



CANYONS FAR SOUTH SDP
PHASE II DRAINAGE REPORT
TOWN OF CASTLE ROCK PROJECT NO. SDP23-0041
AUGUST 2025

For:

**Canyons Far South Owner LP
1144 15th Street, Suite 2600
Denver, CO 80202**

Prepared By:

**Cover 3 Engineering
Centennial, CO 80016**

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ENGINEER'S STATEMENT:

I affirm that this report and plan for the Phase II drainage design of Canyons Far South SDP was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Castle Rock Drainage Design and Technical Criteria for the owners thereof. I understand that the Town of Castle Rock does not and will not assume liability for drainage facilities designed by others.

Signature: _____

Brian K. Moss

Registered Professional Engineer

State of Colorado No. 37702

For and on behalf of Cover 3 Engineering

DEVELOPER'S STATEMENT:

Canyons Far South Owner LP hereby certifies that the drainage facilities for Canyons Far South SDP shall be constructed according to the design presented in this report. I understand that the Town of Castle Rock does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that the Town of Castle Rock reviews drainage plans pursuant to the Municipal Code; but cannot, on behalf of Canyons Far South SDP, guarantee that final drainage design review will absolve Canyons Far South Owner LP and/or their successors and/or assigns of future liability for improper design.

HT CANYONS SOUTH DEVELOPMENT LP

By: Canyons Far South Owner LP, its general partner

By: HT Canyons South LP, its sole member

By: Hines Canyons South LLC, its general partner

By: Hines Canyons South Associates LP, its sole member

By: Hines Investment Management Holdings Limited
Partnership,
its general partner

By: _____

Name: Chad Murphy

Title: Managing Director

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I. SCOPE

The purpose of this report is to verify that the drainage plan for the Canyons Far South Site Development Plan is in general accordance with the *Town of Castle Rock Storm Drainage Design and Technical Criteria (TOCR SDDTC)*, *Town of Castle Rock Public Works Regulations*, and Mile High Flood District (MHFD) where applicable.

II. GENERAL LOCATION AND DESCRIPTION

A. Site Location

- See the Vicinity Map in Appendix D.
- The Canyons Far South SDP project site is in the following areas:
 - NW Section 31, Township 7 South, Range 66 West of the 6th Principal Meridian
 - In Town of Castle Rock, Douglas County, CO.
 - The site is located south of Crowfoot Valley Road, north and west of Castle Oaks Drive, and east of Founders Parkway.
- The Castle Oaks Terrain development (zoned planned development, single family adjacent to the site) is south and southeast of the site and the Macanta (also known as Canyons South) development (zoned planned development, single family adjacent to the site) in Douglas County is north of the site.



Site Location

B. Description of Property

- Canyons Far South SDP will cover approximately 361± acres.
- The site is covered with native grasses, areas of scrub oak with a few pine trees mixed in. The topography is shallow canyons with slopes ranging from 0% to 30%.
- The Natural Resources Conservation Service (NRCS) Soils Classification Map indicates soil types present on the site are predominately classified as HSG C and D. See Appendix D for Soil Maps.
- This site outfalls to the east to McMurdo Gulch, which drains east to Cherry Creek. Tributary B and Tributary 3 of McMurdo Gulch are located within the property and have been analyzed by this project. There are no improvements directly to McMurdo Gulch anticipated for this project.
- McMurdo Gulch Tributary 3 contains flood zone within the property, at the extreme eastern edge of the site. These can be seen in the FEMA FIRM map 08035C0189G located in Appendix D. No impacts to this floodplain are anticipated by this project.
- The McMurdo Gulch Tributary B and Tributary 3 watersheds within the project site contain more than 130 acres and are considered a major drainageway.
- There are no irrigation canals or irrigation ditches on the property.
- Canyons Far South SDP has no significant geologic or topographic features.
- Canyons Far South SDP has cultural resources on the site including earthen dams and stone check dams/drop structures constructed by the Civilian Conservation Corp (CCC). The CCC structures will be preserved and may contribute, to the extent possible, to stabilizing and managing the drainageways. These structures are present along both McMurdo Gulch Tributary B and Tributary 3 on site. Most are in good condition and will be maintained as-is. Calculations have been included to ensure the maximum flow for these structures is not exceeded in the developed condition.
 - There are two locations where the CCC structures are planned to be removed. There is one location along Tributary B that will be removed due to be within the alignment of Edgerock Boulevard, as approved with the Planned Development Plan (PDP) and Annexation documents for this project. One structure along Tributary 3 is in poor condition that will be removed due to the wall failing. No additional clearances were determined to be necessary as required by the PDP or Annexation documents.
 - McMurdo Gulch Tributary B and Tributary 3 have been reviewed by the Army Corps of Engineers and determined to be Non-Jurisdictional per NWO-2021-00560-DEN.
 - Due to these channels being Non-Jurisdictional, this project will work with the Town to document and memorialize the CCC structures that are to be removed.
- Canyons Far South SDP will tie-in to the existing infrastructure along Founders Parkway to the west, Castle Oaks Drive to the south, and Macanta Boulevard in Douglas County to the north.
- Canyons Far South SDP includes five (5) proposed Planning Areas. The Planning Areas will be composed of 439 single-family detached lots, 76 single-family attached lots, future commercial, parks, and preserved natural open space.

III. DRAINAGE BASINS AND SUB-BASINS

A. Major Drainage Basins

- Major drainage basins in the area include McMurdo Gulch Tributary B and Tributary 3 which covers the entirety of the project site. The tributary drainage basins flow generally to the east to McMurdo Gulch and then northeast before it joins Cherry Creek. Within the project site, the reaches of these tributaries have fairly well defined low-flow channels and moderately steep slopes (0.4-5.0%). In the existing condition, these tributaries have velocities up to 14 feet/second.
- The bulk of McMurdo Gulch Tributary B and Tributary 3 is undeveloped in the existing condition. A small amount of the existing Castle Oaks Terrain development to the south drains to the north into Tributary 3. The Macanta (also known as Canyons South) development in Douglas County is currently under construction, and a portion drains to the south into Tributary B. Undeveloped land west of Founders Parkway drains to the east to both Tributary B and Tributary 3. The existing conditions and future filings of Macanta have been taken into consideration in the drainage design of Canyons Far South SDP.
- In the proposed condition, Canyons Far South SDP proposes five (5) Planning Areas. The Planning Areas will be composed of 439 single-family detached lots, 76 single-family attached lots, future commercial, parks, and preserved natural open space. Both existing and proposed conditions have been analyzed by this project.
- Referenced documents for McMurdo Gulch include:
 - *McMurdo Gulch Flood Hazard Area Delineation*, CH2MHill, Amended February 2012
 - *Canyons South Filing No. 1 – Phase III Drainage Report*, Calibre Engineering Inc., August 12, 2019.
 - *Canyons South – Filing 2 Phase III Drainage Report*, Calibre Engineering Inc., July 2021
- Further, existing major drainage basins have been subdivided with this project along Tributary B and Tributary 3 to calculate flows along the channel reaches. These drainage basins are consistent with the proposed basins, to ensure the flows in the channel can be accurately accounted for along each channel reach. See the Preliminary Floodplain Modification Study for more information.
- See the *Pond G and Tributary B Memo* in the Appendix of the Preliminary Floodplain Modification Study, that was shared with Town of Castle Rock in October 2024, for further explanation of the design intent of Pond G and Tributary B.

B. Minor Drainage Basins

- The existing drainage basins for Canyons Far South SDP are divided into sub-basins to more accurately account for storm runoff along the tributary channels and are further described below.
 - Basins B0 through B7: These basins are located along McMurdo Gulch Tributary B. The land uses for these basins include existing single-family residential development from the Macanta development to the north and existing undeveloped open space. Runoff within these basins will be conveyed through existing swales to the Tributary B channel. Tributary B outfalls to McMurdo Gulch offsite to the east.

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- Basin OS1: This basin includes Founders Parkway and existing undeveloped open space west of Founders Parkway. Runoff from this basin will be conveyed to an existing culvert under Founders Parkway to an existing swale to the Tributary B channel. Tributary B outfalls to McMurdo Gulch offsite to the east.
 - Basins 3A through 3E: These basins are located along McMurdo Gulch Tributary 3. The land uses for these basins include existing single-family residential development from the Castle Oaks Terrain development to the south and existing undeveloped open space. Runoff within these basins will be conveyed through existing swales to the Tributary 3 channel. Tributary 3 outfalls to McMurdo Gulch offsite to the east.
 - Basins OS2 through OS5: These basins include Founders Parkway and existing undeveloped open space west of Founders Parkway, or Crimson Sky Drive and residential area to the south. Runoff from these basins will be conveyed to existing culverts under Founders Parkway or to storm outfalls into the site to existing swales to the Tributary 3 channel. Tributary 3 outfalls to McMurdo Gulch offsite to the east.
- See Existing Basin Summary Table below.
 - The existing basin areas and percent impervious is consistent with the *McMurdo Gulch Flood Hazard Area Delineation*. See Report Section V.B. on page 15.

EXISTING BASIN SUMMARY TABLE						
Basin Designation	Design Point	Area (ac)	C ₅	C ₁₀₀	Q ₅ (cfs)	Q ₁₀₀ (cfs)
B0	B0	57.68	0.10	0.51	11.11	108.17
B1	B1	53.50	0.09	0.51	10.76	110.99
B2	B2	94.90	0.10	0.52	16.60	154.01
B3	B3	55.96	0.12	0.53	12.53	98.45
B4	B4	95.67	0.08	0.51	15.14	166.36
B5	B5	23.86	0.08	0.50	4.80	57.94
B6	B6	37.08	0.08	0.50	6.45	77.90
B7	B7	10.70	0.08	0.50	2.14	25.83
OS1	OS1	14.16	0.27	0.60	9.73	39.00
Routed to Trib B Offsite		443.52			89.26	838.64
3A	3A	86.77	0.08	0.50	12.84	154.95
3B	3B	51.27	0.09	0.51	9.92	102.43
3C	3C	33.64	0.08	0.50	5.90	71.17
3D	3D	15.40	0.08	0.50	2.97	35.84
3E	3E	12.88	0.09	0.51	2.78	29.48
OS2	OS2	46.59	0.20	0.57	20.89	106.55
OS3	OS3	25.29	0.08	0.50	3.52	42.49
OS4	OS4	1.46	0.53	0.73	3.49	8.78
OS5	OS5	9.13	0.08	0.50	3.37	40.62
Routed to Trib 3 Offsite		282.43			65.67	592.32

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- The proposed drainage basins for Canyons Far South SDP are divided into G, H, J, and L basins depending on which part of the development site the basins discharge to. These minor drainage basins are divided into sub-basins to more accurately account for storm runoff and are further described below.
- Basin G
 - Basins G0 through G8: These basins are located along McMurdo Gulch Tributary B. The land uses for these basins include proposed single-family residential development, proposed parks and open space, existing residential area from the Macanta development to the north, and existing undeveloped open space. Basin G7 includes future commercial area, that has been added to size infrastructure although the commercial area is not included within this SDP. Runoff within these basins will be conveyed through swales to the Tributary B channel to Pond G. Pond G outfalls to the existing tributary channel. Tributary B ultimately outfalls to McMurdo Gulch offsite to the east.
 - Basins G20 through G23: These basins are located along the spine infrastructure roads. Runoff within these basins will be conveyed to curb and gutter, to proposed inlets, to existing swales, to the Tributary B channel to Pond G. Pond G outfalls to the existing tributary channel. Tributary B ultimately outfalls to McMurdo Gulch offsite to the east.
 - Basins G30 through G36: These basins are located within the residential area. The land uses for these basins include proposed single-family residential development, proposed residential streets, and proposed parks and open space. Runoff within these basins will be conveyed to curb and gutter, to proposed inlets, to existing swales, to the Tributary B channel to Pond G. Pond G outfalls to the existing tributary channel. Tributary B ultimately outfalls to McMurdo Gulch offsite to the east.
 - Basin OS1: This basin includes Founders Parkway and existing undeveloped open space west of Founders Parkway. Runoff from this basin will be conveyed to an existing culvert under Founders Parkway to an existing swale to the Tributary B channel to Pond G. Pond G outfalls to the existing tributary channel. Tributary B ultimately outfalls to McMurdo Gulch offsite to the east.
 - See the Preliminary Floodplain Modification Study for more information regarding final routing to ponds to be confirmed with future Phase III Drainage Reports to ensure an acceptable design of the Tributary B channel.
- Basin H
 - Basins H1 through H4: These basins (including Basin H3) are located along McMurdo Gulch Tributary 3. The land uses for these basins include proposed single-family residential development, proposed parks and open space, and existing undeveloped open space. Runoff within these basins will be conveyed through swales to the Tributary 3 channel to Pond H. Pond H outfalls to the existing tributary channel. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.

- Basin H20: This basin is located along the spine infrastructure roads. Runoff within this basin will be conveyed to curb and gutter, to proposed inlets, to existing swales, to the Tributary 3 channel to Pond H. Pond H outfalls to the existing tributary channel. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.
- Basins H30 through H33: These basins are located within the residential area. The land uses for these basins include proposed single-family residential development, proposed residential streets, and proposed parks and open space. Runoff within these basins will be conveyed to curb and gutter, to proposed inlets, to existing swales, to the Tributary 3 channel to Pond H. Pond H outfalls to the existing tributary channel. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.
- See the Preliminary Floodplain Modification Study for more information regarding final routing to ponds to be confirmed with future Phase III Drainage Reports to ensure an acceptable design of the Tributary 3 channel.
- **Basin J**
 - Basins J1 through J7: These basins are located along McMurdo Gulch Tributary 3. The land uses for these basins include proposed single-family residential development, proposed parks and open space, existing residential area from the Castle Oaks Terrain development to the south, and existing undeveloped open space. Runoff within these basins will be conveyed through swales to the Tributary 3 channel to Pond J. Pond J outfalls to the existing tributary channel and bypasses through Pond H. *Note: Pond J "bypasses" Pond H due to the timing of the release rates of the two ponds. Pond J releases to Pond H, but should be after Pond H has filled and started to release. So Pond J flows are not accounted for in Pond H, but does convey runoff through it. This will be modeled with CUHP-SWMM routing in future Phase III Drainage Reports.* Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.
 - Basin J20: This basin is located along the spine infrastructure roads. Runoff within this basin will be conveyed to curb and gutter, to proposed inlets, to existing swales, to the Tributary 3 channel to Pond J. Pond J outfalls to the existing tributary channel and bypasses through Pond H. *Note: Pond J "bypasses" Pond H due to the timing of the release rates of the two ponds. Pond J releases to Pond H, but should be after Pond H has filled and started to release. So Pond J flows are not accounted for in Pond H, but does convey runoff through it. This will be modeled with CUHP-SWMM routing in future Phase III Drainage Reports.* Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.
 - Basins J30 through J33: These basins are located within the residential area. The land uses for these basins include proposed single-family residential development, proposed residential streets, and proposed parks and open space. Runoff within these basins will be conveyed to curb and gutter, to proposed inlets, to existing swales, to the Tributary 3 channel to Pond J. Pond J outfalls to the existing tributary channel and bypasses through Pond H. *Note: Pond J "bypasses" Pond H due to the timing of the release rates of the two*

ponds. Pond J releases to Pond H, but should be after Pond H has filled and started to release. So Pond J flows are not accounted for in Pond H, but does convey runoff through it. This will be modeled with CUHP-SWMM routing in future Phase III Drainage Reports. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.

- Basins OS2 through OS5: These basins include Founders Parkway and existing undeveloped open space west of Founders Parkway, or Crimson Sky Drive and residential area to the south. Runoff from these basins will be conveyed to existing culverts under Founders Parkway or to storm outfalls into the site to existing swales to the Tributary 3 channel to Pond J. Pond J outfalls to the existing tributary channel and bypasses through Pond H. *Note: Pond J "bypasses" Pond H due to the timing of the release rates of the two ponds. Pond J releases to Pond H, but should be after Pond H has filled and started to release. So Pond J flows are not accounted for in Pond H, but does convey runoff through it. This will be modeled with CUHP-SWMM routing in future Phase III Drainage Reports. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.*
- See the Preliminary Floodplain Modification Study for more information regarding final routing to ponds to be confirmed with future Phase III Drainage Reports to ensure an acceptable design of the Tributary 3 channel.
- **Basin L**
 - Basin L1: This basin is located within the residential area. The land use for this basin includes proposed single-family residential development and open space. Runoff within this basin will be conveyed to a grass swale, then to Pond L. Pond L outfalls to the existing Tributary 3 channel downstream of Pond H. Tributary 3 ultimately outfalls to McMurdo Gulch offsite to the east.
- See Proposed Basin Summary Table below.

BASIN SUMMARY TABLE								
Basin Designation	Design Point	Area (ac)	C₂	C₅	C₁₀₀	Q₂ (cfs)	Q₅ (cfs)	Q₁₀₀ (cfs)
G0	G0	50.94	0.06	0.12	0.53	5.14	12.93	105.26
G1	G1	74.69	0.08	0.13	0.53	7.57	17.77	129.65
G2	G2	50.95	0.08	0.14	0.54	5.89	13.34	91.74
G3	G3	65.98	0.09	0.15	0.54	8.99	19.77	128.64
G4	G4	13.94	0.03	0.08	0.50	0.83	2.94	35.47
G5	G5	30.71	0.03	0.08	0.50	1.50	5.35	64.51
G6	G6	13.16	0.04	0.08	0.51	0.92	2.94	32.12
G7	G7	7.31	0.69	0.73	0.83	18.18	25.96	53.68
G8	G8	7.18	0.05	0.10	0.52	0.67	1.91	18.20
G20	G20	3.75	0.47	0.53	0.73	6.30	9.58	24.15
G21	G21	3.02	0.47	0.53	0.73	5.16	7.82	19.54

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G22	G22	1.94	0.48	0.54	0.74	3.37	5.10	12.60
G23	G23	0.91	0.68	0.73	0.83	2.23	3.19	6.62
G30	G30	2.17	0.54	0.60	0.76	4.24	6.29	14.66
G31	G31	21.90	0.45	0.51	0.72	35.82	54.69	139.83
G32	G32	2.06	0.59	0.64	0.78	4.33	6.35	14.23
G33	G33	3.90	0.56	0.61	0.77	7.87	11.60	26.61
G34	G34	3.76	0.54	0.60	0.76	7.32	10.86	25.35
G35	G35	7.32	0.42	0.48	0.71	10.95	16.97	45.52
G36	G36	1.39	0.53	0.59	0.76	2.67	3.97	9.34
OS1	OS1	14.16	0.21	0.27	0.60	5.48	9.73	38.99
Routed to Pond G		381.15				145.43	249.03	1036.74
H1	H1	13.00	0.12	0.18	0.56	3.94	8.00	44.28
H2	H2	12.14	0.15	0.22	0.58	3.97	7.57	36.39
H3	H3	9.68	0.12	0.18	0.56	2.46	5.01	27.83
H4	H4	10.82	0.08	0.14	0.53	1.52	3.54	25.47
H20	H20	1.45	0.61	0.66	0.80	3.20	4.66	10.20
H30	H30	23.99	0.41	0.48	0.70	35.61	55.28	148.95
H31	H31	11.56	0.55	0.61	0.77	22.98	33.97	78.44
H32	H32	2.42	0.41	0.47	0.70	3.54	5.50	14.94
H33	H33	2.69	0.63	0.67	0.80	5.20	7.53	16.35
Routed to Pond H		87.73				82.42	131.06	402.85
J1	J1	17.31	0.12	0.19	0.56	4.42	8.92	48.90
J2	J2	9.54	0.17	0.23	0.58	3.71	6.95	31.99
J3	J3	33.01	0.04	0.09	0.51	2.25	6.84	70.94
J4	J4	9.80	0.03	0.08	0.51	0.63	2.06	22.99
J5	J5	5.53	0.20	0.27	0.60	2.31	4.14	16.94
J6	J6	13.79	0.04	0.09	0.51	1.10	3.21	31.82
J7	J7	12.13	0.08	0.14	0.53	2.06	4.80	34.48
J20	J20	2.19	0.62	0.67	0.80	4.91	7.12	15.50
J30	J30	2.15	0.57	0.62	0.78	4.40	6.47	14.71
J31	J31	5.68	0.51	0.56	0.75	10.33	15.49	37.46
J32	J32	2.74	0.56	0.61	0.77	5.50	8.12	18.67
J33	J33	1.87	0.58	0.63	0.78	3.88	5.70	12.89
OS2	OS2	46.59	0.14	0.20	0.57	10.68	20.89	106.55
OS3	OS3	25.29	0.03	0.08	0.50	0.99	3.52	42.49
OS4	OS4	1.46	0.47	0.53	0.73	2.29	3.49	8.78
OS5	OS5	9.13	0.03	0.08	0.50	0.95	3.37	40.62
Routed to Pond J		198.22				60.39	111.07	555.73
L1	L1	2.28	0.16	0.23	0.58	0.86	1.62	7.47
Routed to Pond L		2.28				0.86	1.62	7.47

- See the Preliminary Floodplain Modification Study for more information on each channel reach.
- There are no irrigation canals or irrigation ditches on the property.

IV. DRAINAGE DESIGN CRITERIA

A. Regulations

- The Canyons Far South SDP project will be designed using the *Town of Castle Rock Storm Drainage Design and Technical Criteria* and the *Town of Castle Rock Public Works Regulations* when applicable.
- The Canyons Far South SDP project will be designed using the *Urban Storm Drainage Criteria Manual* by the Mile High Flood District (MHFD) when applicable.

B. Drainage Studies, Outfall Systems Plans, Site Constraints

- There are no improvements anticipated directly to McMurdo Gulch as part of the Canyons Far South SDP project. Tributary B and Tributary 3 of McMurdo Gulch are located within the property and have been analyzed by this project. Improvements are anticipated to be necessary including minor stabilization grading, reinforcing, and potential grade control structures along the tributary channel reaches.
- See the Preliminary Floodplain Modification Study for more information.
- The primary constraint for drainage on the Canyons Far South SDP site is the steep grades along the McMurdo Gulch tributaries. Drainage outfall from the streets to the channels will likely require steep pipes.

C. Hydrology

- The Rational Method will be used for calculating runoff for the site. All basins are less than 160 acres. Runoff coefficients are from MHFD DCM Vol 1. This Phase II Drainage Report has been updated to follow the revised criteria adopted by MHFD in March 2024. Conservative values have been assumed to ensure adequate design for all future filings.
- The Rational Method has been used along Tributary B and Tributary 3 instead of CUHP to be conservative. As previously described, existing major drainage basins have been subdivided with this project along Tributary B and Tributary 3 to calculate flows along the channel reaches. These basins are less than 160 acres. These drainage basins are consistent with the proposed basins, to ensure the flows in the channel can be accurately accounted for along each channel reach. By using the rational method, it will generate a higher flow value and will allow for a better analysis by calculating the change of flow along the channel easier than an overall CUHP analysis of each major drainageway. See the Preliminary Floodplain Modification Study for more information.

- A CUHP-SWMM model will be prepared with future Phase III Drainage Reports to confirm routing and release rates for this project. Information has been included within the SDP for reference only. CUHP-SWMM models and results will be provided with the Final Floodplain Modification Study.
- The 5-year storm will be used as the minor storm event and the 100-year storm will be used for the major storm event. The 2-year storm event has been included for the proposed condition to be able to preliminarily size a low-flow channel.
- The design rainfall depths to be used are from 6.1.1 of the *Town of Castle Rock Storm Drainage Design and Technical Criteria*.

D. Hydraulics

- Pipe hydraulics will be included with future Phase III Drainage Report(s).
- Pipe velocities have been held to a maximum of 18 feet per second in the minor storm event. Due to the steep terrain of the site, the major storm event will attempt to hold a maximum of 18 feet per second.
- Variances will be submitted with Future Phase III Drainage Report(s) if necessary.
- Street and inlet capacities will be calculated with in the Phase III Drainage Report(s).
- See Preliminary Floodplain Modification Study for more information on Channel and Swale Hydraulic Calculations
- The 2-year storm event has been calculated to be able to determine the appropriate low flow design along each channel. This will be included with future Phaser III Drainage Report(s) to ensure that the channel reaches an appropriate equilibrium and is properly designed for the proposed condition. Preliminary low flow channels are included in the Preliminary Floodplain Modification Study.
- See Appendix B for more information.

E. Water Quality Enhancement

- Natural channels will be utilized for conveyance where permissible.
- Pond G, H, J, and L are proposed as full spectrum water quality and detention facilities. These permanent water quality enhancement features will treat the Canyons Far South SDP development and include offsite area as necessary. All residential lot impervious areas are treated prior to release offsite.
- The Canyons Far South SDP is within the Cherry Creek Basin and is subject to the Department of Public Health and Environment Water Quality Control Commission – Cherry Creek Reservoir Control Regulation 5 CCR 1002-72. All residential lot impervious areas are treated prior to release offsite.
- In total, there are 1.9 acres of excluded impervious area for land disturbance that is to remain undeveloped and 1.2 acres of excluded impervious area for trails. This can be seen in the Summary of Water Quality Conformance to MS4 Permit in Appendix C.

V. STORMWATER MANAGEMENT FACILITY DESIGN

A. Stormwater Conveyance Facilities

- Tributary B and Tributary 3 of McMurdo Gulch convey runoff through the site to the east.
- The general design of the stormwater conveyance facilities will utilize existing drainage tributaries and channels where possible. Streets, inlets, pipes, and manholes will be used to convey flow from developed areas to existing swales for discharge. The outfalls for these locations will likely include low tailwater basins and grade control structures may be needed in the main channels of Tributary B and Tributary 3. Final design will be included with future Phase III Drainage Report(s).
- Three ponds have been located along Tributary B and Tributary 3 to reduce the total number of ponds, improve long term maintenance, and provide better open space for the residential lots.
- See the *Pond G and Tributary B Memo* in Appendix D, that was shared with Town of Castle Rock in October 2024, for further explanation of the design intent of Pond G and Tributary B.
- More information will be provided with future Phase III Drainage Report(s) as necessary.

B. Stormwater Storage Facilities

- Ponds G, H, J and L are proposed by the Canyons Far South SDP project. These have been designed as full spectrum water quality and detention facilities. These permanent water quality enhancement features will treat the Canyons Far South SDP development and include offsite area as necessary.
- Pond G, H, and J are located along the major drainageway of Tributary B or Tributary 3 of McMurdo Gulch. This allows for convenient conveyance to the ponds from existing or proposed basins by following existing drainage patterns. Note that Pond G is located outside of Castle Rock, in Douglas County. It is the same property owner for this site and the property to the north, so there are no issues constructing the pond in that location. But the Castle Rock drainage assumed by these plans will actually be treated in Douglas County along Tributary B. Therefore, a drainage easement to both the Town and Douglas County is required.
- See summary table below. For more information see Appendix C. More detail will be provided with future Phase III Drainage Report(s).

**CANYONS FAR SOUTH SDP
PHASE II DRAINAGE REPORT
PAGE 16 OF 21**

POND SUMMARY TABLE				
Pond	Watershed Area (acres)	Watershed Imperviousness	Approximate 100-yr Volume Required (acre-feet)	Minimum 100-yr Volume To Be Provided (acre-feet)
Pond G	381.15	19.9%	20.4	20.4
Pond H	87.73	38.2%	6.5	6.5
Pond J	198.22	17.4%	10.3	10.3
Pond L	2.28	23.7%	0.3	0.3

- The ponds outfall to Tributary B or Tributary 3 of McMurdo Gulch. More information regarding outlet structure, emergency overflow, and downstream outfall riprap will be provided with future Phase III Drainage Report(s).
- Release rates for each pond will not exceed the existing flows in the existing channel as calculated by the CUHP-SWMM model of future Phase III Drainage Report(s). See the channel flow summary table in Appendix A.

RELEASE RATE SUMMARY TABLE						
	McMurdo Gulch Tributary B			McMurdo Gulch Tributary 3		
	Area (acres)	Percent Impervious	Flow (CFS)	Area (acres)	Percent Impervious	Flow (CFS)
McMurdo Gulch FHAD (2012)	485.76	10.4%	577	343.04	13.7%	423
Canyons Far South Existing	409.09	5.0%	529	303.83	5.0%	439
Canyons Far South Proposed	409.09	22.1%	407.27	303.83	34.7%	332.99

- All existing release rates are per the existing CUHP of the existing condition of the Major Basins from Canyons Far South Filing No. 1 or 2, included in the SDP for reference only.
 - All proposed release rates are per the CUHP-SWMM model for the ultimate condition of the Major Basins from Canyons Far South Filing No. 1 or 2, included in the SDP for reference only.
 - McMurdo Gulch FHAD basin CC_MCG20 corresponds with flows from Tributary B to McMurdo Gulch.
 - McMurdo Gulch FHAD basin CC_MCG22 corresponds with flows from Tributary 3 to McMurdo Gulch.

EXISTING vs PROPOSED SUMMARY TABLE				
	McMurdo Gulch Tributary B		McMurdo Gulch Tributary 3	
	Area (acres)	Percent Impervious	Area (acres)	Percent Impervious
Canyons Far South SDP - Existing	385.84	7.9%	282.43	8.2%
Canyons Far South SDP - Proposed	381.15	19.9%	288.23	26.4%

- Maintenance is simplified by having three larger ponds. Future Phase III Drainage Report(s) will provide more detail regarding access to each pond and the necessary maintenance of each pond.
- The ponds in this arrangement will also provide better open space for the residential lots. Trails can be added between lots where smaller ponds may have been located. One larger pond may also be seen as a more attractive option. Plus trees have been carefully preserved as much as possible, to allow the ponds to blend into the surrounding hills better.

C. Water Quality Enhancement Control Measures

The Canyons Far South development meets all the standards and requirements listed in section 14.4.5 of the *Town of Castle Rock Storm Drainage Design and Technical Criteria*. In addition to the previously discussed water quality requirements, the proposed Canyons Far South development intends to reduce the amount of site runoff by employing the use of grass swales, existing drainage channels, and infiltration within open space and park areas. Once said runoff arrives at the proposed detention facilities, the use of outlet structures, orifice plates, and micropools are implemented to treat runoff and reduce the release rate of captured flows.

Major drainageway stabilization has been provided in conjunction with the proposed development through the use of grade control structures on each channel reach. Point-source pollutants are not anticipated in the Canyons Far South development; however, these pollutants (if present) will be mitigated through pretreatment and other runoff reduction methods. Grass lined swales and runoff reduction give contaminated flows the chance to naturally filter themselves prior to reaching proposed detention facilities.

A Disconnected Impervious Area Exhibit is provided to ensure that pre-discharge infiltration measures are met for regional water quality facilities. The site includes various existing and proposed swales to allow infiltration. It should be noted, though, that this requirement is made difficult by the Town's competing requirements for concrete lined channels and extensions of storm sewer pipes that do not allow for infiltration. Nonetheless, infiltration is promoted throughout the open space as feasible.

D. Floodplain Modification

- No FEMA floodplain modifications will be required because of the Canyons Far South SDP development. No permanent impacts are within the FEMA FIRM existing floodplain. Utility

crossings of the FEMA FIRM existing floodplain are discussed in the Preliminary Floodplain Modification Study.

- Locally regulated floodplains within major drainageways of Tributary B and Tributary 3 will be minorly impacted by the proposed Canyons Far South development. No building structures are to be placed within the new limits of the locally defined 100-yr floodplain. See existing and proposed drainage maps for the limits of the effective existing and proposed 100-yr floodplain.

E. Geotechnical Investigation and Sub-surface Collection System Design

- No geotechnical concerns are anticipated for the Canyons Far South development. TOCR criteria will be followed where sub-surface underdrain systems are required. Specific underdrain design to be provided with future Phase III Drainage Report(s).

F. Operation and Maintenance

- The property owner shall be responsible for all storm infrastructure on their property. For infrastructure outside of Town owned right-of-way and open space, this will be the responsibility of the Metro District.

G. Additional Permitting

- No additional or special permits are anticipated for the Canyons Far South SDP project.
- 404 permitting and clearances is not applicable for this project – there are no wetlands or Waters of the United States being impacted.
 - McMurdo Gulch Tributary B and Tributary 3 have been reviewed by the Army Corps of Engineers and determined to be Non-Jurisdictional per NWO-2021-00560-DEN.
 - Project ID NWO-2021-00560 from the EPA have confirmed that there are no wetlands or Waters of the United States onsite.

H. General

- Appendix D includes FEMA FIRM maps and the Soils Map that have been used in the calculations of this report. Excerpts from the *McMurdo Gulch Flood Hazard Area Delineation* are included to determine the existing conditions of the site. The existing area and percent impervious for each tributary basin was followed to ensure the project is not releasing flows greater than was assumed by that study. Excerpts from the *Canyons South Filing No. 1 – Phase III Drainage Report* are included to confirm existing drainage patterns and pond outflow rates. Excerpts from the *Canyons South – Filing 2 Phase III Drainage Report* are included to confirm existing drainage patterns and pond outflow rates.

VI. CONCLUSIONS

A. Compliance with Standards

- The Canyons Far South Site Development Plan is in general compliance with the *Town of Castle Rock Storm Drainage Design and Technical Criteria*, Town of Castle

Rock Public Works Regulations, Department of Public Health and Environment Water Quality Control Commission Cherry Creek Reservoir Control Regulation 5 CCR 1002-72, and Mile High Flood District (MHFD) where applicable.

B. Variances

- No variances are anticipated to be requested with the Canyons Far South SDP development at this time. Further analysis, to be completed with future Phase III drainage reports, will determine if a variance(s) will be requested.

C. Drainage Concept

- The proposed drainage system for Canyons Far South SDP will provide a sustainable drainage system for the development. Flows will be conveyed by street curb and gutter or swales, where they will be captured by inlets or culverts, and then will be treated by one of four ponds and will eventually discharge into McMurdo Gulch. The development of Canyons Far South should not adversely impact downstream properties.

VII. REFERENCES

1. *Town of Castle Rock Storm Drainage Design and Technical Criteria*, Castle Rock, CO, latest version
2. *Town of Castle Rock Public Works Regulations*, Castle Rock, CO, latest version
3. *Urban Storm Drainage Criteria Manual*, Mile High Flood District, latest version
4. *McMurdo Gulch Flood Hazard Area Delineation*, CH2MHill, Amended February 2012
5. *Canyons South Filing No. 1 – Phase III Drainage Report*, Calibre Engineering Inc., August 12, 2019.
6. *Canyons South – Filing 2 Phase III Drainage Report*, Calibre Engineering Inc., July 2021

VIII. APPENDICES

- A.** Hydrologic Calculations
- B.** Hydraulic Calculations
- C.** Water Quality Enhancement Control Measures
- D.** Referenced Information



APPENDIX A

HYDROLOGIC CALCULATIONS

Project: Canyons Far South SDP
Location: Castle Rock, CO
Designer: CJG
Date: May 2025
Latest Revision: July 2025



EXISTING IMPERVIOUSNESS AND RUNOFF COEFFICIENT CALCULATIONS

				Paved	Park	Commercial	Single Family	Greenbelts/ Agricultural	Historic			
				Impervious %	95%	25%	85%	60%	5%	5%		
				C ₅	0.81	0.24	0.73	0.53	0.08	0.08		
				C ₁₀₀	0.87	0.59	0.83	0.73	0.50	0.50		
Basin Designation	NRCS Hydrologic Soil Group	Total Area (ac)	Total Area (sf)	Paved (sf)	Park (sf)	Commercial (sf)	Single Family (sf)	Greenbelts/ Agricultural (sf)	Historic (sf)	Percent Impervious	Runoff Coefficients, C	
											C ₅	C ₁₀₀
B0	C/D	57.68	2,512,690	0	0	0	111,797	0	2,400,893	7.4%	0.10	0.51
B1	C/D	53.50	2,330,439	0	0	0	73,256	0	2,257,183	6.7%	0.09	0.51
B2	C/D	94.90	4,133,667	0	0	0	232,290	0	3,901,378	8.1%	0.10	0.52
B3	C/D	55.96	2,437,658	0	0	0	248,902	0	2,188,757	10.6%	0.12	0.53
B4	C/D	95.67	4,167,468	0	0	0	75,444	0	4,092,024	6.0%	0.08	0.51
B5	C/D	23.86	1,039,465	0	0	0	0	0	1,039,465	5.0%	0.08	0.50
B6	C/D	37.08	1,615,265	0	0	0	0	0	1,615,265	5.0%	0.08	0.50
B7	C/D	10.70	466,300	0	0	0	0	0	466,300	5.0%	0.08	0.50
OS1	C/D	14.16	616,860	165,198	0	0	0	0	451,662	29.1%	0.27	0.60
Routed to Future Pond G (Excluding Basin B0)	C/D	385.84	16,807,122	165,198	0	0	629,891	0	16,012,033	7.9%	0.10	0.52
Routed to Trib B Offsite	C/D	443.52	19,319,812	165,198	0	0	741,688	0	18,412,926	7.9%	0.10	0.52
3A	C/D	86.77	3,779,806	0	0	0	0	0	3,779,806	5.0%	0.08	0.50
3B	C/D	51.27	2,233,183	0	0	0	69,608	0	2,163,575	6.7%	0.09	0.51
3C	C/D	33.64	1,465,426	0	0	0	0	0	1,465,426	5.0%	0.08	0.50
3D	C/D	15.40	670,785	0	0	0	0	0	670,785	5.0%	0.08	0.50
3E	C/D	12.88	561,136	0	0	0	14,403	0	546,733	6.4%	0.09	0.51
OS2	C/D	46.59	2,029,554	347,381	0	0	0	0	1,682,174	20.4%	0.20	0.57
OS3	C/D	25.29	1,101,420	0	0	0	0	0	1,101,420	5.0%	0.08	0.50
OS4	C/D	1.46	63,392	0	0	0	63,392	0	0	60.0%	0.53	0.73
OS5	C/D	9.13	397,731	0	0	0	0	0	397,731	5.0%	0.08	0.50
Routed to Trib 3 Offsite	C/D	282.43	12,302,434	347,381	0	0	147,404	0	11,807,650	8.2%	0.10	0.52
Total	C/D	725.95	31,622,246	512,579	0	0	889,091	0	30,220,576	8.0%	0.10	0.52

Note: Historic increased from 2% to 5% to be more consistent with assumptions and total percent impervious from McMurdo Gulch FHAD 2012 Amendment by CH2MHILL (10.4% for Trib B and 13.7% for Trib 3).

Project: Canyons Far South SDP

Location: Castle Rock, CO

Designer: CJG

Date: May 2025

Latest Revision: July 2025

NRCS Conveyance Factors, K ²	
Type of Land Surface	K
Heavy Meadow	2.5
Tillage/Field	5
Short Pasture/Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas	20

Minimum T_c

5

EXISTING TIME OF CONCENTRATION CALCULATIONS

			Initial/Overland Flow Time, T _i			Channelized Flow/Travel Time, T _t					Time of Concentration, T _c (Check)		
Basin Designation	Imperviousness (%)	C ₅	Length (ft)	Slope (%)	T _i (min)	Land Surface	Length (ft)	Slope (%)	Velocity (ft/sec)	T _t (min)	Computed T _c (min)	First Design Point T _c (min)	Selected T _c (min)
B0	7.4%	0.10	100	2.00	14.42	Short Pasture/Lawns	2,600	8.10	1.99	21.75	36.17	N/A	36.17
B1	6.7%	0.09	100	5.00	10.72	Short Pasture/Lawns	2,440	8.80	2.08	19.58	30.30	N/A	30.30
B2	8.1%	0.10	140	2.00	16.97	Short Pasture/Lawns	3,020	6.20	1.74	28.88	45.85	N/A	45.85
B3	10.6%	0.12	100	2.00	14.05	Short Pasture/Lawns	2,820	5.90	1.70	27.64	41.69	N/A	41.69
B4	6.0%	0.08	140	2.00	17.26	Short Pasture/Lawns	2,480	6.70	1.81	22.81	40.08	N/A	40.08
B5	5.0%	0.08	80	4.60	9.99	Short Pasture/Lawns	1,730	11.00	2.32	12.42	22.41	N/A	22.41
B6	5.0%	0.08	100	1.00	18.49	Short Pasture/Lawns	1,460	11.00	2.32	10.48	28.97	N/A	28.97
B7	5.0%	0.08	140	4.60	13.22	Short Pasture/Lawns	1,050	7.00	1.85	9.45	22.67	N/A	22.67
OS1	29.1%	0.27	80	11.00	6.05	Tillage/Field	1060	3.60	0.95	18.62	24.67	28.17	24.67
3A	5.0%	0.08	170	4.00	15.26	Short Pasture/Lawns	2500	6.90	1.84	22.66	37.92	N/A	37.92
3B	6.7%	0.09	70	2.00	12.14	Short Pasture/Lawns	1910	5.10	1.58	20.14	32.27	N/A	32.27
3C	5.0%	0.08	70	5.20	8.98	Short Pasture/Lawns	2120	6.60	1.80	19.65	28.63	N/A	28.63
3D	5.0%	0.08	60	2.00	11.39	Short Pasture/Lawns	1550	8.30	2.02	12.81	24.20	N/A	24.20
3E	6.4%	0.09	120	5.20	11.62	Short Pasture/Lawns	1350	5.40	1.63	13.83	25.45	N/A	25.45
OS2	20.4%	0.20	200	4.80	13.66	Tillage/Field	1390	5.80	1.20	19.24	32.90	30.64	30.64
OS3	5.0%	0.08	200	3.60	17.13	Tillage/Field	1780	5.80	1.20	24.64	41.77	N/A	41.77
OS4	60.0%	0.53	20	2.00	3.68	Paved Areas	370	1.40	2.37	2.61	6.29	18.80	6.29
OS5	5.0%	0.08	10	2.00	4.65	Paved Areas	10	2.00	2.83	0.06	4.71	N/A	5.00

Project: Canyons Far South SDP

Location: Castle Rock, CO

Designer: CJG

Date: May 2025

Latest Revision: July 2025

Design Storm:

5-Yr

1-hr Design Point Rainfall (in):

1.43

EXISTING 5-YEAR PEAK RUNOFF CALCULATIONS

Basin Designation	Design Point	Area (ac)	C _s	C X A	T _c (min)	Intensity (in/hr)	Peak Flow, Q (cfs)
B0	B0	57.68	0.10	5.54	36.17	2.00	11.11
B1	B1	53.50	0.09	4.82	30.30	2.23	10.76
B2	B2	94.90	0.10	9.62	45.85	1.73	16.60
B3	B3	55.96	0.12	6.83	41.69	1.83	12.53
B4	B4	95.67	0.08	8.05	40.08	1.88	15.14
B5	B5	23.86	0.08	1.81	22.41	2.65	4.80
B6	B6	37.08	0.08	2.82	28.97	2.29	6.45
B7	B7	10.70	0.08	0.81	22.67	2.63	2.14
OS1	OS1	14.16	0.27	3.88	24.67	2.51	9.73
3A	3A	86.77	0.08	6.59	37.92	1.95	12.84
3B	3B	51.27	0.09	4.62	32.27	2.15	9.92
3C	3C	33.64	0.08	2.56	28.63	2.31	5.90
3D	3D	15.40	0.08	1.17	24.20	2.54	2.97
3E	3E	12.88	0.09	1.13	25.45	2.47	2.78
OS2	OS2	46.59	0.20	9.43	30.64	2.22	20.89
OS3	OS3	25.29	0.08	1.92	41.77	1.83	3.52
OS4	OS4	1.46	0.53	0.77	6.29	4.55	3.49
OS5	OS5	9.13	0.08	0.69	5.00	4.85	3.37

Project: Canyons Far South SDP

Location: Castle Rock, CO

Designer: CJG

Date: May 2025

Latest Revision: July 2025

Design Storm:

100-Yr

1-hr Design Point Rainfall (in):

2.60

EXISTING 100-YEAR PEAK RUNOFF CALCULATIONS

Basin Designation	Design Point	Area (ac)	C ₁₀₀	C X A	T _c (min)	Intensity (in/hr)	Peak Flow, Q (cfs)
B0	B0	57.68	0.51	29.68	36.17	3.64	108.17
B1	B1	53.50	0.51	27.37	30.30	4.06	110.99
B2	B2	94.90	0.52	49.08	45.85	3.14	154.01
B3	B3	55.96	0.53	29.52	41.69	3.33	98.45
B4	B4	95.67	0.51	48.66	40.08	3.42	166.36
B5	B5	23.86	0.50	12.04	22.41	4.81	57.94
B6	B6	37.08	0.50	18.71	28.97	4.16	77.90
B7	B7	10.70	0.50	5.40	22.67	4.78	25.83
OS1	OS1	14.16	0.60	8.54	24.67	4.56	39.00
3A	3A	86.77	0.50	43.78	37.92	3.54	154.95
3B	3B	51.27	0.51	26.22	32.27	3.91	102.43
3C	3C	33.64	0.50	16.97	28.63	4.19	71.17
3D	3D	15.40	0.50	7.77	24.20	4.61	35.84
3E	3E	12.88	0.51	6.57	25.45	4.49	29.48
OS2	OS2	46.59	0.57	26.45	30.64	4.03	106.55
OS3	OS3	25.29	0.50	12.76	41.77	3.33	42.49
OS4	OS4	1.46	0.73	1.06	6.29	8.27	8.78
OS5	OS5	9.13	0.50	4.61	5.00	8.82	40.62

Project:	Canyons Far South SDP
Location:	Castle Rock, CO
Designer:	CJG
Date:	May 2025
Latest Revision:	July 2025



EXISTING BASIN SUMMARY TABLE						
Basin Designation	Design Point	Area (ac)	C ₅	C ₁₀₀	Q ₅ (cfs)	Q ₁₀₀ (cfs)
B0	B0	57.68	0.10	0.51	11.11	108.17
B1	B1	53.50	0.09	0.51	10.76	110.99
B2	B2	94.90	0.10	0.52	16.60	154.01
B3	B3	55.96	0.12	0.53	12.53	98.45
B4	B4	95.67	0.08	0.51	15.14	166.36
B5	B5	23.86	0.08	0.50	4.80	57.94
B6	B6	37.08	0.08	0.50	6.45	77.90
B7	B7	10.70	0.08	0.50	2.14	25.83
OS1	OS1	14.16	0.27	0.60	9.73	39.00
Routed to Trib B Offsite		443.52			89.26	838.64
3A	3A	86.77	0.08	0.50	12.84	154.95
3B	3B	51.27	0.09	0.51	9.92	102.43
3C	3C	33.64	0.08	0.50	5.90	71.17
3D	3D	15.40	0.08	0.50	2.97	35.84
3E	3E	12.88	0.09	0.51	2.78	29.48
OS2	OS2	46.59	0.20	0.57	20.89	106.55
OS3	OS3	25.29	0.08	0.50	3.52	42.49
OS4	OS4	1.46	0.53	0.73	3.49	8.78
OS5	OS5	9.13	0.08	0.50	3.37	40.62
Routed to Trib 3 Offsite		282.43			65.67	592.32

Project: Canyons Far South SDP

Location: Castle Rock, CO

Designer: CJG

Date: May 2025

Latest Revision: July 2025



IMPERVIOUSNESS AND RUNOFF COEFFICIENT CALCULATIONS

Basin Designation	NRCS Hydrologic Soil Group	Total Area (ac)									Percent Impervious	Runoff Coefficients, C		
			Total Area (sf)	Paved	Park/Pond	Commercial	Single Family	Duplex Lots	Greenbelts/ Agricultural	Historic		C ₂	C ₅	C ₁₀₀
				Impervious %	25%	85%	60%	70%	5%	5%				
				C ₂	0.78	0.18	0.69	0.47	0.56	0.03				
				C ₅	0.81	0.24	0.73	0.53	0.61	0.08				
			C ₁₀₀	0.87	0.59	0.83	0.73	0.77	0.50	0.50				
Basin Designation	NRCS Hydrologic Soil Group	Total Area (ac)	Total Area (sf)	Paved (sf)	Park/Pond (sf)	Commercial (sf)	Single Family (sf)	Duplex Lots (sf)	Greenbelts/ Agricultural (sf)	Historic (sf)	Percent Impervious	C ₂	C ₅	C ₁₀₀
G0	C/D	50.94	2,218,861	7,140	155,441	0	134,876	0	1,921,404	0	10.0%	0.06	0.12	0.53
G1	C/D	74.69	3,253,544	23,929	0	0	370,440	0	2,859,175	0	11.9%	0.08	0.13	0.53
G2	C/D	50.95	2,219,394	11,933	0	0	305,831	0	1,901,630	0	13.1%	0.08	0.14	0.54
G3	C/D	65.98	2,874,062	22,170	0	0	380,877	54,129	2,416,887	0	14.2%	0.09	0.15	0.54
G4	C/D	13.94	607,310	0	0	0	0	0	607,310	0	5.0%	0.03	0.08	0.50
G5	C/D	30.71	1,337,750	0	0	0	0	0	1,337,750	0	5.0%	0.03	0.08	0.50
G6	C/D	13.16	573,376	6,739	0	0	0	0	566,637	0	6.1%	0.04	0.08	0.51
G7	C/D	7.31	318,469	0	0	318,469	0	0	0	0	85.0%	0.69	0.73	0.83
G8	C/D	7.18	312,621	9,382	0	0	0	0	303,239	0	7.7%	0.05	0.10	0.52
G20	C/D	3.75	163,528	99,760	0	0	0	0	63,768	0	59.9%	0.47	0.53	0.73
G21	C/D	3.02	131,668	81,548	0	0	0	0	50,120	0	60.7%	0.47	0.53	0.73
G22	C/D	1.94	84,369	53,331	0	0	0	0	31,038	0	61.9%	0.48	0.54	0.74
G23	C/D	0.91	39,471	34,713	0	0	0	0	4,758	0	84.2%	0.68	0.73	0.83
G30	C/D	2.17	94,710	31,882	0	0	57,042	0	5,785	0	68.4%	0.54	0.60	0.76
G31	C/D	21.90	954,172	179,742	219,879	0	301,432	213,850	39,268	0	58.5%	0.45	0.51	0.72
G32	C/D	2.06	89,548	34,984	0	0	54,069	0	495	0	73.4%	0.59	0.64	0.78
G33	C/D	3.90	170,081	47,590	0	0	46,272	66,220	9,999	0	70.5%	0.56	0.61	0.77
G34	C/D	3.76	163,897	55,884	0	0	97,186	0	10,827	0	68.3%	0.54	0.60	0.76
G35	C/D	7.32	318,673	59,074	106,281	0	148,926	0	4,392	0	54.1%	0.42	0.48	0.71
G36	C/D	1.39	60,675	18,396	0	0	38,769	0	3,509	0	67.4%	0.53	0.59	0.76
OS1	C/D	14.16	616,732	165,198	0	0	0	0	0	451,533	29.1%	0.21	0.27	0.60
Routed to Pond G	C/D	381.15	16,602,911	943,396	481,601	318,469	1,935,722	334,199	12,137,991	451,533	19.9%	0.14	0.20	0.57
H1	C/D	13.00	566,148	0	105,150	0	96,553	0	364,445	0	18.1%	0.12	0.18	0.56
H2	C/D	12.14	528,705	0	346,447	0	40,139	0	142,119	0	22.3%	0.15	0.22	0.58
H3	C/D	9.68	421,659	0	0	0	99,508	0	322,151	0	18.0%	0.12	0.18	0.56
H4	C/D	10.82	471,109	0	135,204	0	12,501	0	323,404	0	12.2%	0.08	0.14	0.53
H20	C/D	1.45	63,162	50,170	0	0	0	0	12,992	0	76.5%	0.61	0.66	0.80
H30	C/D	23.99	1,045,042	191,576	28,123	0	600,961	0	224,382	0	53.7%	0.41	0.48	0.70
H31	C/D	11.56	503,526	193,437	9,409	0	271,621	0	29,059	0	69.6%	0.55	0.61	0.77
H32	C/D	2.42	105,205	31,438	9,409	0	36,994	0	27,363	0	53.0%	0.41	0.47	0.70
H33	C/D	2.69	117,028	73,615	0	0	34,301	0	9,112	0	77.7%	0.63	0.67	0.80
Routed to Pond H	C/D	87.73	3,821,584	540,237	633,743	0	1,192,579	0	1,455,026	0	38.2%	0.28	0.35	0.64
J1	C/D	17.31	754,198	0	124,075	0	138,146	0	491,976	0	18.4%	0.12	0.19	0.56
J2	C/D	9.54	415,736	0	254,704	0	48,946	0	112,086	0	23.7%	0.17	0.23	0.58
J3	C/D	33.01	1,437,839	19,616	0	0	11,373	0	1,406,850	0	6.7%	0.04	0.09	0.51
J4	C/D	9.80	426,673	3,840	0	0	0	0	422,834	0	5.8%	0.03	0.08	0.51
J5	C/D	5.53	240,945	0	0	0	101,675	0	139,271	0	28.2%	0.20	0.27	0.60
J6	C/D	13.79	600,650	0	0	0	24,165	0	576,486	0	7.2%	0.04	0.09	0.51
J7	C/D	12.13	528,533	0	0	0	69,269	0	459,264	0	12.2%	0.08	0.14	0.53
J20	C/D	2.19	95,594	71,233	0	0	0	7,754	16,607	0	77.3%	0.62	0.67	0.80
J30	C/D	2.15	93,495	31,686	0	0	61,171	0	637	0	71.5%	0.57	0.62	0.78
J31	C/D	5.68	247,457	73,514	0	0	146,527	0	27,416	0	64.3%	0.51	0.56	0.75
J32	C/D	2.74	119,542	43,256	0	0	70,686	0	5,600	0	70.1%	0.56	0.61	0.77
J33	C/D	1.87	81,609	31,640	0	0	47,896	0	2,073	0	72.2%	0.58	0.63	0.78
OS2	C/D	46.59	2,029,554	347,381	0	0	0	0	0	1,682,174	20.4%	0.14	0.20	0.57
OS3	C/D	25.29	1,101,420	0	0	0	0	0	0	1,101,420	5.0%	0.03	0.08	0.50
OS4	C/D	1.46	63,392	0	0	0	63,392	0	0	0	60.0%	0.47	0.53	0.73
OS5	C/D	9.13	397,731	0	0	0	0	0	0	397,731	5.0%	0.03	0.08	0.50
Routed to Pond J	C/D	198.22	8,634,371	622,165	378,779	0	783,246	7,754	3,661,101	3,181,325	17.4%	0.12	0.18	0.56
L1	C/D	2.28	99,174	0	0	0	33,709	0	65,465	0	23.7%	0.16	0.23	0.58
Routed to Pond L	C/D	2.28	99,174	0	0	0	33,709	0	65,465	0	23.7%	0.16	0.23	0.58
Total	C/D	669.38	29,158,040	2,105,798	1,494,123	318,469	3,945,256	341,952	17,319,583	3,632,858	21.6%	0.15	0.21	0.57

Project: Canyons Far South SDP

Location: Castle Rock, CO

Designer: CJG

Date: May 2025

Latest Revision: July 2025

NRCS Conveyance Factors, K ²	
Type of Land Surface	K
Heavy Meadow	2.5
Tillage/Field	5
Short Pasture/Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas	20

Minimum T_c

5

TIME OF CONCENTRATION CALCULATIONS

Basin Designation	Imperviousness (%)	C ₅	Initial/Overland Flow Time, T _i			Channelized Flow/Travel Time, T _t					Time of Concentration, T _c (Check)		
			Length (ft)	Slope (%)	T _i (min)	Land Surface	Length (ft)	Slope (%)	Velocity (ft/sec)	T _t (min)	Computed T _c (min)	First Design Point T _c (min)	Selected T _c (min)
G0	10.0%	0.12	70	2.00	11.81	Short Pasture/Lawns	2,500	8.80	2.08	20.07	31.88	N/A	31.88
G1	11.9%	0.13	140	2.00	16.44	Short Pasture/Lawns	2,850	6.40	1.77	26.82	43.26	N/A	43.26
G2	13.1%	0.14	100	2.00	13.76	Short Pasture/Lawns	2,820	5.90	1.70	27.64	41.40	N/A	41.40
G3	14.2%	0.15	140	2.00	16.12	Short Pasture/Lawns	2,430	7.70	1.94	20.85	36.97	N/A	36.97
G4	5.0%	0.08	80	4.60	9.99	Short Pasture/Lawns	1,470	11.00	2.32	10.55	20.55	N/A	20.55
G5	5.0%	0.08	100	1.00	18.49	Short Pasture/Lawns	1,460	11.00	2.32	10.48	28.97	N/A	28.97
G6	6.1%	0.08	140	4.60	13.11	Short Pasture/Lawns	1,050	7.00	1.85	9.45	22.56	N/A	22.56
G7	85.0%	0.73	10	2.00	1.67	Paved Areas	10	2.00	2.83	0.06	1.73	11.61	5.00
G8	7.7%	0.10	140	2.00	17.03	Short Pasture/Lawns	510	7.30	1.89	4.49	21.52	N/A	21.52
G20	59.9%	0.53	10	2.00	2.61	Paved Areas	10	2.00	2.83	0.06	2.67	15.88	5.00
G21	60.7%	0.53	10	2.00	2.58	Paved Areas	10	2.00	2.83	0.06	2.63	15.74	5.00
G22	61.9%	0.54	10	2.00	2.53	Paved Areas	10	2.00	2.83	0.06	2.59	15.55	5.00
G23	84.2%	0.73	10	2.00	1.70	Paved Areas	10	2.00	2.83	0.06	1.76	11.75	5.00
G30	68.4%	0.60	10	2.00	2.29	Paved Areas	10	2.00	2.83	0.06	2.35	14.43	5.00
G31	58.5%	0.51	10	2.00	2.66	Paved Areas	10	2.00	2.83	0.06	2.72	16.12	5.00
G32	73.4%	0.64	10	2.00	2.10	Paved Areas	10	2.00	2.83	0.06	2.16	13.59	5.00
G33	70.5%	0.61	10	2.00	2.21	Paved Areas	10	2.00	2.83	0.06	2.27	14.09	5.00
G34	68.3%	0.60	10	2.00	2.29	Paved Areas	10	2.00	2.83	0.06	2.35	14.45	5.00
G35	54.1%	0.48	10	2.00	2.82	Paved Areas	10	2.00	2.83	0.06	2.88	16.88	5.00
G36	67.4%	0.59	10	2.00	2.33	Paved Areas	10	2.00	2.83	0.06	2.38	14.60	5.00
OS1	29.1%	0.27	80	11.00	6.05	Tillage/Field	1060	3.60	0.95	18.62	24.67	28.17	24.67
H1	18.1%	0.18	75	25.00	4.95	Short Pasture/Lawns	1000	7.00	1.85	9.00	13.95	N/A	13.95
H2	22.3%	0.22	60	2.00	9.82	Short Pasture/Lawns	1140	8.20	2.00	9.48	19.29	27.69	19.29
H3	18.0%	0.18	80	2.00	11.79	Short Pasture/Lawns	1030	9.60	2.17	7.92	19.70	N/A	19.70
H4	12.2%	0.14	130	13.40	8.44	Short Pasture/Lawns	1620	4.70	1.52	17.79	26.23	N/A	26.23
H20	76.5%	0.66	10	2.00	1.99	Paved Areas	10	2.00	2.83	0.06	2.05	13.06	5.00
H30	53.7%	0.48	10	2.00	2.84	Paved Areas	10	2.00	2.83	0.06	2.90	16.95	5.00
H31	69.6%	0.61	10	2.00	2.24	Paved Areas	10	2.00	2.83	0.06	2.30	14.23	5.00
H32	53.0%	0.47	10	2.00	2.86	Paved Areas	10	2.00	2.83	0.06	2.92	17.06	5.00
H33	77.7%	0.67	25	2.00	3.07	Paved Areas	1385	5.10	4.52	5.11	8.18	17.93	8.18
J1	18.4%	0.19	40	2.00	8.31	Short Pasture/Lawns	1200	5.50	1.64	12.18	20.49	N/A	20.49
J2	23.7%	0.23	70	2.00	10.46	Short Pasture/Lawns	720	10.50	2.27	5.29	15.75	24.97	15.75
J3	6.7%	0.09	70	5.20	8.86	Short Pasture/Lawns	2120	6.60	1.80	19.65	28.51	N/A	28.51
J4	5.8%	0.08	60	2.00	11.32	Short Pasture/Lawns	1550	8.30	2.02	12.81	24.13	N/A	24.13
J5	28.2%	0.27	100	2.00	11.97	Short Pasture/Lawns	810	5.70	1.67	8.08	20.05	25.57	20.05
J6	7.2%	0.09	120	5.20	11.55	Short Pasture/Lawns	1350	5.40	1.63	13.83	25.38	N/A	25.38
J7	12.2%	0.14	75	2.00	12.00	Short Pasture/Lawns	740	7.30	1.89	6.52	18.52	N/A	18.52
J20	77.3%	0.67	10	2.00	1.96	Paved Areas	10	2.00	2.83	0.06	2.02	12.91	5.00
J30	71.5%	0.62	10	2.00	2.17	Paved Areas	10	2.00	2.83	0.06	2.23	13.91	5.00
J31	64.3%	0.56	10	2.00	2.44	Paved Areas	10	2.00	2.83	0.06	2.50	15.13	5.00
J32	70.1%	0.61	10	2.00	2.23	Paved Areas	10	2.00	2.83	0.06	2.29	14.15	5.00
J33	72.2%	0.63	10	2.00	2.15	Paved Areas	10	2.00	2.83	0.06	2.21	13.79	5.00
OS2	20.4%	0.20	200	4.80	13.66	Tillage/Field	1390	5.80	1.20	19.24	32.90	30.64	30.64
OS3	5.0%	0.08	200	3.60	17.13	Tillage/Field	1780	5.80	1.20	24.64	41.77	N/A	41.77
OS4	60.0%	0.53	20	2.00	3.68	Paved Areas	370	1.40	2.37	2.61	6.29	18.80	6.29
OS5	5.0%	0.08	10	2.00	4.65	Paved Areas	10	2.00	2.83	0.06	4.71	N/A	5.00
L1	23.7%	0.23	121	2.70	12.46	Short Pasture/Lawns	430	6.50	1.78	4.02	16.48	24.25	16.48

Project: Canyons Far South SDP
Location: Castle Rock, CO
Designer: CJG
Date: May 2025
Latest Revision: July 2025

Design Storm: 2-Yr
1-hr Design Point Rainfall (in): 1.06

2-YEAR PEAK RUNOFF CALCULATIONS

Basin Designation	Design Point	Area (ac)	C ₂	C X A	T _c (min)	Intensity (in/hr)	Peak Flow, Q (cfs)
G0	G0	50.94	0.06	3.20	31.88	1.60	5.14
G1	G1	74.69	0.08	5.70	43.26	1.33	7.57
G2	G2	50.95	0.08	4.31	41.40	1.37	5.89
G3	G3	65.98	0.09	6.13	36.97	1.47	8.99
G4	G4	13.94	0.03	0.40	20.55	2.06	0.83
G5	G5	30.71	0.03	0.88	28.97	1.70	1.50
G6	G6	13.16	0.04	0.47	22.56	1.96	0.92
G7	G7	7.31	0.69	5.06	5.00	3.60	18.18
G8	G8	7.18	0.05	0.34	21.52	2.01	0.67
G20	G20	3.75	0.47	1.75	5.00	3.60	6.30
G21	G21	3.02	0.47	1.43	5.00	3.60	5.16
G22	G22	1.94	0.48	0.94	5.00	3.60	3.37
G23	G23	0.91	0.68	0.62	5.00	3.60	2.23
G30	G30	2.17	0.54	1.18	5.00	3.60	4.24
G31	G31	21.90	0.45	9.96	5.00	3.60	35.82
G32	G32	2.06	0.59	1.21	5.00	3.60	4.33
G33	G33	3.90	0.56	2.19	5.00	3.60	7.87
G34	G34	3.76	0.54	2.04	5.00	3.60	7.32
G35	G35	7.32	0.42	3.05	5.00	3.60	10.95
G36	G36	1.39	0.53	0.74	5.00	3.60	2.67
OS1	OS1	14.16	0.21	2.94	24.67	1.86	5.48
H1	H1	13.00	0.12	1.58	13.95	2.49	3.94
H2	H2	12.14	0.15	1.87	19.29	2.12	3.97
H3	H3	9.68	0.12	1.17	19.70	2.10	2.46
H4	H4	10.82	0.08	0.85	26.23	1.80	1.52
H20	H20	1.45	0.61	0.89	5.00	3.60	3.20
H30	H30	23.99	0.41	9.90	5.00	3.60	35.61
H31	H31	11.56	0.55	6.39	5.00	3.60	22.98
H32	H32	2.42	0.41	0.98	5.00	3.60	3.54
H33	H33	2.69	0.63	1.68	8.18	3.09	5.20
J1	J1	17.31	0.12	2.15	20.49	2.06	4.42
J2	J2	9.54	0.17	1.58	15.75	2.35	3.71
J3	J3	33.01	0.04	1.31	28.51	1.71	2.25
J4	J4	9.80	0.03	0.33	24.13	1.88	0.63
J5	J5	5.53	0.20	1.11	20.05	2.08	2.31
J6	J6	13.79	0.04	0.60	25.38	1.83	1.10
J7	J7	12.13	0.08	0.95	18.52	2.17	2.06
J20	J20	2.19	0.62	1.37	5.00	3.60	4.91
J30	J30	2.15	0.57	1.22	5.00	3.60	4.40
J31	J31	5.68	0.51	2.87	5.00	3.60	10.33
J32	J32	2.74	0.56	1.53	5.00	3.60	5.50
J33	J33	1.87	0.58	1.08	5.00	3.60	3.88
OS2	OS2	46.59	0.14	6.50	30.64	1.64	10.68
OS3	OS3	25.29	0.03	0.73	41.77	1.36	0.99
OS4	OS4	1.46	0.47	0.68	6.29	3.37	2.29
OS5	OS5	9.13	0.03	0.26	5.00	3.60	0.95
L1	L1	2.28	0.16	0.38	16.48	2.30	0.86

Project: Canyons Far South SDP
Location: Castle Rock, CO
Designer: CJG
Date: May 2025
Latest Revision: July 2025

Design Storm: 5-Yr
1-hr Design Point Rainfall (in): 1.43

5-YEAR PEAK RUNOFF CALCULATIONS

Basin Designation	Design Point	Area (ac)	C _s	C X A	T _c (min)	Intensity (in/hr)	Peak Flow, Q (cfs)
G0	G0	50.94	0.12	5.97	31.88	2.16	12.93
G1	G1	74.69	0.13	9.92	43.26	1.79	17.77
G2	G2	50.95	0.14	7.24	41.40	1.84	13.34
G3	G3	65.98	0.15	10.00	36.97	1.98	19.77
G4	G4	13.94	0.08	1.06	20.55	2.77	2.94
G5	G5	30.71	0.08	2.33	28.97	2.29	5.35
G6	G6	13.16	0.08	1.11	22.56	2.64	2.94
G7	G7	7.31	0.73	5.35	5.00	4.85	25.96
G8	G8	7.18	0.10	0.70	21.52	2.71	1.91
G20	G20	3.75	0.53	1.98	5.00	4.85	9.58
G21	G21	3.02	0.53	1.61	5.00	4.85	7.82
G22	G22	1.94	0.54	1.05	5.00	4.85	5.10
G23	G23	0.91	0.73	0.66	5.00	4.85	3.19
G30	G30	2.17	0.60	1.30	5.00	4.85	6.29
G31	G31	21.90	0.51	11.28	5.00	4.85	54.69
G32	G32	2.06	0.64	1.31	5.00	4.85	6.35
G33	G33	3.90	0.61	2.39	5.00	4.85	11.60
G34	G34	3.76	0.60	2.24	5.00	4.85	10.86
G35	G35	7.32	0.48	3.50	5.00	4.85	16.97
G36	G36	1.39	0.59	0.82	5.00	4.85	3.97
OS1	OS1	14.16	0.27	3.87	24.67	2.51	9.73
H1	H1	13.00	0.18	2.38	13.95	3.36	8.00
H2	H2	12.14	0.22	2.64	19.29	2.87	7.57
H3	H3	9.68	0.18	1.77	19.70	2.84	5.01
H4	H4	10.82	0.14	1.46	26.23	2.43	3.54
H20	H20	1.45	0.66	0.96	5.00	4.85	4.66
H30	H30	23.99	0.48	11.40	5.00	4.85	55.28
H31	H31	11.56	0.61	7.00	5.00	4.85	33.97
H32	H32	2.42	0.47	1.13	5.00	4.85	5.50
H33	H33	2.69	0.67	1.81	8.18	4.17	7.53
J1	J1	17.31	0.19	3.21	20.49	2.78	8.92
J2	J2	9.54	0.23	2.19	15.75	3.17	6.95
J3	J3	33.01	0.09	2.96	28.51	2.31	6.84
J4	J4	9.80	0.08	0.81	24.13	2.54	2.06
J5	J5	5.53	0.27	1.47	20.05	2.81	4.14
J6	J6	13.79	0.09	1.30	25.38	2.47	3.21
J7	J7	12.13	0.14	1.64	18.52	2.93	4.80
J20	J20	2.19	0.67	1.47	5.00	4.85	7.12
J30	J30	2.15	0.62	1.33	5.00	4.85	6.47
J31	J31	5.68	0.56	3.19	5.00	4.85	15.49
J32	J32	2.74	0.61	1.67	5.00	4.85	8.12
J33	J33	1.87	0.63	1.17	5.00	4.85	5.70
OS2	OS2	46.59	0.20	9.43	30.64	2.22	20.89
OS3	OS3	25.29	0.08	1.92	41.77	1.83	3.52
OS4	OS4	1.46	0.53	0.77	6.29	4.55	3.49
OS5	OS5	9.13	0.08	0.69	5.00	4.85	3.37
L1	L1	2.28	0.23	0.52	16.48	3.10	1.62

Project:	Canyons Far South SDP	Design Storm:	100-Yr
Location:	Castle Rock, CO	1-hr Design Point Rainfall (in):	2.60
Designer:	CJG		
Date:	May 2025		
Latest Revision:	July 2025		

100-YEAR PEAK RUNOFF CALCULATIONS

Basin Designation	Design Point	Area (ac)	C ₁₀₀	C X A	T _c (min)	Intensity (in/hr)	Peak Flow, Q (cfs)
G0	G0	50.94	0.53	26.75	31.88	3.94	105.26
G1	G1	74.69	0.53	39.80	43.26	3.26	129.65
G2	G2	50.95	0.54	27.39	41.40	3.35	91.74
G3	G3	65.98	0.54	35.78	36.97	3.60	128.64
G4	G4	13.94	0.50	7.03	20.55	5.04	35.47
G5	G5	30.71	0.50	15.49	28.97	4.16	64.51
G6	G6	13.16	0.51	6.70	22.56	4.80	32.12
G7	G7	7.31	0.83	6.09	5.00	8.82	53.68
G8	G8	7.18	0.52	3.70	21.52	4.92	18.20
G20	G20	3.75	0.73	2.74	5.00	8.82	24.15
G21	G21	3.02	0.73	2.22	5.00	8.82	19.54
G22	G22	1.94	0.74	1.43	5.00	8.82	12.60
G23	G23	0.91	0.83	0.75	5.00	8.82	6.62
G30	G30	2.17	0.76	1.66	5.00	8.82	14.66
G31	G31	21.90	0.72	15.86	5.00	8.82	139.83
G32	G32	2.06	0.78	1.61	5.00	8.82	14.23
G33	G33	3.90	0.77	3.02	5.00	8.82	26.61
G34	G34	3.76	0.76	2.87	5.00	8.82	25.35
G35	G35	7.32	0.71	5.16	5.00	8.82	45.52
G36	G36	1.39	0.76	1.06	5.00	8.82	9.34
OS1	OS1	14.16	0.60	8.54	24.67	4.56	38.99
H1	H1	13.00	0.56	7.25	13.95	6.10	44.28
H2	H2	12.14	0.58	6.98	19.29	5.21	36.39
H3	H3	9.68	0.56	5.40	19.70	5.15	27.83
H4	H4	10.82	0.53	5.78	26.23	4.41	25.47
H20	H20	1.45	0.80	1.16	5.00	8.82	10.20
H30	H30	23.99	0.70	16.89	5.00	8.82	148.95
H31	H31	11.56	0.77	8.89	5.00	8.82	78.44
H32	H32	2.42	0.70	1.69	5.00	8.82	14.94
H33	H33	2.69	0.80	2.16	8.18	7.58	16.35
J1	J1	17.31	0.56	9.68	20.49	5.05	48.90
J2	J2	9.54	0.58	5.55	15.75	5.77	31.99
J3	J3	33.01	0.51	16.88	28.51	4.20	70.94
J4	J4	9.80	0.51	4.97	24.13	4.62	22.99
J5	J5	5.53	0.60	3.32	20.05	5.11	16.94
J6	J6	13.79	0.51	7.08	25.38	4.49	31.82
J7	J7	12.13	0.53	6.48	18.52	5.32	34.48
J20	J20	2.19	0.80	1.76	5.00	8.82	15.50
J30	J30	2.15	0.78	1.67	5.00	8.82	14.71
J31	J31	5.68	0.75	4.25	5.00	8.82	37.46
J32	J32	2.74	0.77	2.12	5.00	8.82	18.67
J33	J33	1.87	0.78	1.46	5.00	8.82	12.89
OS2	OS2	46.59	0.57	26.45	30.64	4.03	106.55
OS3	OS3	25.29	0.50	12.76	41.77	3.33	42.49
OS4	OS4	1.46	0.73	1.06	6.29	8.27	8.78
OS5	OS5	9.13	0.50	4.61	5.00	8.82	40.62
L1	L1	2.28	0.58	1.32	16.48	5.64	7.47

Project:

Canyons Far South SDP

Location:

Castle Rock, CO

Designer:

CJG

Date:

May 2025

Latest Revision:

July 2025



BASIN SUMMARY TABLE								
Basin Designation	Design Point	Area (ac)	C ₂	C ₅	C ₁₀₀	Q ₂ (cfs)	Q ₅ (cfs)	Q ₁₀₀ (cfs)
G0	G0	50.94	0.06	0.12	0.53	5.14	12.93	105.26
G1	G1	74.69	0.08	0.13	0.53	7.57	17.77	129.65
G2	G2	50.95	0.08	0.14	0.54	5.89	13.34	91.74
G3	G3	65.98	0.09	0.15	0.54	8.99	19.77	128.64
G4	G4	13.94	0.03	0.08	0.50	0.83	2.94	35.47
G5	G5	30.71	0.03	0.08	0.50	1.50	5.35	64.51
G6	G6	13.16	0.04	0.08	0.51	0.92	2.94	32.12
G7	G7	7.31	0.69	0.73	0.83	18.18	25.96	53.68
G8	G8	7.18	0.05	0.10	0.52	0.67	1.91	18.20
G20	G20	3.75	0.47	0.53	0.73	6.30	9.58	24.15
G21	G21	3.02	0.47	0.53	0.73	5.16	7.82	19.54
G22	G22	1.94	0.48	0.54	0.74	3.37	5.10	12.60
G23	G23	0.91	0.68	0.73	0.83	2.23	3.19	6.62
G30	G30	2.17	0.54	0.60	0.76	4.24	6.29	14.66
G31	G31	21.90	0.45	0.51	0.72	35.82	54.69	139.83
G32	G32	2.06	0.59	0.64	0.78	4.33	6.35	14.23
G33	G33	3.90	0.56	0.61	0.77	7.87	11.60	26.61
G34	G34	3.76	0.54	0.60	0.76	7.32	10.86	25.35
G35	G35	7.32	0.42	0.48	0.71	10.95	16.97	45.52
G36	G36	1.39	0.53	0.59	0.76	2.67	3.97	9.34
OS1	OS1	14.16	0.21	0.27	0.60	5.48	9.73	38.99
Routed to Pond G		381.15				145.43	249.03	1036.74
H1	H1	13.00	0.12	0.18	0.56	3.94	8.00	44.28
H2	H2	12.14	0.15	0.22	0.58	3.97	7.57	36.39
H3	H3	9.68	0.12	0.18	0.56	2.46	5.01	27.83
H4	H4	10.82	0.08	0.14	0.53	1.52	3.54	25.47
H20	H20	1.45	0.61	0.66	0.80	3.20	4.66	10.20
H30	H30	23.99	0.41	0.48	0.70	35.61	55.28	148.95
H31	H31	11.56	0.55	0.61	0.77	22.98	33.97	78.44
H32	H32	2.42	0.41	0.47	0.70	3.54	5.50	14.94
H33	H33	2.69	0.63	0.67	0.80	5.20	7.53	16.35
Routed to Pond H		87.73				82.42	131.06	402.85
J1	J1	17.31	0.12	0.19	0.56	4.42	8.92	48.90
J2	J2	9.54	0.17	0.23	0.58	3.71	6.95	31.99
J3	J3	33.01	0.04	0.09	0.51	2.25	6.84	70.94
J4	J4	9.80	0.03	0.08	0.51	0.63	2.06	22.99
J5	J5	5.53	0.20	0.27	0.60	2.31	4.14	16.94
J6	J6	13.79	0.04	0.09	0.51	1.10	3.21	31.82
J7	J7	12.13	0.08	0.14	0.53	2.06	4.80	34.48
J20	J20	2.19	0.62	0.67	0.80	4.91	7.12	15.50
J30	J30	2.15	0.57	0.62	0.78	4.40	6.47	14.71
J31	J31	5.68	0.51	0.56	0.75	10.33	15.49	37.46
J32	J32	2.74	0.56	0.61	0.77	5.50	8.12	18.67
J33	J33	1.87	0.58	0.63	0.78	3.88	5.70	12.89
OS2	OS2	46.59	0.14	0.20	0.57	10.68	20.89	106.55
OS3	OS3	25.29	0.03	0.08	0.50	0.99	3.52	42.49
OS4	OS4	1.46	0.47	0.53	0.73	2.29	3.49	8.78
OS5	OS5	9.13	0.03	0.08	0.50	0.95	3.37	40.62
Routed to Pond J		198.22				60.39	111.07	555.73
L1	L1	2.28	0.16	0.23	0.58	0.86	1.62	7.47
Routed to Pond L		2.28				0.86	1.62	7.47

Project:

Location:

Designer:

Date:

Latest Revision:

Canyons Far South SDP

Castle Rock, CO

CJG

May 2025

July 2025



EXISTING vs PROPOSED SUMMARY TABLE				
	McMurdo Gulch Tributary B		McMurdo Gulch Tributary 3	
	Area (acres)	Percent Impervious	Area (acres)	Percent Impervious
Canyons Far South SDP - Existing	385.84	7.9%	282.43	8.2%
Canyons Far South SDP - Proposed	381.15	19.9%	288.23	26.4%

Project:

Location:

Designer:

Date:

Latest Revision:

Canyons Far South SDP

Castle Rock, CO

CJG

May 2025

July 2025



POND SUMMARY TABLE				
Pond	Watershed Area (acres)	Watershed Imperviousness	Approximate 100-yr Volume Required (acre-feet)	Minimum 100-yr Volume To Be Provided (acre-feet)
Pond G	381.15	19.9%	20.4	20.4
Pond H	87.73	38.2%	6.5	6.5
Pond J	198.22	17.4%	10.3	10.3
Pond L	2.28	23.7%	0.3	0.3

Project:

Canyons Far South - Filing No. 1

Location:

Castle Rock, CO

Designer:

CJG

Date:

February 2025

Latest Revision:

July 2025

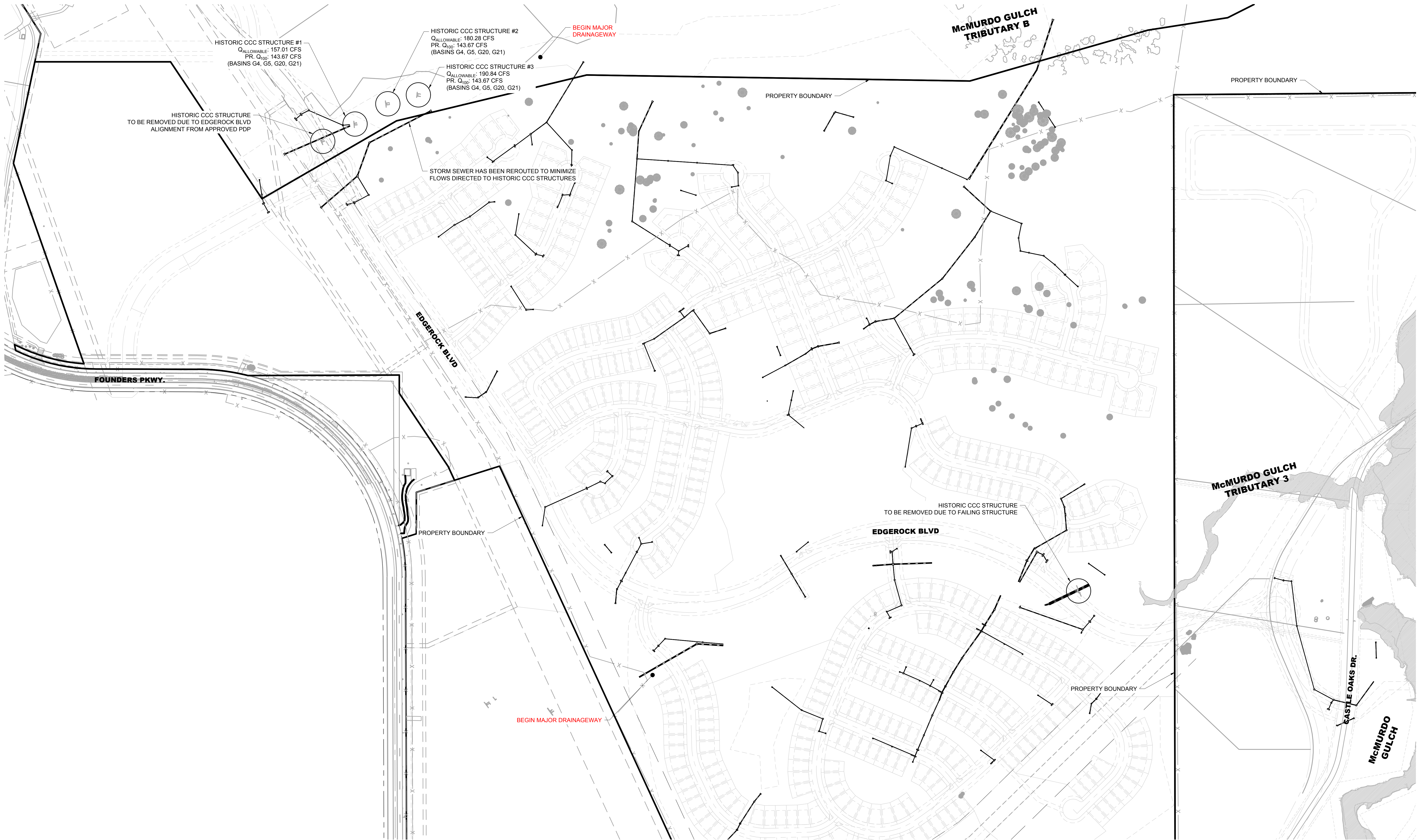


MAJOR DRAINAGEWAY SUMMARY TABLE					
Location	Proposed			Jurisdiction	Improvements Proposed
	SWMM Node	Q ₂ (cfs)	Q ₁₀₀ (cfs)		
Channel Reach B4	Conduit B4 (From Filing No. 1)	35.21	267.35	Castle Rock per IGA with Douglas County	Grade control structures of cutoff walls, riffle drops, and scour pools with riprap and coir mats
Channel Reach B3	Conduit B3 (From Filing No. 1)	83.39	612.40	Castle Rock per IGA with Douglas County	Grade control structures of cutoff walls, riffle drops, and scour pools with riprap and coir mats
Channel Reach B2	Conduit B2 (From Filing No. 1)	83.25	611.81	Castle Rock per IGA with Douglas County	Grade control structures of cutoff walls, riffle drops, and scour pools with riprap and coir mats
Channel Reach B1	Storage Unit PondG (From Filing No. 1)	82.48	611.66	Castle Rock per IGA with Douglas County	Boulder drop to forebay, to Pond G trickle channel to pond outfall pipe
Channel Reach B0	Outfall PondGOut (From Filing No. 1)	15.42	407.27	Castle Rock per IGA with Douglas County	Plunge pool at Pond G outfall, to grade control structures of cutoff walls
Channel Reach 3B	Conduit 3B (From Filing No. 2)	42.92	392.36	Castle Rock	Culvert Pipe
	Storage Unit PondJ (From Filing No. 2)	43.01	392.52	Castle Rock	Forebay to Pond J trickle channel to pond outfall pipe
	Storage Unit PondH (From Filing No. 2)	52.31	429.49	Castle Rock	Forebay to Pond H trickle channel to pond outfall pipe
Channel Reach 3A	Outfall PondHOut (From Filing No. 2)	7.64	332.99	Castle Rock	Reinforced plunge pool at Pond H outfall, to grade control structures of riffle drops, boulder drops, and scour pools with riprap and coir mats
- All SWMM Nodes are from Canyons Far South Filing No. 1 or 2, included in the SDP for reference only. - CUHP-SWMM model generated Flows are from Canyons Far South Filing No. 1 or 2, included in the SDP for reference only.					



APPENDIX B

HYDRAULIC CALCULATIONS



Weir Report

Project filename: Historic CCC Structures.stx

Studio Express by Hydrology Studio v 1.0.0.18

08-12-2025

CCC #1

Weir 1

RECTANGULAR - Broad

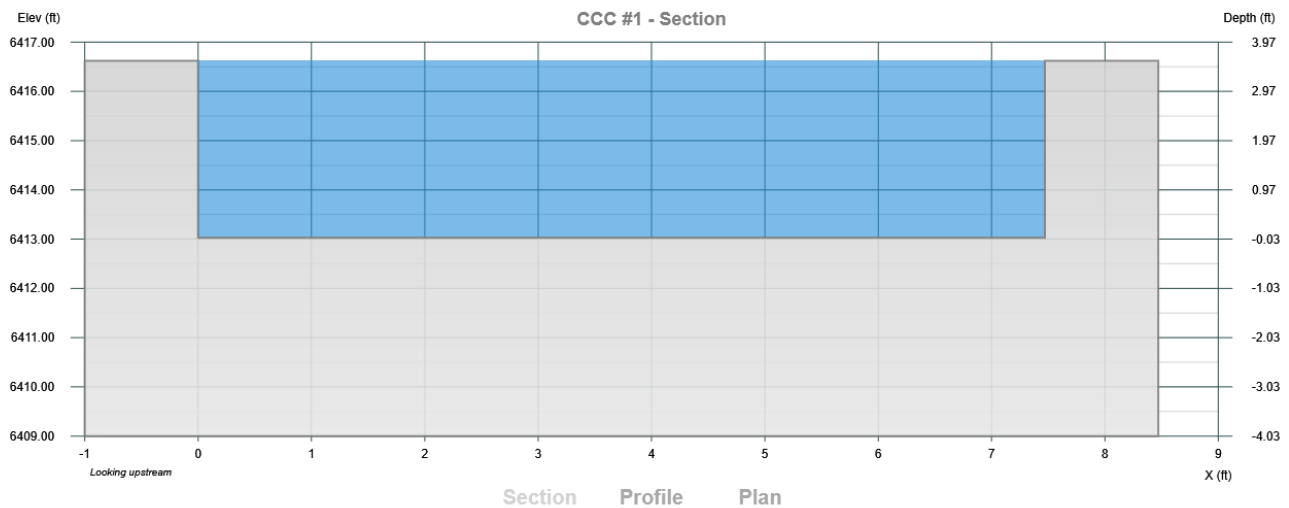
Crest Length = 7.47 ft
Total Depth = 3.59 ft
Crest Elevation = 6413.03 ft
Weir Coefficient, C_w = 3.09

DISCHARGE

Method = Known Depth
known Depth = 3.59 ft

CALCULATION SAMPLE

Flow	Depth	Area	Velocity	Top Width	HGL	EGL	Crit Depth		
(cfs)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(ft)	(ft)		
157.01	3.59	26.82	5.85	7.47	6416.62	6417.15	2.39		



Weir Report

Project filename: Historic CCC Structures.stx

Studio Express by Hydrology Studio v 1.0.0.18

08-12-2025

CCC #2

Weir 2

RECTANGULAR - Broad

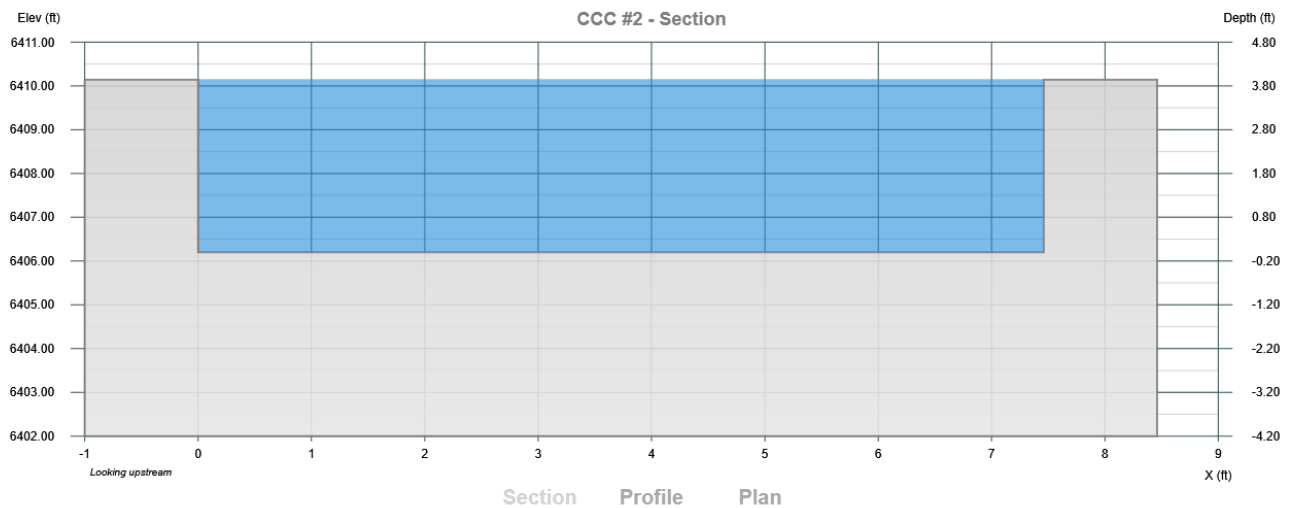
Crest Length = 7.46 ft
Total Depth = 3.94 ft
Crest Elevation = 6406.20 ft
Weir Coefficient, C_w = 3.09

DISCHARGE

Method = Known Depth
known Depth = 3.94 ft

CALCULATION SAMPLE

Flow	Depth	Area	Velocity	Top Width	HGL	EGL	Crit Depth		
(cfs)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(ft)	(ft)		
180.28	3.94	29.39	6.13	7.46	6410.14	6410.73	2.63		



Weir Report

Project filename: Historic CCC Structures.stx

Studio Express by Hydrology Studio v 1.0.0.18

08-12-2025

CCC #3

Weir 3

RECTANGULAR - Broad

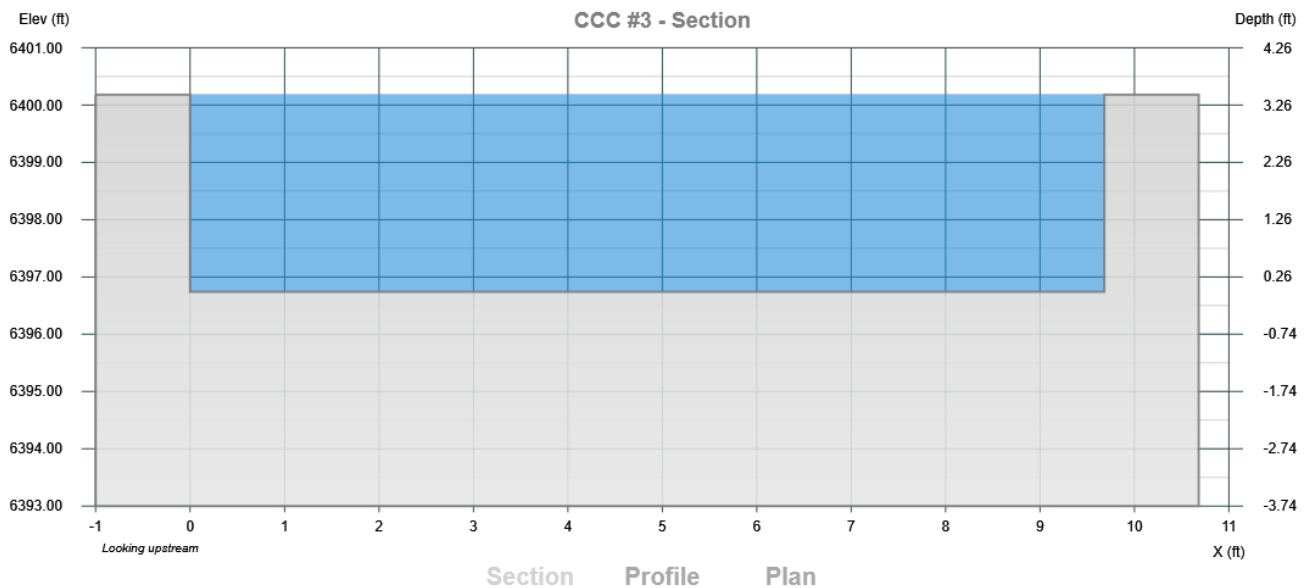
Crest Length = 9.68 ft
Total Depth = 3.44 ft
Crest Elevation = 6396.74 ft
Weir Coefficient, C_w = 3.09

DISCHARGE

Method = Known Depth
known Depth = 3.44 ft

CALCULATION SAMPLE

Flow	Depth	Area	Velocity	Top Width	HGL	EGL	Crit Depth		
(cfs)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(ft)	(ft)		
190.84	3.44	33.30	5.73	9.68	6400.18	6400.69	2.29		





APPENDIX C

WATER QUALITY ENHANCEMENT

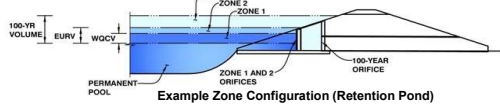
CONTROL MEASURES

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **Canyons Far South SDP**

Basin ID: **Pond G**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	381.15 acres
Watershed Length =	6,490 ft
Watershed Length to Centroid =	3,630 ft
Watershed Slope =	0.043 ft/ft
Watershed Imperviousness =	19.90% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	100.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	3.661 acre-feet
Excess Urban Runoff Volume (EURV) =	6.666 acre-feet
2-yr Runoff Volume (P1 = 1.06 in.) =	7.687 acre-feet
5-yr Runoff Volume (P1 = 1.43 in.) =	17.059 acre-feet
10-yr Runoff Volume (P1 = 1.66 in.) =	23.836 acre-feet
25-yr Runoff Volume (P1 = 1.69 in.) =	26.760 acre-feet
50-yr Runoff Volume (P1 = 2.26 in.) =	44.710 acre-feet
100-yr Runoff Volume (P1 = 2.6 in.) =	57.682 acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	75.383 acre-feet
Approximate 2-yr Detention Volume =	4.986 acre-feet
Approximate 5-yr Detention Volume =	9.971 acre-feet
Approximate 10-yr Detention Volume =	11.950 acre-feet
Approximate 25-yr Detention Volume =	12.360 acre-feet
Approximate 50-yr Detention Volume =	15.389 acre-feet
Approximate 100-yr Detention Volume =	20.398 acre-feet

Optional User Overrides

	acre-feet
	acre-feet
1.06	inches
1.43	inches
1.66	inches
	inches
2.26	inches
2.60	inches
	inches

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	3.661 acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.005 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	13.732 acre-feet
Total Detention Basin Volume =	20.398 acre-feet
Initial Surge Volume (ISV) =	478 ft ³
Initial Surge Depth (ISD) =	0.50 ft
Total Available Detention Depth (H _{total}) =	7.50 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.006 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 H:V
Basin Length-to-Width Ratio (R _{LW}) =	3

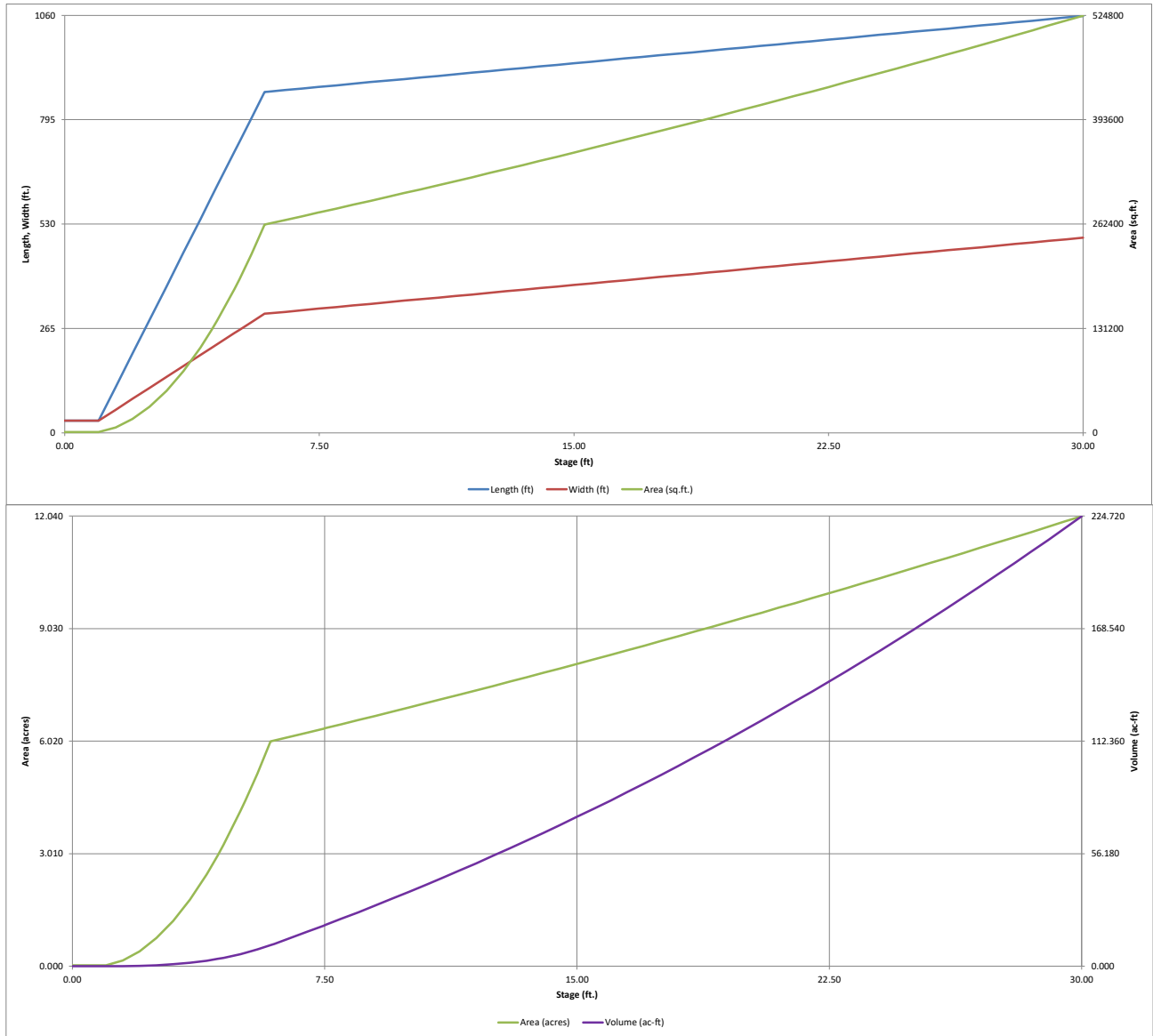
Initial Surge Area (A _{ISV}) =	957 ft ²
Surcharge Volume Length (L _{ISV}) =	30.9 ft
Surcharge Volume Width (W _{ISV}) =	30.9 ft
Depth of Basin Floor (H _{FLOOR}) =	4.89 ft
Length of Basin Floor (L _{FLOOR}) =	865.5 ft
Width of Basin Floor (W _{FLOOR}) =	302.6 ft
Area of Basin Floor (A _{FLOOR}) =	261,898 ft ²
Volume of Basin Floor (V _{FLOOR}) =	454,258 ft ³
Depth of Main Basin (H _{MAIN}) =	1.61 ft
Length of Main Basin (L _{MAIN}) =	878.4 ft
Width of Main Basin (W _{MAIN}) =	315.5 ft
Area of Main Basin (A _{MAIN}) =	277,109 ft ²
Volume of Main Basin (V _{MAIN}) =	433,844 ft ³
Calculated Total Basin Volume (V _{total}) =	20,410 acre-feet

Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	0.00		30.9	30.9	957		0.022		
ISV	0.50		30.9	30.9	957		0.022	478	0.011
	1.00		30.9	30.9	957		0.022	957	0.022
	1.50		116.3	58.7	6,826		0.157	2,705	0.062
	2.00		201.6	86.5	17,436		0.400	8,573	0.197
	2.50		286.9	114.3	32,787		0.753	20,931	0.481
	3.00		372.3	142.0	52,878		1.214	42,150	0.968
	3.50		457.6	169.8	77,711		1.784	74,600	1.713
	4.00		542.9	197.6	107,284		2.463	120,651	2.770
Zone 1 (WQCV)	4.33		599.3	215.9	129,399		2.971	159,647	3.665
	4.50		628.3	225.4	141,597		3.251	182,674	4.194
	5.00		713.6	253.2	180,652		4.147	263,039	6.039
Zone 2 (EURV)	5.15		739.2	261.5	193,293		4.437	291,079	6.682
	5.50		798.9	280.9	224,447		5.153	364,116	8.359
Floor	5.89		865.5	302.6	261,898		6.012	458,859	10.534
	6.00		866.4	303.5	262,927		6.036	487,725	11.197
	6.50		870.4	307.5	267,622		6.144	620,361	14.242
	7.00		874.4	311.5	272,350		6.252	755,353	17.341
Zone 3 (100-year)	7.49		878.3	315.4	277,014		6.359	889,945	20.430
	7.50		878.4	315.5	277,109		6.362	892,716	20.494
	8.00		882.4	319.5	281,901		6.472	1,032,467	23.702
	8.50		886.4	323.5	286,724		6.582	1,174,622	26.966
	9.00		890.4	327.5	291,580		6.694	1,319,197	30.285
	9.50		894.4	331.5	296,467		6.806	1,466,207	33.659
	10.00		898.4	335.5	301,386		6.919	1,615,669	37.091
	10.50		902.4	339.5	306,338		7.033	1,767,599	40.578
	11.00		906.4	343.5	311,321		7.147	1,922,012	44.123
	11.50		910.4	347.5	316,337		7.262	2,078,925	47.726
	12.00		914.4	351.5	321,384		7.378	2,238,354	51.386
	12.50		918.4	355.5	326,463		7.495	2,400,315	55.104
	13.00		922.4	359.5	331,575		7.612	2,564,823	58.880
	13.50		926.4	363.5	336,718		7.730	2,731,895	62.716
	14.00		930.4	367.5	341,894		7.849	2,901,547	66.610
	14.50		934.4	371.5	347,101		7.968	3,073,794	70.565
	15.00		938.4	375.5	352,341		8.089	3,248,653	74.579
	15.50		942.4	379.5	357,612		8.210	3,426,140	78.653
	16.00		946.4	383.5	362,915		8.331	3,606,270	82.789
	16.50		950.4	387.5	368,251		8.454	3,789,060	86.985
	17.00		954.4	391.5	373,618		8.577	3,974,526	91.243
	17.50		958.4	395.5	379,018		8.701	4,162,684	95.562
	18.00		962.4	399.5	384,449		8.826	4,353,549	99.944
	18.50		966.4	403.5	389,912		8.951	4,547,138	104.388
	19.00		970.4	407.5	395,408		9.077	4,743,467	108.895
	19.50		974.4	411.5	400,935		9.204	4,942,551	113.465
	20.00		978.4	415.5	406,495		9.332	5,144,408	118.099
	20.50		982.4	419.5	412,086		9.460	5,349,051	122.797
	21.00		986.4	423.5	417,709		9.589	5,556,499	127.560
	21.50		990.4	427.5	423,365		9.719	5,766,766	132.387
	22.00		994.4	431.5	429,052		9.850	5,979,869	137.279
	22.50		998.4	435.5	434,772		9.981	6,195,824	142.237
	23.00		1,002.4	439.5	440,523		10.113	6,414,646	147.260
	23.50		1,006.4	443.5	446,307		10.246	6,636,352	152.350
	24.00		1,010.4	447.5	452,122		10.379	6,860,958	157.506
	24.50		1,014.4	451.5	457,969		10.514	7,088,480	162.729
	25.00		1,018.4	455.5	463,849		10.649	7,318,933	168.020
	25.50		1,022.4	459.5	469,760		10.784	7,552,334	173.378
	26.00		1,026.4	463.5	475,704		10.921	7,788,698	178.804
	26.50		1,030.4	467.5	481,679		11.058	8,028,043	184.299
	27.00		1,034.4	471.5	487,686		11.196	8,270,383	189.862
	27.50		1,038.4	475.5	493,726		11.334	8,515,735	195.494
	28.00		1,042.4	479.5	499,797		11.474	8,764,114	201.196
	28.50		1,046.4	483.5	505,901		11.614	9,015,537	206.968
	29.00		1,050.4	487.5	512,036		11.755	9,270,020	212.810
	29.50		1,054.4	491.5	518,204		11.896	9,527,579	218.723
	30.00		1,058.4	495.5	524,403		12.039	9,788,229	224.707

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

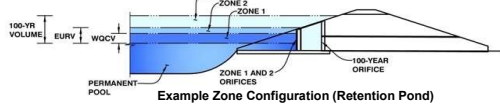


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **Canyons Far South SDP**

Basin ID: **Pond H**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	84.35 acres
Watershed Length =	1,760 ft
Watershed Length to Centroid =	500 ft
Watershed Slope =	0.068 ft/ft
Watershed Imperviousness =	36.90% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	100.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

Note: L / W Ratio < 1
L / W Ratio = 0.84

Steep Slope > 0.06 ft/ft

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	1.206 acre-feet
Excess Urban Runoff Volume (EURV) =	2.874 acre-feet
2-yr Runoff Volume (P1 = 1.06 in.) =	2.795 acre-feet
5-yr Runoff Volume (P1 = 1.43 in.) =	4.971 acre-feet
10-yr Runoff Volume (P1 = 1.66 in.) =	6.476 acre-feet
25-yr Runoff Volume (P1 = 1.69 in.) =	6.992 acre-feet
50-yr Runoff Volume (P1 = 2.26 in.) =	10.942 acre-feet
100-yr Runoff Volume (P1 = 2.6 in.) =	13.659 acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	17.510 acre-feet
Approximate 2-yr Detention Volume =	2.223 acre-feet
Approximate 5-yr Detention Volume =	3.785 acre-feet
Approximate 10-yr Detention Volume =	4.322 acre-feet
Approximate 25-yr Detention Volume =	4.258 acre-feet
Approximate 50-yr Detention Volume =	5.276 acre-feet
Approximate 100-yr Detention Volume =	6.448 acre-feet

Optional User Overrides

	acre-feet
	acre-feet
1.06	inches
1.43	inches
1.66	inches
	inches
	inches
2.26	inches
2.60	inches
	inches

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.206 acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.668 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.574 acre-feet
Total Detention Basin Volume =	6.448 acre-feet
Initial Surcharge Volume (ISV) =	158 ft ³
Initial Surcharge Depth (ISD) =	0.50 ft
Total Available Detention Depth (H _{total}) =	6.50 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.004 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 H:V
Basin Length-to-Width Ratio (R _{LW}) =	5

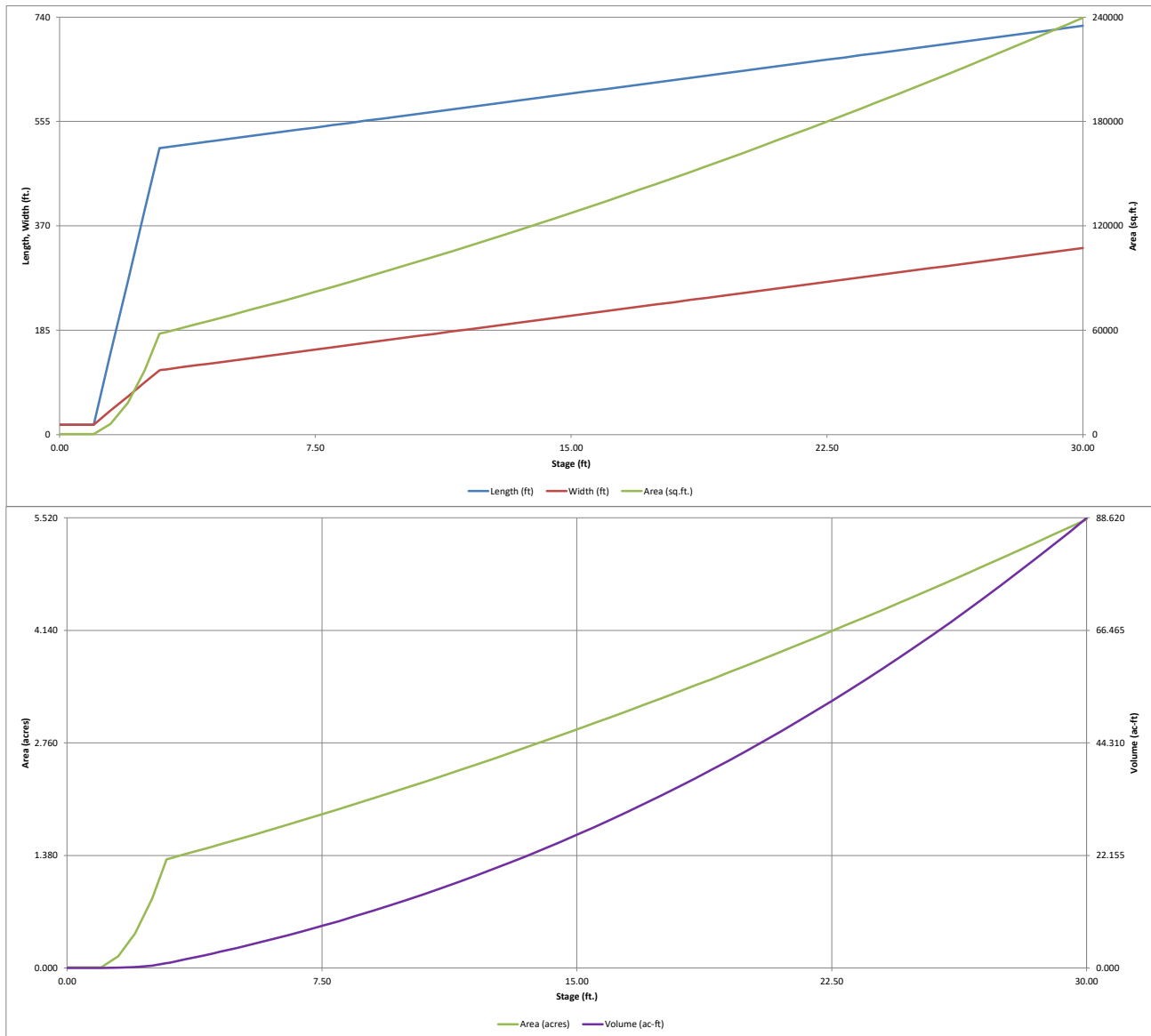
Initial Surcharge Area (A _{ISV}) =	315 ft ²
Surcharge Volume Length (L _{ISV}) =	17.8 ft
Surcharge Volume Width (W _{ISV}) =	17.8 ft
Depth of Basin Floor (H _{FLOOR}) =	1.93 ft
Length of Basin Floor (L _{FLOOR}) =	508.0 ft
Width of Basin Floor (W _{FLOOR}) =	114.3 ft
Area of Basin Floor (A _{FLOOR}) =	58,036 ft ²
Volume of Basin Floor (V _{FLOOR}) =	40,290 ft ³
Depth of Main Basin (H _{MAIN}) =	3.57 ft
Length of Main Basin (L _{MAIN}) =	536.5 ft
Width of Main Basin (W _{MAIN}) =	142.8 ft
Area of Main Basin (A _{MAIN}) =	76,622 ft ²
Volume of Main Basin (V _{MAIN}) =	239,598 ft ³
Calculated Total Basin Volume (V _{total}) =	6.433 acre-feet

Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	0.00		17.8	17.8	315		0.007		
ISV	0.50		17.8	17.8	315		0.007	158	0.004
	1.00		17.8	17.8	315		0.007	315	0.007
	1.50		144.8	42.8	6,188		0.142	1,676	0.038
	2.00		271.8	67.8	18,411		0.423	7,562	0.174
	2.50		398.8	92.8	36,984		0.849	21,146	0.485
Floor	2.93		508.0	114.3	58,036		1.332	41,407	0.951
	3.00		508.5	114.8	58,385		1.340	45,482	1.044
Zone 1 (WQCV)	3.12		509.5	115.8	58,984		1.354	52,524	1.206
	3.50		512.5	118.8	60,894		1.398	75,300	1.729
	4.00		516.5	122.8	63,436		1.456	106,381	2.442
Zone 2 (EURV)	4.30		518.9	125.2	64,976		1.492	125,643	2.884
	4.50		520.5	126.8	66,009		1.515	138,741	3.185
	5.00		524.5	130.8	68,614		1.575	172,395	3.958
	5.50		528.5	134.8	71,252		1.636	207,361	4.760
	6.00		532.5	138.8	73,921		1.697	243,652	5.593
Zone 3 (100-year)	6.50		536.5	142.8	76,622		1.759	281,287	6.457
	7.00		540.5	146.8	79,356		1.822	320,280	7.353
	7.50		544.5	150.8	82,121		1.885	360,648	8.279
	8.00		548.5	154.8	84,918		1.949	402,406	9.238
	8.50		552.5	158.8	87,748		2.014	445,572	10.229
	9.00		556.5	162.8	90,609		2.080	490,160	11.253
	9.50		560.5	166.8	93,503		2.147	536,186	12.309
	10.00		564.5	170.8	96,428		2.214	583,667	13.399
	10.50		568.5	174.8	99,385		2.282	632,619	14.523
	11.00		572.5	178.8	102,375		2.350	683,058	15.681
	11.50		576.5	182.8	105,396		2.420	734,999	16.873
	12.00		580.5	186.8	108,449		2.490	788,459	18.101
	12.50		584.5	190.8	111,535		2.560	843,454	19.363
	13.00		588.5	194.8	114,652		2.632	899,999	20.661
	13.50		592.5	198.8	117,801		2.704	958,112	21.995
	14.00		596.5	202.8	120,983		2.777	1,017,806	23.366
	14.50		600.5	206.8	124,196		2.851	1,079,100	24.773
	15.00		604.5	210.8	127,442		2.926	1,142,008	26.217
	15.50		608.5	214.8	130,719		3.001	1,206,547	27.698
	16.00		612.5	218.8	134,028		3.077	1,272,732	29.218
	16.50		616.5	222.8	137,370		3.154	1,340,580	30.775
	17.00		620.5	226.8	140,743		3.231	1,410,107	32.372
	17.50		624.5	230.8	144,148		3.309	1,481,329	34.007
	18.00		628.5	234.8	147,586		3.388	1,554,261	35.681
	18.50		632.5	238.8	151,055		3.468	1,628,920	37.395
	19.00		636.5	242.8	154,556		3.548	1,705,321	39.149
	19.50		640.5	246.8	158,090		3.629	1,783,481	40.943
	20.00		644.5	250.8	161,655		3.711	1,863,416	42.778
	20.50		648.5	254.8	165,253		3.794	1,945,142	44.654
	21.00		652.5	258.8	168,882		3.877	2,028,674	46.572
	21.50		656.5	262.8	172,543		3.961	2,114,029	48.531
	22.00		660.5	266.8	176,237		4.046	2,201,223	50.533
	22.50		664.5	270.8	179,962		4.131	2,290,271	52.577
	23.00		668.5	274.8	183,719		4.218	2,381,190	54.665
	23.50		672.5	278.8	187,509		4.305	2,473,996	56.795
	24.00		676.5	282.8	191,330		4.392	2,568,704	58.969
	24.50		680.5	286.8	195,184		4.481	2,665,332	61.188
	25.00		684.5	290.8	199,069		4.570	2,763,893	63.450
	25.50		688.5	294.8	202,986		4.660	2,864,406	65.758
	26.00		692.5	298.8	206,936		4.751	2,966,885	68.110
	26.50		696.5	302.8	210,917		4.842	3,071,347	70.508
	27.00		700.5	306.8	214,930		4.934	3,177,807	72.952
	27.50		704.5	310.8	218,976		5.027	3,286,282	75.443
	28.00		708.5	314.8	223,053		5.121	3,396,788	77.980
	28.50		712.5	318.8	227,162		5.215	3,509,341	80.563
	29.00		716.5	322.8	231,304		5.310	3,623,956	83.195
	29.50		720.5	326.8	235,477		5.406	3,740,650	85.874
	30.00		724.5	330.8	239,683		5.502	3,859,439	88.601

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

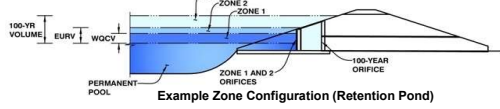


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **Canyons Far South SDP**

Basin ID: **Pond J**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	200.90 acres
Watershed Length =	4,570 ft
Watershed Length to Centroid =	1,530 ft
Watershed Slope =	0.037 ft/ft
Watershed Imperviousness =	18.20% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	100.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	1.809 acre-feet	Optional User Overrides	
Excess Urban Runoff Volume (EURV) =	3.190 acre-feet		
2-yr Runoff Volume (P1 = 1.06 in.) =	3.780 acre-feet	1.06	inches
5-yr Runoff Volume (P1 = 1.43 in.) =	8.673 acre-feet	1.43	inches
10-yr Runoff Volume (P1 = 1.66 in.) =	12.228 acre-feet	1.66	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	13.796 acre-feet		inches
50-yr Runoff Volume (P1 = 2.26 in.) =	23.234 acre-feet	2.26	inches
100-yr Runoff Volume (P1 = 2.6 in.) =	30.087 acre-feet	2.60	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	39.405 acre-feet		inches
Approximate 2-yr Detention Volume =	2.375 acre-feet		
Approximate 5-yr Detention Volume =	4.880 acre-feet		
Approximate 10-yr Detention Volume =	5.911 acre-feet		
Approximate 25-yr Detention Volume =	6.152 acre-feet		
Approximate 50-yr Detention Volume =	7.656 acre-feet		
Approximate 100-yr Detention Volume =	10.257 acre-feet		

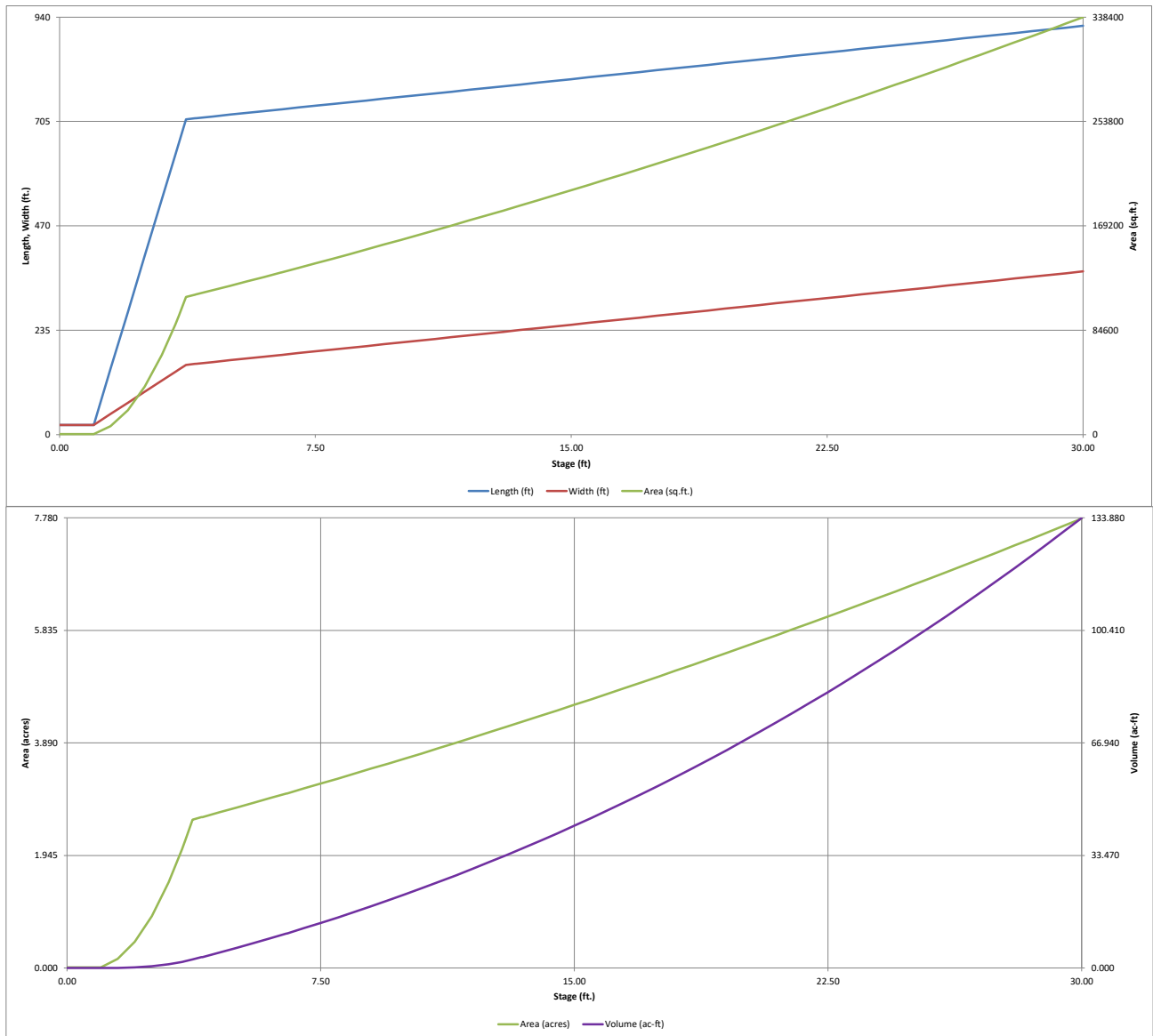
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.809 acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.382 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	7.066 acre-feet
Total Detention Basin Volume =	10.257 acre-feet
Initial Surcharge Volume (ISV) =	236 ft ³
Initial Surcharge Depth (ISD) =	0.50 ft
Total Available Detention Depth (H _{total}) =	6.50 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.004 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 H:V
Basin Length-to-Width Ratio (R _{LW}) =	5
Initial Surcharge Area (A _{ISV}) =	473 ft ²
Surcharge Volume Length (L _{ISV}) =	21.7 ft
Surcharge Volume Width (W _{ISV}) =	21.7 ft
Depth of Basin Floor (H _{FLOOR}) =	2.71 ft
Length of Basin Floor (L _{FLOOR}) =	710.1 ft
Width of Basin Floor (W _{FLOOR}) =	157.2 ft
Area of Basin Floor (A _{FLOOR}) =	111,654 ft ²
Volume of Basin Floor (V _{FLOOR}) =	107,851 ft ³
Depth of Main Basin (H _{MAIN}) =	2.79 ft
Length of Main Basin (L _{MAIN}) =	732.4 ft
Width of Main Basin (W _{MAIN}) =	179.6 ft
Area of Main Basin (A _{MAIN}) =	131,511 ft ²
Volume of Main Basin (V _{MAIN}) =	338,838 ft ³
Calculated Total Basin Volume (V _{total}) =	10.265 acre-feet

Depth Increment =	0.50	ft								
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)	
Top of Micropool	0.00		21.7	21.7	473		0.011			
ISV	0.50		21.7	21.7	473		0.011	236	0.005	
	1.00		21.7	21.7	473		0.011	473	0.011	
	1.50		148.7	46.7	6,952		0.160	2,064	0.047	
	2.00		275.7	71.7	19,782		0.454	8,483	0.195	
	2.50		402.7	96.7	38,962		0.894	22,905	0.526	
	3.00		529.7	121.7	64,491		1.481	48,503	1.113	
Zone 1 (WQCV)	3.40		631.3	141.7	89,487		2.054	79,164	1.817	
	3.50		656.7	146.7	96,371		2.212	88,455	2.031	
Floor	3.71		710.1	157.2	111,654		2.563	110,278	2.532	
Zone 2 (EURV)	3.97		712.2	159.3	113,463		2.605	139,543	3.203	
	4.00		712.4	159.6	113,672		2.610	142,950	3.282	
	4.50		716.4	163.6	117,176		2.690	200,660	4.607	
	5.00		720.4	167.6	120,711		2.771	260,131	5.972	
	5.50		724.4	171.6	124,279		2.853	321,377	7.378	
	6.00		728.4	175.6	127,879		2.936	384,415	8.825	
	Zone 3 (100-year)	6.49		732.3	179.5	131,438		3.017	447,947	10.283
		6.50		732.4	179.6	131,511		3.019	449,262	10.314
		7.00		736.4	183.6	135,175		3.103	515,932	11.844
	7.50		740.4	187.6	138,871		3.188	584,442	13.417	
	8.00		744.4	191.6	142,599		3.274	654,808	15.032	
	8.50		748.4	195.6	146,358		3.360	727,046	16.691	
9.00		752.4	199.6	150,150		3.447	801,172	18.392		
9.50		756.4	203.6	153,974		3.535	877,201	20.138		
10.00		760.4	207.6	157,830		3.623	955,151	21.927		
10.50		764.4	211.6	161,718		3.713	1,035,037	23.761		
11.00		768.4	215.6	165,638		3.803	1,116,874	25.640		
11.50		772.4	219.6	169,590		3.893	1,200,680	27.564		
12.00		776.4	223.6	173,573		3.985	1,286,469	29.533		
12.50		780.4	227.6	177,589		4.077	1,374,258	31.549		
13.00		784.4	231.6	181,637		4.170	1,464,064	33.610		
13.50		788.4	235.6	185,717		4.263	1,555,901	35.719		
14.00		792.4	239.6	189,829		4.358	1,649,786	37.874		
14.50		796.4	243.6	193,973		4.453	1,745,735	40.077		
15.00		800.4	247.6	198,149		4.549	1,843,764	42.327		
15.50		804.4	251.6	202,356		4.645	1,943,889	44.626		
16.00		808.4	255.6	206,596		4.743	2,046,126	46.973		
16.50		812.4	259.6	210,868		4.841	2,150,490	49.368		
17.00		816.4	263.6	215,172		4.940	2,256,999	51.814		
17.50		820.4	267.6	219,508		5.039	2,365,668	54.308		
18.00		824.4	271.6	223,876		5.139	2,476,512	56.853		
18.50		828.4	275.6	228,275		5.240	2,589,549	59.448		
19.00		832.4	279.6	232,707		5.342	2,704,793	62.094		
19.50		836.4	283.6	237,171		5.445	2,822,261	64.790		
20.00		840.4	287.6	241,667		5.548	2,941,969	67.538		
20.50		844.4	291.6	246,195		5.652	3,063,934	70.338		
21.00		848.4	295.6	250,755		5.757	3,188,170	73.190		
21.50		852.4	299.6	255,347		5.862	3,314,694	76.095		
22.00		856.4	303.6	259,970		5.968	3,443,522	79.052		
22.50		860.4	307.6	264,626		6.075	3,574,669	82.063		
23.00		864.4	311.6	269,314		6.183	3,708,153	85.127		
23.50		868.4	315.6	274,034		6.291	3,843,989	88.246		
24.00		872.4	319.6	278,786		6.400	3,982,193	91.419		
24.50		876.4	323.6	283,570		6.510	4,122,780	94.646		
25.00		880.4	327.6	288,386		6.620	4,265,768	97.929		
25.50		884.4	331.6	293,233		6.732	4,411,171	101.267		
26.00		888.4	335.6	298,113		6.844	4,559,006	104.660		
26.50		892.4	339.6	303,025		6.956	4,709,290	108.110		
27.00		896.4	343.6	307,969		7.070	4,862,037	111.617		
27.50		900.4	347.6	312,945		7.184	5,017,264	115.181		
28.00		904.4	351.6	317,953		7.299	5,174,987	118.801		
28.50		908.4	355.6	322,993		7.415	5,335,222	122.480		
29.00		912.4	359.6	328,064		7.531	5,497,985	126.216		
29.50		916.4	363.6	333,168		7.648	5,663,291	130.011		
30.00		920.4	367.6	338,304		7.766	5,831,158	133.865		

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

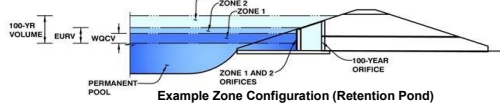


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **Canyons Far South SDP**

Basin ID: **Water Quality Pond L (100-yr detention included to be conservative)**



Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	2.28	acres
Watershed Length =	610	ft
Watershed Length to Centroid =	190	ft
Watershed Slope =	0.036	ft/ft
Watershed Imperviousness =	23.69%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	0.025	acre-feet
Excess Urban Runoff Volume (EURV) =	0.048	acre-feet
2-yr Runoff Volume (P1 = 1.06 in.) =	0.051	acre-feet
5-yr Runoff Volume (P1 = 1.43 in.) =	0.107	acre-feet
10-yr Runoff Volume (P1 = 1.66 in.) =	0.147	acre-feet
25-yr Runoff Volume (P1 = 1.69 in.) =	0.163	acre-feet
50-yr Runoff Volume (P1 = 2.26 in.) =	0.268	acre-feet
100-yr Runoff Volume (P1 = 2.6 in.) =	0.343	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	0.446	acre-feet
Approximate 2-yr Detention Volume =	0.036	acre-feet
Approximate 5-yr Detention Volume =	0.069	acre-feet
Approximate 10-yr Detention Volume =	0.081	acre-feet
Approximate 25-yr Detention Volume =	0.083	acre-feet
Approximate 50-yr Detention Volume =	0.103	acre-feet
Approximate 100-yr Detention Volume =	0.134	acre-feet

Optional User Overrides

		acre-feet
		acre-feet
	1.06	inches
	1.43	inches
	1.66	inches
		inches
	2.26	inches
	2.60	inches
		inches

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.025	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.023	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.086	acre-feet
Total Detention Basin Volume =	0.134	acre-feet
Initial Surge Volume (ISV) =	3	ft ³
Initial Surge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H _{total}) =	5.00	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (R _{LW}) =	5	

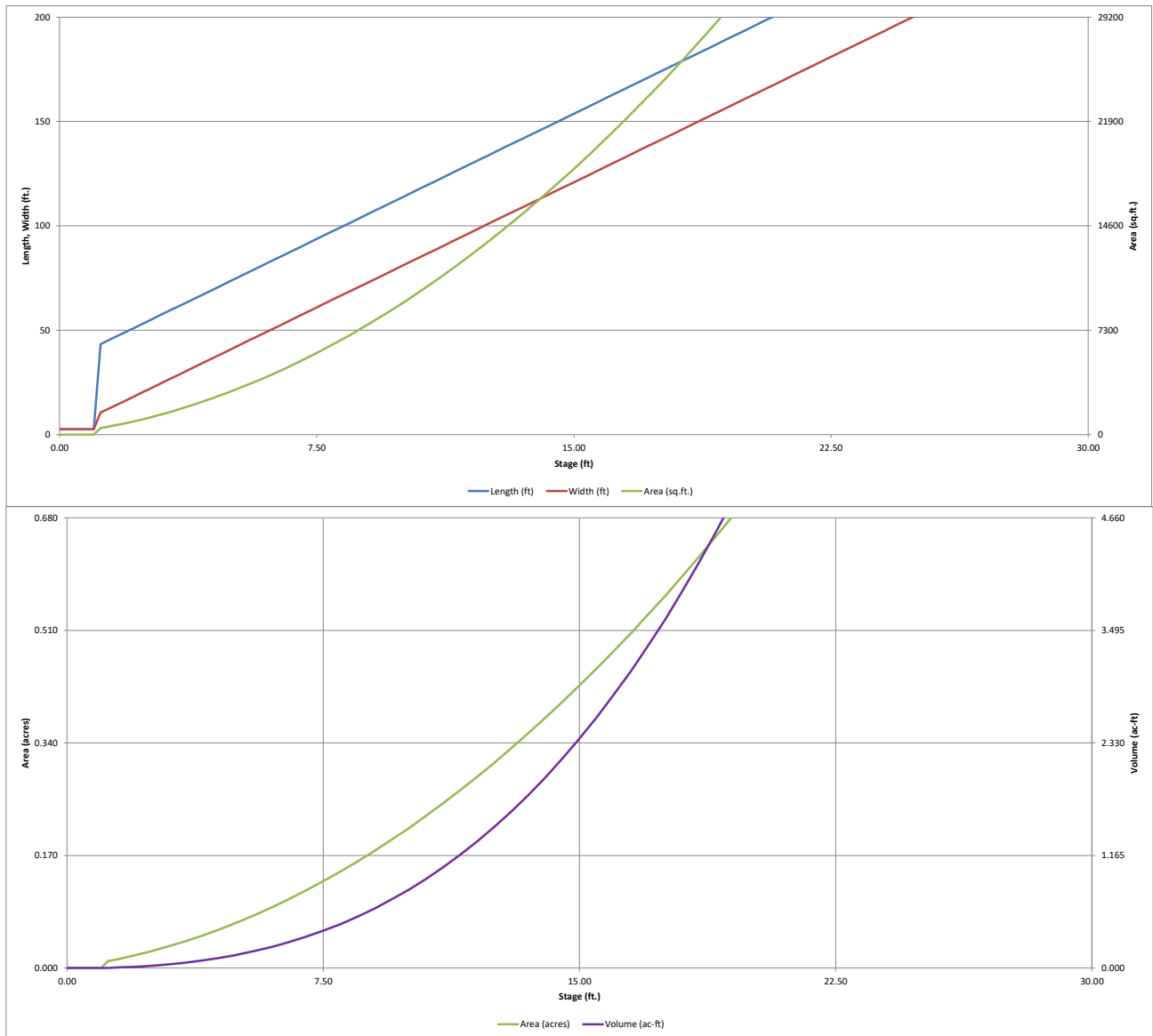
Initial Surge Area (A _{ISV}) =	6	ft ²
Surcharge Volume Length (L _{ISV}) =	2.5	ft
Surcharge Volume Width (W _{ISV}) =	2.5	ft
Depth of Basin Floor (H _{FLOOR}) =	0.20	ft
Length of Basin Floor (L _{FLOOR}) =	43.3	ft
Width of Basin Floor (W _{FLOOR}) =	10.5	ft
Area of Basin Floor (A _{FLOOR}) =	457	ft ²
Volume of Basin Floor (V _{FLOOR}) =	35	ft ³
Depth of Main Basin (H _{MAIN}) =	3.80	ft
Length of Main Basin (L _{MAIN}) =	73.7	ft
Width of Main Basin (W _{MAIN}) =	40.9	ft
Area of Main Basin (A _{MAIN}) =	3,019	ft ²
Volume of Main Basin (V _{MAIN}) =	5,890	ft ³
Calculated Total Basin Volume (V _{total}) =	0.136	acre-feet

Depth Increment = 0.50 ft

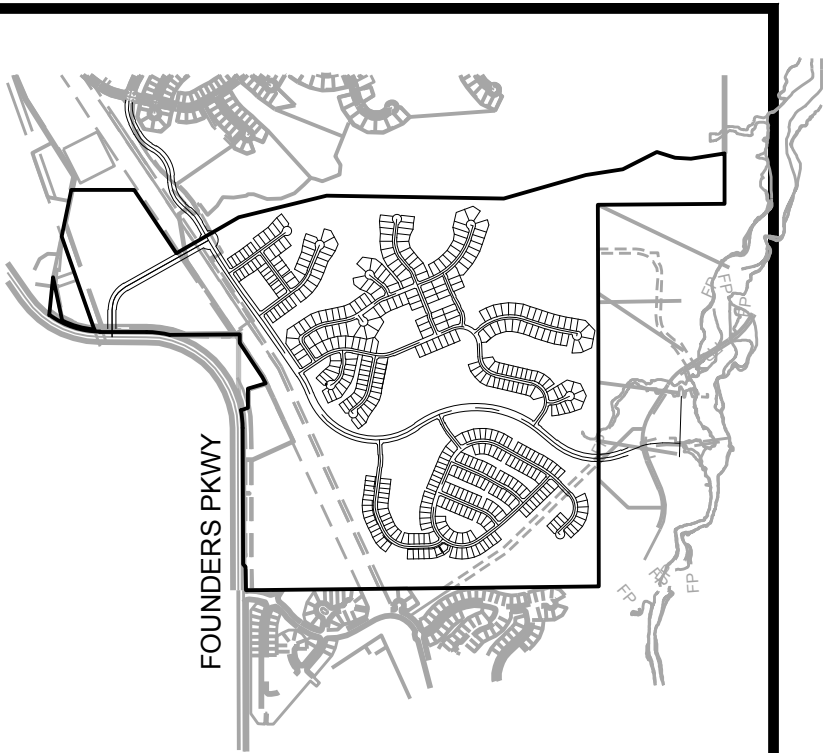
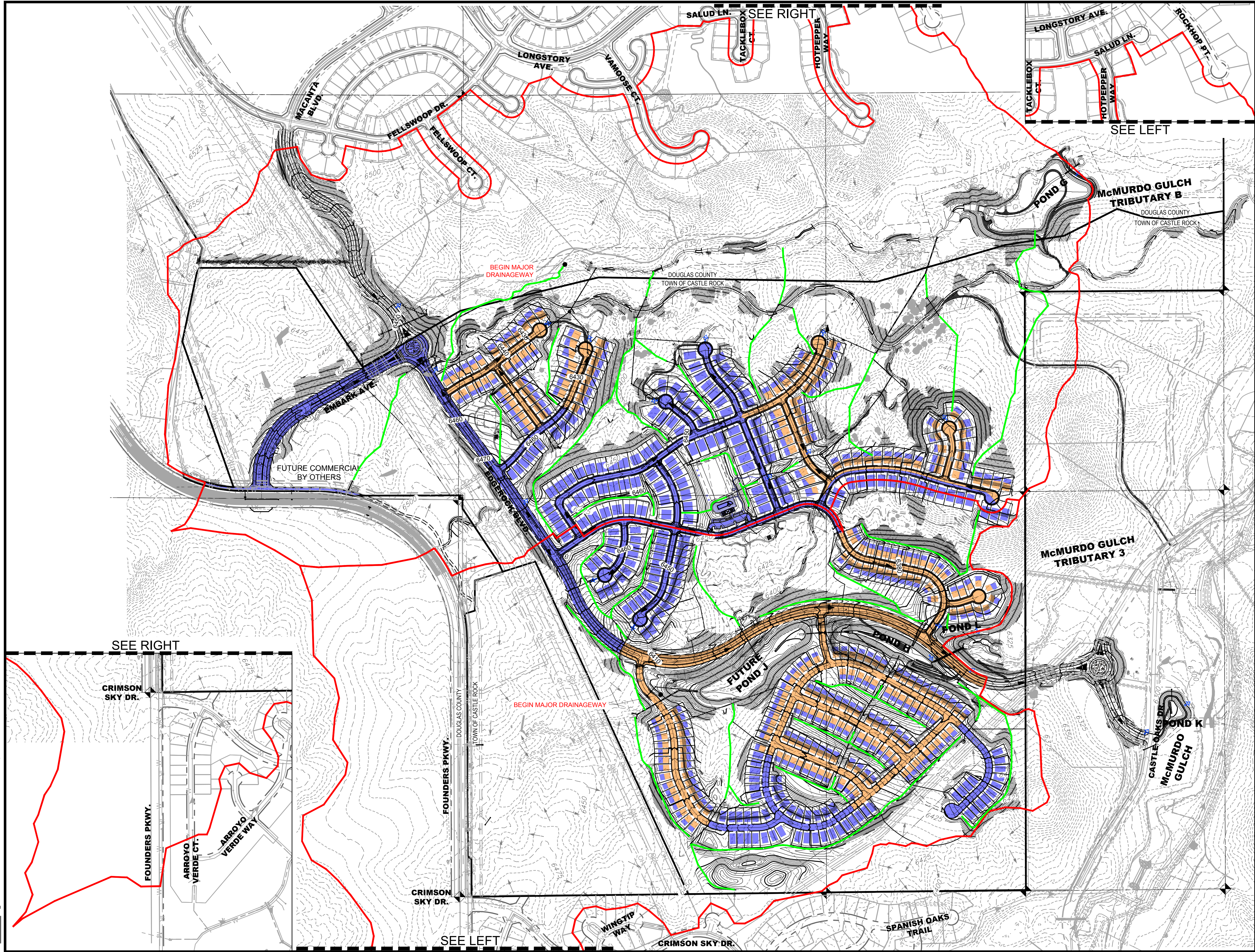
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	0.00		2.5	2.5	6		0.000		
ISV	0.50		2.5	2.5	6		0.000	3	0.000
	1.00		2.5	2.5	6		0.000	6	0.000
Floor	1.20		43.3	10.5	457		0.010	42	0.001
	1.50		45.7	12.9	592		0.014	199	0.005
	2.00		49.7	16.9	843		0.019	556	0.013
	2.50		53.7	20.9	1,125		0.026	1,047	0.024
Zone 1 (WQCV)	2.53		54.0	21.2	1,143		0.026	1,081	0.025
	3.00		57.7	24.9	1,440		0.033	1,687	0.039
Zone 2 (EURV)	3.27		59.9	27.1	1,623		0.037	2,100	0.048
	3.50		61.7	28.9	1,787		0.041	2,492	0.057
	4.00		65.7	32.9	2,165		0.050	3,479	0.080
	4.50		69.7	36.9	2,576		0.059	4,663	0.107
Zone 3 (100-year)	4.93		73.2	40.4	2,955		0.068	5,851	0.134
	5.00		73.7	40.9	3,019		0.069	6,060	0.139
	5.50		77.7	44.9	3,494		0.080	7,687	0.176
	6.00		81.7	48.9	4,000		0.092	9,559	0.219
	6.50		85.7	52.9	4,539		0.104	11,693	0.268
	7.00		89.7	56.9	5,110		0.117	14,104	0.324
	7.50		93.7	60.9	5,713		0.131	16,808	0.386
	8.00		97.7	64.9	6,347		0.146	19,822	0.455
	8.50		101.7	68.9	7,014		0.161	23,161	0.532
	9.00		105.7	72.9	7,713		0.177	26,841	0.616
	9.50		109.7	76.9	8,443		0.194	30,879	0.709
	10.00		113.7	80.9	9,206		0.211	35,290	0.810
	10.50		117.7	84.9	10,001		0.230	40,090	0.920
	11.00		121.7	88.9	10,828		0.249	45,296	1.040
	11.50		125.7	92.9	11,686		0.268	50,923	1.169
	12.00		129.7	96.9	12,577		0.289	56,988	1.308
	12.50		133.7	100.9	13,500		0.310	63,505	1.458
	13.00		137.7	104.9	14,454		0.332	70,493	1.618
	13.50		141.7	108.9	15,441		0.354	77,965	1.790
	14.00		145.7	112.9	16,460		0.378	85,939	1.973
	14.50		149.7	116.9	17,511		0.402	94,430	2.168
	15.00		153.7	120.9	18,593		0.427	103,455	2.375
	15.50		157.7	124.9	19,708		0.452	113,029	2.595
	16.00		161.7	128.9	20,855		0.479	123,168	2.828
	16.50		165.7	132.9	22,033		0.506	133,889	3.074
	17.00		169.7	136.9	23,244		0.534	145,207	3.334
	17.50		173.7	140.9	24,487		0.562	157,139	3.607
	18.00		177.7	144.9	25,762		0.591	169,700	3.896
	18.50		181.7	148.9	27,068		0.621	182,906	4.199
	19.00		185.7	152.9	28,407		0.652	196,773	4.517
	19.50		189.7	156.9	29,778		0.684	211,318	4.851
	20.00		193.7	160.9	31,181		0.716	226,556	5.201
	20.50		197.7	164.9	32,615		0.749	242,504	5.567
	21.00		201.7	168.9	34,082		0.782	259,177	5.950
	21.50		205.7	172.9	35,581		0.817	276,591	6.350
	22.00		209.7	176.9	37,111		0.852	294,763	6.767
	22.50		213.7	180.9	38,674		0.888	313,708	7.202
	23.00		217.7	184.9	40,269		0.924	333,443	7.655
	23.50		221.7	188.9	41,896		0.962	353,982	8.126
	24.00		225.7	192.9	43,554		1.000	375,343	8.617
	24.50		229.7	196.9	45,245		1.039	397,542	9.126
	25.00		233.7	200.9	46,968		1.078	420,594	9.656
	25.50		237.7	204.9	48,722		1.119	444,515	10.205
	26.00		241.7	208.9	50,509		1.160	469,322	10.774
	26.50		245.7	212.9	52,328		1.201	495,030	11.364
	27.00		249.7	216.9	54,179		1.244	521,655	11.976
	27.50		253.7	220.9	56,061		1.287	549,213	12.608
	28.00		257.7	224.9	57,976		1.331	577,721	13.263
	28.50		261.7	228.9	59,923		1.376	607,195	13.939
	29.00		265.7	232.9	61,902		1.421	637,650	14.638
	29.50		269.7	236.9	63,912		1.467	669,102	15.360
	30.00		273.7	240.9	65,955		1.514	701,567	16.106

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



PLOT DATE: 7/30/25 AT 12:22 PM
FILE PATH: E:\PROJECTS\230200 - CANYONS FAR SOUTH - CASTLE ROCK, CO\3 - DRAWINGS\EXHIBITS\1 DISCONNECTED IMPERVIOUS AREA



**KEYMAP
LEGEND**

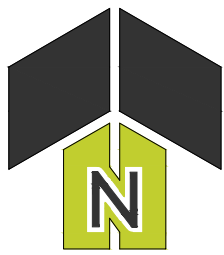
- DISCONNECTED LENGTH/
RECEIVING PERVIOUS AREA (RPA) —
- IMPERVIOUS AREA TO RPA —
- IMPERVIOUS AREA NOT TO RPA —
- WATERSHED —



UNCC
CALL BEFORE
YOU DIG
811
OR

1-800-922-1987

Utility Notification
Center of Colorado



0 300' 600'
1" = 300' (HORIZONTAL)

COVER

ENGINEERING
CANYONS FAR SOUTH
FILING NO. 1
DISCONNECTED IMPERVIOUS AREA
EXHIBIT

Project:

Location:

Designer:

Date:

Latest Revision:

Canyons Far South

Castle Rock, CO

CJG

February 2025

July 2025



DISCONNECTED IMPERVIOUS AREA EXHIBIT																	
North Total Watershed Area (Red)		North Impervious Total Area (Orange & Blue)		20% of Impervious Area		10% for Disconnected Area Required		Disconnected Length (Green)		Wetted Perimeter Average Width		Disconnected Area Provided		Impervious Area to RPA Provided (Blue)		Impervious Area to RPA Percentage Provided (20% Required)	
16,732,141.63	(sf)	1,555,921.08	(sf)	311,184.22	(sf)	31,118.42	(sf)	13,428.14	(ft)	3.00	(ft)	40,284.43	(sf)	1,123,404.48	(sf)	72%	
384.12	(ac)	35.72	(ac)	7.14	(ac)	0.71	(ac)	-		-		0.92	(ac)	25.79	(ac)	72%	

South Total Watershed Area (Red)		South Impervious Total Area (Orange & Blue)		20% of Impervious Area		10% for Disconnected Area Required		Disconnected Length (Green)		Wetted Perimeter Average Width		Disconnected Area Provided		Impervious Area to RPA Provided (Blue)		Impervious Area to RPA Percentage Provided (20% Required)	
12,354,590.99	(sf)	1,613,693.25	(sf)	322,738.65	(sf)	32,273.87	(sf)	14,266.13	(ft)	3.00	(ft)	42,798.40	(sf)	805,975.81	(sf)	50%	
283.62	(ac)	37.05	(ac)	7.41	(ac)	0.74	(ac)	-		-		0.98	(ac)	18.50	(ac)	50%	



Summary of Water Quality Conformance to MS4 Permit

The purpose of this worksheet is to document conformance with the Town of Castle Rock's MS4 permit with regard to permanent water quality on land disturbance projects.

Project Name Canyons Far South SDP

Project Owner HT Canyons South Development LP

Project Location East of Founders Parkway, North of Castle Oaks Drive

ToCR Project Number PREAPP23-0051

Total Site Area 361 acres

Total Size of Common Plan of Development 361 acres

Check all that apply:

☐ **Project within Plum Creek Basin**

☒ **Project within Cherry Creek Basin**

Estimated construction completion date Spring 2024

1. The water quality control measure(s) for applicable development sites shall meet one of the following base design standards as per the SDDTCM Section 14.4. Please select all design standards that were applied to meet conformance with the MS4 on this site.

- ☒ WQCV standard
- ☐ Pollutant removal standard
- ☒ Runoff reduction standard
- ☐ Applicable site draining to regional WQVC control measure (accepts drainage prior to discharging to WOTS)
- ☒ Applicable site draining to regional WQVC control facility (with receiving pervious area control measure upstream of WOTS)
- ☐ Constrained redevelopment sites standard
 - Imperviousness of existing site _____/_____ (Imp. Ac/Site Ac) = ____%
 - Variance required TCV No. _____
- ☐ Existing control measure with WQCV per previous criteria standards
 - Reference Construction Permit No. _____
- ☒ Cherry Creek Basin only, choose one: ☐ Tier 1 ☐ Tier 2 ☒ Tier 3
- ☐ No control measures provided (See Permanent WQ Worksheet for applicability)

Summary of Water Quality Conformance to MS4 Permit

2. Was an exclusion to water quality applied as per SDDTCM Section 13.1.5? ☒ Yes ☐ No

i. If yes, please select all that apply, provide total excluded impervious area(s) and submit variance, as applicable: TCV No. TO BE INCLUDED WITH PHASE III DRAINAGE REPORT(S)

☐ Pavement management site

Excluded impervious area: _____ acres

☐ Excluded roadway redevelopment

Excluded impervious area: _____ acres

☐ Excluded existing roadway areas

Excluded impervious area: _____ acres

☐ Above ground and below ground utilities

☐ Large lot single family home

☐ Non-residential and non-commercial infiltration

Excluded impervious area: _____ acres

☒ Land disturbance for land to remain undeveloped

Excluded impervious area: 1.9 acres

☐ Stream Stabilization Sites

Excluded impervious area: _____ acres

☒ Trails

Excluded impervious area: 1.2 acres

☐ Oil and Gas Exploration

3. For Development and Redevelopment sites, following any exclusions claimed above, was any portion of the site excluded up to 20% of the site and not to exceed one acre? ☐ Yes ☒ No

If yes, complete the following:

Excluded area: _____ acres

Total Site area: _____ acres, _____ % site excluded

4. For Constrained sites, was any portion of the site excluded up to 50% of the site and not to exceed 50% of the impervious area? ☐ Yes ☒ No

If yes, complete the following:

Excluded area: _____ acres

Excluded impervious area: _____ acres

Total Site area: _____ acres, _____ % site excluded

Total Impervious area: _____ acres, _____ % impervious excluded

Permanent Water Quality Determination Worksheet (Taken from 2019 SDDTCM Sections 13.1.4 and 13.1.5)

Project:		Project#		Applicant:
Section	Questions	Response	Check those that apply	Instructions
1	Non-applicable Sites			
1.1	Will the project result in a temporary disturbance of greater than one acre?	No Yes	☐ ☒	Proceed to section 1.2. Proceed to section 2.
1.2	Is the project part of a larger common plan of development or sale where multiple separate and distinct construction activities may be taking place at different times on different schedules, but remain related and are within 1/4 mile of each other? (A common plan of development will generally be documented on a site development plan, master plan, or equivalent, for the property/project)	No Yes	☐ ☐	Proceed to section 1.3. Proceed to section 2.
1.3	Is the project within the Cherry Creek Watershed?	Yes No	☐ ☐	Permanent water quality control measures may be required. Refer to Water Quality Control Regulation 72.7 for details and allowable exclusions. Permanent water quality control measures are not required.
2	Applicable Site Types and Exclusions by Variance			
2.1	Does the project have more than 35% impervious area on the existing site?	No Yes	☒ ☐	Project is an applicable Development Site. Proceed to section 3. Proceed to 2.2.
2.2	Does the project have greater than 75% impervious area on the existing site?	No Yes	☐ ☐	Project is an applicable Redevelopment Site. Proceed to section 3. Project is an applicable Constrained Redevelopment Site. Proceed to 2.3.
2.3	Will 100% of the runoff from the existing and proposed site be captured and treated using one or more of the allowable design standards for permanent water quality?	Yes No	☐ ☐	No further action required. Proceed to 2.4.
2.4	Do any other water quality exclusions apply to the site?	No Yes	☐ ☐	Portions of the project are excluded. Proceed with design in accordance with Constrained Redevelopment standards and apply for variance for <u>Constrained Redevelopment Sites</u> . Proceed to section 3. Following approval of other exclusions, design remaining site in accordance with Constrained Redevelopment standards and apply for variance for <u>Constrained Redevelopment Sites</u> .
3	Applicable Sites with Other Exclusions by Variance			
3.1	Category 1: Roadways, bridges and trails only			
3.1.1	Is the project a bike or pedestrian trail?	Yes No	☐ ☐	Proceed to next line. Proceed to 3.1.2.
	Is the trail for a roadway?	Yes No	☐ ☐	Proceed to 3.1.2. Project is excluded. Submit variance for <u>Trails Excluded from Permanent Water Quality Requirements</u> .
3.1.2	Is the project primarily used for parking or access to parking?	Yes No	☐ ☐	This exclusion does not apply. Permanent water quality is required. Proceed to 3.1.3.
3.1.3	Does the project add impervious area?	No Yes	☐ ☐	Project is excluded. Submit variance for <u>Pavement Management Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to 3.1.4.

Section	Questions	Response	Check those that apply	Instructions
3.1.4	Does the project add more than 8.25 feet of paved width at any location to the existing roadway?	No Yes	☐ ☐	Project is excluded. Submit variance for <u>Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to next line.
	Does the project add more than one acre of paved area per mile to an existing roadway?	No Yes	☐ ☐	Project is excluded. Submit variance for <u>Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to next line.
	Does the project increase the width by two times or more, on average, of the original roadway area?	No Yes	☐ ☐	Existing areas of site are excluded only. Submit variance for <u>Existing Roadway Surfaces Only Excluded from Permanent Water Quality Requirements</u> . This exclusion does not apply. Permanent water quality is required.
3.2	Category 2: Non-residential and non-commercial projects only			
3.2.1	Is the project associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities, including activities necessary to prepare a site for drilling and the movement and placement of drilling equipment?	Yes No	☐ ☐	Project is excluded. Submit variance for <u>Oil and Gas Exploration Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to 3.2.2.
3.2.2	Is the project for stream stabilization?	Yes No	☐ ☐	Project is excluded. Submit variance for <u>Stream Stabilization Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to 3.2.3.
3.2.3	Is the project for installation or maintenance of aboveground or underground utilities or infrastructure that does not permanently alter the terrain, ground cover, or drainage patterns from those present prior to the construction activity including activities to install, replace or maintain utilities under roadways or other paved areas that return the surface to the same condition?	Yes No	☐ ☐	Project is excluded. Submit variance for <u>Aboveground and Underground Utilities Excluded from Permanent Water Quality Requirements</u> . Proceed to 3.2.4.
3.2.4	Is the project on undeveloped land (land with no human-made structures such as buildings or pavement) that will remain undeveloped after the project?	Yes No	☐ ☐	Project is excluded. Submit variance for <u>Sites with Land Disturbances to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements</u> . Proceed to 3.2.5.
3.2.5	Will the post-project condition result in surface water discharge during the 80th percentile storm runoff event?	No Yes	☐ ☐	Project is excluded. Submit study along with variance for <u>Non-residential and Non-commercial Infiltration Conditions Excluded from Permanent Water Quality Requirements</u> . This exclusion does not apply. Permanent water quality is required.
3.3	Category 3: Residential, Agricultural and Commercial projects			
3.3.1	Is the project a single-family residential lot, or agricultural zoned lands, greater than or equal to 2.5 acres in size per dwelling unit?	Yes No	☐ ☒	Proceed to next line. Proceed to 3.3.2.
	Is the project site greater than 10% impervious?	No Yes	☐ ☐	Project is excluded. Submit variance for <u>Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to next line.
	Is the project site greater than 20% impervious?	Yes No	☐ ☐	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Will the post-project condition result in surface water discharge during the 80th percentile storm runoff event?	No Yes	☐ ☐	Project is excluded. Submit study along with variance for <u>Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements</u> . This exclusion does not apply. Permanent water quality is required.

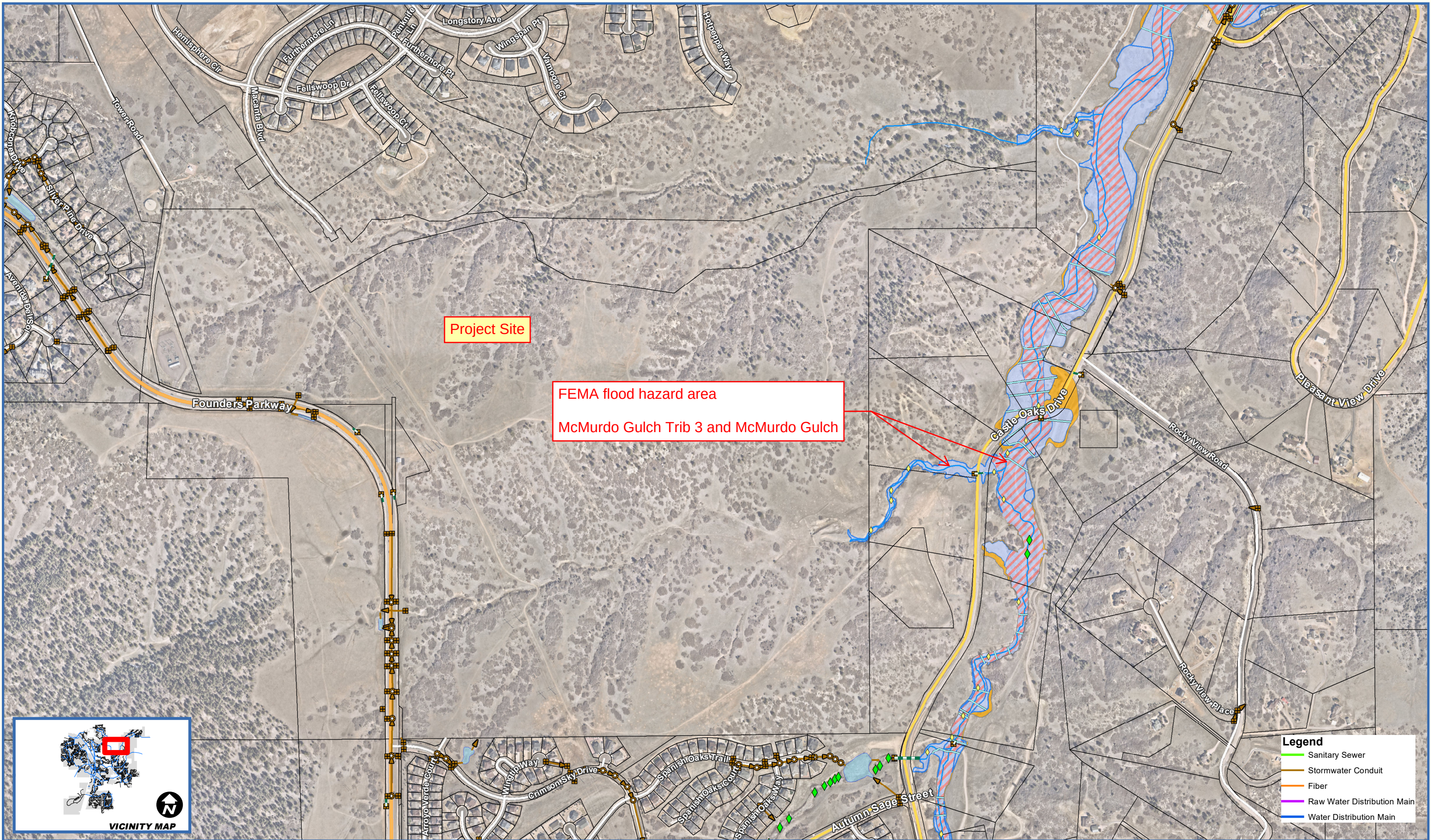
Section	Questions	Response	Check those that apply	Instructions
3.3.2	Will 100% of the runoff from the residential or commercial site be captured?	Yes No	☒ ☐	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is all or a portion of the site undeveloped or will it remain undeveloped after construction?	Yes No	☐ ☐	This portion of the project is excluded. Submit variance for <u>Sites with Land Disturbance to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements</u> . Proceed to next line. Proceed to next line.
	Is the remaining untreated impervious area greater than 20% of the site?	Yes No	☐ ☐	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is the remaining untreated impervious area greater than one acre?	Yes No	☐ ☐	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is it practicable to capture runoff from portions of the site that will not drain to a control measure?	No Yes	☐ ☐	Document justification demonstrating that it is not practicable to capture runoff from this portion of the site in the drainage report . No further action is needed. This exclusion does not apply. Permanent water quality is required.



APPENDIX D

REFERENCED INFORMATION





NOTES TO USERS

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Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodway were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Floodway Data table shown on this FIRM.

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NGS Information Services
NOAA, NNGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

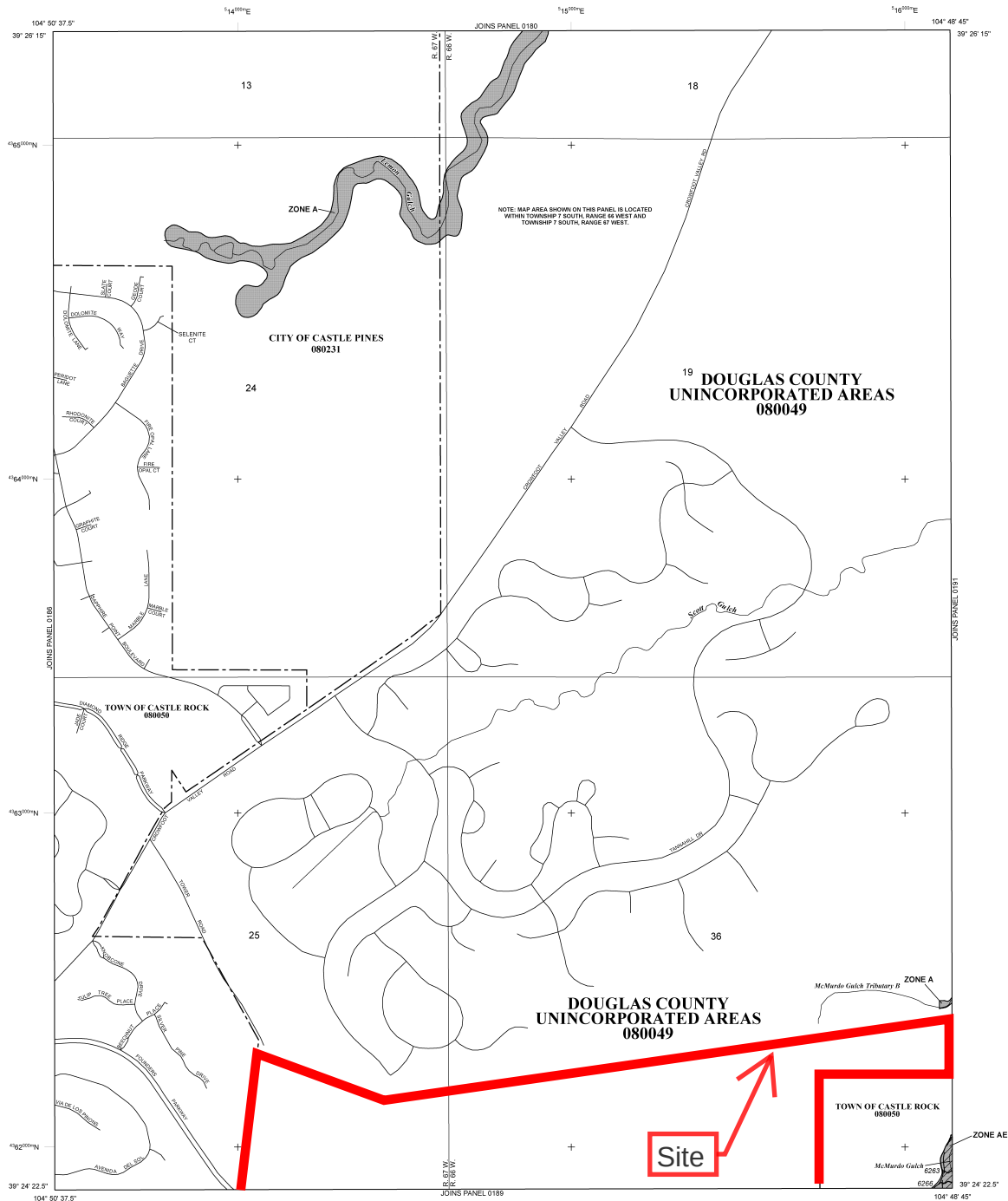
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LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO Delineation BY THE 1% ANNUAL CHANCE FLOOD.
The 1% annual chance flood (100-year flood), also known as the **base flood**, is the flood that has a 1% chance of being equaled or exceeded in any given year. The area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, AV, and VE. The **Base Flood Elevation** is the water-surface elevation of the 1% annual chance flood.

- ZONE A**
No Base Flood Elevations determined.
- ZONE AE**
Base Flood Elevations determined.
- ZONE AH**
Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO**
Flood depths of 1 to 3 feet (usually shear flow on sloping terrain); average depths determined; for areas subject to flooding, velocities also determined.
- ZONE AR**
Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently described. Zone AR indicates that the former flood control system is being retained to provide protection from the 1% annual chance or greater flood.
- ZONE AV**
Areas to be protected from the 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE VE**
Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- FLOODWAY AREAS IN ZONE AE**

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

- OTHER FLOOD AREAS**
- ZONE X**
Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with discharge areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- OTHER AREAS**
- ZONE X**
Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D**
Areas in which flood hazards are undetermined, but possible.
- COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**
- OTHERWISE PROTECTED AREAS (OPAs)**

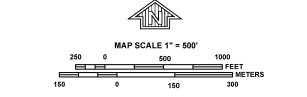
CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% Annual Chance Floodplain Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- Base Flood Elevation line and value; elevation in feet*
- Base Flood Elevation value where uniform within zone; elevation in feet*
- *Referenced to the North American Vertical Datum of 1988
- Cross section line
- Traverse line
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 1000-meter Universal Transverse Mercator grid values, zone 13
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- MI 5
- River Mile

MAP REPOSITORIES
Refer to Map Repository List on Map Index.
EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
SEPTEMBER 30, 2005
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

MARCH 16, 2016: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to update map format, to add roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision.

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NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0187G

FIRM
FLOOD INSURANCE RATE MAP
DOUGLAS COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 187 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CASTLE ROCK, TOWN OF	080050	0187	G
DOUGLAS COUNTY	080049	0187	G
CASTLE PINES, CITY OF	080231	0187	G

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

MAP NUMBER
0803C0187G
MAP REVISED
MARCH 16, 2016

Federal Emergency Management Agency

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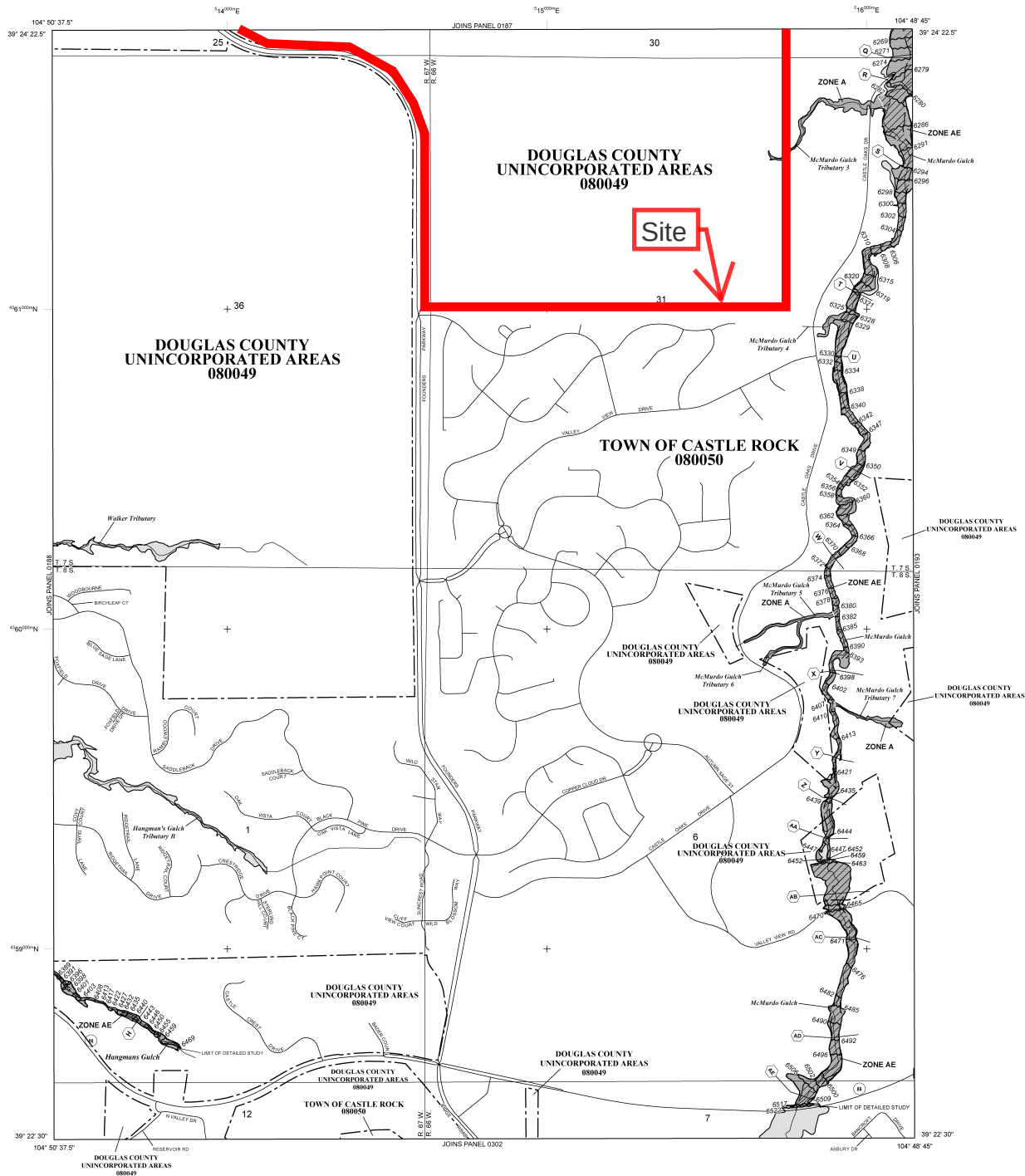
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- Transect line**
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere**
- 1000-meter Universal Transverse Mercator grid values, zone 13**
- 89°00'N**
- DMS10 X**
Bench mark (see explanation in Notes to Users section of this FIRM)
- M15**
River Mile

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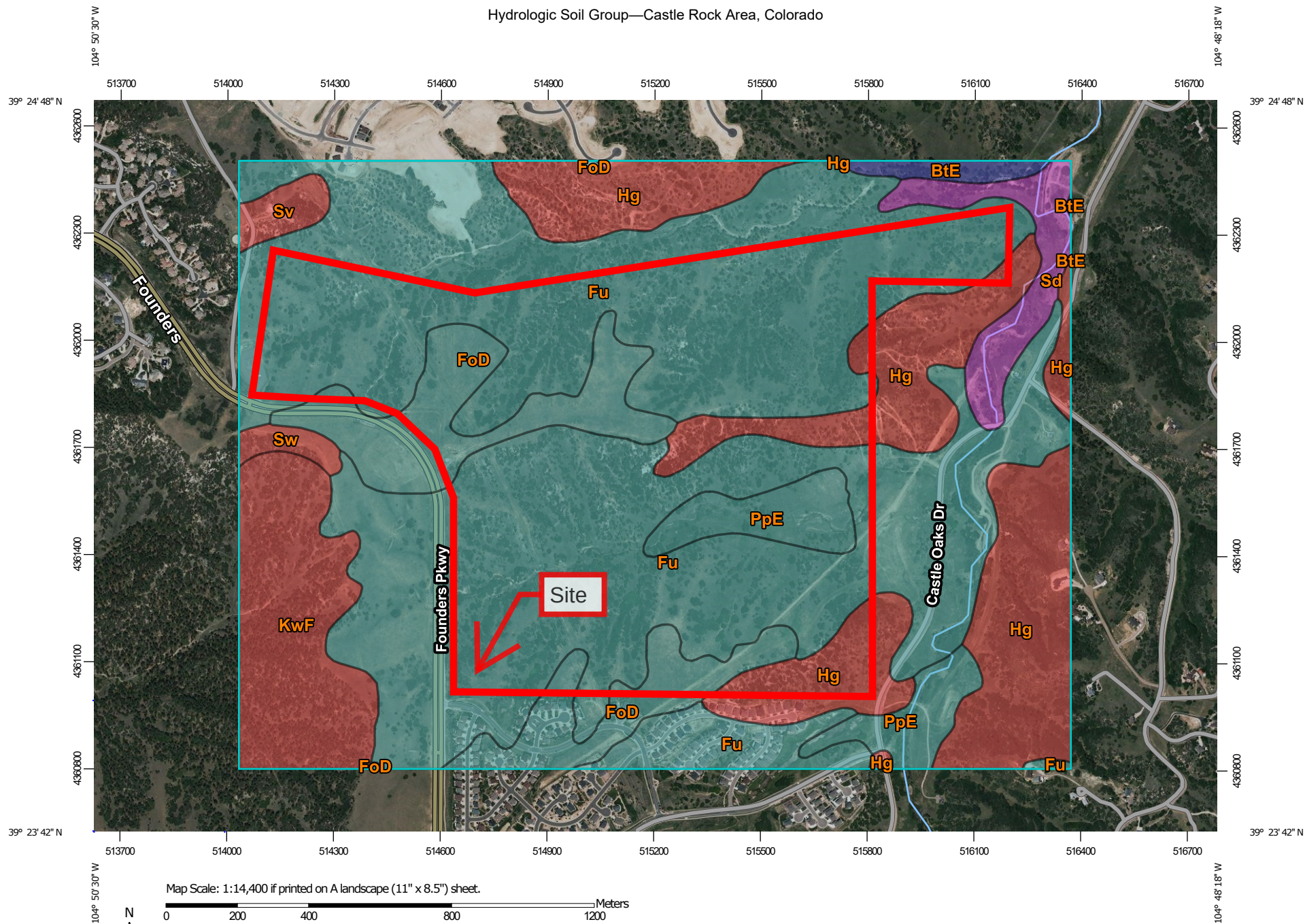
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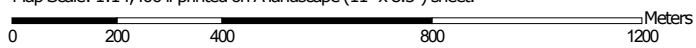
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Hydrologic Soil Group—Castle Rock Area, Colorado



Map Scale: 1:14,400 if printed on A landscape (11" x 8.5") sheet.



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



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

7/5/2023
Page 1 of 4

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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: Castle Rock Area, Colorado

Survey Area Data: Version 15, Sep 1, 2022

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

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BtE	Bresser-Truckton sandy loams, 5 to 25 percent slopes	B	7.0	0.7%
FoD	Fondis clay loam, 3 to 9 percent slopes	C	83.6	8.5%
Fu	Fondis-Kutch association	C	583.0	59.0%
Hg	Hilly gravelly land	D	168.2	17.0%
KwF	Kutch-Newlin-Stapleton complex, 8 to 40 percent slopes	D	67.9	6.9%
PpE	Peyton-Pring-Crowfoot sandy loams, 5 to 25 percent slopes	C	37.3	3.8%
Sd	Sandy alluvial land	A	26.6	2.7%
Sv	Stony steep land	D	8.4	0.8%
Sw	Stony steep land, cold	D	5.8	0.6%
Totals for Area of Interest			987.8	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



**CANYONS FAR SOUTH
POND G AND TRIBUTARY B MEMO**

OCTOBER 2024

TABLE OF CONTENTS

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	B. Initial Submissions	4
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	C. Design Intent	9
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I. SCOPE

The purpose of this memo is to confirm the drainage intent of Pond G and the Tributary B channel for the Canyons Far South development after conversations with the Town of Castle Rock and Douglas County.

II. SUMMARY

A. Overview

- Canyons Far South will cover approximately 361± acres.
 - The site is located south of Crowfoot Valley Road, north and west of Castle Oaks Drive, and east of Founders Parkway.
 - In Town of Castle Rock, Douglas County, CO.



Site Location

- Canyons Far South will tie-in to the existing infrastructure along Founders Parkway to the west, Castle Oaks Drive to the south, and Macanta Boulevard in Douglas County to the north.
- Canyons Far South includes five (5) proposed Planning Areas. The Planning Areas will be composed of single-family lots, future commercial, parks, and preserved natural open space.
- This site outfalls to the east to McMurdo Gulch, which drains northeast to Cherry Creek.
- Tributary 3 of McMurdo Gulch is located within the property in Town of Castle Rock.

CANYONS FAR SOUTH
POND G AND TRIBUTARY B MEMO
PAGE 4 OF 9

- Tributary B (also known as Tributary 2) is located offsite to the north in Douglas County. The north half of the property outfalls to Tributary B. The same developer owns the property where Tributary B is located.
- There are no improvements directly to McMurdo Gulch anticipated for this project.
- McMurdo Gulch Tributary 3 contains flood zone within the property, at the extreme eastern edge of the site. These can be seen in the FEMA FIRM map 08035C0189G located in Appendix D. No impacts to this floodplain are anticipated by this project.

B. Initial Submissions

- Canyons South Planned Development Plan (PDP) was submitted by Dig Studio, Inc. and CORE Consultants, Inc. in October 2022.
 - This plan had assumed the property would be under one ownership and have nine individual ponds located along the property line. This showed seven ponds along the north adjacent to Tributary B.
 - The total area of the ponds as shown on the plan were not sized for the ultimate development conditions. With conservative assumptions (10' pond depth along the perimeter of the pond shape of the PDP) it can be assumed that as drawn, the PDP only accounted for 12.56 acre-feet of pond storage (9.77 acre-feet along Tributary B).
 - The PDP was intended to be conceptual and subject to change.
- Canyons Far South Site Development Plan (SDP) was submitted by Cover 3 Engineering (Cover 3) in October 2023.
 - Pond G was located in the Phase II Drainage Report along Tributary B (offsite to the north in Douglas County) to treat runoff from Canyons Far South, and offsite drainage from the north.
 - Pond G was located to minimize impacts to the property and Tributary B. This would also ensure all runoff would be captured and treated before releasing to McMurdo Gulch. This allowed for the seven individual ponds from the PDP to be removed.
 - Pond G was calculated to require a volume of 18.3 acre-feet.
- Canyons Far South SDP submission 2, Filing 1 submission 1, and Filing 2 submission 1 were submitted in May 2024. These have not been reviewed by the Town of Castle Rock yet.
 - Pond G was moved further downstream away from residential lots and to further minimize impacts to Tributary B. The Pond is now located along an existing stock pond which preserves more trees.
 - Additional Pond G details were added with Filing 1 including a drop structure into the pond and outfall riprap.
 - Channel stabilization was added with Filing 1 with check structures along Tributary B upstream of Pond G. This is due to channel runoff and velocities anticipated to be increased due to development.
 - Channel grading was included with Filing 1 to reduce steep side slopes along the channel where needed. A stock pond upstream of Pond G was also regraded to be removed.

- From May 2024 through October 2024, Cover 3 has discussed this project's lot configuration, open space, and drainage design with the Town of Castle Rock and Douglas County.
 - An analysis was performed and an exhibit was prepared to consider the impacts if seven ponds were to be constructed within the Town of Castle Rock property (as shown on PDP). This would reduce the total volume from 18.3 acre-feet to 11.5 acre-feet (still larger than the PDP's conservatively assumed volume of 9.77 acre-feet, though).
 - With less volume, there would still be significant grading impacts. A large amount of trees and open space would be disturbed with this option. The design team does not think this seven pond option is the best configuration.

III. DRAINAGE DESIGN

A. Existing Conditions and Site Visits

- There have been multiple visits to the site prior to the initiation of design. Existing conditions have also been reviewed through the ALTA Survey and by examining Google Earth.
- This helped the design team to be able to review the existing channels and conditions of the structures along the channels. With this information, the best location for drainage facilities to serve the Canyons Far South development were determined. This also ensured that the existing channel along Tributary B and Tributary 3 would be preserved and enhanced where necessary.
- Images below are from site visits in August 2023.



Tributary B



Tributary B



Tributary 3

B. Regulations and Existing Reports

- Canyons Far South has been designed in general accordance with the *Town of Castle Rock Storm Drainage Design and Technical Criteria*, *Town of Castle Rock Public Works Regulations*, and Mile High Flood District (MHFD) where applicable.
- Snips from the *Castle Rock SDDTC* are included below. Highlights are included for emphasis that influenced the design up to this point.

12.0.3 Vision for Drainageways. Drainageway modification is intended to reflect a natural stream character, attained by preserving and restoring existing natural drainageways and, when necessary, creating new drainageways with natural features. Natural planform and cross-sectional geometry, riparian vegetation, and natural grade control features are to be emulated wherever possible.

The vision is to go beyond just stabilizing a channel against erosion (which technically could be accomplished by lining the channel with concrete), and to implement *enhanced stream stabilization*. Enhanced stream stabilization has the goal of creating natural streams and well-vegetated floodplains that are physically and biologically healthy, with all of the attributes shown in Figure 12-1. This goal is just as important as improving the water quality of runoff flowing off a development site and into a receiving stream.

12.1 Drainageway Preservation and Stabilization

12.1.1 Preservation of Natural Drainageways. Natural drainageways and floodplains shall be preserved wherever possible. Initial site planning documents shall accurately identify all existing drainageways, floodplains, and other site features that may be considered to have a high resource value. The features that are proposed to be left in place and preserved or restored shall be clearly shown on the initial site planning documents. Areas shown to be protected will be subject to the review and acceptance of the Town.

Although a development project can preserve additional areas, drainageways that have one or more of the following features or characteristics, generally defined as major drainageways, shall be protected and preserved.

- Presence of protected habitat for threatened and endangered or other protected species.
- Presence of jurisdictional wetlands.
- Presence of riparian vegetation such as cottonwood or willow trees, shrub willows, and wetland or transitional grasses.

12.1.2 Stabilization of Natural Drainageways. Because the increased runoff from urbanization typically leads to channel erosion (with all the associated impacts described in Section 12.0.2), it is not acceptable to simply "leave a stream alone", even when preserving drainageways as discussed in Section 12.1.1. Detention facilities do not fully mitigate impacts to the drainageways, as the adverse impacts are also related to increased runoff volumes and frequency of runoff events. Therefore, natural drainageways shall be stabilized using one of the three approaches described below:

1. **Preserving Streams Not Yet Impacted.** Drainageways that have not yet experienced degradation from increased urban runoff or other forms of erosion shall be preserved by implementing the following improvements:
 - Grade control structures to limit degradation in the low flow channel, stabilize any existing headcutting and to establish a flatter equilibrium slope than may have existed previously.
 - Bank stabilization at select locations where existing instability or the potential for future instability is evident.
 - The planting of supplemental vegetation to provide for the transition to species suited for "wetter" urban hydrology. Additional moisture can sustain wetland and riparian vegetation. These grasses, sedges and rushes, shrubs, and trees can help to stabilize the channel and provide a diverse habitat for wildlife.
2. **Restoring Impacted Streams.** Drainageways that have already experienced significant erosion and downcutting are to be addressed differently than streams that are not degraded. Restoration of these types of drainageways require the following improvements:
 - Eroded, incised channels, if possible, shall not be stabilized in a manner that retains the incised geometry with steep side banks, but shall be restored by raising the channel invert up to its historic condition and

13.2 Regional, Sub-regional, and On-site Detention Facilities

There are three basic approaches for configuring detention facilities, as described below.

13.2.1 Regional Detention. Regional detention, as recognized by Town of Castle Rock, refers to online facilities located on a major drainageway, with an upstream watershed area generally ranging from about 130-acres to one-square mile. The definition of a major drainageway is discussed in Section 12.0.4. Figure 13-2 provides a generalized illustration of a regional detention approach.

Regional detention facilities may be constructed by a public entity such as a municipality or special district to serve several landowners in the upstream watershed. It may also be possible for a single landowner to construct a regional facility if the upstream watershed lies within the area controlled by the owner. Even if the upper part of the watershed is owned by others, it may be possible for a single landowner to construct a regional facility if the conditions below are satisfied and the Town approves the concept.

Compared to on-site facilities, regional detention facilities are typically more reliable, require less land area, and are more cost effective to construct and maintain. Regional facilities, being larger, can generally provide more favorable riparian habitat and offer greater opportunities for achieving multi-use objectives, such as combining with park and open space resources and connecting to trail systems. Because of these benefits, Town of Castle Rock requires that new development implement regional or sub-regional detention at a subdivision level in lieu of on-site detention at the time each lot is developed. For large subdivisions, the Town requires that regional or sub-regional detention be implemented by the first sub-divider rather than passing on the responsibility for detention to owners of individual filings. The Town encourages sub-regional detention to be the first option evaluated prior to regional detention. Regional detention will be approved by the Town on a case-by-case basis.

- The design team has also reviewed the McMurdo Gulch Assessments from 2011 and 2017 that were provided by Castle Rock.
 - The conceptual plan of improvements only proposed structures along the main channel of McMurdo Gulch. The Canyons Far South property is not located along the main channel of McMurdo Gulch. There are no improvements directly to McMurdo Gulch anticipated for this project.
 - The design intent of both McMurdo Gulch Assessments recommended softer approaches to maintain more natural approaches along the watershed. Canyons Far South has implemented this with the design intent thus far.
 - Further, full-spectrum detention facilities have been designed to release runoff close to historic. Canyons Far South agrees that this is the best approach.
- Additional referenced documents for Canyons Far South include:
 - *McMurdo Gulch Flood Hazard Area Delineation*, CH2MHill, Amended February 2012
 - *Canyons South Filing No. 1 – Phase III Drainage Report*, Calibre Engineering Inc., August 12, 2019.
 - *Canyons South – Filing 2 Phase III Drainage Report*, Calibre Engineering Inc., July 2021

C. Design Intent

- The design team has determined that based on all existing information, site visits, regulations and reports reviewed up to this point, conversations with the Town of Castle Rock and Douglas County, and previous design experience that the one pond option is the best option.
 - This design will ensure McMurdo Gulch Tributary B and McMurdo Gulch downstream are not adversely impacted.
 - Additional open space and mature trees will be preserved with this one pond. It will improve the neighborhood and offsite neighbors in Douglas County.
 - It will ensure long term maintenance is minimized as well with one pond.

IV. CONCLUSIONS

- The previously discussed drainage design for Canyons Far South is the best path forward. Pond G is located along Tributary B as one pond to serve the entire development and offsite areas. Onsite flows will be conveyed to existing Tributary B before being treated by Pond G. The channel will be stabilized and grading modified as necessary. All flows will be captured and released at historic rates to ensure no negative impacts downstream.
- Confirmation from the Town of Castle Rock would be appreciated prior to advancing the design forward.



MCMURDO GULCH ASSESSMENTS

EXCERPTS FROM TOWN OF CASTLE ROCK

Memorandum

McMurdo Gulch Reclamation Template

To: David Van Dellen / Town of Castle Rock
Bill Ruzzo / Cherry Creek Basin Water Quality Authority (CCBWQA)

From: Jim Watt / Muller Engineering Company
Joe Juergensen / Muller Engineering Company
Jim Wulliman / Muller Engineering Company

Date: September 6, 2011

Purpose

A reclamation plan for McMurdo Gulch, a major tributary to Cherry Creek in the upper watershed, was developed in 2010 and implemented in 2011 under the sponsorship of the Cherry Creek Basin Water Quality Authority and the Town of Castle Rock. Although relatively undeveloped at the time of the study, there are significant plans for further build-out in the McMurdo Gulch watershed, making the timing of the reclamation plan advantageous to implement a proactive approach to protect the gulch and reduce sediment and nutrient loads into Cherry Creek in advance of increased stormwater runoff and degradation. It is believed that implementing measures to protect the gulch *before* the onset of severe erosion will be more cost effective and more favorable to downstream water quality than reacting *after* increased runoff has a chance to degrade the gulch.

This memorandum documents the unique design process undertaken for the reclamation of McMurdo Gulch in the three mile study reach to serve as a guide, or “template” for the reclamation of similar tributary streams in the upper Cherry Creek watershed.



The proactive reclamation plan for McMurdo Gulch is intended to preserve and protect the stream’s environmental value prior to significant development in the watershed.

Elements of Reclamation Template

The primary elements of the McMurdo Gulch reclamation template are summarized below.

1. Start the process early. The reclamation process is intended to be proactive, best started prior to the onset of significant development and resulting stream erosion in the watershed. The objective of the approach is to implement improvements at the appropriate pace, in the appropriate locations, and of the appropriate type to stay ahead of problems while still stretching out capital expenditures over time.

2. Examine land use in the watershed. Obtain current aerial photography of the watershed to evaluate the locations and densities of existing developments. Examine planning documents and development plans that show projected land use and note the extents, representative imperviousness, and anticipated timing of development projects in the watershed. The larger the development, higher the average imperviousness, and quicker the anticipated build-out, the more the potential impact on downstream drainageways. Examine the information on soils, imperviousness, hydrology, hydraulics, and improvement recommendations in any existing master plans conducted for the watershed.

3. Inventory the stream. Undertake a field reconnaissance of the mainstem drainageway and major tributaries. Observe signs of instability (headcuts, bed degradation/ aggradation, bank erosion, constricted channel sections) and stability (lack of erosion, favorable cross sectional geometry, dense vegetation), presence of baseflows, soil conditions, stream bed material and sediment transport, longitudinal slope, vegetation characteristics, and any existing hydraulic structures such as dams, ponds, detention facilities, storm sewer outfalls, or grade control structures. Document conditions with field notes and photos. Locations of infrastructure such as roadway crossings and utilities should also be noted and any prior stream stabilization evaluations in existing master plans should be reviewed.

4. Develop plan to implement full-spectrum detention. Develop a plan to control peak discharges from developed areas to levels similar to or less than pre-development conditions over the whole spectrum of storm events -- from frequent small events to large flood-producing storms. At the least, it is anticipated that implementing full-spectrum detention in the watershed (and retrofitting existing detention facilities) to control runoff will reduce the level of improvements required for stream stabilization and will slow the pace of degradation such that funding resources can keep up with the required improvements. At best, it may be found that watershed-wide full-spectrum detention may eliminate the need for capital improvements in some stream reaches.

5. Develop proactive stream reclamation plan. Develop a plan to reinforce erosion “hot-spots” – the points along the stream that are weakest and most at risk for unraveling the stability of the whole system. Weak spots are determined both from observations of instability made during the field reconnaissance (Step 2) and from an evaluation of imposed and resisted shear stress from flood flow events. The goal of the first package of improvements is to address the areas of greatest concern and preserve the most stable stream features to reduce the level of risk for an entire reach at a far lower cost than undertaking an ultimate, conventional 100-year design. This is seen as a better long-term investment than, for the same dollars, applying a conventional design to just a portion of the stream length, perhaps over-securing one small section while leaving the remainder of the reach unprotected and vulnerable.

6. Conduct stream and watershed inventories annually. Track the developed area and imperviousness for each tributary subwatershed and the overall watershed on an annual basis. Inventory any planned or constructed developments in the watershed and assess the functionality of detention facilities in maintaining runoff rates at or below historic levels. Conduct annual stream inventories, assessing how the initial reinforcement improvements are functioning, how revegetation establishment is progressing, whether any signs of additional instability are noticed in reaches not addressed in the initial improvements, and the presence and magnitude of base flows. Prepare a brief report to document findings and present any recommendations for further improvements. Follow up on recommendations through design, funding, and implementation.

Each of these steps was applied to the McMurdo Gulch project, as discussed in the following sections.

Step 1. Start the Process Early

The concept of implementing a proactive stream stabilization approach on McMurdo Gulch was a collaborative idea of staff at the Town of Castle Rock and the Cherry Creek Basin Water Quality Authority. Pieter Van Ry with the Castle Rock Utilities Department and Bill Ruzzo, Technical Manager for the Authority, envisioned a study in the McMurdo Gulch watershed that would explore the benefits of assessing water quality issues and implementing improvements early enough to stay ahead of problems. Such a study, they reasoned, would be a good follow-up to the 2006 McMurdo Gulch Major Drainage-way Master Plan and could serve as an example, or template, for proactive water quality implementation in the upper Cherry Creek watershed. The study was approved and begun in the summer of 2009.

Step 2. Examine Land Use in the Watershed

McMurdo Gulch is a western tributary to Cherry Creek that has a watershed area of 6.5 square miles.

The McMurdo Gulch channel flows northward approximately 6.7 miles long from its southern headwaters to the confluence with Cherry Creek. Current aerial photography of the watershed was obtained and reviewed to determine the locations and densities of existing developments. Figure 1 shows the aerial coverage and identifies watershed and sub-watershed boundaries. At the time of the McMurdo Gulch study, only about one half square mile of the 6.5 square mile watershed was developed with any significant density. A small amount of commercial land use existed along Highway 86 in the southern, upstream end and two residential communities were being developed in the central and lower ends of the watershed. Castle Oaks is located on several tributary drainages that flow into McMurdo Gulch from the west in the central portion of the watershed and Liberty Village is located adjacent to mainstem McMurdo Gulch at the downstream end of the watershed. Canyons South is another large subdivision in the west-central portion of the watershed that is currently in the planning stages.

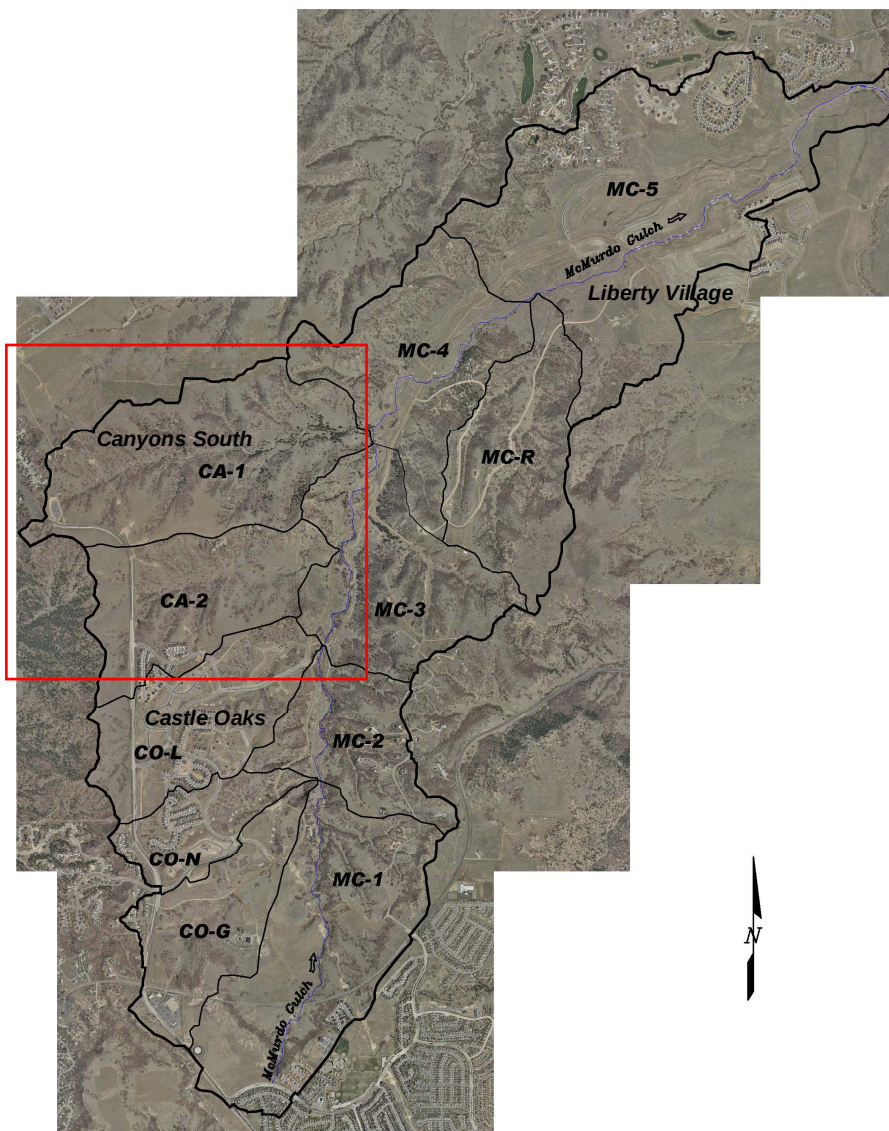


Figure 1. Recent aerial photography of McMurdo Gulch watershed showing the beginning stages of development.

McMurdo Gulch Reclamation Template

The aerial photography was evaluated to break existing land uses up into various categories, such as commercial uses, medium and high density residential, paved and gravel roadways, and open space. Representative imperviousness values were associated with these land uses and an overall estimate

Subwatershed	Area (acres)	Existing Imperviousness	Future Imperviousness
MC-1	503	9%	61%
MC-2	218	4%	33%
MC-3	360	3%	18%
MC-4	379	3%	10%
MC-5	893	8%	31%
MCR	312	3%	8%
CO-G	249	16%	34%
CO-L	298	18%	34%
CO-N	138	24%	34%
CA-1	489	3%	13%
CA-2	315	7%	18%
Overall	4154	8%	27%

Table 1. Existing and future development imperviousness by sub-watershed.

of imperviousness was made. The existing area-weighted impervious of the watershed is approximately 8 percent, as shown in Table 1. The future area-weighted imperviousness is approximately 27 percent that has been assessed under the watershed Protection, 2003) percent. Figure 2 shows

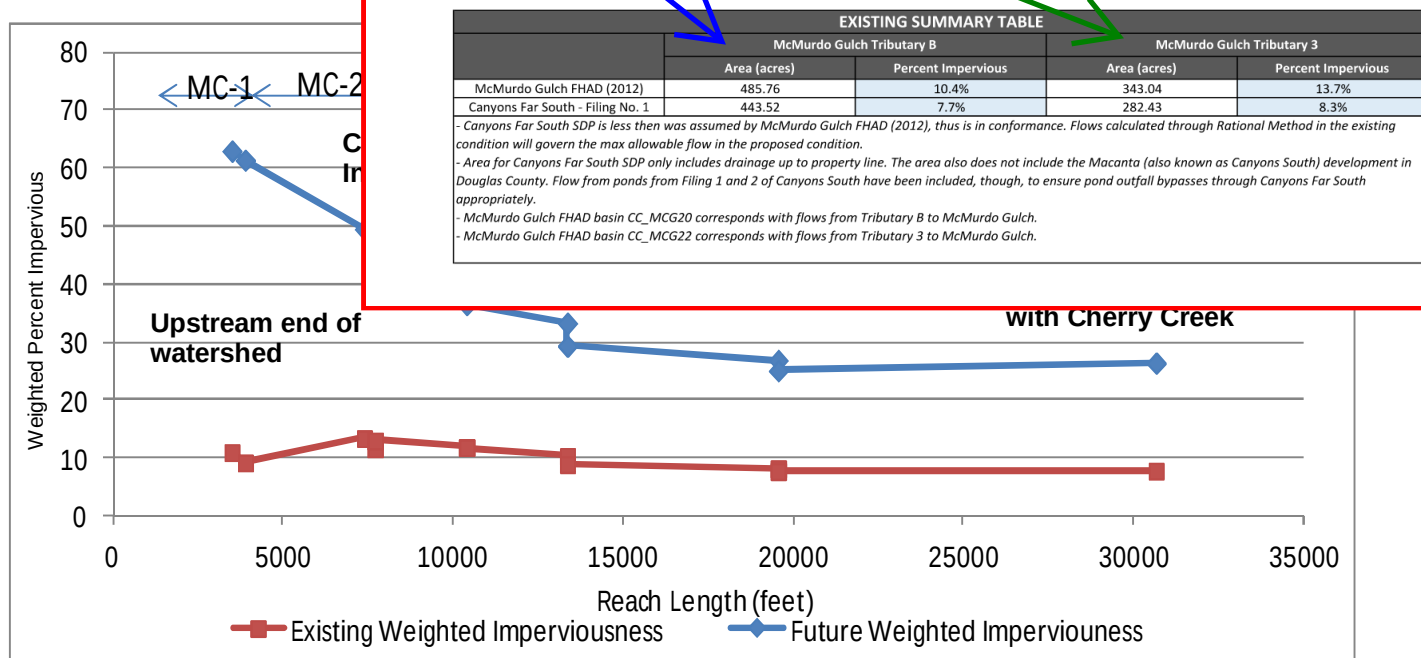


Figure 2. Cumulative imperviousness draining into McMurdo Gulch for existing and future development conditions.

reaches a high of 13 percent downstream of where Castle Oaks drains into the Gulch. This suggests that the timing of the McMurdo Gulch study, though proactive, is certainly not premature, since a portion of the Gulch already exceeds the 10 percent threshold of impacts. In future studies in other watersheds, it is recommended that similar “template” evaluations get started prior to reaching an imperviousness of 5 percent

watersheds to McMurdo Gulch. The light blue and dark blue bars (with and without offsite ponds) show that the combined outflows for the proposed retrofit plan are less than those for the current ponds and less than pre-developed conditions for all events, including the smaller, more frequent storms such as the 2-year. Although additional flow reductions would be possible by providing additional detention storage volume through raised spillways or excavation, based on the modeling completed these more extensive retrofit measures are not necessary to reduce discharges below pre-developed levels.

In addition to these recommended retrofit improvements, it is essential that future detention ponds implemented as part of new development be designed as full-spectrum detention facilities and modeled to ensure that runoff levels remain close to historic. Initial coordination between the Town of Castle Rock, Douglas County, and CCBWQA took place during the design process to define a common requirement of implementing full-spectrum detention for all future development within the basin.

Step 5. Develop Proactive Stream Reclamation Plan

A reclamation plan was developed to address the portions of McMurdo Gulch most susceptible to erosion. The improvements are located over a three mile reach adjacent to and downstream of the Castle Oaks tributaries where the existing watershed imperviousness exceeds 10 percent, as indicated in Figure 2. This is the portion of the gulch most at risk from stresses imposed by increased stormwater runoff and shows signs of weakness in a number of spots.



Boulder cascade drops being constructed at critical locations to protect the Gulch against major erosion while preserving existing riparian vegetation.

MEMORANDUM

CANYONS FAR SOUTH OCTOBER 2024 NOTE:

RED BOXES HAVE BEEN INCLUDED AS A PART OF THIS MEMO.

Project: 2016 McMurdo Gulch Reach Assessment

To: David Van Dellen, Town of Castle Rock
Barbara Horton, Town of Castle Rock
Jim Swanson, JRS Engineering

From: Joe Juergensen, Muller Engineering
John Yager, Muller Engineering
Spencer Wells, Muller Engineering

Date: January 31, 2017

Subject: McMurdo Gulch 2016 Reach Assessment Report

INTRODUCTION AND PROJECT BACKGROUND

Muller Engineering Company has completed a stream assessment of McMurdo Gulch to identify existing areas of potential instability and to prioritize these areas based on the level of severity. This assessment was completed in accordance with the *McMurdo Gulch Reclamation Template* completed by Muller, dated September 6, 2011. The template was completed as an initial phase of work and established a protocol for implementing a proactive management plan for stream preservation/restoration in developing watersheds.

Development has been increasing in the McMurdo Gulch basin and the goal is to implement timely channel stabilization within the study reach in order to mitigate increased flows experienced by the channel, while preserving the natural characteristics of the corridor. In addition to the stream assessment, conceptual design improvements and costs were proposed to address areas of instability that were identified as part of the stream assessment. This effort supplements the 2006 Master Plan completed by PBS&J and will serve as a 5 to 10-year road map to assist the Town of Castle Rock with budgeting of funds within the McMurdo Gulch watershed.

PROJECT LOCATION

The McMurdo Gulch Reclamation project is located in the northeastern corner of Section 6, Township 8 South, the eastern half of Section 31, and the western half of Section 29, Township 7 South, Range 66 West of the 6th Principal Meridian, in Douglas County, Colorado. More specifically, the project runs parallel to Castle Oaks Drive with the downstream limit being the lower crossing of Castle Oaks Drive and the upstream limit approximately 2,000 feet South of State Highway 86, station 90+00 to 350+00 (master plan stationing), including five tributaries at stations 172+00, 206+00, 271+00 (two at this location), and 282+00. A vicinity map showing the project location is presented in Appendix A as part of the McMurdo Gulch Reach Assessment.

- Areas of the channel with little to no erosion (but appear to have erosion potential with future development) can be improved by using purely vegetative approaches. These approaches can help transition the existing, more upland dominated plant species to a more riparian dominated plant species as development activities continue to increase base flows in McMurdo Gulch.
- Rock lining is proposed in areas of steeper slopes, and where the channel is slightly degraded.
- Drop structures and bioengineered bank protection are proposed to raise the channel invert and reconnect the channel to the floodplain in areas where steep slopes and head cuts are forming.

The recommended conceptual level improvements provided in this assessment utilize a different approach to channel stabilization than what was assumed during the development of the McMurdo Gulch Master Plan. The recommended conceptual level improvements are intended to be a softer approach to channel stabilization by taking advantage of existing healthy floodplain benches and banks, minimizing drop structure footprints, and limiting the use of grout and concrete. The softer approach incorporates vegetation and loose rock improvements to the maximum amount practicable. Harder improvements, consisting grouted boulder grade control structures, are recommended only in select locations where the channel geometry creates extreme hydraulic conditions. The overall approach is intended to provide stabilization up to the 100-year event with a final product that appears natural and requires less disturbance.

This assessment did not evaluate the need or costs associated with updating the existing roadway crossings of McMurdo Gulch; however, the size and structure type assumed in the master plan was noted on the reach assessment drawings.

The conceptual improvements discussed above were overlaid on LiDAR topographic mapping (1ft contours, 2014) and aerial imagery. These conceptual plans are presented in Appendix A.

PREVIOUS MASTER PLAN CHANNEL IMPROVEMENTS

Muller Engineering also completed a review of the 2006 McMurdo Gulch Master Plan completed by PBS&J, which identified channel stabilization improvements for the entire length of McMurdo Gulch. In general, the Master Plan recommends taller grouted boulder drop structures with larger footprints to contain the 100-year event along with several stretches of bank protection, and channel grading. Improvements to existing roadway bridge structures and tributary channels that enter McMurdo Gulch were also recommended in the Master Plan.

Master Plan stabilization improvements along McMurdo Gulch that have not already been constructed or are not proposed for stabilization as a result of Muller's recent site visit have been incorporated into the conceptual plans presented in Appendix A. The Master Plan improvements shown on the conceptual plans were updated to reflect stabilization techniques that are consistent with the remainder of this study. The scope of the improvements, including length of channel improvements, quantity and height of grade control structures/rock lining/bank protection, were not re-vamped by Muller, but instead were taken directly from the Master Plan. Master Plan improvements associated with roadway bridges and tributaries were not incorporated into the conceptual plans.

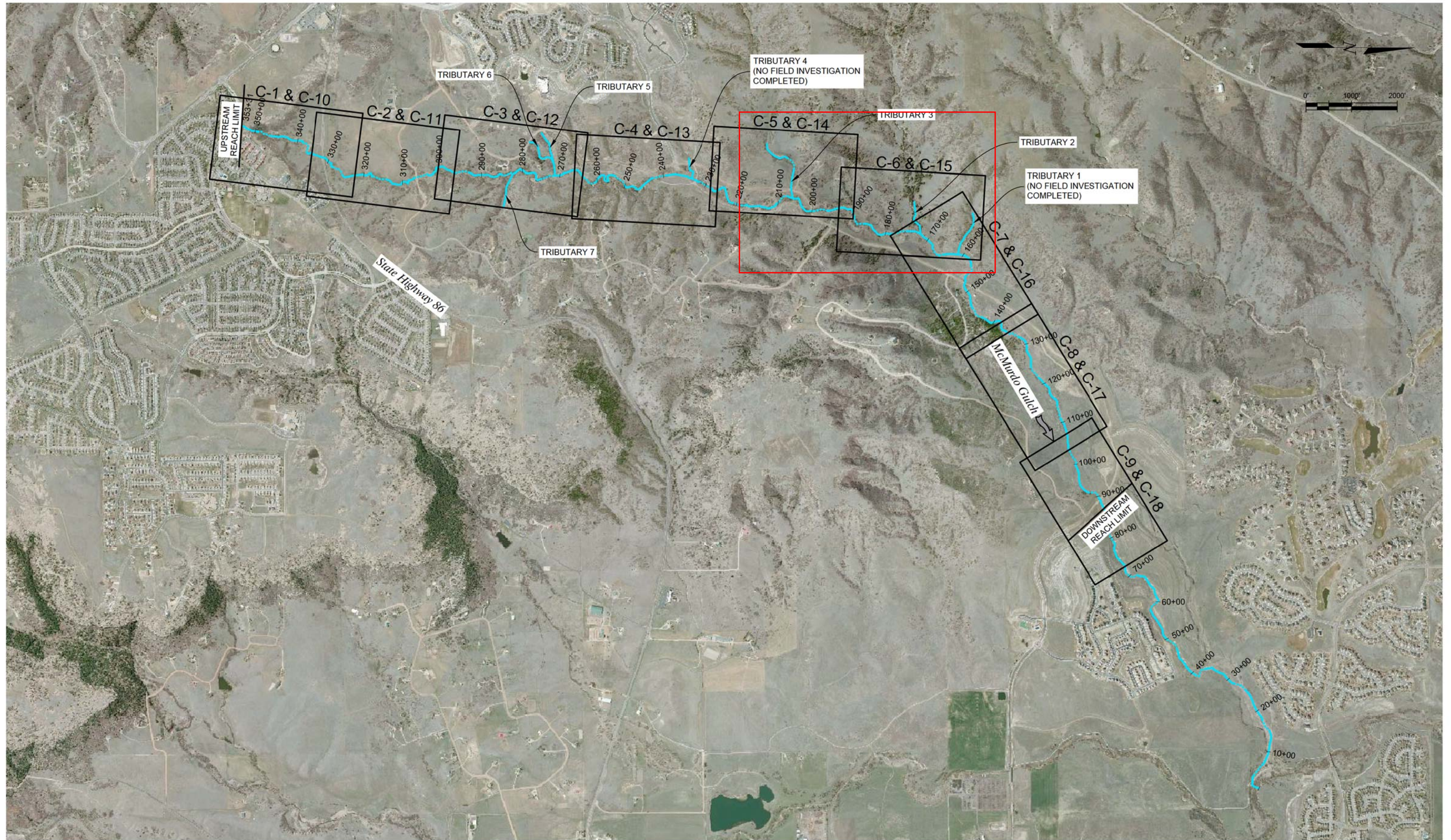
Table 1: Summary by Reach and Priority

Site	Higher Priority Costs		Lower Priority Costs	Potential Remaining Master Plan Improvements**
	First \$1.5M	Second \$1.5M		
STA 125+00 TO STA 132+00		\$367,550		
STA 137+00 TO STA 140+00		\$201,163		
MP STA 139+00 TO STA 141+00				\$54,873
STA 152+00 TO STA 165+00		\$315,069		
STA 172+00 TO STA 176+00	\$353,587			
MP STA 181+00 TO STA 183+00				\$144,983
STA 191+00 TO STA 194+00			\$208,667	
STA 200+00 TO STA 203+00			\$226,462	
MP STA 203+00 TO STA 205+00				\$138,904
STA 207+00 TO STA 214+00	\$437,620			
MP STA 232+00 TO STA 262+00				\$639,040
STA 255+00 TO STA 260+00	\$19,139			
STA 274+00 TO STA 278+00	\$330,117			
MP STA 280+00 TO STA 298+00				\$783,332
STA 317+00 TO STA 330+00			\$582,659	
STA 340+00 TO STA 348+00			\$740,044	
TRIBUTARY 3			\$97,141	
TRIBUTARY 5&6 HIGHER PRIORITY		\$229,253		
TRIBUTARY 5&6 LOWER PRIORITY			\$1,228,707	
Total Construction Cost*	\$1,140,463	\$1,113,034	\$3,083,679	\$1,761,132
10% Design	\$114,046	\$111,303	\$308,368	\$176,113
5% CLOMR and Permitting	\$57,023	\$55,652	\$154,184	\$88,057
10% Construction Services	\$114,046	\$111,303	\$308,368	\$176,113
5% LOMR and Monitoring	\$57,023	\$55,652	\$154,184	\$88,057
Total Design and Permitting Cost	\$342,139	\$333,910	\$925,104	\$528,340
Priority Total	\$1,482,602	\$1,446,944	\$4,008,783	\$2,289,472
Project Total			\$6,938,329	\$9,227,801

*Includes 9% Mobilization/Survey and 15% Contingency Costs.

**Master plan improvement costs only contain remaining master plan improvements on the main stem.
Tributaries 2,3,4 and 7 master plan improvements are not included.

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 NAME: P:07-012.01 CASTLE ROCK ON-CALL 07-012.21 MCMURDO GULCH STORM REPAIR AND REACH ASSESSMENT DRAWINGS 07-012.21 SITE DWG



PREPARED UNDER THE SUPERVISION OF
DESIGNED: SDW
DRAWN: MAB
CHECKED: JAY

CONCEPTUAL DESIGN

PROJECT NO. 07012.21

SHEET REVISIONS			
NO.	DATE	DESCRIPTION	BY



MULLER
ENGINEERING COMPANY
777 S. WADSWORTH BLVD. 4-100
LAKEWOOD, COLORADO 80226

TOWN OF CASTLE ROCK
175 KELLOGG COURT
CASTLE ROCK, CO 80109
(720) 733-6029
CONTACT: DAVID VAN DELLEN

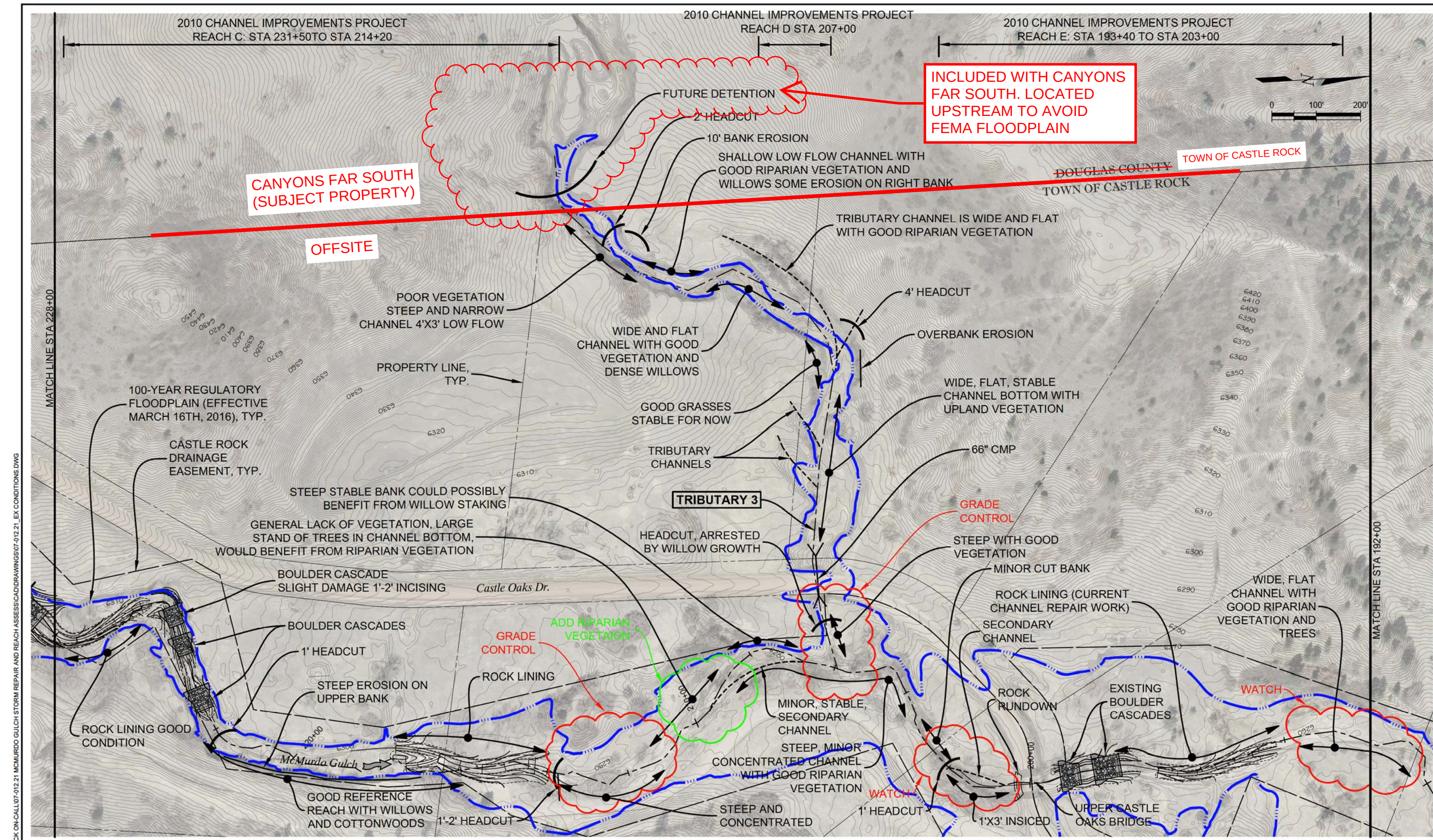


2016 MCMURDO GULCH REACH ASSESSMENT

KEY MAP

Page 19 of 43

DATE 1/2017
DRAWING NO. G-2
SHEET NO. 2 OF 23



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PREPARED UNDER THE SUPERVISION OF

DESIGNED: SDW
DRAWN: MAB
CHECKED: JAY

CONCEPTUAL DESIGN

PROJECT NO. 07012.21

SHEET REVISIONS		
NO.	DATE	DESCRIPTION



MULLER
ENGINEERING COMPANY
777 S. WADSWORTH BLVD. 4-100
LAKEWOOD, COLORADO 80226

TOWN OF CASTLE ROCK
175 KELLOGG COURT
CASTLE ROCK, CO 80109
(720) 733-6029
CONTACT: DAVID VAN DELLEN



2016 MCMURDO GULCH REACH ASSESSMENT

EXISTING CONDITIONS PLAN
STA. 228+00 TO STA. 192+00

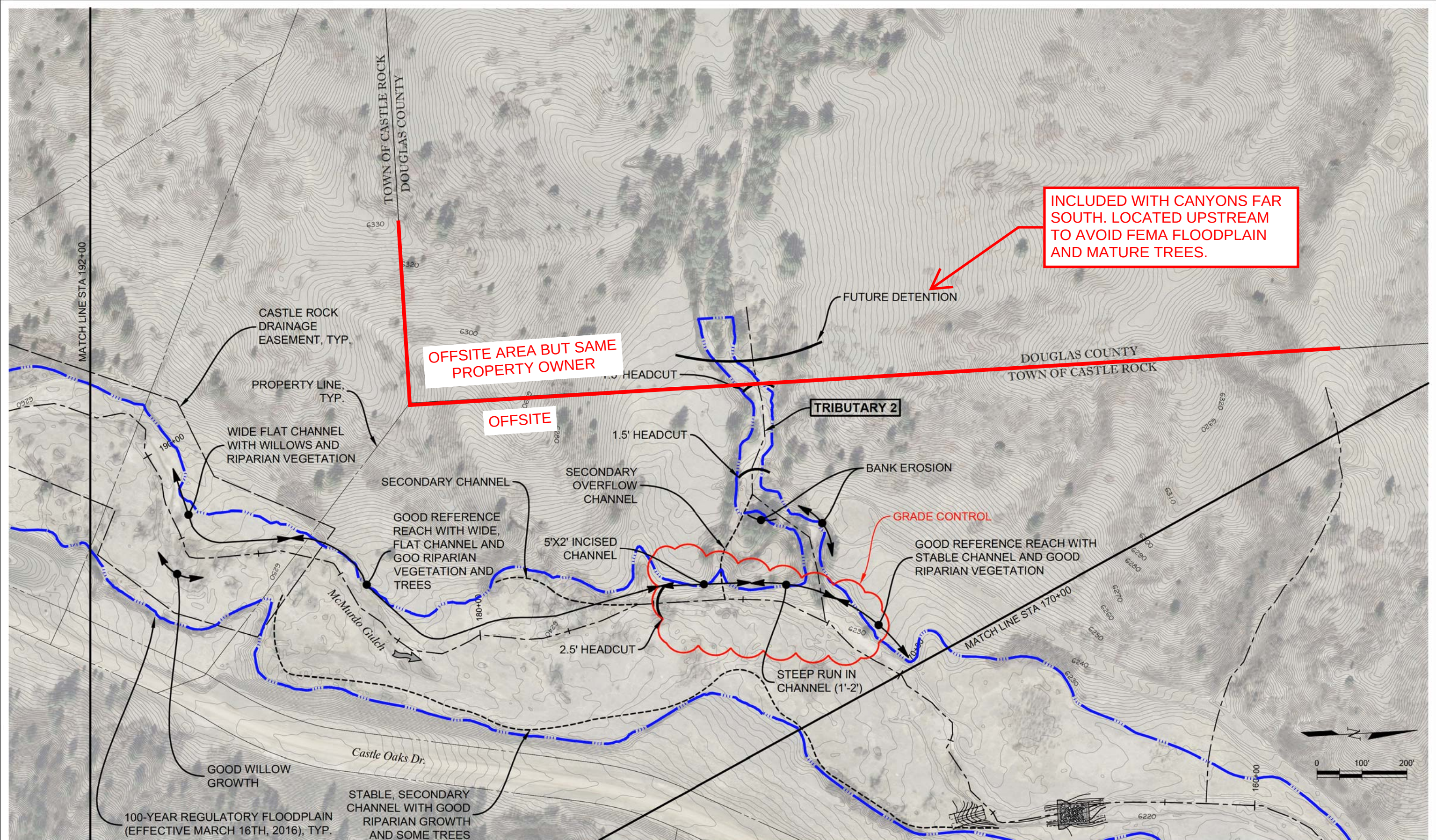
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1/2017

DRAWING NO.
C-5

SHEET NO.
7 OF 23

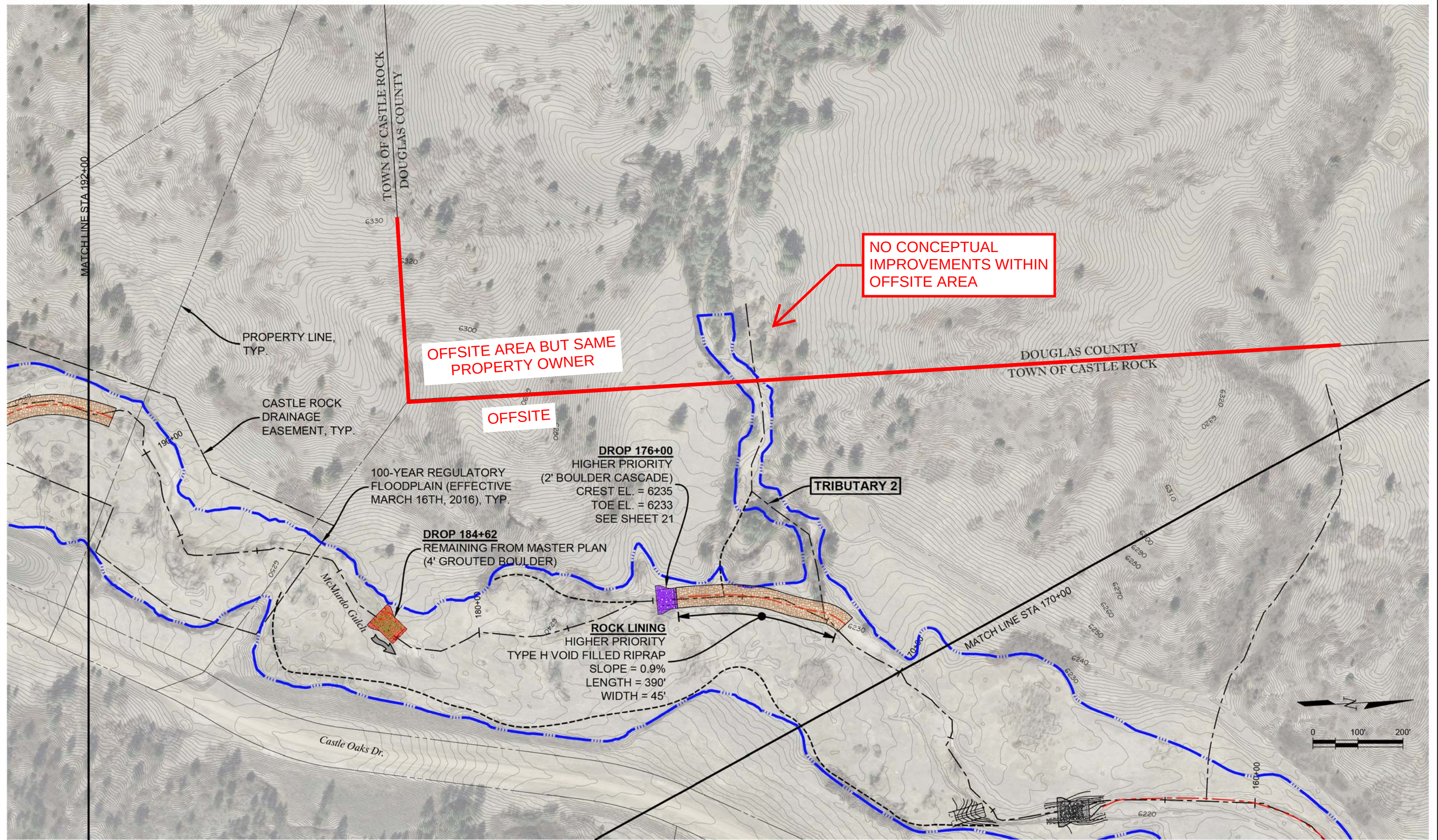
Page 20 of 43

PLOTTED: 2/1/2017 8:39:48 AM
 NAME: P:\07-012.01 CASTLE ROCK ON-CALL\07-012.21 MCMURDO GULCH STORM REPAIR AND REACH ASSESSMENT\DRAWINGS\07-012.21_EX CONDITIONS.DWG



PREPARED UNDER THE SUPERVISION OF DESIGNED: SDW DRAWN: MAB CHECKED: JAY	CONCEPTUAL DESIGN PROJECT NO. 07012.21	<table border="1"> <thead> <tr> <th colspan="4">SHEET REVISIONS</th> </tr> <tr> <th>NO.</th> <th>DATE</th> <th>DESCRIPTION</th> <th>BY</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>			SHEET REVISIONS				NO.	DATE	DESCRIPTION	BY																					 777 S. WADSWORTH BLVD. 4-100 LAKEWOOD, COLORADO 80226	TOWN OF CASTLE ROCK 175 KELLOGG COURT CASTLE ROCK, CO 80109 (720) 733-6029 CONTACT: DAVID VAN DELLEN		2016 MCMURDO GULCH REACH ASSESSMENT	DATE 1/2017
		SHEET REVISIONS																																			
		NO.	DATE	DESCRIPTION	BY																																
EXISTING CONDITIONS PLAN STA. 192+00 TO STA. 170+00		DRAWING NO. C-6																																			
Page 21 of 43		SHEET NO. 8 OF 23																																			

PLOTTED: 2/1/2017 8:53:05 AM
 NAME: P:07-012.01 CASTLE ROCK ON-CALL 07-012.21 MCMURDO GULCH STORM REPAIR AND REACH ASSESSMENT DRAWINGS 07-012.21 CONCEPTUAL DESIGN DWG



PREPARED UNDER THE SUPERVISION OF	DESIGNED: SDW	CONCEPTUAL DESIGN	PROJECT NO. 07012.21	SHEET REVISIONS			 MULLER ENGINEERING COMPANY 777 S. WADSWORTH BLVD. 4-100 LAKEWOOD, COLORADO 80226	 TOWN OF CASTLE ROCK COLORADO	2016 MCMURDO GULCH REACH ASSESSMENT		DATE 1/2017
	DRAWN: MAB			CONCEPTUAL PLAN STA. 192+00 TO STA. 170+00		DRAWING NO. C-15					
	CHECKED: JAY			Page 23 of 43		SHEET NO. 17 OF 23					



CANYONS SOUTH PDP

POND VOLUME REVIEW

PDP STANDARD NOTES

1.

MINERAL RIGHTS ASSOCIATED WITH THIS DEVELOPMENT HAVE NOT BEEN SEVERED. NOTIFICATION OF DEVELOPMENT HEARINGS BEFORE PLANNING COMMISSION AND TOWN COUNCIL SHALL BE PROVIDED TO OWNERS OF MINERAL ESTATES PURSUANT TO ARTICLE 65.5 OF TITLE 24, C.R.S.
2.

A PORTION OF THIS SITE LIES WITHIN FEMA FLOOD ZONE X & A PER MAP DATED March 16, 2016. NO STRUCTURES SHALL BE PERMITTED IN THE APPROVED 100-YEAR FLOOD PLAIN.
3.

THIS DEVELOPMENT PLAN IS NOT IMPACTED BY THE TOWN OF CASTLE ROCK SKYLINE/RIDGELINE PROTECTION REGULATIONS.
4.

THIS SITE IS WITHIN THE TOWN OF CASTLE ROCK PURPLE & RED WATER PRESSURE ZONE.
5.

ALL-WEATHER (CONCRETE OR ASPHALT) SURFACED ACCESS ROADS CAPABLE OF WITHSTANDING THE IMPOSED LOADS OF FIRE APPARATUS (75,000 LBS.) AND ALL REQUIRED FIRE HYDRANTS SHALL BE INSTALLED AND MADE SERVICEABLE PRIOR TO AND DURING ALL CONSTRUCTION.
6.

RIGHT-OF-WAY INGRESS AND EGRESS ACCESS FOR EMERGENCY VEHICLES AND PERSONAL IS GRANTED OVER, ACROSS, ON AND THROUGH ANY AND ALL PRIVATE ROADS, DRIVES, TRAILS AND WALKWAYS.
7.

A WILDLAND/URBAN INTERFACE WILDFIRE VEGETATION MANAGEMENT PLAN (PLAN), OR COMPLIANCE LETTER, IS REQUIRED TO BE SUBMITTED FOR EACH PHASE OF THE PLANNED DEVELOPMENT, WITH THE FIRST SITE DEVELOPMENT PLAN OR CONSTRUCTION DRAWINGS FOR EVALUATION AND APPROVAL BY THE TOWN OF CASTLE ROCK FIRE DEPARTMENT. THE PLAN SHALL BE DEVELOPMENT BY A DESIGN PROFESSIONAL FAMILIAR WITH WILDFIRE MITIGATION TECHNIQUES AND STANDARDS. REFER TO THE TOWN OF CASTLE ROCK COMMUNITY WILDFIRE PROTECTION PLAN.
8.

MONUMENTS, ORNAMENTAL COLUMNS, WINDOW WELLS, COUNTERFORTS, PATIOS, DECKS, RETAINING WALLS, AND THEIR COMPONENTS ARE NOT PERMITTED TO ENCROACH INTO UTILITY EASEMENTS.

UTILIZATION TABLE			
	Site Totals	Private Open Space Areas	Percentage of Site
Acreage	409 ac		100.0%
Planning Areas	165.1ac		40.4%
Open Space Private (OSP)		+/- 8.5ac	2.1% (part of PA)
Open Space Dedicated (PL-2)	217.6 ac		53.2%
Public Land Dedicated (PL-1)	13.8ac		3.4%
Right-of-Way*	12.5 ac		3.1%
* Actual acreage To Be Determined at Site Plan			

LEGAL DESCRIPTION

A PARCEL OF LAND BEING TRACTS V & X, CANYONS SOUTH FILING NO. 1A, 3RD AMENDMENT, A SUBDIVISION PLAT RECORDED AT RECEPTION NO. 2021023312, IN THE RECORDS OF THE DOUGLAS COUNTY CLERK AND RECORDER'S OFFICE AND PORTIONS OF THE SOUTH HALF OF SECTION 30 AND THE NORTH HALF OF SECTION 31, TOWNSHIP 7 SOUTH, RANGE 66 WEST & THE SOUTHEAST QUARTER OF SECTION 25, TOWNSHIP 7 SOUTH, RANGE 67 WEST OF THE SIXTH PRINCIPAL MERIDIAN, COUNTY OF DOUGLAS, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

THE BEARINGS FOR THIS DESCRIPTION ARE BASED ON THE EAST LINE OF THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 30, TOWNSHIP 7 SOUTH, RANGE 66 WEST OF THE SIXTH P.M., AS SHOWN ON SAID PLAT OF CANYONS SOUTH FILING NO.1A, 3RD AMENDMENT TO BEAR S 00°03'56" E, FROM THE EAST QUARTER CORNER OF SAID SECTION 30, BEING MONUMENTED BY A REBAR WITH A 2 INCH ALUMINUM CAP STAMPED "PLS 23515" TO THE SOUTH SIXTEENTH CORNER OF SECTIONS 29/30, BEING MONUMENTED BY A REBAR WITH A 1-1/2 INCH ALUMINUM CAP, STAMPED "PLS 23515", WITH ALL BEARINGS CONTAINED HEREIN RELATIVE THERETO.

COMMENCING AT THE EAST QUARTER CORNER OF SAID SECTION 30, THENCE S 00°03'56" E, ALONG THE EAST LINE OF SAID CANYONS SOUTH FILING NO. 1A, 3RD AMENDMENT AND ALONG THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SAID SECTION 30, A DISTANCE OF 798.31 FEET TO THE NORTHEAST CORNER OF SAID TRACT X AND THE POINT OF BEGINNING;

THENCE S 00°03'56" E, CONTINUING ALONG SAID EAST LINES, A DISTANCE OF 525.32 FEET TO THE SOUTH SIXTEENTH CORNER OF SECTIONS 29/30, ALSO BEING A POINT ON THE NORTH LINE OF CASTLE OAKS, A SUBDIVISION PLAT RECORDED AT RECEPTION NO. 150556, SAID DOUGLAS COUNTY RECORDS; THENCE ALONG THE NORTH AND EAST LINES OF SAID CASTLE OAKS PLAT, THE FOLLOWING THREE (3) COURSES:

1.

S 89°49'31" W, A DISTANCE OF 1319.43 FEET TO THE SOUTHEAST SIXTEENTH CORNER OF SAID SECTION 30;
2.

S 00°04'19" E, ALONG THE WEST LINE OF THE SOUTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SAID SECTION 30, A DISTANCE OF 1331.29 FEET TO THE EAST SIXTEENTH CORNER OF SAID SECTIONS 30/31;
3.

S 00°07'26" E, ALONG THE EAST LINE OF THE WEST HALF OF THE NORTHEAST QUARTER OF SAID SECTION 31, A DISTANCE OF 2643.38 FEET TO A POINT ON THE NORTH LINE OF CASTLE OAKS ESTATES FILING NO. 1, 9TH AMENDMENT, A SUBDIVISION PLAT RECORDED AT RECEPTION NO. 2033082860 AND A POINT ON THE NORTH LINE OF THAT BOUNDARY LINE AGREEMENT RECORDED AT RECEPTION NO. 2007016736, BOTH OF SAID DOUGLAS COUNTY RECORDS;

THENCE S 89°18'28" W, ALONG THE NORTH LINE OF SAID BOUNDARY LINE AGREEMENT AND ALONG THE NORTH LINES OF SAID CASTLE OAKS ESTATES FILING NO. 1, 9TH AMENDMENT, CASTLE OAKS ESTATES FILING NO. 1, AMENDMENT NO. 2, RECORDED AT RECEPTION NO. 2006078876 AND CASTLE OAKS ESTATES FILING NO. 1, RECORDED AT RECEPTION NO. 2003181990, A DISTANCE OF 3675.98 FEET TO THE SOUTHEAST CORNER OF THAT PARCEL OF LAND DESCRIBED IN THAT DEED RECORDED AT RECEPTION NO. 2009029995, SAID DOUGLAS COUNTY RECORDS;

THENCE ALONG THE EAST AND NORTH LINES OF SAID PARCEL OF LAND THE FOLLOWING TWO (2) COURSES:

1.

N 00°13'51" W, A DISTANCE OF 245.55 FEET;
2.

N 47°08'24" W, A DISTANCE OF 34.12 FEET TO A POINT ON THE EAST LINE OF THE FOUNDER'S PARKWAY RIGHT-OF-WAY, ORIGINALLY DEDICATED AS MILLER BOULEVARD, BY THE MILLER BOULEVARD FILING NO. 2 FINAL PLAT, A SUBDIVISION PLAT RECORDED AT RECEPTION NO. 8603133, SAID DOUGLAS COUNTY RECORDS;

THENCE ALONG SAID EAST LINE, THE FOLLOWING TWO COURSES:

1.

N 00°12'47" W, A DISTANCE OF 1420.37 FEET TO A POINT OF CURVATURE;
2.

ALONG THE ARC OF A CURVE TO THE LEFT HAVING A RADIUS OF 1005.00 FEET, A CENTRAL ANGLE OF 10°42'21" AND AN ARC LENGTH OF 187.79 FEET TO THE SOUTHWEST CORNER OF THAT PARCEL OF LAND DESCRIBED IN THAT DEED RECORDED AT RECEPTION NO. 2009099312;

THENCE ALONG THE SOUTH AND EAST LINES OF SAID PARCEL OF LAND THE FOLLOWING FIVE (5) COURSES:

1.

N 72°31'31" E, A DISTANCE OF 73.36 FEET;
2.

N 00°01'17" E, A DISTANCE OF 200.00 FEET;
3.

N 72°31'31" E, A DISTANCE OF 192.84 FEET;
4.

N 24°42'07" W, A DISTANCE OF 72.63 FEET;

SHEET INDEX

1.

COVER SHEET
2.

SITE CHARTS AND NOTES
3.

PDP SITE PLAN
4.

PHASING PLAN
5.

GRADING AND DRAINAGE
6.

ROAD SECTION
7.

PARKS, OPEN SPACE AND TRAILS PLAN
8.

NATURAL FEATURES
9.

PDP ZONING REGULATIONS
10.

PDP ZONING REGULATIONS
11.

PDP DESIGN GUIDELINES
12.

COMMERCIAL AREA AND SOUTHERN BUFFER CHARACTER

5.

N 33°43'04" W, A DISTANCE OF 424.14 FEET TO A POINT ON THE EAST LINE OF THE RIDGE ROAD RIGHT-OF-WAY;

THENCE N 00°01'17" EAST, A DISTANCE OF 88.15 FEET TO A POINT ON THE NORTH LINE OF SAID RIDGE ROAD RIGHT-OF-WAY;
THENCE S 89°47'43" W, ALONG SAID NORTH LINE, A DISTANCE OF 729.78 FEET TO A POINT ON THE NORTH LINE OF SAID FOUNDER'S PARKWAY RIGHT-OF-WAY AND A POINT OF NON-TANGENT CURVATURE;

THENCE ALONG SAID NORTH LINE, THE FOLLOWING THREE COURSES:

1.

ALONG THE ARC OF A NON-TANGENT CURVE TO THE LEFT, HAVING A RADIUS OF 1005.00 FEET, A CENTRAL ANGLE OF 13°57'59" AND ARC LENGTH OF 244.98 FEET, THE CHORD OF WHICH BEARS N 82°51'30" W, A DISTANCE OF 244.37 FEET;
2.

N 89°50'29" W, A DISTANCE OF 488.91 FEET TO A POINT OF CURVATURE;
3.

ALONG THE ARC OF A CURVE TO THE RIGHT, HAVING A RADIUS OF 895.00 FEET, A CENTRAL ANGLE OF 25°36'15" AND AN ARC LENGTH OF 399.95 FEET TO A POINT ON THE EAST LINE OF THE RIDGE ROAD RIGHT-OF-WAY, AS DESCRIBED IN THAT DEED RECORDED AT RECEPTION NO. 2008079259, SAID DOUGLAS COUNTY RECORDS;

THENCE N 11°41'01" W, ALONG THE EAST LINE OF SAID RIDGE ROAD RIGHT-OF-WAY, A DISTANCE OF 29.20 FEET TO A POINT BEING 23.00 FEET NORTH OF THE NORTH LINE OF SAID FOUNDER' PARKWAY RIGHT-OF-WAY AND A POINT OF NON-TANGENT CURVATURE, AND BEING THE SOUTHWEST CORNER OF A PARCEL OF LAND DESCRIBED IN THAT DEED RECORDED AT RECEPTION NO. 2006097242, SAID DOUGLAS COUNTY RECORDS;

THENCE ALONG THE SOUTH AND EAST LINES OF SAID PARCEL OF LAND, THE FOLLOWING TWO (2) COURSES:

1.

ALONG THE ARC OF A NON-TANGENT CURVE TO THE LEFT, HAVING A RADIUS OF 872.00 FEET, A CENTRAL ANGLE OF 22°57'23" AND AN ARC LENGTH OF 349.38 FEET, THE CHORD OF WHICH BEARS S 74°32'56" E, A DISTANCE OF 347.05 FEET;
2.

N 19°21'06" W, A DISTANCE OF 1023.82 FEET TO A POINT ON THE EAST LINE OF THE RIDGE ROAD RIGHT-OF-WAY AS DESCRIBED IN THAT DEED RECORDED AT RECEPTION NO. 2008079259, SAID DOUGLAS COUNTY RECORDS;

THENCE N 11°52'30" E, ALONG SAID EAST LINE, A DISTANCE OF 499.36 FEET TO A POINT ON THE SOUTH LINE OF THAT PARCEL OF LAND DESCRIBED IN THAT DEED RECORDED AT RECEPTION NO. 2018029164, SAID DOUGLAS COUNTY RECORDS;

THENCE ALONG THE SOUTH LINE OF SAID PARCEL OF LAND THE FOLLOWING FOUR (4) COURSES:

1.

N 90°00'00" E, A DISTANCE OF 653.69 FEET;
2.

S 33°43'04" E, A DISTANCE OF 792.75 FEET;
3.

N 59°57'41" E, A DISTANCE OF 749.00 FEET;
4.

N 76°24'57" E, A DISTANCE OF 927.15 FEET TO A POINT ON THE SOUTH LINE OF SAID CANYONS SOUTH FILING NO. 1A, 3RD FILING, ALSO BEING THE WEST CORNER OF SAID TRACT V;

THENCE ALONG THE NORTH LINE OF SAID TRACT V, THE FOLLOWING FOUR (4) COURSES:

1.

N 76°24'57" E, A DISTANCE OF 14.66 FEET;
2.

S 89°06'00" E, A DISTANCE OF 1845.91 FEET;
3.

N 74°02'37" E, A DISTANCE OF 891.67 FEET;
4.

N 81°10'33" E, A DISTANCE OF 389.25 FEET TO A POINT ON THE SOUTH LINE OF SAID CANYONS SOUTH FILING NO. 1A, 3RD FILING;

THENCE ALONG SAID SOUTH LINE, THE FOLLOWING THREE COURSES:

1.

N 63°07'04" E, A DISTANCE OF 395.46 FEET;
2.

S 73°17'30" E, A DISTANCE OF 198.44 FEET;
3.

S 85°55'00" E, A DISTANCE OF 165.88 FEET TO THE WEST CORNER OF SAID TRACT X;

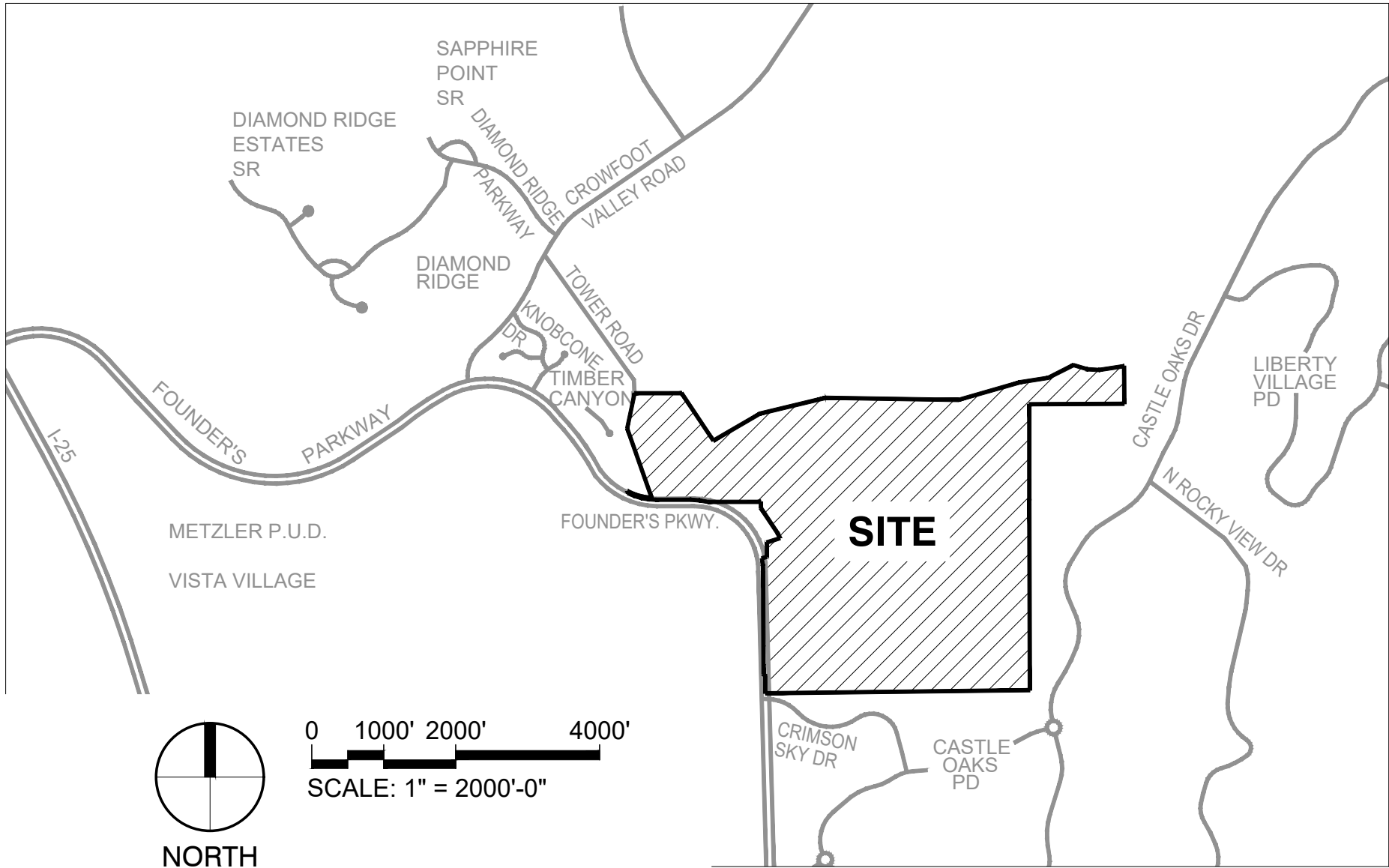
THENCE N 81°10'33" E, ALONG THE NORTH LINE OF SAID TRACT X, A DISTANCE OF 354.66 FEET TO THE POINT OF BEGINNING.

CONTAINING AN AREA OF 17,816,380 SQUARE FEET OR 409.008 ACRES, MORE OR LESS.

CANYONS FAR SOUTH
PLANNED DEVELOPMENT PLAN

PORTIONS OF NORTH HALF OF SECTION 31 & SOUTH HALF OF SECTION 30,
TOWNSHIP 7 SOUTH, RANGE 66 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
PORTION SOUTHEAST QUARTER OF SECTION 25, TOWNSHIP 7 SOUTH,
RANGE 67 WEST OF THE SIXTH PRINCIPAL MERIDIAN
TOWN OF CASTLE ROCK, COUNTY OF DOUGLAS, STATE OF COLORADO

VICINITY MAP



PROJECT BENCHMARK

PROJECT BENCHMARK IS A REBAR WITH A 2.5" ALUMINUM CAP STAMPED "DOUGLAS COUNTY SECONDARY CONTROL 4.004007". SET FLUSH TO THE GROUND. LOCATED ON THE SOUTH SIDE OF CASTLE OAKS DRIVE, APPROXIMATELY 700 FEET NORTHEAST FROM THE INTERSECTION OF CASTLE OAKS DRIVE AND AUTUMN SAGE DRIVE. CASTLE ROCK, COLORADO. PUBLISHED ELEVATION = 1979.760 METERS (6495.20 FEET) NAVD88.

BASIS OF BEARING

THE BEARINGS FOR THIS DESCRIPTION ARE BASED ON THE EAST LINE OF THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 30, TOWNSHIP 7 SOUTH, RANGE 66 WEST OF THE SIXTH P.M., AS SHOWN ON SAID PLAT OF CANYONS SOUTH FILING NO.1A, 3RD AMENDMENT TO BEAR S 00°03'56" E, FROM THE EAST QUARTER CORNER OF SAID SECTION 30, BEING MONUMENTED BY A REBAR WITH A 2 INCH ALUMINUM CAP STAMPED "PLS 23515" TO THE SOUTH SIXTEENTH CORNER OF SECTIONS 29/30, BEING MONUMENTED BY A REBAR WITH A 1-1/2 INCH ALUMINUM CAP, STAMPED "PLS 23515".

VESTING STATEMENT

THIS CANYONS FAR SOUTH PLANNED DEVELOPMENT PLAN AND ZONING REGULATIONS CONSTITUTES A SITE SPECIFIC DEVELOPMENT PLAN PURSUANT TO CHAPTER 17.08 OF THE CASTLE ROCK MUNICIPAL CODE AND SECTION 24-68-101, ET SEQ., C.R.S., AND ESTABLISHES VESTED PROPERTY RIGHTS FOR 15 YEARS FROM ITS EFFECTIVE DATE TO UNDERTAKE AND COMPLETE THE DEVELOPMENT AND USE OF THE PROPERTY IN ACCORDANCE WITH THIS PLAN.

CERTIFICATION OF OWNERSHIP

THE UNDERSIGNED ARE ALL OF THE OWNERS OF THE ABOVE DESCRIBED PROPERTY IN THE TOWN OF CASTLE ROCK.

CANYONS SOUTH, LLC, A DELAWARE LIMITED LIABILITY COMPANY

SIGNED THIS _____ DAY OF _____, 20____

COUNTY OF _____
STATE OF _____

NOTARY BLOCK

SUBSCRIBED AND SWORN TO BEFORE ME THIS _____ DAY OF _____, 20____

BY _____ AS _____ OF
CANYONS SOUTH, LLC.

WITNESS MY HAND AND OFFICIAL SEAL

NOTARY PUBLIC

MY COMMISSION EXPIRES: _____

CONTACTS

APPLICANT:



LOWE, INC.
11777 SAN VICENTE BLVD #900
LOS ANGELES, CA 90049
310.820.6661
LOWE-RE.COM
CONTACT: ERIK CLORE

ENGINEERING:



CORE CONSULTANTS, INC.
3473 S. BROADWAY
ENGLEWOOD, CO 80113
303.703.4444
LIVEYOURCORE.COM
CONTACT: KEVIN ROHBBOUGH

PLANNER/LANDSCAPE ARCHITECT:



DIG STUDIO, INC.
1521 15TH ST
DENVER, CO 80202
720.328.1986
DIGSTUDIO.COM
CONTACT: BILL VITEK

TITLE CERTIFICATION

I, _____, AN AUTHORIZED REPRESENTATIVE OF _____, A TITLE INSURANCE COMPANY LICENSED TO DO BUSINESS IN THE STATE OF COLORADO, HAVE MADE AN EXAMINATION OF THE PUBLIC RECORDS AND STATE THAT ALL OWNERS, MORTGAGES AND LIENHOLDERS OF THE PROPERTY ARE LISTED IN THE CERTIFICATE OF OWNERSHIP AND LIENHOLDER SUBORDINATION CERTIFICATE. 20____, SIGNED THIS _____ DAY OF _____, 20____.

AUTHORIZED REPRESENTATIVE

TITLE INSURANCE COMPANY

COUNTY OF _____
STATE OF _____

NOTARY BLOCK

SUBSCRIBED AND SWORN TO BEFORE ME THIS _____ DAY OF _____, 20____

BY _____ AS AUTHORIZED REPRESENTATIVE
OF _____.

WITNESS MY HAND AND OFFICIAL SEAL

NOTARY PUBLIC

MY COMMISSION EXPIRES: _____

SURVEYOR'S CERTIFICATION

I, _____, A REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY ATTEST THAT THE LEGAL DESCRIPTION AS DESCRIBED HEREON WAS MADE UNDER MY DIRECT SUPERVISION.

MILES M. SMALL
PROFESSIONAL LAND SURVEYOR
COLORADO PLS NO. 38534
FOR AND BEHALF OF CORE CONSULTANT, INC.

DATE

PLANNING COMMISSION RECOMMENDATION

THIS PLANNED DEVELOPMENT PLAN WAS RECOMMENDED FOR APPROVAL BY THE PLANNING COMMISSION OF THE TOWN OF CASTLE ROCK, COLORADO, ON THE _____ DAY OF _____, 20____.

CHAIR _____ DATE _____

ATTEST:

DIRECTOR OF DEVELOPMENT SERVICES _____ DATE _____

TOWN COUNCIL APPROVAL

THIS PLANNED DEVELOPMENT PLAN WAS APPROVED BY THE TOWN COUNCIL OF THE TOWN OF CASTLE ROCK, COLORADO, ON THE _____ DAY OF _____, 20____.

MAYOR _____ DATE _____

ATTEST:

TOWN CLERK _____ DATE _____

DOUGLAS COUNTY CLERK AND RECORDER'S
CERTIFICATE

THIS PLANNED DEVELOPMENT PLAN WAS FILED FOR RECORD IN THE OFFICE OF THE COUNTY CLERK AND RECORDER OF DOUGLAS COUNTY AT _____ ON THE _____ DAY OF _____, 20____ AT RECEPTION NO. _____.

DOUGLAS COUNTY CLERK AND RECORDER

BY: _____ DEPUTY _____ DATE _____



CORE CONSULTANTS, INC.
3473 S. BROADWAY
ENGLEWOOD, CO 80113
303.703.4444
LIVEYOURCORE.COM



DIG STUDIO, INC.
1521 15TH ST
DENVER, CO 80202
720.328.1986
DIGSTUDIO.COM



CANYONS FAR SOUTH
CASTLE ROCK, COLORADO
PLANNED DEVELOPMENT PLAN (PDP)
COVER SHEET

NOT FOR
CONSTRUCTION

DESIGNED BY: _____
DRAWN BY: _____
CHECKED BY: _____

JOB NO.
20-245

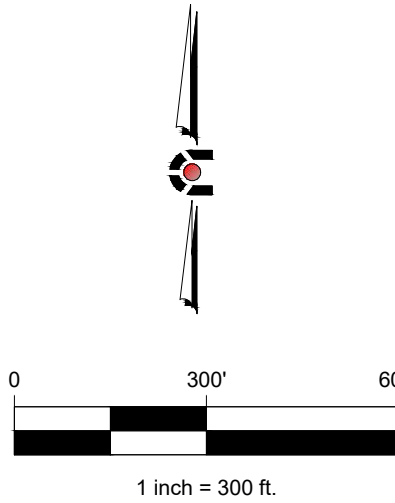
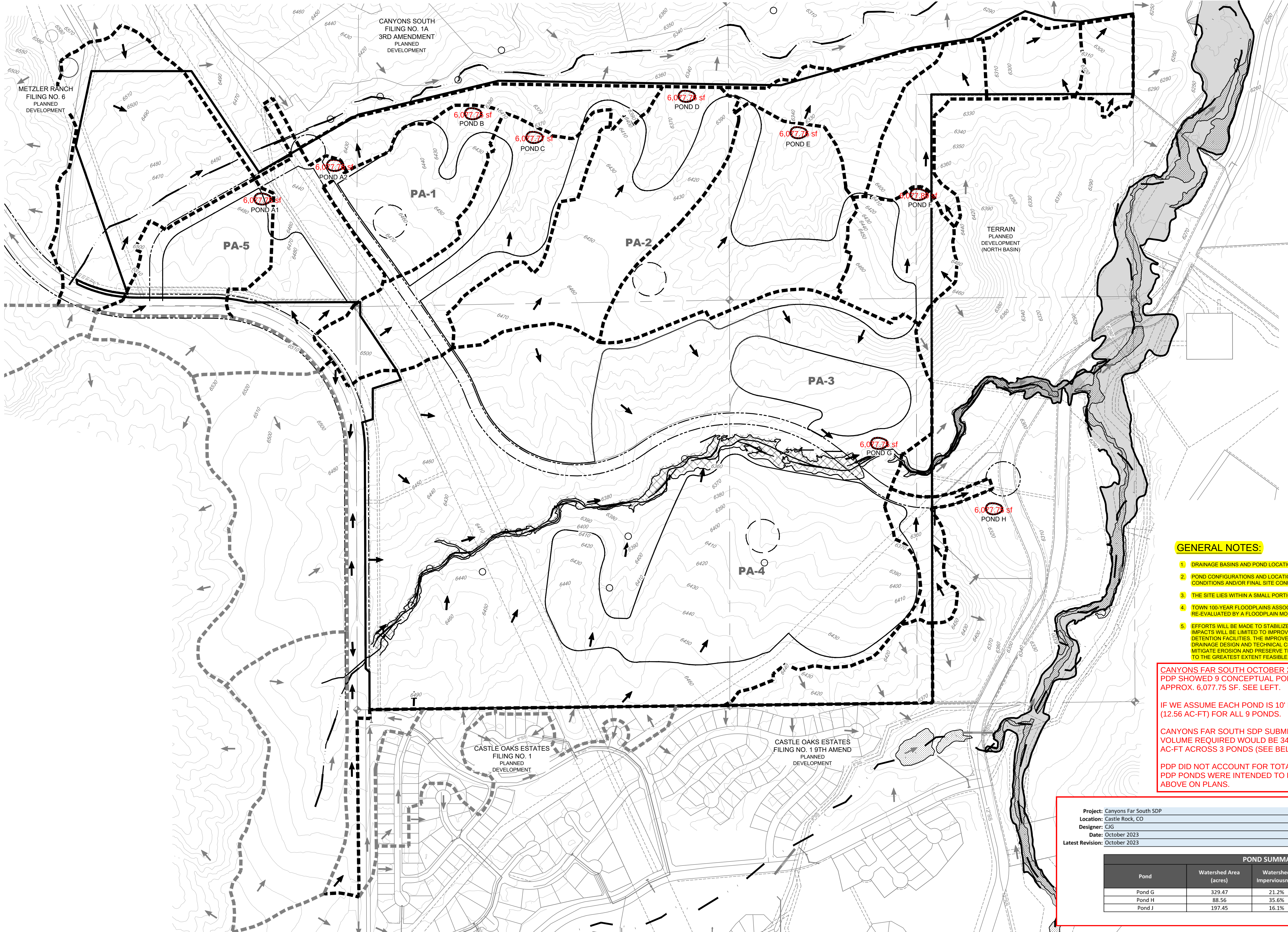
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1 of 13

10/25/2022 11:40 AM X:\20-245 CANYONS SOUTH\CAD\PLANS_OVERALL\UPRIMG_CANYONS SOUTH.DWG

CANYONS SOUTH

PLANNED DEVELOPMENT PLAN

PORTIONS OF NORTH HALF OF SECTION 31 & SOUTH HALF OF SECTION 30,
TOWNSHIP 7 SOUTH, RANGE 66 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
PORTION SOUTHEAST QUARTER OF SECTION 25, TOWNSHIP 7 SOUTH,
RANGE 67 WEST OF THE SIXTH PRINCIPAL MERIDIAN
TOWN OF CASTLE ROCK, COUNTY OF DOUGLAS, STATE OF COLORADO



LEGEND

- PHASE BOUNDARY
- PLANNING AREA BOUNDARY
- DIRECTIONAL FLOW ARROW
- PROPOSED DRAINAGE BASIN
- EXISTING DRAINAGE BASIN
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EX DRAINAGE WAY
- SECTION LINES
- EXISTING EASEMENT
- EX-100 YEAR FLOODPLAIN FEMA
- EX-100 YEAR FLOODPLAIN TOWN
- WETLANDS
- CONCEPTUAL POND LOCATION
- EXISTING CHECK DAM STRUCTURES

ABBREVIATIONS:

- D.E. DRAINAGE EASEMENT
- DRNG DRAINAGE
- ESMT EASEMENT
- FM SEWER FORCE MAIN
- OSD OPEN SPACE DEVELOPMENT
- OSP OPEN SPACE PLANNING
- PA PLANNING AREA
- PH PHASE
- PLD PUBLIC LAND DEDICATION
- R.O.W. RIGHT OF WAY
- SS SANITARY SEWER
- U.E. UTILITY EASEMENT
- W WATER

GENERAL NOTES:

- DRAINAGE BASINS AND POND LOCATIONS ARE APPROXIMATE.
- POND CONFIGURATIONS AND LOCATIONS ARE CONCEPTUAL AND MAY CHANGE DUE TO FIELD CONDITIONS AND/OR FINAL SITE CONFIGURATIONS.
- THE SITE LIES WITHIN A SMALL PORTION OF ZONE A OF THE FEMA 100-YEAR FLOODPLAIN.
- TOWN 100-YEAR FLOODPLAINS ASSOCIATED WITH THE MCJURDO GULCH TRIBUTARY 3 WILL BE RE-EVALUATED BY A FLOODPLAIN MODIFICATION STUDY.
- EFFORTS WILL BE MADE TO STABILIZE, PROTECT, AND PRESERVE THE MAJOR DRAINAGEWAYS ON-SITE. IMPACTS WILL BE LIMITED TO IMPROVEMENTS IN THE AREAS OF DISCHARGES FROM THE PROPOSED DETENTION FACILITIES. THE IMPROVEMENTS WILL CONFORM TO THE TOWN OF CASTLE ROCK STORM DRAINAGE DESIGN AND TECHNICAL CRITERIA MANUAL. THESE IMPROVEMENTS WILL BE DESIGNED TO MITIGATE EROSION AND PRESERVE THE NATURAL CHARACTER AND HISTORICAL DRAINAGE PATTERNS TO THE GREATEST EXTENT FEASIBLE.

CANYONS FAR SOUTH OCTOBER 2024 NOTE:
PDP SHOWED 9 CONCEPTUAL PONDS. ALL POND HAVE THE SAME AREA OF APPROX. 6,077.75 SF. SEE LEFT.

IF WE ASSUME EACH POND IS 10' DEEP, THAT IS TOTAL VOLUME OF 547,200 CF (12.56 AC-FT) FOR ALL 9 PONDS.

CANYONS FAR SOUTH SDP SUBMISSION 1 (OCT. 2023) ASSUMED TOTAL VOLUME REQUIRED WOULD BE 34.32 AC-FT AND PROVIDED WOULD BE 35.8 AC-FT ACROSS 3 PONDS (SEE BELOW).

PDP DID NOT ACCOUNT FOR TOTAL VOLUME NECESSARY FOR DEVELOPMENT. PDP PONDS WERE INTENDED TO BE CONCEPTUAL ONLY AS NOTED IN YELLOW ABOVE ON PLANS.

Project: Canyons Far South SDP
Location: Castle Rock, CO
Designer: CJG
Date: October 2023
Latest Revision: October 2023



POND SUMMARY TABLE				
Pond	Watershed Area (acres)	Watershed Imperviousness	Approximate 100-yr Volume Required (acre-feet)	Approximate 100-yr Volume Provided (acre-feet)
Pond G	329.47	21.2%	18.24	18.3
Pond H	88.56	35.6%	6.62	7.9
Pond J	197.45	16.1%	9.46	9.6

LOWE

CORE CONSULTANTS, INC.
3473 S. BROADWAY
DENVER, CO 80113
303.703.4444
LIVEYOURCORE.COM

CORE

DIG STUDIO, INC.
1521 15TH ST
DENVER, CO 80202
720.328.1986
DIGSTUDIO.COM

Dig Studio

CANYONS SOUTH
CASTLE ROCK, COLORADO
PLANNED DEVELOPMENT PLAN (PDP)
GRADING & DRAINAGE

NOT FOR CONSTRUCTION

DESIGNED BY: CGV
DRAWN BY: CGV
CHECKED BY: KJR

JOB NO.
20-245

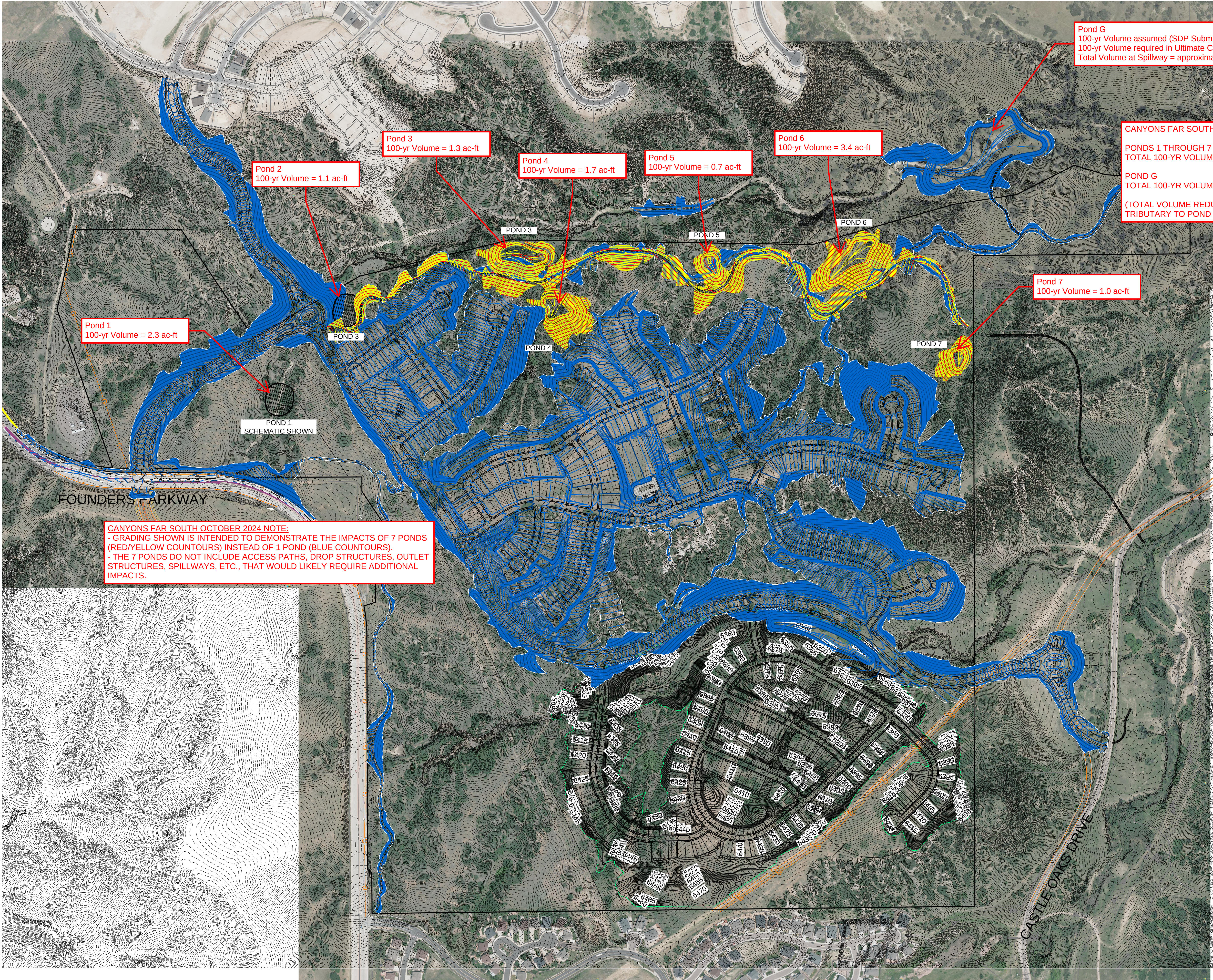
SHEET
5 OF 12

Page 20 of 40



CANYONS FAR SOUTH

1 POND VS 7 POND EXHIBIT



Pond 1
100-yr Volume = 2.3 ac-ft

Pond 2
100-yr Volume = 1.1 ac-ft

Pond 3
100-yr Volume = 1.3 ac-ft

Pond 4
100-yr Volume = 1.7 ac-ft

Pond 5
100-yr Volume = 0.7 ac-ft

Pond 6
100-yr Volume = 3.4 ac-ft

Pond 7
100-yr Volume = 1.0 ac-ft

Pond G
100-yr Volume assumed (SDP Submission 1, Oct. 2023) = 18.3 ac-ft
100-yr Volume required in Ultimate Condition (as drawn with Filing 1, May 2024) = 18.6 ac-ft
Total Volume at Spillway = approximately 19.4 ac-ft

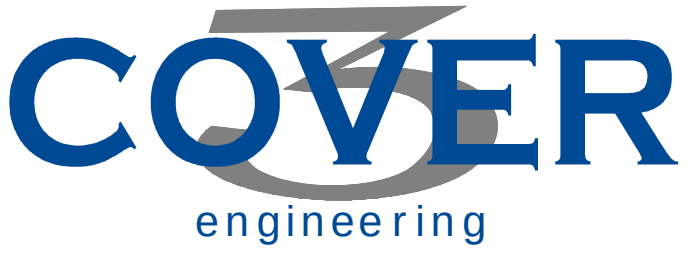
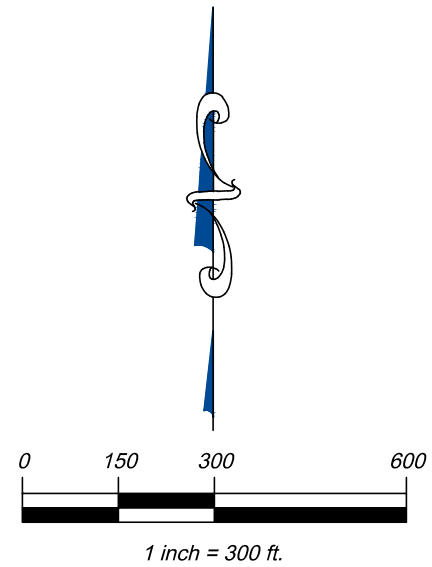
CANYONS FAR SOUTH OCTOBER 2024 NOTE:

PONDS 1 THROUGH 7
TOTAL 100-YR VOLUME = 11.5 AC-FT

POND G
TOTAL 100-YR VOLUME= 19.4 AC-FT

(TOTAL VOLUME REDUCED FOR PONDS 1 THROUGH 7 DUE TO OFFSITE AREA
TRIBUTARY TO POND G BEING REDUCED)

CANYONS FAR SOUTH OCTOBER 2024 NOTE:
- GRADING SHOWN IS INTENDED TO DEMONSTRATE THE IMPACTS OF 7 PONDS
(RED/YELLOW COUNTOURS) INSTEAD OF 1 POND (BLUE COUNTOURS).
- THE 7 PONDS DO NOT INCLUDE ACCESS PATHS, DROP STRUCTURES, OUTLET
STRUCTURES, SPILLWAYS, ETC., THAT WOULD LIKELY REQUIRE ADDITIONAL
IMPACTS.





CANYONS FAR SOUTH

POND G SUMMARY

CANYONS FAR SOUTH OCTOBER 2024 NOTE:
ORIGINAL POND G LOCATION AS SHOWN ON CANYONS FAR SOUTH SDP
SUBMISSION 1 IN OCTOBER 2023



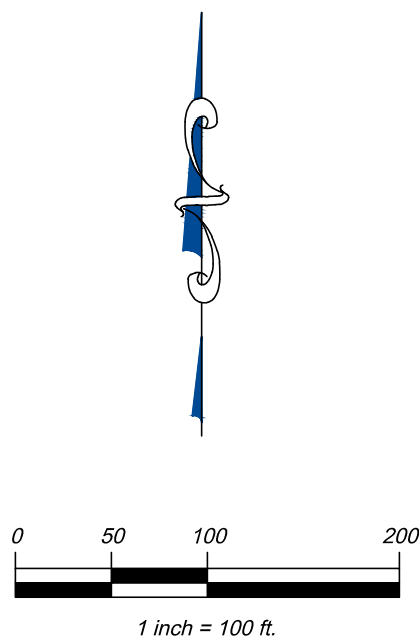
CANYONS FAR SOUTH OCTOBER 2024 NOTE:
POND G UPDATED IN MARCH 2024 TO SHIFT FURTHER DOWNSTREAM TO THE EAST. THE BERM WAS ALIGNED WITH EXISTING STOCK POND. THE LOCATION IS ALSO FURTHER AWAY FROM RESIDENTIAL LOTS AND IS ABLE TO PRESERVE MORE TREES ALONG TRIBUTARY B.

IF POND IS SHIFTED FURTHER DOWNSTREAM, LARGE STAND OF MATURE TREES WOULD BE REMOVED

POND GRADING UPDATED TO FOLLOW EXISTING CONTOURS TO MINIMIZE IMPACTS. POND LOCATED WITHIN EXISTING STOCK POND, TO MINIMIZE TREES TO BE REMOVED.

PROPERTY LINE

DOUGLAS COUNTY
CASTLE ROCK





EXCERPT FROM CANYONS FAR SOUTH
SDP SUBMISSION 1 (OCTOBER 2023)

CANYONS FAR SOUTH OCTOBER 2024 NOTE:
CANYONS FAR SOUTH SDP SUBMISSION 1 FROM OCTOBER 2023

SEE RIGHT

EX. POND C3
Q100 OUTFLOW= 1.5 CFS
TO BYPASS SITE

EX. POND C2
Q100 OUTFLOW= 3.7 CFS
TO BYPASS SITE

EX. POND C1
Q100 OUTFLOW= 21.4 CFS
TO BYPASS SITE

SEE LEFT

FEMA FIRM FLOODPLAIN
**McMURDO GULCH
TRIBUTARY B**
DOUGLAS COUNTY
TOWN OF CASTLE ROCK
PROPERTY BOUNDARY
CHANNEL REACH B1

KEYMAP

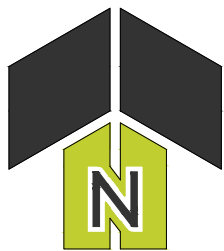
LEGEND

- PROPOSED MAJOR CONTOUR (10') —5250—
- PROPOSED MINOR CONTOUR (2') ———
- EXISTING MAJOR CONTOUR (25') - - - - -5250- - - - -
- EXISTING MINOR CONTOUR (5') - - - - -
- PROPOSED STORM DRAIN PIPE ———
- PROPOSED STORM DRAIN INLET □
- PROPOSED LOW TAILWATER BASIN ▨
- PROPOSED SWALE ·····
- PROPERTY LINE ———
- 100-YR WSEL - - - - -
- DIRECTIONAL FLOW ARROW →
- EMERGENCY OVERFLOW ARROW ↗
- EXISTING BASIN LINE ———
- PROPOSED MAJOR BASIN LINE ———

DESIGN POINT △
PROPOSED BASIN LABEL

B2 BASIN DESIGNATION
AREA (AC.) 1.00 .40 .60
MINOR RUNOFF COEF.
MAJOR RUNOFF COEF.

811 UNCC
CALL BEFORE
YOU DIG
811
OR
1-800-922-1987
Utility Notification
Center of Colorado



0 300' 600.0001"
1" = 300' (HORIZONTAL)

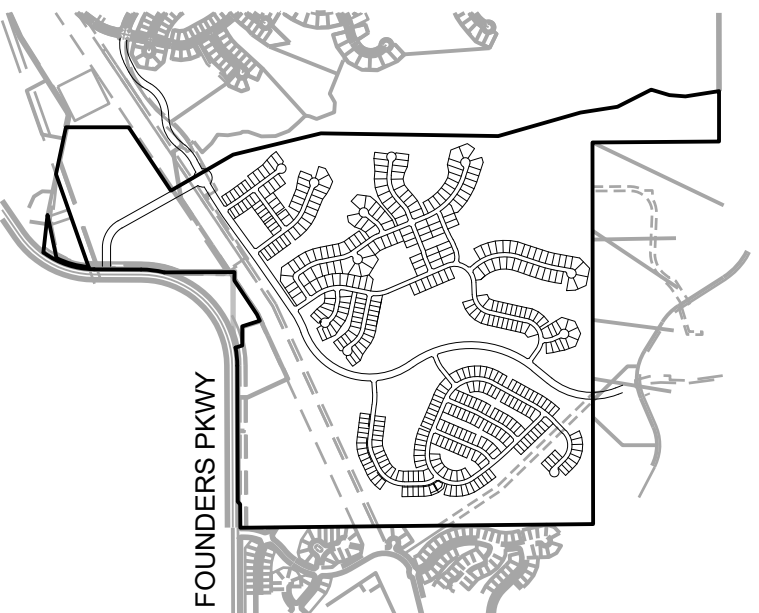
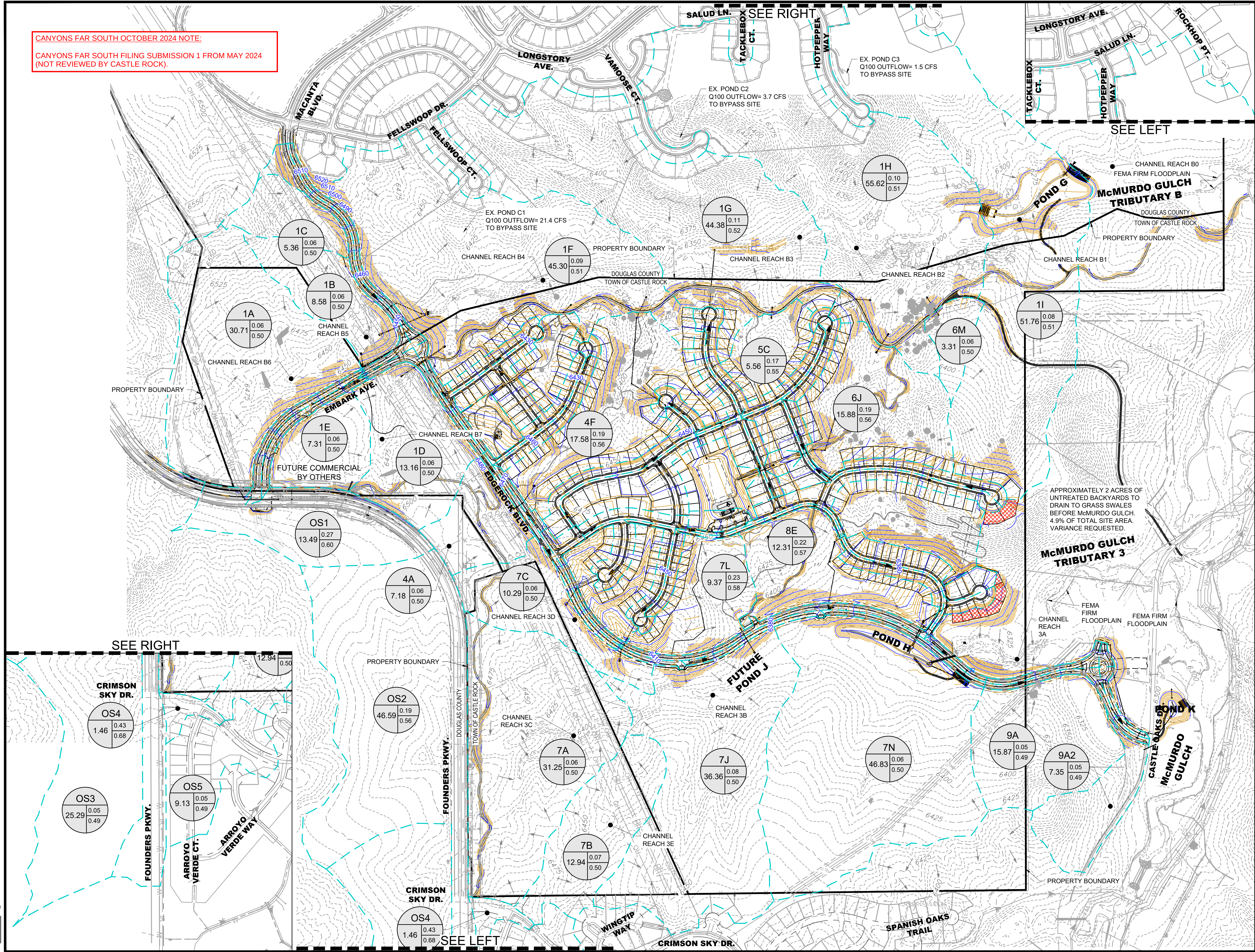
COVER
ENGINEERING
**OVERALL PROPOSED
DRAINAGE MAP
SHEET 3**

POND SUMMARY TABLE				
Pond	Watershed Area (acres)	Watershed Imperviousness	Approximate 100-yr Volume Required (acre-feet)	Approximate 100-yr Volume Provided (acre-feet)
Pond G	329.47	21.2%	18.24	18.3
Pond H	88.56	35.6%	6.62	7.9
Pond J	197.45	16.1%	9.46	9.6



EXCERPTS FROM CANYONS FAR SOUTH
FILING 1 (MAY 2024)
NOT REVIEWED BY TOWN OF CASTLE ROCK

CANYONS FAR SOUTH OCTOBER 2024 NOTE:
CANYONS FAR SOUTH FILING SUBMISSION 1 FROM MAY 2024
(NOT REVIEWED BY CASTLE ROCK).



KEYMAP

LEGEND

- PROPOSED MAJOR CONTOUR (10') — 5250 —
- PROPOSED MINOR CONTOUR (2') — 5250 —
- EXISTING MAJOR CONTOUR (25') — 5250 —
- EXISTING MINOR CONTOUR (5') — 5250 —
- PROPOSED STORM DRAIN PIPE —
- PROPOSED STORM DRAIN INLET —
- PROPOSED LOW TAILWATER BASIN —
- PROPOSED SWALE —
- PROPERTY LINE —
- 100-YR WSEL —
- DIRECTIONAL FLOW ARROW —
- EMERGENCY OVERFLOW ARROW —
- EXISTING BASIN LINE —
- PROPOSED MAJOR BASIN LINE —
- DESIGN POINT —
- PROPOSED BASIN LABEL —

AREA (AC.)	B2	BASIN DESIGNATION
1.00	0.40	MINOR RUNOFF COEF.
1.00	0.60	MAJOR RUNOFF COEF.



UNCC
CALL BEFORE
YOU DIG
811
OR

1-800-922-1987

Utility Notification
Center of Colorado

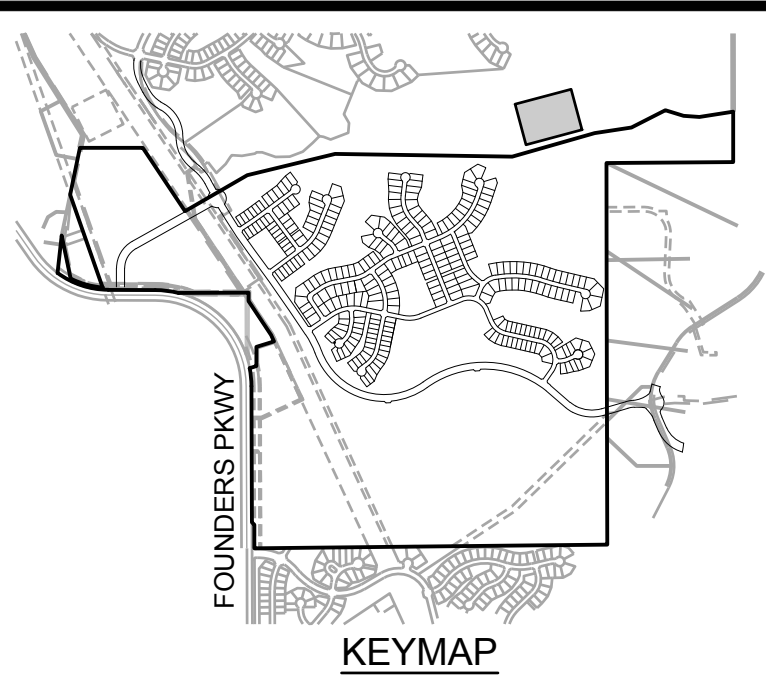
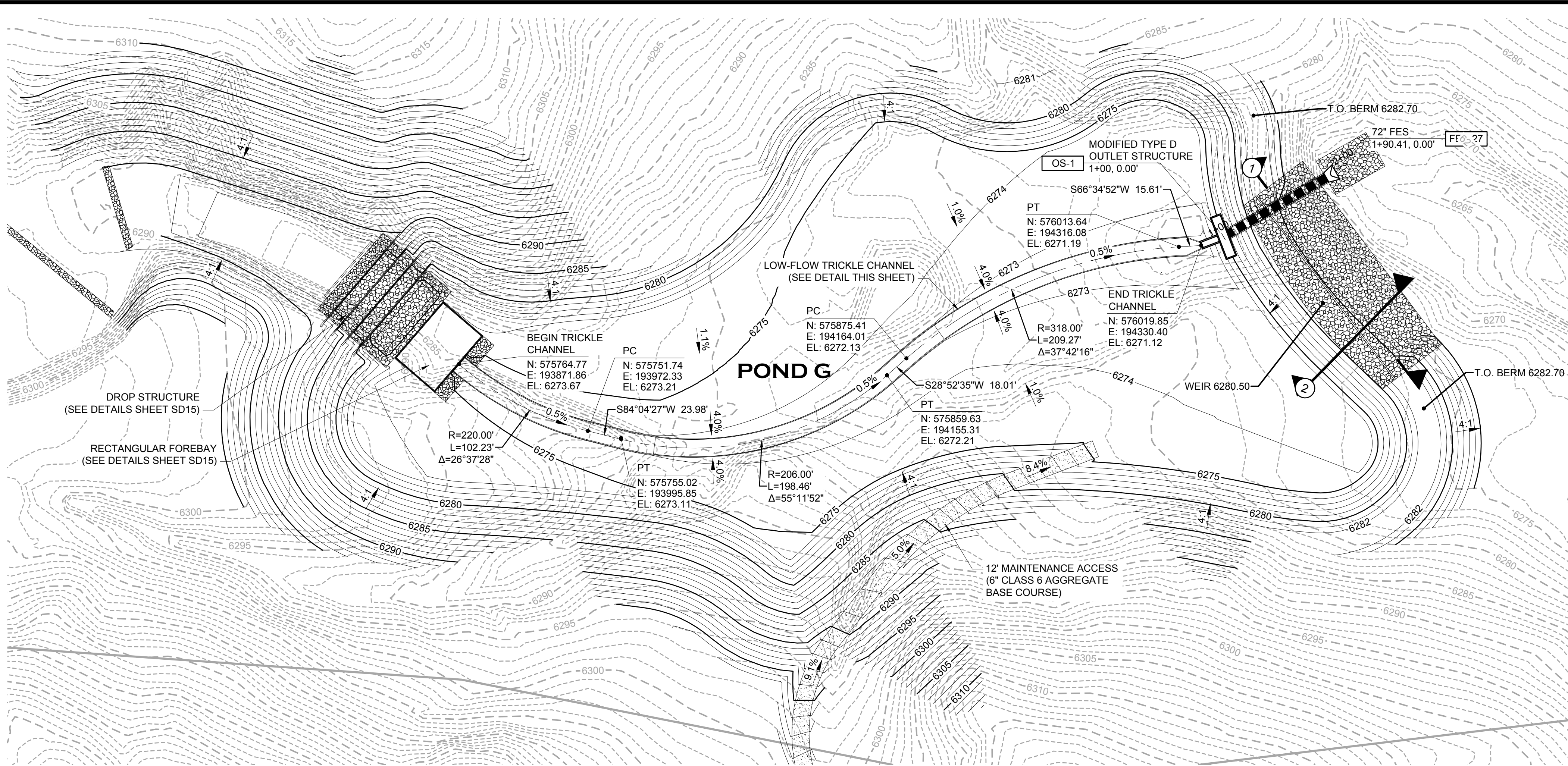


0 300' 600'
1" = 300' (HORIZONTAL)

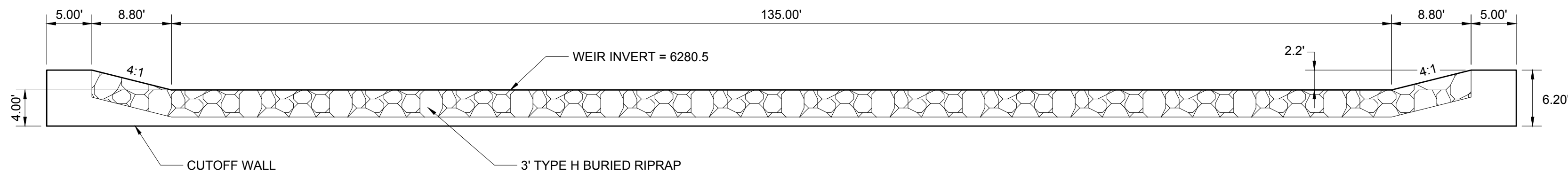
COVER

ENGINEERING
CANYONS FAR SOUTH
FILING NO. 1

PROPOSED OVERALL DRAINAGE MAP
SHEET 3

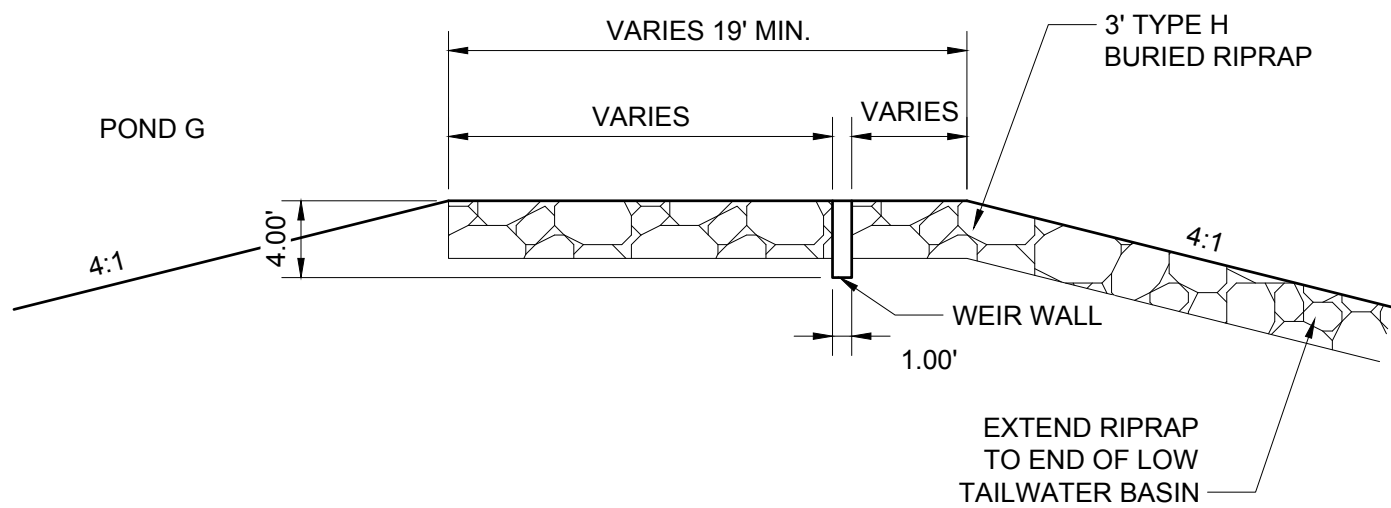


- GENERAL NOTES:**
- ALL STORM LOCATED WITHIN THE RIGHT-OF-WAY IS PUBLIC AND ALL STORM SEWER OUTSIDE OF RIGHT-OF-WAY IS PRIVATE. ALL PRIVATE STORM SEWER WILL BE OWNED AND MAINTAINED BY THE METROPOLITAN DISTRICT.
 - ALL STORM IS SIZED FOR THE 100-YEAR EVENT UNLESS OTHERWISE NOTED.
 - ALL DRAINAGE CHANNELS AND SWALES ARE PRIVATE AND SIZED FOR THE 100-YEAR EVENT UNLESS OTHERWISE NOTED.
 - THE METROPOLITAN DISTRICT WILL BE RESPONSIBLE FOR MAINTAINING ALL CHANNEL IMPROVEMENTS (RIPRAP, ETC.).
 - IN ALL LOCATIONS WHERE STORM SEWER CROSSES WATER, ABOVE OR BELOW, EACH STORM SEWER JOINT WITHIN THE TRENCH WIDTH OF THE CROSSING SHALL BE ENCASED IN A 6" THICK CONCRETE COLLAR EXTENDING 6" BEYOND BOTH SIDES OF THE JOINT.
 - WHERE DOUBLE CDOT TYPE R INLETS ARE UTILIZED, A PIPE SHALL BE PLACED BETWEEN THE 2 INLETS. FLOW WILL BE PASSED BETWEEN THE INLETS VIA A 18" RCP.
- ① INDICATES UTILITY CROSSING NUMBER (SEE CROSSING TABLE LEFT COLUMN)



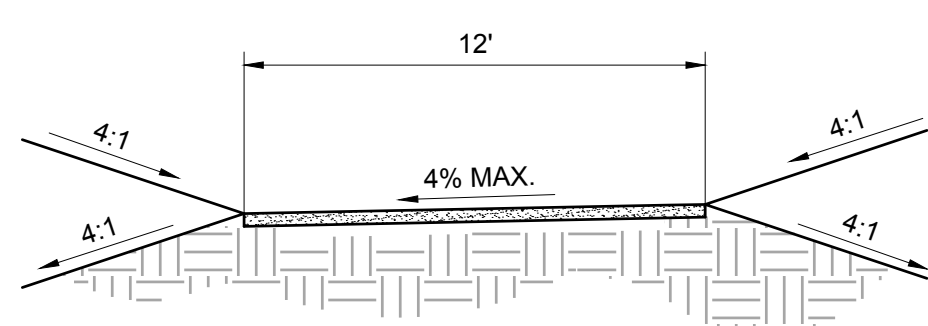
POND G OVERFLOW WEIR SECTION 1

SCALE 1"=10'



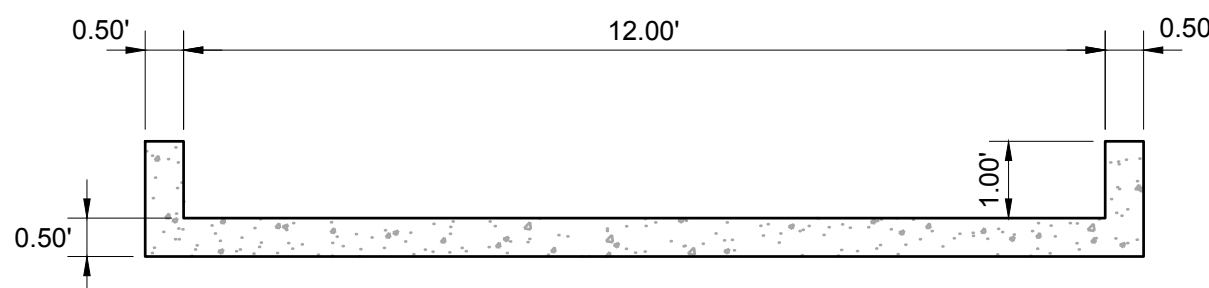
POND G OVERFLOW WEIR SECTION 2

SCALE 1"=10'



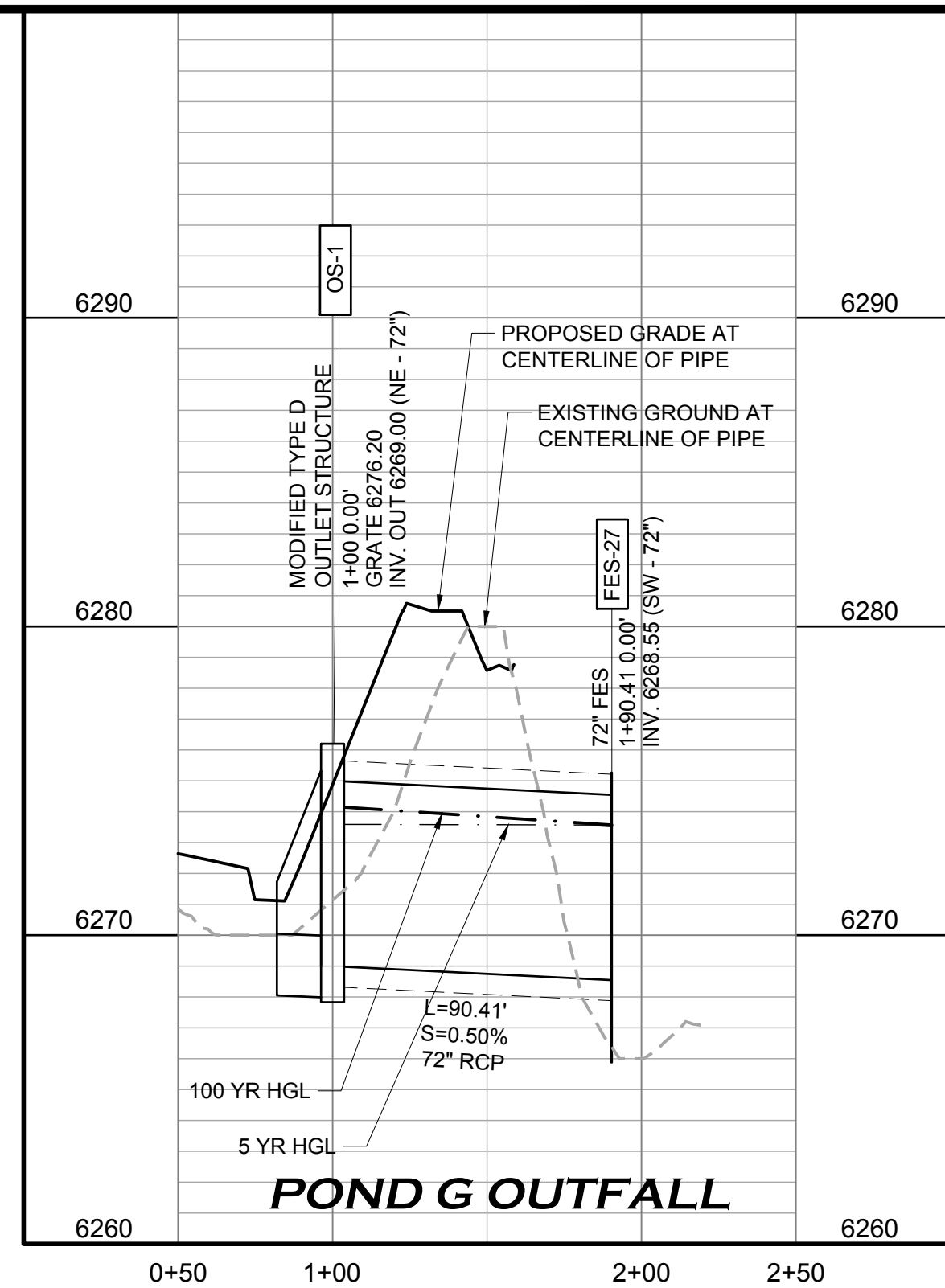
POND MAINTENANCE PATH DETAIL

N.T.S.



POND G TRICKLE CHANNEL SECTION

N.T.S.



POND G OUTFALL

BASIS OF BEARINGS

PROJECT BEARINGS ARE BASED ON THE EAST LINE OF THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 30, TOWNSHIP 7 SOUTH, RANGE 66 WEST OF THE SIXTH P.M., BEARING SOUTH 00°03'56" EAST, FROM THE EAST QUARTER CORNER OF SECTION 30, BEING MONUMENTED BY A REBAR WITH A 2 INCH ALUMINUM CAP STAMPED "PLS 23515" TO THE SOUTH SIXTEENTH CORNER OF SECTIONS 29/30, BEING MONUMENTED BY A REBAR WITH A 1-1/2 INCH ALUMINUM CAP, STAMPED "PLS 23515".

PROFESSIONAL ENGINEER CERTIFICATION

I HEREBY AFFIRM THAT THESE FINAL CONSTRUCTION PLANS WERE PREPARED UNDER MY DIRECT SUPERVISION, IN ACCORDANCE WITH ALL APPLICABLE TOWN OF CASTLE ROCK AND STATE OF COLORADO STANDARDS AND STATUTES, RESPECTIVELY, AND THAT I AM FULLY RESPONSIBLE FOR ALL DESIGN AND REVISIONS RELATIVE TO SAID PLANS.

BRIAN K. MOSS
REGISTERED PROFESSIONAL ENGINEER
STATE OF COLORADO NO. 37702

TOWN APPROVAL BLOCK

TOWN OF CASTLE ROCK APPROVAL PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT SERVICES APPROVAL

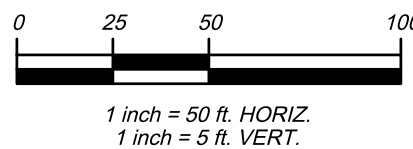
APPROVED BY:

DEVELOPMENT SERVICES DATE: TOCR PROJECT NO: CD24-0011

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PLOT BY: RSGMON PLOT DATE: 5/14/2024 10:22 PM
XREFS:

DATE	REVISION DESCRIPTION

Job Number HINES LP		
Chk BKM	Dnw RLS	Des RLS
Drawing Name: 32SD14-SD15.dwg		



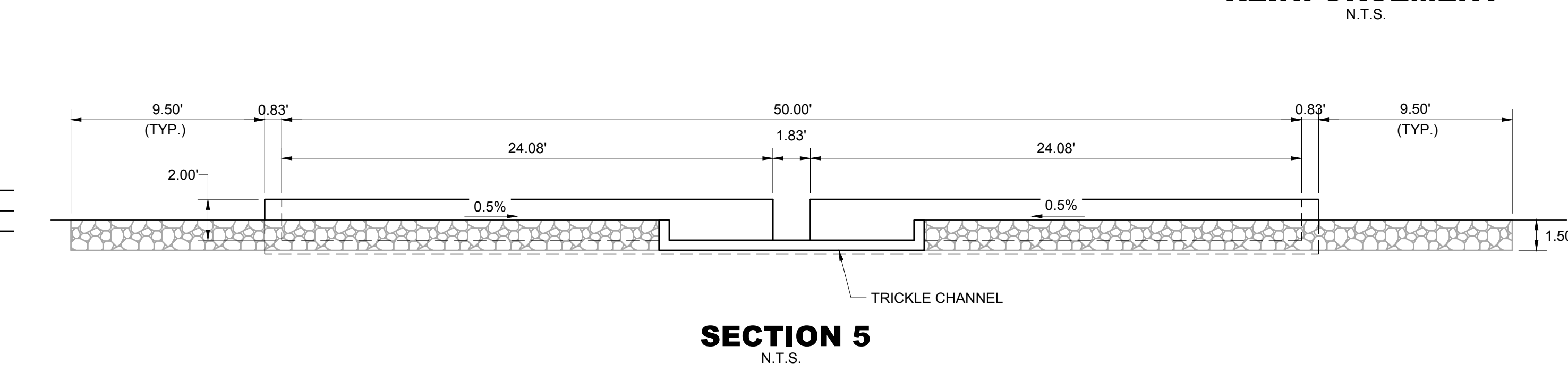
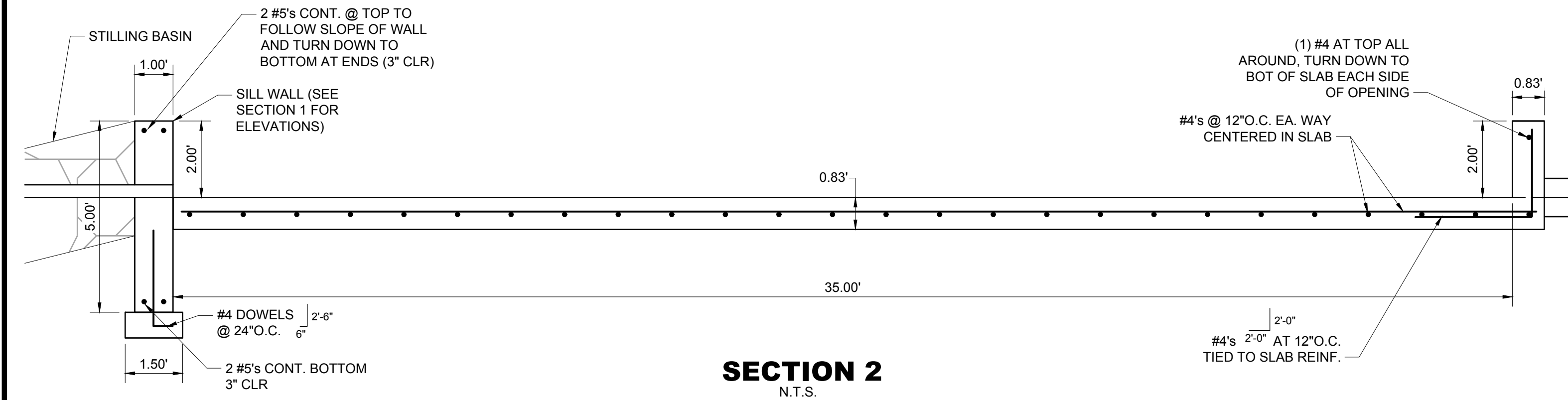
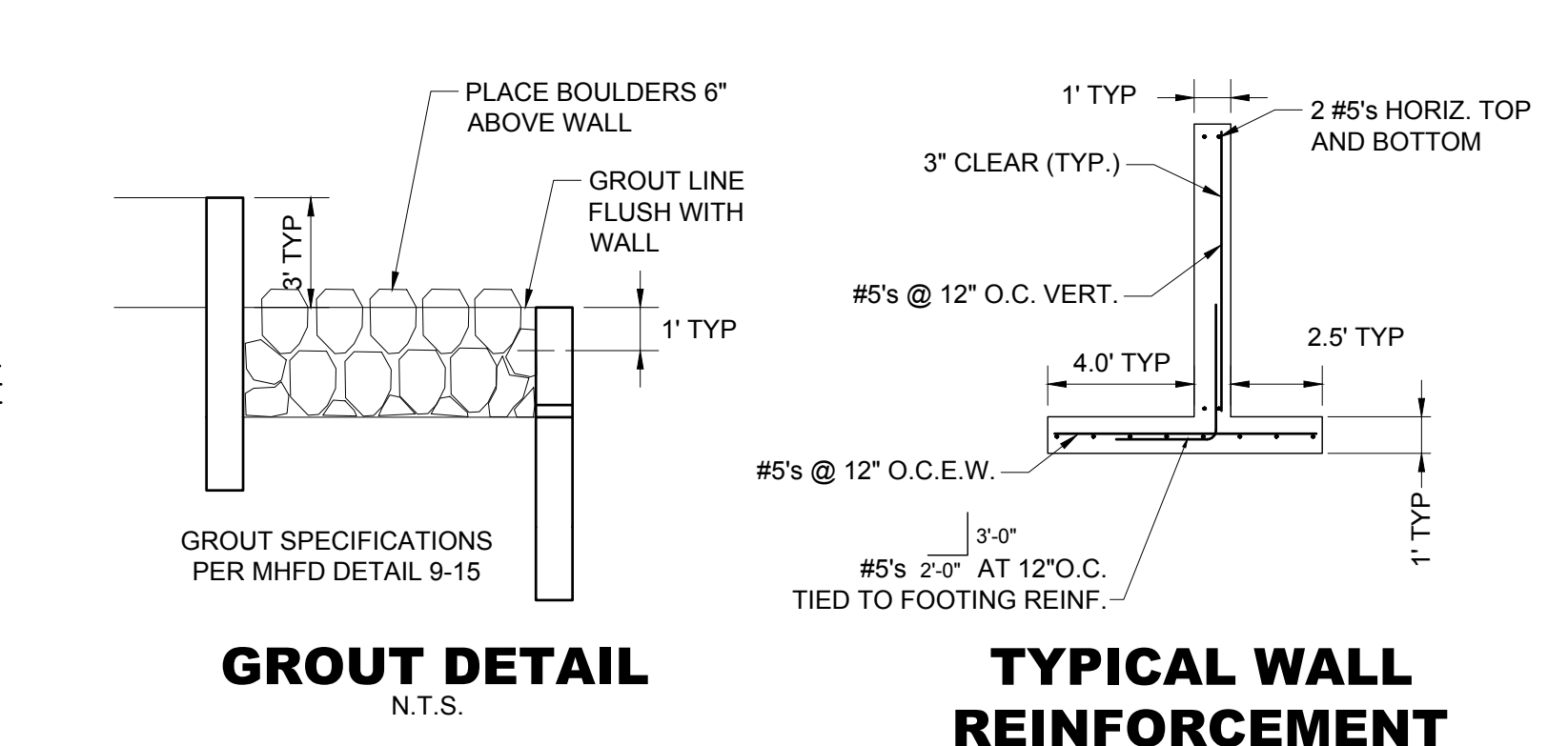
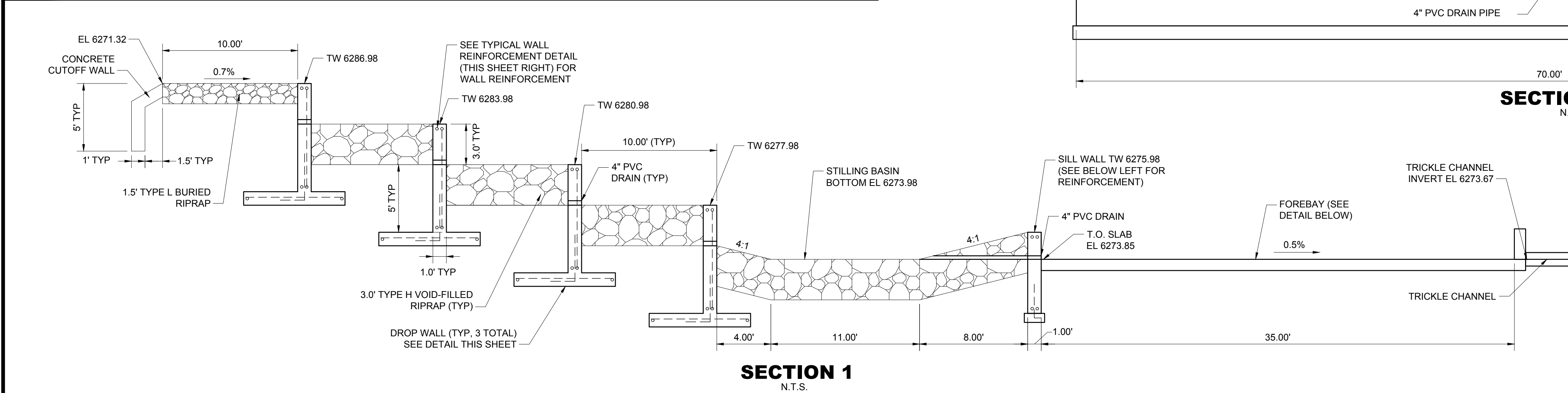
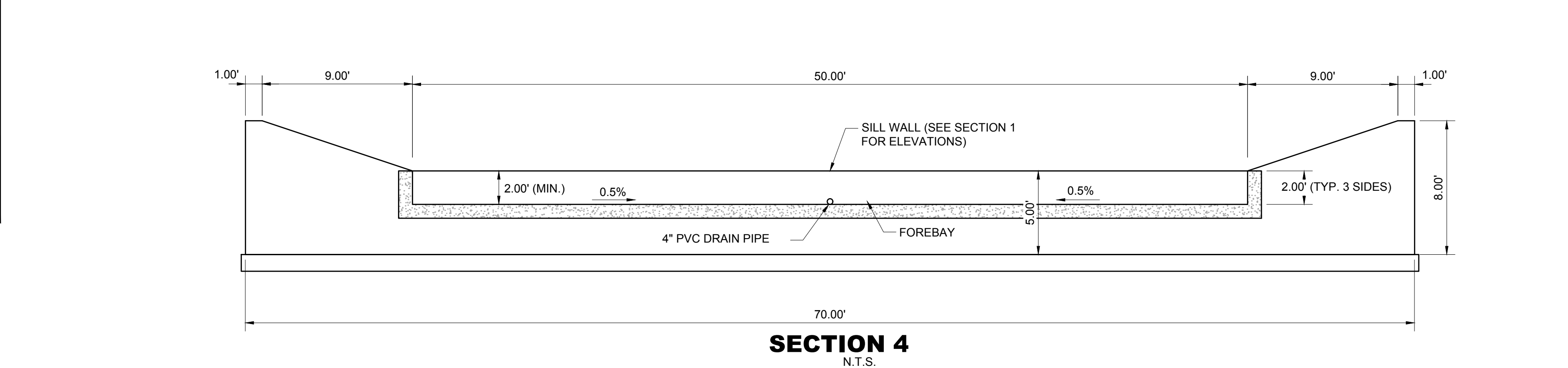
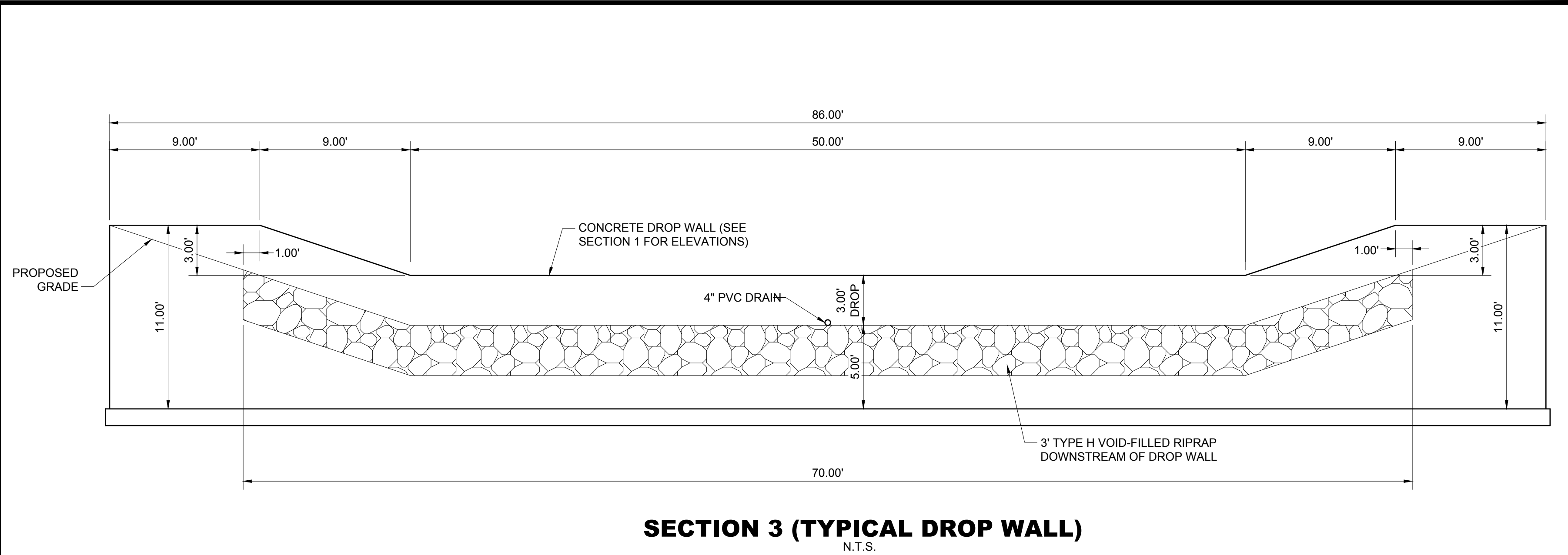
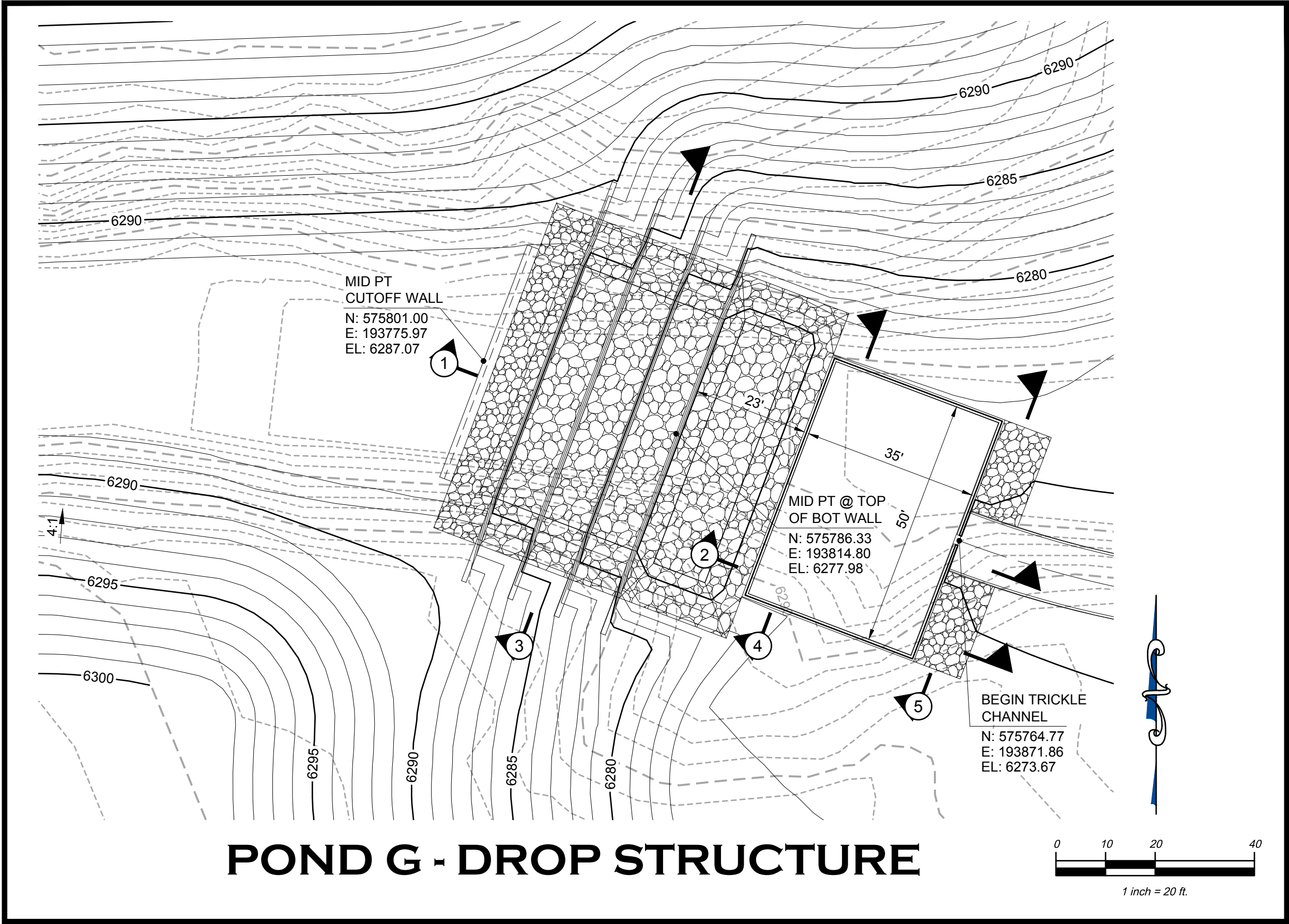
PROJECT BENCHMARK
(AZTEC #401)
DOUGLAS COUNTY
BENCHMARK TT17A
(NAVD88 DATUM)
ELEVATION=6483.68

Hines

COVER
ENGINEERING

CANYONS FAR SOUTH FILING 1
GRADING, ROADWAY, & UTILITY PLANS
POND G - DETAILS

Sheet
SD14
of
185
Date
MAY 15, 2024

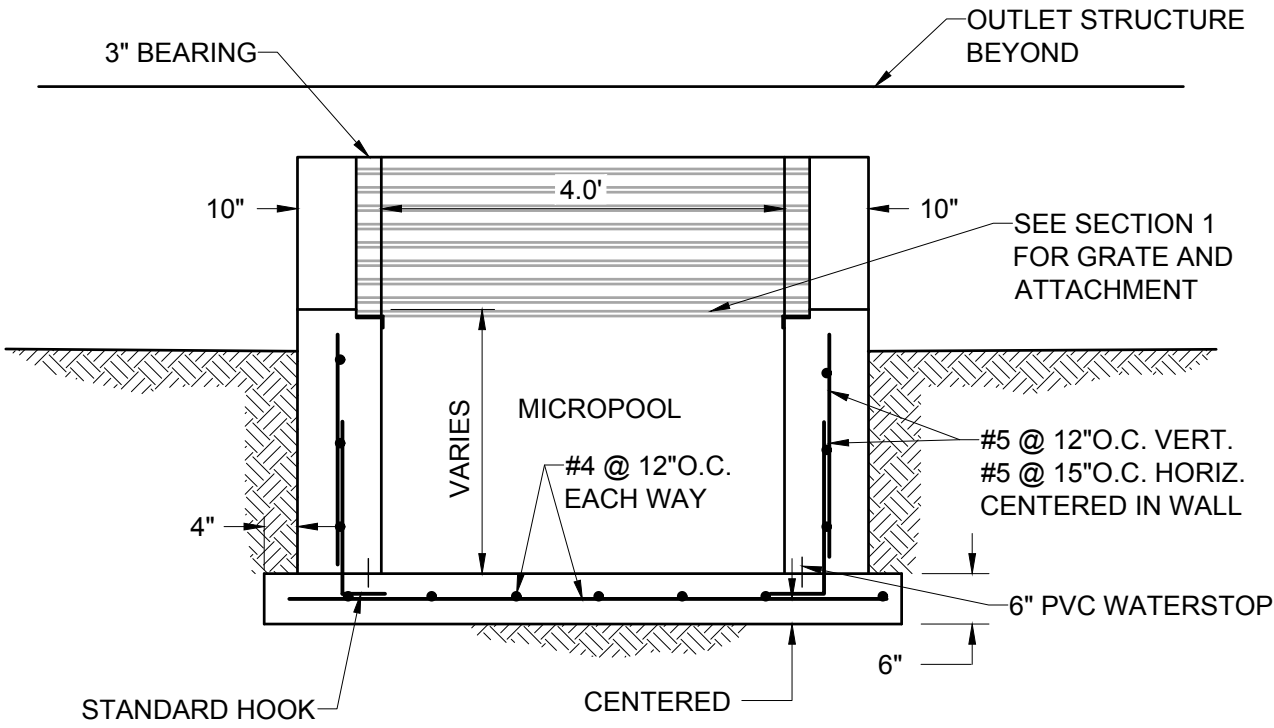


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PLOT DATE: 5/14/2024 10:23 PM
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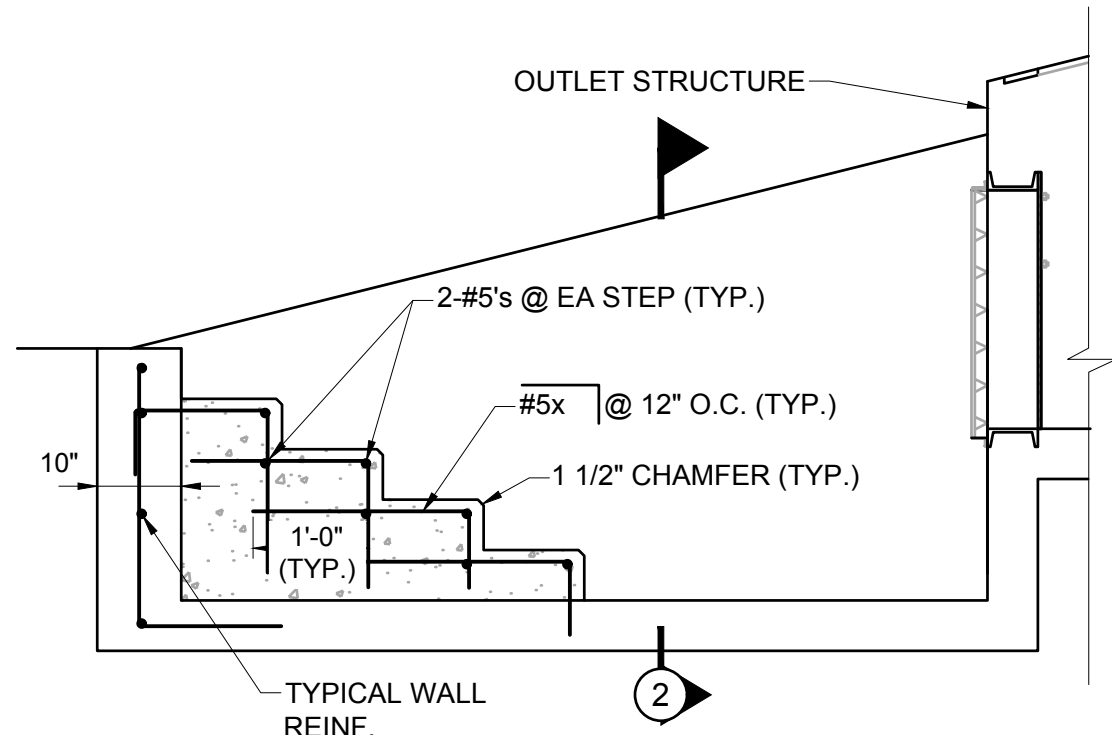
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		Chk BKM Dwn RLS Des RLS	Drawing Name: 32SD14-SD15.dwg			POND G - DETAILS	110 of 185
			(NAVD88 DATUM) ELEVATION=6483.68				Date: MAY 15, 2024
							Page 37 of 43

TOCR PROJECT NO: CD24-0011

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SECTION 2
N.T.S.



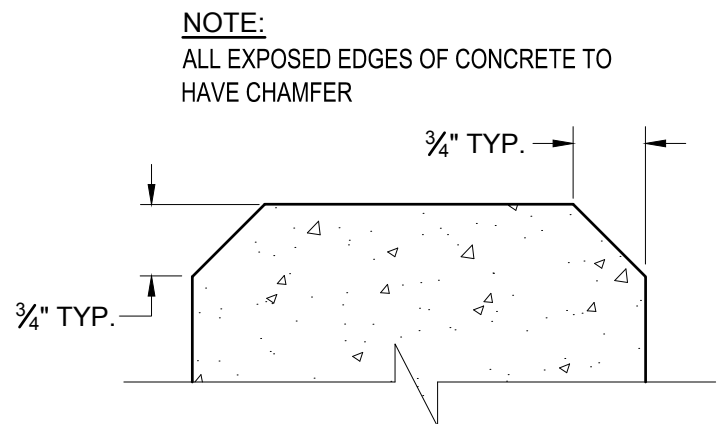
TYPICAL MICROPOOL REINF.
N.T.S.

REINFORCING STEEL

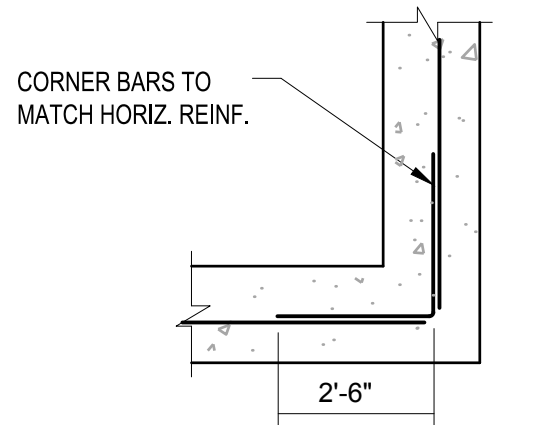
- FABRICATE AND PLACE REINFORCING BARS IN ACCORDANCE WITH CRSI "MANUAL OF STANDARD PRACTICE" AND CRSI "RECOMMENDED PRACTICE FOR PLACING REINFORCING BARS".
- REINFORCING STEEL TO COMPLY WITH ASTM A615, GRADE 60.
- LAP REINFORCING STEEL IN CONCRETE 2'-6" MINIMUM.
- PROVIDE REINFORCING STEEL WITH PROTECTIVE COVERING OF CONCRETE AS NOTED IN SECTIONS. DO NOT USE BRICK OR POROUS MATERIAL TO SUPPORT FOOTING STEEL OFF THE GROUND.
- SUBMIT SHOP DRAWINGS.
- WHERE SINGLE CURTAIN OF REINFORCEMENT SHOWN, CENTER BARS IN WALL.
- REFER TO DETAIL THIS SHEET FOR CORNER BARS.

CONCRETE

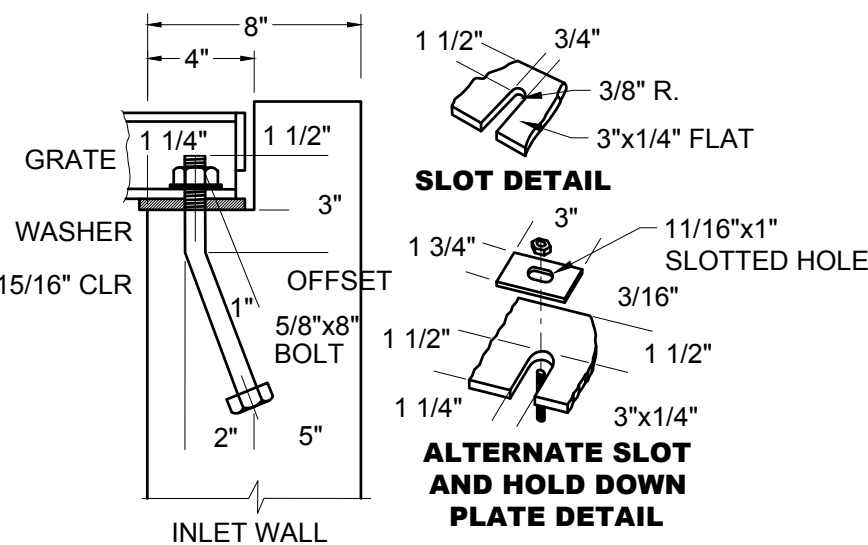
- ALL CONCRETE WORK SHALL CONFORM TO ALL REQUIREMENTS OF ACI 301 "SPECIFICATIONS FOR STRUCTURAL BUILDINGS," EXCEPT AS MODIFIED BY THE SUPPLEMENTAL REQUIREMENTS CONTAINED HERIN OR SHOWN ON THE DRAWINGS, AND AS SPECIFIED IN SECTION 03000.
- ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS 4,500 PSI.
- CEMENT SHALL CONFORM TO ASTM C 150, TYPE III; CONTRACTOR SHALL SUBSTITUTE 20% OF CLASS F FLYASH FOR CEMENT.
- AGGREGATES ASTM C 33.
- CONCRETE SHALL CONTAIN 6% AIR ENTRAINMENT, ±1%.
- PROVIDE 3/4" CHAMFER ON ALL EXPOSED EDGES PER DETAIL ABOVE.
- WATER CEMENT RATIO SHALL BE 0.45 MAX.
- MAXIMUM WATER SOLUBLE CHLORIDE ION CONTENT = 0.3%.



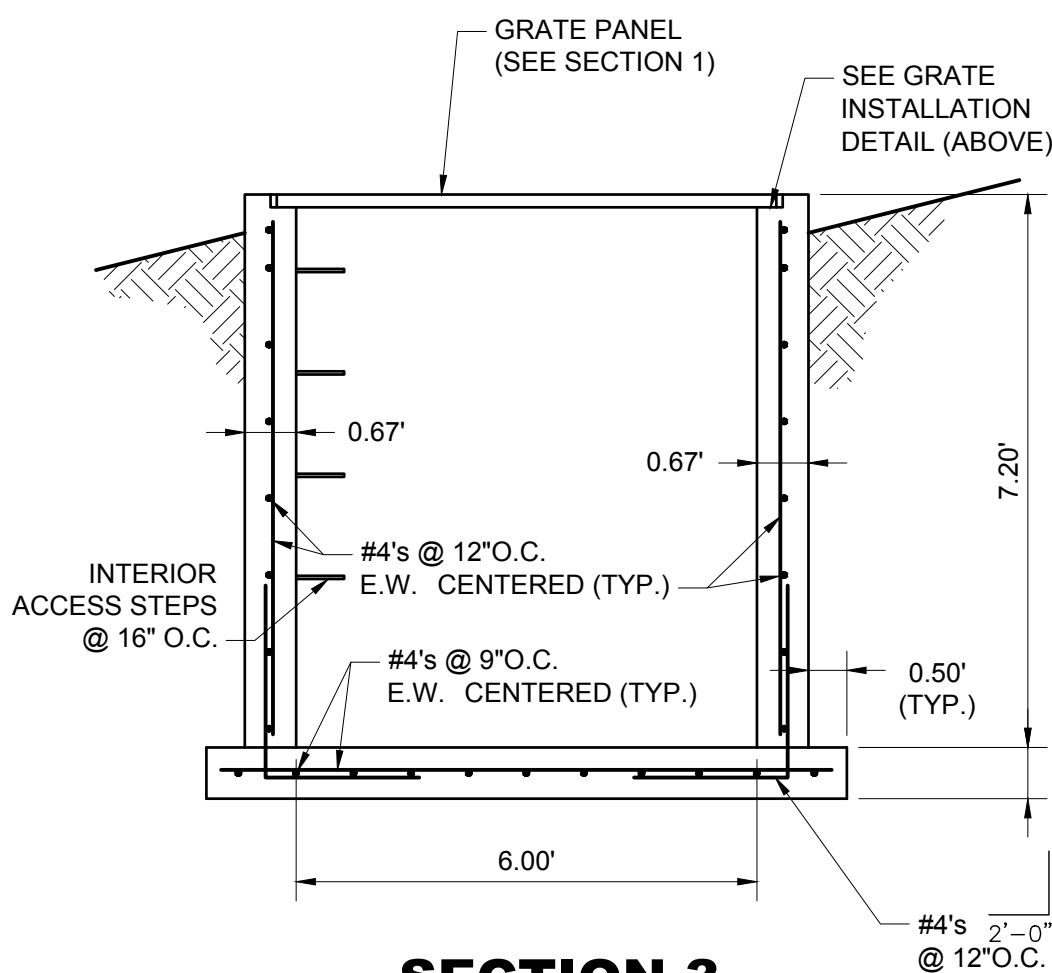
CONCRETE CHAMFER
DETAIL
N.T.S.



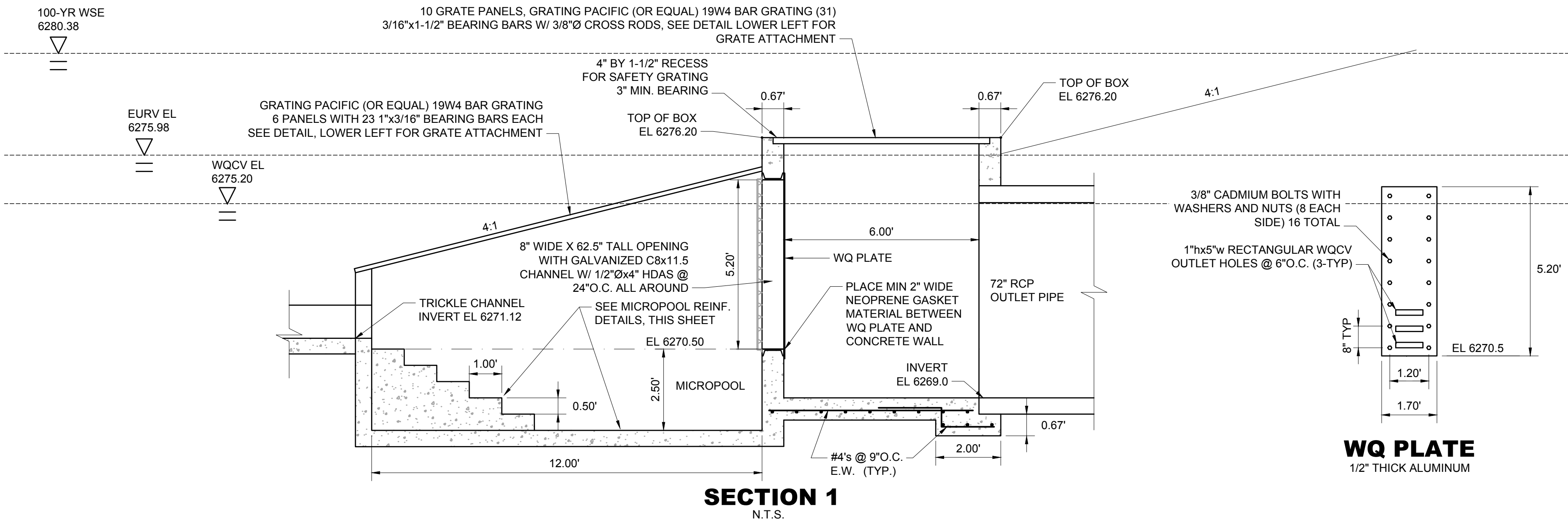
TYPICAL CORNER
REINFORCING DETAIL
N.T.S.



GRATE INSTALLATION DETAIL
N.T.S.

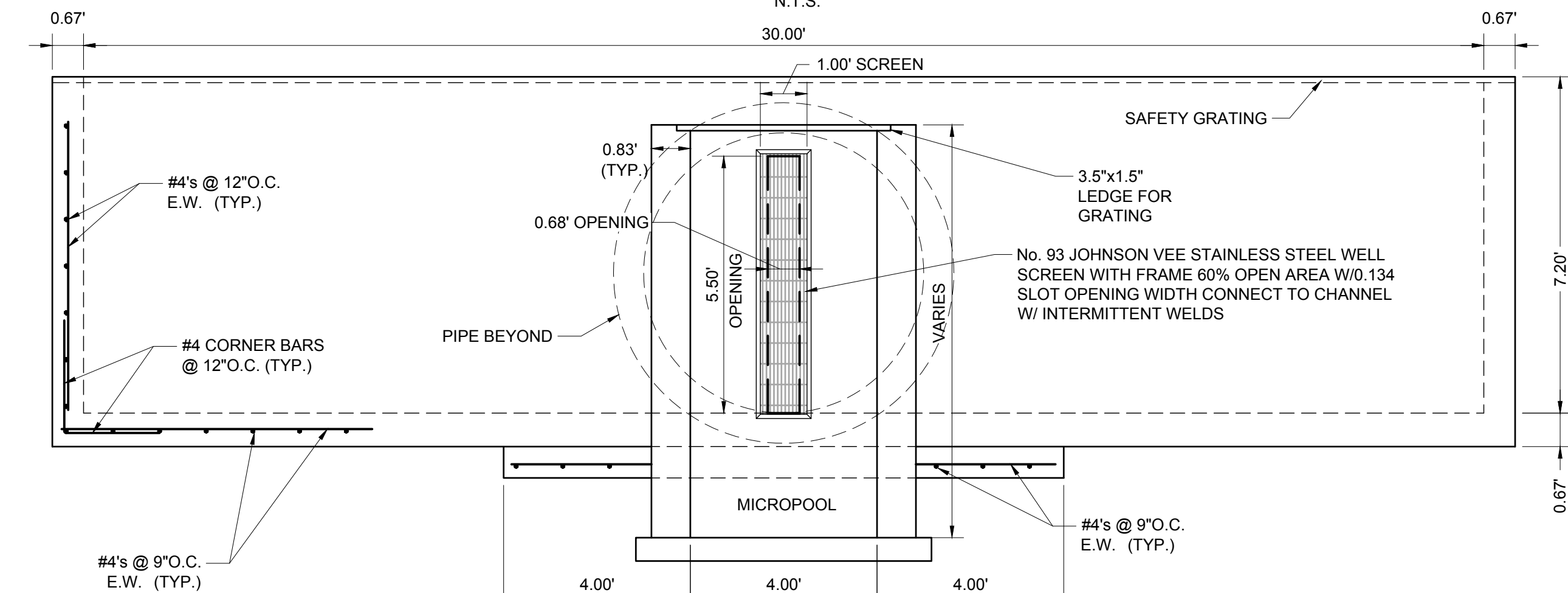


SECTION 3
N.T.S.

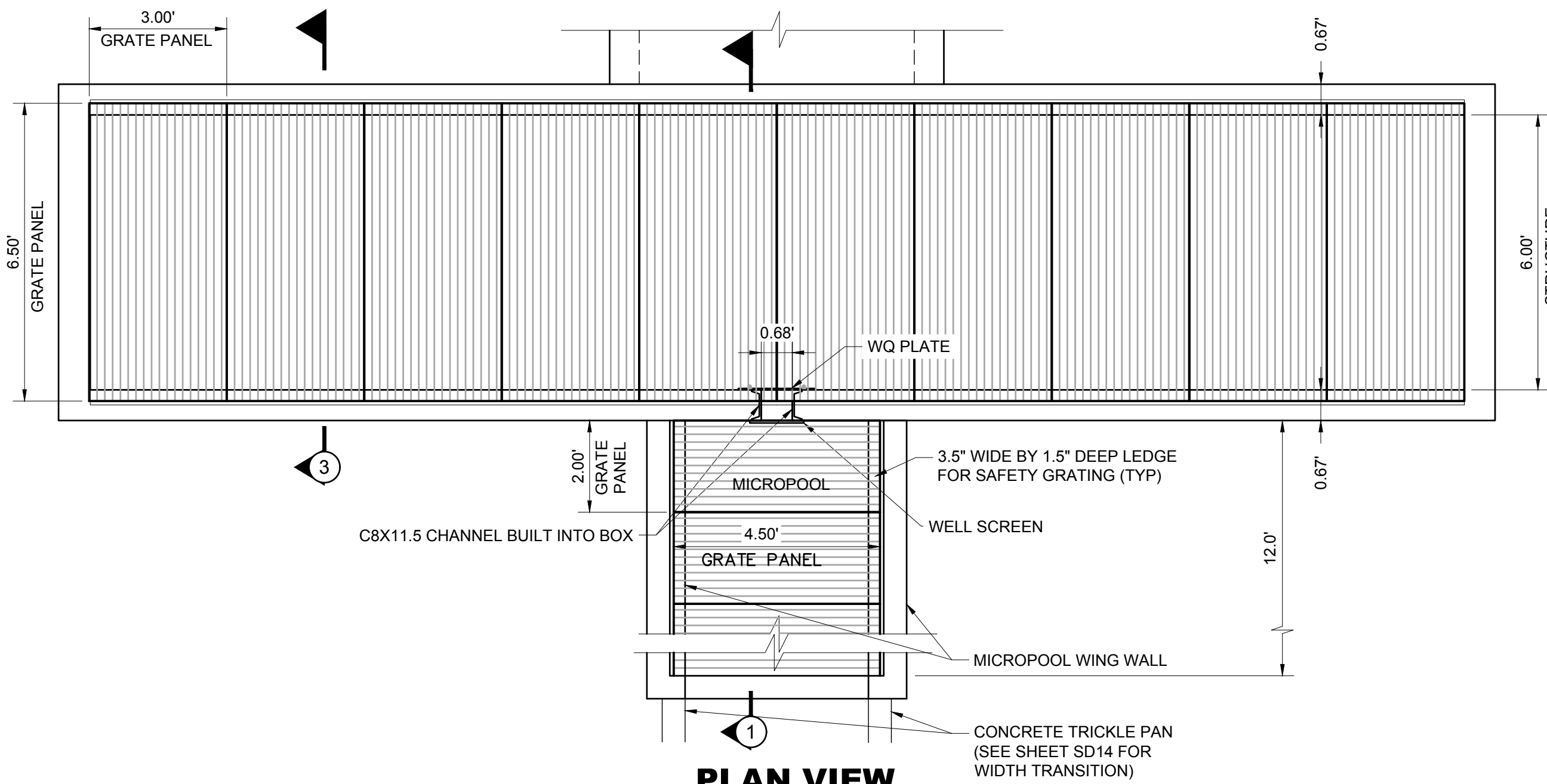


SECTION 1
N.T.S.

WQ PLATE
1/2" THICK ALUMINUM



FRONT VIEW
N.T.S.



PLAN VIEW
N.T.S.

DATE	REVISION DESCRIPTION

Job Number HINES LP			Drawing Name 32SD16.dwg
Chk BKM	Drw RLS	Des RLS	

PROJECT BENCHMARK
(AZTEC #401)
DOUGLAS COUNTY
BENCHMARK TT17A
(NAVD88 DATUM)
ELEVATION=6483.68

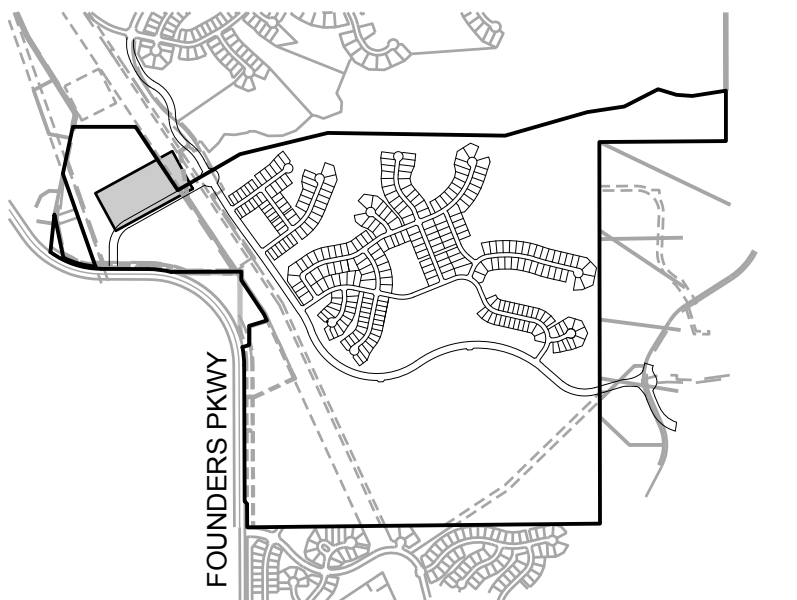
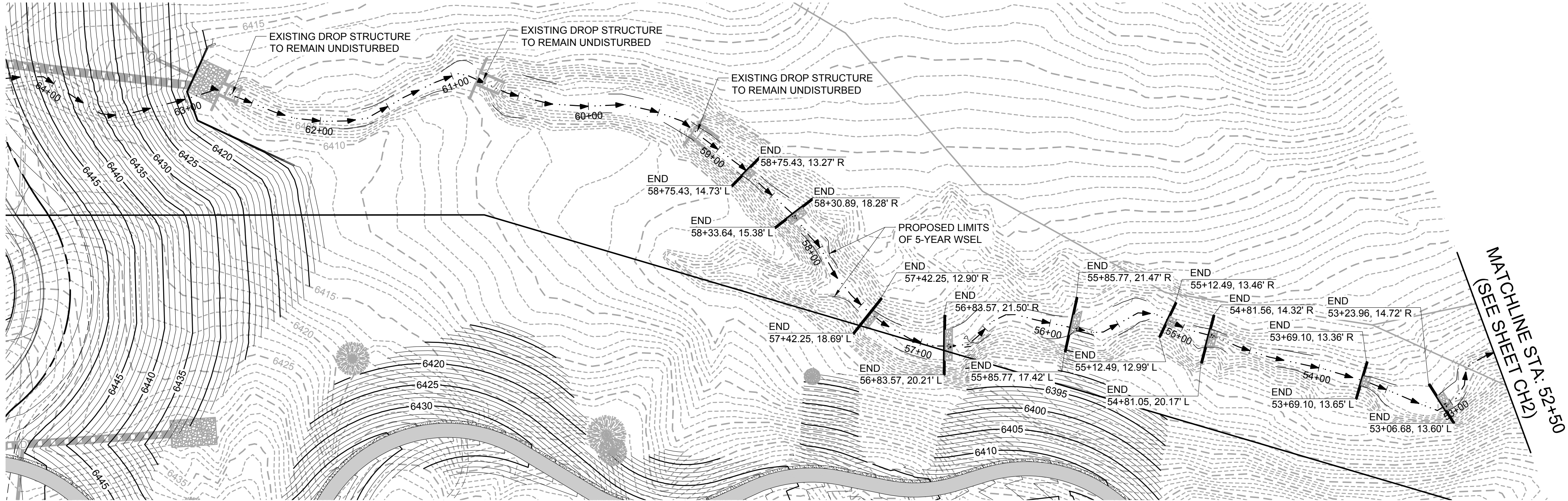
Hines

COVER
ENGINEERING

CANYONS FAR SOUTH FILING 1
GRADING, ROADWAY, & UTILITY PLANS
POND G - DETAILS

TOCR PROJECT NO: CD24-0011

Sheet
SD16
of
185
Date
MAY 15, 2024



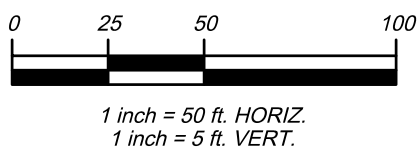
KEYMAP

CONSTRUCTION NOTES:

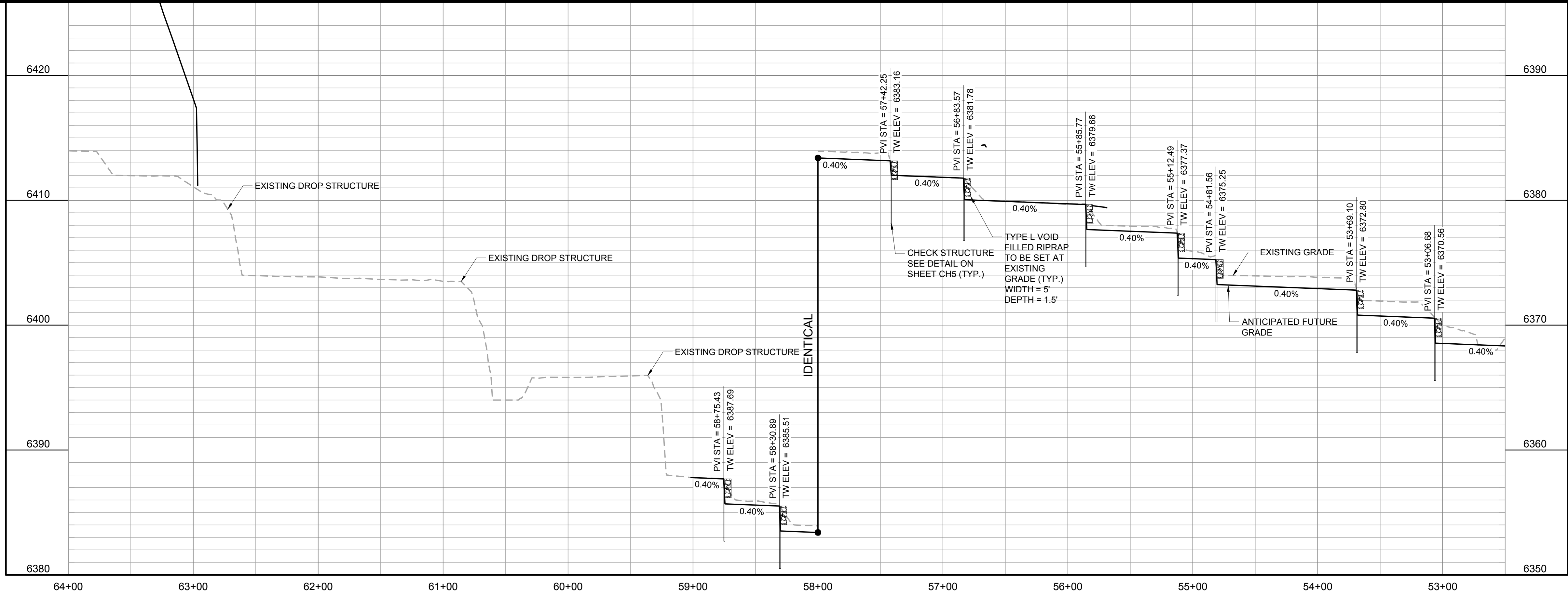
- SEE TESC PLANS FOR EROSION CONTROL MEASURES.
- SEE CONSTRUCTION PLANS FOR DETAILS OF PERMANENT DRAINAGE FACILITIES SUCH AS DETENTION FACILITIES, CULVERTS, STORM DRAINS AND OUTLET PROTECTION.
- EROSION CONTROL BLANKET (ECB) TO BE PLACED ON ALL SLOPES STEEPER THAN 4:1.
- CHECK STRUCTURE RIPRAP SHALL EXTEND TO THE LIMITS OF THE 5-YEAR STORM EVENT. THE END OF THE CHECK STRUCTURE IS SET 10' BEYOND THE 5-YEAR STORM EVENT.

LEGEND:

- 6425 PROPOSED MAJOR CONTOURS
- 6424 PROPOSED MINOR CONTOURS
- 6425 EXISTING MAJOR CONTOURS
- 6424 EXISTING MINOR CONTOURS
- ⓪ PROPOSED STORM DRAIN MANHOLE
- PROPOSED STORM DRAIN PIPE
- PROPOSED STORM DRAIN INLET
- FLOW ARROW
- 5-YEAR WSEL
- PROPOSED RIPRAP



CHANNEL IMPROVMENTS



BASIS OF BEARINGS

PROJECT BEARINGS ARE BASED ON THE EAST LINE OF THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 30, TOWNSHIP 7 SOUTH, RANGE 66 WEST OF THE SIXTH P.M., BEARING SOUTH 00°03'56" EAST, FROM THE EAST QUARTER CORNER OF SECTION 30, BEING MONUMENTED BY A REBAR WITH A 2 INCH ALUMINUM CAP STAMPED "PLS 23515" TO THE SOUTH SIXTEENTH CORNER OF SECTIONS 29/30, BEING MONUMENTED BY A REBAR WITH A 1-1/2 INCH ALUMINUM CAP, STAMPED "PLS 23515".

PROFESSIONAL ENGINEER CERTIFICATION

I HEREBY AFFIRM THAT THESE FINAL CONSTRUCTION PLANS WERE PREPARED UNDER MY DIRECT SUPERVISION, IN ACCORDANCE WITH ALL APPLICABLE TOWN OF CASTLE ROCK AND STATE OF COLORADO STANDARDS AND STATUTES, RESPECTIVELY, AND THAT I AM FULLY RESPONSIBLE FOR ALL DESIGN AND REVISIONS RELATIVE TO SAID PLANS.

BRIAN K. MOSS
REGISTERED PROFESSIONAL ENGINEER
STATE OF COLORADO NO. 37702

TOWN APPROVAL BLOCK

TOWN OF CASTLE ROCK APPROVAL PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF DEVELOPMENT SERVICES APPROVAL

APPROVED BY:

DEVELOPMENT SERVICES
TOCR PROJECT NO: CD24-0011

DATE	REVISION DESCRIPTION

Job Number HINES LP		
Chk	Drw	Des
BKM	RLS	
Drawing Name: 32CH1-CH5.dwg		

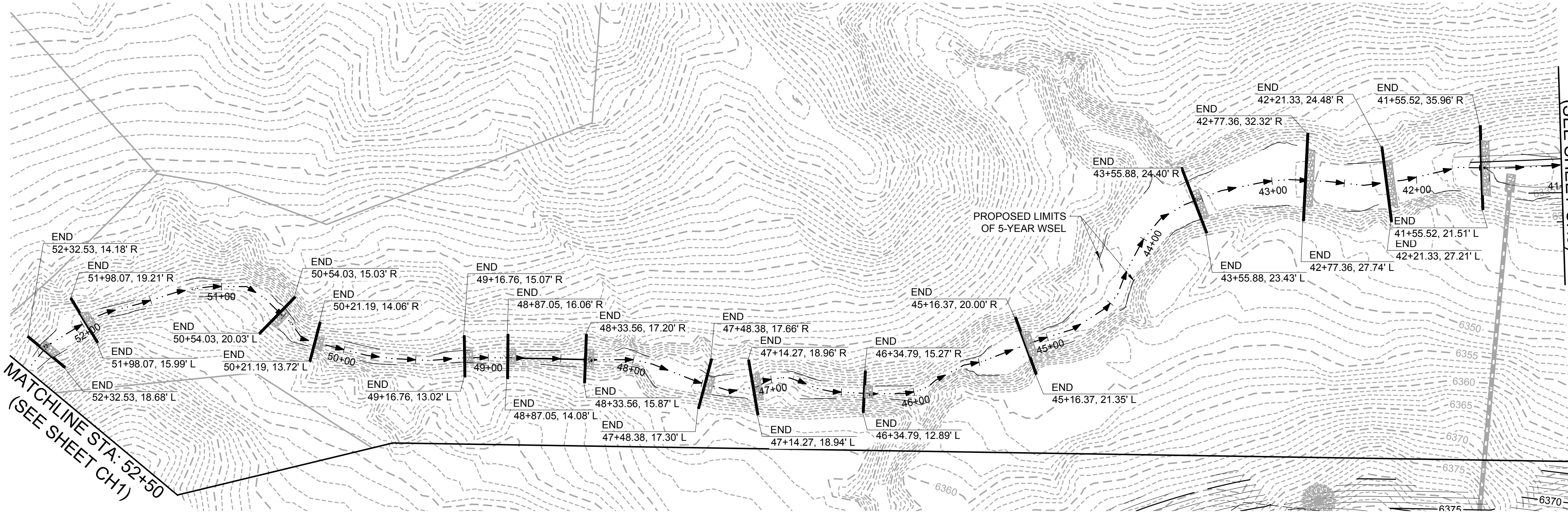
PROJECT BENCHMARK
(AZTEC #401)
DOUGLAS COUNTY
BENCHMARK TT17A
(NAVD88 DATUM)
ELEVATION=6483.68

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COVER
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GRADING, ROADWAY, & UTILITY PLANS
CHANNEL PLAN AND PROFILE

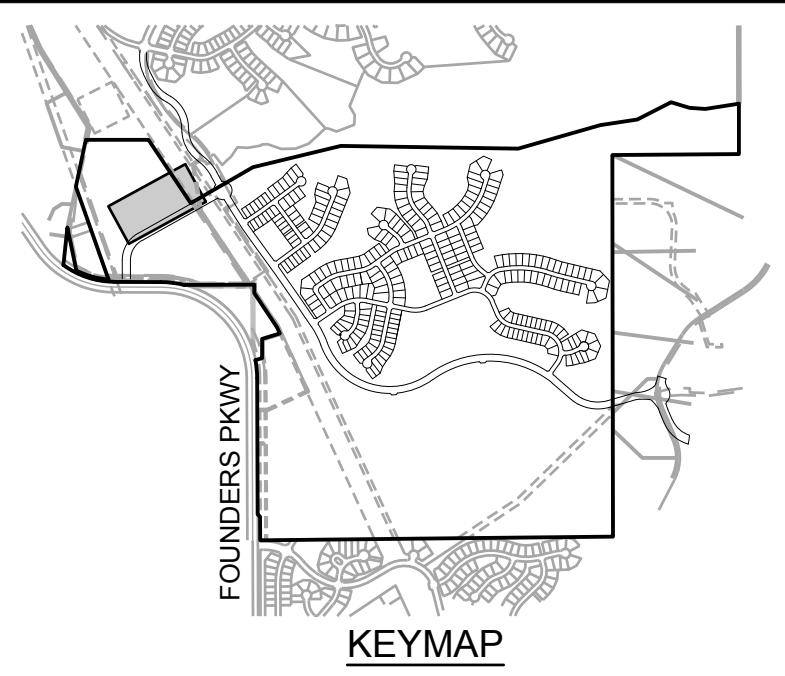
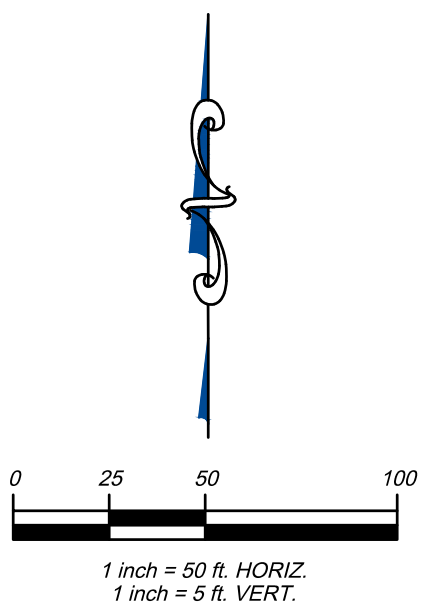
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118 of 185



MATCHLINE STA: 52+50
(SEE SHEET CH1)

MATCHLINE STA: 41+00
(SEE SHEET CH3)

CHANNEL IMPROVMENTS



- ### CONSTRUCTION NOTES:
- SEE TESC PLANS FOR EROSION CONTROL MEASURES.
 - SEE CONSTRUCTION PLANS FOR DETAILS OF PERMANENT DRAINAGE FACILITIES SUCH AS DETENTION FACILITIES, CULVERTS, STORM DRAINS AND OUTLET PROTECTION.
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 - 6424 PROPOSED MINOR CONTOURS
 - 6425 EXISTING MAJOR CONTOURS
 - 6424 EXISTING MINOR CONTOURS
 - PROPOSED STORM DRAIN MANHOLE
 - PROPOSED STORM DRAIN PIPE
 - PROPOSED STORM DRAIN INLET
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 - 5-YEAR WSEL
 - PROPOSED RIPRAP

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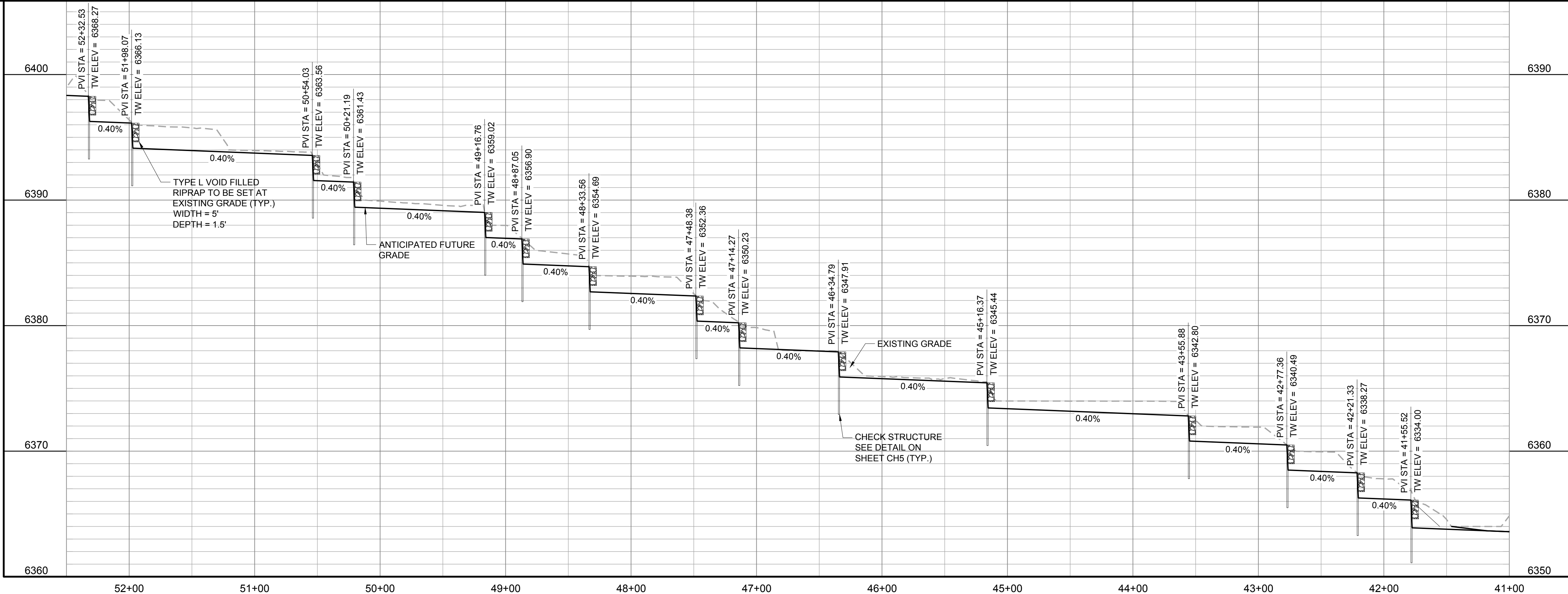
BRIAN K. MOSS
REGISTERED PROFESSIONAL ENGINEER
STATE OF COLORADO NO. 37702

TOWN APPROVAL BLOCK

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DEVELOPMENT SERVICES _____ DATE _____
TOCR PROJECT NO: CD24-0011



TYPE L VOID FILLED
RIPRAP TO BE SET AT
EXISTING GRADE (TYP.)
WIDTH = 5'
DEPTH = 1.5'

ANTICIPATED FUTURE
GRADE

EXISTING GRADE

CHECK STRUCTURE
SEE DETAIL ON
SHEET CH5 (TYP.)

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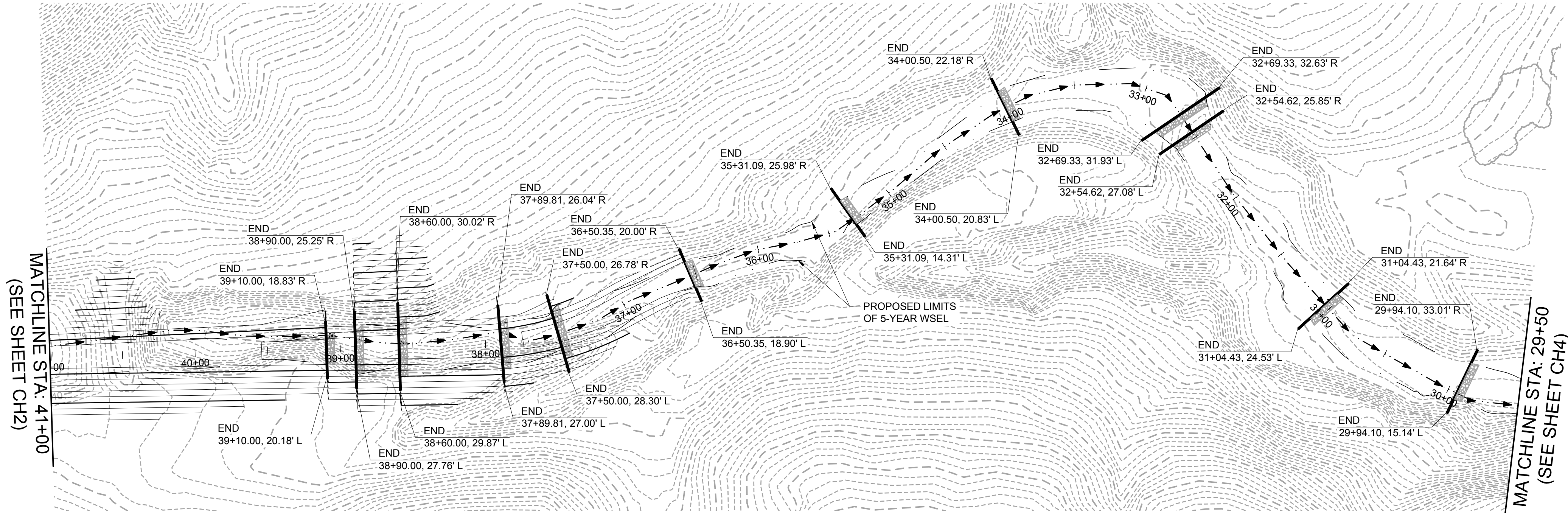
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BKM	RLS	
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DOUGLAS COUNTY
BENCHMARK TT17A
(NAVD88 DATUM)
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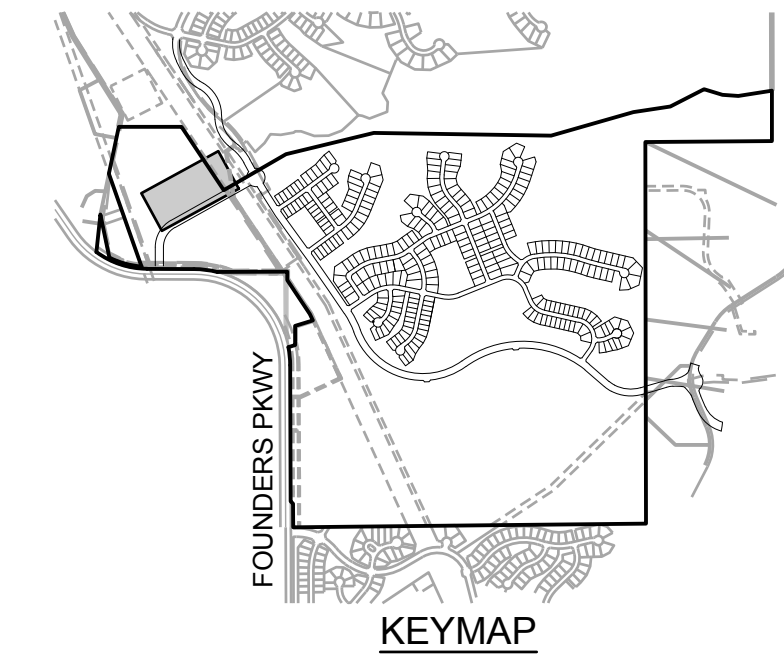
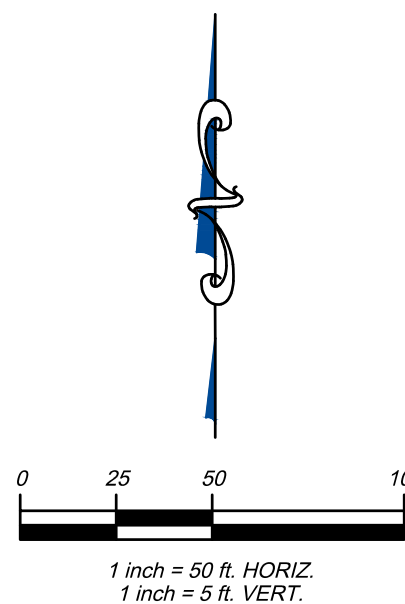
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CHANNEL IMPROVMENTS



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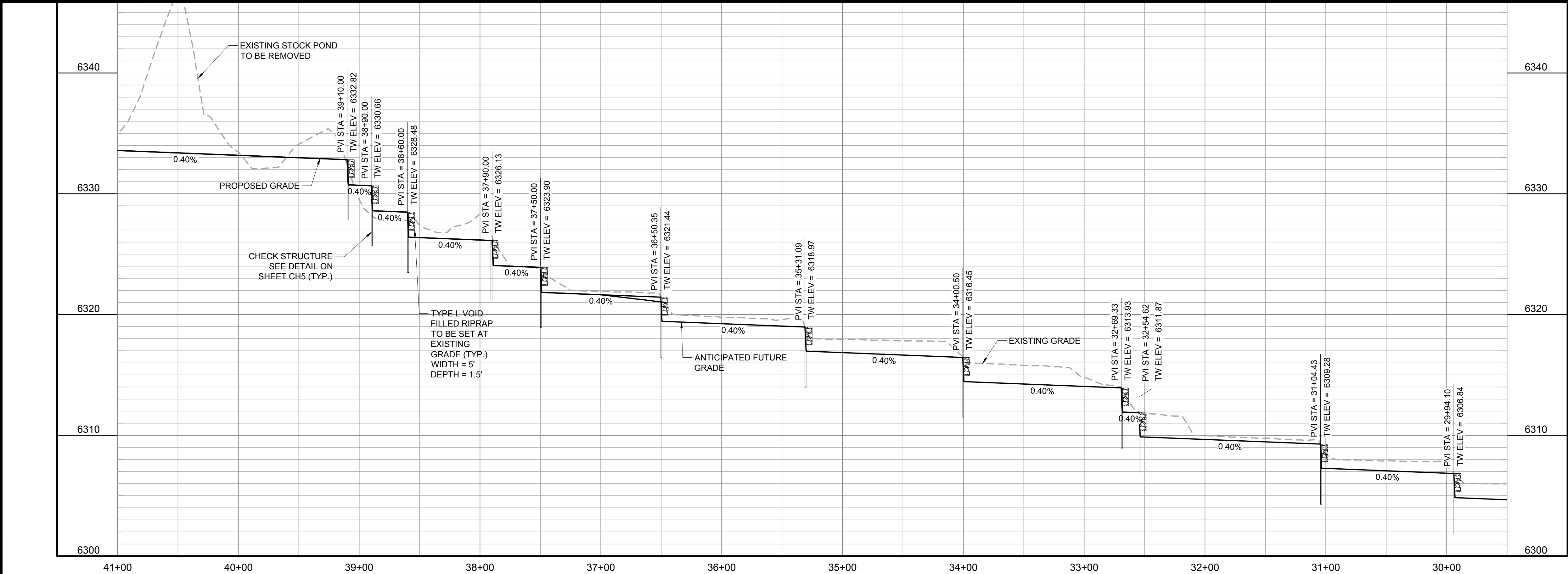
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BKM	RLS	
Drawing Name RLS 32CH1-CH5.dwg		

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BENCHMARK TT17A

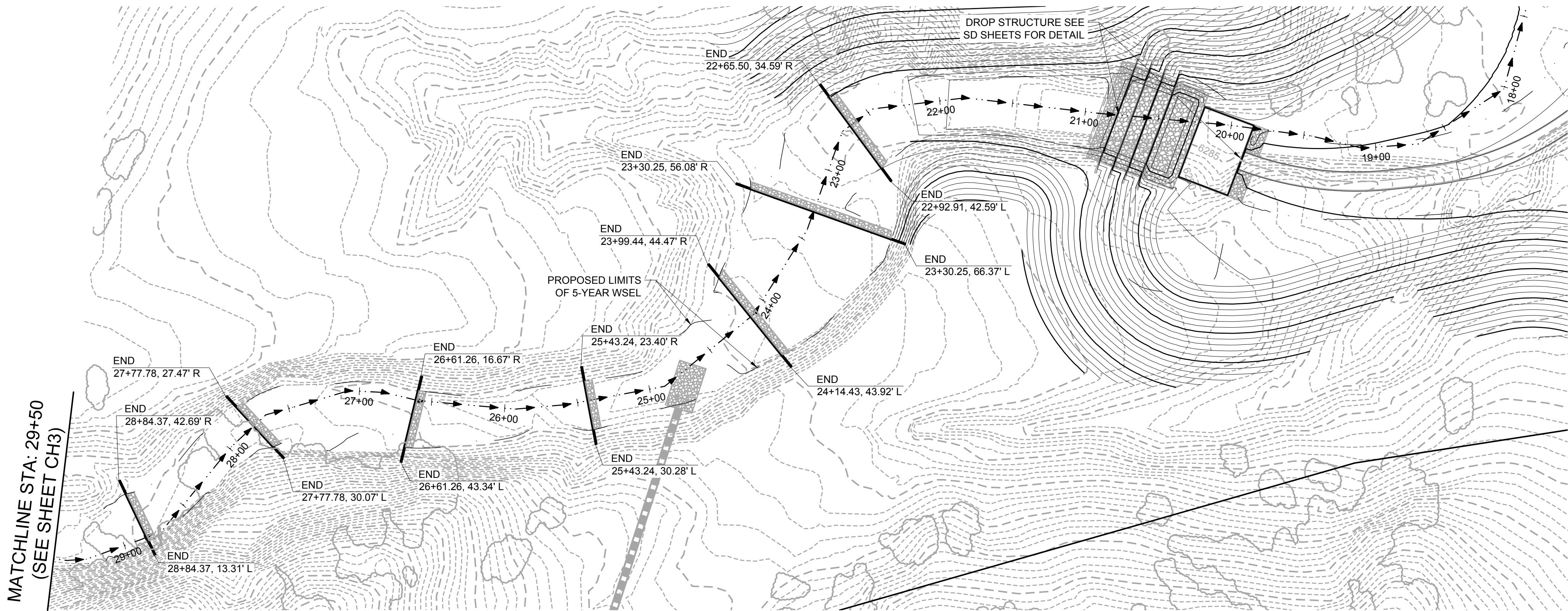
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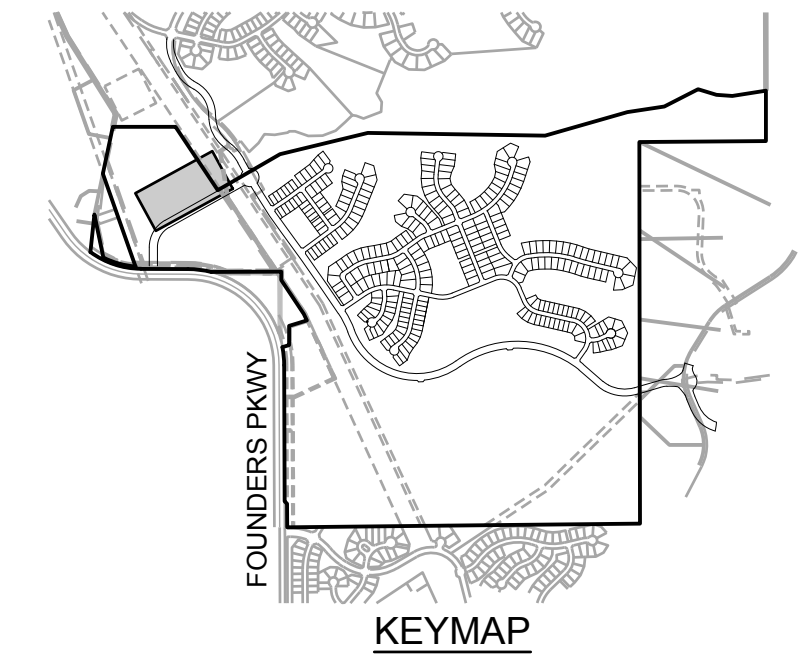
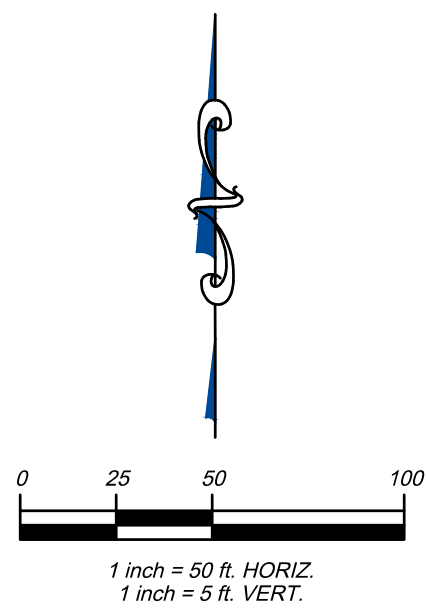
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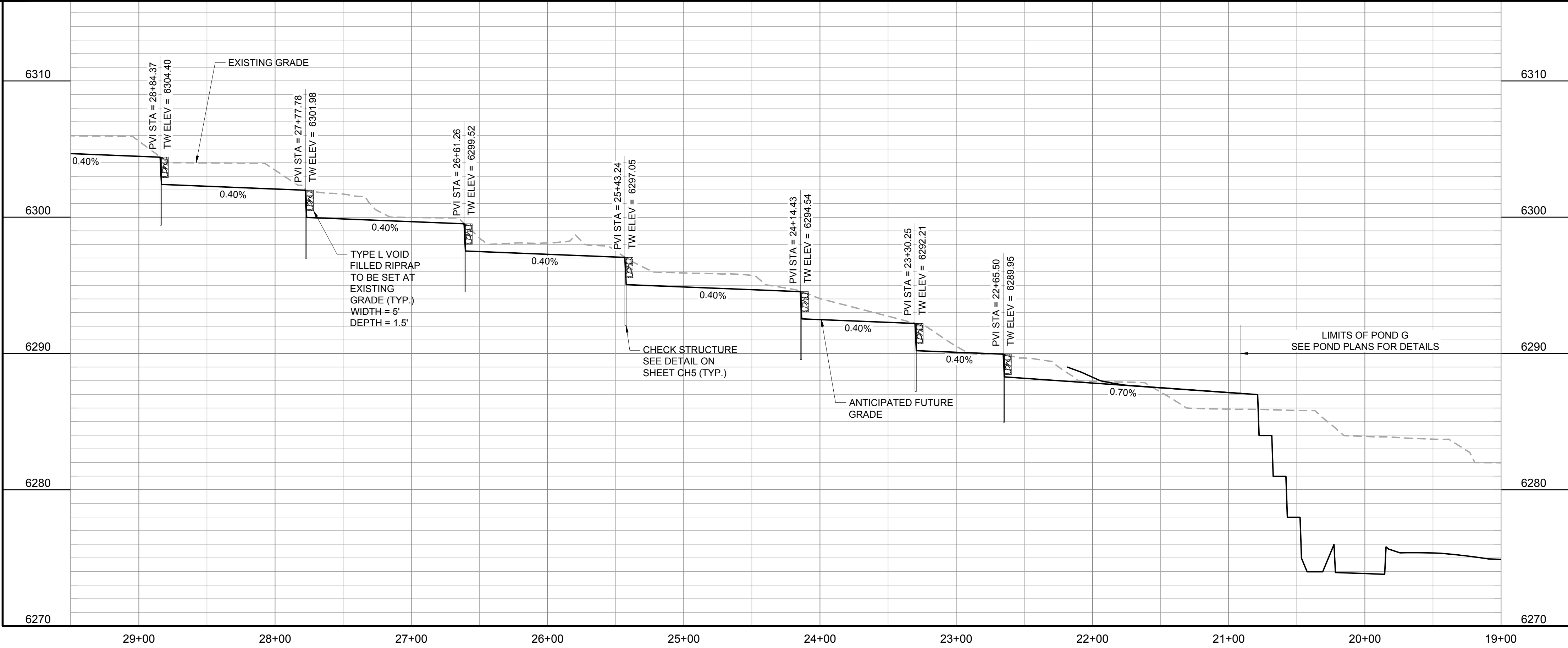
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BENCHMARK TT17A
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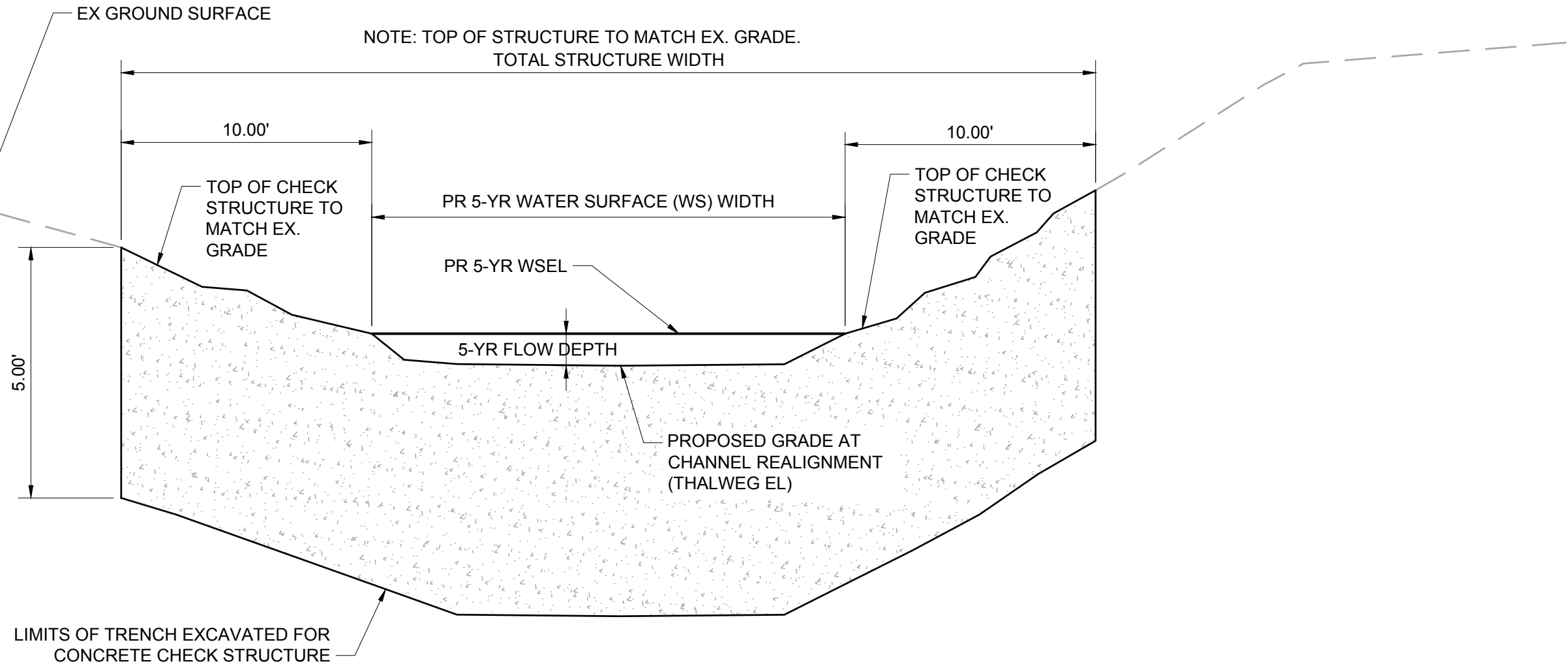
PROJECT BENCHMARK
(AZTEC #401) DOUGLAS COUNTY BENCHMARK TT17A (NAVD88 DATUM) ELEVATION=6483.68

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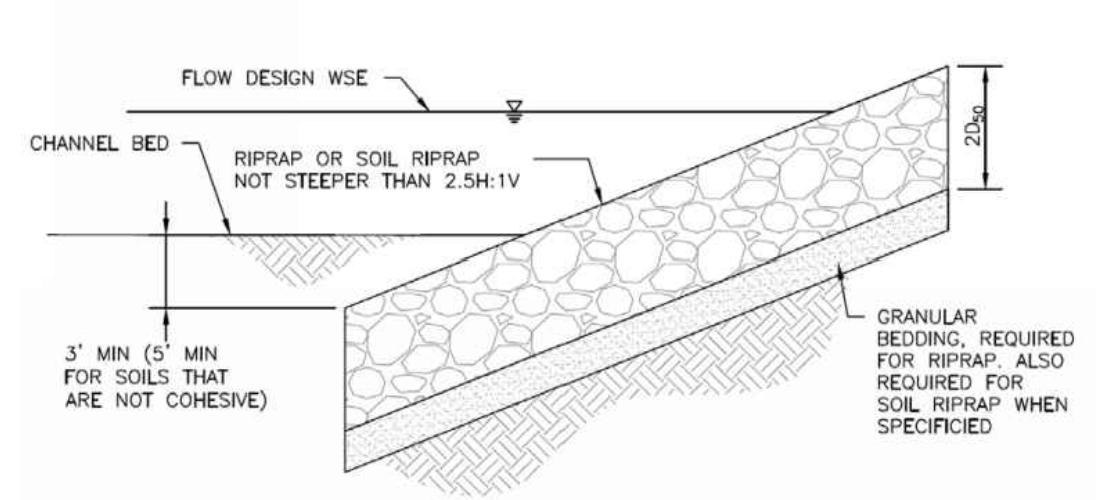
- NOTES:
- DESIGN ASSUMES A CONCRETE CHECK STRUCTURE.
 - STRUCTURE TO BE 1' THICK. TRENCH IN UNDISTURBED SOIL. DO NOT OVER EXCAVATE TO FORM STRUCTURE. FINISH TOP 6" OF STRUCTURE LENGTH.
 - STRUCTURE TO EXTEND 10' EACH SIDE OF 5-YR WATER SURFACE LIMITS.
 - DESIGN ASSUMES A 2' ULTIMATE DROP. CHECK STRUCTURE TO EXTEND 5' BELOW EXISTING CHANNEL INVERT OR KEY 6" INTO BEDROCK.
 - CONCRETE TO BE VIBRATED INTO TRENCH.
 - CONCRETE TO BE 3,500 PSI MIN.
 - CONCRETE STRUCTURE IS ASSUMED FOR CONSTRUCTION. IF SOIL CANNOT BE EXCAVATED WITHOUT SIGNIFICANT SLOUGHING, CONTACT ENGINEER FOR INFORMATION REGARDING SHEET PILING OPTION.
 - VIBRATE CONCRETE TO FILL VOIDS IN TRENCH WALLS. DO NOT OVER VIBRATE AND CAUSE MATERIAL SEPARATION WITHIN THE CONCRETE.
 - SEE TABLE BELOW FOR INDIVIDUAL STRUCTURE INFORMATION.
 - SHEET PILE MUST BE USED WHERE SOIL CANNOT HOLD A VERTICAL WALL.

CHECK STRUCTURE

NOT TO SCALE

STATION	APPROXIMATE THALWEG EL	5-YR WSEL	5-YR FLOW DEPTH (FT)	5-YR WSEL WIDTH (FT)	TOTAL STRUCTURE WIDTH (FT)
58+75.43	6387.67	6388.15	0.48	8	28
58+30.89	6385.52	6386.54	1.02	14	34
57+42.25	6383.17	6383.54	0.37	12	32
56+83.57	6381.77	6382.13	0.36	22	42
55+85.77	6379.72	6380.00	0.28	19	39
55+12.49	6377.49	6377.80	0.31	6	26
54+81.56	6375.00	6376.25	1.25	14	34
53+69.10	6372.90	6373.78	0.88	7	27
53+06.68	6370.65	6371.25	0.60	12	32
52+32.53	6368.15	6368.88	0.73	13	33
51+98.07	6366.21	6367.69	1.48	15	35
50+54.03	6363.62	6364.49	0.87	15	35
50+21.19	6361.32	6362.76	1.44	8	28
49+16.76	6359.08	6359.82	0.74	8	28
48+87.05	6356.82	6358.87	2.05	10	30
48+33.56	6354.80	6356.80	2.00	13	33
47+48.38	6352.43	6353.58	1.15	15	35
47+14.27	6350.27	6351.91	1.64	18	38
46+34.79	6347.86	6348.90	1.04	8	28
45+16.37	6345.50	6345.92	0.42	21	41
43+55.68	6342.80	6343.75	0.95	28	48
42+77.36	6340.53	6341.61	1.08	40	60
42+21.33	6338.30	6339.40	1.10	32	52
41+55.52	6334.40	6337.15	2.75	37	57
39+10.00	6332.82	6333.88	1.06	19	39
38+90.00	6330.66	6332.00	1.34	33	53
38+60.00	6328.47	6330.61	2.14	40	60
37+90.00	6326.13	6327.72	1.59	33	53
37+50.00	6323.90	6326.07	2.17	35	55
36+50.35	6321.05	6321.88	0.83	19	39
35+31.09	6318.61	6319.68	1.07	20	40
34+00.50	6316.54	6317.58	1.04	23	43
32+69.33	6313.70	6315.17	1.47	45	65
32+54.62	6311.91	6313.90	1.99	33	53
31+04.43	6309.42	6309.90	0.48	26	46
29+94.10	6306.90	6307.95	1.05	28	48
28+84.37	6304.53	6306.14	1.61	36	56
27+77.78	6302.00	6303.30	1.30	38	58
26+61.25	6299.56	6300.50	0.94	40	60
25+43.24	6297.00	6298.00	1.00	34	54
24+14.43	6294.56	6295.25	0.69	70	90
23+30.25	6292.23	6292.42	0.19	102	122
22+65.50	6289.96	6290.20	0.24	62	82

CHECK STRUCTURE SUMMARY TABLE



RIPRAP DESIGNATION	% SMALLER THAN GIVEN SIZE BY WEIGHT	INTERMEDIATE ROCK DIMENSION (INCHES)	D ₅₀ * (INCHES)
TYPE VL	70 – 100	12	6
	50 – 70	9	
	35 – 50	6	
	2 – 10	2	
TYPE L	70 – 100	15	9
	50 – 70	12	
	35 – 50	9	
	2 – 10	3	
TYPE M	70 – 100	21	12
	50 – 70	18	
	35 – 50	12	
	2 – 10	4	
TYPE H	70 – 100	30	18
	50 – 70	24	
	35 – 50	18	
	2 – 10	6	

*D₅₀ = MEAN ROCK SIZE

Figure 8-34. Riprap and soil riprap placement and gradation (part 1 of 3)

- SOIL RIPRAP NOTES:
- ELEVATION TOLERANCES FOR THE SOIL RIPRAP SHALL BE 0.10 FEET. THICKNESS OF SOIL RIPRAP SHALL BE NO LESS THAN THICKNESS SHOWN AND NO MORE THAN 2-INCHES GREATER THAN THE THICKNESS SHOWN.
 - WHERE "SOIL RIPRAP" IS DESIGNATED ON THE CONTRACT DRAWINGS, RIPRAP VOIDS ARE TO BE FILLED WITH NATIVE SOIL. THE RIPRAP SHALL BE PRE-MIXED WITH THE NATIVE SOIL AT THE FOLLOWING PROPORTIONS BY VOLUME: 65PERCENT RIPRAP AND 35 PERCENT SOIL. THE SOIL USED FOR MIXING SHALL BE NATIVE TOPSOIL AND SHALL HAVE A MINIMUM FINES CONTENT OF 15 PERCENT. THE SOIL RIPRAP SHALL BE INSTALLED IN A MANNER THAT RESULTS IN A DENSE, INTERLOCKED LAYER OF RIPRAP WITH RIPRAP VOIDS FILLED COMPLETELY WITH SOIL. SEGREGATION OF MATERIALS SHALL BE AVOIDED AND IN NO CASE SHALL THE COMBINED MATERIAL CONSIST PRIMARILY OF SOIL; THE DENSITY AND INTERLOCKING NATURE OF RIPRAP IN THE MIXED MATERIAL SHALL ESSENTIALLY BE THE SAME AS IF THE RIPRAP WAS PLACED WITHOUT SOIL.
 - WHERE SPECIFIED (TYPICALLY AS "BURIED SOIL RIPRAP"), A SURFACE LAYER OF TOPSOIL SHALL BE PLACED OVER THE SOIL RIPRAP ACCORDING TO THE THICKNESS SPECIFIED ON THE CONTRACT DRAWINGS. THE TOPSOIL SURFACE LAYER SHALL BE COMPACTED TO APPROXIMATELY 85% OF MAXIMUM DENSITY AND WITHIN TWO PERCENTAGE POINTS OF OPTIMUM MOISTURE IN ACCORDANCE WITH ASTM D698. TOPSOIL SHALL BE ADDED TO ANY AREAS THAT SETTLE.
 - ALL SOIL RIPRAP THAT IS BURIED WITH TOPSOIL SHALL BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO ANY TOPSOIL PLACEMENT.

GRADATION FOR GRANULAR BEDDING		
U.S. STANDARD SIEVE SIZE	PERCENT PASSING BY WEIGHT	
	TYPE I CDOT SECT. 703.01	TYPE II CDOT SECT. 703.09 CLASS A
3 INCHES	—	90 – 100
1½ INCHES	—	—
¾ INCHES	—	20 – 90
¾ INCHES	100	—
#4	95 – 100	0 – 20
#16	45 – 80	—
#50	10 – 30	—
#100	2 – 10	—
#200	0 – 2	0 – 3

RIPRAP BEDDING

Figure 8-34. Riprap and soil riprap placement and gradation (part 2 of 3)

THICKNESS REQUIREMENTS FOR GRANULAR BEDDING			
RIPRAP DESIGNATION	MINIMUM BEDDING THICKNESS (INCHES)		
	FINE-GRAINED SOILS ¹		COARSE-GRAINED SOILS ²
	TYPE I (LOWER LAYER)	TYPE II (UPPER LAYER)	TYPE II
VL (D ₅₀ = 6 IN)	4	4	6
L (D ₅₀ = 9 IN)	4	4	6
M (D ₅₀ = 12 IN)	4	4	6
H (D ₅₀ = 18 IN)	4	6	8
VH (D ₅₀ = 24 IN)	4	6	8

- NOTES:
- MAY SUBSTITUTE ONE 12-INCH LAYER OF TYPE II BEDDING. THE SUBSTITUTION OF ONE LAYER OF TYPE II BEDDING SHALL NOT BE PERMITTED AT DROP STRUCTURES. THE USE OF A COMBINATION OF FILTER FABRIC AND TYPE II BEDDING AT DROP STRUCTURES IS ACCEPTABLE.
 - FIFTY PERCENT OR MORE BY WEIGHT RETAINED ON THE #40 SIEVE.

Figure 8-34. Riprap and soil riprap placement and gradation (part 3 of 3)



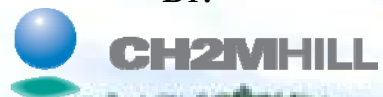
MCMURDO GULCH FLOOD HAZARD AREA DELINEATION

McMURDO GULCH FLOOD HAZARD AREA DELINEATION

NOVEMBER 2007

AMENDED FEBRUARY 2012

By:



PREPARED FOR:



TOWN OF CASTLE ROCK
UTILITIES DEPARTMENT
175 KELLOGG COURT
CASTLE ROCK, CO 80109

PREPARED BY:



4601 DTC BOULEVARD
SUITE 700
DENVER, CO 80237



TETRA TECH RMC



Table 3-2: Hydrologic Soil Groups

Soil Group	ID	Hydrologic Soil Group
Bresser sandy loam, 3 to 9 percent slopes	BrD	B
Bresser-Truckton sandy loams, 5 to 25 percent slopes	BtE	B
Bresser and Truckton soils, 3 to 12 percent slopes, eroded	BuD2	B
Coni rocky loam, 3 to 100 percent slopes	CoG	D
Fondis clay loam, 3 to 9 percent slopes	FoD	C
Fondis-Kutch association	Fu	C
Hilly gravelly land	Hg	D
Loamy alluvial land	Lo	C
Newlin gravelly sandy loam, 8 to 30 percent slopes	NeE	B
Peyton-Pring-Crowfoot sandy loams, 5 to 25 percent slopes	PpE	B
Sampson loam	Sa	B
Sandy alluvial land	Sd	A
Sandy wet alluvial land	Se	D
Stony steep land	Sv	D

Land use and estimated percent imperviousness used in the model are included in **Table 3-3** (based on values in the USDCM, UDFCD, 2001).

Table 3-3: Land Use Percent Imperviousness

Land Use Type	Percent Impervious
Undeveloped	10%
Golf Course	5%
Open Space	5%
Open Water	100%
Roads	95%
Rural	10%
Semi-rural	15%
Urban	65%

The imperviousness of the watershed was analyzed to be consistent with the Town of Castle Rock SWMP as well as with the drainage studies for the various developments along McMurdo Gulch. The existing conditions watersheds have an average imperviousness value of 19.3% with a low of 2% and a high of 75%. The average of the future conditions imperviousness rose to 29.1% with the same low and high impervious values. Some of the undeveloped basins within the watershed are expected to become more urbanized while others are built out with residential development.

3.3.3 Routing

The program EPA-SWMM was used to route the CUHP generated runoff hydrographs. The version of the model used is EPA-SWMM version 5.0. The routing element parameters required for EPA-SWMM are: element number, type (e.g. direct flow, channel, pipe, etc.), length, slope, side slopes and resistance coefficient value. EPA-SWMM parameters utilized in the model for the 100-year storm were obtained from the various models as well as the topographic information provided by the Town of Castle Rock to determine reach lengths and approximate widths of the drainage channels.

A summary of SWMM routing parameters including the lengths of channels and storm sewer, sizes, roughness coefficients, detention volumes, detention release rates, and invert elevations is included in **Appendix A**. The locations of the SWMM design points are shown on **Figure 3-2**. The output information from the EPA-SWMM analysis is also contained in **Appendix A**.

3.3.4 Detention

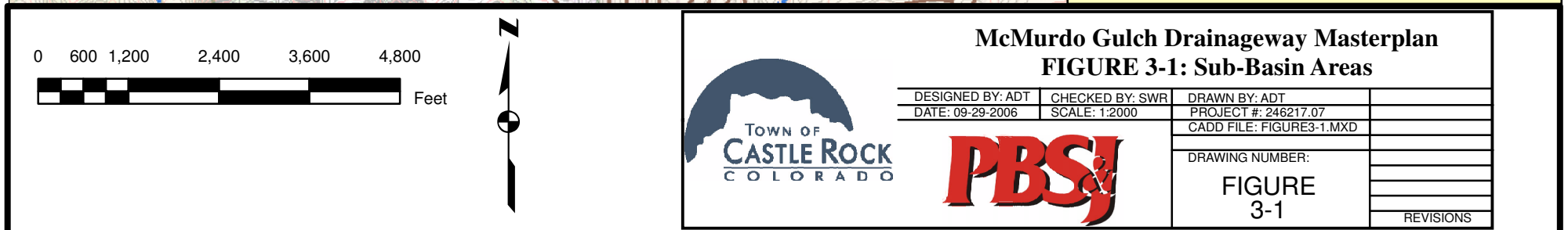
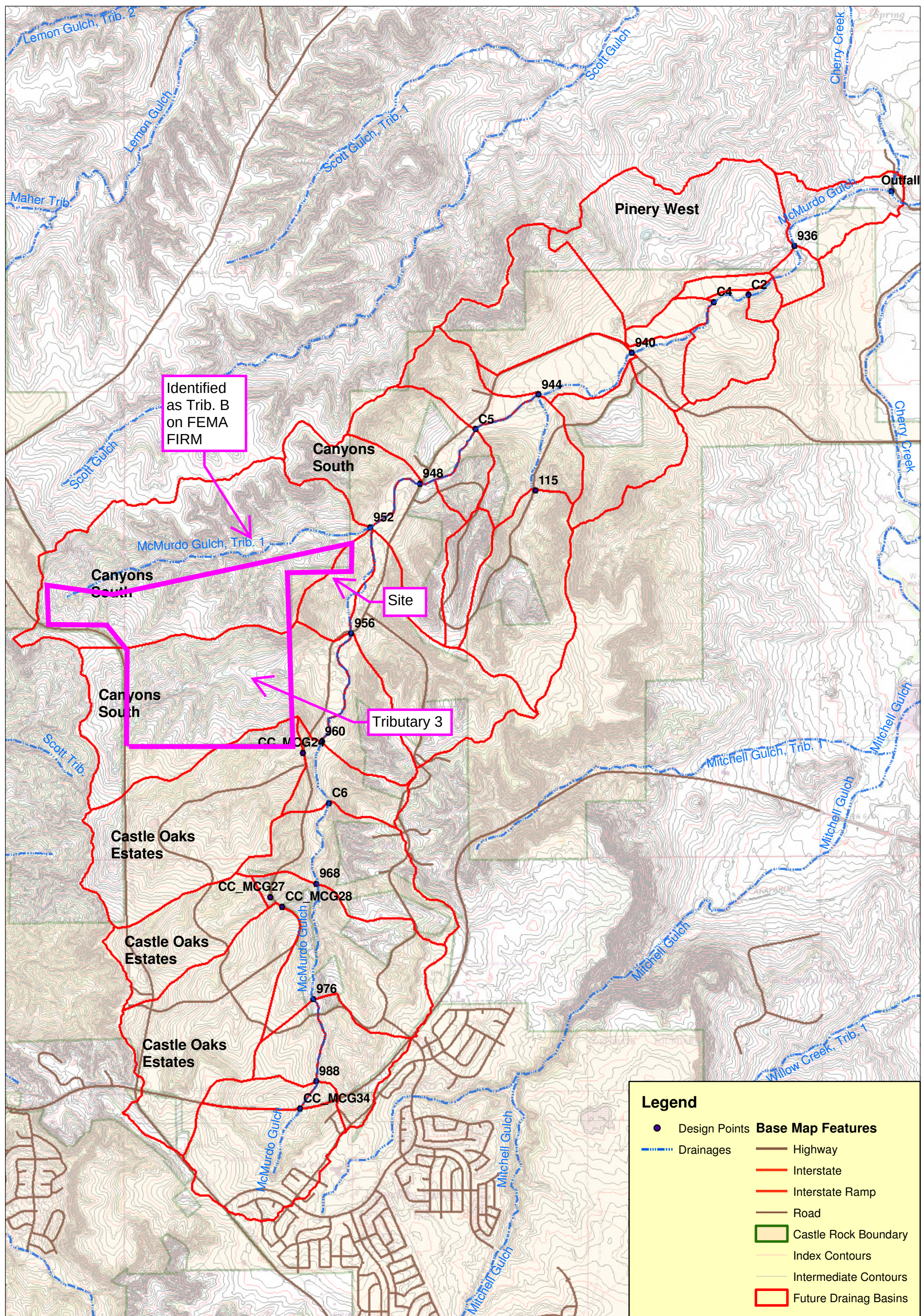
There are fifty-one (51) detention ponds in the future condition. The storage information for these detention ponds is included in **Appendix C** of the separate Baseline Hydrology Report (PBS&J, 2006).

3.4 Model Calibration

Existing conditions model yields flowrates consistent with the Town of Castle Rock SWMP. The Town of Castle Rock SWMP yields an existing 100-year peak flow rate of 5,025 cfs while this study yields a 100-year peak flow rate of 5,020 cfs for the existing conditions.

The previous model shows the peak flow occurring in the reach of channel upstream of the last reach before reaching the confluence with Cherry Creek. In this model, the peak flow rate occurs in the reach immediately upstream of the confluence with Cherry Creek.

The future conditions model for McMurdo Gulch shows that future flow conditions increase even with the proposed detention by the developments. The 100-year flow rate rises to 5,970 cfs in the reach immediately upstream of the confluence with Cherry Creek. There are no previous studies to calibrate this model to. The drainage reports associated with Liberty Village included a future conditions hydrologic model; however, there were discrepancies within the model including acreages for the physical and modeled watershed that did not match. Therefore, it was not deemed a reliable source to compare or calibrate results.



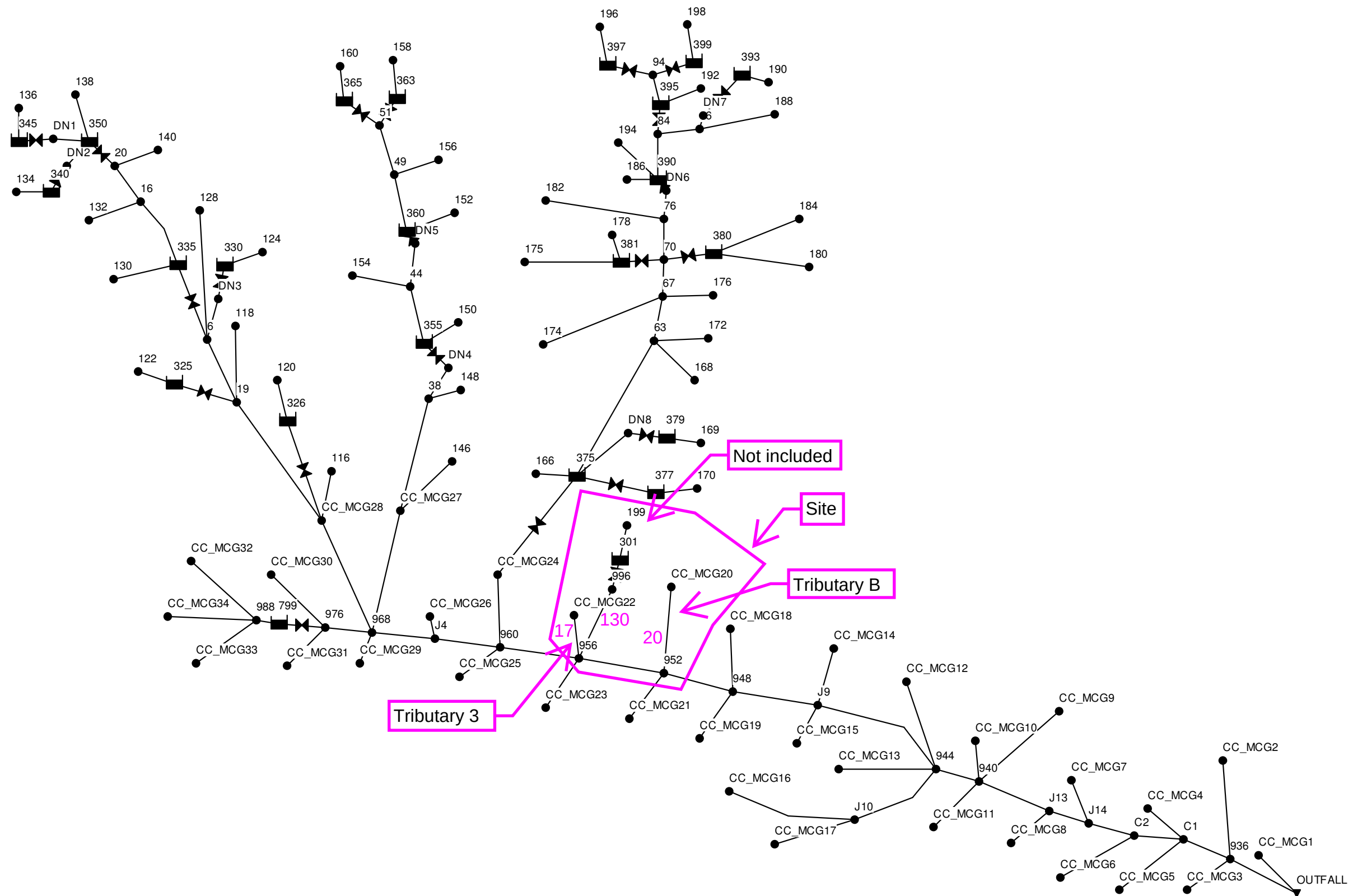
3.5 Summary of Results

A summary of peak runoff rates at primary design points is presented in **Table 3-4**.

The input and output from the CUHP models are included in **Appendix A**. These models are broken into existing and future conditions and include the 2-, 5-, 10-, 25-, 50-, 100- and 500-year storm events (results for the 100-year event only included in the Appendix). The input and output from the EPA-SWMM models are also included in **Appendix A**.

Table 3-4: Summary of Hydrologic Results

Design Point	2-year Flowrate (cfs)	5-year Flowrate (cfs)	10-year Flowrate (cfs)	25-year Flowrate (cfs)	50-year Flowrate (cfs)	100-year Flowrate (cfs)	500-year Flowrate (cfs)
EXISTING CONDITIONS							
936	360	1,050	1,510	3,010	3,640	5,020	7,080
940	330	950	1,350	2,660	3,240	4,440	6,250
944	310	870	1,220	2,410	2,920	3,980	5,580
948	260	730	1,010	2,002	2,430	3,290	4,620
960	110	300	450	970	1200	1,680	2,400
968	70	200	280	540	660	1,000	1,460
976	30	76	100	180	210	300	450
988	80	170	220	350	410	510	680
PROPOSED CONDITIONS							
936	570	1,380	1,880	3,640	4,450	5,970	8,200
940	550	1,310	1,920	3,530	4,290	5,480	7,550
944	540	1,190	1,920	3,360	3,960	4,990	6,830
948	570	1,120	1,420	2,670	3,210	4,300	5,870
960	430	730	900	1,390	1,600	2,040	2,890
968	280	470	570	860	990	1,230	1,640
976	110	170	200	300	360	480	640
988	250	380	450	630	710	850	1,080



Summary of CUHP Input Parameters (Version 1.1)

Catchment Name/ID	Raingage Name/ID	Area in (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Pecent Imperv.	Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions		
							Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imerv. Fraction	Receiv. Perv. Fraction
CC MCG1	CASTLE ROCK	0.122	0.273	0.621	0.031	10.1	0.36	0.10	4.50	0.60	0.0018	0.00	0.20	0.09
CC MCG2	CASTLE ROCK	0.434	0.534	0.997	0.032	22.0	0.36	0.10	4.50	0.60	0.0018	0.00	0.44	0.13
CC MCG3	CASTLE ROCK	0.036	0.148	0.292	0.042	12.1	0.36	0.10	4.50	0.60	0.0018	0.00	0.24	0.09
CC MCG4	CASTLE ROCK	0.026	0.220	0.431	0.018	12.1	0.36	0.10	4.50	0.60	0.0018	0.00	0.24	0.09
CC MCG5	CASTLE ROCK	0.020	0.128	0.231	0.062	12.1	0.36	0.10	4.50	0.60	0.0018	0.00	0.24	0.09
CC MCG6	CASTLE ROCK	0.128	0.384	0.636	0.040	12.1	0.36	0.10	4.50	0.60	0.0018	0.00	0.24	0.09
CC MCG7	CASTLE ROCK	0.039	0.220	0.431	0.020	12.1	0.36	0.10	4.50	0.60	0.0018	0.00	0.24	0.09
CC MCG8	CASTLE ROCK	0.057	0.188	0.361	0.058	12.1	0.36	0.10	4.50	0.60	0.0018	0.00	0.24	0.09
CC MCG9	CASTLE ROCK	0.257	0.314	0.629	0.059	12.7	0.36	0.10	4.12	0.58	0.0018	0.00	0.25	0.09
CC MCG10	CASTLE ROCK	0.113	0.324	0.761	0.040	14.7	0.36	0.10	3.75	0.55	0.0018	0.00	0.29	0.10
CC MCG11	CASTLE ROCK	0.208	0.213	0.649	0.082	14.7	0.36	0.10	3.75	0.55	0.0018	0.00	0.29	0.10
CC MCG12	CASTLE ROCK	0.104	0.431	0.712	0.068	18.8	0.36	0.10	4.50	0.60	0.0018	0.00	0.38	0.12
CC MCG13	CASTLE ROCK	0.151	0.309	0.606	0.036	18.8	0.36	0.10	4.50	0.60	0.0018	0.00	0.38	0.12
CC MCG14	CASTLE ROCK	0.131	0.420	0.671	0.069	18.9	0.36	0.10	4.50	0.60	0.0018	0.00	0.38	0.12
CC MCG15	CASTLE ROCK	0.050	0.315	0.612	0.076	18.9	0.36	0.10	4.50	0.60	0.0018	0.00	0.38	0.12
CC MCG16	CASTLE ROCK	0.075	0.296	0.624	0.056	18.8	0.36	0.10	4.50	0.60	0.0018	0.00	0.38	0.12
CC MCG17	CASTLE ROCK	0.299	0.484	1.100	0.048	16.2	0.36	0.10	4.50	0.60	0.0018	0.00	0.32	0.11
CC MCG18	CASTLE ROCK	0.129	0.360	0.665	0.068	29.9	0.36	0.10	4.50	0.60	0.0018	0.00	0.60	0.15
CC MCG19	CASTLE ROCK	0.140	0.493	0.876	0.055	29.9	0.36	0.10	4.50	0.60	0.0018	0.00	0.60	0.15
CC MCG20	CASTLE ROCK	0.759	0.817	1.704	0.040	10.4	0.36	0.10	3.00	0.50	0.0018	0.00	0.21	0.09
CC MCG21	CASTLE ROCK	0.381	0.733	1.363	0.038	17.5	0.36	0.10	4.50	0.60	0.0018	0.00	0.35	0.11
CC MCG22	CASTLE ROCK	0.536	0.797	1.574	0.035	13.7	0.36	0.10	3.00	0.50	0.0018	0.00	0.27	0.10
CC MCG23	CASTLE ROCK	0.128	0.575	0.893	0.052	15.7	0.36	0.10	3.00	0.50	0.0018	0.00	0.31	0.10
CC MCG25	CASTLE ROCK	0.105	0.279	0.583	0.060	17.7	0.36	0.10	3.00	0.50	0.0018	0.00	0.35	0.11
CC MCG26	CASTLE ROCK	0.252	0.316	0.924	0.048	17.5	0.36	0.10	4.50	0.60	0.0018	0.00	0.35	0.11
CC MCG29	CASTLE ROCK	0.321	0.413	0.859	0.045	17.2	0.36	0.10	4.50	0.60	0.0018	0.00	0.34	0.11
CC MCG30	CASTLE ROCK	0.070	0.251	0.462	0.043	17.2	0.36	0.10	4.50	0.60	0.0018	0.00	0.34	0.11
CC MCG31	CASTLE ROCK	0.119	0.320	0.614	0.042	20.0	0.36	0.10	3.00	0.50	0.0018	0.00	0.40	0.12
CC MCG32	CASTLE ROCK	0.051	0.294	0.521	0.042	20.0	0.36	0.10	3.00	0.50	0.0018	0.00	0.40	0.12
CC MCG33	CASTLE ROCK	0.010	0.064	0.152	0.062	20.0	0.36	0.10	3.00	0.50	0.0018	0.00	0.40	0.12
CC MCG34	CASTLE ROCK	0.249	0.278	0.661	0.042	23.5	0.36	0.10	3.00	0.50	0.0018	0.00	0.47	0.13
198	CASTLE ROCK	0.015	0.057	0.115	0.102	45.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.83	0.21
196	CASTLE ROCK	0.036	0.194	0.479	0.038	45.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.83	0.21
194	CASTLE ROCK	0.047	0.178	0.368	0.056	33.8	0.40	0.05	3.00	0.50	0.0018	0.00	0.68	0.17
192	CASTLE ROCK	0.028	0.095	0.189	0.048	25.8	0.40	0.05	3.00	0.50	0.0018	0.00	0.52	0.14
190	CASTLE ROCK	0.012	0.056	0.123	0.077	45.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.83	0.21
188	CASTLE ROCK	0.021	0.122	0.241	0.068	29.8	0.40	0.05	3.00	0.50	0.0018	0.00	0.60	0.15
186	CASTLE ROCK	0.017	0.095	0.189	0.052	16.5	0.40	0.05	3.00	0.50	0.0018	0.00	0.33	0.11
184	CASTLE ROCK	0.019	0.129	0.258	0.050	47.7	0.40	0.05	3.00	0.50	0.0018	0.00	0.84	0.22
182	CASTLE ROCK	0.011	0.069	0.138	0.060	28.8	0.40	0.05	3.00	0.50	0.0018	0.00	0.58	0.15
180	CASTLE ROCK	0.026	0.185	0.369	0.034	35.1	0.40	0.05	3.00	0.50	0.0018	0.00	0.70	0.17
178	CASTLE ROCK	0.075	0.211	0.422	0.035	31.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.62	0.16
176	CASTLE ROCK	0.036	0.123	0.246	0.045	47.3	0.40	0.05	3.00	0.50	0.0018	0.00	0.84	0.22
175	CASTLE ROCK	0.031	0.193	0.381	0.036	31.8	0.40	0.05	3.00	0.50	0.0018	0.00	0.64	0.16
174	CASTLE ROCK	0.008	0.099	0.199	0.053	9.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.18	0.08
172	CASTLE ROCK	0.019	0.200	0.400	0.048	39.7	0.40	0.05	3.00	0.50	0.0018	0.00	0.79	0.19
170	CASTLE ROCK	0.011	0.038	0.076	0.088	32.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.64	0.16
169	CASTLE ROCK	0.010	0.043	0.085	0.053	32.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.64	0.16
168	CASTLE ROCK	0.033	0.085	0.170	0.073	12.7	0.40	0.05	3.00	0.50	0.0018	0.00	0.25	0.09
166	CASTLE ROCK	0.011	0.095	0.189	0.061	48.4	0.40	0.05	3.00	0.50	0.0018	0.00	0.84	0.22
160	CASTLE ROCK	0.015	0.137	0.275	0.031	45.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.83	0.21
158	CASTLE ROCK	0.015	0.050	0.169	0.045	45.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.83	0.21
156	CASTLE ROCK	0.018	0.116	0.233	0.062	26.6	0.40	0.05	3.00	0.50	0.0018	0.00	0.53	0.14
154	CASTLE ROCK	0.095	0.211	0.422	0.043	43.1	0.40	0.05	3.00	0.50	0.0018	0.00	0.82	0.20
152	CASTLE ROCK	0.008	0.091	0.182	0.040	11.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.22	0.09
150	CASTLE ROCK	0.011	0.052	0.104	0.058	19.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.38	0.12
148	CASTLE ROCK	0.028	0.099	0.199	0.063	19.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.38	0.12
146	CASTLE ROCK	0.008	0.034	0.067	0.046	2.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.04	0.06
140	CASTLE ROCK	0.017	0.101	0.203	0.064	30.8	0.40	0.05	3.00	0.50	0.0018	0.00	0.62	0.16
138	CASTLE ROCK	0.058	0.191	0.428	0.035	70.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.95	0.30
136	CASTLE ROCK	0.088	0.227	0.454	0.054	11.3	0.40	0.05	3.00	0.50	0.0018	0.00	0.23	0.09
134	CASTLE ROCK	0.048	0.145	0.289	0.077	35.5	0.40	0.05	3.00	0.50	0.0018	0.00	0.71	0.17
132	CASTLE ROCK	0.026	0.118	0.237	0.045	39.4	0.40	0.05	3.00	0.50	0.0018	0.00	0.79	0.19
130	CASTLE ROCK	0.007	0.046	0.092	0.012	45.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.83	0.21
128	CASTLE ROCK	0.008	0.062	0.123	0.034	10.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.20	0.09
124	CASTLE ROCK	0.031	0.134	0.267	0.041	27.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.54	0.14
122	CASTLE ROCK	0.014	0.103	0.206	0.035	75.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.98	0.31
120	CASTLE ROCK	0.010	0.062	0.123	0.077	45.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.83	0.21
118	CASTLE ROCK	0.026	0.111	0.222	0.032	24.2	0.40	0.05	3.00	0.50	0.0018	0.00	0.48	0.13
116	CASTLE ROCK	0.010	0.066	0.133	0.066	2.0	0.40	0.05	3.00	0.50	0.0018	0.00	0.04	0.06
199	CASTLE ROCK	0.021	0.120	0.230	0.036	41.1	0.40	0.05	3.00	0.50	0.0018	0.00	0.81	0.19

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 1.1)''

100-Year Storm Event		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph	
Catchment Name/ID	User Comment for Catchment	Ct	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f.)	Excess (inches)	Excess (c.f.)	Peak Flow (cfs)	Total Volume (c.f.)
CC_MCG1		0.137	0.210	30.1	6.36	15.7	4.49	10.6	121	283,430	1.54	437,696	130	437,780
CC_MCG2		0.108	0.293	29.0	8.04	15.1	5.68	13.4	449	1,009,198	1.70	1,714,694	514	1,712,767
CC_MCG3		0.179	0.176	22.5	4.55	11.7	3.22	7.6	48	83,635	1.57	131,331	47	130,699
CC_MCG4		0.144	0.167	34.4	5.93	17.9	4.19	9.9	22	59,474	1.57	93,391	25	93,347
CC_MCG5		0.232	0.161	24.2	4.50	12.6	3.18	7.5	25	46,464	1.57	72,962	25	72,778
CC_MCG6		0.116	0.213	28.2	6.11	14.7	4.32	10.2	136	297,370	1.57	466,954	143	466,706
CC_MCG7		0.145	0.179	31.4	5.81	16.3	4.11	9.7	38	91,685	1.57	143,971	41	143,881
CC_MCG8		0.160	0.189	21.6	4.63	11.2	3.27	7.7	79	132,422	1.57	207,940	76	206,850
CC_MCG9		0.121	0.238	21.7	5.46	11.3	3.86	9.1	355	596,365	1.61	958,130	355	955,976
CC_MCG10		0.129	0.214	31.2	6.63	16.2	4.69	11.1	109	262,522	1.67	439,291	124	439,524
CC_MCG11		0.118	0.234	16.6	4.50	8.7	3.18	7.5	375	483,226	1.67	808,606	347	804,690
CC_MCG12		0.120	0.223	27.2	6.16	14.1	4.35	10.3	115	241,613	1.66	400,285	124	399,380
CC_MCG13		0.112	0.236	22.1	5.51	11.5	3.90	9.2	205	350,803	1.66	581,183	209	580,012
CC_MCG14		0.120	0.231	25.1	5.96	13.1	4.21	9.9	157	304,339	1.66	504,562	166	503,881
CC_MCG15		0.136	0.200	26.8	5.63	14.0	3.98	9.4	56	116,625	1.66	193,351	60	192,836
CC_MCG16		0.137	0.213	26.8	5.87	13.9	4.15	9.8	84	174,240	1.66	288,667	90	287,982
CC_MCG17		0.116	0.252	33.0	7.88	17.1	5.57	13.1	272	694,637	1.62	1,127,471	311	1,125,456
CC_MCG18		0.166	0.292	25.6	7.24	13.3	5.11	12.1	151	299,693	1.80	540,133	170	538,740
CC_MCG19		0.150	0.296	32.0	8.75	16.6	6.18	14.6	131	324,551	1.80	584,935	160	583,404
CC_MCG20		0.125	0.276	53.9	12.94	28.0	9.14	21.6	422	1,763,309	1.70	3,004,351	577	3,003,138
CC_MCG21		0.114	0.266	43.9	10.47	22.8	7.40	17.5	260	885,139	1.64	1,452,003	325	1,451,436
CC_MCG22		0.120	0.267	52.3	12.25	27.2	8.66	20.4	307	1,245,468	1.74	2,169,094	423	2,168,656
CC_MCG23		0.104	0.220	32.7	7.04	17.0	4.97	11.7	117	297,370	1.76	524,703	142	524,641
CC_MCG25		0.139	0.220	24.3	5.59	12.6	3.95	9.3	130	243,936	1.79	436,013	144	435,622
CC_MCG26		0.114	0.250	24.5	6.20	12.7	4.38	10.3	309	584,982	1.64	959,770	325	959,119
CC_MCG29		0.114	0.258	26.5	6.76	13.8	4.78	11.3	364	746,676	1.64	1,222,045	387	1,219,600
CC_MCG30		0.138	0.205	23.8	5.26	12.4	3.72	8.8	88	162,624	1.64	266,158	91	265,717
CC_MCG31		0.130	0.232	25.8	6.10	13.4	4.31	10.2	138	276,461	1.81	501,452	158	500,729
CC_MCG32		0.133	0.205	26.5	5.66	13.8	4.00	9.4	58	118,483	1.81	214,908	66	214,333
CC_MCG33		0.396	0.160	24.4	4.50	12.7	3.18	7.5	12	23,232	1.81	42,139	14	42,031
CC_MCG34		0.106	0.278	17.0	5.13	8.8	3.63	8.6	439	578,477	1.86	1,073,130	435	1,065,541
198		0.538	0.307	12.7	4.45	6.6	2.98	7.5	35	34,848	2.10	73,220	34	72,595
196		0.258	0.350	24.2	8.00	12.6	5.66	13.3	45	83,635	2.10	175,727	54	175,063
194		0.223	0.278	20.3	5.84	10.6	4.13	9.7	69	109,190	1.96	213,892	77	213,729
192		0.277	0.211	18.5	4.50	9.6	3.18	7.5	45	65,050	1.86	120,907	45	120,247
190		0.491	0.297	13.2	4.50	6.8	3.18	7.5	27	27,878	2.10	58,576	27	58,292
188		0.239	0.222	17.7	4.51	9.2	3.19	7.5	36	48,787	1.91	93,104	36	92,616
186		0.282	0.165	23.7	4.50	12.3	3.18	7.5	21	39,494	1.74	68,871	23	68,667
184		0.294	0.332	16.6	5.74	8.6	4.05	9.6	34	44,141	2.14	94,251	36	93,719
182		0.396	0.197	19.9	4.50	10.3	3.18	7.5	17	25,555	1.90	48,451	17	48,084
180		0.220	0.263	24.3	6.42	12.6	4.53	10.7	32	60,403	1.98	119,322	38	119,246
178		0.192	0.277	22.8	6.35	11.9	4.49	10.6	99	174,240	1.92	335,139	113	335,521
176		0.298	0.364	15.1	5.29	7.9	3.53	9.5	72	83,635	2.13	178,157	73	177,400
175		0.203	0.248	24.4	6.13	12.7	4.33	10.2	38	72,019	1.93	139,252	44	139,194
174		0.271	0.141	27.6	4.50	14.4	3.18	7.5	9	18,586	1.65	30,708	9	30,587
172		0.233	0.286	23.6	6.68	12.3	4.72	11.1	24	44,141	2.03	89,796	29	89,791
170		0.770	0.213	18.3	4.50	9.5	3.18	7.5	18	25,555	1.94	49,477	18	49,225
169		0.609	0.210	18.6	4.50	9.7	3.18	7.5	16	23,232	1.94	44,979	17	44,737
168		0.340	0.175	22.4	4.50	11.6	3.18	7.5	44	76,666	1.70	130,113	45	129,384
166		0.331	0.310	14.2	4.89	7.4	3.45	8.1	23	25,555	2.14	54,793	24	54,727
160		0.281	0.307	20.5	6.32	10.6	4.47	10.5	22	34,848	2.10	73,220	26	73,265
158		0.449	0.307	14.6	4.94	7.6	3.49	8.2	31	34,848	2.10	73,220	31	73,040
156		0.242	0.201	19.4	4.50	10.1	3.18	7.5	28	41,818	1.87	78,141	28	77,632
154		0.239	0.391	19.1	6.67	9.9	4.46	12.0	149	220,704	2.08	458,436	171	458,208
152		0.276	0.140	27.9	4.50	14.5	3.18	7.5	9	18,586	1.68	31,156	9	31,047
150		0.515	0.160	24.4	4.50	12.7	3.18	7.5	14	25,555	1.77	45,351	15	45,233
148		0.283	0.184	21.2	4.50	11.0	3.18	7.5	40	65,050	1.77	115,438	41	114,733
146		0.738	0.162	24.1	4.50	12.6	3.18	7.5	10	18,586	1.57	29,158	10	29,084
140		0.278	0.221	17.7	4.50	9.2	3.18	7.5	29	39,494	1.92	75,865	29	75,474
138		0.249	0.493	15.9	5.58	8.3	3.73	12.6	109	134,746	2.42	326,121	128	327,109
136		0.148	0.201	23.5	5.12	12.2	3.62	8.5	113	204,442	1.68	343,462	118	342,873
134		0.250	0.292	16.2	5.13	8.4	3.62	8.5	89	111,514	1.98	220,855	90	219,971
132		0.283	0.297	16.9	5.35	8.8	3.78	8.9	46	60,403	2.03	122,645	48	121,890
130		0.578	0.274	20.8	5.86	10.8	4.14	9.8	10	16,262	2.10	34,169	12	34,147
128		0.384	0.139	28.0	4.50	14.6	3.18	7.5	9	18,586	1.66	30,932	9	30,827
124		0.215	0.220	19.9	4.87	10.4	3.44	8.1	47	72,019	1.87	134,934	48	133,867
122		0.261	0.410	10.5	3.67	5.4	2.45	8.0	40	32,525	2.49	80,901	38	79,745
120		0.468	0.289	13.5	4.50	7.0	3.18	7.5	22	23,232	2.10	48,813	22	48,662
118		0.225	0.201	20.3	4.63	10.5	3.27	7.7	38	60,403	1.84	111,073	40	110,273
116		0.421	0.167	23.3	4.50	12.1	3.18	7.5	13	23,232	1.57	36,448	13	36,342
199		0.286	0.299	17.7	5.58	9.2	3.94	9.3	35	48,555	2.05	99,634	37	99,233

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.006a)

McMurdo Gulch Master Plan Existing Conditions
100-Year Storm

Analysis Options

Flow Units CFS
 Flow Routing Method KINWAVE
 Starting Date JAN-01-2005 00:00:00
 Ending Date JAN-02-2005 12:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Routing Time Step 30.00 sec

*****	Volume	Volume
Flow Routing Continuity	acre-feet	Mgallons
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	601.510	196.011
External Outflow	591.217	192.657
Surface Flooding	0.000	0.000
Evaporation Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	10.930	3.562
Continuity Error (%)	-0.106	

Node Depth Summary

Node	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Total Flooding acre-in	Total Minutes Flooded
6	0.10	1.60	6459.00	0 01:10	0	0
16	0.10	1.87	6471.37	0 00:54	0	0
19	0.10	1.60	6440.80	0 01:10	0	0
20	0.09	1.73	6481.12	0 00:55	0	0
38	0.07	1.12	6428.12	0 00:57	0	0
44	0.08	1.53	6462.53	0 00:35	0	0
49	0.04	0.58	6497.78	0 00:56	0	0
51	0.03	0.46	6529.96	0 01:02	0	0
63	0.14	2.24	6349.24	0 00:53	0	0
67	0.12	1.85	6362.85	0 00:56	0	0
70	0.10	1.56	6368.56	0 00:59	0	0
76	0.08	1.09	6386.29	0 01:11	0	0
84	0.09	1.28	6471.18	0 01:01	0	0
86	0.07	1.11	6486.01	0 00:35	0	0
94	0.13	1.79	6481.79	0 01:01	0	0
116	0.00	0.00	6418.00	0 00:00	0	0
118	0.00	0.00	6440.00	0 00:00	0	0
120	0.03	0.91	6426.91	0 00:30	0	0
122	0.03	1.19	6457.29	0 00:30	0	0
124	0.00	0.00	6480.00	0 00:00	0	0
128	0.00	0.00	6460.00	0 00:00	0	0
130	0.00	0.00	6459.00	0 00:00	0	0
132	0.00	0.00	6470.00	0 00:00	0	0
134	0.00	0.00	6507.00	0 00:00	0	0
136	0.00	0.00	6526.00	0 00:00	0	0
138	0.00	0.00	6480.00	0 00:00	0	0
140	0.01	0.46	6512.36	0 00:30	0	0
146	0.00	0.00	6500.00	0 00:00	0	0
148	0.00	0.00	6500.00	0 00:00	0	0
150	0.00	0.00	6500.00	0 00:00	0	0
152	0.00	0.00	6500.00	0 00:00	0	0
154	0.00	0.00	6500.00	0 00:00	0	0
156	0.00	0.00	6500.00	0 00:00	0	0
158	0.00	0.00	6531.00	0 00:00	0	0
160	0.00	0.00	6531.00	0 00:00	0	0
166	0.00	0.00	6338.00	0 00:00	0	0
168	0.00	0.00	6348.00	0 00:00	0	0
169	0.00	0.00	6387.00	0 00:00	0	0
170	0.00	0.00	6339.00	0 00:00	0	0
172	0.03	0.81	6373.80	0 00:35	0	0
174	0.00	0.00	6362.00	0 00:00	0	0
175	0.00	0.00	6402.00	0 00:00	0	0
176	0.00	0.00	6362.00	0 00:00	0	0
178	0.03	1.06	6432.06	0 00:35	0	0
180	0.04	1.10	6444.10	0 00:35	0	0
182	0.00	0.00	6387.00	0 00:00	0	0

EXISTING CONDITIONS

184	0.04	1.17	6452.87	0	00:30	0	0
186	0.00	0.00	6445.00	0	00:00	0	0
188	0.00	0.00	6485.00	0	00:00	0	0
190	0.00	0.16	6526.16	0	00:30	0	0
192	0.00	0.00	6472.00	0	00:00	0	0
194	0.02	0.70	6474.70	0	00:35	0	0
196	0.00	0.00	6485.00	0	00:00	0	0
198	0.00	0.00	6485.00	0	00:00	0	0
CC_MCG1	0.00	0.12	6005.12	0	00:40	0	0
CC_MCG10	0.01	0.13	6130.13	0	00:40	0	0
CC_MCG11	0.01	0.25	6130.25	0	00:30	0	0
CC_MCG12	0.00	0.12	6165.12	0	00:35	0	0
CC_MCG13	0.00	0.16	6165.16	0	00:35	0	0
CC_MCG14	0.00	0.14	6190.14	0	00:35	0	0
CC_MCG15	0.00	0.07	6190.07	0	00:35	0	0
CC_MCG16	0.02	0.74	6275.74	0	00:35	0	0
CC_MCG17	0.03	0.78	6225.78	0	00:40	0	0
CC_MCG18	0.00	0.14	6215.14	0	00:35	0	0
CC_MCG19	0.01	0.13	6215.13	0	00:40	0	0
CC_MCG2	0.01	0.35	6040.35	0	00:40	0	0
CC_MCG20	0.02	0.29	6240.29	0	00:55	0	0
CC_MCG21	0.01	0.20	6240.20	0	00:45	0	0
CC_MCG22	0.01	0.24	6275.24	0	00:50	0	0
CC_MCG23	0.00	0.12	6275.12	0	00:40	0	0
CC_MCG24	0.13	1.86	6337.86	0	00:58	0	0
CC_MCG25	0.00	0.11	6330.11	0	00:35	0	0
CC_MCG26	0.01	0.20	6350.20	0	00:35	0	0
CC_MCG27	0.07	1.17	6416.17	0	00:57	0	0
CC_MCG28	0.10	1.60	6418.70	0	01:11	0	0
CC_MCG29	0.01	0.23	6385.23	0	00:35	0	0
CC_MCG3	0.00	0.09	6040.09	0	00:35	0	0
CC_MCG30	0.00	0.10	6455.10	0	00:35	0	0
CC_MCG31	0.00	0.13	6455.13	0	00:35	0	0
CC_MCG32	0.01	0.16	6493.16	0	00:35	0	0
CC_MCG33	0.00	0.06	6493.06	0	00:35	0	0
CC_MCG34	0.06	2.11	6512.11	0	00:30	0	0
CC_MCG4	0.00	0.04	6060.04	0	00:40	0	0
CC_MCG5	0.00	0.04	6060.04	0	00:35	0	0
CC_MCG6	0.00	0.12	6070.12	0	00:35	0	0
CC_MCG7	0.00	0.07	6080.07	0	00:40	0	0
CC_MCG8	0.00	0.09	6100.09	0	00:35	0	0
CC_MCG9	0.01	0.25	6130.25	0	00:35	0	0
DN1	0.04	1.01	6525.31	0	00:48	0	0
DN2	0.04	0.69	6506.59	0	00:53	0	0
DN3	0.08	1.00	6478.61	0	01:03	0	0
DN4	0.07	1.10	6452.10	0	00:58	0	0
DN5	0.04	0.52	6473.52	0	01:11	0	0
DN6	0.07	0.95	6408.25	0	01:12	0	0
DN7	0.06	0.65	6525.45	0	00:58	0	0
DN8	0.08	0.23	6385.23	0	01:30	0	0
988	0.07	2.36	6494.86	0	00:35	0	0
J10	0.07	1.96	6211.96	0	00:40	0	0
944	0.64	20.00	6180.00	0	00:44	0.00	10
940	0.63	20.00	6147.00	0	00:49	0.00	5
J13	0.59	20.00	6115.00	0	00:48	0.00	5
J14	0.66	20.00	6097.00	0	00:46	0.00	12
C2	0.68	20.00	6084.00	0	00:46	0.00	10
C1	0.68	20.00	6075.00	0	00:47	0.00	11
936	0.69	20.00	6058.00	0	00:44	0.00	9
976	0.18	1.69	6451.69	0	01:03	0	0
968	0.30	3.53	6383.53	0	01:05	0	0
J4	0.32	3.93	6348.93	0	01:03	0	0
960	0.38	20.00	6342.00	0	01:01	0.00	2
956	0.45	5.50	6275.50	0	00:58	0	0
952	0.54	20.00	6255.00	0	00:51	0.00	5
948	0.59	20.00	6230.00	0	00:40	0.00	10
J9	0.59	20.00	6205.00	0	00:39	0.00	9
199	0.00	0.00	6320.00	0	00:00	0	0
996	0.03	0.65	6312.65	0	00:57	0	0
OUTFALL	19.90	20.00	6020.00	0	00:11	0	0
325	2.03	3.33	6443.33	0	00:47	0	0
326	1.15	3.32	6421.32	0	00:56	0	0
330	0.09	1.31	6479.31	0	01:02	0	0
335	6.05	9.24	6466.74	0	01:11	0	0
340	0.08	1.37	6507.37	0	00:53	0	0
345	0.06	1.77	6526.77	0	00:48	0	0
350	0.07	1.47	6480.97	0	00:56	0	0
355	6.01	8.15	6463.15	0	00:58	0	0
360	0.69	7.18	6481.18	0	01:10	0	0
363	0.09	1.34	6531.34	0	00:57	0	0
365	0.09	1.33	6531.33	0	01:05	0	0
375	10.97	13.08	6350.08	0	00:57	0	0
377	0.23	1.14	6339.14	0	01:26	0	0
379	0.24	1.08	6387.08	0	01:30	0	0
380	0.34	5.93	6418.93	0	00:54	0	0
381	0.24	5.68	6406.68	0	00:46	0	0
390	0.47	5.73	6449.73	0	01:12	0	0
393	0.10	1.38	6526.38	0	00:58	0	0
395	0.21	3.85	6473.85	0	01:05	0	0
397	0.08	1.30	6483.30	0	01:03	0	0

399	0.09	1.44	6483.44	0	00:54	0	0
799	0.15	1.37	6451.47	0	01:18	0	0
301	1.14	4.36	6317.36	0	00:57	0	0

Storage Volume Summary

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
325	13.543	8	33.601	19	0 00:47	20.53
326	3.530	0	24.979	2	0 00:56	10.10
330	3.855	1	64.714	11	0 01:02	26.90
335	137.553	38	337.320	94	0 01:11	231.49
340	4.648	0	93.125	7	0 00:53	53.79
345	1.465	0	56.530	5	0 00:48	99.07
350	9.195	1	185.575	14	0 00:56	223.87
355	111.836	39	202.037	70	0 00:58	138.65
360	6.233	6	81.508	82	0 01:10	44.83
363	2.278	0	36.815	3	0 00:57	15.10
365	2.501	1	36.551	13	0 01:05	13.39
375	209.831	55	308.055	80	0 00:57	409.84
377	7.499	0	39.740	2	0 01:26	3.09
379	7.648	2	37.197	10	0 01:30	2.21
380	3.189	3	71.011	57	0 00:54	52.33
381	2.994	3	88.949	90	0 00:46	139.06
390	15.605	4	233.538	60	0 01:12	137.56
393	2.091	1	31.896	13	0 00:58	11.39
395	3.001	3	65.623	68	0 01:05	71.92
397	3.788	1	68.326	10	0 01:03	36.23
399	2.358	1	37.483	14	0 00:54	15.54
799	95.447	4	872.494	37	0 01:18	164.81
301	10.109	17	44.818	74	0 00:57	22.24

Conduit Flow Summary

Max release to McMurdo
Gulch through CUHP,
not Rational Method

Conduit	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Velocity ft/sec	Length Factor	Maximum /Design Flow	Total Minutes Surcharged
1	433.46	0 00:33	8.80	1.00	0.01	0
2	66.10	0 00:35	26.90	1.00	0.00	0
3	13.62	0 00:35	14.59	1.00	0.00	0
988	510.10	0 00:37	8.94	1.00	0.01	0
5	91.10	0 00:35	>50.00	1.00	0.00	0
6	157.90	0 00:35	>50.00	1.00	0.00	0
7	387.02	0 00:35	>50.00	1.00	0.00	0
976	295.93	0 01:07	8.09	1.00	0.00	0
9	305.31	0 01:11	9.34	1.00	0.00	0
10	172.30	0 00:59	7.50	1.00	0.00	0
968	996.22	0 01:07	9.73	1.00	0.02	0
12	1189.29	0 01:05	9.89	1.00	0.02	0
13	325.20	0 00:35	>50.00	1.00	0.00	0
14	144.35	0 00:35	>50.00	1.00	0.00	0
15	409.81	0 00:58	9.79	1.00	0.01	0
960	1677.77	0 01:06	11.37	1.00	0.03	0
17	423.13	0 00:50	>50.00	1.00	0.00	0
18	141.88	0 00:40	>50.00	1.00	0.00	0
956	2185.93	0 01:06	10.80	1.00	0.05	0
20	577.27	0 00:55	>50.00	1.00	0.00	0
21	324.68	0 00:45	>50.00	1.00	0.00	0
952	3039.00	0 01:01	11.91	1.00	0.07	0
23	169.70	0 00:35	>50.00	1.00	0.00	0
24	159.80	0 00:40	>50.00	1.00	0.00	0
948	3287.77	0 01:01	12.05	1.00	0.07	0
26	60.23	0 00:35	>50.00	1.00	0.00	0
27	166.44	0 00:35	>50.00	1.00	0.00	0
28	3442.65	0 01:02	12.88	1.00	0.07	0
29	209.49	0 00:35	>50.00	1.00	0.00	0
30	123.67	0 00:35	>50.00	1.00	0.00	0
31	89.26	0 00:39	6.76	1.00	0.00	0
32	396.83	0 00:43	8.92	1.00	0.01	0
33	124.19	0 00:40	>50.00	1.00	0.00	0
34	347.13	0 00:30	>50.00	1.00	0.00	0
944	3978.96	0 01:03	12.22	1.00	0.09	0
940	4438.63	0 01:02	15.87	1.00	0.08	0
37	76.36	0 00:35	>50.00	1.00	0.00	0
38	354.73	0 00:35	>50.00	1.00	0.00	0
39	40.93	0 00:40	38.71	1.00	0.00	0
40	4481.70	0 01:03	14.74	1.00	0.09	0
41	4511.18	0 01:04	13.54	1.00	0.10	0
42	4610.54	0 01:04	13.03	1.00	0.11	0

Tributary 3

Tributary B

EXISTING CONDITIONS

43	4642.88	0	01:05	13.96	1.00	0.10	0
936	5018.30	0	01:07	13.42	1.00	0.11	0
45	24.91	0	00:40	39.27	1.00	0.00	0
46	142.84	0	00:35	>50.00	1.00	0.00	0
47	24.85	0	00:35	41.21	1.00	0.00	0
48	46.92	0	00:35	35.99	1.00	0.00	0
49	514.00	0	00:40	>50.00	1.00	0.00	0
50	129.90	0	00:40	>50.00	1.00	0.00	0
51	310.79	0	00:40	22.18	1.00	0.00	0
52	89.63	0	00:30				
53	117.56	0	00:35				
54	128.47	0	00:35				
58	28.97	0	00:35	5.38	1.00	0.01	0
220	242.28	0	00:56	8.31	1.00	0.07	0
218	270.15	0	00:55	8.28	1.00	0.08	0
61	11.73	0	00:35				
62	47.55	0	00:30				
63	9.24	0	00:35				
65	48.33	0	00:35				
214	262.29	0	01:11	8.29	1.00	0.08	0
212	38.14	0	00:30	14.76	1.00	0.33	0
70	39.50	0	00:35				
71	21.81	0	00:30	12.01	1.00	0.20	0
210	291.00	0	01:11	9.16	1.00	0.08	0
74	12.74	0	00:35				
75	25.61	0	00:35				
77	31.46	0	00:30				
250	28.14	0	01:04	5.20	1.00	0.01	0
80	44.93	0	00:57	6.28	1.00	0.01	0
238	176.75	0	00:36	5.92	1.00	0.07	0
230	165.24	0	00:58	8.08	1.00	0.04	0
85	170.88	0	00:35				
86	28.37	0	00:35				
87	9.30	0	00:35				
88	14.64	0	00:35				
89	40.61	0	00:35				
90	9.96	0	00:35				
91	54.42	0	00:35				
93	33.92	0	00:30				
298	51.11	0	01:01	11.60	1.00	0.67	0
286	100.84	0	01:02	5.24	1.00	0.04	0
274	144.45	0	01:12	7.25	1.00	0.04	0
262	298.81	0	00:59	9.76	1.00	0.07	0
258	343.33	0	00:57	9.00	1.00	0.10	0
256	398.03	0	00:54	8.20	1.00	0.14	0
104	45.39	0	00:35				
105	26.68	0	00:30	>50.00	1.00	0.00	0
107	35.97	0	00:30				
288	38.42	0	00:35	16.26	1.00	0.29	0
294	76.09	0	00:36	6.38	1.00	0.02	0
110	22.82	0	00:35				
111	17.23	0	00:35				
278	36.20	0	00:32	14.19	1.00	0.32	0
270	37.81	0	00:35	16.19	1.00	0.28	0
266	111.76	0	00:37	7.44	1.00	0.03	0
117	44.41	0	00:35				
119	73.04	0	00:30				
120	9.30	0	00:35				
254	28.81	0	00:35	18.83	1.00	0.16	0
122	45.27	0	00:35				
123	23.74	0	00:30				
124	16.58	0	00:30				
125	18.45	0	00:30				
224	98.88	0	00:51	7.00	1.00	0.03	0
128	53.75	0	00:55	6.12	1.00	0.01	0
216	26.90	0	01:03	13.05	1.00	0.24	0
234	138.59	0	00:59	6.93	1.00	0.04	0
242	44.82	0	01:11	5.16	1.00	0.01	0
282	137.55	0	01:12	8.14	1.00	0.03	0
290	11.39	0	00:59	10.13	1.00	0.10	0
260	2.21	0	01:30	8.94	1.00	0.01	0
129	37.24	0	00:35				
130	17.60	0	01:23	2.85	1.00	0.01	0

Routing Time Step Summary

Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00

Analysis begun on: Tue Apr 25 17:41:22 2006
Total elapsed time: 00:00:02



**CANYONS SOUTH FILING NO. 1
PHASE III DRAINAGE REPORT**



CANYONS SOUTH FILING NO. 1

PHASE III DRAINAGE REPORT

AUGUST 2019

For:

HT Canyons South Development LP
1144 15th Street, Suite 3675
Denver, CO 80202

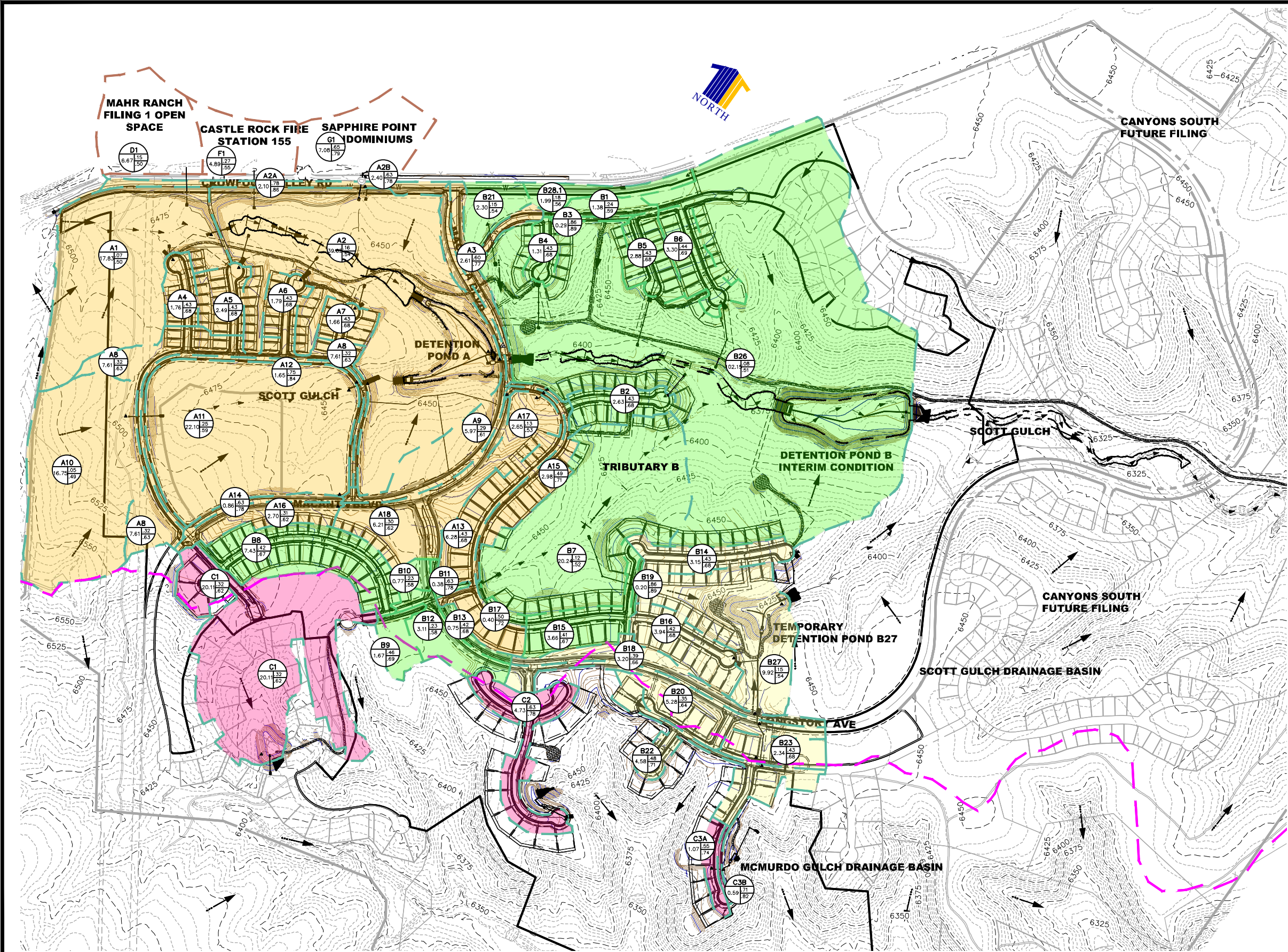
Prepared By:

Calibre Engineering, Inc.
9090 S. Ridgeline Blvd. Suite 105
Highlands Ranch, CO 80129

Contact: Brian Moss
303.339.5406

BKM@Calibre.us.com





KEYMAP

LEGEND

- PROPOSED MAJOR CONTOUR (10') —5250—
- PROPOSED MINOR CONTOUR (2') —5250—
- EXISTING MAJOR CONTOUR (25') - -5250- -
- EXISTING MINOR CONTOUR (5') - -5250- -
- PROPOSED STORM DRAIN PIPE ———
- PROPOSED STORM DRAIN INLET □
- PROPOSED LOW TAILWATER BASIN ■
- PROPOSED SWALE ———
- PROPERTY LINE ———
- 100-YR WSEL ———
- DIRECTIONAL FLOW ARROW ———
- EMERGENCY OVERFLOW ARROW ———
- PROPOSED BASIN LINE ———
- EXISTING BASIN LINE ———
- MAJOR BASIN LINE ———
- DESIGN POINT ———
- PROPOSED BASIN LABEL ———

C-6 BASIN DESIGNATION		
AREA (AC.)	MINOR RUNOFF COEF.	MAJOR RUNOFF COEF.
1.00	.40	.60

- POND A BASINS
- POND B BASINS
- TEMPORARY POND B27 BASINS
- MCMURDO GULCH BASINS



1-800-922-1987
Utility Notification
Center of Colorado

PATH: P:\HINES\CS\CADD\HIBITS\X-PDR OVERALL.DWG
PLOT BY: KYLER SANFORD PLOT DATE: 8/12/2019 10:41 AM
XREFS: 00Base, 20EPN, 20Base

DATE	REVISION	DESCRIPTION



Drawing Name	X-PDR Overall.dwg
Job Number	HINES CS
Prepared For	HINES
Designer	KLK
Drafter	KLK
Checked	BKM

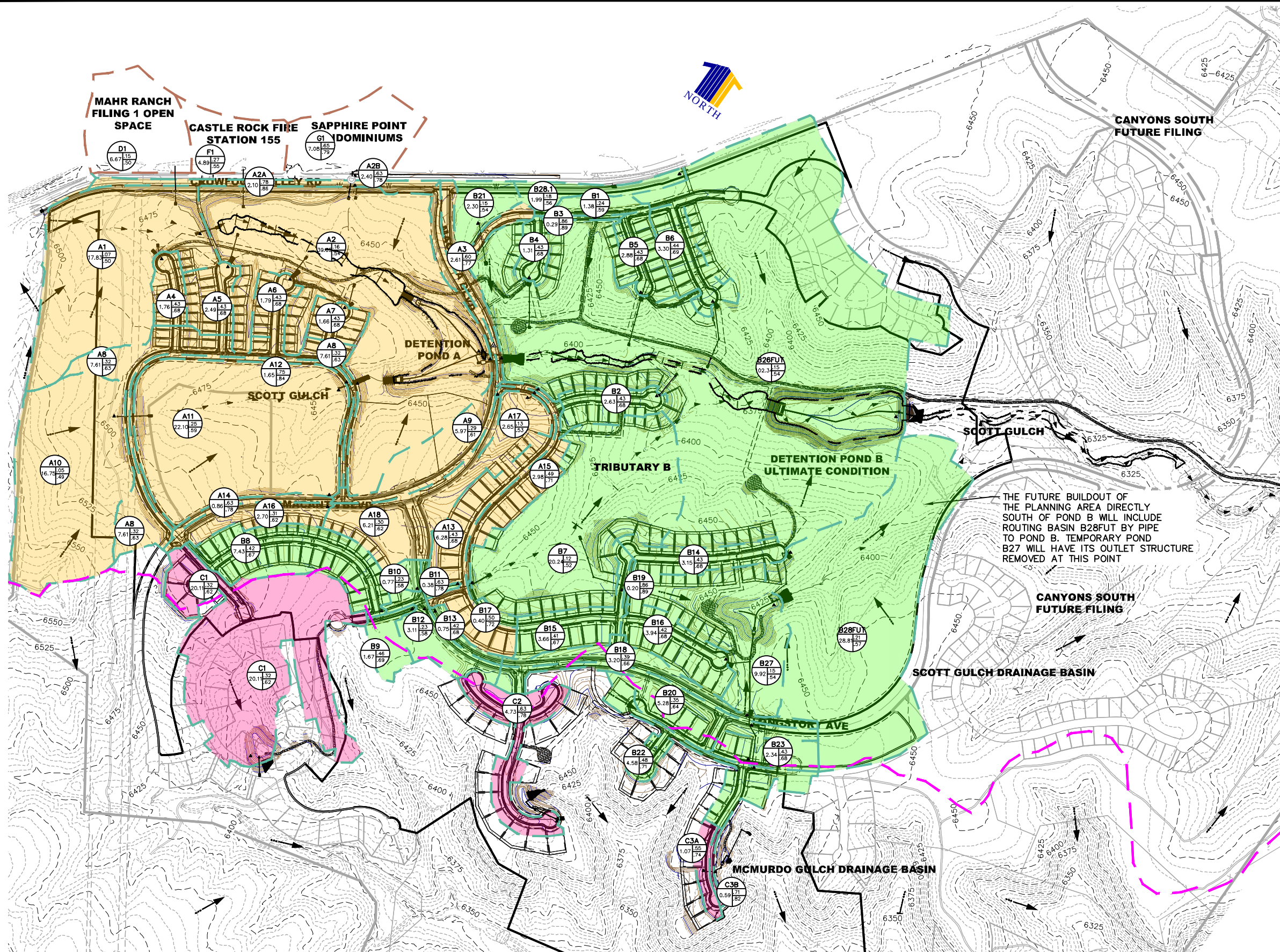


Calibre
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www.calibre-engineering.com
Construction Management Civil Engineering Surveying

CANYONS SOUTH
SITE IMPROVEMENT PLANS
INTERIM OVERALL DRAINAGE PLAN

Sheet	1 of 6
DR1	
Date	JUNE 2019

PATH: P:\HINES\CSCAD\HIBITS\X-PDR OVERALL.DWG
PLOT BY: KYLER SANFORD. PLOT DATE: 8/12/2019 10:50 AM
XREFS: 00Base, 20EPN, 20Base.



KEYMAP

LEGEND

- PROPOSED MAJOR CONTOUR (10') —5250—
 - PROPOSED MINOR CONTOUR (2') —5250—
 - EXISTING MAJOR CONTOUR (25') - -5250- -
 - EXISTING MINOR CONTOUR (5') - -5250- -
 - PROPOSED STORM DRAIN PIPE ———
 - PROPOSED STORM DRAIN INLET □
 - PROPOSED LOW TAILWATER BASIN ▢
 - PROPOSED SWALE ————
 - PROPERTY LINE ———
 - 100-YR WSEL ———
 - DIRECTIONAL FLOW ARROW ———→
 - EMERGENCY OVERFLOW ARROW ———→
 - PROPOSED BASIN LINE ———
 - EXISTING BASIN LINE ———
 - MAJOR BASIN LINE ———
 - DESIGN POINT ———
 - PROPOSED BASIN LABEL ———
- C-6 BASIN DESIGNATION
AREA (AC.) 1.00 .40 .60 MINOR RUNOFF COEF. MAJOR RUNOFF COEF.
- POND A BASINS
POND B BASINS
TEMPORARY POND B27 BASINS
MCMURDO GULCH BASINS



UNCC
CALL BEFORE
YOU DIG
811
OR
1-800-922-1987
Utility Notification
Center of Colorado

DATE	REVISION	DESCRIPTION



Drawing Name X-PDR Overall.dwg
Job Number HINES CS
Prepared For HINES
Designer KLB
Drafter KLB
Checked BKM



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CANYONS SOUTH
SITE IMPROVEMENT PLANS
FUTURE OVERALL DRAINAGE PLAN

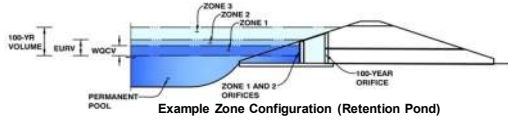
Sheet FD1	1 of 1
Date JUNE 2019	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project:

Basin ID:



Required Volume Calculation

Selected BMP Type =	EDB		
Watershed Area =	20.11	acres	
Watershed Length =	1.718	ft	
Watershed Slope =	0.050	ft/ft	
Watershed Imperviousness =	34.20%	percent	
Percentage Hydrologic Soil Group A =	0.0%	percent	
Percentage Hydrologic Soil Group B =	0.0%	percent	
Percentage Hydrologic Soil Groups C/D =	100.0%	percent	
Desired WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	Denver - Capitol Building		
Water Quality Capture Volume (WQCV) =	0.275	acre-feet	Optional User Override
Excess Urban Runoff Volume (EURV) =	0.631	acre-feet	1-hr Precipitation
2-yr Runoff Volume (P1 = 1.06 in.) =	0.519	acre-feet	1.06 inches
5-yr Runoff Volume (P1 = 1.43 in.) =	0.893	acre-feet	1.43 inches
10-yr Runoff Volume (P1 = 1.66 in.) =	1.234	acre-feet	1.66 inches
25-yr Runoff Volume (P1 = 1.69 in.) =	1.670	acre-feet	1.69 inches
50-yr Runoff Volume (P1 = 2.26 in.) =	2.473	acre-feet	2.26 inches
100-yr Runoff Volume (P1 = 2.6 in.) =	3.173	acre-feet	2.60 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	4.269	acre-feet	3.14 inches
Approximate 2-yr Detention Volume =	0.486	acre-feet	
Approximate 5-yr Detention Volume =	0.843	acre-feet	
Approximate 10-yr Detention Volume =	0.966	acre-feet	
Approximate 25-yr Detention Volume =	0.957	acre-feet	
Approximate 50-yr Detention Volume =	1.187	acre-feet	
Approximate 100-yr Detention Volume =	1.467	acre-feet	

Stage-Storage Calculation

Zone 1 Volume (WQVCV) =	0.275	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.356	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.835	acre-feet
Total Detention Basin Volume =	1.467	acre-feet
Initial Surcharge Volume (SV) =	user	ft ³
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{det}) =	user	ft
Depth of Trickle Channel (H_{trc}) =	user	ft
Slope of Trickle Channel (S_{trc}) =	user	ft/ft
Slopes of Main Basin Sides (S_{mb}) =	user	H:V
Basin Length-to-Width Ratio (R_{wvl}) =	user	

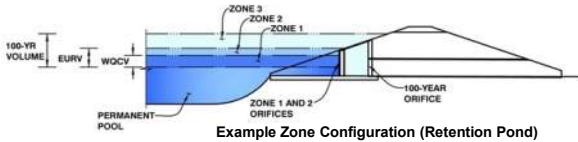
[illegible]

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: **Canyons South**

Basin ID: **Pond C1**



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.72	0.275	Orifice Plate
Zone 2 (EURV)	4.33	0.356	Orifice Plate
Zone 3 (100-year)	6.97	0.835	Weir&Pipe (Restrict)
		1.467	Total

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = inches

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.40	2.79					
Orifice Area (sq. inches)	1.23	1.23	1.77					

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

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = inches

Calculated Parameters for Vertical Orifice

Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Slope = H:V (enter zero for flat grate)
Horiz. Length of Weir Sides = feet
Overflow Grate Open Area % = %, grate open area/total area
Debris Clogging % = %

Calculated Parameters for Overflow Weir

Height of Grate Upper Edge, H_u = feet
Over Flow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area = should be ≥ 4
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

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

Pond C1 Outflow accounted for by Canyons Far South

Routed Hydrograph Results

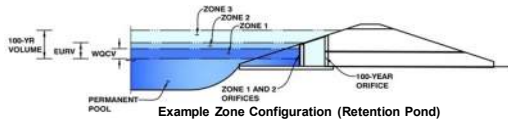
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	0.53	1.07	1.06	1.43	1.66	1.69	2.26	2.6	3.14
Calculated Runoff Volume (acre-ft) =	0.275	0.631	0.519	0.893	1.234	1.670	2.473	3.17	4.269
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.274	0.631	0.518	0.892	1.234	1.670	2.473	3.173	4.269
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.11	0.30	0.62	0.97	1.3	1.83
Predevelopment Peak Q (cfs) =	0.0	0.0	0.2	2.2	5.9	12.5	19.5	26.3	36.9
Peak Inflow Q (cfs) =	4.4	10.1	8.3	14.2	19.5	26.3	38.8	49.6	66.3
Peak Outflow Q (cfs) =	0.1	0.2	0.2	2.3	7.7	14.3	20.1	21.4	39.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	1.3	1.1	1.0	0.8	1.1
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.1	0.4	0.8	1.2	1.2	1.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	48	68	63	71	68	64	58	54	49
Time to Drain 99% of Inflow Volume (hours) =	50	73	67	77	76	74	72	70	67
Maximum Ponding Depth (ft) =	2.62	4.19	3.74	4.83	5.16	5.43	6.13	7.18	8.24
Area at Maximum Ponding Depth (acres) =	0.18	0.25	0.23	0.28	0.29	0.30	0.34	0.39	0.44
Maximum Volume Stored (acre-ft) =	0.256	0.597	0.487	0.763	0.857	0.938	1.166	1.549	1.987

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project:

Basin ID:



Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	4.73	acres
Watershed Length =	1.255	ft
Watershed Slope =	0.016	ft/ft
Watershed Imperviousness =	67.20%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	
Water Quality Capture Volume (WQCV) =	0.104	acre-feet
Excess Urban Runoff Volume (EURV) =	0.308	acre-feet
2-yr Runoff Volume (P1 = 1.06 in.) =	0.262	acre-feet
5-yr Runoff Volume (P1 = 1.43 in.) =	0.393	acre-feet
10-yr Runoff Volume (P1 = 1.66 in.) =	0.479	acre-feet
25-yr Runoff Volume (P1 = 1.69 in.) =	0.541	acre-feet
50-yr Runoff Volume (P1 = 2.26 in.) =	0.751	acre-feet
100-yr Runoff Volume (P1 = 2.6 in.) =	0.909	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	1.156	acre-feet
Approximate 2-yr Detention Volume =	0.246	acre-feet
Approximate 5-yr Detention Volume =	0.370	acre-feet
Approximate 10-yr Detention Volume =	0.422	acre-feet
Approximate 25-yr Detention Volume =	0.400	acre-feet
Approximate 50-yr Detention Volume =	0.489	acre-feet
Approximate 100-yr Detention Volume =	0.546	acre-feet

Optional User Override

1-hr Precipitation

1.06	inches
------	--------

1.43	inches
------	--------

1.66	inches
------	--------

 inches

2.26 inches

2.60 inches

inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.104	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.204	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.238	acre-feet
Total Detention Basin Volume =	0.546	acre-feet
Initial Surge Volume (ISV) =	user	ft ³
Initial Surge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{det}) =	user	ft
Depth of Trickle Channel (H_{tr}) =	user	ft
Slope of Trickle Channel (S_{tr}) =	user	ft/ft
Slopes of Main Basin (S_{mb}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

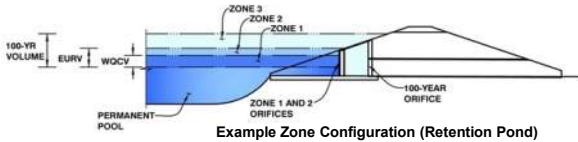
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Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: **Cnyons South**

Basin ID: **Pond C2**



	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.42	0.104	Orifice Plate
Zone 2 (EURV)	2.87	0.204	Orifice Plate
Zone 3 (100-year)	4.08	0.238	Weir&Pipe (Restrict)
		0.546	Total

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = inches

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.00	2.00					
Orifice Area (sq. inches)	0.89	0.89	1.23					

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

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = inches

Calculated Parameters for Vertical Orifice

Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Slope = H:V (enter zero for flat grate)
Horiz. Length of Weir Sides = feet
Overflow Grate Open Area % = %, grate open area/total area
Debris Clogging % = %

Calculated Parameters for Overflow Weir

Height of Grate Upper Edge, H_g = feet
Over Flow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area = should be ≥ 4
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

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

Pond C2 Outflow accounted for by Canyons Far South

Routed Hydrograph Results

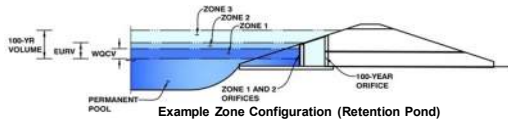
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	0.53	1.07	1.06	1.43	1.66	1.69	2.26	2.6	3.14
Calculated Runoff Volume (acre-ft) =	0.104	0.308	0.262	0.393	0.479	0.541	0.751	0.90	1.156
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.103	0.307	0.262	0.392	0.478	0.540	0.750	0.907	1.154
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.07	0.20	0.43	0.67	0.9	1.30
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.3	0.9	2.0	3.2	4.3	6.1
Peak Inflow Q (cfs) =	1.1	3.3	2.8	4.2	5.1	5.7	7.9	9.5	12.1
Peak Outflow Q (cfs) =	0.1	0.1	0.1	0.3	1.2	1.9	3.6	3.7	7.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	1.3	0.9	1.1	0.8	1.3
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.2	0.2	0.5	0.5	0.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	44	68	64	71	70	69	65	63	59
Time to Drain 99% of Inflow Volume (hours) =	47	73	69	78	77	77	75	74	72
Maximum Ponding Depth (ft) =	1.32	2.70	2.44	3.10	3.28	3.37	3.63	4.00	4.21
Area at Maximum Ponding Depth (acres) =	0.11	0.16	0.15	0.18	0.19	0.19	0.20	0.22	0.22
Maximum Volume Stored (acre-ft) =	0.092	0.281	0.238	0.350	0.383	0.400	0.449	0.527	0.575

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project:

Basin ID:



Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	1.66	acres
Watershed Length =	420	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	70.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	
Water Quality Capture Volume (WQCV) =	0.038	acre-feet
Excess Urban Runoff Volume (EURV) =	0.113	acre-feet
2-yr Runoff Volume (P1 = 1.06 in.) =	0.096	acre-feet
5-yr Runoff Volume (P1 = 1.43 in.) =	0.143	acre-feet
10-yr Runoff Volume (P1 = 1.66 in.) =	0.174	acre-feet
25-yr Runoff Volume (P1 = 1.69 in.) =	0.194	acre-feet
50-yr Runoff Volume (P1 = 2.26 in.) =	0.269	acre-feet
100-yr Runoff Volume (P1 = 2.6 in.) =	0.324	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	0.410	acre-feet
Approximate 2-yr Detention Volume =	0.090	acre-feet
Approximate 5-yr Detention Volume =	0.135	acre-feet
Approximate 10-yr Detention Volume =	0.155	acre-feet
Approximate 25-yr Detention Volume =	0.146	acre-feet
Approximate 50-yr Detention Volume =	0.178	acre-feet
Approximate 100-yr Detention Volume =	0.198	acre-feet

Optional User Override
1-hr Precipitation

1.06	inches
1.43	inches
1.66	inches
	inches
2.26	inches
2.60	inches
	inches

Stage-Storage Calculation

Zone 1 Volume (WQVCV) =	0.038	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.075	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.085	acre-feet
Total Detention Basin Volume =	0.198	acre-feet
Initial Surcharge Volume (SV) =	user	ft ³
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{DAV}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{MB}) =	user	H:V
Basin Length-to-Width Ratio (R_{LW}) =	user	

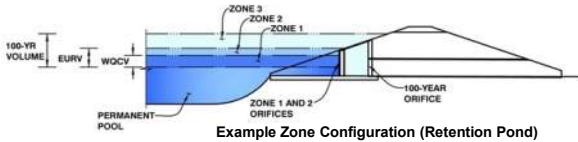
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Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: **Canyons South**

Basin ID: **Pond C3**



	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.24	0.038	Orifice Plate
Zone 2 (EURV)	2.51	0.075	Orifice Plate
Zone 3 (100-year)	3.49	0.085	Weir&Pipe (Restrict)
		0.198	Total

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = inches

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.80						
Orifice Area (sq. inches)	0.37	0.44						

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	2.65	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	2.92	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	2.92	N/A	feet
Overflow Grate Open Area % =	78%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H _g =	3.38	N/A	feet
Over Flow Weir Slope Length =	3.01	N/A	feet
Grate Open Area / 100-yr Orifice Area =	50.47	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	6.86	N/A	ft ²
Overflow Grate Open Area w/ Debris =	3.43	N/A	ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	2.35		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.14	N/A	ft ²
Outlet Orifice Centroid =	0.12	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	0.74	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

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

Pond C3 Outflow accounted for by Canyons Far South

Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	0.53	1.07	1.06	1.43	1.66	1.69	2.26	2.6	3.14
Calculated Runoff Volume (acre-ft) =	0.038	0.113	0.096	0.143	0.174	0.194	0.269	0.32	0.410
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.037	0.113	0.096	0.143	0.174	0.194	0.268	0.323	0.410
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.09	0.26	0.55	0.86	1.1	1.64
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.2	0.4	0.9	1.4	1.9	2.7
Peak Inflow Q (cfs) =	0.5	1.6	1.4	2.0	2.5	2.8	3.8	4.6	5.8
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.2	0.6	1.0	1.5	1.5	3.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	1.5	1.0	1.0	0.8	1.3
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.1	0.1	0.2	0.2	0.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	42	65	61	69	68	66	63	61	57
Time to Drain 99% of Inflow Volume (hours) =	46	71	66	76	75	75	73	72	70
Maximum Ponding Depth (ft) =	1.14	2.42	2.18	2.72	2.85	2.91	3.16	3.50	3.65
Area at Maximum Ponding Depth (acres) =	0.04	0.07	0.07	0.08	0.08	0.08	0.09	0.10	0.10
Maximum Volume Stored (acre-ft) =	0.034	0.106	0.089	0.129	0.140	0.144	0.167	0.199	0.215



**CANYONS SOUTH – FILING 2
PHASE III DRAINAGE REPORT**



CANYONS SOUTH FILING NO. 2

PHASE III DRAINAGE REPORT

JANUARY 2022

For:

**HT Canyons South Development LP
1144 15th Street, Suite 3675
Denver, CO 80202**

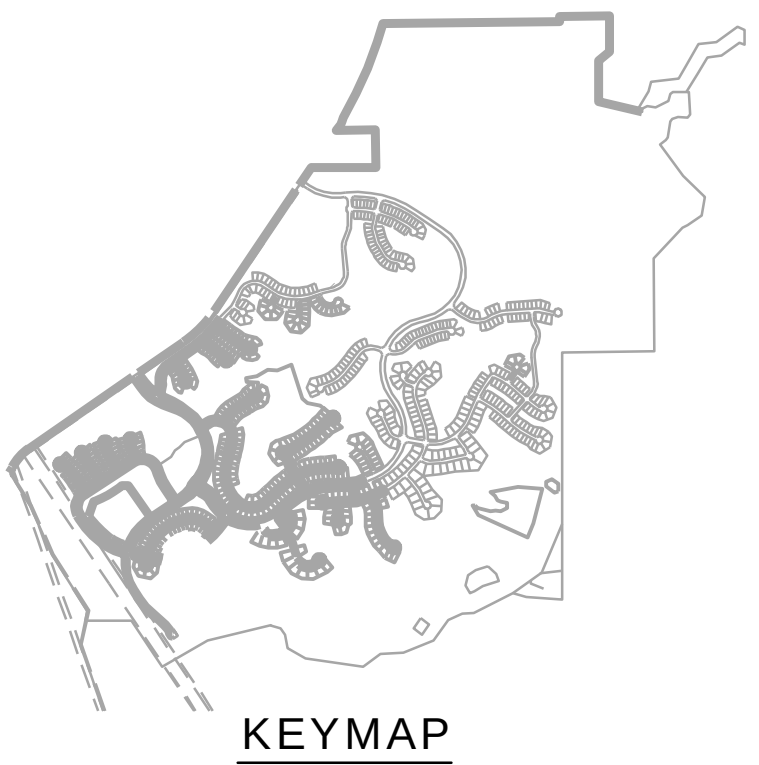
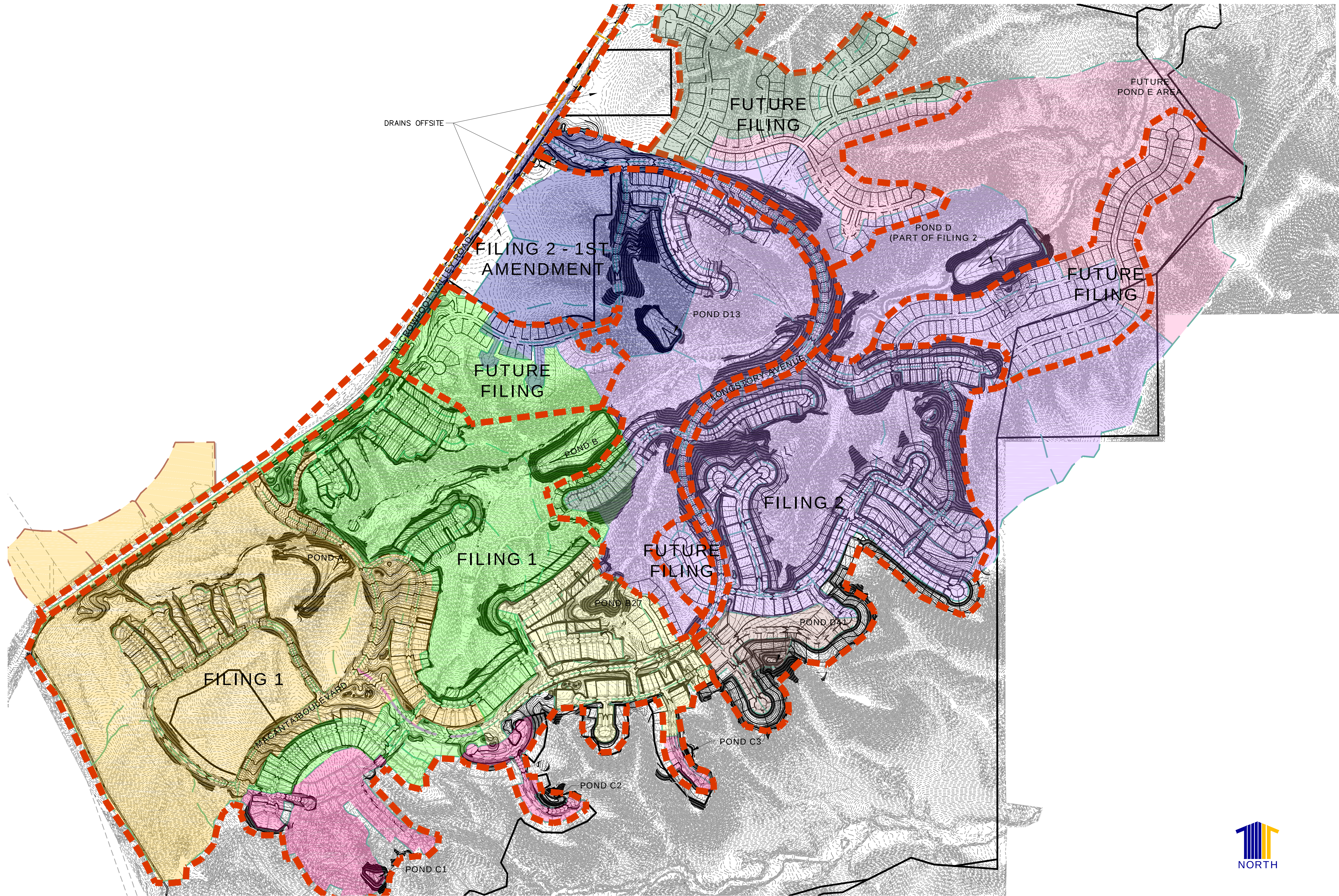
Prepared By:

**Calibre Engineering, Inc.
9090 S. Ridgeline Blvd. Suite 105
Highlands Ranch, CO 80129**

**Contact: Brian Moss
303.339.5406
BKM@Calibre.us.com**



PATH: J:\HINES CS\DRAINAGE\X-OVERALL DRAINAGE MAP.DWG
PLOTTED BY: JUSTIN KELLER PLOT DATE: 9/27/2021 11:13 AM
XREFS:



- LEGEND**
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 - PROPOSED MINOR CONTOUR (2') ———
 - EXISTING MAJOR CONTOUR (25') - - -5250- - -
 - EXISTING MINOR CONTOUR (5') - - - - -
 - PROPERTY LINE ———
 - PROPOSED BASIN LINE ———
 - EXISTING BASIN LINE ———
 - FILING LINE - - - - -

- POND A BASINS
- POND B BASINS
- POND B27 BASINS
- POND C BASINS
- POND D BASINS
- POND D13 BASINS
- POND D41 BASINS
- POND E BASINS
- POND F BASINS (LOCATION TO BE DETERMINED)



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Center of Colorado

DATE	REVISION	DESCRIPTION



Drawing Name	X-Overall Drainage Map.dwg
Job Number	HINES CS
Prepared For	HINES

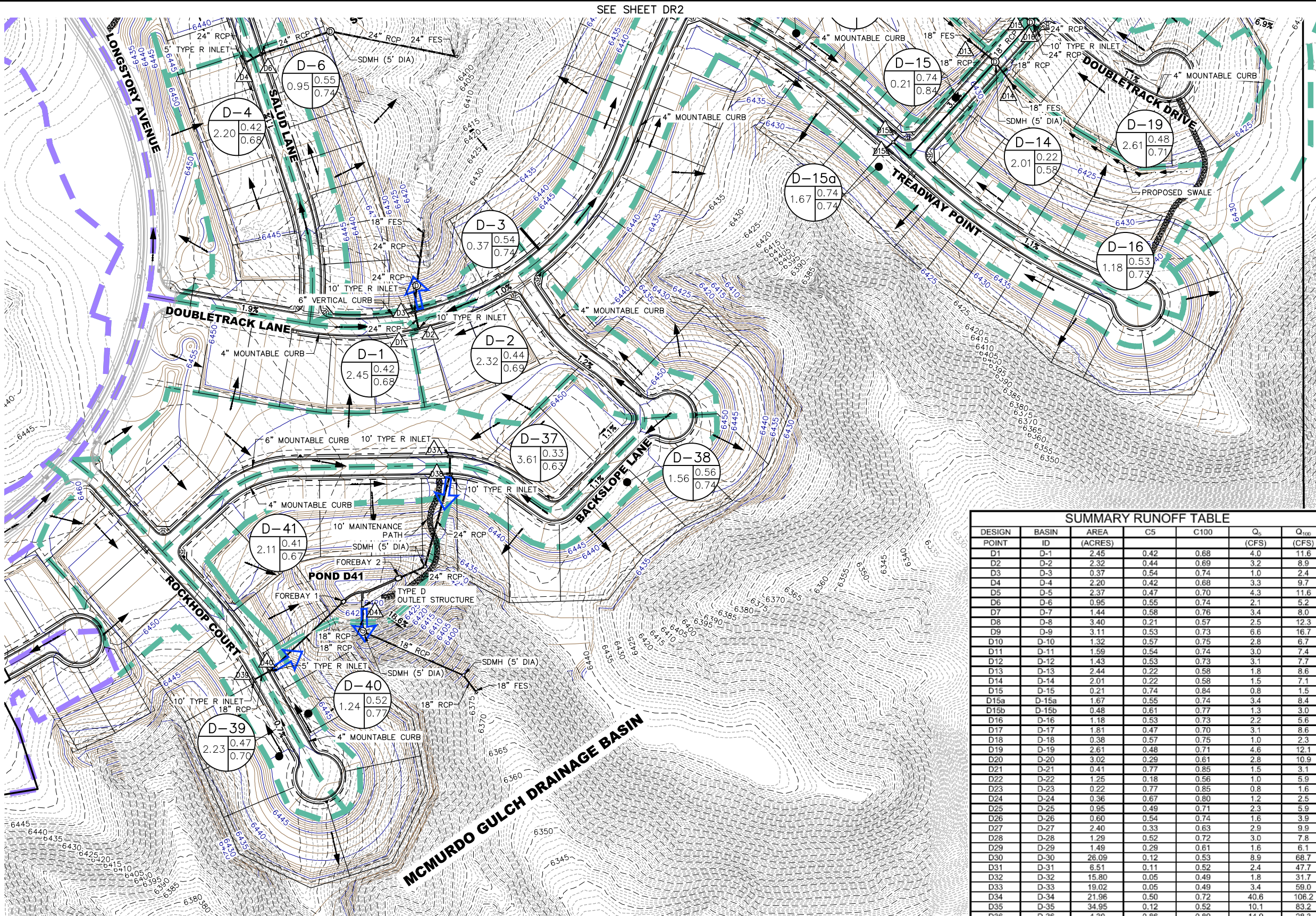
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1 inch = 400 ft. Horizontal			
Designer	JCK	Drafter	JCK
Checked	BKM		

Calibre
Calibre Engineering, Inc.
9090 South Ridgeline Boulevard, Suite 105
Highlands Ranch, CO 80129 (303) 730-0434
www.calibre-engineering.com
Construction Management Civil Engineering Surveying

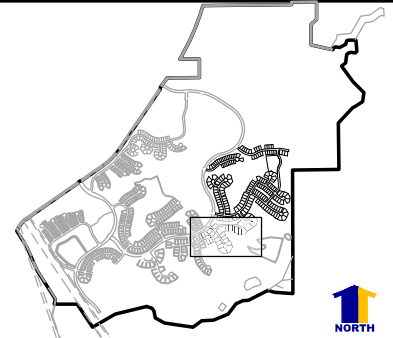
CANYONS SOUTH
OVERALL DRAINAGE MAP

Sheet	1 of 1
DM1	
Date	SEPTEMBER 2021

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PLOTTED BY: JUSTIN KELLER PLOT DATE: 11/16/2021 3:09 PM
XREFS:



SUMMARY RUNOFF TABLE						
DESIGN POINT	BASIN ID	AREA (ACRES)	C5	C100	Q ₅ (CFS)	Q ₁₀₀ (CFS)
D1	D-1	2.45	0.42	0.68	4.0	11.6
D2	D-2	2.32	0.44	0.69	3.2	8.9
D3	D-3	0.37	0.54	0.74	1.0	2.4
D4	D-4	2.20	0.42	0.68	3.3	9.7
D5	D-5	2.37	0.47	0.70	4.3	11.6
D6	D-6	0.95	0.55	0.74	2.1	5.2
D7	D-7	1.44	0.58	0.76	3.4	8.0
D8	D-8	3.40	0.21	0.57	2.5	12.3
D9	D-9	3.11	0.53	0.73	8.6	16.7
D10	D-10	1.32	0.57	0.75	2.8	6.7
D11	D-11	1.59	0.54	0.74	3.0	7.4
D12	D-12	1.43	0.53	0.73	3.1	7.7
D13	D-13	2.44	0.22	0.58	1.8	8.6
D14	D-14	2.01	0.22	0.58	1.5	7.1
D15	D-15	0.21	0.74	0.84	0.8	1.5
D15a	D-15a	1.67	0.55	0.74	3.4	8.4
D15b	D-15b	0.48	0.61	0.77	1.3	3.0
D16	D-16	1.18	0.53	0.73	2.2	5.6
D17	D-17	1.81	0.47	0.70	3.1	8.6
D18	D-18	0.38	0.57	0.75	1.0	2.3
D19	D-19	2.61	0.48	0.71	4.6	12.1
D20	D-20	3.02	0.29	0.61	2.8	10.9
D21	D-21	0.41	0.77	0.85	1.5	3.1
D22	D-22	1.25	0.18	0.56	1.0	5.9
D23	D-23	0.22	0.77	0.85	0.8	1.6
D24	D-24	0.36	0.67	0.80	1.2	2.5
D25	D-25	0.95	0.49	0.71	2.3	5.9
D26	D-26	0.60	0.54	0.74	1.6	3.9
D27	D-27	2.40	0.33	0.63	2.9	9.9
D28	D-28	1.29	0.52	0.72	3.0	7.8
D29	D-29	1.49	0.29	0.61	1.6	6.1
D30	D-30	26.09	0.12	0.53	8.9	68.7
D31	D-31	6.51	0.11	0.52	2.4	47.7
D32	D-32	15.80	0.05	0.49	1.8	31.7
D33	D-33	19.02	0.05	0.49	3.4	59.0
D34	D-34	21.96	0.50	0.72	40.6	106.2
D35	D-35	34.95	0.12	0.52	10.1	83.2
D36	D-36	4.30	0.86	0.89	14.9	28.3
D37	D-37	3.61	0.33	0.63	4.3	14.9
D38	D-38	1.96	0.56	0.75	4.3	10.3
D39	D-39	2.23	0.47	0.70	4.2	11.5
D40	D-40	0.75	0.61	0.77	2.0	4.7
D41	D-41	2.11	0.41	0.67	3.4	10.0



- GENERAL NOTES:
- LEGEND**
- PROPOSED MAJOR CONTOUR (5') —5250—
 - PROPOSED MINOR CONTOUR (1') ———
 - EXISTING MAJOR CONTOUR (5') - - - - -5250- - - - -
 - EXISTING MINOR CONTOUR (1') - - - - -
 - PROPOSED STORM DRAIN PIPE ———
 - PROPOSED STORM DRAIN INLET □
 - PROPOSED RIPRAP PAD ▒
 - PROPERTY LINE ———
 - DIRECTIONAL FLOW ARROW ———→
 - PROPOSED BASIN LINE ———
 - OFFSITE BASIN LINE ———
 - PROPOSED SWALE ———
 - DESIGN POINT ▲
 - PROPOSED CHECK STRUCTURE ———

- EMERGENCY OVERFLOW ARROW ———→
- PROPOSED BASIN LABEL

A-1	BASIN DESIGNATION
1.00	MINOR RUNOFF COEF.
.40	MAJOR RUNOFF COEF.

PROJECT BENCHMARK:
(AZTEC #401)
DOUGLAS COUNTY BENCHMARK TT17A
(NAVD88 DATUM) ELEVATION=6483.68

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ASSISTANT DIRECTOR OF DEVELOPMENT REVIEW

DATE

THESE CONSTRUCTION PLANS HAVE BEEN REVIEWED BY DOUGLAS COUNTY FOR STREET AND DRAINAGE, AND GRADING, EROSION AND SEDIMENT CONTROL IMPROVEMENTS ONLY.

ENGINEERING DIVISION ACCEPTANCE BLOCK

DATE	REVISION	DESCRIPTION



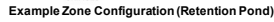
Drawing Name 30DR1.dwg	Job Number HINES CS	Prepared For HINES	Designer JCK	Drafter JCK	Checked BKM
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Calibre
Calibre Engineering, Inc.
9090 South Ridgeline Boulevard, Suite 105
Highlands Ranch, CO 80129 (303) 730-0434
www.calibre-engineering.com
Construction Management Civil Engineering Surveying

CANYONS SOUTH - FILING NO. 2
GRADING AND EROSION CONTROL PLANS
PROPOSED DRAINAGE MAP

MHFD-Detention, Version 4.04 (February 2021)

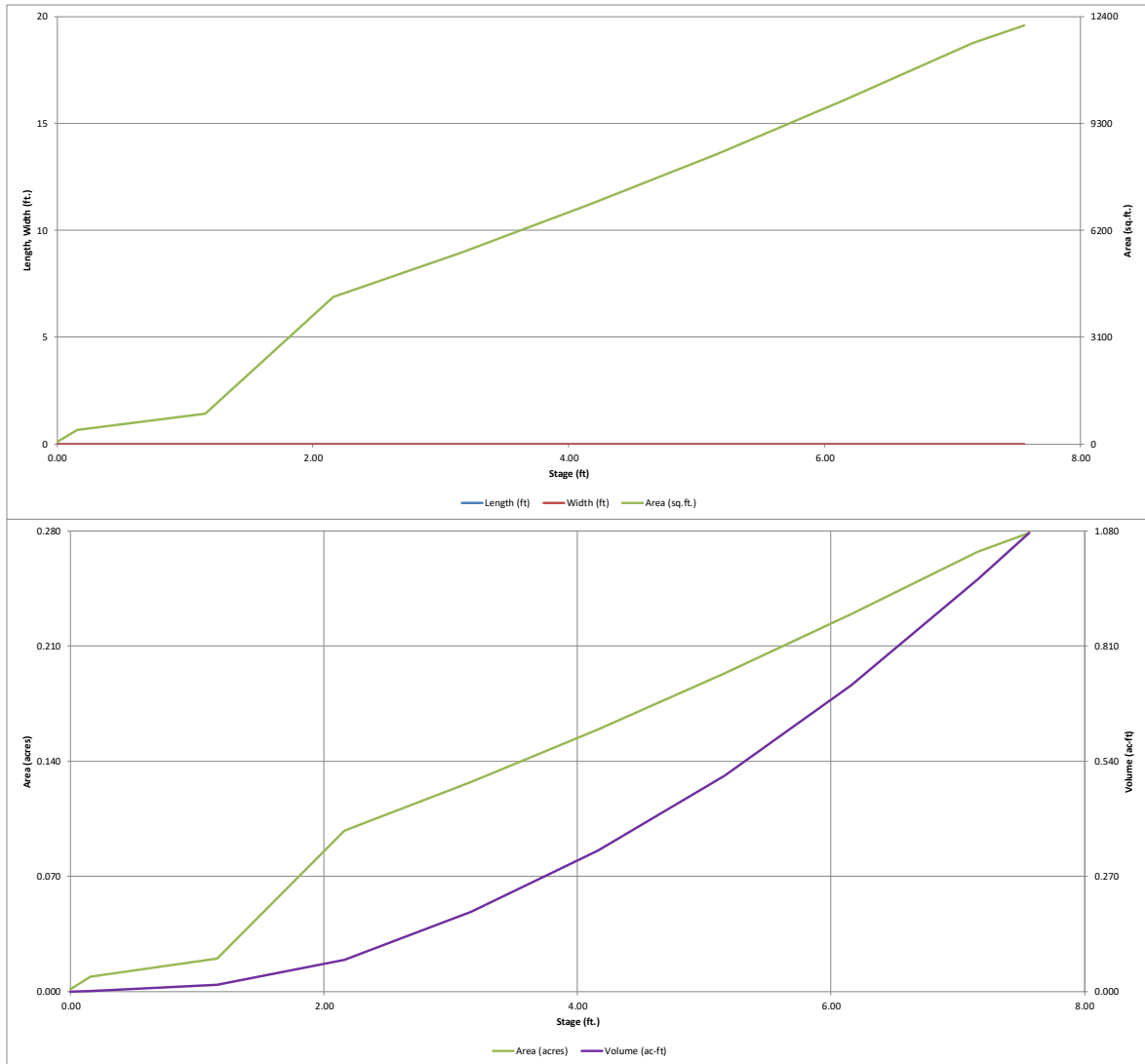
Basin ID: Pond D41

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DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Po

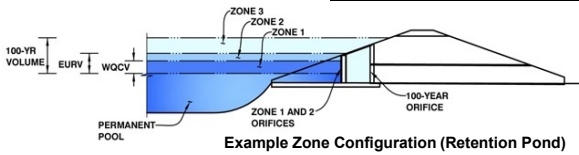


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Canyons South - Filing 2a

Basin ID: Pond D41



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.12	0.181	Orifice Plate
Zone 2 (EURV)	5.10	0.314	Rectangular Orifice
Zone 3 (100-year)	7.22	0.487	Weir&Pipe (Restrict)
Total (all zones)		0.982	

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

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

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 5.10 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = N/A inches
Orifice Plate: Orifice Area per Row = 0.60 sq. inches (diameter = 7/8 inch)

Calculated Parameters for Plate
WQ Orifice Area per Row = 4.167E-03 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.50						
Orifice Area (sq. inches)	0.60	0.60						

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

User Input: Vertical Orifice (Circular or Rectangular)

Zone 2 Rectangular Not Selected
Invert of Vertical Orifice = 3.12 N/A ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = 5.10 N/A ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height = 2.00 N/A inches
Vertical Orifice Width = 5.00 inches

Calculated Parameters for Vertical Orifice
Zone 2 Rectangular Not Selected
Vertical Orifice Area = 0.07 N/A ft²
Vertical Orifice Centroid = 0.08 N/A feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Zone 3 Weir Not Selected
Overflow Weir Front Edge Height, H_o = 5.10 N/A ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 5.67 N/A feet
Overflow Weir Gate Slope = 0.00 N/A H:V
Horiz. Length of Weir Sides = 2.91 N/A feet
Overflow Gate Type = Close Mesh Gate N/A
Debris Clogging % = 50% N/A %

Calculated Parameters for Overflow Weir
Zone 3 Weir Not Selected
Height of Gate Upper Edge, H_u = 5.10 N/A feet
Overflow Weir Slope Length = 2.91 N/A feet
Gate Open Area / 100-yr Orifice Area = 7.38 N/A
Overflow Gate Open Area w/o Debris = 13.04 N/A ft²
Overflow Gate Open Area w/ Debris = 6.52 N/A ft²

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

Zone 3 Restrictor Not Selected
Depth to Invert of Outlet Pipe = 0.33 N/A ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 18.00 N/A inches
Restrictor Plate Height Above Pipe Invert = 18.00 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Zone 3 Restrictor Not Selected
Outlet Orifice Area = 1.77 N/A ft²
Outlet Orifice Centroid = 0.75 N/A feet
Half-Central Angle of Restrictor Plate on Pipe = 3.14 N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 7.56 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 20.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.68 feet
Stage at Top of Freeboard = 9.24 feet
Basin Area at Top of Freeboard = 0.28 acres
Basin Volume at Top of Freeboard = 1.08 acre-ft

Pond D41 Outflow accounted for by Canyons Far South

Routed Hydrograph Results

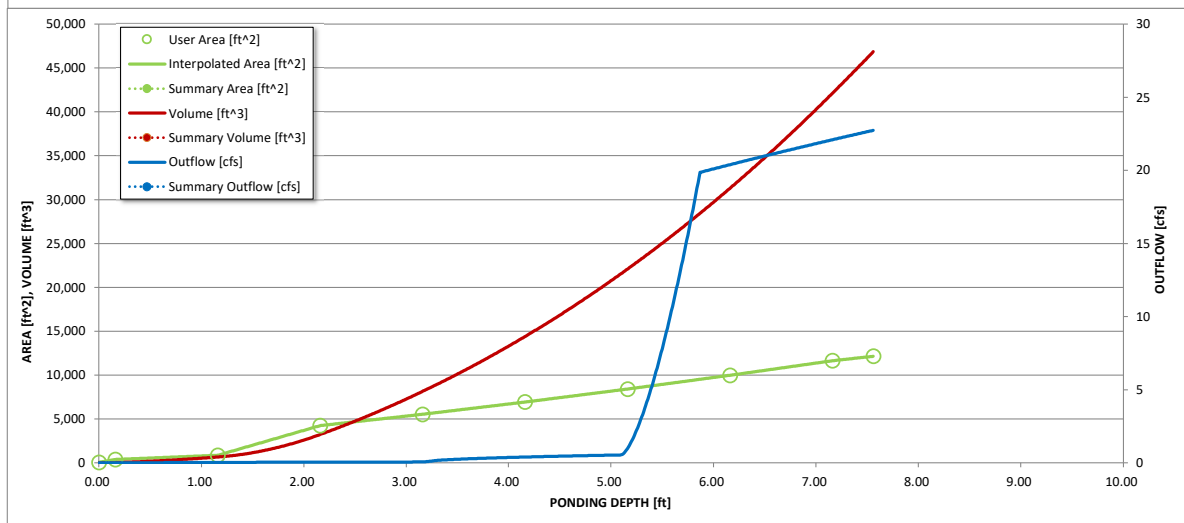
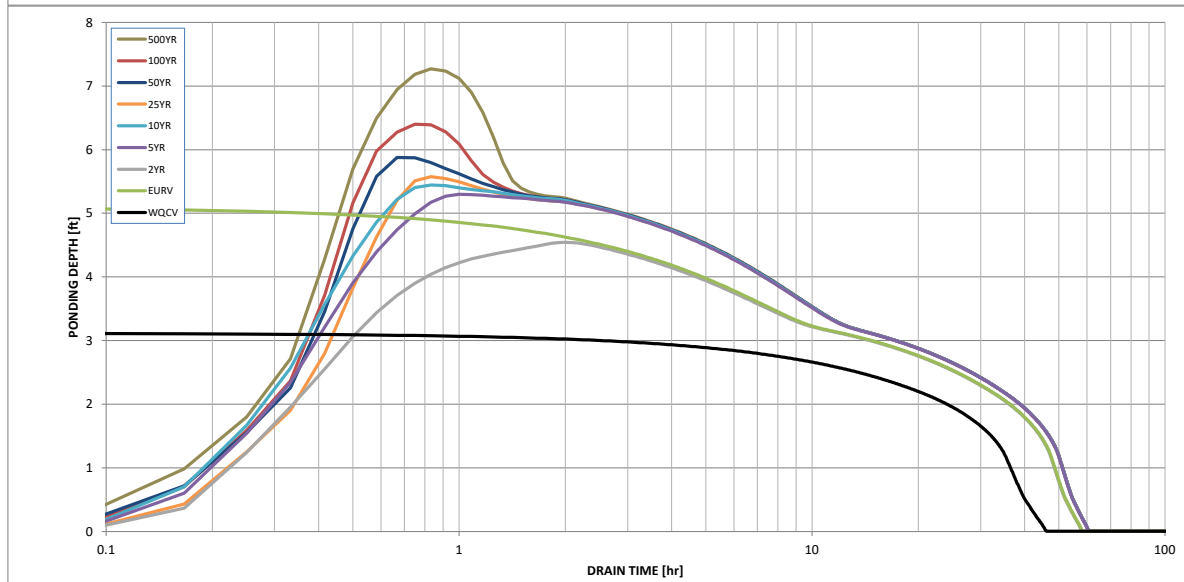
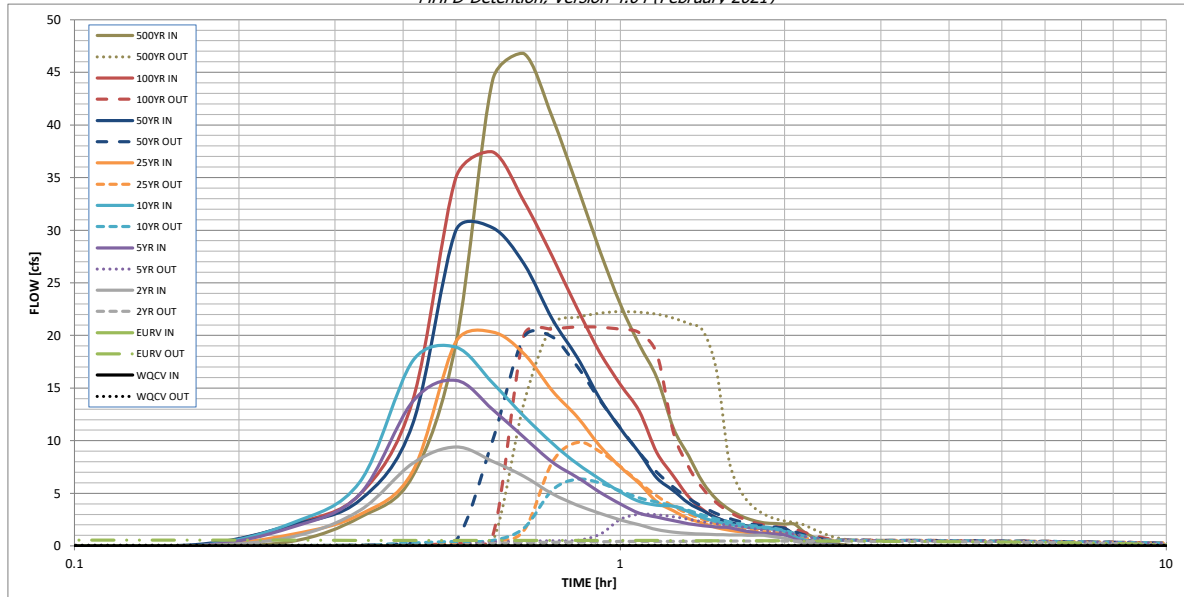
The user can override the default CUHP hydrographs and runoff volumes

(Columns W through AF)

	WQCV	EURV	2 Year	5 Year				100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.06	1.43	1.66	1.69	2.26	2.60	3.14
One-Hour Rainfall Depth (in) =	0.181	0.495	0.452	0.735	0.925	0.982	1.476	1.806	2.287
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.452	0.735	0.925	0.982	1.476	1.806	2.287
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.5	5.5	7.7	9.6	16.4	21.0	27.5
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.14	0.52	0.73	0.90	1.55	1.98	2.59
Peak Inflow Q (cfs) =	N/A	N/A	9.4	15.7	18.9	20.3	30.2	37.4	46.8
Peak Outflow Q (cfs) =	0.1	0.5	0.5	3.0	6.3	9.8	19.9	20.8	22.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.8	1.0	1.2	1.0	0.8
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	0.2	0.4	0.7	1.5	1.5	1.6
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	48	48	48	47	46	43	40	37
Time to Drain 99% of Inflow Volume (hours) =	43	52	52	53	53	52	51	50	48
Maximum Ponding Depth (ft) =	3.12	5.10	4.54	5.29	5.44	5.57	5.88	6.40	7.27
Area at Maximum Ponding Depth (acres) =	0.13	0.19	0.17	0.20	0.20	0.21	0.22	0.24	0.27
Maximum Volume Stored (acre-ft) =	0.182	0.495	0.393	0.532	0.562	0.589	0.653	0.772	0.993

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.07	0.43
	0:15:00	0.00	0.00	0.87	1.76	2.18	1.09	1.99	2.05	2.71
	0:20:00	0.00	0.00	3.39	4.93	6.10	2.99	4.36	4.91	6.63
	0:25:00	0.00	0.00	7.84	13.73	17.59	7.08	11.60	13.80	19.24
	0:30:00	0.00	0.00	9.40	15.74	18.88	19.40	29.97	34.99	44.26
	0:35:00	0.00	0.00	8.04	12.95	15.47	20.33	30.23	37.43	46.77
	0:40:00	0.00	0.00	6.60	10.30	12.33	18.25	26.78	32.72	40.74
	0:45:00	0.00	0.00	4.95	7.97	9.76	14.75	21.57	27.52	34.21
	0:50:00	0.00	0.00	3.88	6.53	7.81	12.26	17.91	22.56	28.09
	0:55:00	0.00	0.00	3.12	5.12	6.36	9.52	14.03	18.41	22.96
	1:00:00	0.00	0.00	2.48	3.98	5.13	7.51	11.15	15.34	19.12
	1:05:00	0.00	0.00	2.00	3.12	4.22	5.92	8.85	12.80	15.98
	1:10:00	0.00	0.00	1.54	2.73	3.87	4.21	6.46	8.86	11.22
	1:15:00	0.00	0.00	1.32	2.41	3.77	3.34	5.28	6.66	8.57
	1:20:00	0.00	0.00	1.19	2.11	3.25	2.60	4.07	4.68	6.04
	1:25:00	0.00	0.00	1.12	1.93	2.68	2.16	3.34	3.44	4.44
	1:30:00	0.00	0.00	1.08	1.81	2.30	1.75	2.67	2.69	3.48
	1:35:00	0.00	0.00	1.05	1.74	2.05	1.50	2.26	2.20	2.83
	1:40:00	0.00	0.00	1.03	1.48	1.89	1.34	1.99	1.88	2.43
	1:45:00	0.00	0.00	1.02	1.31	1.78	1.24	1.82	1.71	2.20
	1:50:00	0.00	0.00	1.02	1.20	1.70	1.19	1.74	1.65	2.12
	1:55:00	0.00	0.00	0.84	1.13	1.58	1.16	1.68	1.63	2.09
	2:00:00	0.00	0.00	0.73	1.04	1.38	1.14	1.67	1.63	2.09
	2:05:00	0.00	0.00	0.47	0.67	0.90	0.74	1.08	1.06	1.36
	2:10:00	0.00	0.00	0.30	0.42	0.57	0.48	0.69	0.68	0.87
	2:15:00	0.00	0.00	0.18	0.26	0.35	0.30	0.43	0.42	0.54
	2:20:00	0.00	0.00	0.11	0.15	0.21	0.18	0.26	0.25	0.32
	2:25:00	0.00	0.00	0.06	0.09	0.12	0.11	0.15	0.15	0.19
	2:30:00	0.00	0.00	0.02	0.04	0.05	0.05	0.07	0.07	0.09
	2:35:00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.03
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

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

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

[illegible]



**JURISDICTIONAL DETERMINATION
FOR THE CANYONS SOUTH DEVELOPMENT SITE**

December 22, 2017

Mr. Aaron Eilers
Denver Regulatory Office
U.S. Army Corps of Engineers
9307 S. Wadsworth Blvd.
Littleton, CO 80128-6901

RE: Request for Approved Jurisdictional Determination for The Canyons South
Development Site, Douglas County, Colorado

Dear Mr. Eilers:

On behalf of Lowe Enterprises (Lowe), ERO Resources Corporation (ERO) is requesting an approved Jurisdictional Determination (JD) for the wetlands and other waters associated with two drainages on the Canyons South property (property) located east of the intersection at Founders Parkway and Crowfoot Valley Road in Castle Rock, Douglas County, Colorado (project area; Figure 1). In 2005, the Corps issued a JD for multiple drainages on the property and found them to be nonjurisdictional and not regulated under Section 404 of the Clean Water Act (File No. 200580638). On November 30, December 1, and December 8, 2017, ERO assessed the project area for potential wetlands and waters of the U.S. (2017 site visits).

The property is a roughly 1,600-acre parcel within an undeveloped portion of Castle Rock. The legal description of the project area is Sections 17 through 20, 30, and 31, Township 7 South, Range 66 West and Sections 14 and 15, Township 7 South, Range 67 West of the 6th Principal Meridian in Douglas County, Colorado (Figure 1). The UTM coordinates of the approximate center of the project area are NAD 83; 515558mE, 4363401mN, Zone 13N. The latitude/longitude of the project area is 39.419996°N/104.819251°W. The elevation of the project area is approximately 6,400 feet above sea level. Photos of the project area are attached.

The project area consists primarily of upland grasslands and Gambel oak (*Quercus gambelii*) woodlands (Figures 2a through 2c). During the 2017 site visits, the dominant vegetation in the upland understory consisted of smooth brome (*Bromus inermis*), cheatgrass (*Bromus tectorum*), blue grama (*Bouteloua gracilis*), purple threeawn (*Aristida purpurea*), and western wheatgrass (*Pascopyrum smithii*). The property is actively grazed by livestock.

The property is bounded by residential development and undeveloped lands on the north and west, the Pradera Golf Course and residential community on the northeast, and undeveloped lands and limited residential development on the south and southeast (Figures 2a through 2d).

Several drainages (Scott Gulch, Drainage 1, Drainage 2, and Drainage 3) traverse the property, generally trending from southwest to northeast toward Cherry Creek. Lowe retained ERO to

Denver
1842 Clarkson St.
Denver, CO 80218
303.830.1188

Durango
1015 ½ Main Avenue
Durango, CO 81301
970.422.2136

Hotchkiss
P.O. Box 932
161 South 2nd St.
Hotchkiss, CO 81419
970.872.3020

Idaho
4001 East Main Street
Emmett, ID 83617
208.365.7684

www.eroresources.com

Consultants in
Natural Resources
and the Environment

document the conditions of three of the drainages – Scott Gulch, Drainage 1, and Drainage 3 – with the intention of determining their jurisdictional status as potential waters of the U.S. Drainage 2, which is located on the southern portion of the property was excluded from the field survey and the property owner is not seeking a jurisdictional determination of this feature. A discussion of the drainages of interest is provided below.

Scott Gulch

Scott Gulch (Gulch) traverses the center of the project area and is shown as an intermittent stream on the U.S. Geological Survey (USGS) Castle Rock North quadrangle. The headwaters of the Gulch originate in the west corner of the project area (Figure 2b). During the 2017 site visits, sporadic wetlands were identified along and within the Gulch channel, as well as short sections of upland inclusions/swales that lacked characteristics of a defined bed and bank. Review of historic imagery on Google Earth (years 1937, 1956, and 1999) (Google Earth Pro 2017) appear to indicate that historically the Gulch was a continuous feature that reached Cherry Creek. Subsequently, development activities in the vicinity of the Gulch contributed to notable alterations of the drainage channel within the project area and downstream. In 2003, construction of the Pradera community was in the initial phases, which directly and indirectly affected downstream flows within the Gulch. In 2004, an irrigation pond was constructed on the Gulch channel (see 2005 Google Earth image). During 2013, flooding contributed to excessive bank erosion and instability and incision along the Gulch, which was evident during the 2017 site visits (Photo 1).

The wetlands associated with the Gulch occur intermittently within and along the margin of the channel and consist predominantly of foxtail barley (*Hordeum jubatum*), meadow foxtail (*Alopecurus pratensis*), redtop (*Agrostis gigantea*), Baltic rush (*Juncus balticus*), and Nebraska sedge (*Carex nebrascensis*) (Photos 2 and 3; Figure 2b). The upstream section of the Gulch is a narrow and shallow channel, ranging in width from 2 to 4 feet with a rough depth of 0.5 to 1 foot. Short sections of upland swales/inclusions occur in the upper portion of the Gulch, which were defined by the loss of channel characteristics (bed and bank) and dominance of upland vegetation species (Photos 4, 5, and 6).

A large stock pond is situated approximately halfway down the Gulch in the project area. The stock pond exhibits evidence of recent ponding, including surface cracks and limited vegetation cover (Photo 7; Figure 2b). An upland berm separates the stock pond from the downstream Gulch channel, at which point the Gulch channel is headcut and incised (Photo 8). The width of the Gulch channel increases to approximately 25 to 30 feet with an approximate depth of 10 to 15 feet. According to the current landowner, following the 2013 flooding events, this section of the Gulch degraded. Along this reach, wetlands occur within the Gulch channel bed and ponded water was noted in areas (Photo 9). Sections of the channel are also devoid of vegetation and several segments support upland vegetation species. A datapoint (DP1) conducted on the downstream end of the Gulch channel

documented nonwetland conditions, including dominance by upland species and a lack of hydric soils and hydrology indicators (Photo 10; Figure 2b).

The Gulch continues from the property onto adjacent open space lands before entering the Pradera Golf Course property (Figure 2c). This section of the Gulch is a sandy bottom channel that mostly lacks vegetation within the Gulch channel (Photo 11). The drainage meets a culvert that passes under Raintree Drive and continues downstream before connecting with an irrigation pond on the Pradera Golf Course. This section of the Gulch channel supports cattail wetlands and may be augmented by stormwater runoff from Raintree Drive (Photo 12). According to the acting maintenance superintendent of the Pradera Golf Course, the irrigation pond, which was constructed on the Gulch in 2004, is primarily filled using potable water sourced by Pinery Water. Outflow from the irrigation pond occurs only during peak storm events, such as the 2013 event (Boyd, pers. comm. 2017). Two overflow weirs are located downgradient of the irrigation pond and across the golf course greens (Figure 2a); the downstream weir was constructed above an outlet culvert that diverts stormwater runoff and overflow waters from the irrigation pond. A cattail and willow scrub-shrub wetland occurs directly downstream of the weir (Photo 13; Figure 2a, DP2]). The scrub-shrub wetland transitions into an upland swale that is dominated by upland grasses (blue gramma [*Bouteloua gracilis*], cheatgrass [*Bromus tectorum*], smooth brome [*Bromus intermis*]) and upland forbs (Photo 14; DP3 and DP4). The upland swale continues for roughly 1,000 feet (Photo 15) before reaching a rock weir and culvert that continues under Pradera Parkway. A detention pond located southeast of the Gulch and Pradera Parkway also feeds into the weir/culvert associated with Pradera Parkway (Photo 16). The drainage continues downstream and north of Pradera Parkway before meeting Cherry Creek, a jurisdictional water of the U.S., roughly 1-mile northeast of the Pradera residential community. This section of the Gulch is likely fed primarily by stormwater runoff and from the detention pond south of Pradera Parkway; the Gulch channel within this section supports a dense cattail wetland (Photo 17).

Drainage 1

The unnamed Drainage 1 occurs on the southern section of the project area (Figure 2c). Drainage 1 is shown as an intermittent stream on the USGS quadrangle and is a tributary to McMurdo Gulch. Review of historic imagery indicates that the drainage was historically present with a continuous channel along its current alignment (Google Earth 1937, 1955). A large upland inclusion on the downstream end of the drainage is visible on the 1993 imagery, which was consistent with field observations during the 2017 site visits.

The very downstream portion of the drainage before the confluence with McMurdo Gulch is a sandy swale that lacks defined banks (Photo 18). Sporadic pine tree saplings occur within the drainage (Photo 19). The upland inclusion visible on Google Earth (2017) lacks a defined bed and bank and supports a dominance of mature ponderosa pine (*Pinus ponderosa*) trees (Photo 20). No wetlands were observed within the downstream portion of the drainage.

Drainage 3

The unnamed Drainage 3 occurs on the north end of the property (Figure 2d). Drainage 3 is shown as an intermittent stream on the USGS quadrangle. The upstream end of the drainage begins on the northern portion of the property. The upstream end of the drainage is an upland swale with no characteristics of a channel bed and bank. The drainage continues as an upland swale northeast across the property and onto the adjacent property (Photos 21 and 22). The drainage remains an upland feature for the remainder of its length; the drainage terminates on the southeast corner of the Pradera Golf Course where it meets the golf greens and a small irrigation pond. Review of historic imagery in Google Earth shows a drainage feature present in the location of Drainage 3 during 1937 and 1999. In 2004, the Pradera Golf Course was constructed and a small irrigation pond was created on the downstream end of Drainage 3 (Google Earth image 2004).

Summary

Based on the 2017 site visits and review of historic Google Earth aerial imagery, Scott Gulch, Drainage 1, and Drainage 3 do not appear to have continuous hydrologic connections to any other potential or known waters of the U.S. Scott Gulch is a sandy channel with intermittent sections of upland swales/breaks upstream of the large stock pond. Below the stock pond, wetlands are contained within the channel and may be primarily supported by groundwater, a result of the degraded channel invert, and intermittent storm flows. The wetlands transition into a channel with a sandy bed for most of the reach to Raintree Drive. Construction of the Pradera Golf Course irrigation pond on the drainage created a barrier that prevents conveyance of downstream flows except during major storm events. The upland swale downstream of the lower overflow weir suggests that flows from the irrigation pond overflow rarely reach the culvert below Pradera Parkway. Based on these observations, ERO believes that flows within Scott Gulch south of Pradera Parkway do not reach Cherry Creek and that flows below the irrigation pond occur only during major storm events.

Drainage 1 contains a significant upland swale on the downstream end of the drainage and does not show evidence of intermittent flows. ERO believes that Drainage 1 does not have a surface connection with McMurdo Gulch or other waters of the U.S.

Drainage 3 is an upland swale and does not show evidence of intermittent flows. ERO believes that Drainage 3 does not have a surface connection with a downstream water of the U.S.

On behalf of Lowe, ERO requests an approved JD of Scott Gulch and Drainage 1 as described above. Please let us know if you need additional information to make this determination.

Please contact me with any questions at ecrumb@eroresources.com.

Sincerely,



Esa Crumb
Biologist

cc: Erik Clore, Lowe Enterprises

Attachments: Photo log; Google Earth Image log; Figures 1, 2a, 2b, 2c, 2d; datasheets

References

Google Earth Pro. 2017. Historical imagery from 1937 to 2017. Last accessed December 12, 2017.

Boyd, M. 2017. Personal communication with Pradera Golf Course Superintendent. December 15.

REQUEST FOR CORPS JURISDICTIONAL DETERMINATION (JD)

U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT

The information that you provide will be used in evaluating your request to determine whether there are any aquatic resources within the project area subject to federal jurisdiction under the regulatory authorities referenced below. **Note:** Submission of requested information is voluntary; however, if information is not provided, the request for an AJD cannot be evaluated nor can an AJD be issued.

CORPS USE ONLY:
DATE RECEIVED:

PROJECT NO.:

1. PROPERTY LOCATION:

Street Address:

City/Township/Parish: Castle Rock

County: Douglas State: CO

Acreage of Parcel/Review Area for JD: 1600 acres

Section: 17-20,30,31 Township: 7S Range: 66W

Latitude: 39.419996°N Longitude: 104.819251°W

(For linear projects, please include the center point of the proposed alignment.)

2. REQUESTOR CONTACT INFORMATION:

Typed or printed name: Erik Lowe

Company name: Lowe Enterprises

Street Address: 7979 East Tufts Avenue

City: Denver State: CO Zip: 80237

Daytime phone no.: 303-850-2406

Email address: eclore@lowe-re.com

3. MAP: Please attach a survey/plat map and vicinity map identifying location and review area for the JD.**4. REASON FOR REQUEST (check as many as applicable):**

- ☐ I intend to construct/develop a project or perform activities on this parcel which may require authorization from the Corps, and the JD would be used to avoid and minimize impacts to jurisdictional aquatic resources and as an initial step in a future permitting process.
- ☐ I intend to construct/develop a project or perform activities on this parcel which may require authorization from the Corps; this request is accompanied by my permit application and the JD is to be used in the permitting process.
- ☐ I intend to construct/develop a project or perform activities in a navigable water of the U.S. which is included on the district Section 10 list and/or is subject to the ebb and flow of the tide.
- ☐ A Corps JD is required in order to obtain my local/state authorization.
- ☐ I intend to contest jurisdiction over a particular aquatic resource and request the Corps confirm that jurisdiction does/does not exist over the aquatic resource on the parcel.
- ☐ I believe that the site may be comprised entirely of dry land/upland.
- ☒ Other: the property may be sold and the potential buyer wishes to know the jurisdictional status of the aquatic resources

5. TYPE OF DETERMINATION BEING REQUESTED:

- ☒ I am requesting an approved JD
- ☐ I am requesting a preliminary JD
- ☐ I am requesting a "no permit required" letter as I believe my proposed activity is not regulated.
- ☐ I am unclear as to which JD I would like to request and require additional information.

6. OWNERSHIP DETAILS:

- ☒ I currently own this property.
- ☐ I plan to purchase this property.
- ☐ I am an agent/consultant acting on behalf of the requestor.
- ☐ Other (please explain):

***Authorities:** Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Program of the U.S. Army Corps of Engineers; Final Rule for 33 CFR Parts 320-332. **Uses:** This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public, and may be made available as part of a public notice as required by federal law. Your name and property location where federal jurisdiction is to be determined will be included in the approved jurisdictional determination (AJD), which will be made available to the public on the District's website and on the Headquarters USACE website.

By signing below, you are indicating that you have the authority, or are acting as the duly authorized agent of a person or entity with such authority, to and do hereby grant Corps personnel right of entry to legally access the site if needed to perform the JD. Your signature shall be an affirmation that you possess the requisite property rights to request a JD on the subject property.

Signature:

Date:

12/21/17

Canyon South Property

Sections 17-20 and 30-31, T7S, R66W; Sections 14 and 15, T7S, R67W; 6th PM

UTM NAD 83: Zone 13N; 515558mE, 4363401mN

Latitude, Longitude: 39.419996°N, 104.819251°W

USGS Castle Rock North, CO Quadrangle

Douglas County, Colorado

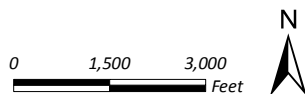
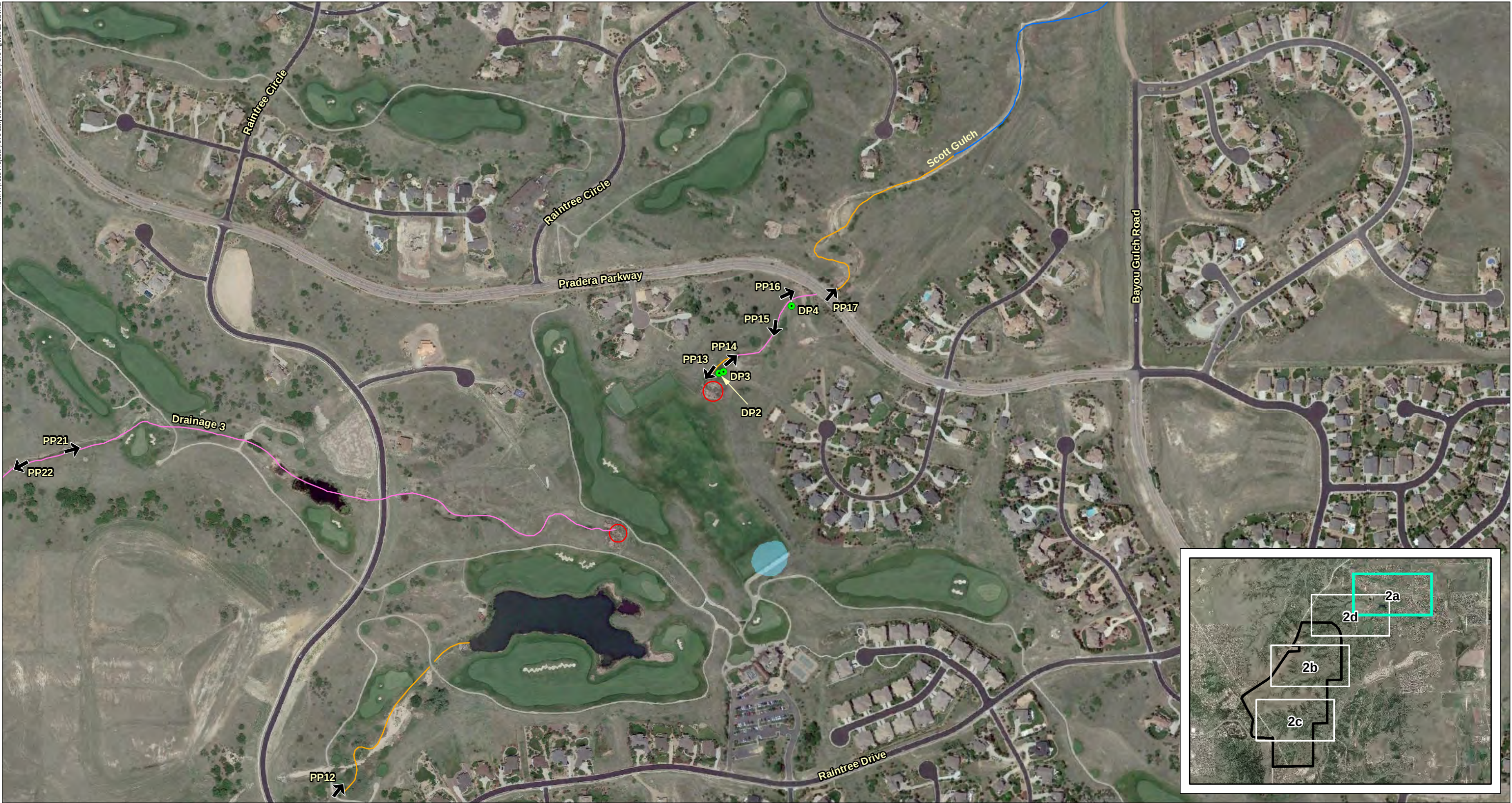


Figure 1
Vicinity Map

Prepared for: Lowe Enterprises
File: 7076 Figure 1.mxd (GS)
December 19, 2017





Canyon South Property

- Data Point
- ➔ Photo Point
- Channel
- Potential Wetland
- Upland Swale
- Wetland
- Weir
- Lake/Pond
- Property Boundary

Image Source: Google Earth©, June 2017

0 225 450 Feet



Figure 2a
Scott Gulch
Jurisdictional Determination

Prepared for: Lowe Enterprises
File: 7076 Figures 2a-2d.mxd (GS)
December 21, 2017





Canyon South Property

- | | | |
|---------------|---------------------|---------------------|
| ● Data Point | — Potential Wetland | □ Weir |
| ➔ Photo Point | — Upland Swale | ☁ Lake/Pond |
| — Channel | — Wetland | □ Property Boundary |

Image Source: Google Earth©, June 2017

0 225 450
Feet



Figure 2b
Scott Gulch
Jurisdictional Determination

Prepared for: Lowe Enterprises
File: 7076 Figures 2a-2d.mxd (GS)
December 21, 2017





Canyon South Property

- | | | |
|---------------|---------------------|---------------------|
| ● Data Point | — Potential Wetland | □ Weir |
| ➔ Photo Point | — Upland Swale | ☁ Lake/Pond |
| — Channel | — Wetland | □ Property Boundary |

Image Source: Google Earth®, June 2017

0 225 450 Feet



Figure 2c
Drainage 1
Jurisdictional Determination

Prepared for: Lowe Enterprises
File: 7076 Figures 2a-2d.mxd (GS)
December 21, 2017





Canyon South Property

- | | | |
|---------------|---------------------|---------------------|
| ● Data Point | — Potential Wetland | □ Weir |
| ➔ Photo Point | — Upland Swale | ■ Lake/Pond |
| — Channel | — Wetland | □ Property Boundary |

Image Source: Google Earth®, June 2017

0 225 450 Feet



Figure 2d
Drainage 3
Jurisdictional Determination

Prepared for: Lowe Enterprises
File: 7076 Figures 2a-2d.mxd (GS)
December 21, 2017



PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 1 - View of extreme channel degradation on Scott Gulch following the 2013 floods. View is to the northeast..



Photo 2 - The upstream end of the Scott Gulch channel with in-channel wetland vegetation. View is to the northeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 3 - Channel section on upstream end of Scott Gulch supporting some wetland vegetation; headcutting is visible downstream. View is to the northeast.



Photo 4 - Upland swale/channel break near the upstream end of Scott Gulch. View is to the northeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 5 - Channel segment on upstream end of Scott Gulch lacking wetland vegetation. View is to the northeast.



Photo 6 - Narrow channel on Scott Gulch lacking wetland vegetation and upstream of fallen cottonwood tree. View is to the northeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 7 - A large stock pond located on Scott Gulch near the center of the project area. View is to the east.



Photo 8 - Wetlands in the Scott Gulch channel viewed below a large cutbank downstream of the stock pond. View is to the southeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 9 - A section of Scott Gulch showing channel and bank degradation following the 2013 floods. View is to the east.



Photo 10 - A section of a sandy bottom channel near the downstream end of the gulch near DP1. View is to the northeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 11 - A section of the channel on the adjacent property, located between the project area and the Pradera Golf community. Not shown on the figures. View is to the north.



Photo 12 - The Scott Gulch channel downstream of Raintree Drive and upstream of the large irrigation pond on the Pradera Golf Course. View is to the northeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 13 - A willow-dominated wetland located downstream of the lower overflow weir below the Pradera Golf Course greens. View is to the southwest.



Photo 14 - An upland break located downstream of the willow wetland, located near DP3. View is to the northeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 15 - The remnant Scott Gulch channel downstream of the overflow weir, which consists of an upland swale. View is to the south.



Photo 16 - An upland inclusion above the weir and culvert that pass under Pradera Parkway. View is to the northeast.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 17 - The Scott Gulch channel downstream of Pradera Parkway. View is to the northeast.



Photo 18 - A section of Drainage 1 showing a lack of defined channel. View is to the west.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 19 - A section of Drainage 1 showing sporadic evergreen tree saplings growing in the drainage bed. View is to the southwest.



Photo 20 - A large upland inclusion located near the downstream end of Drainage 1. View is to the west.

PHOTO LOG
CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION
DOUGLAS COUNTY, COLORADO
NOVEMBER 22, DECEMBER 1 AND 8, 2017



Photo 21 – Downstream section of Drainage 3, upstream of Pradera Golf course, showing a channel with upland vegetation. View is to the northeast.



Photo 22 – Downstream section of Drainage 3 looking upstream, channel with upland vegetation. View is to the southwest.

CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION REQUEST
HISTORICAL IMAGERY LOG

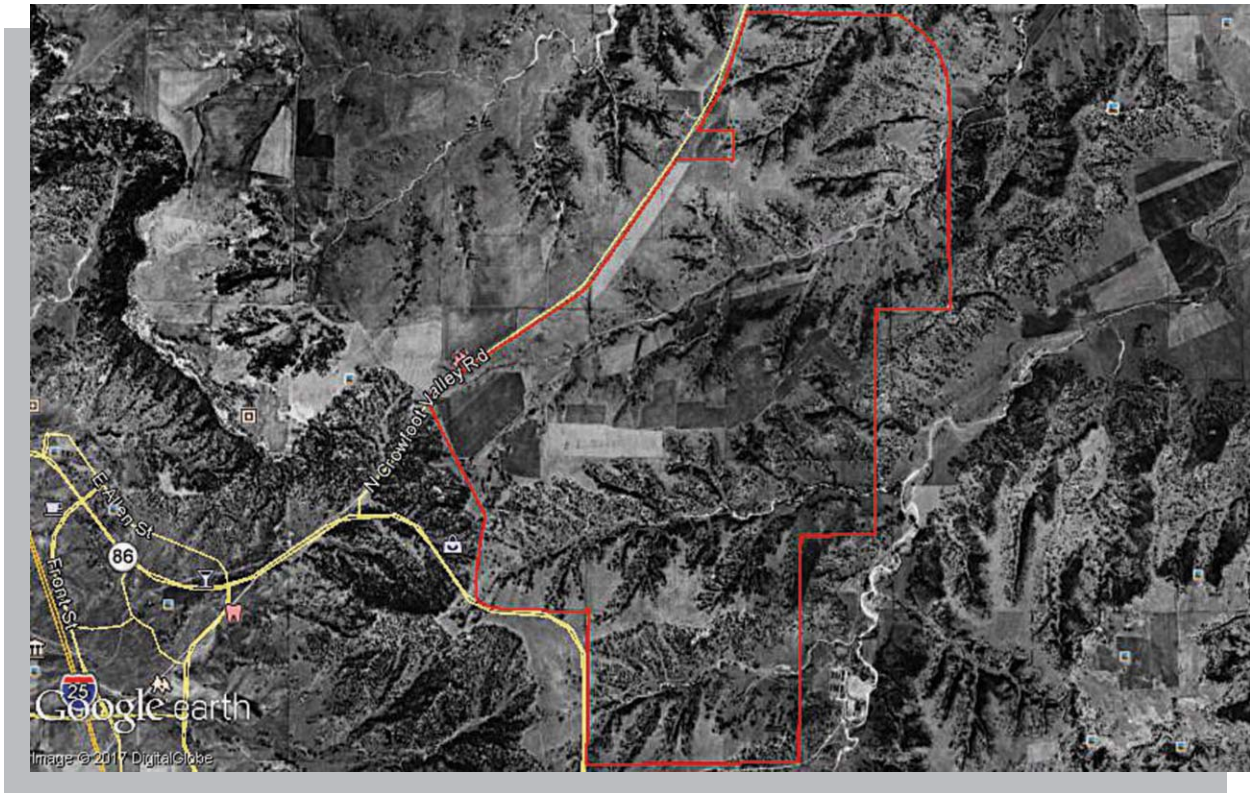


Photo 1 - 1937 imagery showing a continuous drainage in the location of Scott Gulch from the headwaters to the current location of the Pradera community and a continuous drainage at the location of Drainage 1.

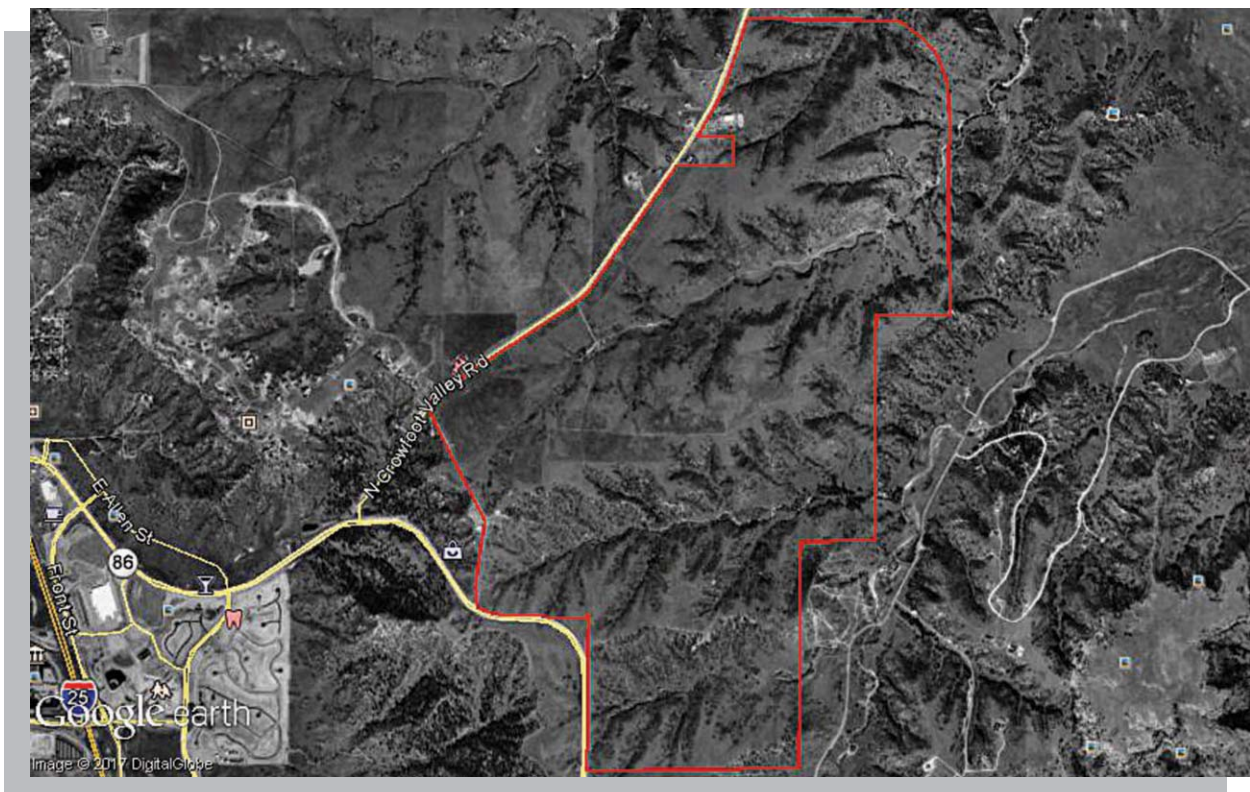


Photo 2 - 1999 imagery showing continuous drainage in the location of Scott Gulch and development activity west of the project area.

CANYONS SOUTH PROPERTY JURISDICTIONAL DETERMINATION REQUEST
HISTORICAL IMAGERY LOG

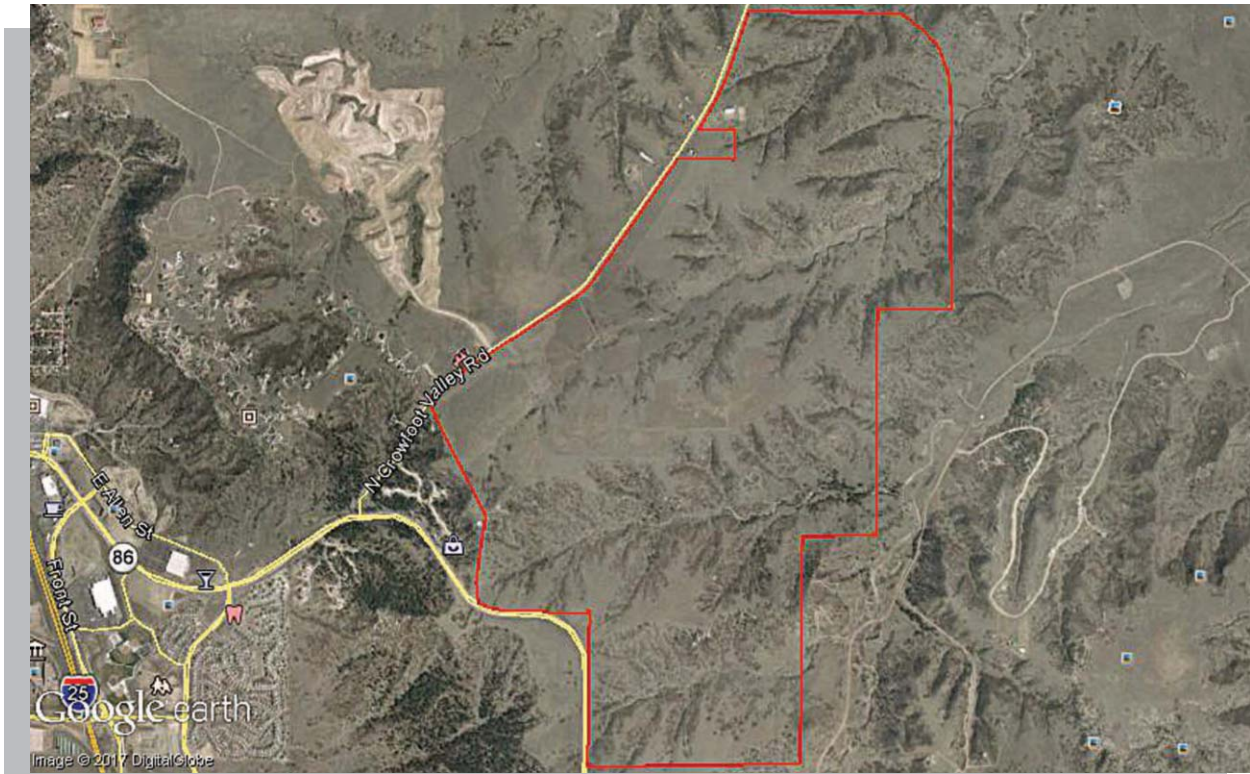


Photo 3 - 2003 imagery shows that the Scott Gulch drainage is continuous up to the Pradera community locations and development is expanding to the northeast and west of the property.

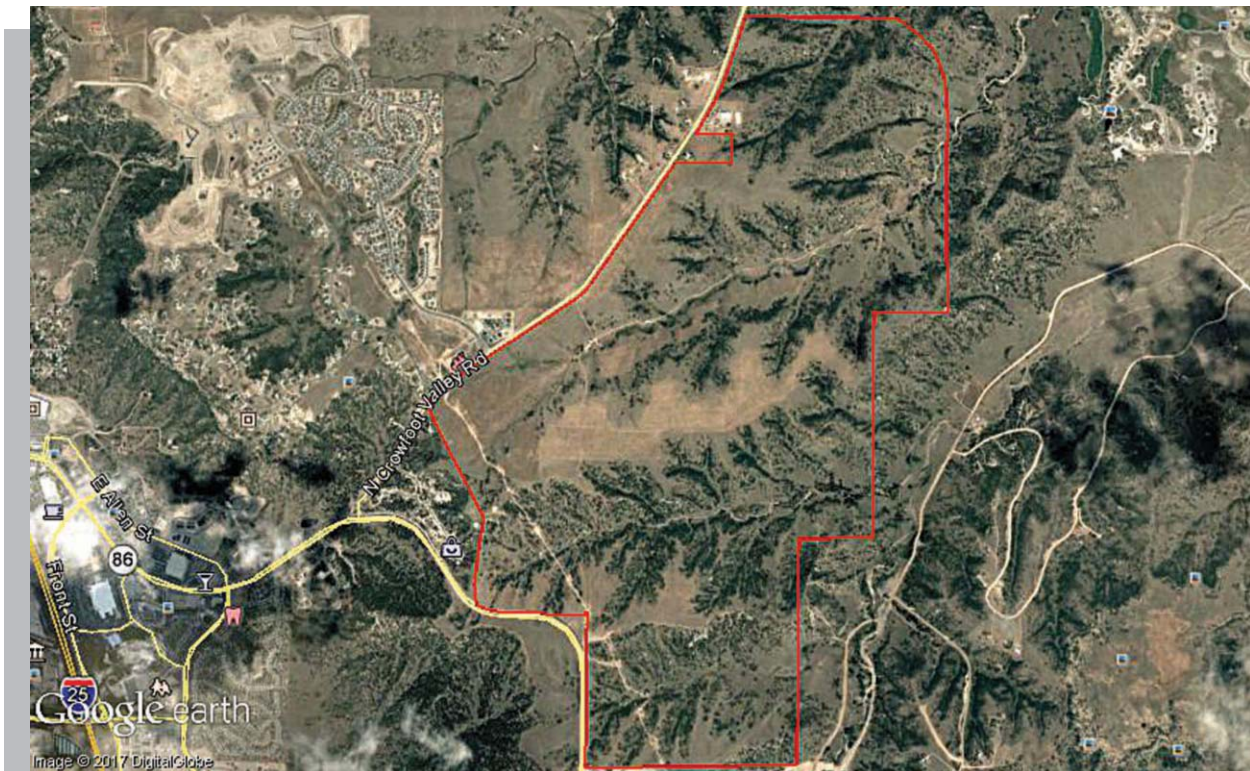


Photo 4 - 2005 imagery shows that the irrigation pond has been constructed on Scott Gulch and the Pradera Golf Course was developed.



Photo 5 - 1955 imagery showing a continuous channel along Drainage 1 at the location of the existing upland inclusion.

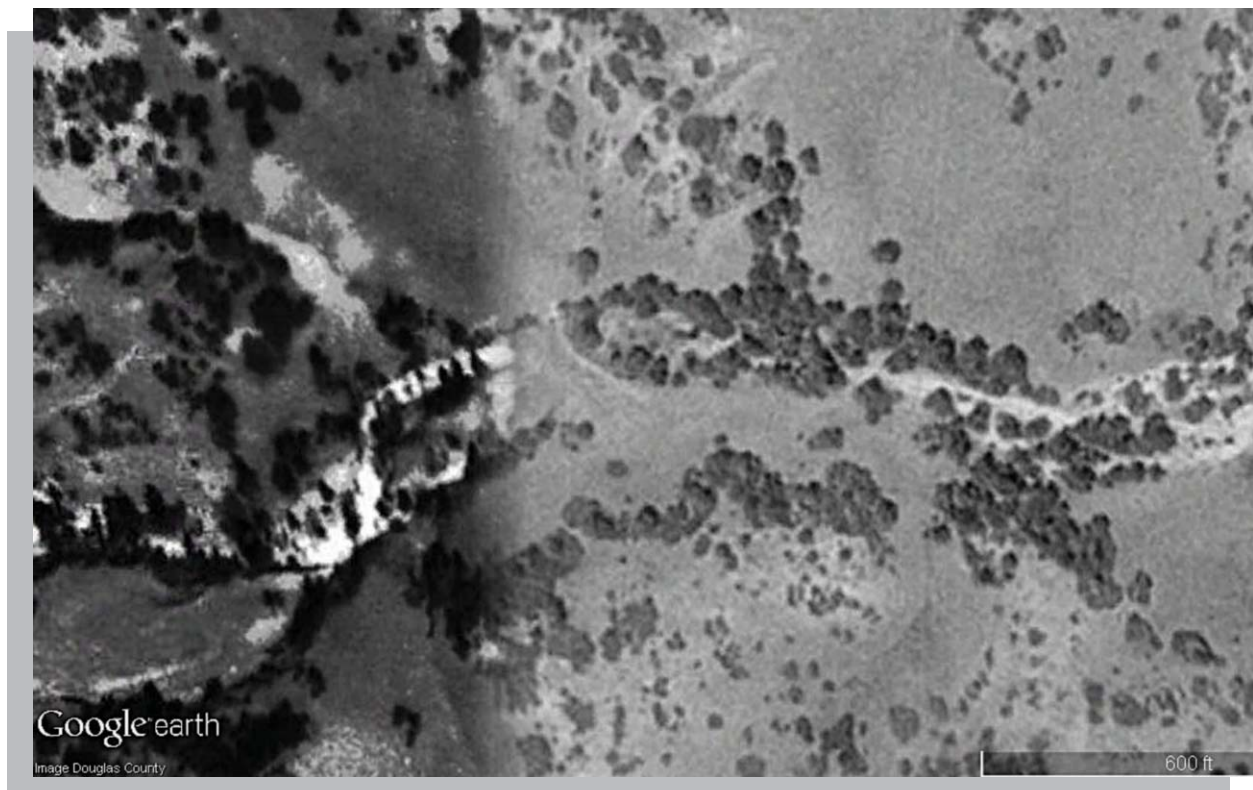


Photo 6 - 1993 imagery shows the upland inclusion on Drainage 1.



Photo 7 - 2017 imagery shows the current extent of the upland inclusion on Drainage 1.



Image 8 - 1937 imagery showing evidence of a drainage feature in the location of Drainage 3.



Image 9 - 1999 imagery showing Drainage 3 present in a similar location and condition as 1937.



Image 10 - 1993 imagery shows the construction of an irrigation pond and adjacent greens on the downstream end of Drainage 3.

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Canyons South Property City/County: Douglas Sampling Date: Dec 1 2017
 Applicant/Owner: Lowe Enterprises State: Co Sampling Point: DP-02
 Investigator(s): E. Crumb Section, Township, Range: Sec 17-20, 30, 31, Tnship 7S, Range 66W
 Landform (hillslope, terrace, etc.): swale/basin Local relief (concave, convex, none): none Slope (%): 0
 Subregion (LRR): G Lat: 39.419996°N Long: 104.819251°W Datum: NAD83
 Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
 Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
 Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐	Hydic Soil Present? Yes ☒ No ☐	Wetland Hydrology Present? Yes ☒ No ☐	Is the Sampled Area within a Wetland? Yes ☒ No ☐
Remarks: Wetland below overflow weir on Scott Gulch			

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
1. _____				
2. _____				
3. _____				
4. _____				
				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species <u> </u> x 1 = _____ FACW species <u> </u> x 2 = _____ FAC species <u> </u> x 3 = _____ FACU species <u> </u> x 4 = _____ UPL species <u> </u> x 5 = _____ Column Totals: <u> </u> (A) <u> </u> (B) Prevalence Index = B/A = _____
= Total Cover				
Sapling/Shrub Stratum (Plot size: _____)				Hydrophytic Vegetation Indicators: ☐ 1 - Rapid Test for Hydrophytic Vegetation ☒ 2 - Dominance Test is >50% ☐ 3 - Prevalence Index is ≤3.0 ¹ ☐ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ☐ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
1. <u>Salix exigua</u>	<u>25</u>	Y	FACW	
2. _____				
3. _____				
4. _____				
5. _____				
= Total Cover				
Herb Stratum (Plot size: <u>5X5</u>)				Hydrophytic Vegetation Present? Yes ☒ No ☐
1. <u>Carex nebrascensis</u>	<u>80</u>	Y	OBL	
2. _____				
3. _____				
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
= Total Cover				
Woody Vine Stratum (Plot size: _____)				
1. _____				
2. _____				
= Total Cover				
% Bare Ground in Herb Stratum <u>20</u>				
Remarks:				

SOIL

Sampling Point: Dp-02

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-4	10YR 3/1	100					Clayloam	
4-9	7.5YR 3/2	97	2.5YR4/6	3	C	PL/M	Sandloam ☒	faint redox

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.

²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- | | |
|--|---|
| ☐ Histosol (A1) | ☐ Sandy Gleyed Matrix (S4) |
| ☐ Histic Epipedon (A2) | ☐ Sandy Redox (S5) |
| ☐ Black Histic (A3) | ☐ Stripped Matrix (S6) |
| ☐ Hydrogen Sulfide (A4) | ☐ Loamy Mucky Mineral (F1) |
| ☐ Stratified Layers (A5) (LRR F) | ☐ Loamy Gleyed Matrix (F2) |
| ☐ 1 cm Muck (A9) (LRR F, G, H) | ☐ Depleted Matrix (F3) |
| ☐ Depleted Below Dark Surface (A11) | ☒ Redox Dark Surface (F6) |
| ☐ Thick Dark Surface (A12) | ☐ Depleted Dark Surface (F7) |
| ☐ Sandy Mucky Mineral (S1) | ☐ Redox Depressions (F8) |
| ☐ 2.5 cm Mucky Peat or Peat (S2) (LRR G, H) | ☐ High Plains Depressions (F16) |
| ☐ 5 cm Mucky Peat or Peat (S3) (LRR F) | (MLRA 72 & 73 of LRR H) |

Indicators for Problematic Hydric Soils³:

- ☐ 1 cm Muck (A9) (LRR I, J)
- ☐ Coast Prairie Redox (A16) (LRR F, G, H)
- ☐ Dark Surface (S7) (LRR G)
- ☐ High Plains Depressions (F16)
- (LRR H outside of MLRA 72 & 73)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☒ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- | | |
|--|--|
| ☐ Surface Water (A1) | ☐ Salt Crust (B11) |
| ☐ High Water Table (A2) | ☐ Aquatic Invertebrates (B13) |
| ☐ Saturation (A3) | ☐ Hydrogen Sulfide Odor (C1) |
| ☐ Water Marks (B1) | ☐ Dry-Season Water Table (C2) |
| ☐ Sediment Deposits (B2) | ☒ Oxidized Rhizospheres on Living Roots (C3) |
| ☐ Drift Deposits (B3) | (where not tilled) |
| ☐ Algal Mat or Crust (B4) | ☒ Presence of Reduced Iron (C4) |
| ☐ Iron Deposits (B5) | ☐ Thin Muck Surface (C7) |
| ☐ Inundation Visible on Aerial Imagery (B7) | ☐ Other (Explain in Remarks) |
| ☐ Water-Stained Leaves (B9) | |

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- (where tilled)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)
- ☐ Frost-Heave Hummocks (D7) (LRR F)

Field Observations:

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? Yes ☐ No ☐ Depth (inches): _____
(includes capillary fringe)

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Canyons South Property City/County: Douglas Sampling Date: Dec 1 2017
 Applicant/Owner: Lowe Enterprises State: Co Sampling Point: DP-03
 Investigator(s): E. Crumb Section, Township, Range: Sec 17-20, 30, 31, Tnship 7S, Range 66W
 Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 0
 Subregion (LRR): G Lat: 39.419996°N Long: 104.819251°W Datum: NAD83
 Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
 Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
 Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☐ No ☒	Is the Sampled Area within a Wetland? Yes ☐ No ☒
Hydric Soil Present? Yes ☐ No ☒	
Wetland Hydrology Present? Yes ☐ No ☒	
Remarks: Wetland below overflow weir on Scott Gulch	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>0</u> (A) Total Number of Dominant Species Across All Strata: <u>1</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>0</u> (A/B)																
1. _____																				
2. _____																				
3. _____																				
4. _____																				
				Prevalence Index worksheet: <table border="0"> <tr> <td>Total % Cover of:</td> <td>Multiply by:</td> </tr> <tr> <td>OBL species</td> <td>x 1 = _____</td> </tr> <tr> <td>FACW species</td> <td>x 2 = _____</td> </tr> <tr> <td>FAC species</td> <td>x 3 = _____</td> </tr> <tr> <td>FACU species</td> <td>x 4 = _____</td> </tr> <tr> <td>UPL species</td> <td>x 5 = _____</td> </tr> <tr> <td>Column Totals:</td> <td>(A) _____ (B) _____</td> </tr> <tr> <td colspan="2">Prevalence Index = B/A = _____</td> </tr> </table>	Total % Cover of:	Multiply by:	OBL species	x 1 = _____	FACW species	x 2 = _____	FAC species	x 3 = _____	FACU species	x 4 = _____	UPL species	x 5 = _____	Column Totals:	(A) _____ (B) _____	Prevalence Index = B/A = _____	
Total % Cover of:	Multiply by:																			
OBL species	x 1 = _____																			
FACW species	x 2 = _____																			
FAC species	x 3 = _____																			
FACU species	x 4 = _____																			
UPL species	x 5 = _____																			
Column Totals:	(A) _____ (B) _____																			
Prevalence Index = B/A = _____																				
= Total Cover																				
Sapling/Shrub Stratum (Plot size: _____) 1. _____ 2. _____ 3. _____ 4. _____ 5. _____ = Total Cover																				
Herb Stratum (Plot size: 5X5) 1. <u>Bromus tectorum</u> <u>60</u> Y <u>FACU</u> 2. <u>Herb unknown (dead)</u> 3. _____ 4. _____ 5. _____ 6. _____ 7. _____ 8. _____ 9. _____ 10. _____ = Total Cover																				
Woody Vine Stratum (Plot size: _____) 1. _____ 2. _____ = Total Cover																				
% Bare Ground in Herb Stratum <u>40</u>																				

Hydrophytic Vegetation Indicators:
☐ 1 - Rapid Test for Hydrophytic Vegetation
☐ 2 - Dominance Test is >50%
☐ 3 - Prevalence Index is ≤3.0¹
☐ 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☐ No ☒

Remarks:

SOIL

Sampling Point: Dp-03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-6	10YR 3/1	100					Clayloam	
6-12	7.5YR 4/3	100					sands/gr	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- | | |
|--|--|
| ☐ Histosol (A1) | ☐ Sandy Gleyed Matrix (S4) |
| ☐ Histic Epipedon (A2) | ☐ Sandy Redox (S5) |
| ☐ Black Histic (A3) | ☐ Stripped Matrix (S6) |
| ☐ Hydrogen Sulfide (A4) | ☐ Loamy Mucky Mineral (F1) |
| ☐ Stratified Layers (A5) (LRR F) | ☐ Loamy Gleyed Matrix (F2) |
| ☐ 1 cm Muck (A9) (LRR F, G, H) | ☐ Depleted Matrix (F3) |
| ☐ Depleted Below Dark Surface (A11) | ☐ Redox Dark Surface (F6) |
| ☐ Thick Dark Surface (A12) | ☐ Depleted Dark Surface (F7) |
| ☐ Sandy Mucky Mineral (S1) | ☐ Redox Depressions (F8) |
| ☐ 2.5 cm Mucky Peat or Peat (S2) (LRR G, H) | ☐ High Plains Depressions (F16) |
| ☐ 5 cm Mucky Peat or Peat (S3) (LRR F) | |

Indicators for Problematic Hydric Soils³:

- ☐ 1 cm Muck (A9) (LRR I, J)
- ☐ Coast Prairie Redox (A16) (LRR F, G, H)
- ☐ Dark Surface (S7) (LRR G)
- ☐ High Plains Depressions (F16)
- (LRR H outside of MLRA 72 & 73)**
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- | | |
|--|---|
| ☐ Surface Water (A1) | ☐ Salt Crust (B11) |
| ☐ High Water Table (A2) | ☐ Aquatic Invertebrates (B13) |
| ☐ Saturation (A3) | ☐ Hydrogen Sulfide Odor (C1) |
| ☐ Water Marks (B1) | ☐ Dry-Season Water Table (C2) |
| ☐ Sediment Deposits (B2) | ☐ Oxidized Rhizospheres on Living Roots (C3) |
| ☐ Drift Deposits (B3) | (where not tilled) |
| ☐ Algal Mat or Crust (B4) | ☐ Presence of Reduced Iron (C4) |
| ☐ Iron Deposits (B5) | ☐ Thin Muck Surface (C7) |
| ☐ Inundation Visible on Aerial Imagery (B7) | ☐ Other (Explain in Remarks) |
| ☐ Water-Stained Leaves (B9) | |

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- (where tilled)**
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)
- ☐ Frost-Heave Hummocks (D7) (LRR F)

Field Observations:

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? Yes ☐ No ☐ Depth (inches): _____
(includes capillary fringe)

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Canyons South Property City/County: Douglas Sampling Date: Dec 1 2017
 Applicant/Owner: Lowe Enterprises State: Co Sampling Point: DP-04
 Investigator(s): E. Crumb Section, Township, Range: Sec 17-20, 30, 31, Tnship 7S, Range 66W
 Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 0
 Subregion (LRR): G Lat: 39.419996°N Long: 104.819251°W Datum: NAD83
 Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
 Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
 Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☐ No ☒	Is the Sampled Area within a Wetland? Yes ☐ No ☒
Hydric Soil Present? Yes ☐ No ☒	
Wetland Hydrology Present? Yes ☐ No ☒	
Remarks: upland swale/remnant channel	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>0</u> (A) Total Number of Dominant Species Across All Strata: <u>1</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>0</u> (A/B)
1. _____				
2. _____				
3. _____				
4. _____				
		= Total Cover		Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species <u> </u> x 1 = _____ FACW species <u> </u> x 2 = _____ FAC species <u> </u> x 3 = _____ FACU species <u> </u> x 4 = _____ UPL species <u> </u> x 5 = _____ Column Totals: <u> </u> (A) _____ (B) Prevalence Index = B/A = _____
		= Total Cover		
Sapling/Shrub Stratum (Plot size: _____)				
1. _____				
2. _____				
3. _____				
4. _____				
5. _____				
		= Total Cover		
Herb Stratum (Plot size: <u>5X5</u>)				
1. <u>Bromus inermis</u>	<u>35</u>	<u>Y</u>	<u>FACU</u>	
2. <u>Elymus trachycalus</u>	<u>5</u>		<u>FACU</u>	
3. <u>Thlaspi arvense</u>	<u>4</u>		<u>FACU</u>	
4. <u>Elymus canadensis</u>	<u>10</u>		<u>FACU</u>	
5. _____				
6. _____				
7. _____				
8. _____				
9. _____				
10. _____				
		= Total Cover		
Woody Vine Stratum (Plot size: _____)				
1. _____				
2. _____				
		= Total Cover		
% Bare Ground in Herb Stratum <u>46</u>				
Hydrophytic Vegetation Indicators: ☐ 1 - Rapid Test for Hydrophytic Vegetation ☐ 2 - Dominance Test is >50% ☐ 3 - Prevalence Index is ≤3.0 ¹ ☐ 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) ☐ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.				
Hydrophytic Vegetation Present? Yes ☐ No ☒				

Remarks:

SOIL

Sampling Point: Dp-04

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

[illegible]

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.

²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- | | | | |
|--------------------------|--|--------------------------|------------------------------------|
| ☐ | Histosol (A1) | ☐ | Sandy Gleyed Matrix (S4) |
| ☐ | Histic Epipedon (A2) | ☐ | Sandy Redox (S5) |
| ☐ | Black Histic (A3) | ☐ | Stripped Matrix (S6) |
| ☐ | Hydrogen Sulfide (A4) | ☐ | Loamy Mucky Mineral (F1) |
| ☐ | Stratified Layers (A5) (LRR F) | ☐ | Loamy Gleyed Matrix (F2) |
| ☐ | 1 cm Muck (A9) (LRR F, G, H) | ☐ | Depleted Matrix (F3) |
| ☐ | Depleted Below Dark Surface (A11) | ☐ | Redox Dark Surface (F6) |
| ☐ | Thick Dark Surface (A12) | ☐ | Depleted Dark Surface (F7) |
| ☐ | Sandy Mucky Mineral (S1) | ☐ | Redox Depressions (F8) |
| ☐ | 2.5 cm Mucky Peat or Peat (S2) (LRR G, H) | ☐ | High Plains Depressions (F16) |
| ☐ | 5 cm Mucky Peat or Peat (S3) (LRR F) | | (MLRA 72 & 73 of LRR H) |

Indicators for Problematic Hydric Soils³:

- ☐ 1 cm Muck (A9) (**LRR I, J**)
- ☐ Coast Prairie Redox (A16) (**LRR F, G, H**)
- ☐ Dark Surface (S7) (**LRR G**)
- ☐ High Plains Depressions (F16)
(**LRR H outside of MLRA 72 & 73**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- | | |
|--|---|
| ☐ Surface Water (A1) | ☐ Salt Crust (B11) |
| ☐ High Water Table (A2) | ☐ Aquatic Invertebrates (B13) |
| ☐ Saturation (A3) | ☐ Hydrogen Sulfide Odor (C1) |
| ☐ Water Marks (B1) | ☐ Dry-Season Water Table (C2) |
| ☐ Sediment Deposits (B2) | ☐ Oxidized Rhizospheres on Living Roots (C3) |
| ☐ Drift Deposits (B3) | (where not tilled) |
| ☐ Algal Mat or Crust (B4) | ☐ Presence of Reduced Iron (C4) |
| ☐ Iron Deposits (B5) | ☐ Thin Muck Surface (C7) |
| ☐ Inundation Visible on Aerial Imagery (B7) | ☐ Other (Explain in Remarks) |
| ☐ Water-Stained Leaves (B9) | |

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
(where tilled)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)
- ☐ Frost-Heave Hummocks (D7) (LRR F)

Field Observations:

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____

Water Table Present? Yes ☐ No ☐ Depth (inches): _____

Saturation Present? Yes ☐ No ☐ Depth (inches): _____
(includes capillary fringe)

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Great Plains Region

Project/Site: Canyons South Property City/County: Douglas Sampling Date: Dec 1 2017
 Applicant/Owner: Lowe Enterprises State: Co Sampling Point: DP-01
 Investigator(s): E. Crumb Section, Township, Range: Sec 17-20, 30, 31, Tnship 7S, Range 66W
 Landform (hillslope, terrace, etc.): Channel Local relief (concave, convex, none): none Slope (%): 0
 Subregion (LRR): G Lat: 39.419996°N Long: 104.819251°W Datum: NAD83
 Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)
 Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
 Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐ No ☒	Is the Sampled Area within a Wetland?	Yes ☐ No ☒
Hydric Soil Present?	Yes ☐ No ☒		
Wetland Hydrology Present?	Yes ☐ No ☒		
Remarks: Channel bed			

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC (excluding FAC-): <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>50</u> (A/B)
1. _____		_____	_____	
2. _____		_____	_____	
3. _____		_____	_____	
4. _____		_____	_____	
= Total Cover				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species x 1 = _____ FACW species x 2 = _____ FAC species x 3 = _____ FACU species x 4 = _____ UPL species x 5 = _____ Column Totals: (A) (B) Prevalence Index = B/A = _____
Sapling/Shrub Stratum (Plot size: _____) 1. _____ 2. _____ 3. _____ 4. _____ 5. _____ = Total Cover				
Herb Stratum (Plot size: 5X5) 1. <u>Agrostis gigantea</u> <u>35</u> Y FACW 2. <u>Festuca pratensis</u> <u>25</u> Y FACU 3. <u>Elymus canadensis</u> <u>5</u> FACU 4. _____ 5. _____ 6. _____ 7. _____ 8. _____ 9. _____ 10. _____ = Total Cover				
Woody Vine Stratum (Plot size: _____) 1. _____ 2. _____ = Total Cover				
% Bare Ground in Herb Stratum <u>35</u>				

Hydrophytic Vegetation Indicators:
☐ 1 - Rapid Test for Hydrophytic Vegetation
☐ 2 - Dominance Test is >50%
☐ 3 - Prevalence Index is ≤3.0¹
☐ 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☐ No ☒

Remarks:

SOIL

Sampling Point: Dp-01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features			Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹		
0-4	10YR 6/2	98	2.5YR 4/8	2	C	PL	Sand relic redox
4-14	2.4YR 4/2	100				Clay/Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- | | |
|--|--|
| ☐ Histosol (A1) | ☐ Sandy Gleyed Matrix (S4) |
| ☐ Histic Epipedon (A2) | ☐ Sandy Redox (S5) |
| ☐ Black Histic (A3) | ☐ Stripped Matrix (S6) |
| ☐ Hydrogen Sulfide (A4) | ☐ Loamy Mucky Mineral (F1) |
| ☐ Stratified Layers (A5) (LRR F) | ☐ Loamy Gleyed Matrix (F2) |
| ☐ 1 cm Muck (A9) (LRR F, G, H) | ☐ Depleted Matrix (F3) |
| ☐ Depleted Below Dark Surface (A11) | ☐ Redox Dark Surface (F6) |
| ☐ Thick Dark Surface (A12) | ☐ Depleted Dark Surface (F7) |
| ☐ Sandy Mucky Mineral (S1) | ☐ Redox Depressions (F8) |
| ☐ 2.5 cm Mucky Peat or Peat (S2) (LRR G, H) | ☐ High Plains Depressions (F16) |
| ☐ 5 cm Mucky Peat or Peat (S3) (LRR F) | (MLRA 72 & 73 of LRR H) |

Indicators for Problematic Hydric Soils³:

- ☐ 1 cm Muck (A9) (LRR I, J)
- ☐ Coast Prairie Redox (A16) (LRR F, G, H)
- ☐ Dark Surface (S7) (LRR G)
- ☐ High Plains Depressions (F16)
- (LRR H outside of MLRA 72 & 73)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____
Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- | | |
|--|---|
| ☐ Surface Water (A1) | ☐ Salt Crust (B11) |
| ☐ High Water Table (A2) | ☐ Aquatic Invertebrates (B13) |
| ☐ Saturation (A3) | ☐ Hydrogen Sulfide Odor (C1) |
| ☐ Water Marks (B1) | ☐ Dry-Season Water Table (C2) |
| ☐ Sediment Deposits (B2) | ☐ Oxidized Rhizospheres on Living Roots (C3) |
| ☐ Drift Deposits (B3) | (where not tilled) |
| ☐ Algal Mat or Crust (B4) | ☐ Presence of Reduced Iron (C4) |
| ☐ Iron Deposits (B5) | ☐ Thin Muck Surface (C7) |
| ☐ Inundation Visible on Aerial Imagery (B7) | ☐ Other (Explain in Remarks) |
| ☐ Water-Stained Leaves (B9) | |

Secondary Indicators (minimum of two required)

- ☒ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Oxidized Rhizospheres on Living Roots (C3)
- (where tilled)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ FAC-Neutral Test (D5)
- ☐ Frost-Heave Hummocks (D7) (LRR F)

Field Observations:

Surface Water Present? Yes ☐ No ☐ Depth (inches): _____
Water Table Present? Yes ☐ No ☐ Depth (inches): _____
Saturation Present? Yes ☐ No ☐ Depth (inches): _____
(includes capillary fringe)

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:



DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
DENVER REGULATORY OFFICE, 9307 SOUTH WADSWORTH BOULEVARD
LITTLETON, COLORADO 80128-6901

April 28, 2021

SUBJECT: Approved Jurisdictional Determination – Corps File No. NWO-2021-00560-DEN, Canyons South Property Parcel, Douglas County, Colorado

Erik Clore
Lowe Enterprises
5299 DTC Blvd., Ste 1260
Greenwood Village, CO 80111

Dear Mr. Clore:

This letter is in reference to the property located at approximate latitude 39.402243, longitude -104.823604, in Douglas County, Colorado. The submittal dated February 24, 2021 and received March 23, 2021, consists of a request for an Approved Jurisdictional Determination for the above project site. The delineated area located on the subject property has been reviewed in accordance with Section 404 of the Clean Water Act (Section 404) under which the U.S. Army Corps of Engineers regulates the discharge of dredged and fill material, and any excavation activity associated with a dredge and fill project in waters of the United States.

At your request, an Approved Jurisdictional Determination (JD) has been prepared for the approximate 340-acre review area. Based on the April 5, 2021 site visit and a review of available information, we have determined that the review area contains an ephemeral stream and in-channel wetlands. The ephemeral stream and its in-channel wetlands are excluded waters or features. Therefore, the review area does not contain waters of the United States. The discharge of fill material onto this project site does not require a Department of the Army permit under Section 404.

The JD is attached to this letter. If you are not in agreement with the JD decision, you may request an administrative appeal under regulation 33 CFR 331, by using the attached Appeal Form and Administrative Appeal Process form. The request for appeal must be received within 60 days from the date of this letter. It is not necessary to submit a Request for Appeal if you do not object to the JD.

This JD is valid for a period of five years from the date of this letter, unless new information warrants revisions of the JDs before the expiration date, or unless the Corps has identified, after a possible public notice and comment, that specific geographic areas with rapidly changing environmental conditions merit re-verification on a more frequent basis.

If there are any questions please feel free to contact Celena Cui at (303) 979-4120 or by e-mail at Celena.H.Cui@usace.army.mil, and reference **Corps File No. NWO-2021-00560-DEN**.

Sincerely,

A handwritten signature in black ink, appearing to read 'K. Downing', with a stylized flourish at the end.

Kiel Downing
Chief, Denver Regulatory Office

Enclosure(s)

cc: Justin Apfel, Great Ecology



**U.S. ARMY CORPS OF ENGINEERS
REGULATORY PROGRAM
APPROVED JURISDICTIONAL DETERMINATION FORM (INTERIM)
NAVIGABLE WATERS PROTECTION RULE**

I. ADMINISTRATIVE INFORMATION

Completion Date of Approved Jurisdictional Determination (AJD): 4/28/2021

ORM Number: Omaha District, Denver Regulatory Office, NWO-2021-00560-DEN, Canyon South

Associated JDs: N/A

Review Area Location¹: State/Territory: Colorado City: Castle Rock County/Parish/Borough: Douglas County

Center Coordinates of Review Area: Latitude 39.402489 Longitude -104.822882

II. FINDINGS

A. Summary: Check all that apply. At least one box from the following list MUST be selected. Complete the corresponding sections/tables and summarize data sources.

- ☐ The review area is comprised entirely of dry land (i.e., there are no waters or water features, including wetlands, of any kind in the entire review area). Rationale: N/A or describe rationale.
- ☐ There are "navigable waters of the United States" within Rivers and Harbors Act jurisdiction within the review area (complete table in Section II.B).
- ☐ There are "waters of the United States" within Clean Water Act jurisdiction within the review area (complete appropriate tables in Section II.C).
- ☒ There are waters or water features excluded from Clean Water Act jurisdiction within the review area (complete table in Section II.D).

B. Rivers and Harbors Act of 1899 Section 10 (§ 10)²

§ 10 Name	§ 10 Size	§ 10 Criteria	Rationale for § 10 Determination
N/A.	N/A.	N/A.	N/A.

C. Clean Water Act Section 404

Territorial Seas and Traditional Navigable Waters ((a)(1) waters): ³				
(a)(1) Name	(a)(1) Size	(a)(1) Criteria	Rationale for (a)(1) Determination	
N/A.	N/A.	N/A.	N/A.	

Tributaries ((a)(2) waters):				
(a)(2) Name	(a)(2) Size	(a)(2) Criteria	Rationale for (a)(2) Determination	
N/A.	N/A.	N/A.	N/A.	

Lakes and ponds, and impoundments of jurisdictional waters ((a)(3) waters):				
(a)(3) Name	(a)(3) Size	(a)(3) Criteria	Rationale for (a)(3) Determination	
N/A.	N/A.	N/A.	N/A.	

Adjacent wetlands ((a)(4) waters):				
(a)(4) Name	(a)(4) Size	(a)(4) Criteria	Rationale for (a)(4) Determination	
N/A.	N/A.	N/A.	N/A.	

¹ Map(s)/figure(s) are attached to the AJD provided to the requestor.

² If the navigable water is not subject to the ebb and flow of the tide or included on the District's list of Rivers and Harbors Act Section 10 navigable waters list, do NOT use this document to make the determination. The District must continue to follow the procedure outlined in 33 CFR part 329.14 to make a Rivers and Harbors Act Section 10 navigability determination.

³ A stand-alone TNW determination is completed independently of a request for an AJD. A stand-alone TNW determination is conducted for a specific segment of river or stream or other type of waterbody, such as a lake, where upstream or downstream limits or lake borders are established. A stand-alone TNW determination should be completed following applicable guidance and should NOT be documented on the AJD Form.



**U.S. ARMY CORPS OF ENGINEERS
REGULATORY PROGRAM
APPROVED JURISDICTIONAL DETERMINATION FORM (INTERIM)
NAVIGABLE WATERS PROTECTION RULE**

D. Excluded Waters or Features

Excluded waters ((b)(1) – (b)(12)): ⁴				
Exclusion Name	Exclusion Size		Exclusion ⁵	Rationale for Exclusion Determination
Ephemeral Stream	Approx. 5,000	linear feet	(b)(3) Ephemeral feature, including an ephemeral stream, swale, gully, rill, or pool.	The stream has a discontinuous ordinary high water mark and is best characterized as an ephemeral stream within the project reach. During the site visit, the stream contained areas with pooling water or no water. No water was observed at the Castle Oaks Drive culvert.
Channel Wetlands	N/A.	N/A.	(b)(1) Non-adjacent wetland.	The wetlands are located within the channel bottom of the ephemeral stream. Therefore, the wetlands are not adjacent to a tributary that has perennial or intermittent flow. In addition, the wetlands are separated from McMurdo Gulch by an upland swale.

III. SUPPORTING INFORMATION

A. Select/enter all resources that were used to aid in this determination and attach data/maps to this document and/or references/citations in the administrative record, as appropriate.

☒ Information submitted by, or on behalf of, the applicant/consultant: [April 2021 Delineation and Data Sheet](#)

This information [is](#) sufficient for purposes of this AJD.

Rationale: [N/A](#)

☐ Data sheets prepared by the Corps: [Title\(s\) and/or date\(s\)](#).

☒ Photographs: [Aerial: Google Earth Image, 6 October 2019](#)

☒ Corps site visit(s) conducted on: [4/5/2021](#)

☐ Previous Jurisdictional Determinations (AJDs or PJDs): [ORM Number\(s\) and date\(s\)](#).

☒ Antecedent Precipitation Tool: [provide detailed discussion in Section III.B.](#)

☐ USDA NRCS Soil Survey: [Title\(s\) and/or date\(s\)](#).

☐ USFWS NWI maps: [Title\(s\) and/or date\(s\)](#).

☒ USGS topographic maps: [1965 Castle Rock North, 1: 24,000](#)

Other data sources used to aid in this determination:

Data Source (select)	Name and/or date and other relevant information
USGS Sources	N/A.
USDA Sources	N/A.
NOAA Sources	N/A.
USACE Sources	N/A.
State/Local/Tribal Sources	N/A.
Other Sources	N/A.

⁴ Some excluded waters, such as (b)(2) and (b)(4), may not be specifically identified on the AJD form unless a requestor specifically asks a Corps district to do so. Corps districts may, in case-by-case instances, choose to identify some or all of these waters within the review area.

⁵ Because of the broad nature of the (b)(1) exclusion and in an effort to collect data on specific types of waters that would be covered by the (b)(1) exclusion, four sub-categories of (b)(1) exclusions were administratively created for the purposes of the AJD Form. These four sub-categories are not new exclusions, but are simply administrative distinctions and remain (b)(1) exclusions as defined by the NWPR.



**U.S. ARMY CORPS OF ENGINEERS
REGULATORY PROGRAM
APPROVED JURISDICTIONAL DETERMINATION FORM (INTERIM)
NAVIGABLE WATERS PROTECTION RULE**

- B. Typical year assessment(s):** Site visit was performed during the wet season with the three months prior indicating normal conditions.
- C. Additional comments to support AJD:** N/A or provide additional discussion as appropriate.