GPD)	Previous Zoning Demand (GPD)
Residential	64,000	N/A
Commercial	N/A	9,420

The water demands were calculated using the Town of Erie's maximum day demand criteria, JR's proposed site plan of 10 one-bedroom units and 54 two-bedroom units, JR's assumption of one person per bedroom per unit, and JR's proposed site plan of 3.14 acres. The acreage did not change between the previous zoning plan and the revised site plan.

FIRE FLOW TEST

High Country Pipe & Utility prepared a hydrant flow test for the proposed residential site which is included in Appendix D. The analysis concluded that the residual hydrant static pressure was 112.5 psi and the residual pressure was 84 psi. Both values are in compliance with the Town of Erie's fire flow criteria of static head and residual pressures. The fire flow rate requirements by the Town of Erie are 1,500 GPM for a new multifamily residential development. The measured flowrate out of the 2.5 inch

nozzle results in a 2,304 GPM flowrate at the minimum pressure for fire flow from the 6 inch nozzle, therefore complying with the Town of Erie's standards.

A report to the Town Council by the Town Engineering staff, as well as the outside reviewer, stated that the overall water system is capable of handling the proposed flows. Based on previous discussions with the Town of Erie, we understand that a model was not necessary for the water distribution system. The Town Council approved the zoning change for this project including the revised water demands.

CONCLUSIONS

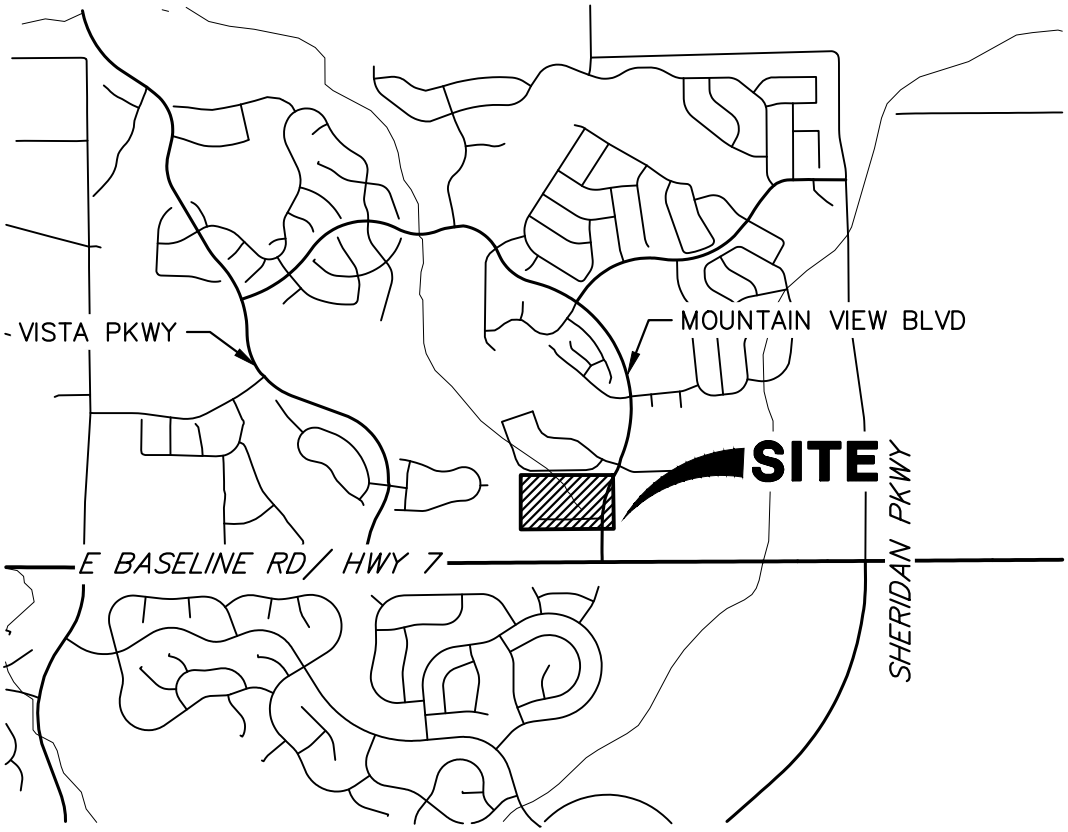
The proposed Village Cooperative of Erie at Vista Ridge utility design is in conformance with Town of Erie Standards and Specifications and the Town's Wastewater Collection System Master Plan.

The revision to the planned land use will have no adverse effect on the existing Town water and wastewater infrastructure. The Town's existing water and wastewater infrastructure is determined to be able to serve the proposed Village Cooperative multi-family facility.

REFERENCES

1. Standards and Specifications for Design and Construction of Public Improvements, Town of Erie, Colorado (2023 Edition)
2. Wastewater Collection System Master Plan, Merrick and Company, Colorado (August 2020)
3. Vista Ridge Planned Development – Development Plan Amendment No. 7 [Slide 24], Town of Erie Engineering Staff, Colorado (May 2024)
4. Hydrant Flow Test, High Country Pipe & Utility, Fort Collins, Colorado (December 2023)

APPENDIX A - VICINITY MAP



2000 1000 0 2000

ORIGINAL SCALE: 1" = 2000'

VICINITY MAP
VILLAGE COOPERATIVE OF ERIE
JOB NO. 1616200
11/1/24
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

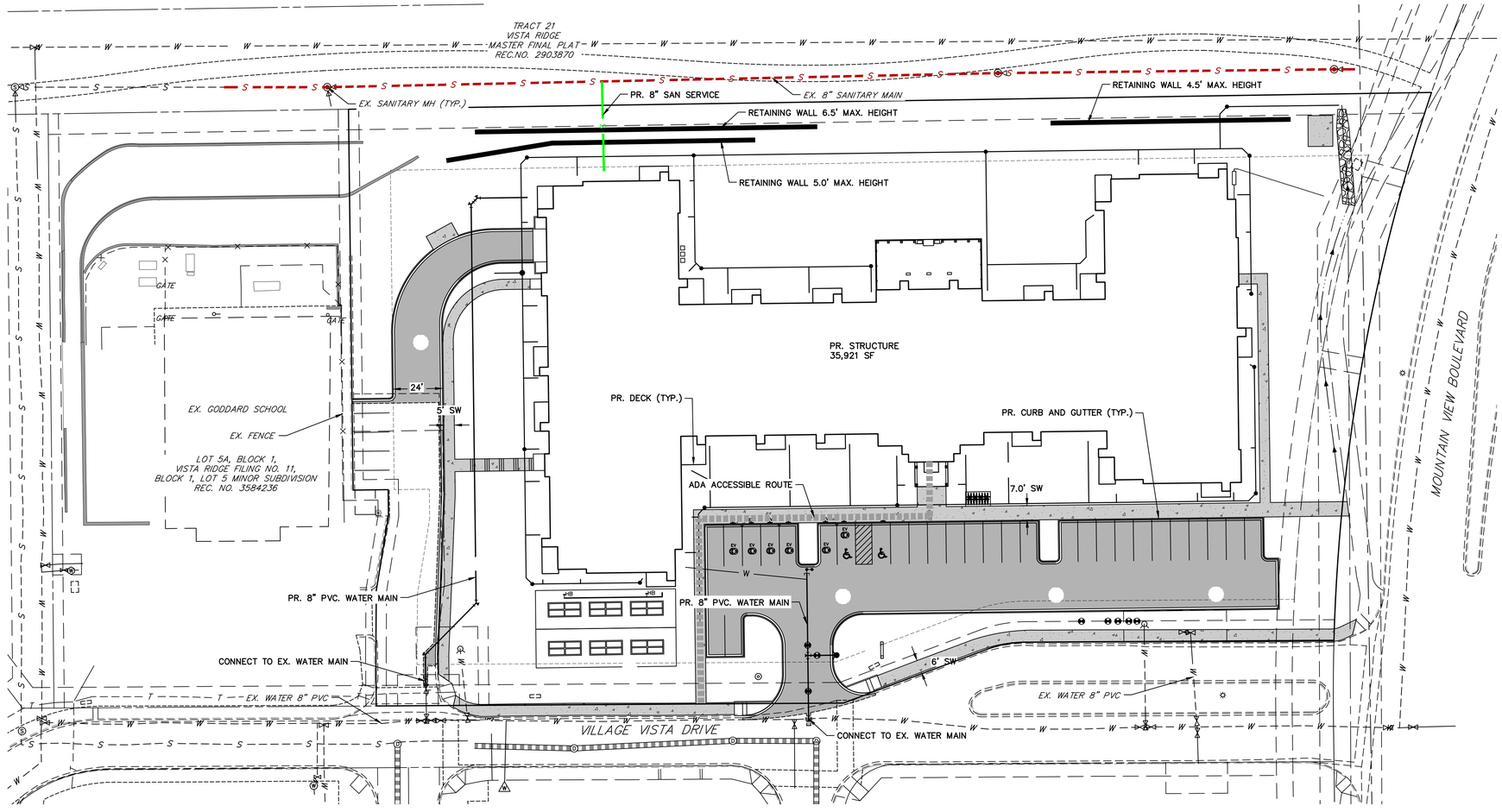
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

APPENDIX B – SANITARY SEWER SYSTEM MAP & CALCULATIONS

THE VILLAGE COOPERATIVE OF ERIE

A REPLAT OF LOTS 5B AND 5C, BLOCK 1, VISTA RIDGE FILING NO.11, BLOCK 1, LOT 5 MINOR SUBDIVISION
LOCATED IN THE SOUTHEAST ONE-QUARTER OF SECTION 32, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M.,
TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

SANITARY MAP



LEGEND

EXISTING SANITARY SEWER — S — S —

PROPOSED SANITARY SEWER — S — S —

N

30 15 0 30 60

ORIGINAL SCALE: 1" = 30'

SANITARY BASIN MAP
THE VILLAGE COOPERATIVE OF ERIE
JOB NO. 16162.00
11/1/24
SHEET 1 OF 1

811 Know what's **below.** **Call** before you dig.

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Fort Collins 970-491-9888 • www.jrengineering.com

Project Name	VILLAGE COOPERATIVE
Project No.	16162.00
Calculated By	CMJ
Checked By	
Date	11/1/2024

Wastewater Loading for Village Cooperative						
Runs/ Branches	**Number of one BR Dwelling Units**	**Number of two BR Dwelling Units**	**Average Daily Flow (GPD)**	**Total - Average Daily Flow (gpd)**	**Average Daily Flow (MGD)**	**Average Daily Flow (cfs)**
1	10	54	16,646	16,646	0.017	0.026

Average Daily Flow (gpm)	**Peak Factor Used**	**Peak Flow (cfs)**	**Infiltration/Contigency (10% of ADF, MGD)**	**Infiltration/Contigency (10% of ADF, cfs)**	**Peak Design Flow (gpm)**	**Peak Design Flow (cfs)**
11.56	4.00	0.103	0.002	0.010	50.86	0.113

Min. Pipe Slope (ft/ft)	**Mannings n**	**Pipe Diameter (D,ft)**	**Pipe Area (A,ft^2)**	**Depth in Circular Pipe (d, ft)**	**Alpha (a, rad)**	**Solver (Iterate Alpha till 0)**
0.0500	0.012	0.333	0.1	0.03	2.6717	0.0436

Wetted Area (sf)	**Wetted Perimeter (ft)**	**Hydraulic Radius (R, in)**	**Pipe Capacity (cfs)**	**Velocity (ft/s)**	**Pipe % Full**
0.0308	0.45	0.1	0.41	4.67	27.82%

Notes

Mannings Value	0.012
Residential Flow Rate (gal/cap/day)	90.000
People per dwelling unit	2.890

See Appendix B for Village Cooperative San Map

Abbreviations:	
BR	Bedroom
gpd	Gallons/Day
DU	Dwelling Units
ac	Acre

712.00 Design Flow

The design will include consideration of providing service for the entire area tributary to the outfall point. The following wastewater flow rates, which include infiltration, shall be used:

User Type	Unit Wastewater Flow Rate
Residential	90 gallons/capita/day
Industrial	1,500 gallons/acre/day
Commercial	1,000 gallons/acre/day
Park/Recreation	50 gallons/acre/day
Elementary Schools	13 gallons/student/day
Jr. & Sr. High Schools	20 gallons/student/day

The Town's minimum residential population density or household density is 2.89 people per dwelling unit. The land usage shall be as noted on an approved PUD and/or Plat.

Wastewater flow peaking factors shall be computed using the following equation:

$$PF = 2.6 * Q_{Max\ Day}^{-0.16}$$

Where $Q_{Max\ Day}$ = maximum daily flow in CFS

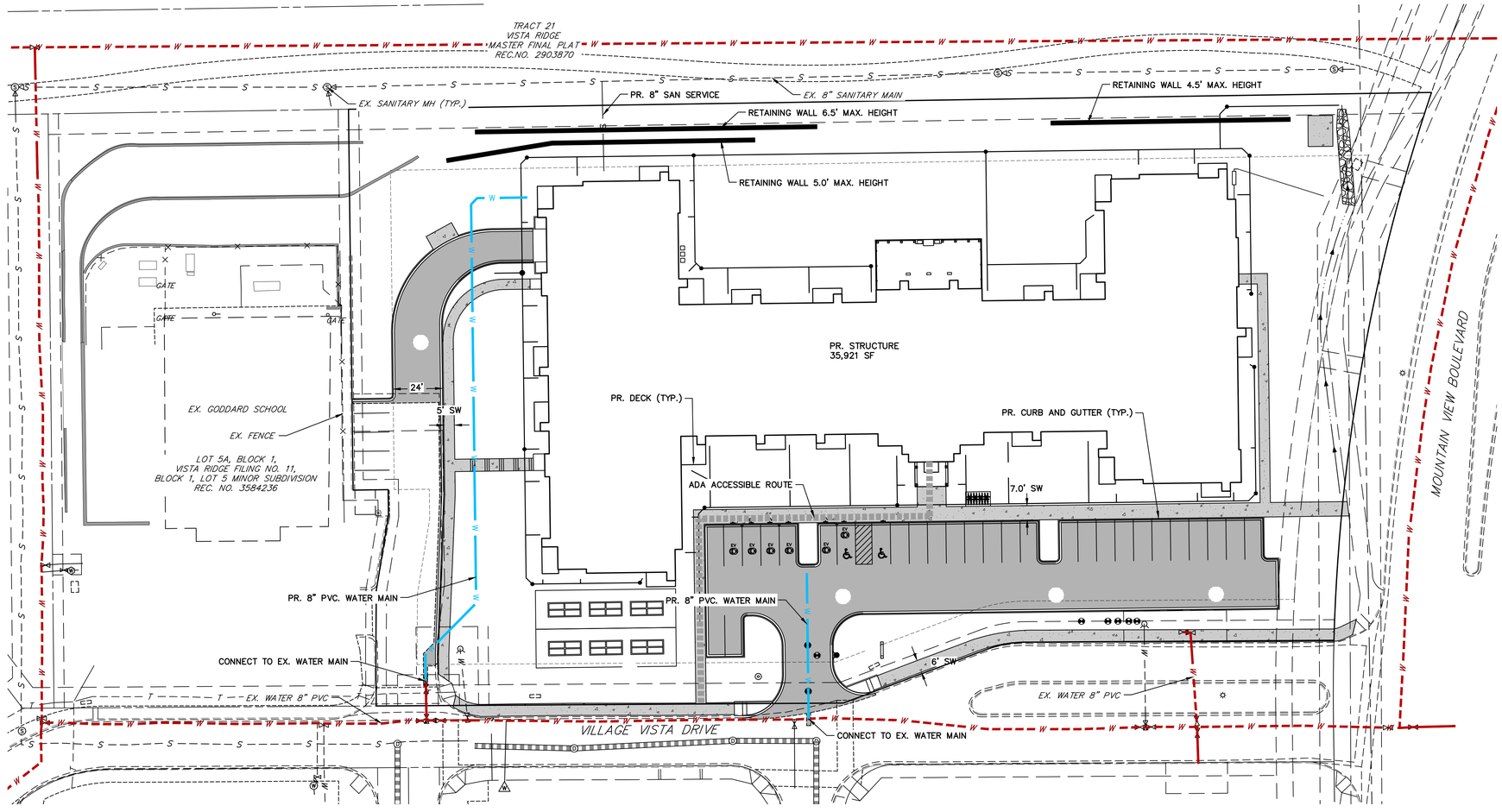
The peaking factor will not be less than 2.0 or greater than four (4.0).

APPENDIX C – WATER SYSTEM MAP

THE VILLAGE COOPERATIVE OF ERIE

A REPLAT OF LOTS 5B AND 5C, BLOCK 1, VISTA RIDGE FILING NO.11, BLOCK 1, LOT 5 MINOR SUBDIVISION
LOCATED IN THE SOUTHEAST ONE-QUARTER OF SECTION 32, TOWNSHIP 1 NORTH, RANGE 68 WEST OF THE 6TH P.M.,
TOWN OF ERIE, COUNTY OF WELD, STATE OF COLORADO

POTABLE WATER MAP



LEGEND

EXISTING WATER — W — W —

PROPOSED WATER — W — W —

N

30 15 0 30 60

ORIGINAL SCALE: 1" = 30'

POTABLE WATER MAP
THE VILLAGE COOPERATIVE OF ERIE
JOB NO. 16162.00
11/1/24
SHEET 1 OF 1

811 Know what's below. Call before you dig.

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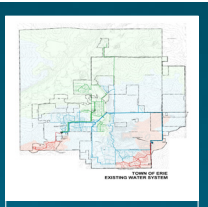
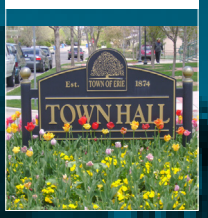
APPENDIX D – REFERENCES

WASTEWATER COLLECTION SYSTEM MASTER PLAN





WASTEWATER COLLECTION SYSTEM MASTER PLAN

Submitted to:
Town of Erie

TOWN OF ERIE
1874

Submitted by:

MERRICK®

2480 West 26th Avenue, B225 • Denver, CO 80211
Tel: +1 303-964-3333 • Fax: +1 303-964-3355
www.merrick.com

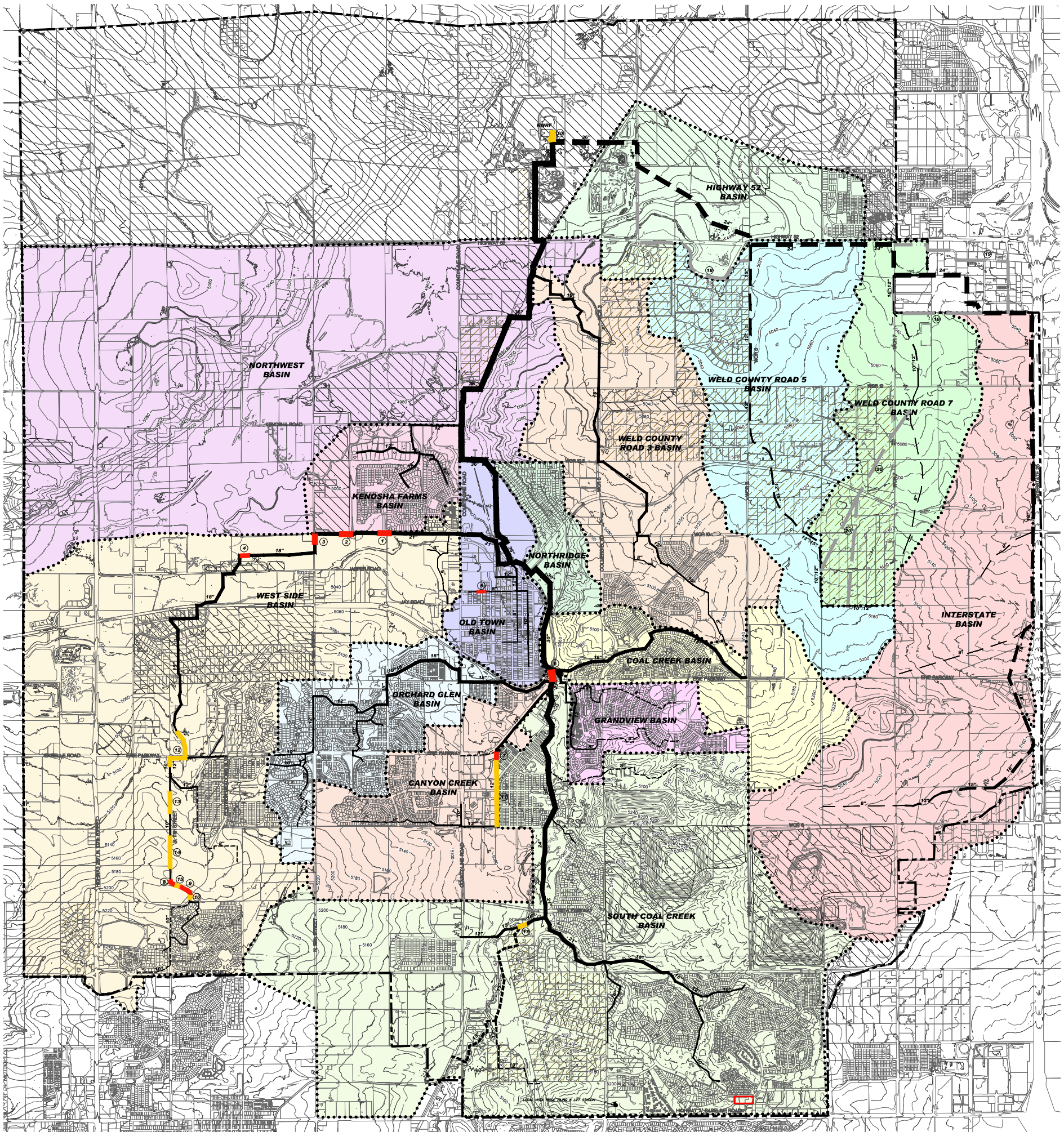
Using water records and experience with similar systems, the updated the wastewater flow EQR schedule was developed to assign flows to undeveloped areas based on the 2015 Comprehensive Plan land use categories. The updated EQR schedule is presented in Table 5.

Table 5: EQR Schedule

	Land Use Category	Loading (EQR/Acre)
Residential	Rural Residential (RR)	1
	Low Density Residential (LDR)	4
	Medium Density Residential (MDR)	8
	High Density Residential (HDR)	16
Mixed Use	Mixed Use (MU)	4
	Downtown (DT)	4
Commercial	Neighborhood Commercial (NC)	4
	Community Commercial (CC)	4
	Regional Commercial (RC)	5
Business/ Industrial	Business	4
	Industrial	6
School	School	2*

* Existing schools used peak month flow with 2 safety factors. Future schools used 2 EQR/Acre if area was known, otherwise 25 EQR based on typical school use data.

This projection scenario does not include areas currently designated as Open Space or Agriculture or areas that are already served by other jurisdictions. Areas served by other jurisdictions or areas that will not be served by Erie in the future are shown hatched on the Wastewater Collection System Master Plan Map on Figure WW-1. Open space and agricultural areas were not included in wastewater loadings and are not called out on Figure WW-1. With the adjusted build-out projections, the Ultimate Maximum Day Flow for the Town of Erie is estimated to be 10.6 MGD. Table 6 presents the ultimate projected flows separated by customer classification.



LEGEND

- 5280 — 20' CONTOUR
- 10' CONTOUR
- ERIE PARKWAY — STREET/ HIGHWAY

COLLECTION SYSTEM PIPES

- 8"
- 10"
- 12"
- 15"
- 16"/18"
- 21"
- 24"
- 30"
- 36"
- EXISTING TRUNK SEWER
- PLANNED DEVELOPMENT TRUNK SEWER
- ULTIMATE TRUNK SEWER
- ALTERNATIVE ROUTE
- MARGINAL CAPACITY AT ULTIMATE BUILD-OUT, d/D>0.5 FOR ≤12" PIPES, d/D>0.7 FOR LARGER PIPES
- INADEQUATE CAPACITY AT ULTIMATE BUILD-OUT, d/D>0.83

MAP NUMBERS

- (1)-(6) PIPES WITH ADVERSE OR FLAT SLOPES
- (7)-(9) PRESSURIZED PIPES
- (10)-(17) PIPES WITH MARGINAL CAPACITY
- (18)-(19) HWY 52/ I25 INTERCEPTOR ALTERNATIVE ALIGNMENTS
- (20) WCR 5/7 INTERCEPTORS ALTERNATIVE ALIGNMENT

SANITARY BASINS

- SANITARY BASIN LIMTS
- CANYON CREEK
- COAL CREEK
- GRANDVIEW
- HIGHWAY 52
- INTERSTATE
- KENOSHA FARMS
- NORTHRIDGE
- NORTHWEST
- OLD TOWN
- ORCHARD GLEN
- SOUTH COAL CREEK
- WELD COUNTY ROAD 3
- WELD COUNTY ROAD 5
- WELD COUNTY ROAD 7
- WEST SIDE
- AREAS NOT INCLUDED
- SEPTIC SYSTEM AREAS

1,200 0 1,200 2,400
1 inch = 1,200 feet

TOWN OF ERIE 1874

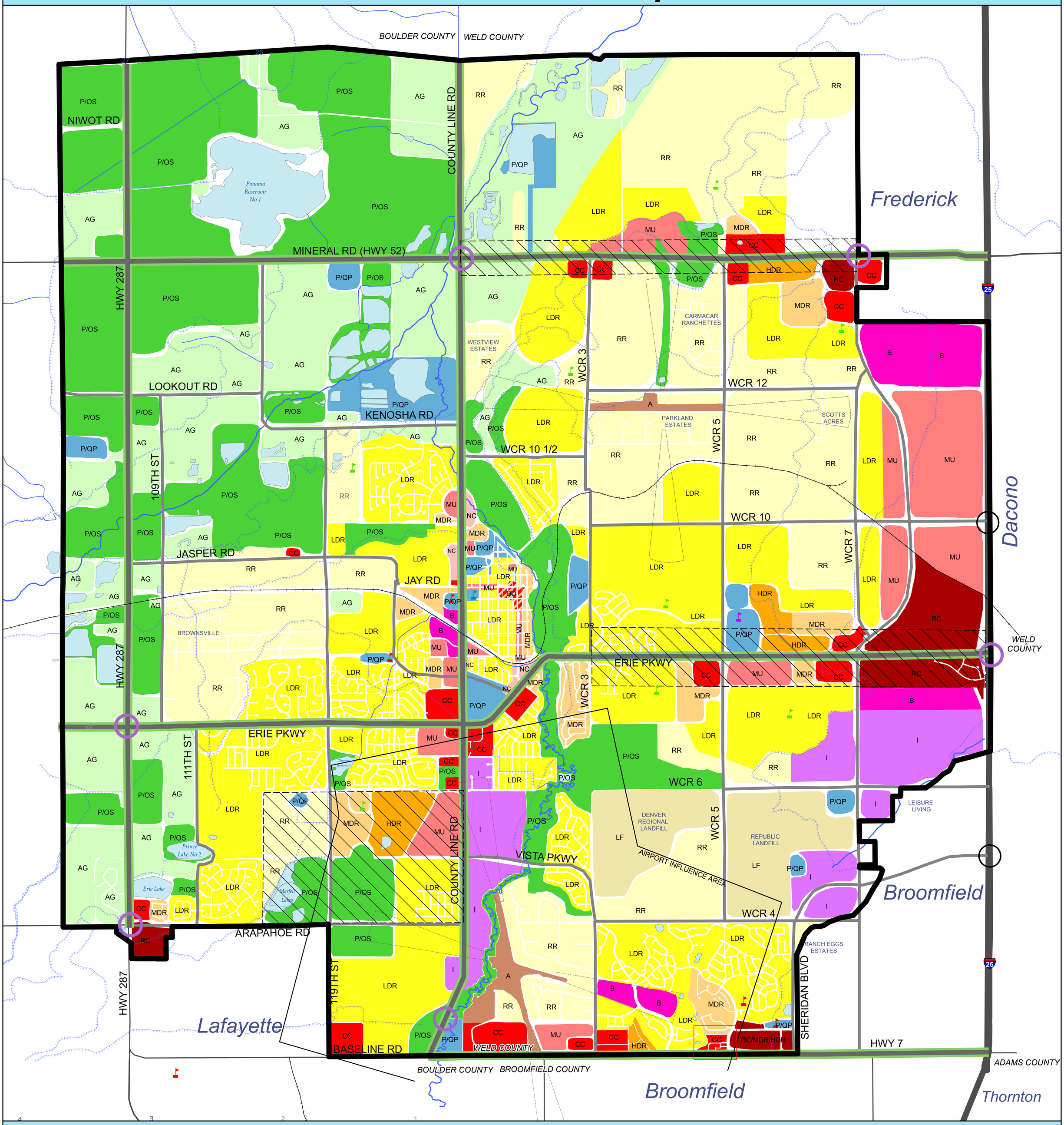
WASTEWATER COLLECTION SYSTEM MASTER PLAN

MERRICK®

AUGUST 2020

WW-1

Town of Erie, Colorado
Comprehensive Plan - 2015 Update
Land Use Plan Map



Land Use Plan Legend

AG	Agriculture	MDR	Medium Density Residential (6-12 du/ac)	B	Business		Canal/Ditch
P/OS	Parks/Public Open Space	HDR	High Density Residential (12-20 du/ac)	I	Industrial		Railroad
P/QP	Public/Quasi Public	DD	Downtown District		Reservoirs		Community Gateways
LF	Landfill	NC	Neighborhood Commercial		County Boundary		I-25 Interchange (Future)
A	Airport	CC	Community Commercial		Planning Area Boundary		Elementary School
RR	Rural Residential (0-2 du/ac)	RC	Regional Commercial		Areas of Special Consideration		Middle School
LDR	Low Density Residential (2-6 du/ac)	MU	Mixed Use				High School
							Proposed

0 0.25 0.5 1 Miles

Sources: Boulder CO GIS, Weld CO GIS, CDOT, Town of Erie

Note: This map is intended to serve as a guide for future land use patterns within the Town of Erie's Planning Area Boundary and is advisory in nature. Land Use patterns depicted on the map are generalized, recognizing that development proposals may contain a mixture of land uses and density levels which achieve the intent of the Town of Erie Comprehensive Plan. Adopted Date: Dec. 21, 2005.

The Comprehensive Plan contains guidelines for the refinement of the generalized areas depicted on the map. These guidelines should be referred to by applicants prior to the preparation of a development submittal and by Town staff, elected, and appointed officials as part of the development review process.

Town Boundary Not Shown - Refer to Zoning Map for Town Boundary

Map Revision Date: June 12, 2017

HYDRANT FLOW TEST

High Country PIPE & UTILITY
Serving Colorado & Neighboring States since 1970

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Ft. Collins, CO 80526
Office: (970) 213-3411
Scheduling: (970) 310-4117
Email: office@highcountrypipe.com
www.highcountrypipe.com

Hydrant Flow Test

Inspection Date: 12-18-2023

Time of Test: 9:40 am

Business/Property Information:

Facility: Village Cooperative

Address: 3000 Village Vista Dr Erie Co 80516

Contact Person: Jim Fitzmorriss

Contact Phone: 303-358-7008

Contractor: JR Engineering

Flow Test (*Use 2 ½ outlet for testing*)

Residual Hydrant
Static Pressure: 112.5 Residual Pressure: 84

Location or #: East Flow 1300

Flow Hydrant west
GPM: 1220 Pitot PSI:

Location or #: West Flow available @ 20 PSI:

2nd Flow Hydrant
GPM: Pitot PSI:

Location or #: Flow available @ 20 PSI:

Comments: Jim wanted static on the 2 hydrants and Flow at even the Residual hydrant

Contractor/Owner/Owner Representative: Jim Fitzmorris JR Engineering

Signature:

Testers Name: John Snyder

Signature:

VISTA RIDGE PLANNED DEVELOPMENT – DEVELOPMENT PLAN AMENDMENT NO. 7

Vista Ridge Planned Development – Development Plan Amendment No. 7

Town Council

Chris LaRue, Principal Planner

Harry Brennan, Senior Planner

May 14, 2024 (Continued from March 12, 2024)

Approval Criteria

e. Adequate and sufficient public safety, utility facilities and services, recreation facilities, parks, open space, and schools are available to serve the property, while maintaining sufficient levels of service to existing development.

f. The PD zone district provides adequate vehicular circulation and parking facilities in terms of traffic volumes, convenience, safety, access, screening and noise.

Staff: There are adequate and available public services and utilities for this area. Further evaluation by staff will occur with later applications including Site Plan and Plat. Traffic generated by this land use is significantly lower than if the site were to be fully built out with commercial uses such as retail.