



AGENDA
CITY OF GLENWOOD SPRINGS
Planning and Zoning Commission
Regular Meeting
DECEMBER 12, 2023
Council Chambers, First Floor
101 W. 8TH STREET
6:00 PM

1 Attendance Instructions

- A. This meeting is being held in person as well as via ZOOM.

Please click the link below to join the webinar:

<https://us02web.zoom.us/j/83388525249?pwd=WTa0YVY2WERGc1NocIRiVXRpMIINZz09>

Passcode: 177366

Or Telephone Dial:

+1 719 359 4580 US

+1 253 215 8782 US (Tacoma)

+1 346 248 7799 US (Houston)

Webinar ID: 833 8852 5249

2 Roll Call

3 Conflicts of Interest

4 Receipt of the Minutes

- A. November 14, 2023 Planning and Zoning Commission Draft Minutes

- B. September 26, 2023 Planning and Zoning Commission Draft Minutes

5 Comments from citizens appearing for items not on the agenda

6 New Items

- A. Planning File #63-23, The Benedict Major Site/Architectural Plan

- B. Planning File #45-23, Matters of State Interest 1041 Permit Application, and Location and Extent, Xcel Energy Mitchel Creek Line Rebuild

- C. Planning File #68-23 Code Amendments to Title 070 related to Storm-water Development Standards and Fee In-Lieu.

7 Commissioner Comments

8 Director Comments

9 Adjournment

MINUTES
CITY OF GLENWOOD SPRINGS
Planning and Zoning Commission

Regular Meeting
November 14, 2023
Council Chambers, First Floor
101 W. 8TH STREET 6:00 PM

1. Roll Call

Present: Commissioners: Amy Connerton, Matthew Simms, Carolyn Cipperly, George Shaver, Pete Waller, April Davey, Gregory Cowan

Also Present: Community Development Director Hannah Klausman, Planner II Emery Ellingson, Building Permit Technician, Melinda Benis

Actions: Commissioner Shaver made a motion to seat Alternate Commissioner Gregory Cowan, motion seconded by Commissioner Connerton. Voice vote taken; motion passed unanimously.

2. Conflicts of Interest

None

3. Receipt of Minutes

September 26, 2023 Planning and Zoning Commission regular meeting minutes.

Commissioner Connerton made motion to accept minutes with minor corrections to spelling and grammar. Motion seconded by Commissioner Waller. Changes to the minutes included:

- Need to correct meeting date.
- Need to add Commissioner Cipperly's recusal for Planning File 46-23 Garage Variance for 1019 Bennett on item number 2 on page 1.
- Need to remove Commissioner Cowan from attendance list.
- Need to correct notes for Engineering update on Cowdin improvements.
- Question on unanimous approval counts for planning items.

Commissioner Connerton amended the original motion to have staff revise draft minutes prepared for review at next regularly scheduled Planning & Zoning Commission minutes, seconded by Commissioner Waller. Voice vote taken, passed unanimously.

October 3, 2023 Planning and Zoning Commission special meeting minutes

Commissioner Waller made a motion to approve the minutes, seconded by Commissioner Connerton. Voice vote taken, passed unanimously.

October 24, 2023 Planning and Zoning Commission regular meeting minutes

Commissioner Waller made a motion to approve minutes, seconded by Commissioner Shaver with suggested correction on page 1 to indicate Commissioner Cipperly's recusal from Planning File 46-23,

adding page numbers to minutes, and pair staff responses to commissioner questions. Voice vote taken, passed unanimously.

4. Comments from citizens for items not appearing on the agenda

No public comment was offered.

5. New Items

Planning File 49-23, Sign Variance 402 7th Street

Planner II Emery Ellingson presented Planning File #49-23 requesting the following two variances:

- **Action Item 1:** Exceed maximum number of wall, projecting, or roof signs for a single tenant in a multitenant building for the 7th Street frontage.
- **Action Item 2:** Exceed maximum amount of wall, projecting, or roof sign area for the 7th Street frontage.

Staff recommend denial of both variances with findings and conditions in the staff report.

Applicant provided Commission with an updated rendering showing existing and proposed frontages with signage. Commissioner questions included the following:

- **Clarification on number of signs allowed per tenant in a multi-tenant building.** Staff confirmed the walls, projecting, and roof signs were limited to one sign per use. Staff also explained the Code does allow for one secondary sign per building and provided additional explanation how the existing and proposed signs are counted per Code.
- **Clarification on total amount of wall signage allowed per frontage:** Staff explained signage allowance based on 2 square feet per linear foot of frontage and provided additional explanation how the existing sign area and proposed sign areas are counted per Code.
- **Question on when new code was approved:** Staff confirmed the new Development Code was adopted in 2018.
- **Questions on existing projecting signs for Mona Lisa and the Brewpub, suspended signs, and window signage:** Staff explained differences between projected and suspended signs as well as provided further information on restrictions on window signage.
- **Question on how the individual signs were counted, including further clarification on how the corner signs were counted:** Staff explained total count of signs and that the corner signs, because physically separated would count towards different frontages, with projecting hotel sign area split between the 7th Street and Cooper Avenue frontages.
- **Confirmation that existing 7th Street signage would be reduced with proposed signs.** Staff confirmed proposed signage would reduce the amount of 7th Street total signage.
- **Question about existing projecting sign for Mona Lisa, formerly 7th Street Salon:** Staff confirmed there would still be a projecting sign for that use.

- **Question if there were future proposals for new businesses on Cooper Avenue frontage:** Staff explained if there would be a new business on Cooper, that new business would be allowed 1 wall/roof/projecting sign.
- **Questions on color and design of signs:** Staff deferred to applicant to explain more about sign color and design and confirmed that proposed color was not subject to variance.
- **Questions on illumination:** Staff explained that the proposed illuminated signs would be illuminated with neon, which is the only type of interior illuminated sign allowed in the Downtown Core.

Applicant Greg Post, Roaring Fork Sign and Lighting provided the Commission with a short presentation detailing the variance request and the signage proposed.

- **Questions on variance criteria:** Applicant provided additional information on the seven variance criteria from the applicant perspective, including further description of location and functionality of the proposed signage. Applicant also discussed limitations of one sign per tenant in a multi-tenant building.
- **Questions on window signage and if applicant had considered window signage:** Applicant Tony Sherman, owner of building, explained that proposed changes to entrance to include sliding glass doors and would not include opportunities for window signage.
- **Questions on existing signage above entrance doors:** Applicant explained existing signage above entrance doors on 7th Street were an acrylic sign.

Commissioner Connerton made motion to approve Action Item 1 with findings and conditions as described:

- Subject property having exceptional shape, citing size of building.
- Strict application would be an undue hardship as rebranding is common for businesses.
- Applicant did not create the hardship as they did not create original signage areas.
- Does not harm the public.
- Could be considered a hardship as denying variance would limit wayfinding opportunities.
- Variance would not violate Building or Fire Code
- Variance would be minimum variance as total sign area would be decreased.

Commissioner Simms seconded the motion. Commissioner discussion included the following:

- If signage could be done slightly differently to be closer to Code limit of one wall/projecting/roof sign, such as only one sign on Cooper and one on 7th.
- Questions if window signage could be incorporated in some way.
- Discussion of appropriate scale for a sign for the hotel in context of Downtown and wayfinding needs.
- Effect of removing corner "Hotel sign". Staff confirmed variance would still be required for number of signs.
- If signs would need to be turned off at night. Staff confirmed that would only be required if the sign was within 300' of a residential zoning district.

- If applicant would be willing to continue and redesign. Applicant explained they could potentially be open to a redesign. Staff explained Commission could add conditions to the motion.

Commissioner Shaver called the item to question. Motion passed 6-1 with Commissioners Connerton, Simms, Shaver, Waller, Davey, and Cowan in favor and with Commissioner Cipperly opposed.

Commissioner Connerton made motion to approve Action Item 2 with findings as described for Action Item 1. Commissioner Cowan seconded the motion. Commissioner Shaver called the item to question. Motion passed unanimously 7-0.

6. Commissioner Comments

Commissioner Connerton wished everyone a Happy Thanksgiving.

7. Director Comments

Community Development Director Hannah Klausman provided the Commission with a summary of upcoming items for the December 12th meeting, including a 1041 application and a Major Site and Architectural Plan application. The Commission expressed interest in doing a site visit the day of the meeting for the Major Site and Architectural Plan application.

8. Adjournment

Meeting adjourned at 7:15 PM.



MINUTES
CITY OF GLENWOOD SPRINGS
Planning and Zoning Commission
Regular Meeting
September 26, 2023
Council Chambers, First Floor
101 W. 8TH STREET 6:00 PM

1) Roll Call

Present: Commissioners: Amy Connerton, Carolyn Cipperly, Peter Waller, Chair George Shaver, Joy White, and John Houghton.

Also Present: Director of Community and Economic Development Hannah Klausman (Online), Assistant City Attorney Richard Peterson-Cremer, Long Range Principal Planner Jim Hardcastle, Planner II Emery Ellingson, and City Engineer Ryan Gordon.

Chair Shaver asked for a motion to seat alternate Commissioner Houghton, Commissioner Cipperly motioned to seat him, and Commissioner Waller seconded the motion. Motion passed unanimously.

2) Conflicts of interest: Commissioner Cipperly recused herself from Planning File 46-23 Variance for a Garage Setback at 1019 Bennett Avenue as she received a public notice.

3) Receipt of the Draft Minutes for July 27, 2023:

- a. Commissioner Waller made a motion to receive the minutes, second by Commissioner White.
- b. July 27, 2023: Correction #1 concerning the Child Care Code Amendments, the correct church in question should be clarified as the Episcopal church. Correction #2 regarding receiving minutes from previous meeting, the vote was incorrectly recorded as 5-2 with 2 Abstaining and should state 5-0 with 2 abstaining.
- c. Motion passed 5-0 with Commissioner Connerton abstaining

4) Comments from citizens appearing for items not on the agenda:

No Comments were made.

5) New Items

- a. **Traffic and Circulation Review 8th Street and Cowdin Drive Update**

City Engineer Ryan Gordon PE provided the Commission with a presentation on traffic and circulation updates for possible traffic improvements and safety in the vicinity of 8th Street & Midland Avenue.

Safety: Police records indicate there have been 3 vehicle accidents in the last 4-5 years, only one including a pedestrian.

Traffic and intersection size: Updated traffic report in the Glenwood Meadows looked at movement in this area with future buildout with BLD, Habitat 4 Humanity at Cowdin Drive and 8th Street, and 480 Donegan Road. Traffic counts in October 2022 to establish a baseline and CDOT projections for growth for 2030 and 2040 horizons, totaling 16 intersections including 8th Street and Midland Avenue, a level A service, in the green horizon for said projections. Kimley Horn and Associates did the initial report, as verified by SGM and the City Engineer. Recommendations from this report include minor upgrades: to extend the left turn lane from Midland Avenue onto 8th Street, currently 125ft to be lengthened to 300ft, though road widening would need to occur. The intersection is properly sized with signalizations, though a roundabout could be created but challenges are associated with this, but this is too early to discuss in the near growth horizon.

Improvements: Items to be adjusted include managing the stop bar at Cowdin Drive well behind 8th Street, realigning the curb and gutter into the roadway, allowing better line of sight, and managing an ailing elm which impedes turn movements. Changes being considered include addressing signage on Cowdin Drive to keep the ingress/egress open from the bridge work, a controlled crossing to be addressed by a pedestrian initiated signaled cross light, or a rapid flash beacon, possibly a raised ped crosswalk, and/or an intertwined crossing signalization to be coordinated with the existing signal light at 8th Street and Midland Avenue to avoid vehicular stacking which would impede crossing traffic.

Conversations with Transportation Commission and project considerations include.

- A 10' wide path from Community Center which transitions to a 6' sidewalk at Midland Avenue to just past Overlin Drive which is not sized for bicycles which creates deficiencies within citywide bicycle network.
- The intersection of Overlin Drive and Midland Avenue require some consideration with safety concerns which might be addressed with an Overlin Drive one-way-in, a realigning of a right-angle intersection to make ingress and egress safer, and parking impacts need to be addressed with private apartments affected.
- Midland Avenue would need widening for the recommended left Midland Avenue turn lane onto 8th Street.
- 8th Street acceleration slip-lane, acceleration lane, to merge heading north on Midland Avenue built to CDOT standards needs to be looked at.
- Bike and pedestrian connectivity are a jumble and mess of concrete and conflicting signage that can be misunderstood by all users at 7th & 8th Streets.

- The improvements at the public parking lot on 7th Street for the old wastewater plant will address striping, sidewalks, security in the parking lot, bike lanes, lighting, and fencing all to improve circulation and facilitate consistent and friendly movement into downtown from Glenwood Meadows Shopping Center, the Red Mountain and Cowdin neighborhoods, and back-and-forth.

Commissioner questions with staff responses and comments included the following:

- These improvements will occur at 8th Street and Cowdin Drive? **Staff response:** Yes, the improvements will eventually occur at 8th and Cowdin.
- Can these conceptual diagrams be added to the record for this meeting? **Staff response:** These conceptual diagrams can be added to the record for this meeting. See Figures 1 & 2 below.

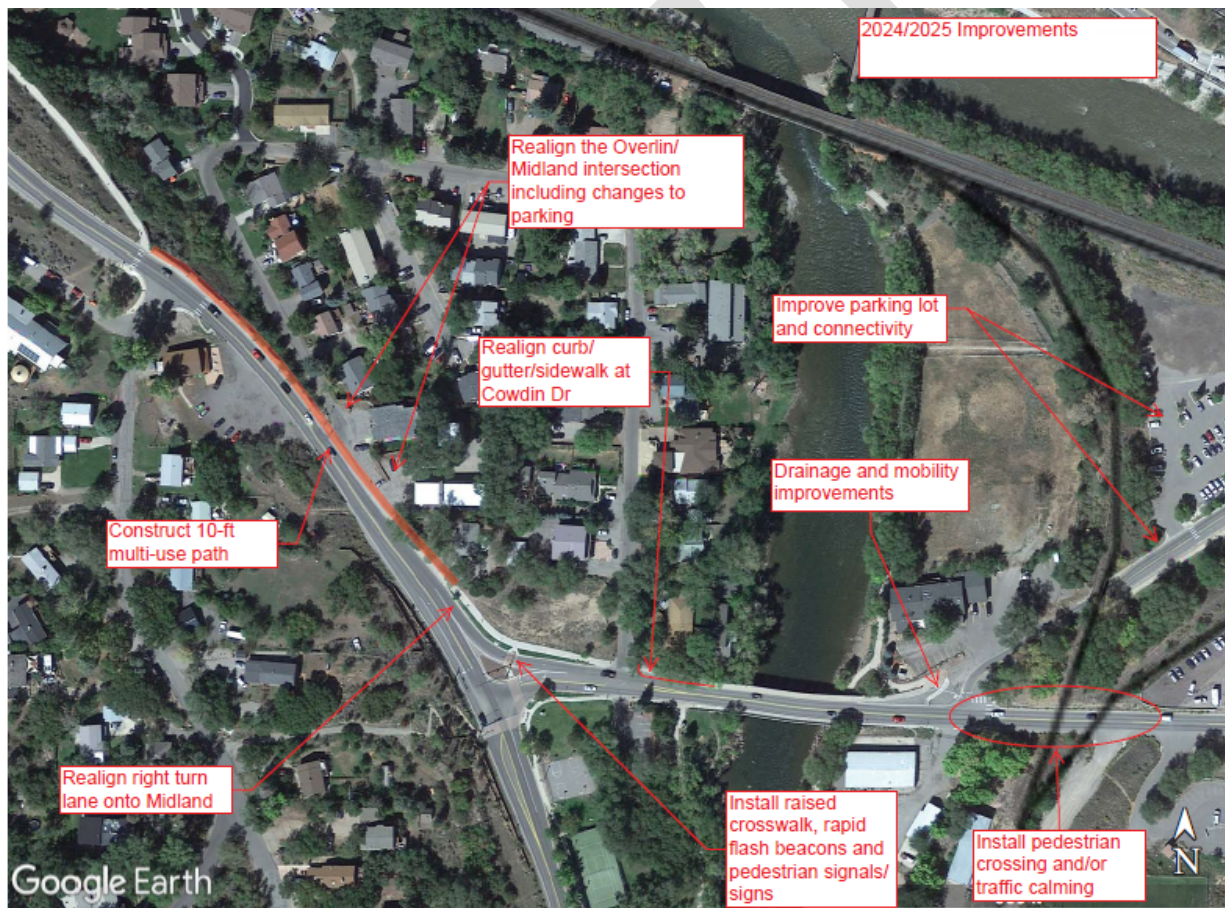


Figure 1: Diagram from presentations on Traffic and Circulation Review 8th and Cowdin Street Update

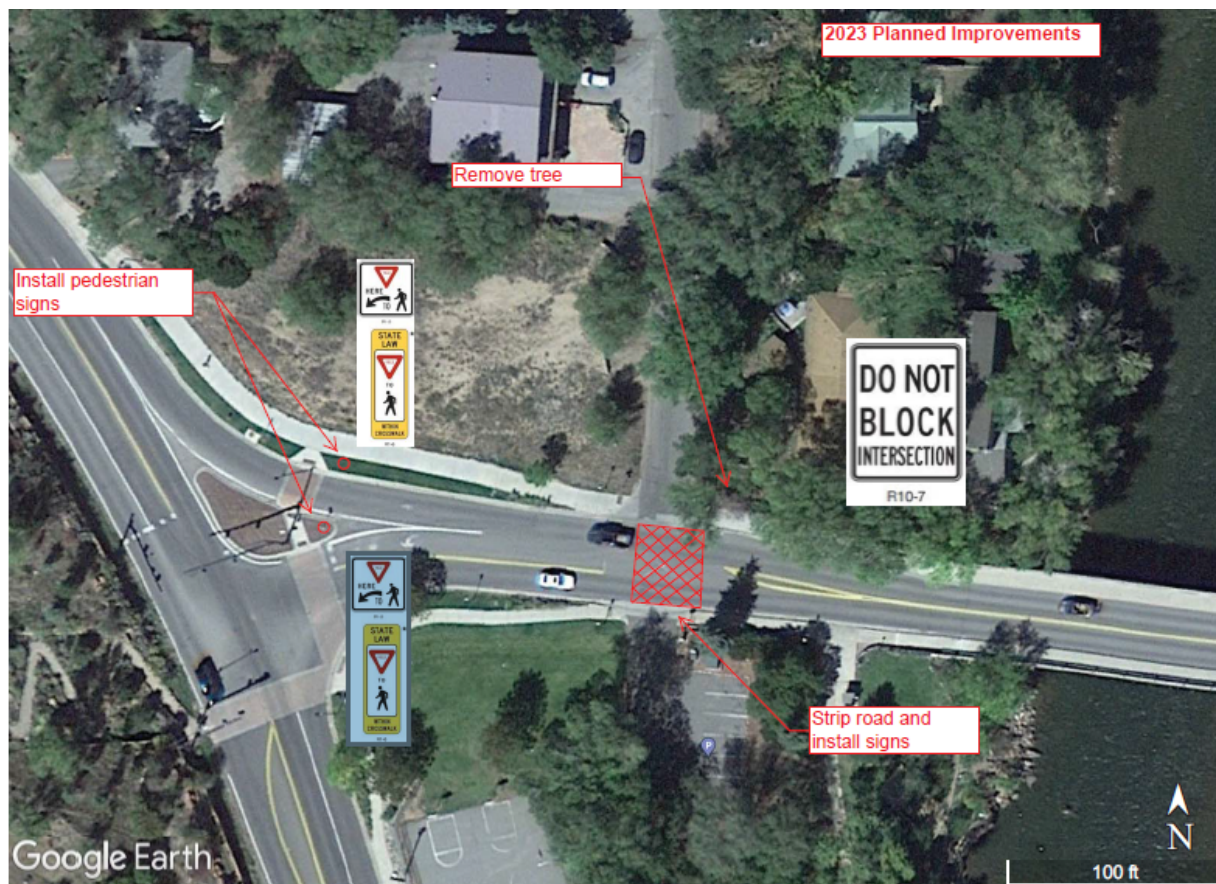


Figure 2: Diagram from presentations on Traffic and Circulation Review 8th and Cowdin Street Update

- There is concern voiced at previous meetings between pedestrian/vehicular movements at the corner of Cowdin Drive and 8th Street compounded by the elm tree you spoke of. Can this tree be removed? There is a shed too that is of concern. **Staff response:** A site visit with the City Forester Heather Listerman will occur in the next week to determine what can be done concerning the elm and other features.
- What budget conversations and considerations have been addressed for these improvements you have discussed tonight? **Staff response:** Budget 2024 calendar year fees are allocated for design of the shared use path and parking lot. 2025 on the west side of the 8th Street bridge, deteriorating concrete apron is in the Public Works' budget to replace sidewalk. 2024 budget money within Safe Streets for All program could be used to address the striping at the crosswalk with pushbuttons.
- Can you please identify the elements of improvement that are associated with this specific development versus additional items to be addressed by the City? **Staff response:** the Habitat 4 Humanity project and the previous approval only included a review of traffic impacts for the intersection and that has been completed. City projects of concern in the area that exist currently are not the responsibility of the developer and any work going forward is separate from that approval. Striping work can be addressed sooner than later.

- Would a roundabout here address any of the safety concerns at 8th and Cowdin? **Staff response:** Roundabouts won't help at all with pedestrian safety, their design is meant to keep traffic moving. The best option for those on foot is better signaling at an intersection. Significant engineering can be done to make this happen here, but the grade and existing retaining wall make the possibility problematic.
- Would a 10' path require greater setbacks for the Habitat 4 Humanity development? **Staff response:** The 10' path would not necessarily require greater setbacks for the Habitat 4 Humanity development.
- Are there traffic calming efforts that could be made at the 7th Street and 8th Street intersection that would trickle down and benefit the 8th and Cowdin intersection. **Staff response:** There are elements of improvements regarding the intended City improvements that would positively benefit the 8th Street and Cowdin Drive intersection and we will keep you apprised.

Public comment included:

- None was intended to be taken as this was an informational presentation.

b. Planning File #76-20 Dimension Variances for 703 & 709 9th Street

Long Range Principal Planner Jim Hardcastle presented planning file #76-20. An application for the Consideration of four (4) dimensional variances from Municipal Code section 070.020.060(b) to establish two residential lots below the required area minimum of 5,000 (sq ft); establish front lot setbacks below the required distance minimum of 20', and on one lot: establish a side lot setback below the required distance minimum of 5'; and establish a rear lot setback below the required distance minimum of 10'.

Commissioner questions with staff responses and comments included the following:

- A variety of locations and types of adjacent uses and existing conditions on site were requested. **Staff response:** Clarifications were given to these requests.
- If approved how do variances requested are approved how would these non-conforming uses exist in the future, and what would happen if they were not approved? **Staff response:** The approval of the variance pertaining to Action Item #1 relates to lot area minimum square foot size and if approved are retained with the lot in perpetuity. The other 3 Actions Items numbers 2-4 relate to setback encroachments which apply specifically to the area of non-conformity of existing buildings and are dissolved should buildings be removed. If they are then rebuilt current standard zoning setbacks would be observed. If these variances are not approved, the lot would remain as is with challenges in ability to sell the lots.
- Can the lots be combined as one parcel to avoid the variances? **Staff response:** No, as no more than one single family dwelling unit is allowed to exist on a single lot.

No public comment was offered.

Commissioner Cipperly made motion to approve Action item #1 to allow applicant to establish a front lot setback below the required distance minimum of 20' on existing residential lots at 703 & 707 9th Street, as limited by Section 070.020.060(b) Table 020.8: Minimum Setbacks, Front (from other streets) (ft) 20. seconded by Commissioner Connerton. Motion unanimously approved 6-0.

Commissioner Cipperly made motion to approve Action item #2 with to allow applicant to allow applicant to establish a front lot setback below the required distance minimum of 20' on existing residential lots at 703 & 707 9th Street, as limited by Section 070.020.060(b) Table 020.8: Minimum Setbacks, Front (from other streets) (ft) 20', regard to existing residential structures, seconded by Commissioner White. Motion unanimously approved 6-0.

Commissioner Cipperly made motion to approve Action item #3, to allow applicant to establish a side lot setback below the required distance minimum of 5' on an existing residential lot at 707 9th Street, as limited by Section 070.020.060(b) Table 020.8: Minimum Setbacks, Side (ft) 5', with regard to existing residential structures, seconded by Commissioner Connerton. Motion unanimously approved 6-0.

Commissioner Cipperly made motion to approve Action Item #4, to allow applicant to establish a rear lot setback below the required distance minimum of 10' on an existing residential lot at 707 9th Street, as limited by Section 070.020.060(b) Table 020.8: Minimum Setbacks, Rear (ft) 10', with regard to existing residential structures, seconded by Commissioner Connerton. Motion unanimously approved 6-0.

c. Planning File 46-23 Variance for a Garage Setback 1019 Bennett Avenue

Commissioner Cipperly recused from the item, leaving five Commissioners to discuss the item.

Planner II Emery Ellingson presented Planning File #46-23 requesting a variance to construct a garage in the rear setback of property at 1019 Bennett Avenue and to exceed required rear yard coverage.

Commissioner questions with staff responses and comments included the following:

- If the attached garage were subject to requirements of required rear yard coverage or if that only applied to accessory structures. **Staff response:** Staff stated that Commissioner Houghton may be correct in assessment that an attached garage structure would not be considered accessory and therefore not subject to required rear yard coverage requirement.
- Questions about purpose of required rear yard coverage. **Staff response:** Staff explained required rear yard coverage was a way to limit accessory structures within the rear yard setback since some situations allow for their location in the rear setback.

- If the property would still have enough parking for the existing use as a duplex. **Staff response:** Staff explained the existing rear parking area was functionally limited to one space so addition of garage would not reduce or increase available parking even though turn radius of the alley would limit a two car garage to one space.
- If there were other accessory structures in the rear setback on this lot. **Staff response:** Staff confirmed there was an existing shed on property.
- Questions about setting precedence with approval. **Staff response:** Staff explained a previous variance on Bennett Avenue had been approved for a garage within rear setback. Staff also explained that the purpose of the variance process was to assess each application with its individual context.
- If any existing structures in the alley had been damaged. **Staff response:** Staff could not confirm whether any particular structures in this alley had recently been damaged.

No public comment was offered.

Commissioner White made a motion to continue the item to the next regularly scheduled meeting, seconded by Commissioner Connerton. Motion unanimously approved 5-0 as Commissioner Cipperly had recused herself for this item.

d. Request to continue to next regular meeting. Planning File 49-23, Sign Variance 402 7th Street

Commissioner Waller made a motion to continue the item to the next regularly scheduled meeting, seconded by Commissioner Connerton. Motion unanimously approved 6-0 as Commissioner Cipperly had returned for this item.

e. CONTINUED TO OCTOBER 3, 2023, Special Meeting. Code Amendment to Title 070 regarding density bonus and zoning use standards

6) Commissioner Comments

Commissioner questions, comments, and staff responses included the following:

- Commissioners discussed two areas of pedestrian safety concern at Donegan Road and 8th Street & Midland Avenue as there has been a fatality on Donegan concerning a motorcycle, how can we bring this forward for evaluation. There is a button on the City website labeled “Report a Concern” that might be helpful for things like this. In the past P&Z has talked about getting reports from other committees, but maybe this is more of a work session function. **Staff response:** Staff can bring it to the attention of the City Engineer.
- Public information would be helpful concerning the closures, work, and trail access in and around the Meadows, the Jeanne Golay Trail, and Red Mountain subdivision. **Staff response:** Staff will contact Matt Langhorst and Bryana Starbuck to get updates and make information more readily available to the public.

- The survey regarding upzoning and density bonuses that was presented to the public was well done.

7) Director Comments

Community Development Director Hannah Klausman shared the following:

- A special P&Z meeting will be held on October 3, 2023, the packet will have two items and survey results regarding code amendments concerning upzoning and density bonuses, a variance, and multiple applications at the next regularly scheduled meeting.

8) Adjournment

Meeting adjourned at 8:40pm.

DRAFT



Planning and Zoning Commission Report

Date: December 12, 2023
To: Planning and Zoning Commission
From: Watkins Fulk-Gray, AICP, Senior Planner
Subject: Planning File #63-23 – Major Site/Architectural Plan for
“The Benedict” at 2800 Midland Ave.

REQUEST	Consideration of a Major Site/Architectural Plan for a 34-unit multifamily building
APPLICANT	Kyle Mead, Shopworks Architecture
OWNER	Justin Raddatz, Catholic Charities Housing
LOCATION	2800 Midland Ave. (PIN 218521151002)
ZONE	RE (Resort)
SURROUNDING LAND USES	North: Residential South: Convalescent home East: Residential West: Residential
LOT SIZE	23,880 square feet (0.548 acres), based on provided survey

ACTION ITEM

Per Section 070.060.050 of the *Glenwood Springs Municipal Code* (the “Code”), the Planning and Zoning Commission (Commission) is a recommending body for Major Site/Architectural Plans. Final approval is in the purview of City Council.

Action 1 – Major Site Plan & Architectural Plan – consideration of a Major Site & Architectural Plan for development of a 34-unit multifamily residential building.

Staff recommendation: *Staff recommends **approval** of the Major Site/Architectural Plan for development of a 34-unit multifamily residential building with findings and conditions at the end of this staff report.*

BACKGROUND

Project Summary

The Benedict is an affordable senior housing project proposed by a partnership spearheaded by Catholic Charities Housing, which is an arm of the Catholic Archdiocese of Denver. Catholic Charities Housing owns and operates about 2,000 affordable homes in Colorado. The proposed project is located on an approximately half-acre lot on the 27th St. roundabout at the corner of Midland Ave. and 27th St. The Benedict proposal includes 34 one-bedroom apartments affordable for people

aged 55 or older who make between 30% and 80% area median income (AMI), which equates to monthly rent of approximately \$558 to \$1,489.

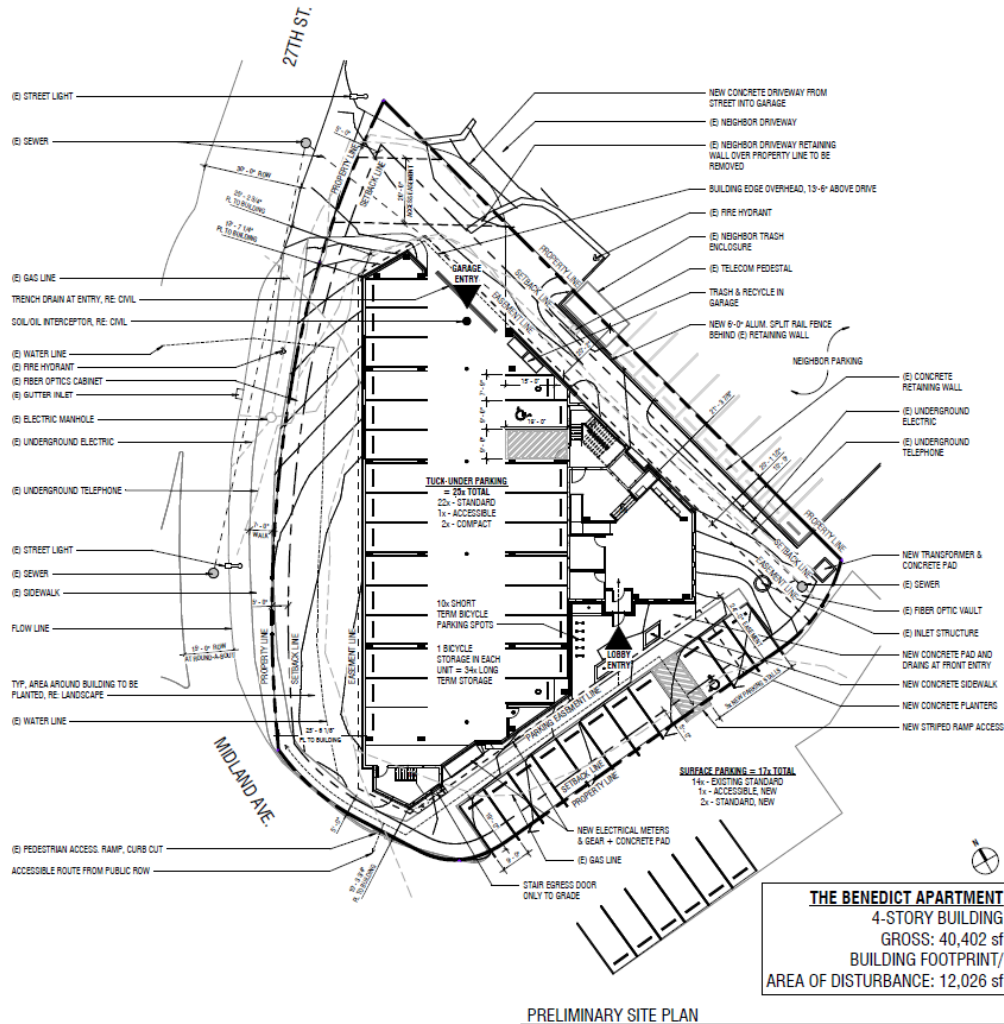
Location and Background

An approximately 0.55-acre lot, the site has an irregular shape that arcs with the roundabout and the curve of 27th St., resulting in a long street frontage. The lot was created in 2015 by plat. The existing and proposed access to the site is via 27th St. in a 20-foot access easement shared with the Racquet Club condos to the east. In addition to the access easement, there are numerous utility easements on the lot.

The site location, which is Lot 2 of the Stoney River Minor Subdivision, sits in the middle of several high-density residential uses. To the south is Roaring Fork Senior Living, an assisted living and memory care center classified in the zoning code as a “convalescent home” (a type of residential use) that was approved in 2013. To the west across the roundabout are The Terraces condominium buildings. Cottonwood Landing townhomes lie to the north on Woodberry Drive, accessed from 27th St. Finally, the three buildings of the Racquet Club condominiums are immediately to the east of The Benedict’s site.

The nearest transit stop, excluding an unused Ride Glenwood stop nearby on Midland, is the 27th St. Bus Rapid Transit (BRT) station. The 27th St. station provides the highest level of service available from the Roaring Fork Transit Authority (RFTA), and an underpass linking the west side of Highway 82 to the station is scheduled for completion in October 2024. It is about a quarter-mile from the project site.

A fee waiver for The Benedict’s system improvement fees was approved by City Council in July of 2023, based on conceptual plans for a 34-unit affordable senior living development. A parking reduction was administratively approved in January 2023, and is contingent upon the development being compliant with the conceptual plans submitted with the parking reduction request. This parking reduction will be discussed later in this report.



Above: The project site plan.

PROJECT ANALYSIS

The application is a Major Site/Architectural Plan Application for a 34-unit multifamily residential development. The following section provides further details on the compliance of the proposed project with Code standards.

CODE STANDARD		PROPOSED	REQUIREMENT MET
Lot Standards	N/A, no minimum per RE Zone District	N/A	N/A
Lot Coverage	N/A	44.8%	N/A
Open Space	20% of parcel; 4,776 sf (based on survey provided)	13,186 sf	YES
Landscape	10% of parcel; 2,388 sf (based on survey provided)	27.4%; 6,584 sf	YES

Parking Area Landscaping			
Surface Area Landscape	10% of total parking area not part of structured parking (325 sf required)	406	YES
Interior Landscape	10 sf per parking space not part of structured parking; (170 sf required)	406	YES
Setback			
Front	5' minimum, 60' maximum	13'7.25"	YES
Rear	10'	20'1.5"	YES
Side	5'	10'3.75"	YES
Height	60 ft.	57'2.25"	YES
Parking	1.5 per unit + 1 guest space per 5 units; 58 required; HOWEVER: parking reduction issued requiring 42 spaces	42	YES
Sidewalk	8-foot width	8 feet	YES
Bike Parking	6 spaces	44	YES
Trash Enclosure	Required to be enclosed	Enclosed	YES
Architectural Elements	Four sided, 5 elements	5+	YES
Storage	1 cubic ft per 3 square feet floor area per unit (4,700 cubic feet required total)	Not provided; applicant to provide and Staff to verify at Final Plans	UNDETERMINED
Affordable Housing	7 deed restricted for resident occupancy and affordability	34	YES

Incentives for Residential Developments (Section 070.45.080)

This analysis will show that not all aspects of the development code are met with this project as proposed. Section 070.045.080 of the land use code offers incentives for new developments that provide affordable residential units, including site design flexibility. Section 070.045.080 states that site flexibility includes, but is not limited to, minimum lot size, building height, lot coverage, impervious coverage, setbacks, and landscaping. Parking is not allowed as one of the flexible applications. This project is therefore eligible for a flexible application of some of the code's standards. These are the areas in which the project does not meet the strict standards of the code:

1. Planting strip requirements
 - a. Width of planting strip: tapers from 0 feet to the required five feet
 - b. Street trees: none included in landscaping plan
2. Building orientation
3. Height transitions on east side of proposed building

All of the above items are eligible to be approved under the flexible application approach permitted by 070.45.080 and can be approved by City Council. Staff recommends utilizing this approach for

the above items except street trees.

These items will be discussed in more detail in subsequent sections.

Site Layout and Building Design (Section 070.040.080)

Section 070.040.080 Residential Site and Building design provides standards for multi-family developments related to building orientation, architectural elements, height, and façade articulation. This proposed project meets the requirements such as four-sided design, building height, and material, but does not meet other design standards.

Building Materials

The primary materials are brick and cement board in a reverse board-n-batten pattern and lap siding. These are approved primary materials. Other materials include wood trim, cementitious trim, metal accents, and asphalt shingles. The cement board siding is proposed to be painted off-white and gray.

Building Color

Code requires that the predominant exterior colors on a multi-family building be earth tones to minimize visual impact, with darker accent colors to be utilized on garage door surfaces. White and other highly reflective colors are prohibited, except on accent materials. While the applicant proposes off-white colors for portions of the exterior, Staff believes that the proposed colors have the potential to appear brighter and more reflective in the sunshine than what is intended to be allowed by Section 070.040.080(e)(6) of the Code. Staff has recommended conditions of approval to modify the exterior building colors to be more earth toned.

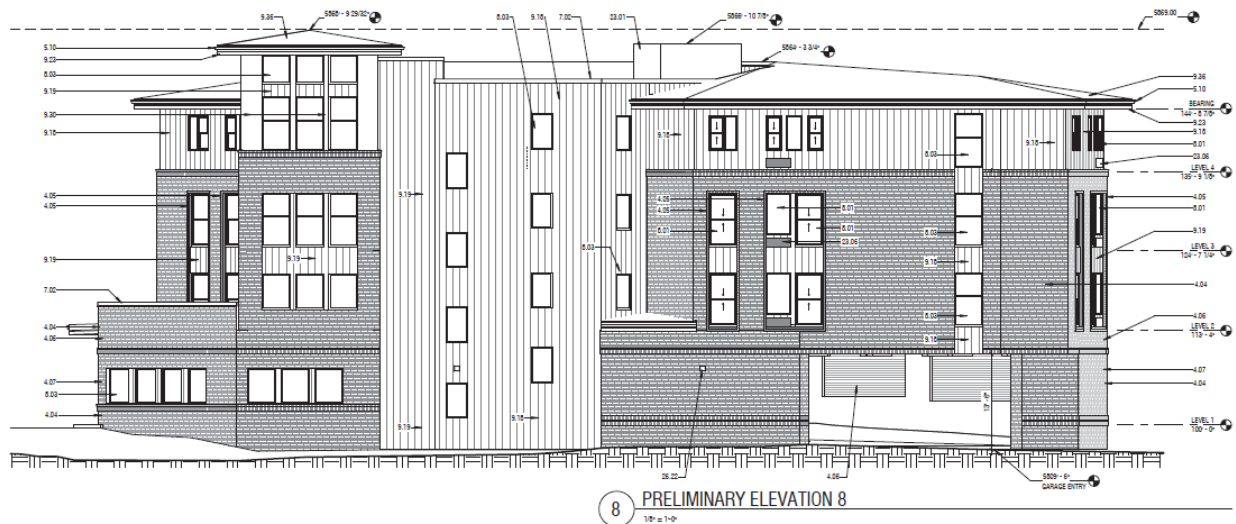
Building Orientation

Code requires that all multi-family buildings shall have an entrance oriented toward the street, and, to the maximum extent feasible, the primary entrance and façade of individual buildings shall be oriented toward either the street or common open space areas. The proposed design does not have entrances either for individual units or the primary building entrance along the street frontage (27th Street).

One of the goals of the building orientation standards is to promote a pedestrian-friendly environment. The requirement that entrances be oriented to the street can serve to form connections between the public and private sphere and to make the streetscape more inviting to pedestrians. However, the presence of structured parking, which is a feature the City encourages, does not make ground-level unit entrances possible. While this code standard is not being met, the applicants have stated that they are amenable to modifications to the plans such as changes to brick patterns and colors and modifications to the louver openings along 27th St. to make the streetscape more attractive. Staff leaves to the discretion of P&Z and City Council the option of a specific condition of approval requiring changes to the building's 27th St. streetscape such as brick and louver modifications. For the issue of building orientation and entrances on the street, Staff recommends a flexible application of the strict code standard, as permitted by Section 070.45.080.



Above: The elevation drawings for the building along 27th St.



Above: Building elevations as viewed from the east.

Lot Coverage

Residential zone districts are subject to lot coverage requirements. This project is not considered “infill residential,” as defined in the code, because the RE zone district is a mixed-use rather than a residential district (though residential uses are allowed). Therefore, the maximum lot coverage requirements for “infill residential” do not apply.

Massing and Form

Section 070.040.080(e)(8)(c) contains design standards for projects on block faces that contain 75% or more single-family homes. This section does not apply to The Benedict because there are no single-family homes in the block faces that the project is a part of.

Height Transitions

The maximum proposed height of The Benedict is 57’2.25.” According to plans for Roaring Fork Senior Living, its maximum height is in the mid-50-foot range. (The specific height cannot be determined by the plans due to a difference in how maximum height was measured at the time the

project was approved). The Terraces are four stories, the fourth story being part of the sloping roofline, but because the base elevation is considerably above The Benedict's, it appears significantly taller than the other nearby developments. Cottonwood Landing is three stories with a partial fourth story accommodated through a pitched roof. The Racquet Club condominiums are four stories, with two stories built below the grade of the front parking lot using the sloping grade of the riverbank, and the topmost story accommodated by a mansard roof. Having been built into the riverbank slope, the Racquet Club condos' maximum height will be significantly lower than The Benedict's, which is compounded by the approximately six feet of grade difference between the two lots.

Section 070.040.080(e)(8)(b) of the Municipal Code requires that new buildings which exceed the height of adjacent dwellings by one or more stories use three of the four mitigation techniques listed in code to make the proposed building more compatible with neighboring residential development.

Adjacent dwellings to the south:

The heights of the buildings at Roaring Fork Senior Living is comparable to that proposed by The Benedict. Staff finds that the standards in 070.040.080(e)(8)(b) do not apply to the buildings to the south because their maximum height is close to that of the proposed building.



Above: The view from the project site to the south.

Adjacent dwellings to the east:

While the condominiums to the east have the same number of stories as most of the proposed building, The Benedict will be substantially taller due to the grade difference between the two lots and the fact that the Racquet Club condominiums are built onto the riverbank. Staff finds that the following mitigation techniques have been incorporated into the proposed design:

1. 070.040.080(e)(8)(b)(3), *Utilizing a roof pitch and overhang similar to that of the neighboring structures.* The proposed building has overhangs similar to those of the Racquet Club condos. It also has a similar roof pitch as the flatter part of the mansard roofs of those condos.
2. 070.040.080(e)(8)(b)(4), *Utilizing dormers and sloping roofs to accommodate upper stories.* The proposal uses sloping roofs to accommodate the upper (fourth) story.

As the proposed design does not include three techniques from 070.040.080(e)(8)(b), it does not meet the code standard for height transitions on the site's east side. Staff proposes applying flexibility to this code standard as allowed by 070.045.090.



Above: The view to the east from the project site.

Adjacent dwellings to the north:

Because 27th St. separates The Benedict site from Cottonwood Landing to the north, Cottonwood

Landing is not considered “adjacent.” Therefore, the standards of 070.040.080(e)(8)(b) do not apply.



Above: Cottonwood Landing townhomes to the north.

Adjacent dwellings to the west:

The Terraces condominiums to the west are separated from the site by Midland Ave. and the roundabout, making them also not adjacent to The Benedict. Section 070.040.080(e)(8)(b) does not apply.



Above: The Terraces to the west.

Storage

Multifamily dwellings must provide at least one cubic foot of enclosed storage space per three square feet of gross floor area per unit. No information about storage has been provided by the applicant, but they indicate that the project can meet this requirement. A condition of approval has been suggested requiring the applicant to submit this information at Final Plan Review.

Common Open Space

Code requires 20% of the site be common open space. Based on the survey provided by the applicant, the required amount of common open space is 4,776 square feet. Setbacks, landscaped areas, and the proposed second level terrace can be considered part of common open space, but interior parking lot landscaping areas cannot. The areas proposed as common open space are not delineated on the plans, but the applicant plans to incorporate a much greater amount of common open space than what is required. A condition of approval has been included ensuring that the Final Plans Review delineates the common open space so that Staff can determine that what is proposed as common open space can be counted as such.

Landscaping

For a property zoned RE, the Code requires that 10% of the parcel be landscaped. The total amount of required landscaped area for this lot is 2,388 square feet, based on the lot area shown in the

applicant's survey. The proposed development will have 6,584 square feet of landscaping, which meets the requirement. Requirements for planting by type is found in the table below.

Plant Material	Code Requirement	Required	Provided	Meets Req.
Trees	1 per 400 sf req. landscaped area (2,388 sf)	6	4	YES – Via shrub substitution
Shrubs	1 per 100 sf req. landscaped area (2,388 sf)	24	191	YES
Perennials	1 per 50 sf req. landscaped area (2,388 sf)	48	112	YES
Street trees	One tree per 75 feet of street frontage	3	0	NO
Native and drought-resistant species	Native and drought tolerant species must account for 75% of plantings	231, based on total of 307 plantings	131; 43%	NO

Based on required landscaped area of 2,388 sf

As the table above shows, the planting program does not include a sufficient proportion of plantings that are native and drought-resistant species. A condition of approval has been included to address this shortcoming.

Planting Strip

Typically, a planting strip at least five feet in width providing separation between street and sidewalk is required with new development. There is currently a planting strip in place along 27th St. that tapers from zero to the required five feet. Because the planting strip is not a uniform five-foot minimum in width, it technically does not meet Code requirements. Staff recommends the flexible application of Code standards be applied to this requirement, per the incentives available in Section 070.045.080, Incentives for Residential Development.

As the table above shows, no street trees are included in the landscaping plan, while three are required. The applicant has indicated that this shortcoming is due to the presence of water, sewer, and other utility infrastructure under the surface. The City's Public Works Department does have policies for proper spacing between utility lines and plants with large root systems. However, there are discrepancies on the plans that make it difficult to verify if there is no place to put street trees. Staff has recommended a condition of approval asking the applicant to provide more information to either demonstrate that there is no way to provide street trees or to revise the landscaping plan to include them. Street trees are important because of the shade they provide pedestrians, their role in reducing the urban heat island effect, and their visual contribution to the streetscape.

Parking Lot Landscaping

For parking lots with fewer than 20 spaces, the Code requires that 10% of the total parking area be designated for landscaping, including 10 square feet of interior parking landscaping per parking space. The total parking area is approximately 3,250 square feet, requiring 325 square feet of

parking area landscaping (including 170 square feet of interior parking area landscaping). These landscaping areas will be included in the terminus islands and areas immediately adjacent to the 17 off-street parking spaces. Structured parking, such as what is proposed on the bottom level of the building, is exempt from parking area landscaping requirements.

The Municipal Code also requires screening for parking areas within side or rear setback areas adjacent to a residential use, which the twelve off-street parking spaces are. Staff has included a recommended condition of approval to use one of the five approved screening methods on the two ends of the row of off-street parking.

Off-Street Parking and Loading

The code standard for off-street parking in multifamily developments is 1.5 spaces per multifamily units, plus one guest parking space per five multifamily units. The number of off-street parking spaces required is therefore 58. However, the project in January of 2023 applied for and received an administrative parking reduction of 29%, or 17 spaces, through a combination of parking reduction measures including providing structured parking, providing bicycle parking beyond the code requirement, and providing free transit passes to residents. While not an approved parking reduction method, the findings for the parking reduction also noted that a study from the Institute of Traffic Engineers suggests that there is a reduced trip generation for senior housing developments compared to other types of housing.

The Benedict proposes 42 off-street parking spaces, including 25 in structured parking, 11 surface parking spaces on the south end of the lot, and six surface parking spaces on a neighboring property, which is permitted through a 2015 parking and access easement. The total of 42 off-street parking spaces is equal to what was proposed in the January 2023 parking reduction application. The programmed parking therefore meets Code requirements.

Access and Circulation

The primary access to the site is proposed as the existing shared driveway that also serves the Racquet Club condominiums from 27th St. A 1990 access agreement grants access through The Benedict lot for the condos. Currently, traffic can enter the driveway from either direction on 27th St. and can exit onto 27th St. going either right or left. However, the City's Engineering Department recommends two changes to create better and safer traffic conditions after the completion of this project.

First, Engineering recommends a "right-in, right-out" modification to 27th St. enforced with a "wishbone" at the access point to The Benedict and the Racquet Club condos. A "wishbone" is a curb-like structure in the median of the street that physically prevents a left turn out of The Benedict and the condominiums. To go left from here, vehicles would need to use the eastern roundabout at 27th St. and S. Grand Ave., where they can then reverse back over the river and continue west on 27th. This modification is necessary to avoid conflicting left turns from The Benedict's and Cottonwood Landing's offset access points and generally for safe traffic movement on 27th St.

Secondly, Engineering also recommends the project be modified to include a new vehicular circulation method with a paved cross access between the off-street parking and roundabout

access point off of the roundabout, along the proposed building's east side, connecting to the existing access point off of 27th St. This cross access is required by 070.040.070(e)(4)(c), unless waived by the Community Development Director and City Engineer. A condition of approval has been recommended for a modification to the plans to include this cross access and to require allowing vehicular access to and from adjacent properties.

Pedestrian circulation on the site will be provided by the existing eight-foot sidewalk that spans from the property boundary at the roundabout to the edge of the property along 27th St. and an internal walkway from the roundabout to the plaza entrance of the building on the property's south side.

Traffic Impact

The preliminary traffic memo provided by the applicants states that the number of parking spaces provided is likely sufficient to satisfy the average maximum estimated parking demand for the development (though demonstrating that it meets the maximum parking demand is not a requirement of approval) and states that the existing roadway and intersection infrastructure is likely sufficient to accommodate the additional traffic generated by The Benedict. The traffic memo's assumptions about parking demand are based on publications from the Institute of Transportation Engineers.

Drainage and Geotechnical

The applicants submitted a soil study/geotechnical study and a drainage study. According to the City's 1978 geohazards study, this site lies in a rockfall hazard zone. It is therefore subject to the Hillside Development standards in Section 070.040.020(b), though there are no steep slopes on the site. The geotechnical study prepared for the applicants does not recommend mitigation for debris flow or rockfall due to the past grading of the property and the existing development on all sides of the property. The project meets the requirements of 070.040.020(b), though Section 070.040.020(b)(4)(e), Viewshed Protection, merits further explanation. These requirements are intended for "retaining the essential visual qualities" of areas of precious natural vistas rather than infill lots surrounded by development such as the subject lot. It is Staff's view that the principles in 070.040.020(b)(4)(e), if adhered to in a strict form, would prohibit development on this lot, which is not the intent of the regulations. Section 070.040.020(b)(4)(e) contains principles rather than prescriptive standards, and Staff believes that no project redesign is necessary.

The drainage study finds that the existing stormwater infrastructure is adequate to serve the proposed development. A condition of approval has been recommended requiring the project to comply with recommendations identified in the drainage report.

Community Housing

Section 070.045.70 requires all residential and mixed-use developments proposing the construction of ten or more new dwelling units or residential lots to set aside a portion of these as affordable units and to be occupied by members of the local workforce. These requirements are called "inclusionary zoning" standards. This project goes well above the City's inclusionary zoning requirements for affordability, proposing all of the units to be affordable for people who earn 30% to 80% of AMI, which is a deep level of affordability that rarely materializes in Glenwood Springs.

While the affordability component of the proposal exceeds Code requirements, the proposal does not include the resident occupancy requirement that requires 20% of the units be set aside for members of the local workforce. The applicant team has indicated that such a requirement is infeasible because of federal law requirements that control the use of the project's federal funding. Staff has identified two potential solutions to this conflict. A "tenant selection plan" will be the administrative tool the operator of the development uses to pick who is offered the opportunity to be a tenant. A condition of approval has been recommended that would require their tenant selection plan to include a priority for members of the local workforce as defined in the City's Housing Guidelines.

The low-income housing tax credit (LIHTC) award from the Colorado Housing Finance Authority (CHFA) that makes the deep affordability of this project possible requires affordability for 40 years. As a second potential solution to the conflict between federal requirements attached to the project's funding and the City's inclusionary zoning, Staff has recommended as a condition of approval that if the project is to be converted to a market-rate project after 40 years, then whatever inclusionary zoning requirements the City has at that time should apply to the project moving forward. If the project were converted to market-rate and today's requirements are still in effect, 20% of the units (seven units) will have to be kept affordable for tenants earning 100% AMI or less and who meet the local occupancy requirements.

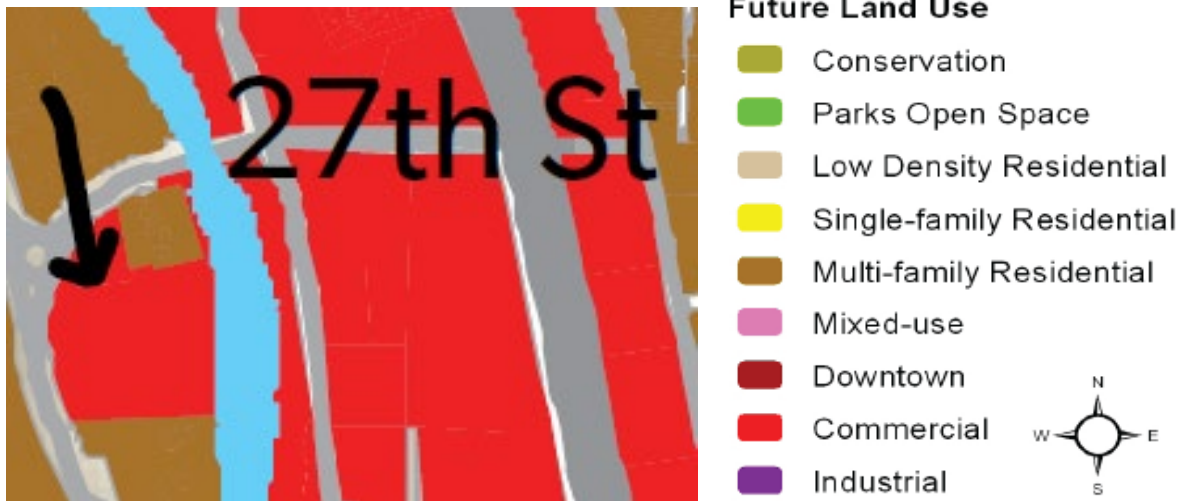
Lighting

The Code sets a maximum of 10.0 foot-candles for illumination brightness. Three locations in the project's plaza are estimated to exceed this 10.0 limit. A condition of approval has been suggested requiring modification to the site lighting in order to not exceed this limit.

COMPREHENSIVE PLAN COMPATIBILITY

Below is staff's analysis of the proposed project and its compatibility with the Comprehensive Plan.

The subject property is shown on the Future Land Use Map (FLUM) in the Comprehensive Plan as Commercial. The Comprehensive Plan's definition of the "commercial" future land use designation states "a wide range of general retail goods and services for both regional and local markets." Similar to the existing senior living facility to the south that also is designated Commercial on the FLUM, The Benedict proposes a type of residential development and is not compliance with the future land use map.



The following describes how the proposed project supports or does not support specific goals, policies, and actions from the Comprehensive Plan.

Comprehensive Plan goals impacted by this proposal:

Goal: Maintain Glenwood Springs as the regional tourism, retail, commercial, and governmental center of Garfield County.

Staff comment: While a half-acre parcel is not likely to tip the competitive balance of Glenwood's commercial activity, the project site's future land use designation is Commercial, so the proposed residential use would take away from what could be new commercial land uses. However, commercial competitiveness does not only depend on the development of vacant land for commercial purposes.

Goal: Direct development to locations and building forms that are cost effective to serve.

Staff comment: The project site is already served by City infrastructure and emergency services.

Goal: Provide equitable and diverse housing for the entire community.

Staff comment: The proposed development would fill a community need. According to the 2023 Strategic Housing Plan Update, Glenwood has a current need of about 745 dwelling units between 30% and 80% AMI, the tenant income range targeted by this proposal. The Plan Update does not break down housing need by age, but the 2019 Greater Roaring Fork Regional Housing Study projected that the share of people 65 years or older to be 44% of the projected population growth in Glenwood Springs. Eligible tenants for The Benedict must be 55 or older.

Goal: Support social diversity.

Staff comment: Social diversity is supported by the presence of a variety of housing types, features, and price points. This project would provide affordable housing for seniors, which is not a segment of housing need that the free market typically provides.

Comprehensive Plan policies or actions impacted by this proposal:

Policy or action: Encourage a compact urban form.

Staff comment: The proposal involves infill development of a prominent vacant parcel of land that is surrounded on all sides by development. This means development would occur inward and not push development outward.

Policy or action: Support appropriate mass, scale and density of new development.

Staff comment: The proposed building will certainly appear tall and massive next to the Racquet Club condominiums to the east, which is partly because of the site layout of these condominium buildings that are built into the riverbank. However, the The Benedict's proposed height is less than that allowed by its zoning. Multifamily housing is also the current land use on all sides of the project location.

Policy or action: Create a community for all.

Staff comment: The proposed project would create housing for a segment of the population not typically served by the free market, creating a new opportunity for low-income seniors to remain in the community.

Policy of action: Increase housing density.

Staff comment: The proposal is a dense multifamily dwelling that will increase density in this neighborhood.

Policy or action: Identify potential parcels for the development of senior housing and identify partners to develop.

Staff comment: The proposed project is a senior housing development. The applicant has brought the project forward independently.

Policy or action: Direct growth to areas where utilities and services can be provided efficiently.

Staff comment: The project site is already served by all utilities and services.

REVIEWING AGENCY COMMENTS

An overview of any comments received from referral agencies is provided below. Comments are also attached with application information.

Engineering Department – Due to the increase in traffic that The Benedict is predicted to cause, the Engineering Department recommends the installation of a “wishbone” road improvement that enforces a right-in, right-out traffic pattern for residents of both The Benedict and the existing condos. By allowing only right turns, motorists will need to use the eastern roundabout on 27th St. to drive west from The Benedict and from the existing condos. Engineering also recommends a cross access vehicular circulation method be created for use of neighboring properties.

Public Work, Water, Wastewater, Electric – The Public Works Department sent a standard list of conditions and questions, most of which will be addressed at the building permit phase. A condition of approval has been suggested requiring compliance with this condition list.

Fire Department – The Fire Department requests a handful of conditions:

- The elevator should have a cab big enough to accommodate a stretcher
- The sidewalks on the south side of the property should remain as shown in the drawings for Fire Department access
- Electrical vehicle charging stations, if any, should be shown on the plans along with the locations of shut-offs
- Existing fire hydrants should be maintained and kept clear during construction

A condition of approval has been suggested requiring compliance with this condition list.

SITE/ARCHITECTURAL PLAN REVIEW APPROVAL CRITERIA

A Major Site/Architectural Plan Review application must meet the approval criteria outlined in Section 070.060.050(a)(6) of the code as outlined below. Staff analysis follows each criteria.

- a. The site/architectural plan is consistent with the general purpose and intent of this Code;*

The proposed plan is consistent with the general purpose and intent of the Municipal Code, including the proposed use and the intent of the development standards.

- b. The site/architectural plan is consistent with the dimensional, design, development, and all other standards of this Code;*

With the exceptions noted in this report that are permitted a flexible application of code requirements by 070.045.080, the proposal is consistent with all Code standards.

- c. The site/architectural plan is consistent with any previously approved plat, PUD, or any other precedent land use approval;*

Staff believes the proposal is consistent with the Stoney River Minor Subdivision plat and the administratively-approved parking reduction.

- d. The site/architectural plan is consistent with the Comprehensive Plan and other adopted City policies and plans.*

As noted in the section analyzing Comprehensive Plan consistency, many of the Plan's goals, policies, and actions support this project, though the Plan's FLUM does not support it. Staff recommends approaching this criterion of approval as a question of whether the project meets the aims of the Comprehensive Plan on the balance, weighing both the reasons for and against. Using this approach the project is supported by the Comprehensive Plan because it meets many of the housing and land use goals, policies, and actions.

Staff believes the proposal is consistent with the Strategic Housing Plan Update, which was adopted in 2023. The Plan Update calls for the creation or preservation of 1,346 affordable dwelling units to meet current demand, and this project would supply new affordable units.

ACTION ALTERNATIVES AND STAFF RECOMMENDATION:

The Planning and Zoning Commission may approve, approve with conditions, or deny the Major Site/Architectural Plan. The Commission may also continue the hearing with a request for specific information necessary to determine compliance with the Municipal Code and City goals and policies.

Action 1 – Major Site/Architectural Plan –Major Site/Architectural Plan for development of a 34-unit multifamily residential building.

Staff Recommendation/Suggested Motion

Staff recommends **approval** of the Major Site/Architectural Plan with the following **findings and conditions**:

Suggested Findings:

1. The site/architectural plan is consistent with general purpose and intent of the Code;
2. The site/architectural plan is consistent with dimensional, design, development, and all other standards of this Code;
3. The site/architectural plan is not in conflict with precedent land use approvals; and
4. The site/architectural plan is consistent the Comprehensive Plan and other adopted City policies and plans, including the Strategic Housing Plan Update.

Suggested Conditions

1. The development shall comply with the requirements of the Code. Any future physical changes or improvements to the property or buildings are subject to the review and approval of the Community Development Director for compliance with applicable requirements of the Glenwood Springs Municipal Code.
2. The owner shall comply with all verbal representations made in the public hearings, as outlined in all application materials, and/or as revised per conditions herein and approved by

- the Community Development Director.
3. The applicant shall comply with recommendations identified in the technical reports submitted as part of the application, including but not limited to the drainage report and subsoil study.
 4. The applicant shall comply with all conditions requested in the referral agency comments, including but not limited to the Fire Department's, Public Works Department's, and Engineering's.
 5. All gas line relocations shall be coordinated with Black Hills Energy.
 6. If the development converts to a free market project at the end of the LIHTC term, any inclusionary zoning or similar requirements in effect at that time shall apply to the development.
 7. As part of the Final Plans Review, the following elements of the project shall be modified:
 - a. Revise landscaping plan to meet code requirements regarding required number of native and drought-resistant plantings.
 - b. Revise the landscaping plan to include the required number of street trees unless it is demonstrated to the satisfaction of the Public Works Director and City Engineer that there is no available location to accommodate both the Public Works Department's utility spacing needs, sight distance requirements, and tree plantings.
 - c. Revise landscaping plan to show hydrozones and comply with hydrozone plant grouping requirements per the Municipal Code.
 - d. Revise landscaping plan to include a hedge or another approved method of screening the off-street parking spaces found in Section 070.40.060(h)(6)(c)(3)(ii).
 - e. The transformer shall be screened in a manner congruent with Section 070.040.050(f) of the Municipal Code.
 - f. Delineate the project's common open space on plans.
 - g. Modify the proposed exterior building colors to be more earth toned.
 - h. Create a vehicular cross access from the lot's south side to the existing access to 27th St. on the lot's north side.
 - i. Modify the lighting plan so that the maximum light level does not exceed 10.0 foot-candles.
 - j. Include details on the plans for storage space for each individual unit.
 8. Prior to issuance of the building permit, the owner shall:
 - a. Submit to the Community Development Director proof that the tenant selection plan includes a preference for qualified residents that meet the City's Housing Guidelines standards for resident occupancy to the extent permissible by state and federal programs.
 - b. Record an easement allowing cross access to and from the adjacent lot to the south and the adjacent lot to the east using the vehicular cross access required by condition 7(h) herein.
-
-

ALTERNATIVE MOTION

***A member of City Council has requested that land use applications include suggested motions for both approval and denial. In most instances, Staff has worked diligently with the applicant to

address requirements outlined in the *Glenwood Springs Municipal Code* (Code) applicable to any given proposal. Therefore, we are usually in support of an application by the time it reaches the Planning and Zoning Commission and/or City Council. However, if the Planning and Zoning Commission does not believe the application meets the Code's minimum standards, your denial motion should be based on one or more of the same approval criteria applicable to the application. You should support your findings with information outlining the shortcomings of the request as shown in the example below:

MOTION TO DENY

Action 1:

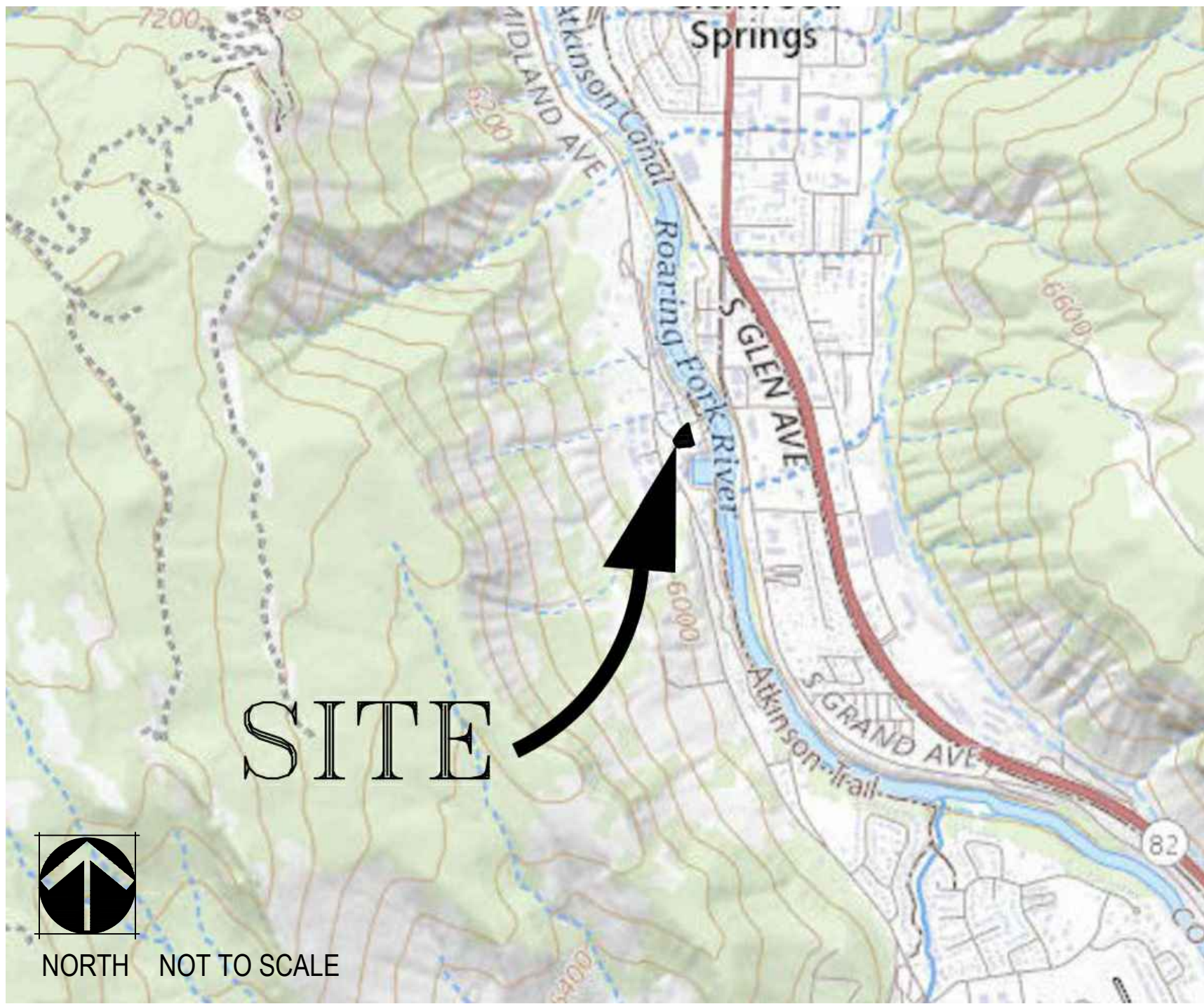
Consideration of a Major Site/Architectural Plan review for the construction of a 34-unit multifamily building in the RE (Resort) Zone District. I move to **DENY** finding that -

1. The site/architectural plan is not consistent with general purpose and intent of the Code because **[insert reasoning]**;
2. The site/architectural plan is not consistent with dimensional, design, development, and other standards of this Code **[insert where you find inconsistencies with Code requirements]**; and
3. The site/architectural plan is not in conformance with **[insert applicable Comprehensive Plan or other City plan or policy sections here]** of the Comprehensive Plan and other City plans and policies.

THE BENEDICT

LOT 2 STONEY RIVER MINOR SUBDIVISION, ACCORDING TO THE RECORDED
PLAT THEREOF RECORDED MAY 27, 2015 UNDER RECEPTION 863126,
COUNTY OF GARFIELD, STATE OF COLORADO

VICINITY MAP



FEMA STATEMENT

This property is not in a flood plain.

GEOLOGIC HAZARDS DISCLOSURE

This property is subject to geologic hazards per the adopted mapping by the City of Glenwood Springs. There are no hazards to note. A final Geologic Hazard Report will be submitted upon application of a building permit.

SHEET INDEX

COVER SHEET	CS-001
EXISTING CONDITIONS	C-1.0
SITE PLAN	C-2.0
GRADING AND DRAINAGE PLAN	C-3.0
UTILITY PLAN	C-4.0
LANDSCAPE COVER SHEET	LP-001
LANDSCAPE NOTES	LP-002
PLANT LIST	LP-003
LANDSCAPE PLAN	LP-101
LANDSCAPE PLAN	LP-102
SNOW STORAGE PLAN	LP-103
PLANTING DETAILS	LP-201
PLANTING DETAILS	LP-202
ARCHITECTURAL SITE PLAN	A-01
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SITE LIGHTING PLAN	E-01

Project Description					
Lot Size Information	Acres	Square feet	Lot Coverage	Existing (Sq Ft & %)	Proposed (Sq. Ft. & %)
	0.55	23,958		23,880 SF; 100%	10,694 SF; 44.8%
Limits of Disturbance	Existing (Sq & %)	Proposed (Sq. Ft. & %)	Average Slope within Limits of Disturbance	Percentage %	
	23,880 SF; 100%	12,026 SF; 50.3%		5%	
Off-street Parking Spaces	Existing # Vehicle Spaces	Proposed # Vehicle Spaces	Bicycle Parking	Existing # Spaces	Proposed # Spaces
	14	42		0	10 guest; 34 in unit
Residential Units	# Existing Units	# Proposed Units	Non-residential Uses	Type of Use(s)	Gross Floor Area (Sq. Ft.)
	0	34		A-3, B	3,268 SF
Open Space	Existing (Sq ft & %)	Proposed (Sq Ft & %)	Total Landscaped area	Existing (Sq Ft & %)	Proposed (Sq Ft & %)
	0	13,186 SF		439 SF; 1.8%	6584; 27.4%
Building Height	Existing	Proposed	Total Impervious Area	Existing (Sq Ft & %)	Proposed (Sq Ft & %)
	0'	58'-10.5"		4,191 SF; 18%	17,972 SF; 75%
Snow Storage	Required (sq ft)	Proposed (sq ft)	Other		
	765 SF	765 SF			

APPLICANT / LAND OWNER

CATHOLIC CHARITIES HOUSING
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ARCHITECT

SHOPWORKS ARCHITECTURE
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303.433.4094
KYLE@SHOPWORKSARC.COM

PLANNER / LANDSCAPE ARCHITECT

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CONTACT: ANTHONY YORK
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FRISCO, CO 80443
PO BOX 2320
970.368.7068
AYORK@NORRIS-DESIGN.COM

CIVIL ENGINEER

SOPRIS ENGINEERING
CONTACT: STEPHANIE HELFENBEIN
502 MAIN STREET, #A-3
CARBONDALE, CO 81623
970.704.0593
STEPHANIE@SOPRISENG.COM

BASIS OF BEARING AND BENCHMARKS

SCHEDULE B EXCEPTIONS TO TITLE:

THIS PROPERTY IS SUBJECT TO THE FOLLOWING EXCEPTIONS TO TITLE AS LISTED IN NCS NUMBER CCH2108725NT
PREPARED BY CHICAGO TITLE INSURANCE COMPANY:

9. RESERVATIONS CONTAINED IN THE PATENT:

FROM: THE UNITED STATES OF AMERICA
TO: LEWIS BAILOR
RECORDING DATE: MARCH 14, 1891
RECORDING NO.: BOOK 12 PAGE 72

WHICH AMONG OTHER THINGS RECITES AS FOLLOWS:
A RIGHT OF WAY THEREON FOR DITCHES OR RESERVOIRS CONSTRUCTED BY THE AUTHORITY OF THE UNITED STATES OF AMERICA. THE RIGHT OF THE PROPRIETOR OF A VEIN OR LODE TO EXTRACT AND REMOVE HIS ORE THEREFROM SHOULD THE SAME BE FOUND TO PENETRATE OR INTERSECT THE PREMISES HEREBY GRANTED AS PROVIDED BY LAW.
NOTHING TO PLOT.

10. TERMS, CONDITIONS, PROVISIONS, AGREEMENTS AND OBLIGATIONS CONTAINED IN THE QUIT-CLAIM DEED AS SET FORTH BELOW: **NOTHING TO PLOT.**

RECORDING DATE: NOVEMBER 15, 1892
RECORDING NO.: BOOK 20 PAGE 241

11. TERMS, CONDITIONS, PROVISIONS, AGREEMENTS AND OBLIGATIONS CONTAINED IN THE WARRANTY DEED AS SET FORTH BELOW: **NOTHING TO PLOT.**

RECORDING DATE: JULY 15, 1909
RECORDING NO.: BOOK 79 PAGE 80

30' SANITARY SEWER EASEMENT ALONG THE WESTERLY SIDE OF SUBJECT PROPERTY AS INDICATED ON THE PLAT OF GLENWOOD SPRINGS RACQUET CLUB PLANNED UNIT DEVELOPMENT: **PLOTTED HEREON.**

RECORDING DATE: OCTOBER 3, 1979
RECORDING NO.: RECEPTION NO. 298203

AND AS SHOWN ON THE PLAT OF LOTS 1 & 2, GLENWOOD SPRINGS RACQUET CLUB PLANNED UNIT DEVELOPMENT, AS AMENDED:

RECORDING DATE: MAY 22, 1981
RECORDING NO.: RECEPTION NO. 315113

12. TERMS, CONDITIONS, PROVISIONS, AGREEMENTS AND OBLIGATIONS CONTAINED IN THE ORDINANCE NO. 10-79 AS SET FORTH BELOW: **NOTHING TO PLOT.**

RECORDING DATE: MARCH 12, 1982
RECORDING NO.: BOOK 894 PAGE 509

13. TERMS, CONDITIONS, PROVISIONS, AGREEMENTS AND OBLIGATIONS CONTAINED IN THE ORDINANCE NO. 39, SERIES OF 1985 AS SET FORTH BELOW: **NOTHING TO PLOT.**

RECORDING DATE: JANUARY 8, 1988
RECORDING NO.: BOOK 727 PAGE 430

14. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT: **PLOTTED HEREON AS REC. # 421379**

GRANTED TO: CITY OF GLENWOOD SPRINGS, COLORADO
PURPOSE: PUBLIC UTILITY EASEMENT
RECORDING DATE: FEBRUARY 20, 1991
RECORDING NO.: BOOK 799 PAGE 230

15. EASEMENT(S) FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT: **NOTHING TO PLOT.**

GRANTED TO: CITY OF GLENWOOD SPRINGS
PURPOSE: PUBLIC ACCESS EASEMENT
RECORDING DATE: JULY 2, 2010
RECORDING NO.: RECEPTION NO. 788060

16. TERMS, CONDITIONS, PROVISIONS, AGREEMENTS AND OBLIGATIONS CONTAINED IN THE MEMORANDUM OF AGREEMENT TO PLAT AND RECONVEY AS SET FORTH BELOW: **NOTHING TO PLOT.**

RECORDING DATE: SEPTEMBER 5, 2012
RECORDING NO.: RECEPTION NO. 823720

AMENDMENT TO AGREEMENT TO PLAT AND RECONVEY: **NOTHING TO PLOT.**

RECORDING DATE: JANUARY 28, 2015
RECORDING NO.: RECEPTION NO. 858695

17. TERMS, CONDITIONS, PROVISIONS, AGREEMENTS AND OBLIGATIONS CONTAINED IN THE AGREEMENT AS SET FORTH BELOW: **NOTHING TO PLOT.**

RECORDING DATE: MARCH 7, 2014
RECORDING NO.: RECEPTION NO. 846979

18. TERMS, CONDITIONS, PROVISIONS, AGREEMENTS AND OBLIGATIONS CONTAINED IN THE AGREEMENT REGARDING EASEMENTS AND LIFT STATION OWNERSHIP AS SET FORTH BELOW: **PLOTTED HEREON.**

RECORDING DATE: OCTOBER 8, 2014
RECORDING NO.: RECEPTION NO. 854488

19. EASEMENTS, NOTES, TERMS, CONDITIONS, PROVISIONS, AGREEMENTS AND OBLIGATIONS AS SHOWN ON THE PLAT OF STONEY RIVER MINOR SUBDIVISION: **PLOTTED HEREON.**

RECORDING DATE: MAY 27, 2015
RECORDING NO.: RECEPTION NO. 863126

20. TERMS, CONDITIONS, PROVISIONS, AGREEMENTS AND OBLIGATIONS CONTAINED IN THE SUBDIVISION AND DEVELOPMENT AGREEMENT BY AND BETWEEN THE CITY OF GLENWOOD SPRINGS AND GLENWOOD SPRINGS LAND, LLC RELATING TO DEVELOPMENT OF THE STONEY RIVER ASSISTED LIVING AND MEMORY CARE FACILITIES AS SET FORTH BELOW: **NOTHING TO PLOT.**

RECORDING DATE: MAY 27, 2015
RECORDING NO.: RECEPTION NO. 863127

21. RECIPROCAL EASEMENTS, FOR THE PURPOSE(S) SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS CREATED BY THE FOLLOWING DOCUMENT: **PLOTTED HEREON.**

DOCUMENT: DECLARATION OF EASEMENTS
EXECUTED BY: GLENWOOD SPRINGS LAND, LLC, AN ILLINOIS LIMITED LIABILITY COMPANY
PURPOSE: INGRESS AND EGRESS FOR VEHICLES AND PEDESTRIANS
RECORDING DATE: MAY 27, 2015
RECORDING NO.: RECEPTION NO. 863128

THE BENEDICT
MAJOR SITE PLAN
GLENWOOD SPRINGS, COLORADO

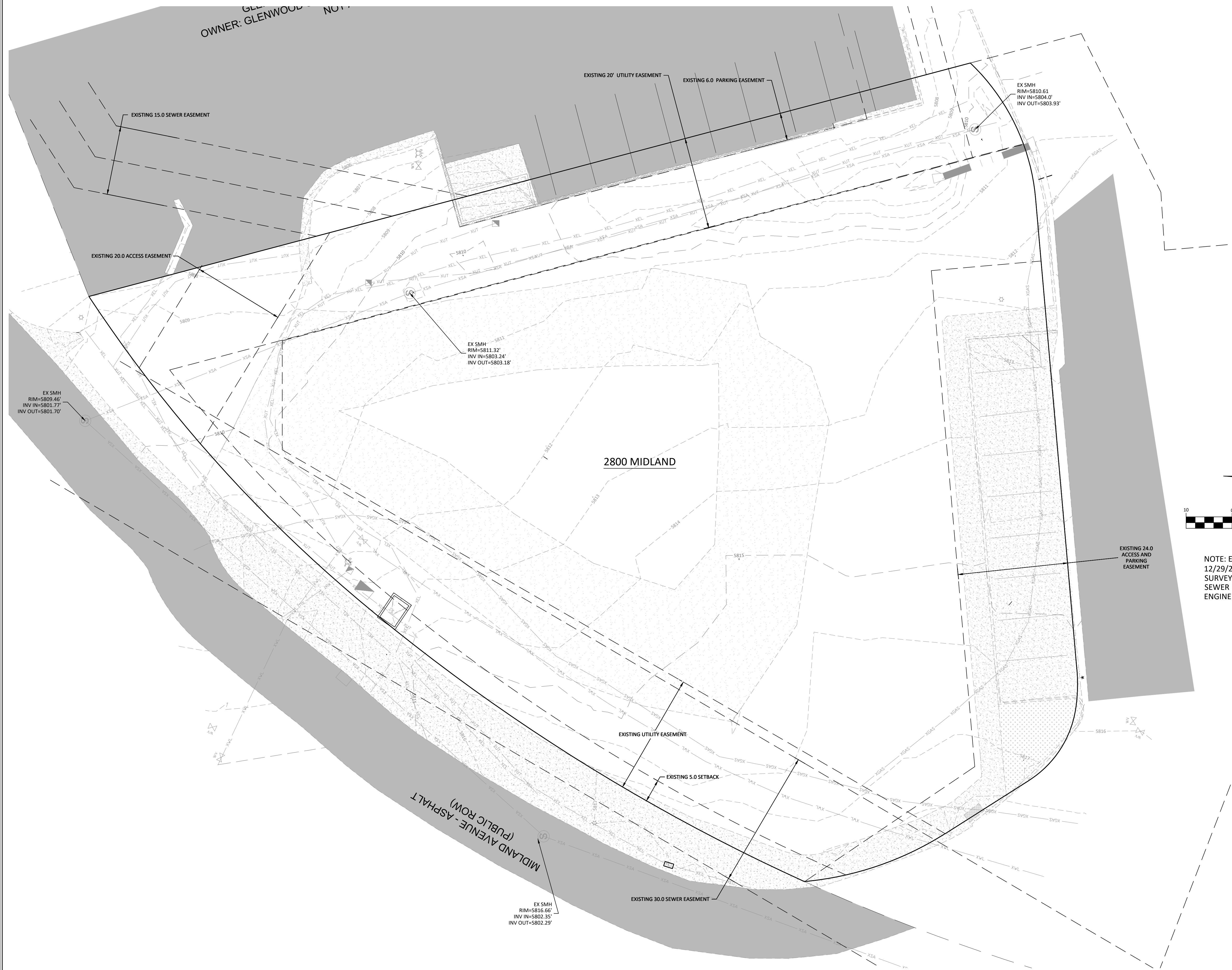
OWNER:
CATHOLIC CHARITIES
HOUSING
6240 SMITH ROAD
DENVER, CO 80216

NOT FOR
CONSTRUCTION

DATE:
10/17/23 Submittal 01

SHEET TITLE:
COVER

CS-001



SOPRIS ENGINEERING LLC
 5502 MAIN STREET • SUITE A3 • CARBONDALE CO 81623
 (970) 704-0311 • soprisengineering.com

DATE:		10-17-23
JOB NO.		31256
DESIGNED BY	SOH	10/17/23
DRAWN BY	SOH	10/17/23
CHECKED BY		

THE BENEDICT
MAJOR SITE PLAN
GLENWOOD SPRINGS, COLORADO

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TITLE
EXISTING CONDITIONS
DRAWING NO.
C-1.0

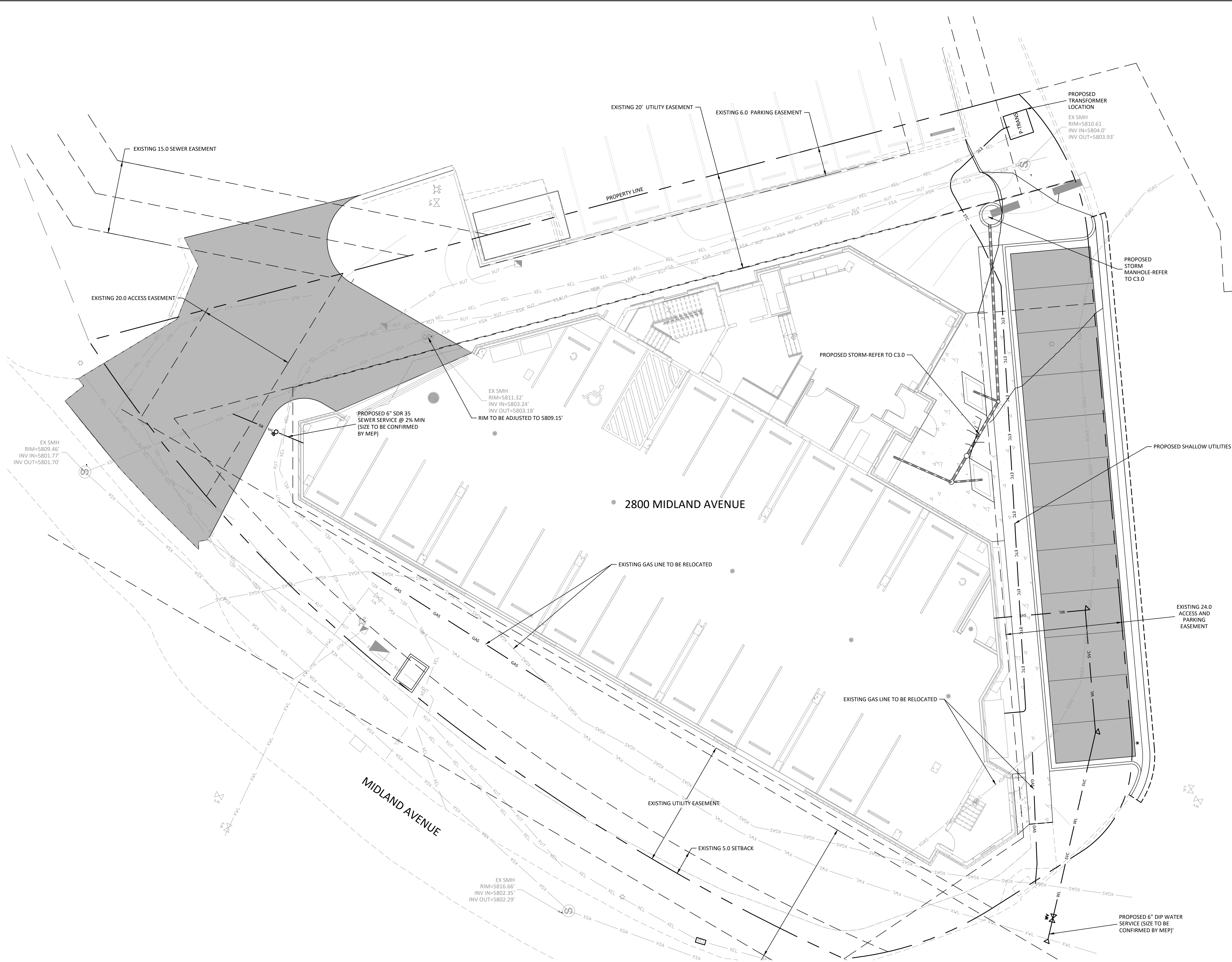


**Know what's below.
Call before you dig**

CALL 2-BUSINESS DAYS IN ADVANCE
BEFORE YOU DIG, GRADE, OR EXCAVATE
FOR THE MARKING OF UNDERGROUND
MEMBER UTILITIES



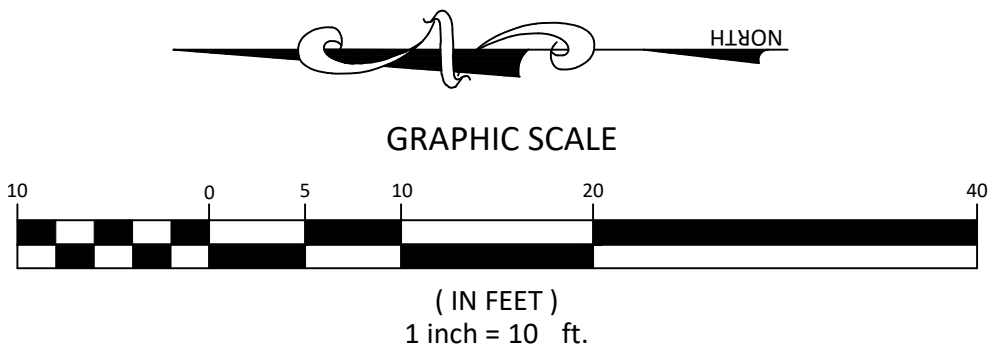
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PROPOSED LEGEND	
	PROPOSED CONTOUR
	PROPOSED CONTOUR INTERVAL
	PROPOSED 8" WATER MAIN
	PROPOSED 12" WATER MAIN
	PROPOSED 8" SANITARY SEWER MAIN
	PROPOSED 12" SANITARY SEWER MAIN
	PROPOSED ELEC, TELE, CABLE, GAS
	PROPOSED ELEC, TELE, CABLE
	PROPOSED GAS
	PROPOSED TELEPHONE
	PROPOSED UNDERGROUND ELECTRIC
	PROPOSED OVERHEAD ELECTRIC
	PROPOSED CABLE
	PROPOSED FIBER OPTIC
	PROPOSED IRRIGATION PIPE
	PROPOSED SWALE OR DITCH
	PROPOSED STORM SEWER

	PROPOSED CONCRETE
	PROPOSED ASPHALT
	PROPOSED SAWCUT

EXISTING LEGEND	
	EXISTING CONTOUR
	EXISTING CONTOUR INTERVAL
	EXISTING 8" WATER MAIN
	EXISTING 12" WATER MAIN
	EXISTING 8" SANITARY SEWER MAIN
	EXISTING ELEC, TELE, CABLE, GAS
	EXISTING ELEC, TELE, CABLE
	EXISTING GAS
	EXISTING TELEPHONE
	EXISTING UNDERGROUND ELECTRIC
	EXISTING OVERHEAD ELECTRIC
	EXISTING CABLE
	EXISTING FIBER OPTIC
	EXISTING IRRIGATION PIPE
	EXISTING STORM SEWER
	EXISTING EASEMENT
	EXISTING PROPERTY LINE
	EXISTING WIRE FENCE
	EXISTING ROCK WALL
	EXISTING ELECTRIC MANHOLE
	EXISTING DRAINAGE DRY-WELL
	EXISTING SEWER MANHOLE
	EXISTING TELEPHONE MANHOLE
	EXISTING UTILITY MANHOLE
	EXISTING GUY WIRE
	EXISTING POWER POLE
	EXISTING FIRE HYDRANT
	EXISTING WATER VALVE
	EXISTING CURB STOP
	EXISTING GAS METER
	EXISTING ELECTRIC TRANSFORMER
	EXISTING ELECTRIC METER
	EXISTING TELEPHONE PEDESTAL
	EXISTING CATV PEDESTAL
	EXISTING SEWER CLEANOUT
	EXISTING LIGHT POLE
	EXISTING SIGN
	EXISTING STORM INLET



Know what's below.
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CALL 2 BUSINESS DAYS IN ADVANCE
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FOR THE MARKING OF UNDERGROUND
MEMBER UTILITIES



DATE:	10-17-23
JOB NO.	31256
DESIGNED BY	SOH 10/17/23
DRAWN BY	SOH 10/17/23
CHECKED BY	

THE BENEDICT
MAJOR SITE PLAN
GLENWOOD SPRINGS, COLORADO

DATE	REVISION

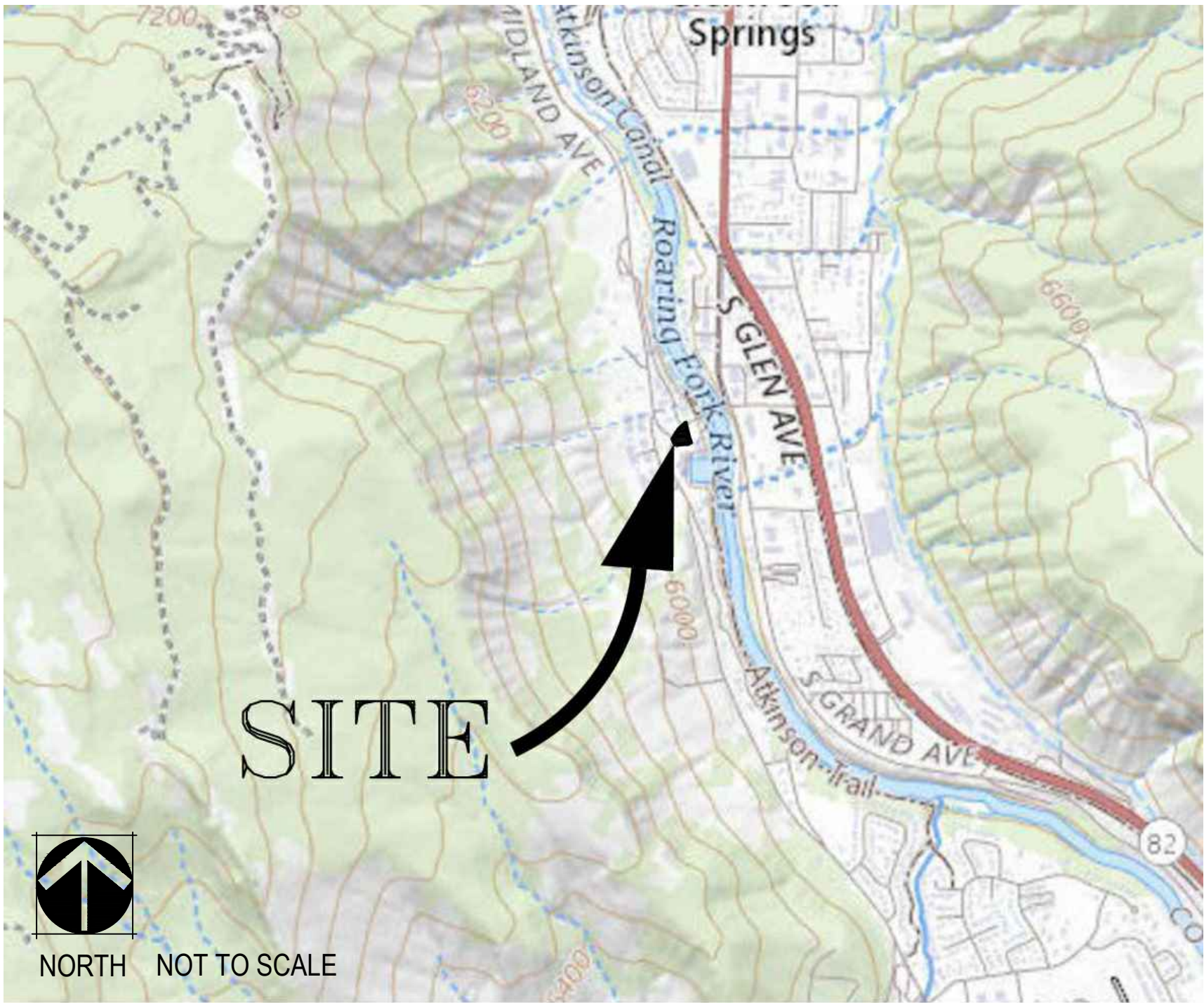
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DRAWING NO.	C-4.0

THE BENEDICT

LANDSCAPE PLAN

LOT 2 STONEY RIVER MINOR SUBDIVISION, ACCORDING TO THE RECORDED
PLAT THEREOF RECORDED MAY 27, 2015 UNDER RECEPTION 863126,
COUNTY OF GARFIELD, STATE OF COLORADO

VICINITY MAP



APPLICANT / LAND OWNER

CATHOLIC CHARITIES HOUSING
CONTACT: JUSTIN RADDATZ
6240 SMITH ROAD
DENVER, CO 80216
303.433.4094
JRADDATZ@CCDENVER.ORG

ARCHITECT

SHOPWORKS ARCHITECTURE
CONTACT: KYLE MEAD
301 W. 45TH AVENUE
DENVER, CO 80216
303.433.4094
KYLE@SHOPWORKSARC.COM

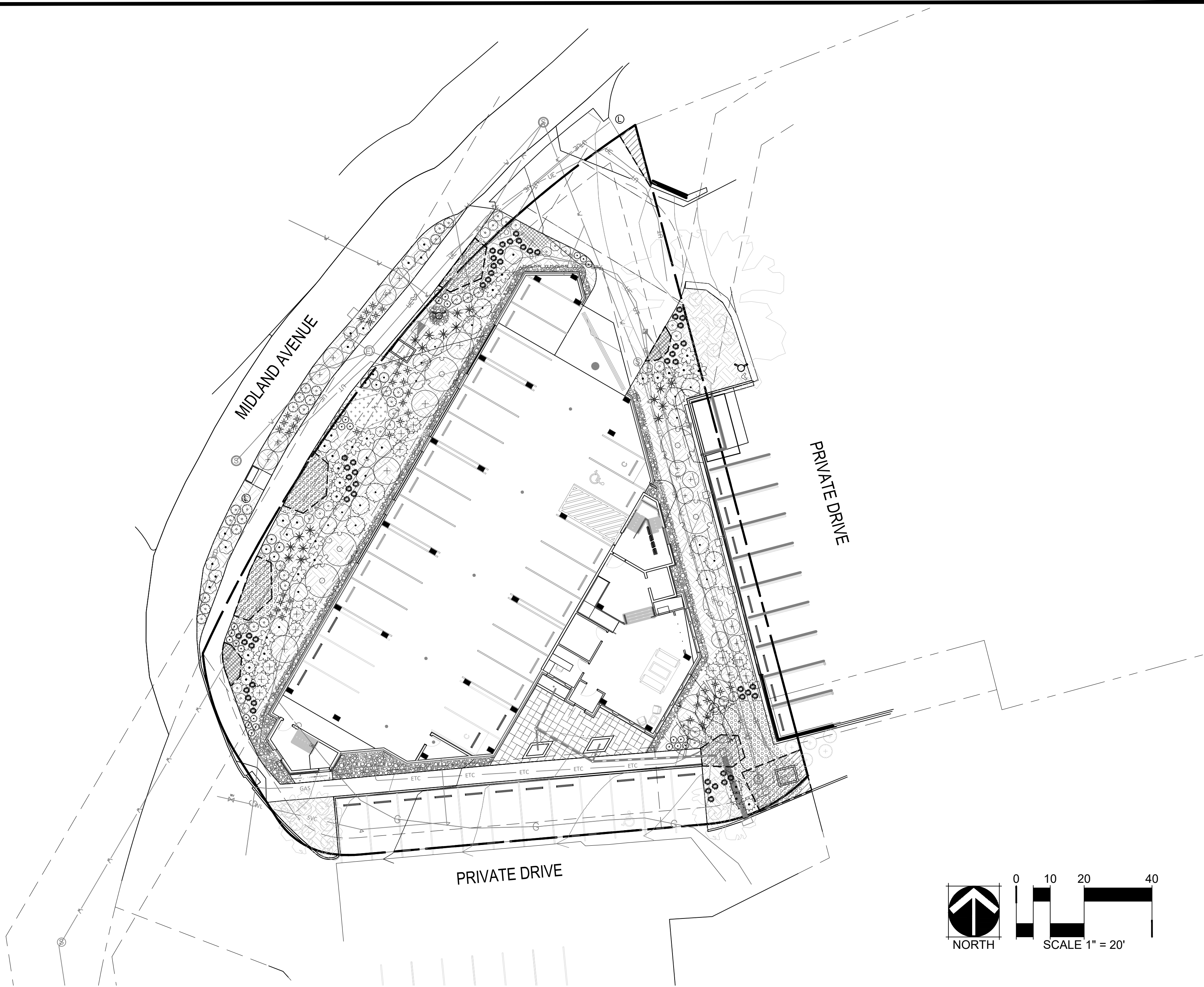
PLANNER / LANDSCAPE ARCHITECT

NORRIS DESIGN
CONTACT: ANTHONY YORK
409 MAIN STREET, SUITE 207
FRISCO, CO 80443
PO BOX 2320
970.368.7068
AYORK@NORRIS-DESIGN.COM

CIVIL ENGINEER

SOPRIS ENGINEERING
CONTACT: STEPHANIE HELFENBEIN
502 MAIN STREET, #A-3
CARBONDALE, CO 81623
970.704.0593
STEPHANIE@SOPRISENG.COM

OVERALL LANDSCAPE PLAN



OVERALL LANDSCAPE REQUIREMENTS

	REQUIRED	EXISTING	PROVIDED
LANDSCAPE AREA (SQUARE FEET)	4,775 (20% OF SITE)	439	5,393
TREES	12 (1 TREE PER 400 SF)	2	4
SHRUBS	48 (1 TREE PER 100 SF)	10	191
PERENNIALS	96 (1 TREE PER 50 SF)	0	112

NOTES:
EXISTING TREES MAY BE USED TO SATISFY THE LANDSCAPE REQUIREMENTS. UP
TO 50 PERCENT OF REQUIRED TREES MAY BE SUBSTITUTED WITH SHRUBS (ABOVE
REQUIRED AMOUNT) AT A RATE OF 10 SHRUBS PER 1 TREE.
SEE TOWN OF GLENWOOD SPRINGS, CODE SECTION 070.040.050 LANDSCAPING

SHEET INDEX

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PLANTING DETAILS	LP-201

THE BENEDICT
MAJOR SITE PLAN
LANDSCAPE PLAN
GLENWOOD SPRINGS, COLORADO

OWNER:
CATHOLIC CHARITIES
HOUSING
6240 SMITH ROAD
DENVER, CO 80216

NOT FOR
CONSTRUCTION

DATE:
10-17-2023

COVER

LP-001

GENERAL NOTES

1. THESE PLANS SHALL NOT BE UTILIZED FOR CONSTRUCTION OR PERMITTING UNLESS STATED FOR SUCH USE IN THE TITLE BLOCK.
2. DRAWINGS ARE INTENDED TO BE PRINTED ON 24" X 36" PAPER. PRINTING THESE DRAWINGS AT A DIFFERENT SIZE WILL IMPACT THE SCALE. VERIFY THE GRAPHIC SCALE BEFORE REFERENCING ANY MEASUREMENTS ON THESE SHEETS. THE RECIPIENT OF THESE DRAWINGS SHALL BE RESPONSIBLE FOR ANY ERRORS RESULTING FROM INCORRECT PRINTING, COPYING, OR ANY OTHER CHANGES THAT ALTER THE SCALE OF THE DRAWINGS.
3. VERIFY ALL PLAN DIMENSIONS PRIOR TO START OF CONSTRUCTION. NOTIFY THE OWNER'S REPRESENTATIVE TO ADDRESS ANY QUESTIONS OR CLARIFY ANY DISCREPANCIES.
4. WRITTEN DIMENSIONS TAKE PRECEDENCE OVER SCALED DIMENSIONS.
5. SUBMIT A CHANGE ORDER FOR APPROVAL FOR ANY CHANGES TO WORK SCOPE RESULTING FROM FIELD CONDITIONS OR DIRECTION BY OWNER'S REPRESENTATIVE WHICH REQUIRE ADDITIONAL COST TO THE OWNER PRIOR TO PERFORMANCE OF WORK.
6. THE CONTRACTOR SHALL PROVIDE A STAKED LAYOUT OF ALL SITE IMPROVEMENTS FOR INSPECTION BY THE OWNER'S REPRESENTATIVE AND MAKE MODIFICATIONS AS REQUIRED. ALL LAYOUT INFORMATION IS AVAILABLE IN DIGITAL FORMAT FOR USE BY THE CONTRACTOR.
7. IF A GEOTECHNICAL SOILS REPORT IS NOT AVAILABLE AT THE TIME OF CONSTRUCTION, NORRIS DESIGN RECOMMENDS A REPORT BE AUTHORIZED BY THE OWNER AND THAT ALL RECOMMENDATIONS OF THE REPORT ARE FOLLOWED DURING CONSTRUCTION. THE CONTRACTOR SHALL USE THESE CONTRACT DOCUMENTS AS A BASIS FOR THE BID. IF THE OWNER ELECTS TO PROVIDE A GEOTECHNICAL REPORT, THE CONTRACTOR SHALL REVIEW THE REPORT AND SUBMIT AN APPROPRIATE CHANGE ORDER TO THE OWNER'S REPRESENTATIVE IF ADDITIONAL COSTS ARE REQUESTED.
8. CONTRACTOR SHALL CONFIRM THAT SITE CONDITIONS ARE SIMILAR TO THE PLANS, WITHIN TOLERANCES STATED IN THE CONTRACT DOCUMENTS, AND SATISFACTORY TO THE CONTRACTOR PRIOR TO START OF WORK. SHOULD SITE CONDITIONS BE DIFFERENT THAN REPRESENTED ON THE PLANS OR UNSATISFACTORY TO THE CONTRACTOR, THE CONTRACTOR SHALL CONTACT THE OWNER'S REPRESENTATIVE FOR CLARIFICATION AND FURTHER DIRECTION.
9. CONTRACTOR IS RESPONSIBLE TO PAY FOR, AND OBTAIN, ANY REQUIRED APPLICATIONS, PERMITTING, LICENSES, INSPECTIONS AND METERS ASSOCIATED WITH WORK.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY FINES OR PENALTIES ASSESSED TO THE OWNER RELATING TO ANY VIOLATIONS OR NON-CONFORMANCE WITH THE PLANS, SPECIFICATIONS, CONTRACT DOCUMENTS, JURISDICTIONAL CODES, AND REGULATORY AGENCIES.
11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION OF ALL UTILITY LOCATES PRIOR TO ANY EXCAVATION. REFER TO ENGINEERING UTILITY PLANS FOR ALL PROPOSED UTILITY LOCATIONS AND DETAILS. NOTIFY OWNER'S REPRESENTATIVE IF EXISTING OR PROPOSED UTILITIES INTERFERE WITH THE ABILITY TO PERFORM WORK.
12. UNLESS IDENTIFIED ON THE PLANS FOR DEMOLITION OR REMOVAL, THE CONTRACTOR IS RESPONSIBLE FOR THE COST TO REPAIR UTILITIES, ADJACENT OR EXISTING LANDSCAPE, ADJACENT OR EXISTING PAVING, OR ANY PUBLIC AND PRIVATE PROPERTY THAT IS DAMAGED BY THE CONTRACTOR OR THEIR SUBCONTRACTOR'S OPERATIONS DURING INSTALLATION, ESTABLISHMENT OR DURING THE SPECIFIED MAINTENANCE PERIOD. ALL DAMAGES SHALL BE REPAIRED TO PRE-CONSTRUCTION CONDITIONS AS DETERMINED BY THE OWNER'S REPRESENTATIVE. CONTRACTOR SHALL BE RESPONSIBLE FOR LOGGING ANY DAMAGES PRIOR TO START OF CONSTRUCTION AND DURING THE CONTRACT PERIOD.
13. ALL WORK SHALL BE CONFINED TO THE AREA WITHIN THE CONSTRUCTION LIMITS AS SHOWN ON THE PLANS. ANY AREAS OR IMPROVEMENTS DISTURBED OUTSIDE THESE LIMITS SHALL BE RETURNED TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE. IN THE EVENT THE CONTRACTOR REQUIRES A MODIFICATION TO THE CONSTRUCTION LIMITS, WRITTEN PERMISSION MUST BE OBTAINED FROM THE OWNER'S REPRESENTATIVE PRIOR TO ANY DISTURBANCE OUTSIDE OF THE LIMITS OF WORK.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OF ANY OF THEIR TRENCHES OR EXCAVATIONS THAT SETTLE.
15. THE CONTRACTOR SHALL BE RESPONSIBLE TO PREPARE AND SUBMIT A TRAFFIC CONTROL PLAN TO THE APPROPRIATE JURISDICTIONAL AGENCIES AND THE OWNER'S REPRESENTATIVE IF THEIR WORK AND OPERATIONS AFFECT OR IMPACT THE PUBLIC RIGHTS-OF-WAY. OBTAIN APPROVAL PRIOR TO ANY WORK WHICH AFFECTS OR IMPACTS THE PUBLIC RIGHTS-OF-WAY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY FINES OR PENALTIES ASSESSED TO THE OWNER RELATING TO THIS REQUIREMENT DURING THE CONTRACT PERIOD.
16. SIGHT TRIANGLES AND SIGHT LINES SHALL REMAIN UNOBSTRUCTED BY EQUIPMENT, CONSTRUCTION MATERIALS, PLANT MATERIAL OR ANY OTHER VISUAL OBSTACLE DURING THE CONTRACT PERIOD AND AT MATURITY OF PLANTS PER LOCAL JURISDICTIONAL REQUIREMENTS. NO PLANT MATERIAL OTHER THAN GROUND COVER IS ALLOWED TO BE PLANTED ADJACENT TO FIRE HYDRANTS AS STIPULATED BY JURISDICTIONAL REQUIREMENTS.
17. COORDINATE SITE ACCESS, STAGING, STORAGE AND CLEANOUT AREAS WITH OWNER'S REPRESENTATIVE.
18. CONTRACTOR IS RESPONSIBLE FOR PROVIDING TEMPORARY SAFETY FENCING AND BARRIERS

LAYOUT NOTES

1. WRITTEN DIMENSIONS WILL TAKE PRECEDENCE OVER SCALED DIMENSIONS.
2. SHOULD SITE CONDITIONS BE DIFFERENT THAN WHAT IS INDICATED ON THE DRAWINGS CONTACT THE LANDSCAPE ARCHITECT IMMEDIATELY FOR CLARIFICATION.
3. CURVED WALKS AND CURB EDGES ARE INTENDED TO BE CONSTRUCTED WITH SMOOTH FLOWING CURVES. ANYTHING OTHER THAN SMOOTH FLOWING CURVES WILL BE REJECTED.
4. THE CONTRACTOR SHALL OBTAIN, AT HIS EXPENSE, ALL PERMITS WHICH ARE NECESSARY TO PERFORM THE PROPOSED WORK.
5. THE CONTRACTOR SHALL PROVIDE A STAKED LAYOUT OF ALL SITE IMPROVEMENTS FOR INSPECTION BY THE OWNER'S REPRESENTATIVE AND MAKE MODIFICATIONS AS REQUIRED AT NO ADDITIONAL COST TO THE OWNER.
6. THE CONTRACTOR SHALL INSTALL SLEEVING FOR IRRIGATION IMPROVEMENTS PRIOR TO INSTALLING CONCRETE FLATWORK. REFER TO IRRIGATION PLANS.
7. LAYOUT WALKS, SCORE JOINTS AND PAVING PATTERNS AS CLOSELY AS POSSIBLE TO PLANS, DETAILS, AND SPECIFICATIONS. DO NOT DEVIATE FROM PLANS UNLESS SPECIFIC APPROVAL IS OBTAINED FROM THE OWNER'S REPRESENTATIVE.
8. ALL WORK SHALL BE CONFINED TO THE AREA WITHIN THE CONSTRUCTION LIMITS AS SHOWN ON THE PLANS. ANY AREAS OR IMPROVEMENTS DISTURBED OUTSIDE THESE LIMITS SHALL BE RETURNED TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE. IN THE EVENT THE CONTRACTOR REQUIRES A MODIFICATION TO THE CONSTRUCTION LIMITS, WRITTEN PERMISSION MUST BE OBTAINED FROM THE LANDSCAPE ARCHITECT PRIOR TO ANY DISTURBANCE OUTSIDE OF THE LIMITS OF WORK. SEE TECHNICAL SPECIFICATIONS.
9. CONTRACTOR IS RESPONSIBLE FOR PROVIDING TEMPORARY FENCING AROUND ALL PLAY STRUCTURES UNTIL PROPER FALL SURFACE IS COMPLETELY INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
10. CONTRACTOR IS RESPONSIBLE FOR SUPERVISING ALL SAFETY SURFACING AND PAVEMENT DURING THE CURING PROCESS.

- AROUND ALL IMPROVEMENTS SUCH AS WALLS, PLAY STRUCTURES, EXCAVATIONS, ETC. ASSOCIATED WITH THEIR WORK UNTIL SUCH FACILITIES ARE COMPLETELY INSTALLED PER THE PLANS, SPECIFICATIONS AND MANUFACTURER'S RECOMMENDATIONS.
19. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTION OF THEIR MATERIAL STOCK PILES AND WORK FROM VANDALISM, EROSION OR UNINTENDED DISTURBANCE DURING THE CONSTRUCTION PERIOD AND UNTIL FINAL ACCEPTANCE IS ISSUED.
 20. THE CONTRACTOR SHALL KNOW, UNDERSTAND AND ABIDE BY ANY STORM WATER POLLUTION PREVENTION PLAN (SWPPP) ASSOCIATED WITH THE SITE. IF A STORM WATER POLLUTION PREVENTION PLAN IS NOT PROVIDED BY THE OWNER'S REPRESENTATIVE, REQUEST A COPY BEFORE PERFORMANCE OF ANY SITE WORK.
 21. MAINTAIN ANY STORM WATER MANAGEMENT FACILITIES THAT EXIST ON SITE FOR FULL FUNCTIONALITY. THE CONTRACTOR SHALL INSTALL AND MAINTAIN ANY NEW STORM WATER MANAGEMENT FACILITIES THAT ARE IDENTIFIED IN THE SCOPE OF WORK TO FULL FUNCTIONALITY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY FINES OR PENALTIES ASSESSED TO THE OWNER FOR FAILURE TO MAINTAIN STORM WATER MANAGEMENT FACILITIES DURING THE CONTRACT PERIOD.
 22. THE CONTRACTOR SHALL PREVENT SEDIMENT, DEBRIS AND ALL OTHER POLLUTANTS FROM EXITING THE SITE OR ENTERING THE STORM SEWER SYSTEM DURING ALL DEMOLITION OR CONSTRUCTION OPERATIONS THAT ARE PART OF THIS PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY FINES OR PENALTIES ASSESSED TO THE OWNER RELATING TO THESE REQUIREMENTS DURING THEIR CONTRACTED COURSE OF WORK.
 23. THE CONTRACTOR SHALL BE RESPONSIBLE TO PREVENT ANY IMPACTS TO ADJACENT WATERWAYS, WETLANDS, OR OTHER ENVIRONMENTALLY SENSITIVE AREAS RESULTING FROM WORK DONE AS PART OF THIS PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY FINES OR PENALTIES ASSESSED TO THE OWNER RELATING TO THESE STANDARDS DURING THEIR CONTRACTED COURSE OF WORK.
 24. THE CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL INSURE THAT ALL LOADS OF CONSTRUCTION MATERIAL IMPORTED TO OR EXPORTED FROM THE PROJECT SITE SHALL BE PROPERLY COVERED TO PREVENT LOSS OF MATERIAL DURING TRANSPORT. TRANSPORTATION METHODS ON PUBLIC RIGHT-OF WAYS SHALL CONFORM TO JURISDICTIONAL REQUIREMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY FINES OR PENALTIES ASSESSED TO THE OWNER RELATING TO THESE REQUIREMENTS.
 25. THE CLEANING OF EQUIPMENT IS PROHIBITED AT THE JOB SITE UNLESS AUTHORIZED BY THE OWNER'S REPRESENTATIVE IN A DESIGNATED AREA. THE DISCHARGE OF WATER, WASTE CONCRETE, POLLUTANTS, OR OTHER MATERIALS SHALL ONLY OCCUR IN AREAS DESIGNED FOR SUCH USE AND APPROVED BY THE OWNER'S REPRESENTATIVE.
 26. THE CLEANING OF CONCRETE EQUIPMENT IS PROHIBITED AT THE JOB SITE EXCEPT IN DESIGNATED CONCRETE WASHOUT AREAS. THE DISCHARGE OF WATER CONTAINING WASTE CONCRETE IN THE STORM SEWER IS PROHIBITED.
 27. OPEN SPACE SWALES: IF SWALES ARE EXISTING ON SITE AND ARE NOT INTENDED TO BE MODIFIED AS PART OF THE PLANS, THE CONTRACTOR SHALL BE RESPONSIBLE TO MAINTAIN THE CONVEYANCE OF WATER WITHIN THE SWALES DURING THE CONTRACT PERIOD. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DIVERSION OR PUMPING OF WATER IF REQUIRED TO COMPLETE WORK. ANY SWALES DISTURBED BY THE CONTRACTOR SHALL BE REPAIRED/RESTORED TO THEIR ORIGINAL CONDITION. IF THE SWALE NEEDS TO BE DISTURBED OR MODIFIED FOR ANY REASON, THE CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE FOR APPROVAL PRIOR TO DISTURBANCE.
 28. DETENTION AND WATER QUALITY PONDS: IF DETENTION PONDS AND WATER QUALITY PONDS ARE EXISTING ON SITE AND ARE NOT INTENDED TO BE MODIFIED AS PART OF THE PLANS, THE CONTRACTOR SHALL MINIMIZE DISTURBANCE TO THE PONDS, DRAINAGE STRUCTURES AND SPILLWAYS DURING CONSTRUCTION. ALL PONDS, DRAINAGE STRUCTURES AND SPILLWAYS SHALL BE MAINTAINED IN OPERABLE CONDITIONS AT ALL TIMES. ANY POND OR SPILLWAY AREAS DISTURBED BY THE CONTRACTOR SHALL BE REPAIRED/RESTORED TO THEIR ORIGINAL CONDITION. IF THE POND NEEDS TO BE DISTURBED OR MODIFIED FOR ANY REASON, THE CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE FOR APPROVAL PRIOR TO DISTURBANCE.
 29. MAINTENANCE ACCESS BENCHES: IF MAINTENANCE BENCHES OR ACCESS ROADS EXIST ON SITE AND ARE NOT INTENDED TO BE MODIFIED AS PART OF THE PLANS, THE CONTRACTOR SHALL MINIMIZE DISTURBANCE TO THE BENCHES OR ACCESS ROADS DURING CONSTRUCTION. ANY BENCHES OR ACCESS ROADS DISTURBED BY THE CONTRACTOR SHALL BE REPAIRED/RESTORED TO THEIR ORIGINAL CONDITION. THE CONTRACTOR SHALL MAINTAIN ACCESS TO ALL EXISTING BENCHES AND ACCESS ROADS DURING THE CONSTRUCTION PERIOD. IF ACCESS NEEDS TO BE BLOCKED FOR ANY REASON, THE CONTRACTOR SHALL NOTIFY THE OWNER'S REPRESENTATIVE FOR APPROVAL PRIOR TO INTERRUPTION OF ACCESS.
 30. LOCAL, STATE AND FEDERAL JURISDICTIONAL REQUIREMENTS, RESTRICTIONS OR PROCEDURES SHALL SUPERSEDE THESE PLANS, NOTES AND SPECIFICATIONS WHEN MORE STRINGENT. NOTIFY THE OWNER'S REPRESENTATIVE IF CONFLICTS OCCUR.

LANDSCAPE NOTES

1. THE CONTRACTOR SHALL FOLLOW THE LANDSCAPE PLANS AND SPECIFICATIONS AS CLOSELY AS POSSIBLE. ANY SUBSTITUTION OR ALTERATION SHALL NOT BE ALLOWED WITHOUT APPROVAL OF THE OWNER'S REPRESENTATIVE. OVERALL PLANT QUANTITY AND QUALITY SHALL BE CONSISTENT WITH THE PLANS.
2. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL PLANT QUANTITIES. GRAPHIC QUANTITIES TAKES PRECEDENCE OVER WRITTEN QUANTITIES.
3. THE OWNER'S REPRESENTATIVE RESERVES THE RIGHT TO INSPECT AND TAG ALL PLANT MATERIAL PRIOR TO SHIPPING TO THE SITE. IN ALL CASES, THE OWNER'S REPRESENTATIVE MAY REJECT PLANT MATERIAL AT THE SITE IF MATERIAL IS DAMAGED, DISEASED, OR DECLINING IN HEALTH AT THE TIME OF ONSITE INSPECTIONS OR IF THE PLANT MATERIAL DOES NOT MEET THE MINIMUM SPECIFIED STANDARD IDENTIFIED ON THE PLANS AND IN THE SPECIFICATIONS. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER'S REPRESENTATIVE FOR INSPECTION AND APPROVAL OF ALL MATERIALS AND PRODUCTS PRIOR TO INSTALLATION.
4. THE OWNER'S REPRESENTATIVE MAY ELECT TO UPSIZE PLANT MATERIAL AT THEIR DISCRETION BASED ON SELECTION, AVAILABILITY, OR TO ENHANCE SPECIFIC AREAS OF THE PROJECT. THE CONTRACTOR SHALL VERIFY PLANT MATERIAL SIZES WITH OWNER'S REPRESENTATIVE PRIOR TO PURCHASING, SHIPPING OR STOCKING OF PLANT MATERIALS. SUBMIT CHANGE ORDER REQUEST TO OWNER'S REPRESENTATIVE FOR APPROVAL IF ADDITIONAL COST IS REQUESTED BY THE CONTRACTOR PRIOR TO INSTALLATION. RE-STOCKING CHARGES WILL NOT BE APPROVED IF THE CONTRACTOR FAILS TO SUBMIT A REQUEST FOR MATERIAL CHANGES.
5. THE CONTRACTOR SHALL WARRANTY ALL CONTRACTED WORK AND MATERIALS FOR A PERIOD OF ONE YEAR AFTER SUBSTANTIAL COMPLETION HAS BEEN ISSUED BY THE OWNER'S REPRESENTATIVE FOR THE ENTIRE PROJECT UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS OR SPECIFICATIONS.
6. IN NO CASE SHALL IRRIGATION BE EMITTED WITHIN THE MINIMUM DISTANCE FROM BUILDING OR WALL FOUNDATIONS AS STIPULATED IN THE GEOTECHNICAL REPORT. ALL IRRIGATION DISTRIBUTION LINES, HEADS AND EMITTERS SHALL BE KEPT OUTSIDE THE MINIMUM DISTANCE AWAY FROM ALL BUILDING AND WALL FOUNDATIONS AS STIPULATED IN THE GEOTECHNICAL REPORT.
7. LANDSCAPE MATERIAL LOCATIONS SHALL HAVE PRECEDENCE OVER IRRIGATION MAINLINE AND LATERAL LOCATIONS. COORDINATE INSTALLATION OF IRRIGATION EQUIPMENT SO THAT IT DOES NOT INTERFERE WITH THE PLANTING OF TREES OR OTHER LANDSCAPE MATERIAL.
8. THE LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING POSITIVE DRAINAGE EXISTS IN ALL LANDSCAPE AREAS. SURFACE DRAINAGE ON LANDSCAPE AREAS SHALL NOT FLOW TOWARD STRUCTURES AND FOUNDATIONS. MAINTAIN SLOPE AWAY FROM FOUNDATIONS PER THE GEOTECHNICAL REPORT RECOMMENDATIONS. ALL LANDSCAPE AREAS BETWEEN WALKS AND CURBS SHALL DRAIN FREELY TO THE CURB UNLESS OTHERWISE IDENTIFIED ON THE GRADING PLAN. IN NO CASE SHALL THE GRADE, TURF THATCH, OR OTHER LANDSCAPE MATERIALS DAM WATER AGAINST WALKS. MINIMUM SLOPES ON LANDSCAPE AREAS SHALL BE 2%; MAXIMUM SLOPE SHALL BE 25% UNLESS SPECIFICALLY IDENTIFIED ON THE PLANS OR APPROVED BY THE OWNER'S REPRESENTATIVE.
9. PRIOR TO INSTALLATION OF PLANT MATERIALS, AREAS THAT HAVE BEEN COMPACTED OR DISTURBED BY CONSTRUCTION ACTIVITY SHALL BE THOROUGHLY LOOSENEED TO A DEPTH OF 8" - 12" AND AMENDED PER SPECIFICATIONS.
10. ALL LANDSCAPED AREAS ARE TO RECEIVE ORGANIC SOIL PREPARATION AS NOTED IN THE TECHNICAL SPECIFICATIONS.
11. TREES SHALL NOT BE LOCATED IN DRAINAGE SWALES, DRAINAGE AREAS, OR UTILITY EASEMENTS. CONTACT OWNER'S REPRESENTATIVE FOR RELOCATION OF PLANTS IN QUESTIONABLE AREAS PRIOR TO INSTALLATION.
12. AT SEED AREA BOUNDARIES ADJACENT TO EXISTING NATIVE AREAS, OVERLAP ABUTTING NATIVE AREAS BY THE FULL WIDTH OF THE SEEDER.
13. EXISTING TURF AREAS THAT ARE DISTURBED DURING CONSTRUCTION, ESTABLISHMENT AND THE MAINTENANCE PERIOD SHALL BE RESTORED WITH NEW SOD TO MATCH EXISTING TURF SPECIES. DISTURBED NATIVE AREAS WHICH ARE TO REMAIN SHALL BE OVER SEEDED AND RESTORED WITH SPECIFIED SEED MIX.
14. CONTRACTOR SHALL OVER SEED ALL MAINTENANCE OR SERVICE ACCESS BENCHES AND ROADS WITH SPECIFIED SEED MIX UNLESS OTHERWISE NOTED ON THE PLANS.
15. ALL SEEDED SLOPES EXCEEDING 25% IN GRADE (4:1) SHALL RECEIVE EROSION CONTROL BLANKETS. PRIOR TO INSTALLATION, NOTIFY OWNER'S REPRESENTATIVE FOR APPROVAL OF LOCATION AND ANY ADDITIONAL COST IF A CHANGE ORDER IS NECESSARY.
16. WHEN COMPLETE, ALL GRADES SHALL BE WITHIN +/- 1/8" OF FINISHED GRADES AS SHOWN ON THE PLANS.
17. THE CONTRACTOR IS EXPECTED TO KNOW AND UNDERSTAND THE TOWN AND COUNTY SPECIFICATIONS FOR LANDSCAPE AND IRRIGATION. IN CASES OF DISCREPANCIES THE HIGHER OF THE TWO STANDARDS SHALL HAVE PRECEDENCE.
18. THE DEVELOPER, HIS SUCCESSORS AND ASSIGNS SHALL BE RESPONSIBLE FOR THE INSTALLATION, MAINTENANCE AND REPLACEMENT OF ALL IMPROVEMENTS SHOWN OR INDICATED ON THE APPROVED LANDSCAPE PLAN ON FILE IN THE PLANNING DEPARTMENT.
19. AS DIRECTED ON PLANS, ALL TREES, SHRUBS, ORNAMENTAL GRASSES, PERENNIALS AND DESIGNATED AREAS OF NATIVE SEED SHALL BE IRRIGATED. ALL TREES, SHRUBS ORNAMENTAL GRASSES TO BE DRIP IRRIGATED. PERENNIALS AND SEED AREAS TO BE SPRAYED.
20. ALL EXISTING TREES SHALL BE PROTECTED AND PRESERVED TO THE EXTENT POSSIBLE.

PLANT LIST

DECIDUOUS ORNAMENTAL TREES	QTY	BOTANICAL NAME	COMMON NAME	ROOT	SIZE	WATER USE	HEIGHT	SPREAD
AC GI	2	ACER GINNALA	AMUR MAPLE	B & B	2.5" CAL.	MOD	20'-25'	20'-25'
AM GR	2	AMELANCHIER X GRANDIFLORA 'AUTUMN BRILLIANCE'	AUTUMN BRILLIANCE SERVICEBERRY	B & B	2.5" CAL.	MOD	20'-25'	20'-25'
DECIDUOUS SHRUBS	QTY	BOTANICAL NAME	COMMON NAME	ROOT	SIZE	WATER USE	HEIGHT	SPREAD
AM RE	4	AMELANCHIER ALNIFOLIA 'REGENT'	REGENT SERVICEBERRY	CONT.	#5	LOW	7'-8'	7'-8'
PE LS	24	PEROVSKIA ATRIPLICIFOLIA 'LITTLE SPIRE' TM	LITTLE SPIRE RUSSIAN SAGE	CONT.	#5	VERY LOW	2'-3'	2'-3'
PO PB	32	POTENTILLA FRUTICOSA 'PINK BEAUTY'	PINK BEAUTY POTENTILLA	CONT.	#5	LOW	2'-3'	2'-3'
PR BE	6	PRUNUS BESSEYI	WESTERN SAND CHERRY	CONT.	#5	LOW	6'-7'	5'-6'
RH AU	13	RHUS TRILOBATA 'AUTUMN AMBER'	AUTUMN AMBER SUMAC	CONT.	#5	VERY LOW	1'-2'	5'-6'
RO WO	8	ROSA WOODSII	MOUNTAIN ROSE	CONT.	#5	LOW	5'-6'	5'-6'
SY PA	5	SYRINGA MEYERI 'PALIBIN'	DWARF KOREAN LILAC	CONT.	#5	LOW	5'-6'	5'-6'
SY VU	6	SYRINGA VULGARIS	COMMON PURPLE LILAC	CONT.	#5	LOW	9'-12'	9'-10'
EVERGREEN SHRUBS	QTY	BOTANICAL NAME	COMMON NAME	ROOT	SIZE	WATER USE	HEIGHT	SPREAD
BE RP	28	BERBERIS REPENS	CREeping BARBERRY	CONT.	5 GAL.	LOW	1'-2'	1'-2'
JU PN	17	JUNIPERUS PROCUMBENS 'NANA'	DWARF CREEPING JUNIPER	CONT.	5 GAL.	LOW	1'-2'	3'-4'
JU BL	12	JUNIPERUS SQUAMATA 'BLUE STAR'	BLUE STAR JUNIPER	CONT.	5 GAL.	LOW	3'-4'	4'-5'
PI NI	12	PICEA ABIES 'NIDIFORMIS'	BIRD'S NEST SPRUCE	CONT.	5 GAL.	LOW	4'-5'	4'-5'
PI GG	13	PICEA PUNGENS 'GENTRY'S GEM'	GENTRY'S GEM SPRUCE	CONT.	5 GAL.	MOD	4'-5'	4'-5'
PI MG	11	PICEA PUNGENS 'MONTGOMERY'	MONTGOMERY SPRUCE	CONT.	5 GAL.	MOD	5'-6'	5'-6'
ORNAMENTAL GRASSES	QTY	BOTANICAL NAME	COMMON NAME	ROOT	SIZE	WATER USE	HEIGHT	SPREAD
CA KF	55	CALAMAGROSTIS X ACUTIFLORA 'KARL FOERSTER'	KARL FOERSTER FEATHER REED GRASS	CONT.	#1	LOW	4'-5'	1'-2'
PE AL	18	PENNISETUM ALOPECUROIDES	CHINESE FOUNTAIN GRASS	CONT.	#1	LOW	3'-4'	3'-4'
SC SC	39	SCHIZACHYRIUM SCOPARIUM 'BLAZE'	BLAZE LITTLE BLUESTEM	CONT.	#1	LOW	3'-4'	2'-3'

By my count:
Native: 154
Drought resistant: 181
Native & drought: 131
Total plantings: 307
% native: 50%
% drought resistant: 59%
% native & drought: 43%

Note: counts include the 2 picea that are unclear

XERISCAPE WILDFLOWER SEED MIXTURE

COMMON NAME	% OF TOTAL	OZ. PER 1,000 S.F.
ENGELMANN DAISY	12%	0.96 OZ.
ROCKY MOUNTAIN BEEPLANT	10%	0.80 OZ.
BLUE FLAX	10%	0.80 OZ.
MAXMILANS SUNFLOWER	10%	0.80 OZ.
PLAINS COREOPSIS	10%	0.80 OZ.
CALIFORNIA POPPY	10%	0.80 OZ.
PALMER'S PENSTEMON	10%	0.80 OZ.
BLANKETFLOWER	8%	0.64 OZ.
PALE EVENING PRIMROSE	5%	0.40 OZ.
PRAIRIE CONEFLOWER	5%	0.40 OZ.
MEXICAN HAT	5%	0.40 OZ.
FIRECRACKER PENSTEMON	2%	0.16 OZ.
ROCKY MOUNTAIN PENSTEMON	2%	0.16 OZ.
DOTTED GAYFEATHER	1%	0.08 OZ.
TOTAL	100%	8.0 OZ.

WESTERN NATIVE SEED.COM
SPREAD SEED AT A RATE OF 8 OUNCES PER 1,000 SQUARE FEET

SITE AMENITY SCHEDULE



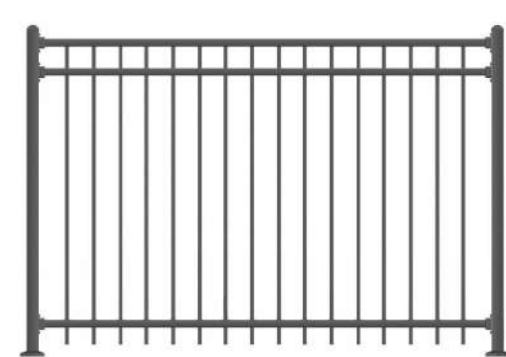
1 DESCRIPTION: BENCH
MANUFACTURER: TBD
MODEL: TBD
COLOR / FINISH: STANDARD BLACK
NOTES: INSTALL PER MANUFACTURER'S SPECIFICATIONS OR APPROVED EQUAL



2 DESCRIPTION: BOULDER
MANUFACTURER: LOCAL SOURCE
MODEL: N/A
COLOR / FINISH: NATURAL FINISH
NOTES: REFER TO LANDSCAPE DETAILS FOR INSTALLATION SPECIFICATIONS



3 DESCRIPTION: BIKE RACK
MANUFACTURER: TBD
MODEL: TBD
COLOR / FINISH: STANDARD BLACK
NOTES: INSTALL PER MANUFACTURER'S SPECIFICATIONS OR APPROVED EQUAL



4 DESCRIPTION: 4' METAL PICKET FENCE
MANUFACTURER: TBD
MODEL: TBD
COLOR / FINISH: STANDARD BLACK
NOTES: INSTALL PER MANUFACTURER'S SPECIFICATIONS OR APPROVED EQUAL



5 DESCRIPTION: CONCRETE PLANTER
COLOR / FINISH: MATCH ARCHITECTURE

MAJOR SITE PLAN LANDSCAPE PLAN

GLENWOOD SPRINGS, COLORADO

CATHOLIC CHARITIES
HOUSING
6240 SMITH ROAD
DENVER, CO 80216

NOT FOR
CONSTRUCTION

10-17-2023

LP-101

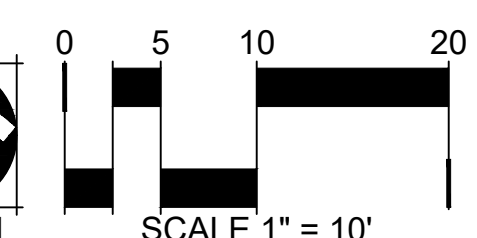


GLENWOOD SPRINGS, COLORADO

VER, CO 80216

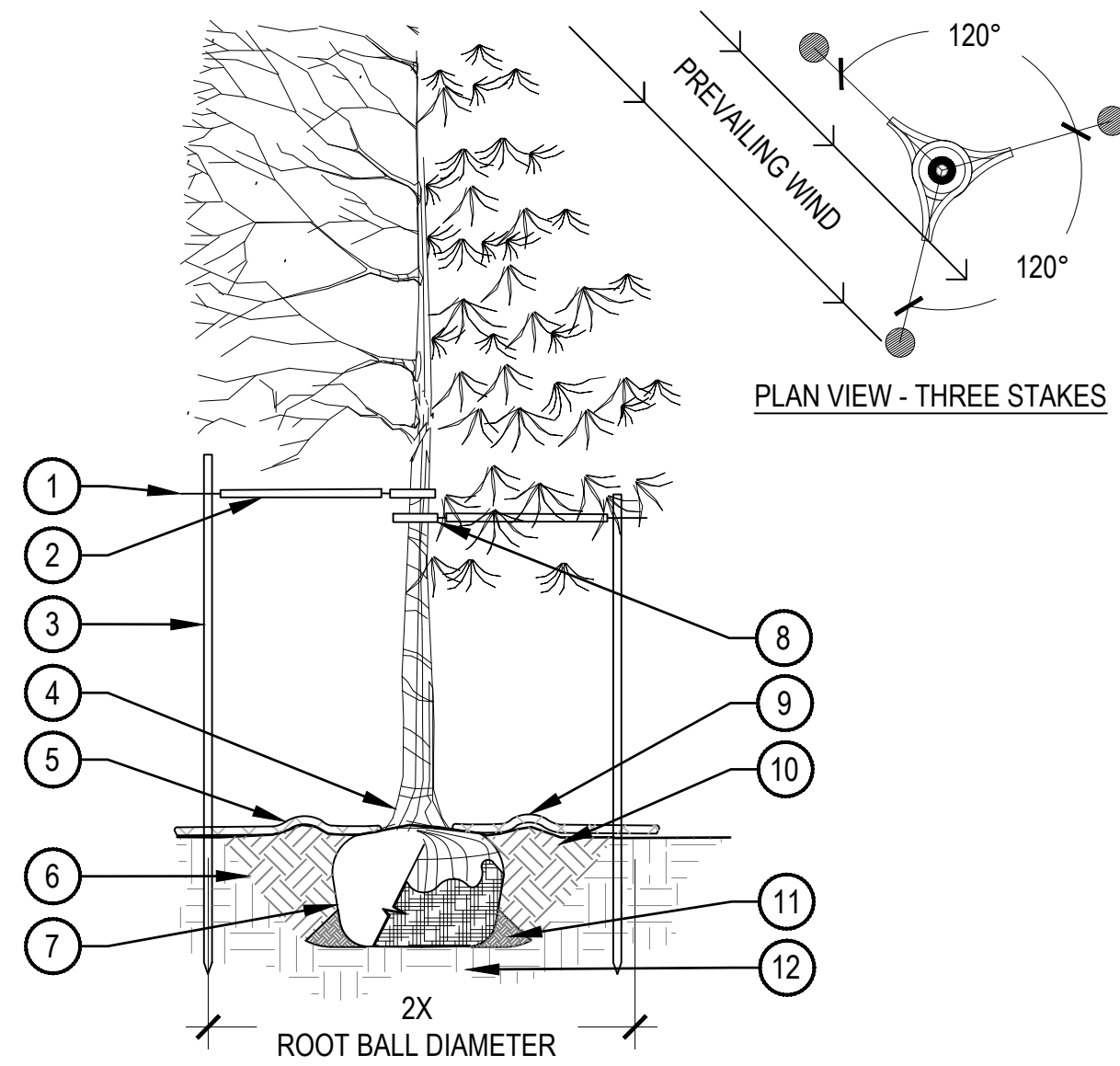
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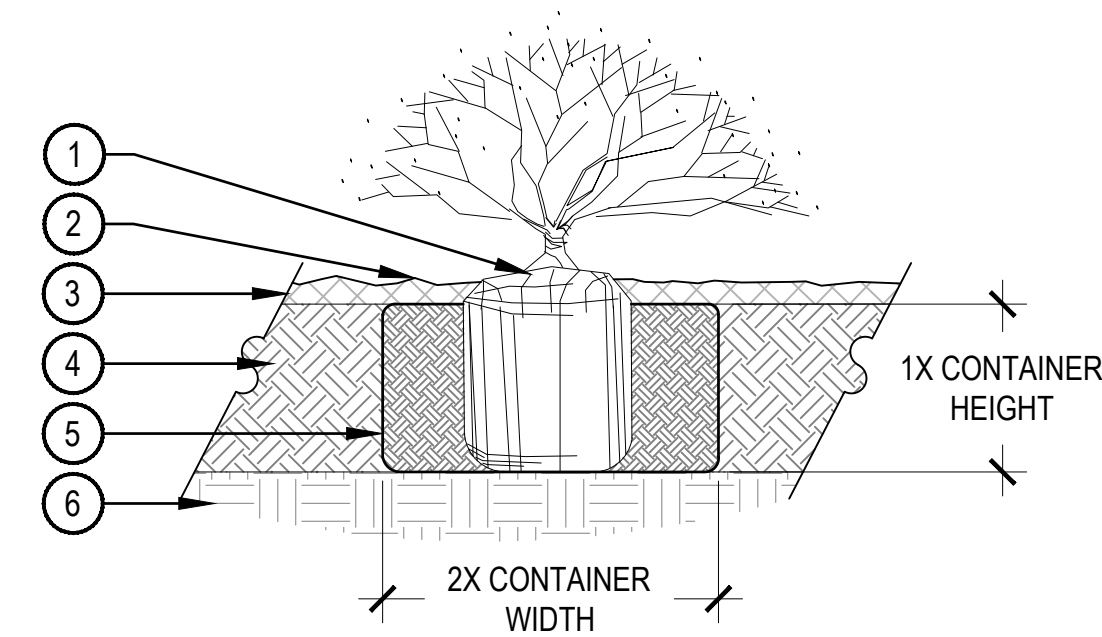


PRUNING NOTES:
1. ALL PRUNING SHALL COMPLY WITH ANSI A300 STANDARDS.
2. DO NOT HEAVILY PRUNE TREE AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO-DOMINANT LEADERS AND BROKEN BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED. HOWEVER, DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN.

STAKING NOTES:
1. STAKE TREES PER DIAGRAM. AFTER A MINIMUM OF (3) THREE YEARS CONFIRM TREE IS ESTABLISHED. CHECK FOR ROOTBALL STABILITY. APPLY HAND PRESSURE TO TRUNK OF TREE, WHEN ROOTBALL DOES NOT MOVE, REMOVE STAKING.
a. 2" CALIPER SIZE AND UNDER DECIDUOUS AND ASPEN TREES - MINIMUM 2 STAKES - ONE ON N.W. SIDE, ONE ON S.W. SIDE (OR PREVAILING WIND SIDE AND 180° FROM THAT SIDE).
b. EVERGREEN TREES - 3 STAKES PER DIAGRAM.
c. 3" CALIPER SIZE AND LARGER - 3 STAKES PER DIAGRAM.
2. WIRE OR CABLE SHALL BE MINIMUM 12 GAUGE. TIGHTEN WIRE OR CABLE ONLY ENOUGH TO KEEP FROM SLIPPING. ALLOW FOR SOME TRUNK MOVEMENT. NYLON STRAPS SHALL BE LONG ENOUGH TO ACCOMMODATE 1-1/2" OF GROWTH AND BUFFER ALL BRANCHES FROM WIRE.
3. ADJUST STAKING, STRAPS AND GUY WIRES ANNUALLY.
4. TREATED WOOD POST PREFERRED. METAL T STAKES WITH PLASTIC SAFETY CAPS ACCEPTABLE WITH APPROVAL FROM OWNER.



- 1 GALVANIZED WIRE
- 2 PLACE MINIMUM 1/2" PVC PIPE AROUND EACH WIRE, EXPOSED WIRE SHALL BE MAXIMUM 2" EACH SIDE
- 3 INSTALL STAKING PER SPECIFICATIONS
- 4 PLANT TREE SO THAT FIRST ORDER MAJOR ROOT IS 1'-2" ABOVE FINAL GRADE
- 5 2'-0" RADIUS MULCH RING, CENTERED ON TRUNK, 3" DEPTH, ON TOP OF WEED FABRIC, DO NOT PLACE MULCH IN CONTACT WITH TREE TRUNK, FINISHED GRADE REFERENCES TOP OF MULCH
- 6 1:1 SLOPE ON SIDES OF PLANTING HOLE
- 7 REMOVE ALL TWINE, ROPE, BURLAP AND WIRE FROM THE ENTIRE ROOTBALL AND TRUNK
- 8 GROMMETED NYLON STRAPS
- 9 4-6" HIGH WATER SAUCER IN NON-TURF AREAS
- 10 BACKFILL AROUND ROOTBALL WITH PLANT MIX, PLANT MIX SHALL CONSIST OF EQUAL PARTS TOPSOIL, COMPOST, EXCAVATED SOIL, PLUS MYCORRHIZAL INOCULANT PER SPECIFICATIONS
- 11 PLACE SOIL AROUND ROOT BALL FIRMLY, DO NOT COMPACT OR TAMP, SETTLE SOIL WITH WATER TO FILL ALL AIR POCKETS
- 12 PLACE ROOT BALL ON UNDISTURBED SOIL TO PREVENT SETTLEMENT



NOTE:
1. BROKEN OR CRUMBLING ROOT-BALLS WILL BE REJECTED.
2. CARE SHOULD BE TAKEN NOT TO DAMAGE THE SHRUB OR ROOT-BALL WHEN REMOVING IT FROM ITS CONTAINER.
3. ALL JUNIPERS SHOULD BE PLANTED SO THE TOP OF THE ROOT-BALL OCCURS ABOVE THE FINISH GRADE OF THE MULCH LAYER.
4. DIG PLANT PIT TWICE AS WIDE AND AS HIGH AS THE CONTAINER.
5. PRUNE ALL DEAD OR DAMAGED WOOD PRIOR TO PLANTING, DO NOT PRUNE MORE THAN 20% OF LIMBS.

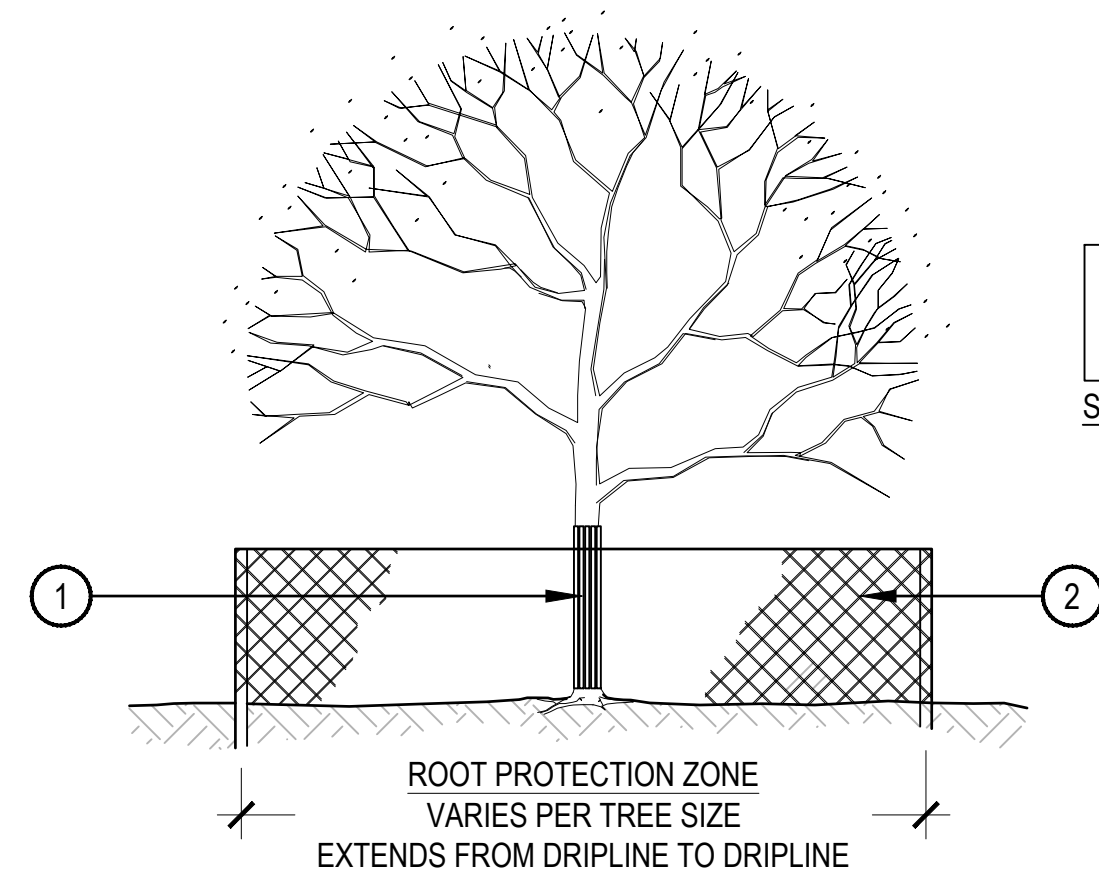
1 TREE PLANTING DETAIL

SCALE: 3/16" = 1'-0"

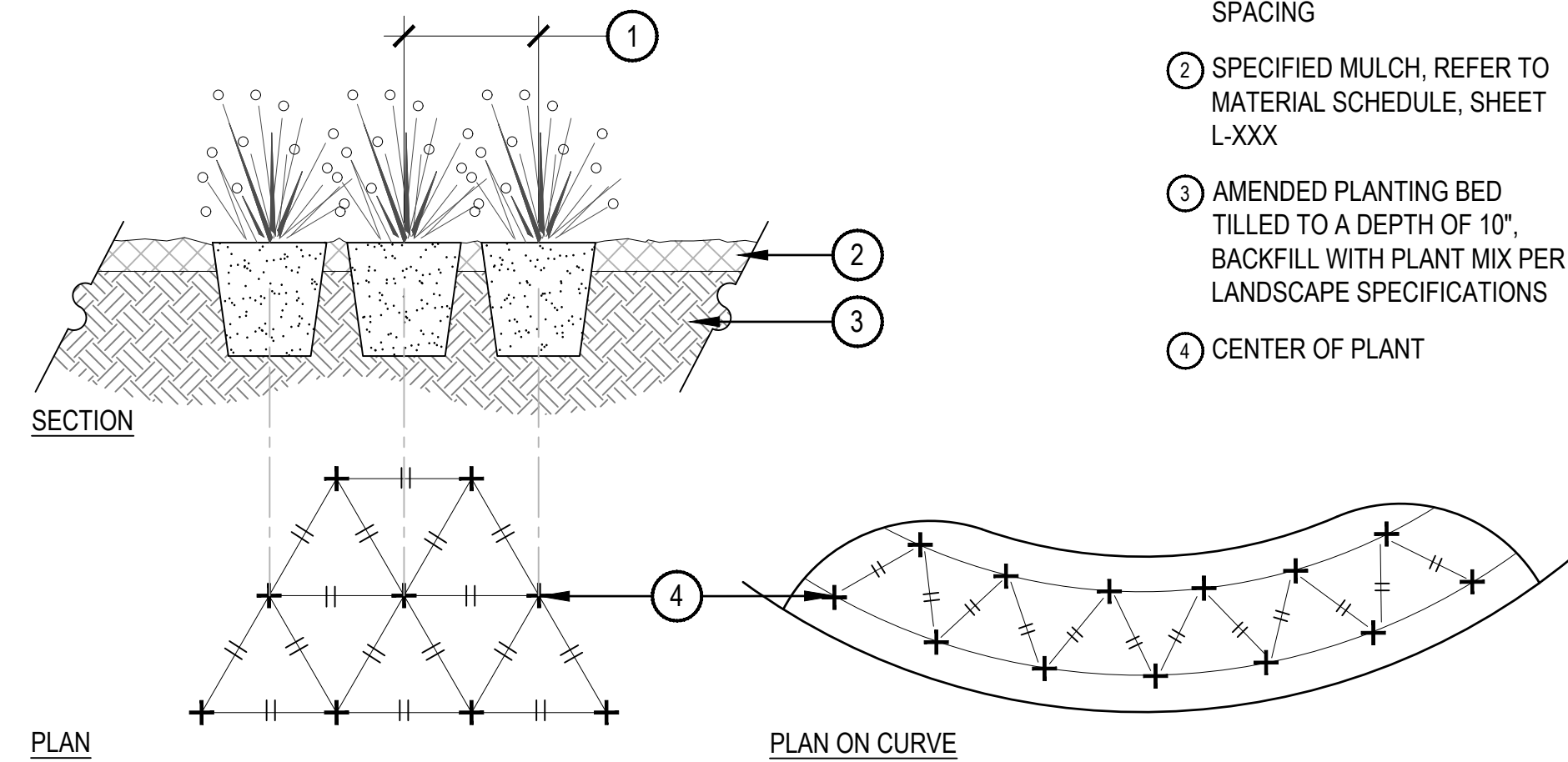
2 SHRUB PLANTING

SCALE: 1 1/2" = 1'-0"

NOTES:
1. TREES TO BE PROTECTED AND PRESERVED SHALL BE IDENTIFIED ON THE TRUNK WITH WHITE SURVEY TAPE. GROUPING OF MORE THAN ONE TREE MAY OCCUR.
2. TO PREVENT ROOT SMOTHERING, SOIL STOCKPILES, SUPPLIES, EQUIPMENT OR ANY OTHER MATERIAL SHALL NOT BE PLACED OR STORED WITHIN THE DRIP LINE OR WITHIN 15 FEET OF A TREE TRUNK, WHICHEVER IS GREATER.
3. FENCING MATERIAL SHALL BE SET AT THE DRIP LINE OR 15 FEET FROM TREE TRUNK, WHICHEVER IS GREATER, AND MAINTAINED IN AN UPRIGHT POSITION THROUGHOUT THE DURATION OF CONSTRUCTION ACTIVITIES.
4. FENCING MATERIAL SHALL BE BRIGHT, CONTRASTING COLOR, DURABLE, AND A MINIMUM OF FOUR FEET IN HEIGHT. TREE ROOTS SHALL NOT BE CUT UNLESS CUTTING IS UNAVOIDABLE.
5. WHEN ROOT CUTTING IS UNAVOIDABLE, A CLEAN SHARP CUT SHALL BE MADE TO AVOID SHREDDING OR SMASHING. ROOT CUTS SHOULD BE MADE BACK TO A LATERAL ROOT. ROOTS SHALL BE CUT NO MORE THAN 1/3 OF THE RADIUS FROM DRIPLINE TO TRUNK. WHENEVER POSSIBLE, ROOTS SHOULD BE CUT BETWEEN LATE FALL AND BUD OPENING, DURING DORMANCY PERIOD. ROOT STIMULATOR SHALL BE APPLIED TO CUT ROOTS. EXPOSED ROOTS SHALL BE COVERED IMMEDIATELY TO PREVENT DEHYDRATION. ROOTS SHALL BE COVERED WITH SOIL OR BURLAP AND KEPT MOIST. WATERING OF PROTECTED TREES IN WHICH ROOTS WERE CUT SHALL BE PROVIDED BY THE CONTRACTOR.
6. WHEN ROOT CUTTING IS UNAVOIDABLE, A CLEAN SHARP CUT SHALL BE MADE TO AVOID SHREDDING OR SMASHING. ROOT CUTS SHOULD BE MADE BACK TO A LATERAL ROOT. WHENEVER POSSIBLE, ROOTS SHOULD BE CUT BETWEEN LATE FALL AND BUD OPENING, DURING DORMANCY PERIOD. EXPOSED ROOTS SHALL BE COVERED IMMEDIATELY TO PREVENT DEHYDRATION. ROOTS SHALL BE COVERED WITH SOIL OR BURLAP AND KEPT MOIST. WATERING OF PROTECTED TREES IN WHICH ROOTS WERE CUT SHALL BE PROVIDED BY THE CONTRACTOR.
7. ANY GRADE CHANGES (SUCH AS THE REMOVAL OF TOPSOIL OR ADDITION OF FILL MATERIAL) WITHIN THE DRIP LINE SHOULD BE AVOIDED FOR EXISTING TREES TO REMAIN. RETAINING WALLS AND TREE WELLS ARE ACCEPTABLE ONLY WHEN CONSTRUCTED PRIOR TO GRADE CHANGE.



- 1 TRUNK PROTECTION - 1" BOARDS NO LESS THAN 5' LONG OR TO REACH FIRST SCAFFOLD BRANCH. WIRE TO HOLD BOARDS IN PLACE, NO NAILS PERMITTED. INCLUDE WRAPPING OF BURLAP UNDER BOARDS.
- 2 BRANCH PROTECTION - PROTECT LOWER BRANCHES OF TREE CANOPY. PROVIDE CONSTRUCTION FENCING OR EQUAL AT DRIPLINE MINIMUM.
- 3 PLACE SIGNS EVERY 50', PLACE SIGNS WHERE VISIBLE, ATTACH TO FENCING.



NOTES:
1. WHEN PLANTED ON A CURVE, ORIENT ROWS TO FOLLOW THE LONG AXIS OF AREAS WHERE PLANTS ARE MASSSED.

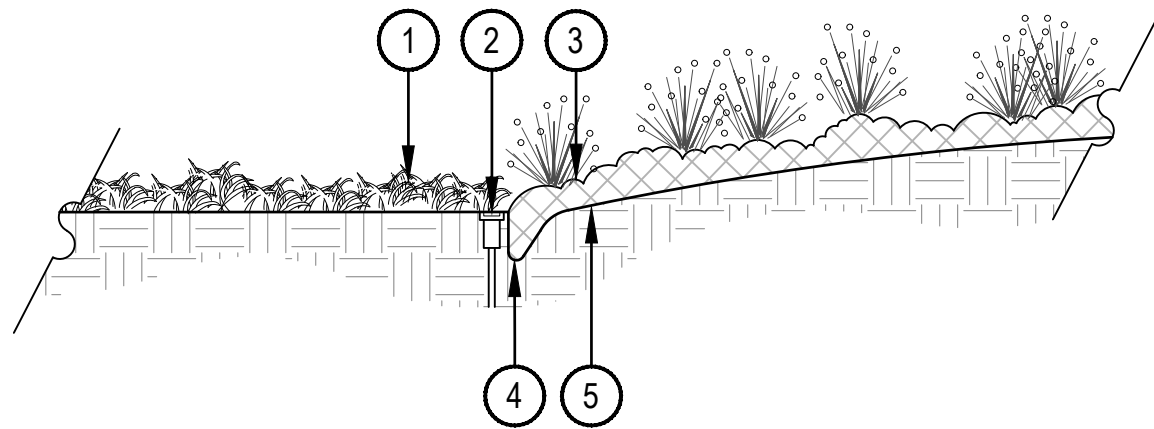
3 TREE PROTECTION

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

4 ORNAMENTAL GRASS AND PERENNIAL PLANT LAYOUT

SCALE: 1" = 1'-0"

- 1 TURFGRASS OR DYLAND SEED
- 2 IRRIGATION HEADS SHOULD BE LOCATED ADJACENT TO MULCH BEDS, OFFSET HEAD INTO GRASS AREA TO ENSURE STABLE SUPPORT
- 3 PLANTING BED
- 4 VERTICAL SPADE CUT EDGE FILLED WITH SPECIFIED MULCH, TAPER EDGE OF BED SO MULCH IS DEEPER AGAINST SPADED EDGE
- 5 SPECIFIED DEPTH OF MULCH, TYPICALLY WOOD MULCH 3"-4" DEEP



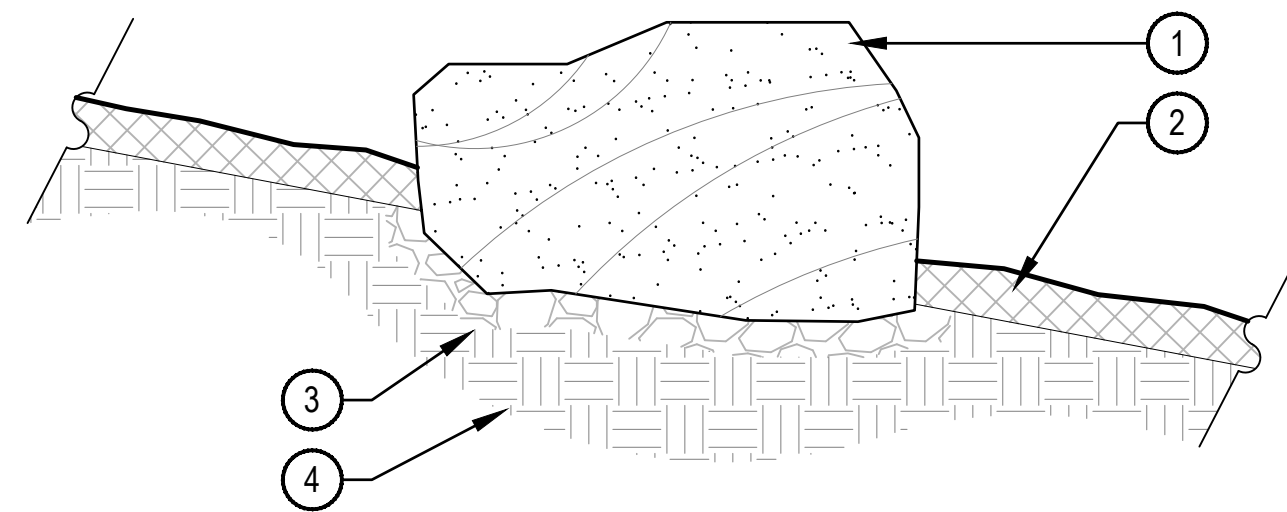
5 SPADE CUT EDGE

SCALE: 1/2" = 1'-0"

6 LANDSCAPE BOULDER

SCALE: 3/4" = 1'-0"

NOTES:
1. THESE ARE FREE STANDING BOULDERS ONLY. BOULDERS ASSOCIATED WITH THE BOULDER RETAINING WALLS, PARK ENTRY SIGNS AND INTERPRETIVE SIGNS ARE NOT INCLUDED IN THIS COUNT.
2. THE OWNERS REPRESENTATIVE SHALL APPROVE LOCATIONS AND SIZES OF ALL BOULDERS PRIOR TO PLACING.
3. CONTRACTOR SHALL SUBMIT SAMPLE OR PHOTOS FOR APPROVAL.



- 1 BOULDER, NATURALLY SET BOULDER SO THAT A MINIMUM 1/4 OF BOULDER IS BELOW FINISH GRADE
- 2 SPECIFIED MULCH, CRUSHER FINES OR COBBLE, REFER TO PLAN
- 3 3" MINIMUM ROAD BASE COMPACTED TO 95% OF STANDARD PROCTOR DENSITY
- 4 UNDISTURBED GRADE

THE BENEDICT
MAJOR SITE PLAN
GLENWOOD SPRINGS, COLORADO

Prepared for:
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Housing
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Prepared by:
Cameron Hemenway
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arc.com
720-681-6417

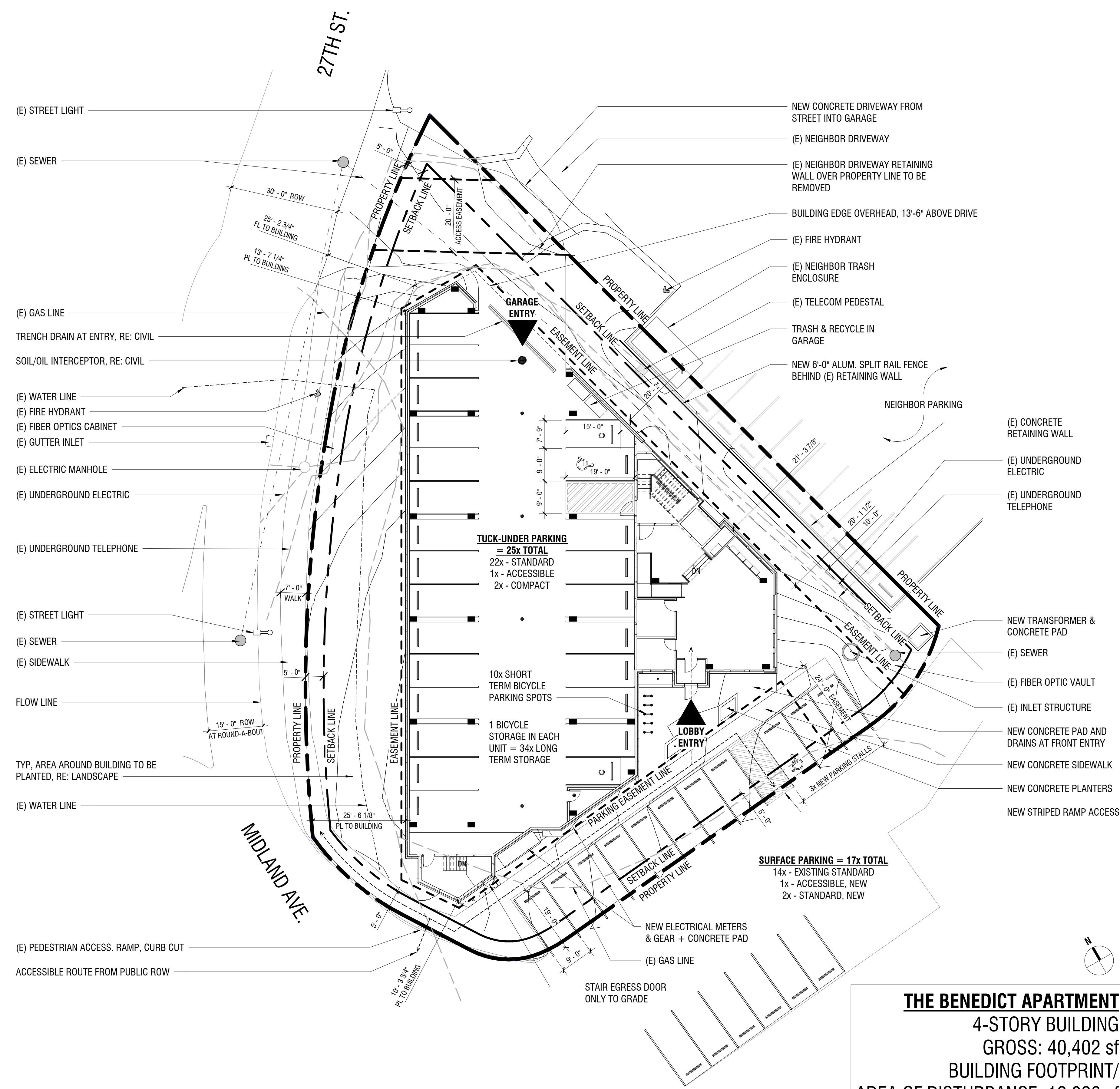
NOT FOR
CONSTRUCTION

DATE:
10/17/23

SHEET TITLE:
ARCHITECTURAL
SITE PLAN

SHEET NUMBER:

A-01



THE BENEDICT APARTMENT
4-STORY BUILDING
GROSS: 40,402 sf
BUILDING FOOTPRINT/
AREA OF DISTURBANCE: 12,026 sf

PRELIMINARY SITE PLAN

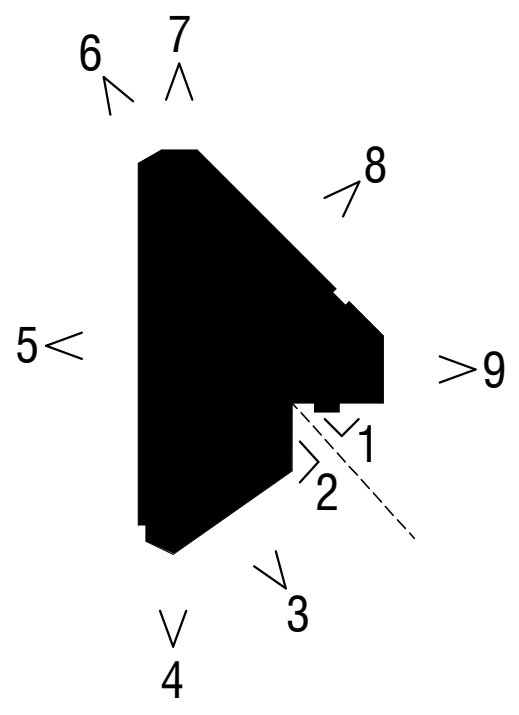
1/16" = 1'-0"

CHECKED BY: KM
DRAWN BY: CH2



3 PRELIMINARY ELEVATION 3
1/8" = 1'-0"

KEYNOTES PER SHEET	
Key Value	Keynote Text
3.01	CONCRETE PAD, RE: CIVIL
3.05	CONCRETE PLANTER, RE: LANDSCAPE
4.04	BRICK, NORMAN
4.05	BRICK, ACCENT FRAME
4.06	BRICK, SMOOTH
4.07	BRICK, ROCKFACE
5.08	METAL MECHANICAL LOUVER, PAINT TO MATCH ADJACENT
5.10	METAL GUTTER, PRE-FINISHED - DARK GREY
5.32	ALUMINUM, SPLIT RAIL FENCE, 6'-0" - BLACK
7.01	60 MIL CLASS A, TPO ROOF MEMBRANE ON (R-30) RIGID INSULATION, 1/2" DENS DECK COVERBOARD, 6 MIL AIR BARRIER
7.02	METAL PARAPET CAPPRE-FINISHED, CONTINUOUS
8.01	VINYL WINDOW, TYP. AT UNITS, RE: WINDOW TYPES
8.03	ALUMINUM CLAD WOOD WINDOW (SIERRA PACIFIC), TYP. AT AMENITY: RE WINDOW TYPES
8.04	HM EXT. DOOR, INSULATED, PAINTED, RE: DOOR TYPES
9.11	CEMENTITIOUS SIDING, 6" LAP BOARD, RUSTIC, FACTORY PRIMED, FIELD PAINTED - OFF WHITE
9.18	CEMENTITIOUS REVERSE BOARD-N-BATTEN SIDING, RUSTIC, FACTORY PRIMED, FIELD PAINTED - OFF WHITE
9.19	CEMENTITIOUS REVERSE BOARD-N-BATTEN SIDING, RUSTIC, FACTORY PRIMED, FIELD PAINTED - DARK GREY
9.23	CEMENTITIOUS FASCIA TRIM, RUSTIC, FACTORY PRIMED, FIELD PAINTED - DARK GREY
9.30	ALASKAN YELLOW CEDAR, EXT. TRIM, CLEAR FINISH
9.36	ASPHALT ROOF SHINGLE - DARK GREY
23.01	DOAS W/ ERV UNIT ON ROOF CURB; RE: MECHANICAL
23.06	42" PTAC UNIT; RE: WINDOW DETAILS AND MECHANICAL
26.01	TRANSFORMER AND CONNECTION CABINET, RE: ELECTRICAL
26.03	ELECTRIC METERS, RE: ELECTRICAL
26.15	EXTERIOR WALL SCONCE, RE: ELECTRICAL
26.22	SURFACE MOUNTED FIXTURE, RE: ELECTRICAL



VIEW KEY PLAN



2 PRELIMINARY ELEVATION 2
1/8" = 1'-0"



1 PRELIMINARY ELEVATION 1
1/8" = 1'-0"



THE BENEDICT
MAJOR SITE PLAN
GLENWOOD SPRINGS, COLORADO

Prepared for:
Justin Raddatz
Catholic Charities
Housing
JRaddatz@ccdenver.org
720-639-7608

Prepared by:
Cameron Hemenway
cameron@shopworks
arc.com
720-681-6417

NOT FOR
CONSTRUCTION

DATE:
10/17/23

SHEET TITLE:
BUILDING
ELEVATIONS

SHEET NUMBER:
A-02

CHECKED BY: CH2
DRAWN BY:

CHECKED BY: Author
DRAWN BY:

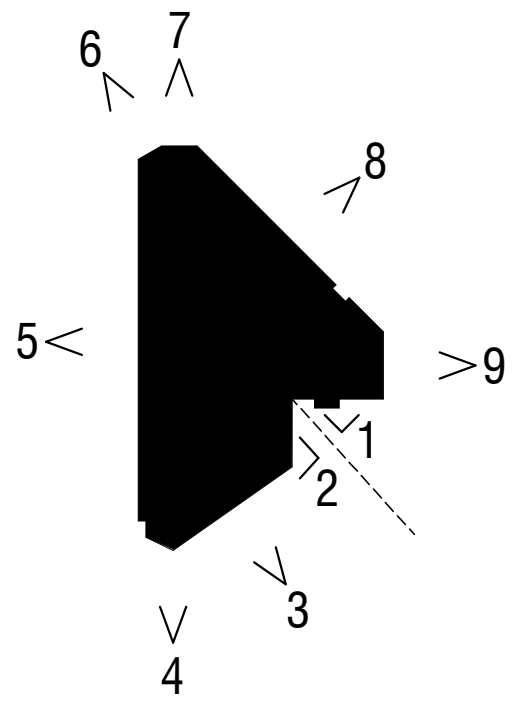


5 PRELIMINARY ELEVATION 5
1/8" = 1'-0"

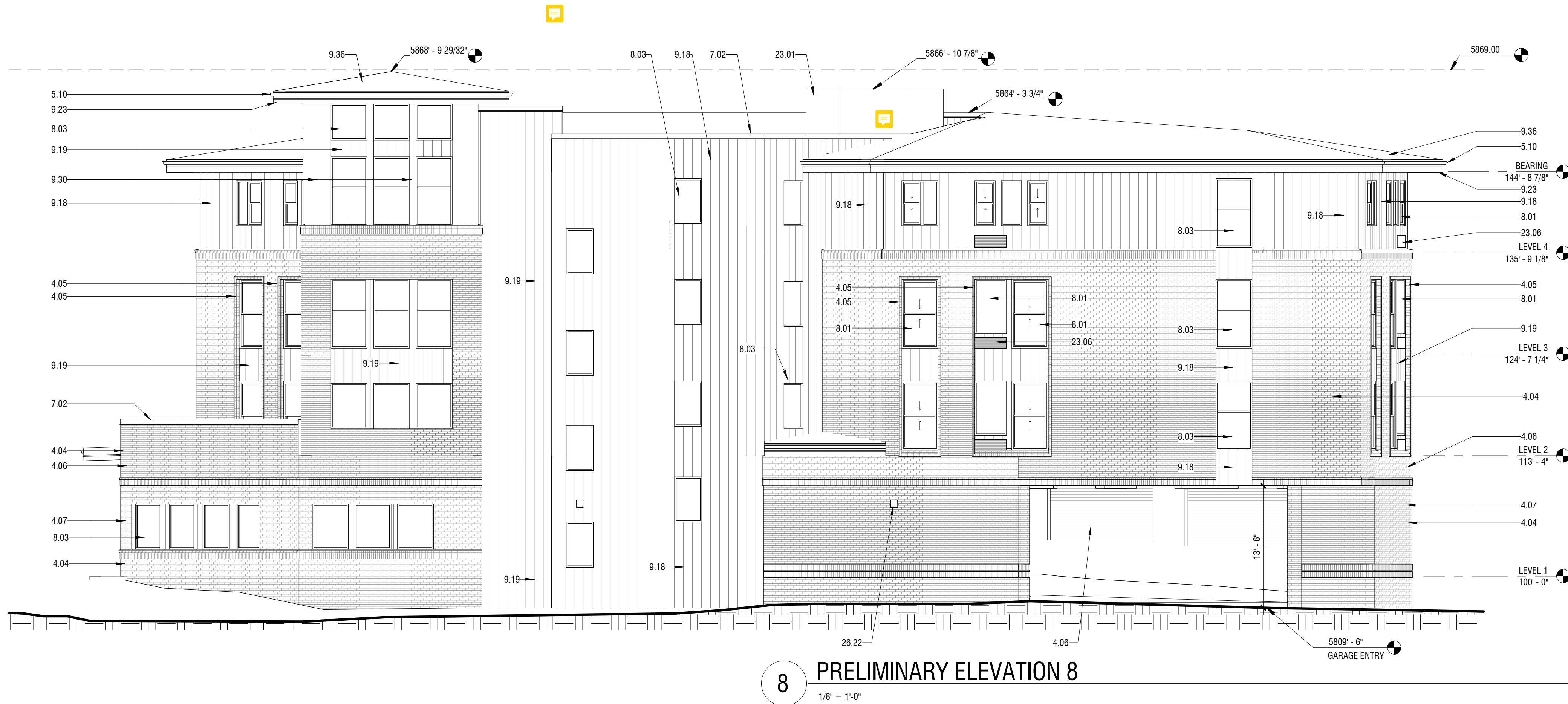


4 PRELIMINARY ELEVATION 4
1/8" = 1'-0"

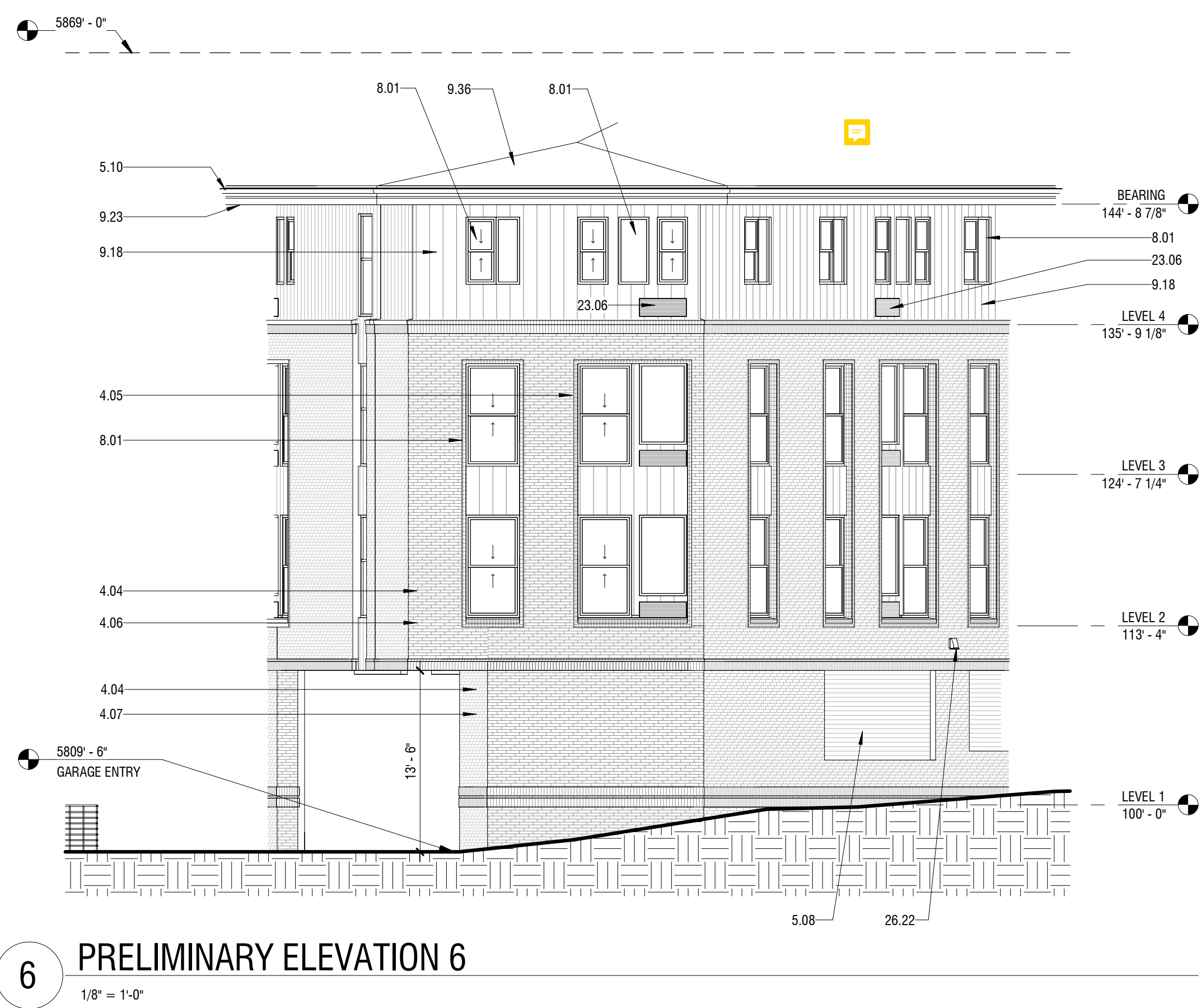
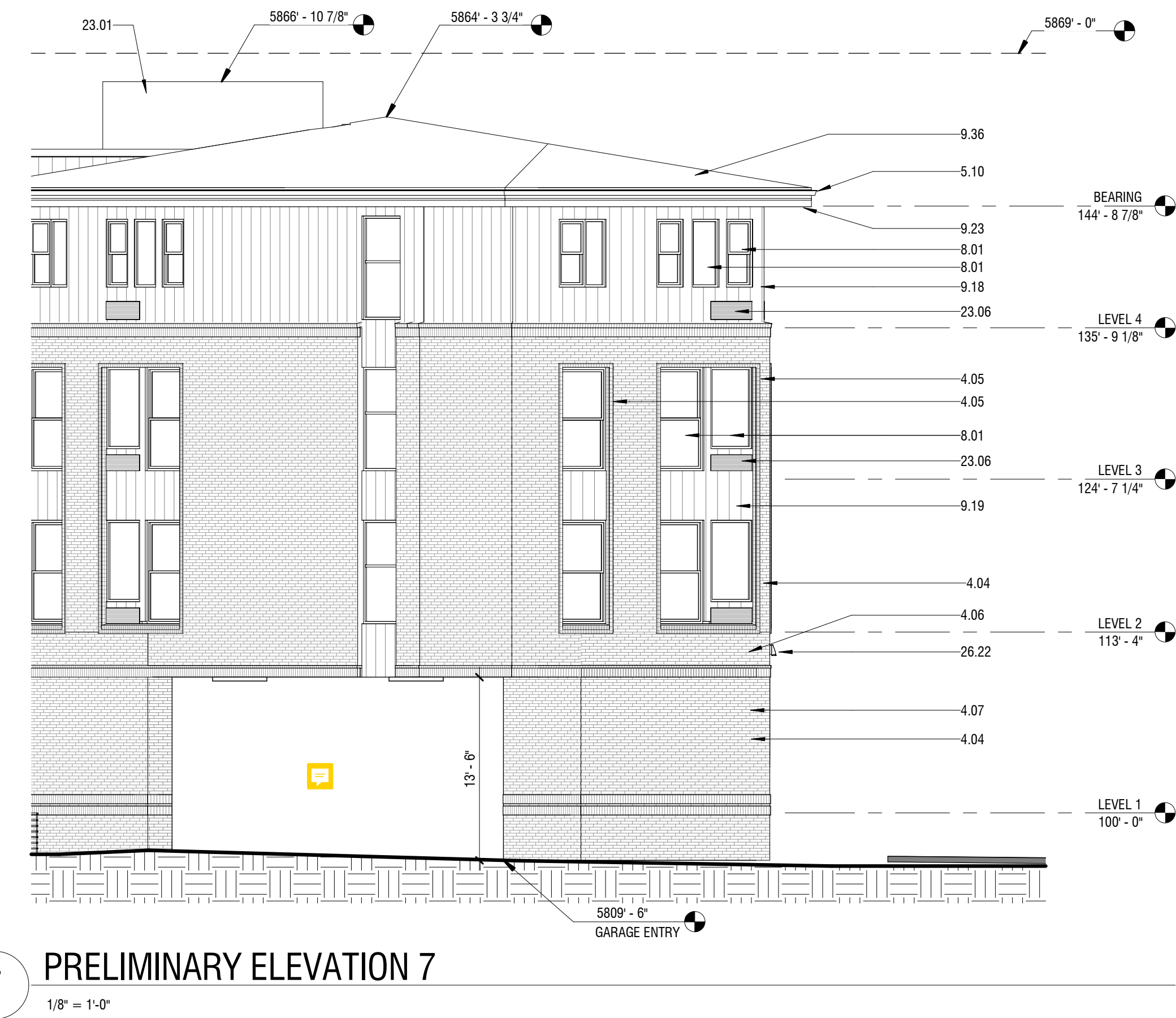
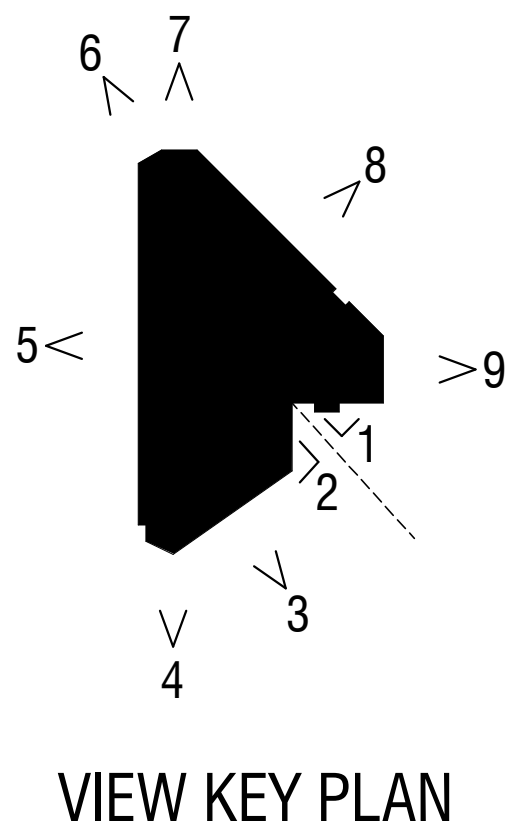
KEYNOTES PER SHEET	
Key Value	Keynote Text
4.04	BRICK, NORMAN
4.05	BRICK, ACCENT FRAME
4.06	BRICK, SMOOTH
4.07	BRICK, ROCKFACE
5.08	METAL MECHANICAL LOUVER, PAINT TO MATCH ADJACENT
5.10	METAL GUTTER, PRE-FINISHED - DARK GREY
8.01	VINYL WINDOW, TYP. AT UNITS, RE: WINDOW TYPES
8.03	ALUMINUM CLAD WOOD WINDOW (SIERRA PACIFIC), TYP. AT AMENITY, RE: WINDOW TYPES
8.04	HM EXT. DOOR, INSULATED, PAINTED, RE: DOOR TYPES
9.18	CEMENTITIOUS REVERSE BOARD-N-BATTEN SIDING, RUSTIC, FACTORY PRIMED, FIELD PAINTED - OFF WHITE
9.19	CEMENTITIOUS REVERSE BOARD-N-BATTEN SIDING, RUSTIC, FACTORY PRIMED, FIELD PAINTED - DARK GREY
9.23	CEMENTITIOUS FASCIA TRIM, RUSTIC, FACTORY PRIMED, FIELD PAINTED - DARK GREY
9.36	ASPHALT ROOF SHINGLE - DARK GREY
23.01	DOAS W/ ERY UNIT ON ROOF CURB, RE: MECHANICAL
23.06	42" PTAC UNIT, RE: WINDOW DETAILS AND MECHANICAL
26.01	TRANSFORMER AND CONNECTION CABINET, RE: ELECTRICAL
26.03	ELECTRIC METERS, RE: ELECTRICAL
26.15	EXTERIOR WALL SCONCE, RE: ELECTRICAL
26.22	SURFACE MOUNTED FIXTURE, RE: ELECTRICAL



VIEW KEY PLAN



KEYNOTES PER SHEET	
Key Value	Keynote Text
4.04	BRICK, NORMAN
4.05	BRICK, ACCENT FRAME
4.06	BRICK, SMOOTH
4.07	BRICK, ROCKFACE
5.08	METAL MECHANICAL LOUVER, PAINT TO MATCH ADJACENT
5.10	METAL GUTTER, PRE-FINISHED - DARK GREY
7.02	METAL PARAPET CAPPRE-FINISHED, CONTINUOUS
8.01	VINYL WINDOW, TYP. AT UNITS, RE: WINDOW TYPES
8.03	ALUMINUM CLAD WOOD WINDOW (SIERRA PACIFIC), TYP. AT AMENITY: RE WINDOW TYPES
9.18	CEMENTITIOUS REVERSE BOARD-N-BATTEN SIDING, RUSTIC, FACTORY PRIMED, FIELD PAINTED - OFF WHITE
9.19	CEMENTITIOUS REVERSE BOARD-N-BATTEN SIDING, RUSTIC, FACTORY PRIMED, FIELD PAINTED - DARK GREY
9.23	CEMENTITIOUS FASCIA TRIM, RUSTIC, FACTORY PRIMED, FIELD PAINTED - DARK GREY
9.30	ALASKAN YELLOW CEDAR, EXT. TRIM, CLEAR FINISH
9.36	ASPHALT ROOF SHINGLE - DARK GREY
23.01	DOAS W/ ERY UNIT ON ROOF CURB; RE: MECHANICAL
23.06	42" PTAC UNIT, RE: WINDOW DETAILS AND MECHANICAL
26.22	SURFACE MOUNTED FIXTURE, RE: ELECTRICAL



Prepared for:
Justin Raddatz
Catholic Charities
Housing
JRaddatz@ccdenver.org
720-639-7608

Prepared by:
Cameron Hemenway
cameron@shopworks
arc.com
720-681-6417

NOT FOR
CONSTRUCTION

DATE:
10/17/23

SHEET TITLE:

BUILDING
ELEVATIONS

SHEET NUMBER:

A-04

KEYNOTES PER SHEET	
Key Value	Keynote Text

THE BENEDICT

MAJOR SITE PLAN

GLENWOOD SPRINGS, COLORADO

Prepared for:
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720-639-7608

Prepared by:
Cameron Hemenway
cameron@shopworks
arc.com
720-681-6417

NOT FOR
CONSTRUCTION

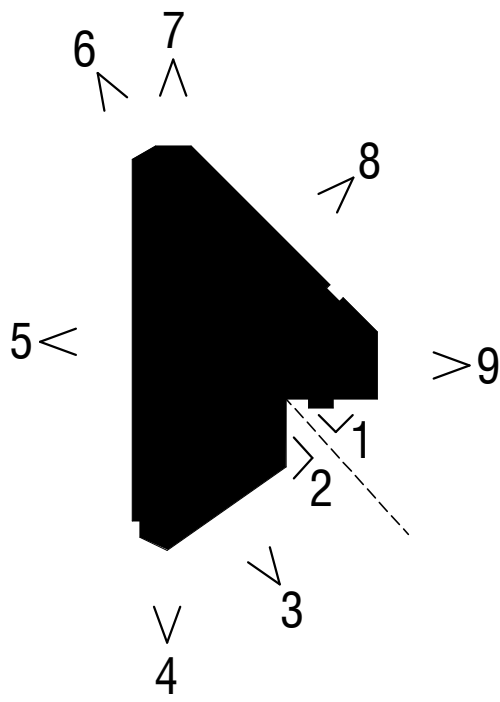
DATE:
10/17/23

SHEET TITLE:

BUILDING
ELEVATIONS

SHEET NUMBER:

A-05



VIEW KEY PLAN

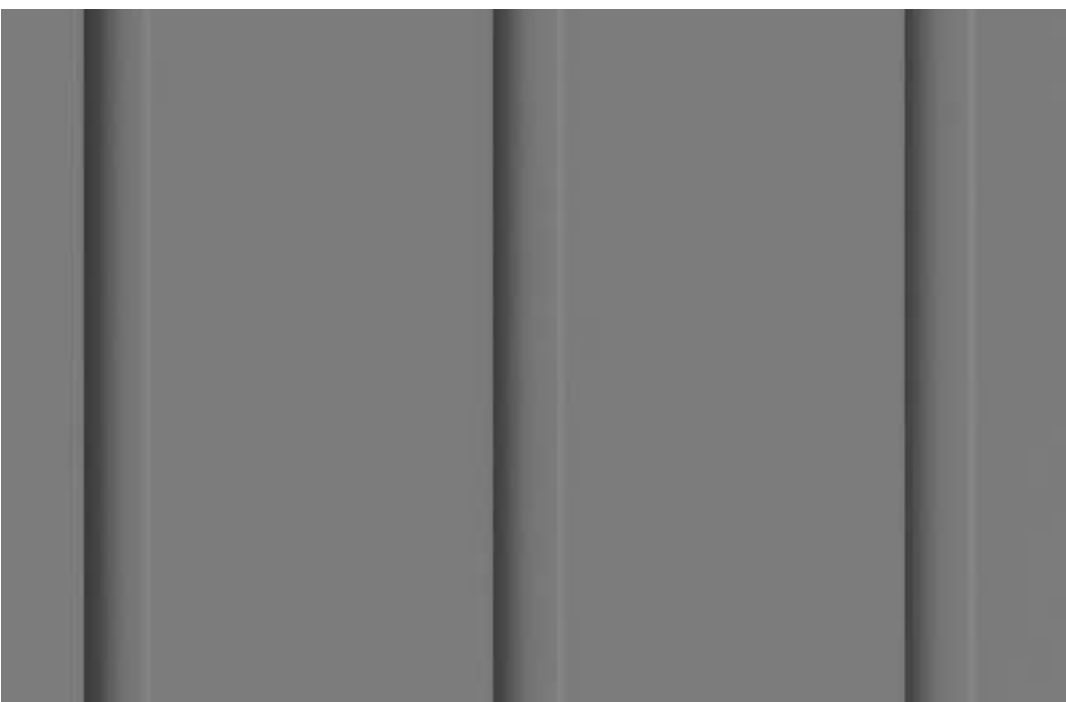


9 PRELIMINARY ELEVATION 9
1/8" = 1'-0"

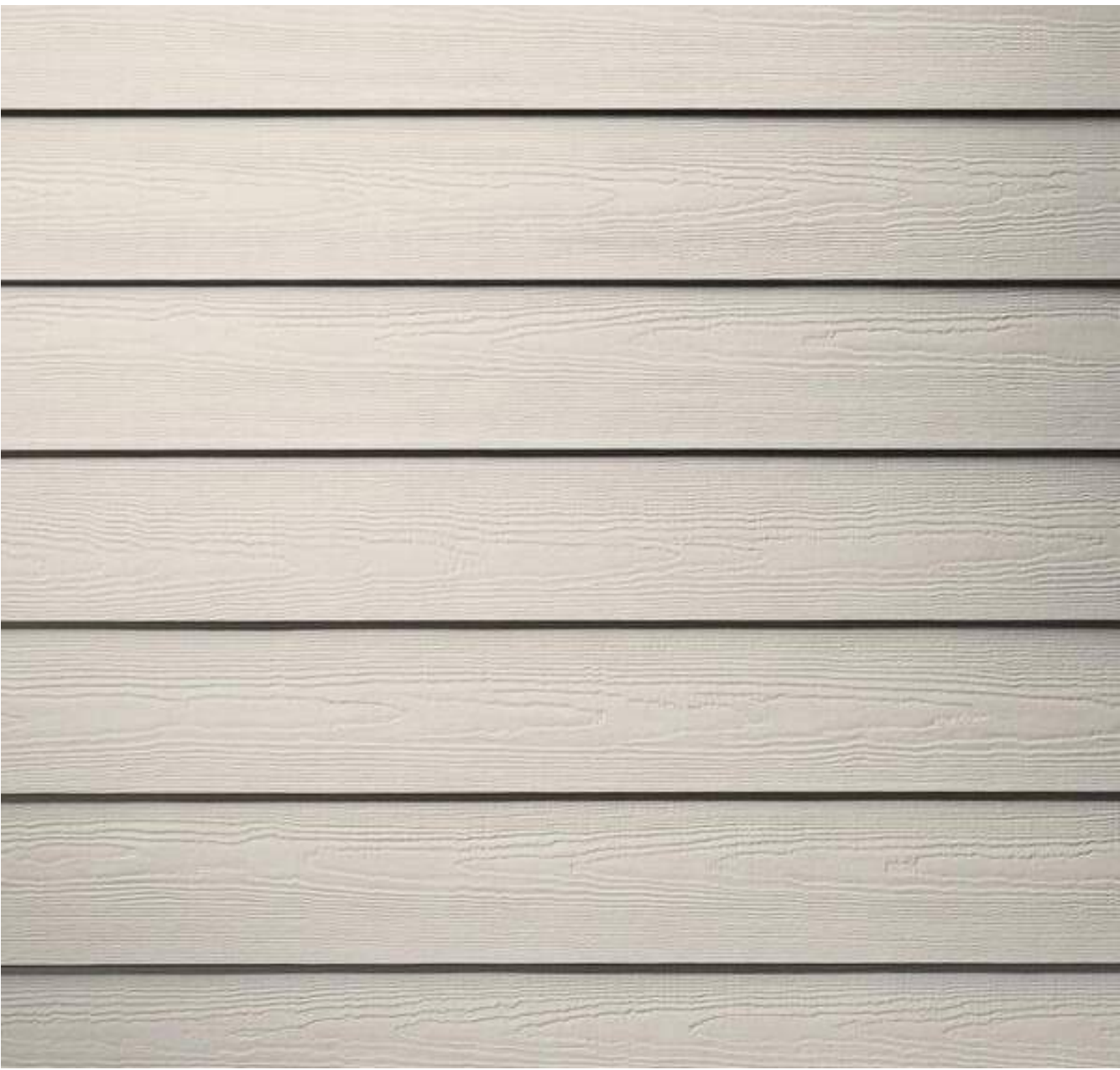
CHECKED BY: Checker
DRAWN BY: Author



REVERSE BOARD-N-BATTEN: PAINTED OFF WHITE



REVERSE BOARD-N-BATTEN: PAINTED DARK GREY



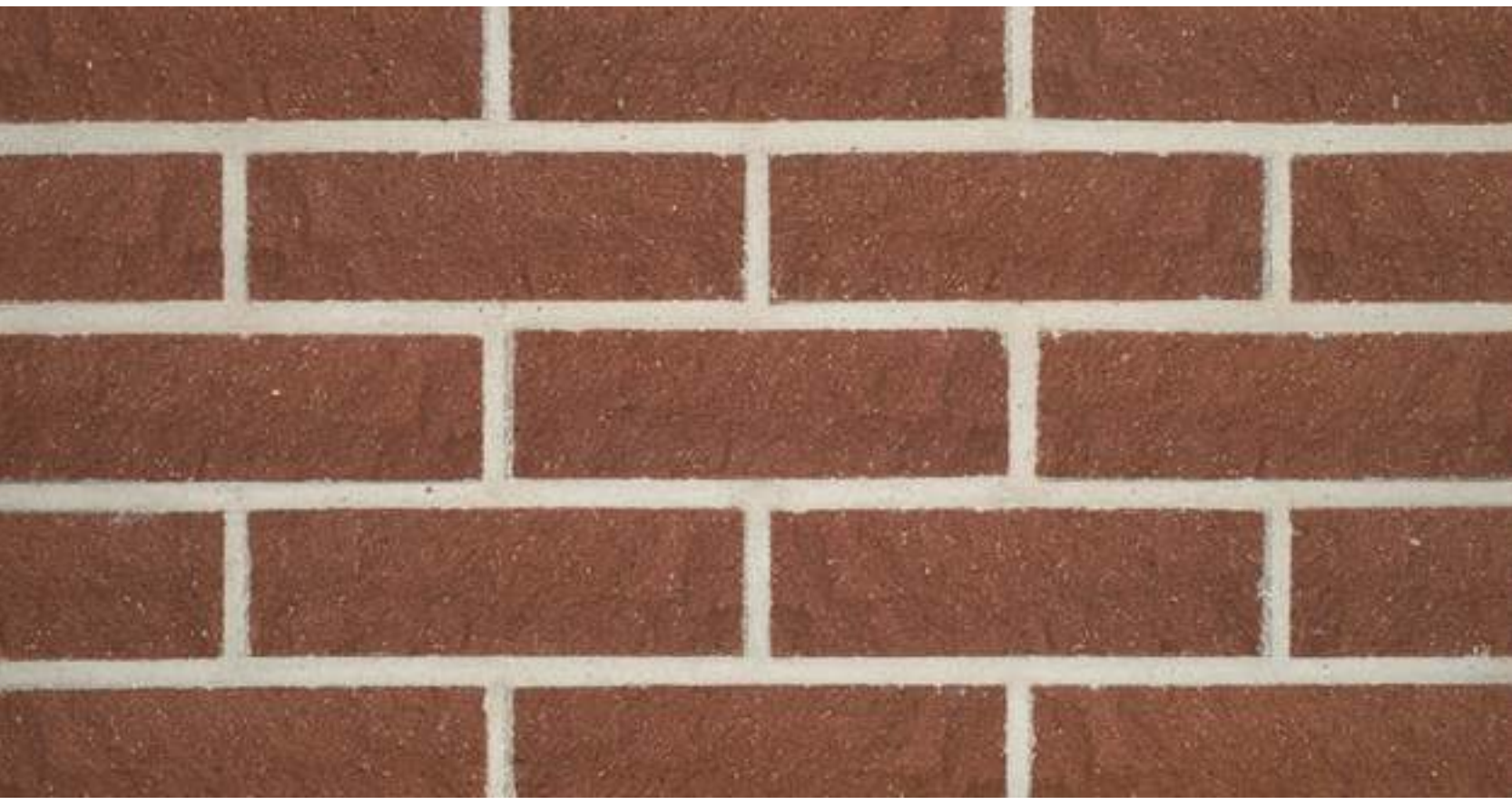
LAP SIDING: 4" & 6" REVEAL, PAINTED OFF WHITE



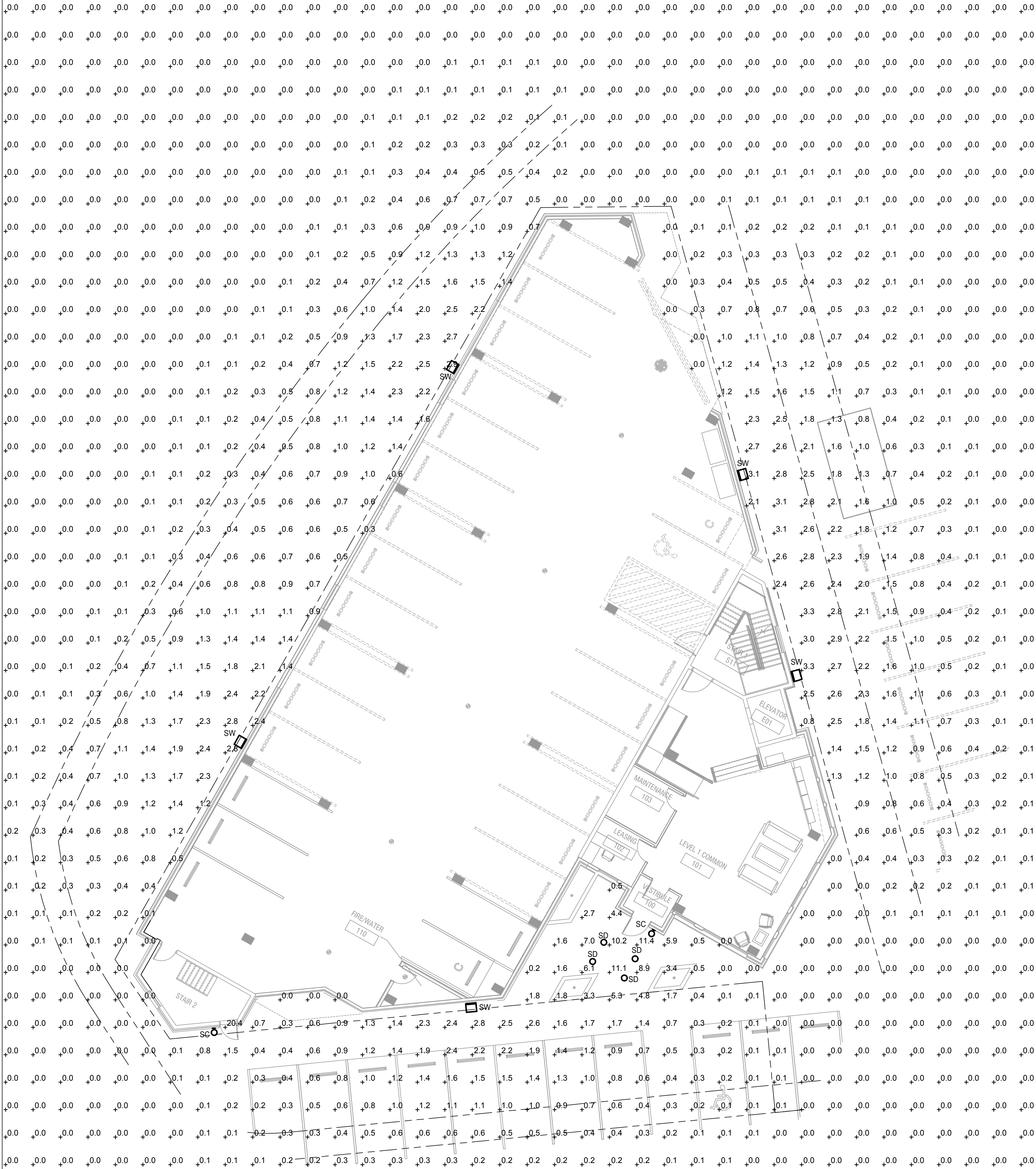
MALARKEY: WINDSOR, BLACK OAK



SUMMIT BRICK: MORNING SAGE, SEMI-SMOOTH TEXTURE



SUMMIT BRICK: PLUM, ROCKFACE TEXTURE



SCHEDULE										
Symbol	Label	Quantity	Manufacturer	Catalog Number	Description	Lamp	Number Lamps	Lumens Per Lamp	Light Loss Factor	Wattage
	SC		LITHONIA	OLLWD LED P1 40K 120 DDB	LED WALL CYLINDER	LED	1	500		9
	SD		LITHONIA	LDN6 30/05 LO6AR LS	6IN LDN, 3000K, 500LM, CLEAR, SPECULAR REFLECTOR, CRI80	LED	1	548		6
	SW		LITHONIA	WDGE2 LED P3 30K 80CRI	WDGE2 LED WITH P3 - PERFORMANCE PACKAGE, 3000K, 80CRI, TYPE 3 MEDIUM OPTIC	LED	1	3063		32
Installation Height (above finished grade)										
8'-0"										
Installation Details										
Wall Mounted										
CEILING										
Wall Mounted										

Statistics						
Description	Symbol	Avg	Max	Min	Max/Min	Avg/Min
Site	+	0.5 fc	20.4 fc	0.0 fc	N/A	N/A



2 FIXTURE TYPE SD
N.T.S.



1 FIXTURE TYPE SC
N.T.S.



3 FIXTURE TYPE SW
N.T.S.

THE BENEDICT
MAJOR SITE PLAN
GLENWOOD SPRINGS, COLORADO

OWNER:
CATHOLIC CHARITIES
HOUSING
6240 SMITH ROAD
DENVER, CO 80216

NOT FOR
CONSTRUCTION

DATE:
10-17-2023

SHEET TITLE:
SITE LIGHTING
PLAN
1" = 10'

E01



October 17, 2023

City of Glenwood Springs
Community Development Department
101 W. 8th Street
Glenwood Springs, CO 81601

Re: The Benedict – Major Site Architectural Plan Pre-Application

Dear City of Glenwood Springs:

Shopworks Architecture and Norris Design, on behalf of Catholic Charities Housing, are pleased to submit this pre-application for a new multifamily housing community in Glenwood Springs at 2800 Midland Avenue. The proposal includes 34 multifamily units, all of which are deed-restricted for affordability.

This proposal includes three levels of apartments over one level of tuck-under parking. A parking reduction of 30% has been approved by the City, and the CHFA Low-Income Housing Tax Credit (LIHTC) has been awarded.

Construction of the project is proposed to be completed in one phase.

EXISTING CONDITIONS

The 0.547-acre parcel is currently vacant and surrounded by residential development. To the east are multifamily condos; to the south and east is senior housing; and to the north of Midland Avenue is attached single-family residential.

PROPOSAL

The Benedict includes 34 multifamily apartment units, all of which are deed-restricted for affordability. Tuck-under parking is provided on the first level, with 42 parking spaces provided. On the three levels above parking, the project proposes amenity areas, a lobby, and the residential units.

ACCESS AND CIRCULATION

Access is provided via two existing driveways off Midland Ave. There is an existing access easement on the northern drive access and the southern access is a private drive shared with the senior housing. An existing access easement is located on the northern drive access (Rec. #413296).

ARCHITECTURAL CHARACTER

The exterior design of the buildings promotes a distinctive multi-family character with materials, massing, and details that will complement and enhance adjacent residential areas. The 4-story massing is broken up with varying roof forms to establish a pleasing rhythm on the façade. A strategically placed amenity area on the 2nd floor helps to break up the massing and give the buildings a pedestrian scale. The primary exterior materials are brick and board and batten. The building exterior is highly detailed with a distinct base, middle, and top to create a noticeably human scaled pedestrian experience.

LANDSCAPE CHARACTER

The landscape is designed to complement the architecture and reflect the local environment's water limitations with native plant species. The plan proposes large, aesthetically pleasing



planting beds around the building. Due to utility easements restricting space for new trees, these proposed beds provide shrubs and ornamental trees to meet planting requirements. At the main building access along the south side of the site, enhanced paving and raised planters integrated into the architecture define the entrance. Five bike racks are provided near this entrance and additional perennial planters along the south building elevation bring pedestrian scale to the facade. Two existing landscape islands with trees and shrubs at either end of the existing parking aisle will be protected during construction. Along Midland Avenue, a small nook with a bench and crusher fines surfacing creates a pleasant space for residents and nearby pedestrians. Layered landscape screens the tuck under parking stalls with large shrubs and layered with shrubs and ornamental grasses. Adjacent to the east site boundary, plants offer screening of the existing trash enclosure, and a metal picket fence provides safety for the grade change to the existing parking aisle. Pockets of wildflowers throughout the site provide seasonal colors and space for seasonal sidewalk snow storage. The plant palette consists of native and low water demand species, suitable to the local region and chosen from the Town of Glenwood Spring's approved plant list. All landscape areas will be maintained by the Owner.

NEIGHBORHOOD MEETING

A Neighborhood Meeting was held on Wednesday from 5:00 – 6:00 PM at the Glenwood Springs Community Center. Four neighbors attended. The meeting was conducted in an open-house format, with 7 foam boards portraying the project's concept and related information displayed on easels across the room. Members of the development team were available for questions and comments throughout the meeting, and comment cards were provided at the final table in the room. At the end of the meeting, no comment cards were returned; however, the neighbors in attendance expressed concerns over traffic congestion and views of Mt. Sopris being obstructed. Neighbors were offered business cards for the development team and the opportunity to leave their information to be added to a distribution list for future information on the project.

COMPLIANCE WITH APPROVAL CRITERIA

The approval criteria for all site and architectural plan types is found in the Glenwood Springs Land Development Code Sec. 070.060.050(6):

"In reviewing a proposed site/architectural plan application, the Director, Planning Commission, and/or City Council shall consider whether:

- a. The site/architectural plan is consistent with the general purpose and intent of this Code.
The site plan is consistent with the general purpose and intent of the code. The development team has worked with City Staff and referral agencies to ensure that any potential impacts of the development are considered and have been mitigated for public health and safety.
- b. The site/architectural plan is consistent with the dimensional, design, development, and all other standards of this Code;
The site plan is consistent with the dimensional, design, development and other standards of the Code. The only item on the site plan that is not consistent with the development standards in the Code is the parking requirements. A parking reduction request was approved by City Staff in January of 2023.
- c. The site/architectural plan is consistent with any previously approved plat, PUD, or any other precedent land use approval; and
There are no precedent land use approvals such as a PUD for this project site; as such, this criteria is not applicable. The Major Site and Architectural Plan that is the subject of this review will be the first land use approval for the site.
- d. The site/architectural plan is consistent with the Comprehensive Plan and other adopted City policies and plans."



The proposed Major Site and Architectural Plan is consistent with the Comprehensive Plan in several ways:

1. Provide equitable and diverse housing for the entire community
 - a. The proposed plan provides deed-restricted housing for both income and age (affordable senior housing) in an area surrounded by residential and other senior housing.
2. Address transportation needs and provide multiple convenient travel choices
 - a. The site is located at the corner of Midland Ave. and 27th St., approximately 0.3 miles away from the nearest public transit station (the RFTA Park and Ride Station at 27th St. and S. Glen Ave.). Additionally, the developer is committed to providing transit passes and rideshare services for future residents who can no longer or do not wish to drive, as many seniors no longer drive.
3. Support social diversity
 - a. Affordable senior housing is needed in both Glenwood Springs and beyond. This project supports social diversity and aims to reduce the gap of affordable livability for senior residents.

This application has been prepared by and for the following parties to the benefit of the residents of Glenwood Springs:

Owner

Catholic Charities Housing
Justin Raddatz
6240 Smith Road
Denver, CO 80216
720-639-7608
jraddatz@ccdenver.org

Architect

Shopworks Architecture
Kyle Mead
301 W. 45th Avenue
Denver, CO 80216
303-433-4094 ext. 105
kyle@shopworksarc.com

Developer

Blueline Development, Inc.
1004 South Avenue West
Missoula, MT 59801
Gabrielle Carazo
Darcy McClure
908.463.5868
gabby@bluelinedevelopment.com
darcy@bluelinedevelopment.com

Civil Engineer/Survey

Sopris Engineering, LLC
Stephanie Helfenbein
502 Main St., Ste. A-3
Carbondale, CO 81623
720-704-0593
stephanie@sopriseng.com



Landscape Architecture/ Entitlements

Norris Design
Elena Scott
Mallory Redmon
Anthony York
409 Main Street
Frisco, CO 80443
303-892-1166
escott@norris-design.com
mredmon@norris-design.com
ayork@norris-design.com

Thank you for your consideration of our application. We look forward to meeting with you to discuss further. Should you have any concerns or questions, you may reach out to either of us directly at kyle@shopworksarc.com/720-681-6405 or at mredmon@norris-design.com/303-892-1166.

Sincerely,

Mallory Redmon

Kyle Mead, Shopworks Architecture
Mallory Redmon, Norris Design



October 17, 2023

City of Glenwood Springs
Community Development Department
101 W. 8th Street
Glenwood Springs, CO 81601

Re: The Benedict – Housing Mitigation Plan

This Housing Mitigation Plan demonstrates compliance with the Glenwood Springs Community Housing Guidelines, which apply to *Article 070.045 – Community Housing Standards and Guidelines* in the Glenwood Springs Municipal Code.

The proposal includes 34 multifamily units, all of which are deed-restricted for affordability. This proposal includes three levels of rental apartments over one level of tuck-under parking. All of the units are in one building, which will be constructed in one phase. The Benedict has been awarded a CHFA Low-Income Housing Tax Credit (LIHTC) to construct the project.

1. A Provision of Affordable Units - Total number of units as Community Housing Units (CH), description of each type of unit, bedroom configuration and net square footage

Per the Code, a minimum of Twenty (20) percent of the total residential units in any new residential or mixed-use development proposing to create ten (10) or more residential dwelling units. The Benedict proposes 100 (100) percent of the development to be affordable at Area Median Income (AMI) rates of thirty (30) percent to eighty (80) percent. See Table 1.

Table 1 – Unit Size and Type

Unit Type	Unit Quantity	Bedrooms	Bathrooms	Sq. Ft.	Type
1.1	25	1	1	537	Rental
1.2	9	1	1	549	Rental
Total	34	34	34	540 (avg.)	Rental

2. Will the property be Subdivided?

Property shall consist of a multi-family development and not a subdivision. The existing lot is 0.547-acres.

3. Targeted Income Category

The Benedict will include rental units between 30% to 80% AMI. See Table 2 below.

Table 2 – AMI Designation

AMI	Unit Quantity
30%	7
40%	4
70%	17
80%	6
Total	34



4. Calculation of average size of finished net square footage for both market rate units and community housing units, excluding garages and unfinished basements.

All the units are proposed as affordable. See Table 3 for additional square footage information for the building.

Table 3 – Building Square Footage

Area	Square Feet
Leasable Area (Units)	18,366
Parking	8,668
Amenity Area	4,400
Circulation / Support	7,686
Balcony	814
Total	39,934

5. Location of community housing units and/or lots within the development.

All units are community housing units. See floor plans included with the submittal packet.

6. A phasing / construction plan schedule

The property will be built in one phase estimated at 15 months.

7. An estimate of homeowners association assessments

No homeowners association will be assessed for the rental units. Per LIHTC requirements, the rental rate includes rent and utilities.

MEMORANDUM

To: City of Glenwood Springs, Planning and Engineering Departments

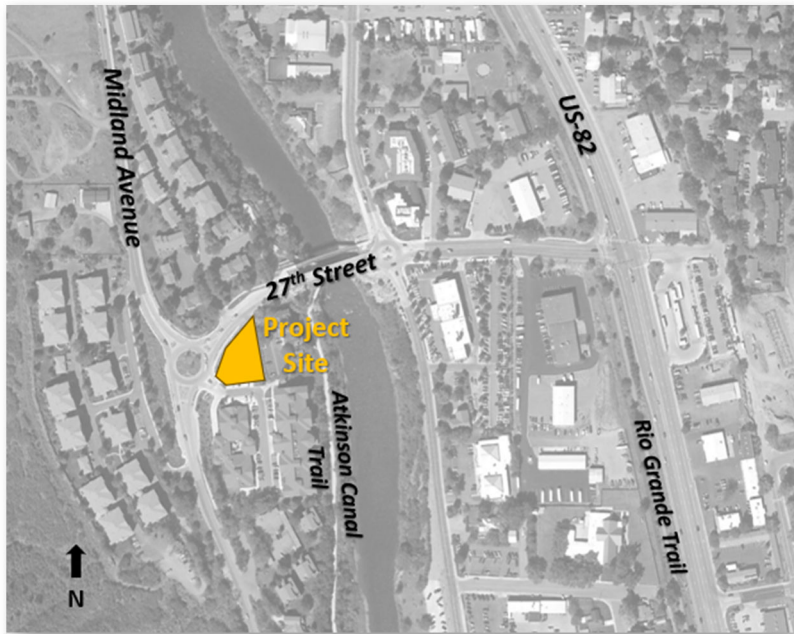
From: Mandy Ricks, EIT
Cassie Slade, PE, PTOE

Date: October 17, 2023

Project: The Benedict Project – Glenwood Springs, Colorado

Subject: Traffic Assessment Letter

The Fox Tuttle Transportation Group has completed a preliminary transportation analysis for the proposed affordable housing development, The Benedict, in Glenwood Springs, Colorado. The project property is located on the vacant site east of the roundabout intersection of Midland Avenue and 27th Street, as shown in the vicinity map in **Figure 1**. Access to the property is on 27th Street with the existing full movement access. The Benedict is proposed as a single building with parking on the first level and



affordable housing units on the remaining three (3) floors. It is proposed that there will be 34 affordable multifamily dwelling units in the building, all one-bedroom apartments. The site will include 42 parking spaces total with some on the ground level of the building and others as surface parking accessed by the private drive.

The purpose of this "trip generation memo" is to determine how many vehicular trips would be generated by the proposed project.

Figure 1. Vicinity Map

Existing Multi-Modal Amenities

Pedestrian and Bicycle

There are currently non-continuous sidewalks on 27th Street along the north side and along most of the south side as well. 27th Street provides access to the Atkinson Canal Trail, the Rio Grande Trail, and the 27th Street Station RFTA Park-and-Ride. There are also sidewalks along the east side of Midland Avenue. There are no on-street bicycle facilities within the study area; however, bicyclists are permitted to travel in the general travel lanes and shoulders, and many bicyclists utilize the trails to connect through town and nearby communities.

The Atkinson Canal Trail is a 1.4-mile paved multi-use trail that parallels the Roaring Fork River along the west side. Access to the trail is less than 200 feet from the property site.

The Rio Grande Trail connects Glenwood Springs to Aspen. The 42-mile trail is a rail-to-trails project that provides multi-modal connectivity through the Roaring Fork Valley. Trail users are protected from vehicular traffic, except at intersections, making the Rio Grande Trail a safer option for pedestrians and bicyclists. Residents of The Benedict can access the trail by traveling approximately 0.21-mile east of 27th Street.

Transit

The Roaring Fork Transportation Authority (RFTA) provides public transportation service between communities adjacent to and within the Roaring Fork Valley. The 27th Street Station, an RFTA Park-and-Ride, is located 0.3-mile east of the project site. It provides access to the Ride Glenwood Springs route, the Local Valley route, the Hogback route, and the VelociRFTA route.

The Ride Glenwood Springs bus is a free bus with stops across Glenwood Springs. It runs from the Glenwood Springs Mall on the northwest side of town to the Roaring Fork Marketplace on the southeast corner of Glenwood Springs, with the closest stop to The Benedict near the 27th Street Station.

The Local Valley bus route travels between Glenwood Springs and Aspen with stops along SH 82. The Hogback route connects riders from Rifle, Silt, New Castle, and Glenwood Springs, ending at the 27th Street Station.

The Bus Rapid Transit, named VelociRFTA, is an express transit service with parking available at the 27th Street Station Park-and-Ride. It travels between Aspen and Glenwood Springs with limited stops in the Roaring Fork Valley.

Trip Generation

To estimate the future volume of trips associated with The Benedict property, the anticipated land use was multiplied by the trip data contained in the Institute of Transportation Engineers' (ITE) Trip Generation Manual¹. The most applicable land use category was multiplied by the trip rate for the daily, AM peak hour, and PM peak hour to approximate the projected traffic. **Table 1** summarizes the estimated total vehicle trips for the project based on ITE rates. For conservative purposes, there were no adjustments made for multi-modal users or internal capture.

Table 1. Trip Generation Estimate

Land Use	Size	Unit	Average Daily Trips				AM Peak Hour Trips				PM Peak Hour Trips			
			Rate	Total	In	Out	Rate	Total	In	Out	Rate	Total	In	Out
ITE #223: Affordable Housing	34	DU	4.81	164	82	82	0.50	17	4	13	0.50	17	10	7

Source: ITE Trip Generation Manual and Handbook, 11th Edition, 2021.

It was estimated the proposed The Benedict project will generate up to 164 vehicle trips per day (vpd) with up to 17 vehicles per hour (vph) in the AM peak hour and up to 17 vph in the PM peak hour.

Trip Distribution and Assignment

The estimated trip volumes were distributed based on existing traffic characteristics, land uses, and traffic patterns in the area. The overall assumed distribution percentages are listed below and shown on **Figure 2**:

- 10% to/from the north via Midland Avenue
- 10% to/from the south via Midland Avenue
- 30% to/from the north via US 82
- 50% to/from the south via US 82

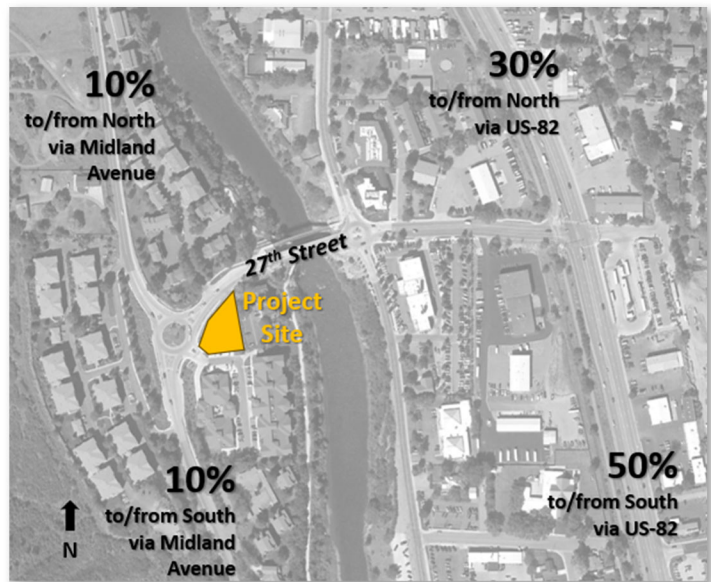
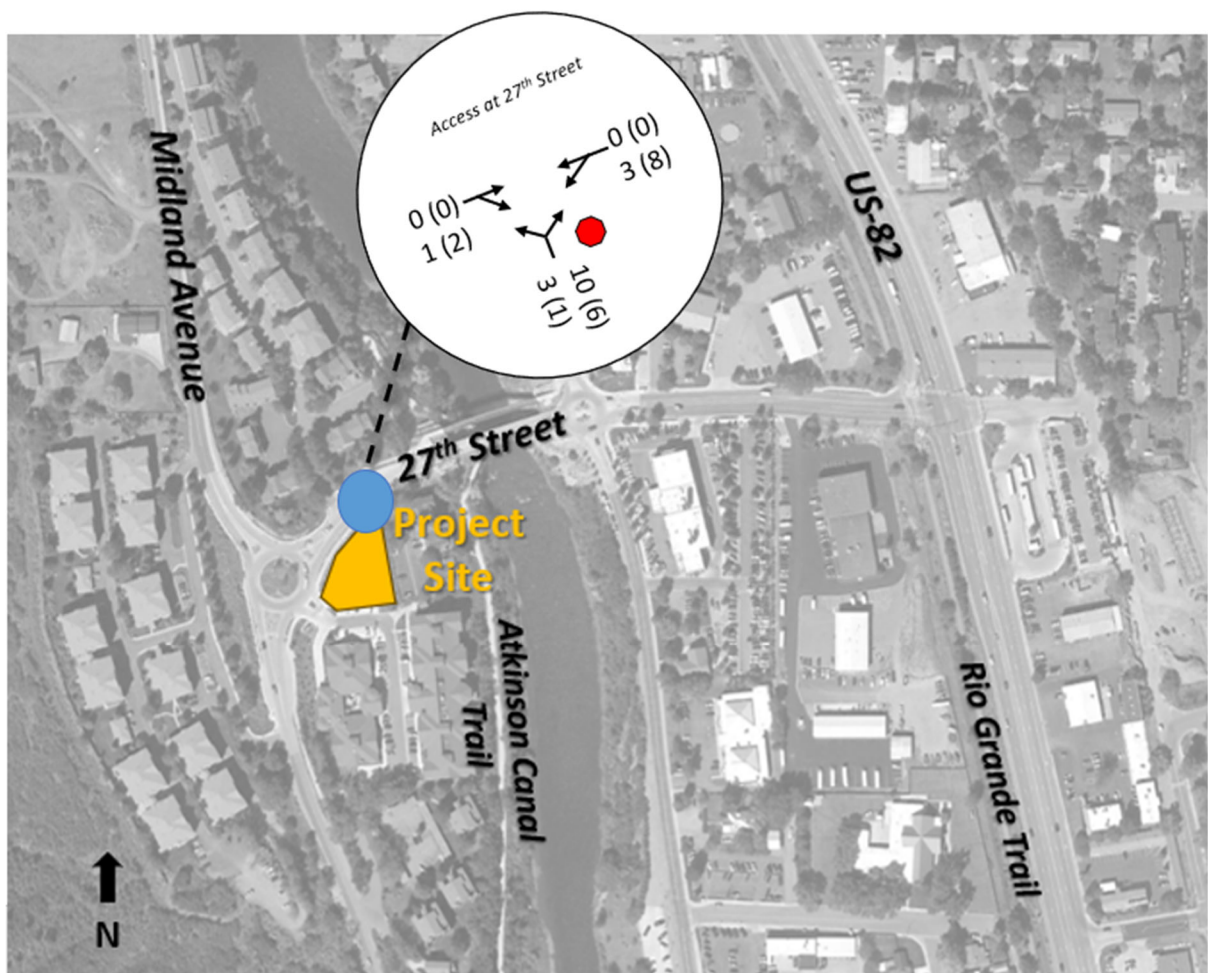


Figure 2. Anticipated Trip Distribution

¹ Trip Generation Manual. 11th Edition. Institute of Transportation Engineers. Washington, DC. 2021.

Using these distribution assumptions, the projected site traffic from **Table 1** was assigned to the access intersection of 27th Street and Midland Avenue for the weekday AM and PM peak hours. **Figure 3** summarizes the site-generated trip assignment.

Figure 3. Estimated Site-Generated Trip Assignment



Legend

- XX (XX) AM and PM site generated peak hour trips
- ← Existing lane configuration

Parking Plan

It is generally agreed that affordable housing communities generate less automobile trips, and subsequent parking demand, than other residential uses. This observation is supported by various field studies that have been conducted nationally, field studies that we have conducted in the region for other projects, and local field studies conducted at similar projects in nearby communities. Unfortunately, there is no industry standard for how to reduce typical residential trip generation and parking rates for lower-income residential projects. The reduction of auto trips and parking demand for affordable housing communities is due to these projects typically being located in areas with better access to transit use and closer proximity to retail, schools, and employment where non-auto modes can be effectively utilized.

ITE published a Parking Generation report (5th Edition) that summarizes data obtained from research and experience by transportation engineering and planning professionals. This publication contains peak parking demand data and parking rates based on field studies at specific land use categories. The Parking Generation report provides parking demand for “Affordable Housing”. The ITE data for this land use type was based on 29 sites which had an average parking demand of 0.99 space per dwelling unit with the lowest demand at 0.32 spaces per dwelling unit and the 85th percentile at 1.33 spaces per unit.

Applying the ITE average rate of $P = 0.99x$ for this land use, **The Benedict project is anticipated to generate a peak parking demand of 34 parking spaces for 34 apartment units.**

Conclusions

The Benedict project proposes to build multifamily affordable housing units on the vacant property east of the Midland Avenue/27th Street roundabout. The four-story building will include 25 parking spaces on the first level and 34 dwelling units on the next three (3) floors. There will also be 17 surface level parking along the east and south sides of the building, for a total of 42 off-street parking spaces. The number of parking spaces is anticipated to accommodate the estimated peak parking demand of 34 spaces. The traffic assessment estimated that The Benedict project would generate up to 164 vehicle trips per day (vpd) with up to 17 vehicles per hour (vph) in each of the peak hours. **It is anticipated that the existing roadway network and intersections will be able to accommodate the anticipated The Benedict traffic without the need for additional analysis or mitigation.**

Hopefully, the contents of this memorandum are helpful. If you have any questions, please give me a call.

Sincerely,

FOX TUTTLE TRANSPORTATION GROUP, LLC



Cassie Slade, P.E., PTOE
Principal



Engineering
Department
Ashley Dostal,
Asst. City Engineer

Date: December 5th, 2023

To: Catholic Charities Housing

Re: 2800 Midland Ave, Benedict, for **Major Site Plan Review**

All references to “City of Glenwood Springs Engineering Specifications”

Department Comments, Off-site

1. No improvements to be required to the pedestrian roundabout.

Department Comments, Onsite

1. The section of 27th Street to which the site gains access is classified as an arterial. As such, the City will require access points and curb cuts to be consolidated and to restrict access or limit turning movements. Located on the inside of the curve of 27th Street, this driveway is currently problematic for vehicles entering the roadway from a sight distance perspective. A minimum of 325’ is required, measured from the driver’s eye to the middle of the oncoming travel lane. In this case, a right-in, right-out access to 27th Street is preferred to reduce the number of conflicting movements that can be made at this driveway, which is also influenced by the adjacent, offset intersection to the north at Woodberry Drive. The movements restricted by the right-in, right-out control will be accommodated by U-turn movements at the adjacent roundabouts. This could add about 12 trips to the 27th and Midland roundabout in the PM peak that would be entering the Benedict site from points east and about 7 trips to the 27th/S. Grand roundabout in the AM peak for trips leaving the site destined for points west. Additionally, the landscaping on the 27th Street side of the building should be carefully considered so that it does not further restrict sight distance from the driveway to the west.
2. Under the City of Glenwood Springs Municipal Code, in section *070.040.070.e.4.c Cross access between abutting development* requires a circulation with the project. The fire department currently gets approx. 300 calls a year to the memory care center and this housing will increase this number. With the requirement of the right-in right-out and all three properties having dead-ends, Engineering recommends as a condition of approval to have an access between the apartments to the east and the subject property proposed building. The City of Glenwood Springs Fire Department has also given their approval of this driveway access.

Planning Item: 63-23
Applicant: Kyle Mead, Shopworks Architecture
Owner: Justin Raddatz, Catholic Charities Housing
Location: 2800 Midland Avenue
Parcel: 2185-21-151-002
Date of Comments: 11-22-2023

The following are W/WW, Electric, and Public Works comments based on the application cover sheet dated 10-17-2023 Submittal 01.

W/WW Department Comments

- All sanitary sewer, sewer laterals, water mains and water services shall have a tracer wire installed.
- The water, sewer and electric details need to follow city standards details at the City of Glenwood Springs Engineering Department website, Engineering Standards.
- All services that are to be used for combined fire sprinkler/domestic water must be designed and constructed to NFPA24 requirements and will be considered private. Design needs to show in detail thrust blocks and calculations, restrains, etc. This must be noted on the plans.
- The water service shown to the building is a single 6". Does the developer plan to feed all units with a single meter or individual meters. Water and sewer billings may be based on number of units versus meter count with the flat fee. This will be looked at in more detail at the time of building permit.
- The city will need to see a detail for the fire riser room that shows fire/domestic services, meter, and backflow installation at time of building permit.

W/WW Department Contact Information:

- Utility Billing – 970-384-6400 (Account setup; Water Meter Purchase)
 - Community Development Department – 970-384-6411 (Improvements Fees)
-

Electric Department Comments

- Owner will be responsible for cost associated with line extensions and or relocations through the ROW/property and all infrastructure for the new development.
- Final service layout, transformer locations and site planning will need to be coordinated with the City of Glenwood Springs Electric Department. The proposed transformer location will need to be approved for access to the location by city staff.

- Owners GC/excavation company will be responsible for all trenching, including the line extension trenches to new transformer locations, electric primary and secondary conduit installation, electric pull vaults and transformer vaults.
- The City of Glenwood Springs Electric Department Costing Proposal will be paid in full prior to any work commencing. Any additions to the proposal will be due at time of completion of work or any saving will be refunded at time of completion of work.
- Developer can install a 2" conduit from transformer locations to the building. The city can provide 100% Fiber to The Home (FTTH) internet and voice services (VoIP) provided by our Community Broadband Network. Please reach out to CBN to find out details for your project if you are interested in another data/phone service option outside the ones noted in the engineering report.
- Developer to supply a Load Calculation form to the City of Glenwood Springs Electric Department for the building and supply it as part of the submittal packet to Comm Dev.

Electric Department Contact Information:

- Doug Hazzard – 970-384-6353 (Electric Superintendent)
- CBN – 970-384-4800 (CBN Main Office)
- Utility Billing – 970-384-6400 (Account setup)

PW Department Comments

- The amount of vegetation adjacent to the building, within the 5' noted in the geotech report, should be looked at and approved by the geotechnical engineer.
- Site plans between civil, landscape and architectural should all be coordinated and depict the same site planning. There are discrepancies.
- Being that this will be a moderate to heavy structurally loaded building, will the developer be designing the foundation around deep foundation supports?
- Will the development site planning include a right in/right out design at the entrance shared with the condominium units? Are the existing owners on board with that design?

Public Works Contact Information:

- Matthew Langhorst – 970-384-6438 (PW Director)

Watkins Fulk-Gray

From: Robin Pitt
Sent: Wednesday, November 22, 2023 8:55 AM
To: Watkins Fulk-Gray
Subject: RE: Land Use Referral, #63-23 "The Benedict"

Here are FD comments for this project:

- Elevator to be large style cab that can accommodate an EMS stretcher
- Sidewalks on south side near main entrance and access ramp to shared parking/driveway to Memory Care to remain as shown in drawings for FD access.
- Conversations to be had with Memory Care to include FD access to both existing buildings and the new building and fire truck/ambulance parking during EMS calls. GSFD historically runs a large volume of calls to Memory Care- a typical response includes 1 ambulance, 1 fire engine and 1 battalion chief vehicle.
- Electrical vehicle charging stations to be shown and locations of shut-offs
- Existing fire hydrants need to be maintained and kept clear during construction process.

Thanks,

Robin Pitt

Fire Marshal
Glenwood Springs Fire Department
970-384-6433 (office) | 970-379-9814 (cell)

[*Accessibility Policy / Póliza de accesibilidad*](#)

From: Watkins Fulk-Gray <watkins.fulkgray@cogs.us>
Sent: Thursday, November 16, 2023 4:02 PM
To: Ashley Dostal <ashley.dostal@cogs.us>; Ben Colia <benjamin.colia@cogs.us>; Bill Kimminau <bill.kimminau@cogs.us>; Bryana Starbuck <bryana.starbuck@cogs.us>; Dan Roper <daniel.roper@cogs.us>; Derek Wheatley <derek.wheatley@cogs.us>; Doug Hazzard <doug.hazzard@cogs.us>; Emery Ellingson <emery.ellingson@cogs.us>; Hannah Klausman <hannah.klausman@cogs.us>; Jim Hardcastle <james.hardcastle@cogs.us>; John Hassell <john.hassell@cogs.us>; Joseph Deras <joseph.deras@cogs.us>; Karl Hanlon <kjh@mountainlawfirm.com>; Lee Barger <lee.barger@cogs.us>; Matthew Langhorst <matthew.langhorst@cogs.us>; paul.ficklin@blackhillscorp.com; Peter Hayes <peter.hayes@cogs.us>; Richard J. Peterson-Cremer <rjp@mountainlawfirm.com>; Robin Pitt <robin.pitt@cogs.us>; Rodney Tarullo <rodney.tarullo@cogs.us>; Ryan Gordon <ryan.gordon@cogs.us>; Sara Weigel <sara.weigel@cogs.us>; Sharpe, Jason <jason.sharpe@centurylink.com>; Victor Meraz <victor.meraz@cogs.us>; Warren Hays <warren.hays@cogs.us>
Subject: RE: Land Use Referral, #63-23 "The Benedict"

Hello all,

This is a friendly reminder to send me comments about this 34-unit affordable housing development, The Benedict. We will meet with the applicant team and discuss this project at the coming Department Review meeting on Tuesday, 11/21.

Thank you,
Watkins Fulk-Gray

From: Watkins Fulk-Gray

Sent: Thursday, October 26, 2023 6:43 PM

To: Ashley Dostal <ashley.dostal@cogs.us>; Ben Colia <benjamin.colia@cogs.us>; Bill Kimminau <bill.kimminau@cogs.us>; brian.killian@state.co.us; Bryana Starbuck <bryana.starbuck@cogs.us>; Dan Roper <daniel.roper@cogs.us>; Derek Wheatley <derek.wheatley@cogs.us>; Doug Hazzard <doug.hazzard@cogs.us>; Emery Ellingson <emery.ellingson@cogs.us>; Hannah Klausman <hannah.klausman@cogs.us>; Jim Hardcastle <james.hardcastle@cogs.us>; John Hassell <john.hassell@cogs.us>; Joseph Deras <joseph.deras@cogs.us>; Karl J. Hanlon; Lee Barger <lee.barger@cogs.us>; Matthew Langhorst <matthew.langhorst@cogs.us>; paul.ficklin@blackhillscorp.com; Peter Hayes <peter.hayes@cogs.us>; Richard J. Peterson-Cremer <rjp@mountainlawfirm.com>; Robin Pitt <robin.pitt@cogs.us>; Rodney Tarullo <rodney.tarullo@cogs.us>; Ryan Gordon <ryan.gordon@cogs.us>; samantha.canetti@state.co.us; Sara Weigel <sara.weigel@cogs.us>; Sharpe, Jason <jason.sharpe@centurylink.com>; Victor Meraz <victor.meraz@cogs.us>; Warren Hays <warren.hays@cogs.us>; Watkins Fulk-Gray <watkins.fulkgray@cogs.us>

Subject: Land Use Referral, #63-23 "The Benedict"

Referral Agencies,

The City has received the applications described below. Please review the submittal materials and provide comments as applicable. Please let me know if you have any questions.

Planning Item 63-23 Major Site/Architectural Plan Review for 2800 Midland Ave., The Benedict

Applicant: Kyle Mead, Shopworks Architecture
Owner: Justin Raddatz, Catholic Charities Housing
Location: 2800 Midland Ave
Zone: RE (Resort)
Parcel: 218521151002

Project Description:

Construction of a 34-unit multifamily building, all of which will be deed restricted for affordability and rented to adults age 55 and over. The proposed building will be approximately 58 feet tall with 42 parking spaces. Application materials available at ☐ [63-23 Major Site-Arch 2800 Midland The Benedict](#). Please let Watkins Fulk-Gray know if the link doesn't work.

This application is scheduled for a department review on Tuesday, November 21 at 1:30pm. Departments are encouraged to submit comments as applicable by November 14, 2023. Please submit comments and questions to Watkins Fulk-Gray at watkins.fulkgray@cogs.us or by calling 970-384-6428.

Thank you,

Watkins Fulk-Gray

Watkins Fulk-Gray, AICP

Senior Planner, Economic and Community Development
City of Glenwood Springs
101 W. 8th Street
Glenwood Springs, CO 81601
970.384.6428 (o)

**** City Hall is open to the public on Mondays-Thursdays from 7:30 a.m.-5:30 p.m. and closed on Fridays. Phone calls and emails will be returned during the new business hours.**

** El ayuntamiento está abierto al público de lunes a jueves de 7:30 a.m. a 5:30 p.m. y está cerrado los viernes. Se contestarán llamadas telefónicas y correos electrónicos durante el nuevo horario laboral.

ENGINEERING NARRATIVE
FOR
The Benedict
Major Site Plan Application
Glenwood Springs, Colorado

Prepared by:
Sopris Engineering, LLC
502 Main Street Suite A3
Carbondale, Colorado 81623

SE Project Number: 31256
October 17, 2023



Yancy Nichol, PE
Principal

A handwritten signature in blue ink that reads "Stephanie Helfenbein".

Stephanie Helfenbein
Project Engineer



1.0 INTRODUCTION AND PURPOSE

1.1 Project Description

The site is located to south east of the 27th Street/Midland Avenue roundabout and west of the Roaring Fork River in Glenwood Springs, Colorado. The site is currently undeveloped and consists largely of gravel and very little vegetation. It is planned to be developed into an affordable housing development consisting of 34-one-bedroom units.

1.2 Existing Site Description (Refer to C1.0: Existing Conditions)

The existing site consists largely of a gravel covered area with very little vegetation. It slopes generally to the northeast at 5%-8%, with an approximate grade difference across the building footprint of 5-feet. Midland Avenue is along the site's eastern boundary with a shared access/drive along the southern boundary. There is an existing residential development to the east whose access crosses the site. The site is surrounded by utilities and there is an existing 18" culvert at the southeast corner of the site which we understand was previously installed as part of the overall Stony River Development.

The existing conditions are based upon a site topographic survey prepared by Tuttle Survey Services (TSS). The utility information shown on the existing conditions map was also included on the TSS survey, supplemented with sewer manhole depth information from Sopris Engineering. The utility locations shown on the drawings should be verified for construction purposes.

2.0 ACCESS/SITE IMPROVEMENTS

Two accesses are proposed for the site:

- The existing access at the south side of the 27th Street bridge currently serving the existing multi-family development east of the site is proposed to also serve as access to the proposed parking garage. There is an existing retaining wall along the south side of the access which will need to be slightly modified to accommodate the access into the garage. We will coordinate with the adjacent property owner on the necessary modifications.

- There is also an existing access at the south west side of the site which we understand was constructed as part of the Stony River Development to serve the entire development site. There are eight existing parking spaces on the south side of the site which are within a parking/access easement. These parking spaces are proposed to be removed and replaced with twelve spaces, four of which will not be included within the parking/access easement. A new valley pan and sidewalk will be installed adjacent to the parking. Due to the existing slope of the access, we do cannot propose any handicap parking spaces along the south side of the building.

3.0 UTILITIES

The existing and proposed sewer, water, electric, telephone, cable, and gas locations described below are shown on C4.0- *Utility Plan*.

3.1 Sanitary Sewer

The site will be served by the City of Glenwood Springs Wastewater department. There are existing sewer mains along the eastern boundary as well as along the western boundary. We propose installing a new 6" sewer service at the northern corner of the property to serve the project site. Sewer service size is to be confirmed by MEP.



According to the 2023 West Glenwood Sanitation District's EQR schedule, total site sewer usage is equal to 34 EQRs. We have assumed that the waste generated per 1 EQR is 300 gallons per day (gpd). The total waste generated onsite is 10,200 gpd and is summarized in Table 1 below:

TABLE 1 - SEWER USAGE SUMMARY					
Use	# Units	EQR/Unit	# EQRs	GPD/EQR	GPD
Multi Family	34	1.0	34	300	10,200
TOTAL =			34	TOTAL =	10,200

3.2 Potable Water System

The proposed development will be served by the City of Glenwood Spring's water system. There is an existing water main which runs along the western property line on which we propose to install a new 6" water service and route to the water entry room which is proposed at the south side of the building. Water service size to be confirmed by MEP. The service will be sized to provide a reliable water supply adequate to meet fire flow requirements and in-house needs of the proposed development with some irrigation.

The water usage was calculated based upon the City of Glenwood Springs municipal code, section 080.060.020. Total water usage is summarized in Table 2 below:

TABLE 2 - PROPOSED WATER USAGE SUMMARY						
Multi Family	# Units	Unit	EQR/Unit	# EQRs	GPD/EQR	GPD
1 BDR-537 SF	22	0.06/100 SF	0.32	7.1	350	2,481
1 BDR-549 SF	9	0.06/100 SF	0.33	3.0	350	1,038
1 BDR-694 SF	3	0.06/100 SF	0.42	1.2	350	437
2nd Floor Amenity Restrooms (1 toilet/1 sink)	2	0.25/EACH	0.25	0.5	350	175
Irrigated Space > 3500 SF (Rounded to the next highest 1000)	4000	0.1/2000 SF	0.10	0.2	350	70
			TOTAL	12.0	TOTAL	4,201

3.3 Shallow Utilities

- **Electric:**

SERVICE PROVIDER AND CONTACT: City of Glenwood Springs Electric Department

The City of Glenwood Springs (COGS) has existing facilities on and near the site which will be utilized to meet the needs of the proposed development. As building plans are further developed, it will be necessary to coordinate with COGS Electric Department with the needs of the development to determine what if any upgrades need to be made to their existing infrastructure to serve the subject site. A will serve letter has been requested and will be provided upon receipt.

- **Telephone:**

SERVICE PROVIDER AND CONTACT: CenturyLink/Lumen



CenturyLink has existing facilities on and near the site which will be utilized to meet the needs of the proposed development. As building plans are further developed, it will be necessary to coordinate with CenturyLink with the needs of the development to determine what if any upgrades need to be made to their existing infrastructure to serve the subject site. A will serve letter has been requested and will be provided upon receipt.

- **Cable:**

SERVICE PROVIDER AND CONTACT: Comcast

Comcast Cable has existing facilities on and near the site which will be utilized to meet the needs of the proposed development. As building plans are further developed, it will be necessary to coordinate with Comcast with the needs of the development to determine what if any upgrades need to be made to their existing infrastructure to serve the subject site. A will serve letter has been requested and will be provided upon receipt.

- **Gas:**

SERVICE PROVIDER AND CONTACT: Black Hills Energy

Black Hills Energy has existing facilities on and near the site which will be utilized to meet the needs of the proposed development. As building plans are further developed, it will be necessary to coordinate with Black Hills Energy with the needs of the development to determine what if any upgrades need to be made to their existing infrastructure to serve the subject site. A will serve letter has been requested and will be provided upon receipt.

The existing and proposed shallow utilities are shown on *C4.0 Utility Plan*

4.0 DRAINAGE

Please refer to the Drainage Report included with the application.

5.0 FLOOD ZONES

The site is outside of any flood hazard zones.

6.0 CONCLUSIONS

Through this preliminary design process, the following has been determined:

- The development can be served by all required utilities.
- Water service required for domestic and fire suppression capabilities will be provided to the proposed building.



DRAINAGE NARRATIVE
FOR
The Benedict
Major Site Plan Application
Glenwood Springs, Colorado

Prepared by:
Sopris Engineering, LLC
502 Main Street Suite A3
Carbondale, Colorado 81623

SE Project Number: 31256
October 17, 2023



I hereby affirm that this report and the accompanying plans for the Benedict, located at 2800 Midland Glenwood Springs, Colorado, was prepared by me (or under my direct supervision) for the owners thereof in accordance with the provisions of the City of Glenwood Springs Stormwater, Drainage, Water Quality and Erosion Control Chapter and approved variances and exceptions listed thereto. I understand that it is the policy of the City of Glenwood Springs that Glenwood Springs does not and will not assume liability for drainage facilities designed by others.

Yancy Nichol, PE
License No. 28377
Licensed Professional Engineer, State of Colorado



I. Purpose of Narrative

- To demonstrate compliance with the *2014 Supplemental Drainage and Erosion Control Report* for the Stony River Development prepared by SGM
- To comply with design standards of the City of Glenwood Springs

II. Project Location, Background & Overview

The project site is located at 2800 Midland Avenue, in Glenwood Springs, Colorado. The site encompasses approximately 0.548 acres and it currently exists as a vacant lot along the southeast side of Midland Avenue just south of the 27th Street Bridge. There is very little, to no existing vegetation and the site is largely covered by gravel. It appears to have been filled as part of the previous stages of development and may have been utilized as a staging area. The site generally slopes to the north east with slopes in the range of 5%-8%. The site is almost directly adjacent the Roaring Fork River and the Roaring Fork River receives all drainage from the site.

The project site is Lot 2 of the Stony River Minor Subdivision and was included in an overall drainage study for the entire development, prepared by SGM in 2014. The study is included with this application for reference. This study is not being prepared to reanalyze the entire development and associated offsite drainage basins, only to confirm that what is being proposed is in compliance with the original 2014 study and assumptions.

III. Hydrologic Methods and Assumptions

Onsite drainage areas were analyzed using the Rational Method (Equation 1):

$$\text{Equation 1: } Q = C * I * A$$

Q = Runoff Flow Rate (cfs); C = Runoff Coefficient, I=Rainfall Intensity (in/hr); A=Area of Basin (acres)

The runoff coefficient (C) is a variable that represents the ratio of runoff to rainfall volumes during a storm event. The determination of C mainly depends on the soil type, watershed impervious and storm event frequency. Each drainage basin was studied to determine the percent of impervious area. The Mile High Flood District (MHFD)(formerly UDFCD) out of Denver, CO has developed runoff coefficient tables in Chapter 6 of Volume 1 of their Urban Storm Drainage Criteria Manual. This table was used to determine the corresponding 25-year weighted average runoff coefficients based on a Type B hydrologic soil classification.

The design rainfall duration used in the Rational Method is referred to as the time of concentration. The time of concentration is the cumulative travel time, including overland flow and channelized flow, for runoff to get from the furthest point upstream of a basin to a designated DP. A minimum time of concentration of 10 minutes was used for all developed basins given the size of the basins and the relatively short travel distances.

Precipitation data for the site was taken from the NOAA Atlas 14, Volume 8, Version 2 rainfall data specific to Glenwood Spring, Colorado.



Existing and Developed Onsite Drainage Basins

Onsite Basins

There is one on site basin which is divided into two basins to align with the developed site as well as the original 2014 drainage study. They are detailed on the attached Drainage Basin Map. The basins currently exist as gravel areas with little to no vegetation. The developed basins consist largely of roof surface with a minor area that is sidewalk. The site has been analyzed for the peak rainfall runoff for the 25-year, 10-minute storm duration and the summary of the analysis is included in the table below:

25-YR EXISTING PEAK RUNOFF SUMMARY						DESIGN POINT ID	25-YR POST DEVELOPMENT PEAK RUNOFF SUMMARY						POST DEVELOPMENT- PRE
BASIN I.D.	% IMPERVIOUS	C ₂₅	I ₂₅ (in/hr)	AREA (acres)	Q ₂₅ (cfs)		BASIN I.D.	% IMPERVIOUS	C ₂₅	I ₂₅ (in/hr)	AREA (acres)	Q ₂₅ (cfs)	
EX-NORTH	2%	0.26	3.78	0.103	0.10	DP-NORTH	DE-NORTH	100%	0.88	3.78	0.103	0.34	0.24
EX-SOUTH	2%	0.26	3.78	0.196	0.19	DP-SOUTH	DE-SOUTH	100%	0.88	3.78	0.196	0.65	0.46

The two basins are compared to the 2014 "Roaring Fork Skilled Nursing Facility North and South Basins from table 2 of the 2014 report included below:

Basin ID	Area (Acres)	Q ₂₅ (cfs) Generated Within the Basin	Inlet/Design Point
Roaring Fork Skilled Nursing Facility (South)	0.24	0.96	20
Roaring Fork Skilled Nursing Facility (North)	0.04	0.17	Off-Site through Basin 6 to Roaring Fork River

With developoment, both the north and south basin will not generate more runoff than was included in the report and is therefore in compliance with the orignal report. Additionally, no on site detention was required in the original 2014 and we are not propsing any due to our close proximity to the Roaring Fork River.

Water Quality Treatment

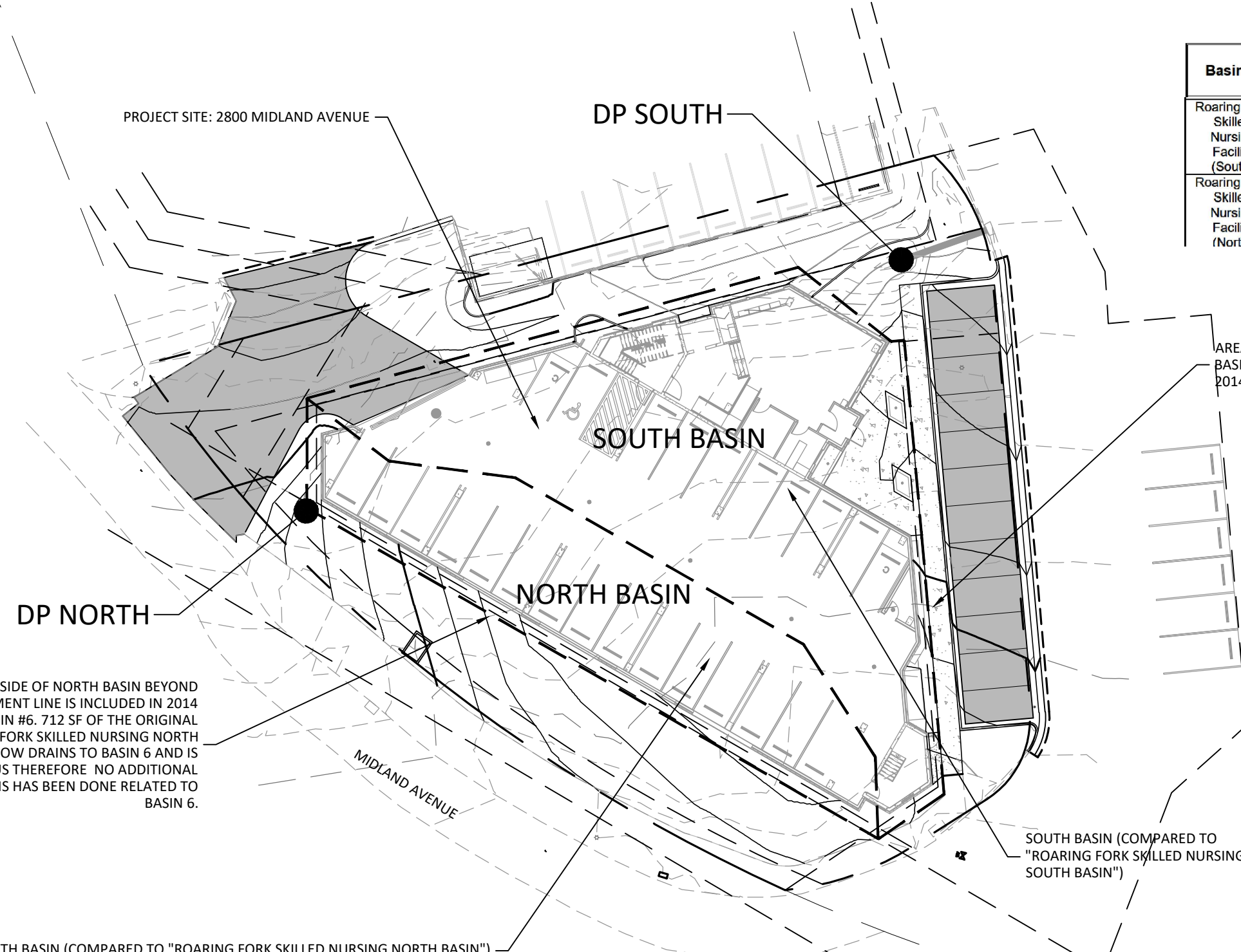
We are not proposing any water quality treatment as all of our runoff is from roof/sidewalks and will have no pollutants.

Conclusions

The result of this drainage narrative is that the proposed development is in compliance with the original 2014 study and that the existing stormwater infrastructure is adequate to serve the development.



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EXCERPT FROM TABLE 2: 25 YEAR PEAK FLOWS
FOR ON SITE BASINS FROM 2014 REPORT

Basin ID	Area (Acres)	Q ₂₅ (cfs) Generated Within the Basin	Inlet/Design Point
Roaring Fork Skilled Nursing Facility (South)	0.24	0.96	20
Roaring Fork Skilled Nursing Facility (North)	0.04	0.17	Off-Site through Basin 6 to Roaring Fork River

NOTE: REFER TO 2014 SGM STONY RIVER DEVELOPMENT SUPPLEMENTAL DRAINAGE AND EROSION CONTROL REPORT FOR ADDITIONAL INFORMATION.

25-YR EXISTING PEAK RUNOFF SUMMARY							25-YR POST DEVELOPMENT PEAK RUNOFF SUMMARY						POST DEVELOPMENT- PRE
BASIN I.D.	% IMPERVIOUS	C ₂₅	I ₂₅ (in/hr)	AREA (acres)	Q ₂₅ (cfs)	DESIGN POINT ID	BASIN I.D.	% IMPERVIOUS	C ₂₅	I ₂₅ (in/hr)	AREA (acres)	Q ₂₅ (cfs)	
EX-NORTH	2%	0.26	3.78	0.103	0.10	DP-NORTH	DE-NORTH	100%	0.88	3.78	0.103	0.34	0.24
EX-SOUTH	2%	0.26	3.78	0.196	0.19	DP-SOUTH	DE-SOUTH	100%	0.88	3.78	0.196	0.65	0.46



SCALE: 1"=30'

SOPRIS ENGINEERING LLC
502 MAIN STREET • SUITE A3 • CARBONDALE CO 81623
(970) 704-0311 • soprisengineering.com

NO.	REVISION	BY	DATE
THE BENEDICT GLENWOOD SPRINGS, COLORADO			
DRAINAGE MAP			
DATE: 10-17-23			
JOB NO. 31256			
SHEET 1 OF 1			

SUPPLEMENTAL DRAINAGE AND EROSION CONTROL REPORT

FIRST PHOENIX GROUP
STONEY RIVER DEVELOPMENT &
TERRY CLAASSEN, ROARING FORK LODGE, LLC
SKILLED NURSING FACILITY

FEBRUARY 2014

Prepared by



118 West Sixth Street, Suite 200
Glenwood Springs, CO 81601
970.945.1004
970.945.5948 fax

SUPPLEMENTAL DRAINAGE AND EROSION CONTROL REPORT

FIRST PHOENIX GROUP
STONEY RIVER DEVELOPMENT &
TERRY CLAASSEN, ROARING FORK LODGE, LLC
SKILLED NURSING FACILITY

REVIEWED BY

SGM Project # 2012-469.001

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Appendix I Drawings
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1.0 Project Background

1.1 Project Overview

1.1.1 Project Purpose

The purpose of this report is to address the drainage requirements specified in the City of Glenwood Springs' (City's) Municipal Code, Article 070.030.040, Requirements for Design Improvements and Dedications, Drainage, which identifies specific expectations and content to be contained in drainage plans, drainage improvements, and drainage easements [070.030.040(a-c)] within the City. Additionally, this report addresses specific review comments provided by the City Engineer and Assistant Public Works Director on the impacts of off-site drainage and hydraulic performance of the 27th Street and Midland Roundabout. See Appendix A for a copy of the specific review comments.

1.1.2 Project Description

The proposed project is located along Midland Avenue southeast of the 27th Street and Midland Roundabout (Figure 1). The proposed project is new construction of a senior living and memory care facility. A rehabilitation and nursing facility is also being proposed north of the project site under separate submittal.

1.2 Referenced Studies

Several studies were reviewed to support the drainage analysis and calculations for the Stoney River development project including:

- Final Drainage Study for the Riverview Terrace (Martin/Martin, Rev. October 1996)
- Stormwater Assessment and Education Report of the Watershed Improvement and Project Education Project for the City of Glenwood Springs (Matrix Design Group, 2003)
- Drainage & Analysis Report for the Roaring Fork Lodge, PUD (Red Mountain Civil, April 12, 2007)
- Roaring Fork Lodge Construction Set Drawings (Record Set 10/30/09)

Limited to no information was available to support the design of the stormwater infrastructure at the 27th Street and Midland Roundabout.

A summary of the available reference documents are provided below.

Riverview Terrace Drainage Study

The purpose of this report was to evaluate the off-site and on-site drainage associated with the Riverview Terrace development. The Riverview Terrace development is situated west of the proposed Stoney River development (Figure 1).

This report documented that off-site historical runoff from the west is diverted by a debris flow/rock fall cutoff fence and captured by storm inlets above the Riverview Terrace development site and routed via 30" storm sewers pipes through the site. The storm pipes were designed to convey the entire historic 100-year design storm.

According to the Final Drainage Plan (sheet number D1, see Figure 2) all runoff generated both on-site and collected from off-site is conveyed via 30" CMPs, roadside ditches, 18" corrugated metal pipe (CMP) and 24" CMP to a point east of Midland Avenue, north of the proposed development across 27th Street. From this point the stormwater is collected in existing storm mains and discharged to the Roaring Fork River. Detention for this development was not provided because the developed runoff flows for the site did not exceed the historic runoff flows.

Drainage basins defined in this report were reproduced and their drainage flow rates determined using NRCS's WinTR-55 program. The flow rates generated from the WinTR-55 program were used to populate Autodesk®'s Storm and Sanitary Analysis software, which was used to evaluate the hydraulic profile of the existing storm sewer system in the 27th Street roundabout and determine potential street flow in the roundabout that may impact the Stoney River Assisted Living Facility.

Stormwater Assessment and Education Report

The purpose of this report was to evaluate non-point source pollution contributions to waterways within the City of Glenwood Springs and develop an education project on ways to mitigate these stormwater impacts. Several stormwater management tools were developed as a result of this study and used for this report. Specifically, the following information was reviewed:

- GIS database of the stormwater infrastructure
- Electronic mapping of drainage basins
- Identification and inventory of major storm drain outfalls and
- Field confirmation of storm outfalls, to name a few.

The hydrologic data for stormwater runoff presented in this report was used to calculate the 25-year peak flows for various off-site and on-site drainage basins.

Roaring Fork Lodge, PUD and Roundabout Drainage Analysis & Construction Set Drawings

The Drainage & Analysis Report for On-Site Drainage for the Roaring Fork Lodge, PUD and the Roundabout Construction Set Drawings supported the calculations and rational behind the on-site drainage design for the proposed Roaring Fork Lodge¹.

These documents were used to support the off-site and on-site drainage analysis to the Stoney River Development.

1.3 Field Verification

SGM staff conducted several site visits to verify drainage conditions presented in the above referenced studies.

¹ This development was never constructed and was proposed in the same location as the Stoney River development addressed in this report.



Figure 1. Overview of Project Area and Adjacent Land Uses (locations are approximate).

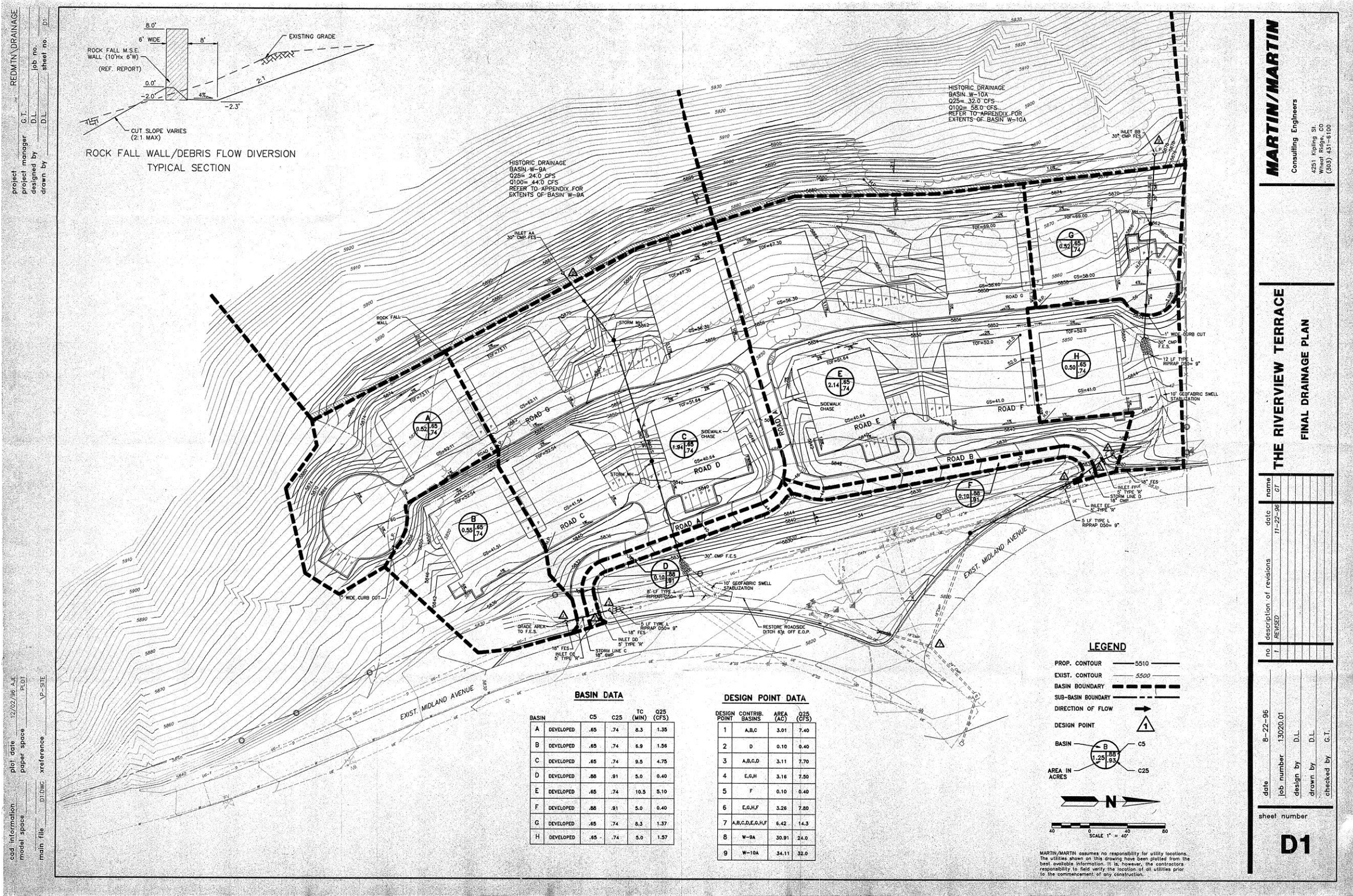


Figure 2. Sheet D1 from the Riverview Terrace Drainage Study.

2.0 Off-Site Drainage - Existing Hydrology and Runoff

The Riverview Terrace Drainage Study combined with the Roaring Fork Lodge Storm Sewer Plans [contained within the Roaring Fork Lodge Construction Set (Record) Drawings] provided the most current information to estimate the potential off-site drainage impacts to the proposed project area. WinTR-55 was used to calculate the 25-year design storm peak flows from upstream off-site basins.

Eleven off-site basins were delineated upstream of the Stoney River Development. Figure 3 depicts the names and areas of these basins. No changes to the off-site drainage patterns are included as part of the Stoney River Development design.

A majority of the soils within the off-site basins can be generally classified as hydrologic soil group D, Torriorthents-Rock outcrop complex. A copy of the Natural Resources Conservation Service (NRCS) Soil Report for the off-site basins is included in Appendix B.

Following is a summary of the off-site basin characteristics including the peak flows generated from the 25-year design storm. All supporting calculations for this section are included in Appendix C.

Figure 4 provides a schematic of the off-site basin flows generated and modeled in WinTR-55.

2.1 Off-Site Basin 1 (OS1)

The OS1 basin is approximately 133.5 acres in area and consists of steep land with slopes up to 70 percent. The upper elevations are rock which change to sparsely vegetated lands near Midland Avenue.

Off-site drainage generated within this basin is generally conveyed north along and across Midland Avenue to the east. A poorly defined ditch along the west side of Midland conveys some drainage to the north in areas. However, there is a lack of cross drainage features along the approximate 3,000 linear feet of Midland Avenue from the highpoint near the CR 154 intersection to the nearest cross culvert location approximately 1,100 feet south of the Hagar Lane intersection. The upstream end of this 18" CMP is blocked by sediment in the lower half and the upper side has been crushed by roadway traffic. The flowline of the west ditch at this location is low enough that it appears to convey flow past the culvert entrance. This culvert and the downstream storm conveyance system associated with it should be rehabilitated in order to facilitate proper drainage within this basin. With minimal functioning cross drainage features, the west side ditch along Midland could convey flows from the entire basin northwards toward the Stoney River Development. The 25-year peak flow is estimated to be approximately 69.27 cubic feet per second (cfs) based on a WinTR-55 (see Appendix C).

Based on aerial imagery, USGS topography and the capacity of the roadway and ditch section at Cross Section #2 [estimated to be 20.75 cfs (Figure 5)] it is estimated that only 20 cfs (of the 69.27 cfs generated during the 25-year design storm) will be directed northward towards the project area. The remaining 50 cfs of runoff is assumed to overtop Midland at some point south of Hagar Lane and flow eastward toward the Roaring Fork River.

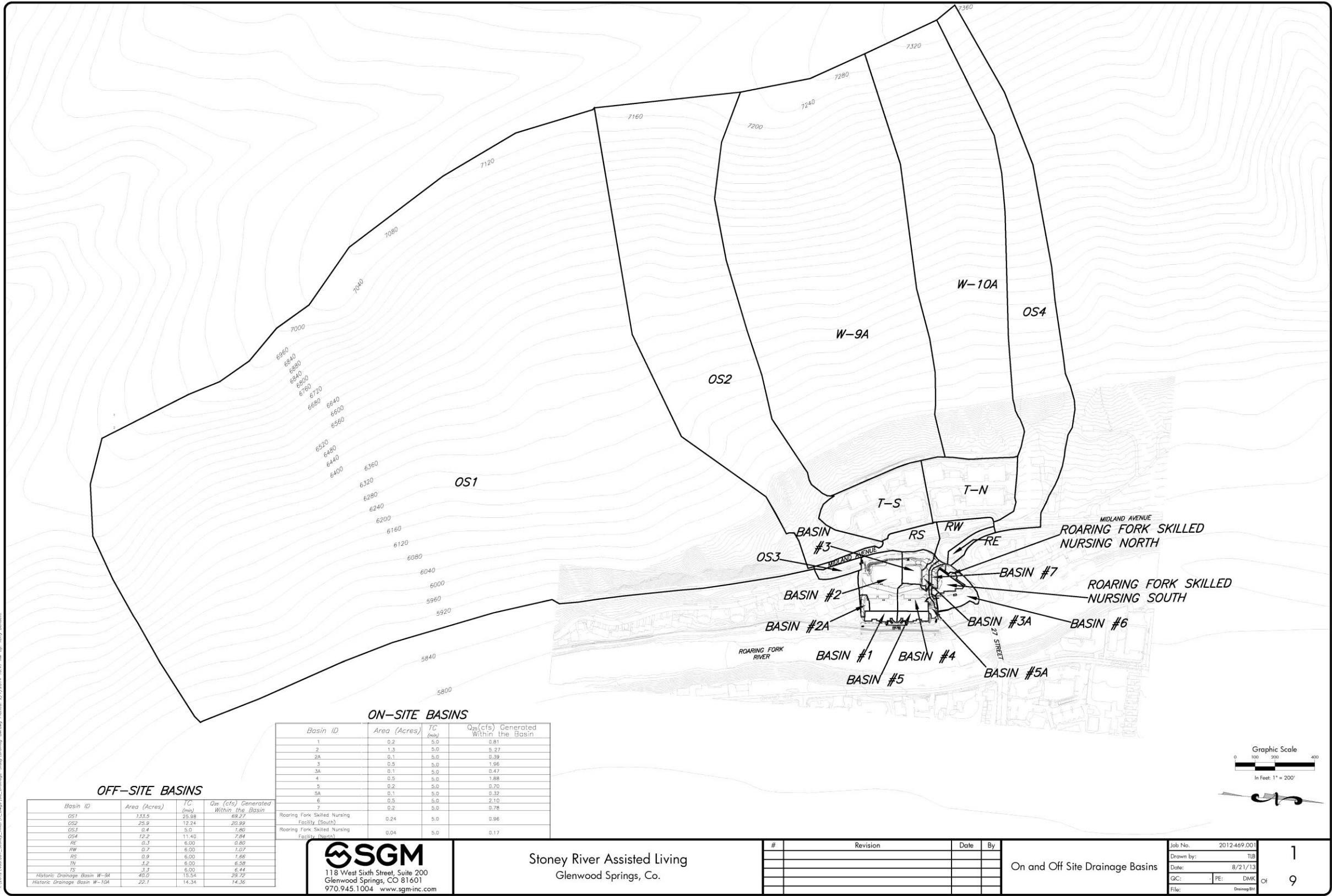


Figure 3. Off-Site and On-Site Basin Designations and Areas.

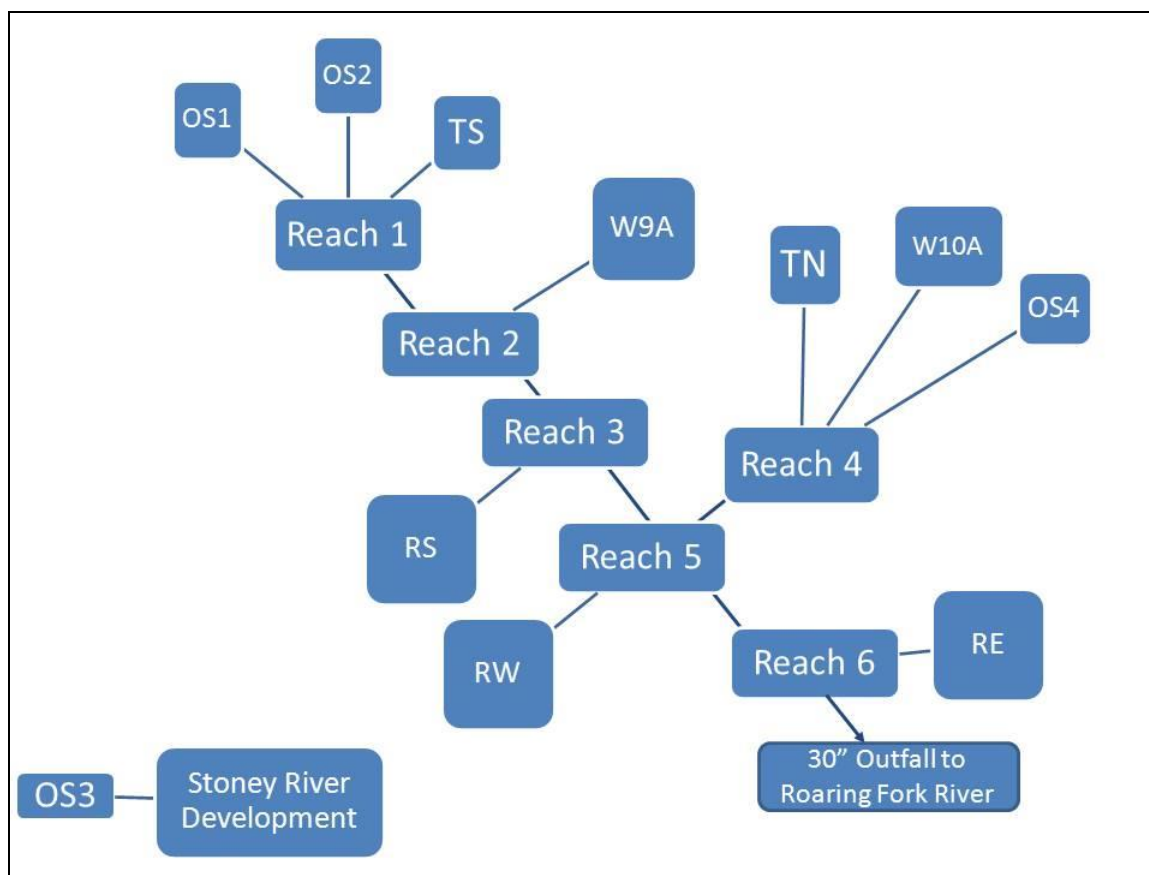


Figure 4. Off-Site Basin Flow Schematic.

2.2 Off-Site Basin 2 (OS2)

The OS2 basin is approximately 25.9 acres in area and consists of steep land with slopes as great as 70 percent. The upper elevations are rock which change to sparsely vegetated lands near Midland Avenue.

Off-site drainage generated within this basin is generally conveyed east as a combination of sheet flow in the upper reaches of the basin and within small channels to a point along Midland Avenue, just south of the Terraces development and drainage boundary. There are no existing drainage structures within this basin. The 25-year peak flow is estimated to be approximately 21 cfs, based on WinTR-55 (see Appendix C).

Based on aerial imagery and USGS topography, it is estimated that 21 cfs from this basin and 20 cfs from OS1 (total of 41 cfs) is directed northeast where it enters the City's existing storm drain system. Any overflows are contained to Midland Avenue where a 6" curb exists. Cross Section #3 (Figure 5), located downstream of the point where OS1 and OS2 combine flows, has a capacity of 44 cfs. The capacity at this curb and gutter section of Midland Avenue is greater than the combined flows from OS1 and OS2.

Rick Barth, P.E. of Red Mountain Civil, designed the 27th Street Roundabout. Discussions with him indicated that he and former City Engineer, Mike McDill, developed the Roundabout drainage plan. The intent of the original design was to have flows generated within OS1 and OS2 be conveyed to a 30-inch pipe on the west side of Midland Avenue,

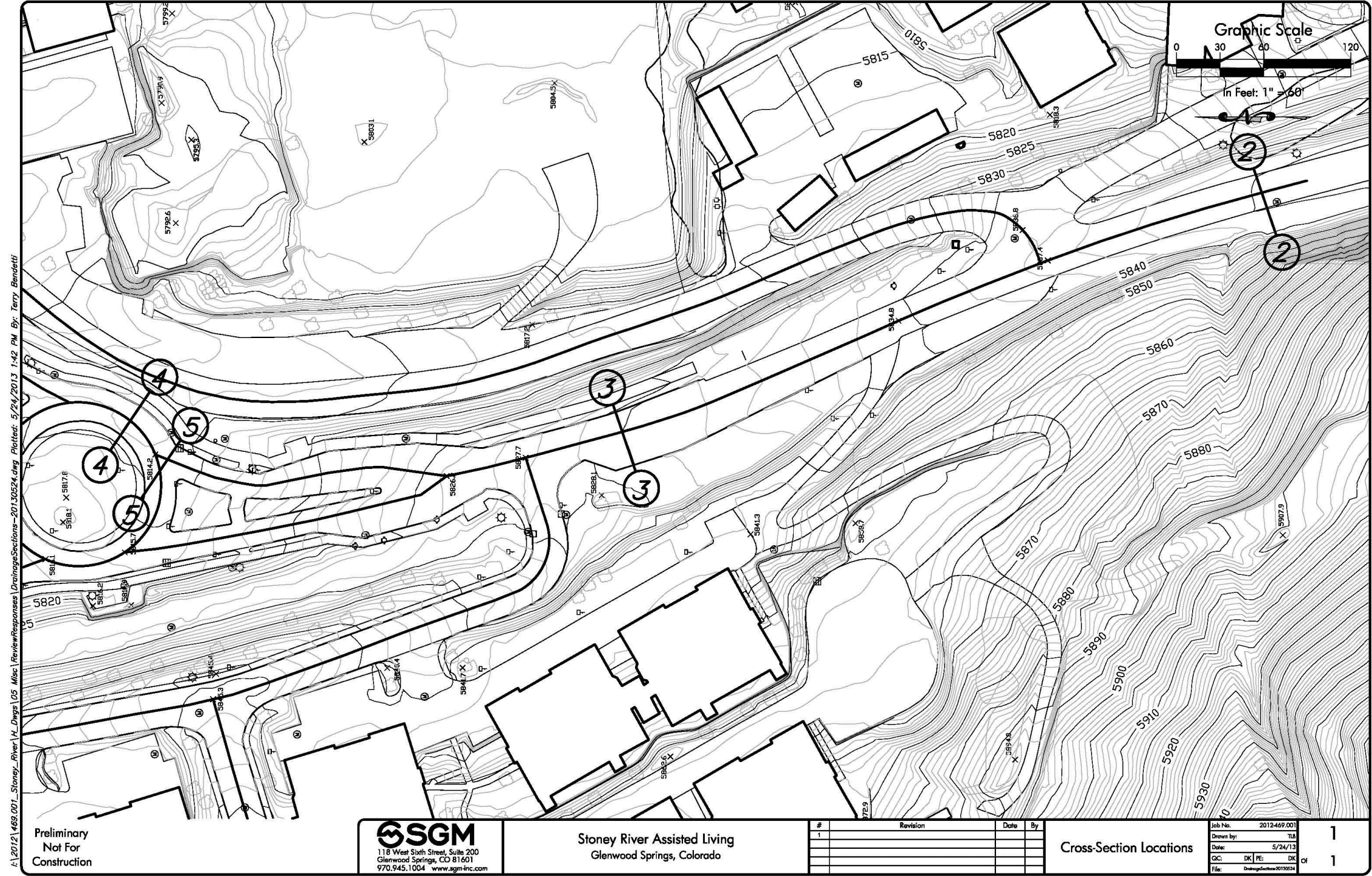


Figure 5. Cross-Section Locations along Midland Avenue and 27th Street.

near the Terraces Development. This currently does not happen due to the lack of a ditch and/or culvert at the southern emergency access road to the Terraces Development. High flows will tend to spread out onto Midland Avenue. It is recommended that the ditch to the 30" culvert be reconstructed in order to reduce potential impacts on traffic and on the Stoney River Development. The Fire Department will need to provide input on the construction of this culvert and drivability of the emergency access road. Ditch depth may be limited by the presence of an existing gas line.

2.3 Off-Site Basin 3 (OS3)

The OS3 basin is approximately 0.40 acres in area and consists of pavement. Off-site drainage generated within this basin is generally conveyed as sheet flow to the east-northeast along the fire access road from the intersection of Midland Avenue and Hagar Lane towards the southwestern portion of the Stoney River Development. The 25-year peak flow conveyed to this point is approximately 1.80 cfs based on the Rational Method analysis (see Appendix C).

A 2' high berm with 2H:1V side slopes and a 2' wide crest will be constructed at the northern portion of this basin in order to protect the buildings at the southwestern portion of the Stoney River Development. This berm will redirect drainage flows across the south parking lot to Inlet #16, located on the south side of the property (See the Proposed On-Site Drainage discussion below). These flows will be combined with those generated within On-Site Basin No. 2 and conveyed in a 15" ADS pipe, which ultimately discharges to the Roaring Fork River.

2.4 Off-Site Basin 4 (OS4)

The OS4 basin is located north of the Terraces Development and is approximately 12.2 acres in area and consists of sparsely vegetated land. Off-site drainage generated within this basin is conveyed west to east as a combination of overland flow, sheet flow and channel flow where it intercepts Midland Avenue. From Midland Avenue the flow is directed to the south and intercepted by the existing curb inlets along the eastern edge of Midland Avenue. At the curb inlets the flows are then combined with flows generated in Off-Site Basin RE and ultimately discharged to the Roaring Fork River. The 25-year peak flow is estimated to be 7.84 cfs based on WinTR-55 (see Appendix C).

2.5 Midland Avenue Off-Site Basins RE, RS, and RW

There are three off-site basins that encompass the roadway and adjacent property at the Midland Avenue and 27th Street Roundabout (Figure 3). Basin RE consists of pavement and includes the portion of Midland Avenue from the Roundabout to the north to a point just south of the north access drive to the Terraces Development. The area of this basin is 0.3 acres and the 25-year peak flow is estimated to be 0.80 cfs based on Win TR-55 (Appendix C). Basin RW consists of pavement, lawn and grass area within the Terraces Development and the northwest portion of the Roundabout. The area of this basin is 0.7 acres and the 25-year peak flow is approximately 1.07 cfs, based on Win TR-55. Basin RS consists of pavement, lawn and grass area within the southeastern portion of the Terraces Development and the south portion of the Roundabout. The area of this basin is 0.9 acres and the 25-year peak flow is approximately 1.66 cfs, based on Win TR-55.

The runoff generated within Basin RS is combined with surface flows from OS1 and OS2 (bypass flows from the existing 30" pipe) near Cross Section #5 at the existing curved vane

grate inlet. The capacity of the road at this location is approximately 48.6 cfs. According to model analysis of the existing storm drain system in the Roundabout this inlet does not intercept drainage flows generated by the 25-year design storm. Instead, drainage flows are bypassed to the east of the project as street flow and discharged to the Roaring Fork River. The capacity of the roadway at Cross Section #4, just east of Cross Section #5 along 27th Street, is approximately 46.8 cfs.

2.6 Terraces Development Off-Site Basins W-9A, W-10A, TN, and TS

The 1996 Martin/Martin Final Drainage Study for the Riverview Terrace was used to represent off-site flows from the Riverview Terrace Development. Figure 2 provides an overview of the Terraces Development and the associated drainage basin boundaries and 25-year flows associated with the Martin/Martin study. This report divided the Terraces Development into four basins for purposes of estimating off-site flows. Basin W-9A is the area located to the west along the south portion of the development. This basin is approximately 40 acres in area and consists of steep land with slopes as great as 70 percent. The upper elevations are rock which change to sparsely vegetated lands near Midland Avenue. The 25-year peak flow generated within this basin was estimated to be 29.72 cfs based on Win TR-55. The flows generated within this basin are collected in a 30" CMP and conveyed to the Roundabout storm sewer system. Basin W-10A is the area located to the west along the northern half of the development and has the same general land uses as Basin W-9A. This basin is approximately 22.1 acres in area with an estimated 25-year peak flow of 14.36 cfs. The flows generated within this basin are also collected in a 30" CMP and conveyed to the Roundabout storm sewer system. Basin TN is the northern portion of the Terraces Development and consists of buildings, parking lots, curb and gutter and landscaping. The area of this basin is 3.2 acres with an estimated 25-year peak flow of 6.58 cfs. Flows generated within this basin are collected in a 18" CMP and conveyed to the Roundabout storm sewer system. Basin TS encompasses the southern portion of the Terraces Development and consists of the same land uses as Basin TN. The area of this basin is 3.3 acres with an estimated 25-year peak flow of 6.44 cfs. Flows generated within this basin are collected in a 18" CMP and conveyed to the Roundabout storm sewer system.

2.7 Summary Off-Site Existing Hydrology and Runoff

A summary of the area and 25-year peak flows for the off-site basins is summarized in Table 1. Supporting calculations are included in Appendix C. Figure 6 shows where the general locations of the existing inlets are located within the Roundabout.

Table 1. 25-year peak flows for the off-site basins.

Basin ID	Area (Acres)	Q ₂₅ (cfs) Generated Within the Basin
OS1	133.5	69.27
OS2	25.9	20.99
OS3	0.4	1.8
OS4	12.2	7.84
RE	0.3	0.8
RW	0.7	1.07
RS	0.9	1.66
TN	3.2	6.58
TS	3.3	6.44
Historic Drainage Basin W-9A ²	40	29.72
Historic Drainage Basin W-10A	22.1	14.36

2.8 Potential of Off-Site Flows Impacting the Project Area

Off-site flows have the potential to enter the Stoney River Development at the southwest and western edges of the Memory Care Building. At the southwest portion of the project area, drainage from offsite basin OS3 will impact the project area. A 2' by 2' berm (with side slopes 2H:1V) will be constructed to avoid and mitigate drainage from OS3. This berm will direct flows from OS3 east towards the proposed inlets along the southern edge of the project area. The intercepted drainage will be conveyed to the Roaring Fork River through the proposed project storm drainage piping. The proposed storm drainage system for the project area has been designed to collect and convey off-site drainage flows impacting the site, as well as on-site drainage flows, for the 25- year design storm event.

The western portion of the project area has the potential to be impacted by drainage flows generated in off-site basins OS1, OS2, TS, W9A, RW and RS. Presently, flows generated in these basins are conveyed to the Roaring Fork River through an existing City storm drain system beneath the 27th Street and Midland Avenue Roundabout, with overflows from the system being conveyed via 27th Street. To determine the potential street flow volume rate generated by the 25-year storm event in the roundabout at the location where the west entryway to the Facility will be located, AutoDesk's® "Storm and Sanitary Analysis" (SSA) software was used to model the roundabout's existing storm drain system. Model results indicate that in order to keep off-site street flows in the 27th Street roundabout and prevent them from impacting the Facility, design of the entryway should be capable of conveying at least 30 cfs of street flow.

The proposed design provides for a special valley pan to be constructed adjacent to the Roundabout at the western entrance to the Facility. The special valley pan has 6 inches of rise from the flow line to its crest, throughout its length. See sheet 9 in Appendix I for a detail of the valley pan. Using design widths and elevations at the proposed entryway to the Facility in combination with existing data for the roundabout, the most restrictive street

² These areas as delineated for purposes of this report are slightly different than those presented in the Martin/Martin Drainage Study however are within the general range.

drainage capacity was calculated to be 46.8 cfs and occurs at cross-section 4B, see sheets 2 and 9 in Appendix I. The proposed design will prevent off-site drainage flows that are in the 27th Street roundabout from impacting the Facility and, in addition, will not alter the current drainage flow pattern.

A description of how the SSA model was constructed and the results of the analysis can be found in Appendix E; a detailed description of the software's capabilities can be found in Appendix D.

Also, site design proposes that the existing inlet at the western access driveway and 27th Street will be replaced with a curved vane valley pan inlet designed to collect a majority of the gutter flows at this location for storm events smaller than the 25-year event.



Figure 6. Existing Stormwater Conveyance Features. Locations indicated by a ★.

3.0 Proposed On-Site Drainage

This section outlines the methodology used to support the selection of stormwater infrastructure on-site at the Stoney River Development.

Article 070.030.040(a)(3)-(8) of the City's Municipal Code requires that the following calculations to support the on-site selection of stormwater infrastructure:

1. Locations of existing channels, dry washes and stream beds with their twenty-five (25) year storm calculations (discussed in the Existing Hydrology and Runoff section below);
2. Calculations and quantities of flow at points of concentration; and
3. Identification of possible breach points where irrigation ditches and dry washes intersect (discussed in the Existing Hydrology and Runoff section below).

Twelve on-site basins were delineated on the Stoney River Development. Figure 3 depicts the areas of the on-site basins. Appendix F provides additional detail pertaining to the on-site basins and stormwater infrastructure.

3.1 Existing Hydrology and Runoff

The overall topography of the site is steep, sloping from west to east. There is a steep slope from Midland Avenue to a terrace and temporary road at the western edge of the site. From this point the site slopes at a steep grade to the east where it meets the Atkinson Trail just above the Roaring Fork River's 100-year floodplain. Drainage from the western portion of the site is conveyed east where it ultimately discharges into the Roaring Fork River. There are no existing dry washes or stream beds on the project area. There are no potential breach points at the project area that may be impacted by the proposed project.

3.1.1 Soils

The existing soils at the site are classified as hydrologic soil group B (Ascalon-Pena complex), which are characterized as having a moderate infiltration rate when thoroughly wet, with 6 to 25 percent slopes. These soils are moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. See Appendix B for the Natural Resources Conservation Service (NRCS) Soil Report.

Yeh and Associates conducted a subsurface investigation to provide recommendations for foundation design and construction of a commercial structure and pavements for drives and parking areas³. The subsoils encountered in the borings consisted of 4 to 16 feet of fill, natural silt, clay and gravel underlain by very dense gravel, cobble and boulder materials. Bedrock was not encountered to the maximum explored depth of 50 feet. Fill was encountered in the parking lot areas. The materials appeared to be ancient colluvial and/or landslide deposits.

³ Geotechnical Investigation and Pavement Recommendations, Roaring Fork Lodge, March 27, 2007.

To reduce water accumulation outside of foundation walls, foundation drains should be installed around the exterior of the foundation walls and the ground surface surrounding the building should be sloped to drain away from any buildings and structures.

3.1.2 25-Year Peak Flows

The Rational Method was used to calculate the 25-year design storm peak flows for the on-site basins. Table 2 summarizes the on-site basin characteristics including the peak flow generated from a 25-year, 24-hour precipitation event and the inlet/design points. Appendix G provides the calculations for the peak and bypass flows for the inlets.

Table 2. 25-year peak flows for the on-site drainage basins.

Basin ID	Area (Acres)	Q ₂₅ (cfs) Generated Within the Basin	Inlet/Design Point	Bypass Flow (cfs)	Bypass Collection Point
1	0.2	0.81	Off-Site to Roaring Fork River	--	--
2 ⁴	1.3	5.27	13, 14, 15 & 16	1.76	17
2A	0.1	0.39	17	Sag, no bypass; Spread = 5.8'; Depth = 0.3	--
3	0.5	1.96	Collected in 12, 11, 10, 9, 8 & 7; conveyed to 6	--	--
3A	0.1	0.47	6	0	--
4 ⁵	0.5	1.88	5	0.45	3
5	0.2	0.70	3	Sag, no bypass; Spread = 12.3'; Depth = 0.34'	--
5A	0.1	0.32	3	Sag, no bypass; Spread = 12.3'; Depth = 0.34'	--
6	0.5	2.10	Existing riprap rundown at northeast corner of property	--	--
7	0.2	0.78	4	0.02	3
Roaring Fork Skilled Nursing Facility (South)	0.24	0.96	20	--	--
Roaring Fork Skilled Nursing Facility (North)	0.04	0.17	Off-Site through Basin 6 to Roaring Fork River	--	--

⁴ OS3 contributes to BS#2; the flows are not included in the value represented in this row for this basin. However, the bypass flows represented include contributions from OS3.

⁵ A portion of the flow from the Roaring Fork Skilled Nursing Facility is collected and conveyed to BS#4;

3.2 Proposed Stormwater Infrastructure

The proposed grading for the project directs all stormwater away from the buildings and structures. In addition, there are several stormwater inlets that will capture the 25-year runoff volume from the driveways, landscape and sidewalks within the project area and convey the drainage subsurface to an outlet point where it ultimately discharges to the Roaring Fork River. Runoff collected by roof drains will be conveyed subsurface in a solid pipe and connect to the stormwater infrastructure to avoid inundating the foundations with water.

The stormwater piping will be dual-walled HDPE with water-tight gaskets and sized to collect and convey stormwater above the 25-year storm. Flows not contained in the stormwater piping will be directed as surface flow to the Roaring Fork River, which is consistent with historical drainage patterns. All proposed catch basins have a 6" deep sediment trap and the two basins in sump condition also have a Snout[®] structure. Both configurations provide for a level of water quality treatment before drainage enters the stormwater system for ultimate discharge to the Roaring Fork River. The proposed outfalls will have riprap at their outlets designed to prevent erosion. (See Appendix H for riprap sizing calculations).

AutoDesk's[®] Storm and Sanitary Analysis software was used to simulate the hydraulic conditions within the proposed storm drainage infrastructure for the 25-year design storm event (See Appendix F for the model report and Appendix D for a description of the software's capability). There are two storm drain alignments that make up the model, one for the system at the south side of the project, the South Trunk, and one for the system beneath the main access road of the project, the North Trunk (see Figure 7).

The south trunk is made up of inlets 12, 13, 14, 15, 16, 21, 17, 18, 19 and an outlet. Drainage from on-site basins 2 and 2A, in addition to off-site drainage from basin OS3, is collected in this trunk and conveyed to the outlet point and discharged onto a riprap apron above the Roaring Fork River. From the outlet discharge point, drainage flows as overland flow to the Roaring Fork River.

The north trunk is made up of inlets 11, 10, 9, 8, 7, 6, 20, 5, 4, 3, 2, 1 and an outlet. Drainage from on-site basins 3, 3A, 4, 5, 5A, 7 and the proposed Roaring Fork Skilled Nursing Facility is collected in this trunk and conveyed to the outlet point and discharged onto a riprap apron above the Roaring Fork River. From the outlet discharge point, drainage flows as overland flow to the Roaring Fork River.

Results from the model analysis indicate:

- The capacity of the storm drain system is sufficient to convey drainage flows generated from the 25-year design storm at full or less-than-full capacity.
- The storm drain system operates under open channel flow conditions for drainage flows generated from the 25-year design storm.
- The pipe velocities for the design storm are greater than the recommended self-cleaning velocity of 3 feet per second (fps).
- Pipes are not surcharged during conveyance of drainage flow volumes associated with the 25-year design storm.
- The hydraulic grade line associated with the 25-year design storm drainage volumes indicate that the forces at grates and manhole lids are not sufficient enough to cause safety hazards during the storm event.

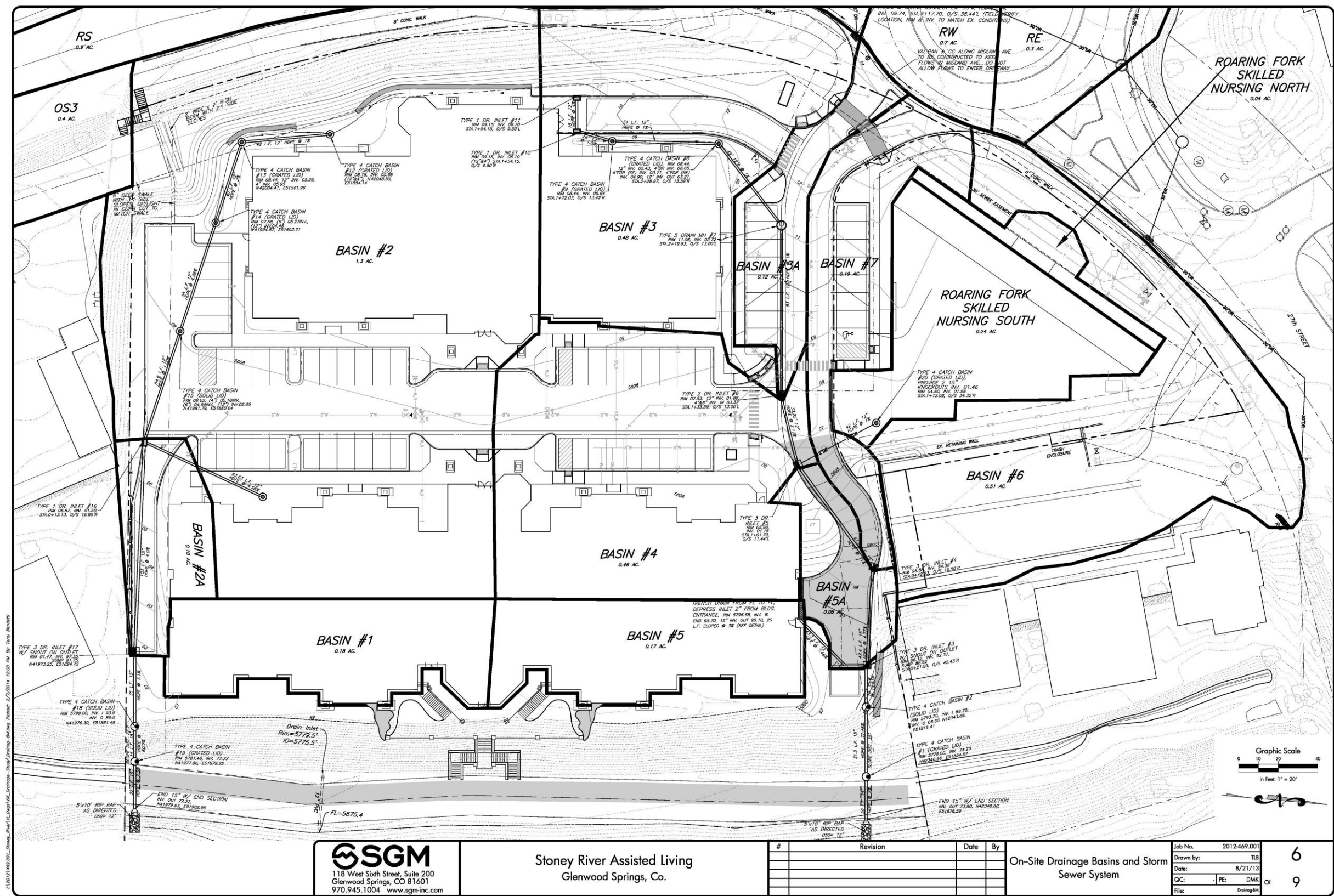


Figure 7. On-Site Drainage Basins.

See drawing sheets 7 and 8 for profiles (Appendix I), which include the energy and hydraulic grade lines associated with the 25-year design storm.

Drainage generated in on-site basin 1 is discharged to the surface at the east side of the Facility. This drainage historically has been collected in an existing low area upslope of the Atkinson Trail. The project proposes to install an inlet in the low area to allow for the area to drain and not impact the trail. The proposed inlet will convey the drainage under the Atkinson Trail and discharge it onto the Roaring Fork River embankment, which is consistent with the historic drainage flow pattern in this area.

4.0 Stormwater Management and Erosion Control

This project will disturb more than 1 acre and require compliance with the Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division (WQCD) General Construction Stormwater Permit, including the development of a Stormwater Management Plan (SWMP).

The proposed Stoney River project is essentially its own drainage basin and the stormwater runoff from the site will be mitigated through the use of temporary on-site Best Management Practices (BMPs) during construction until the site is permanently revegetated. The overarching objectives of the stormwater management and erosion control for the project includes:

1. Minimize the amount of disturbed soil.
2. Control and minimize erosion and sedimentation during and after the construction phase of a project.
3. Prevent runoff from offsite areas from flowing across the site.
4. Slow down the runoff.
5. Reduce pollutants in stormwater runoff (i.e., stormwater quality management).

Temporary and permanent BMPs have been selected to keep in line with these objectives.

In general the Contractor will not allow vehicles that are used for grading activities to come into contact with the asphalt parking lots and surfaces during grading activities so as to avoid tracking of dirt and sediment onto the streets parking lot. The Contractor will also be responsible for sweeping the parking lot and adjacent streets as needed daily. If activities require the equipment to contact the parking lot, the Contractor will be responsible for washing the equipment in a designated area that will contain both the sediment and water prior to entering the public street. The collected wash water will be disposed of properly.

The Contractor will also need to identify the areas where the disposal of sediment will occur and the equipment washing area (note the identified wash area will allow the wash water to evaporate, without risk of coming into contact with other stormwater features).

4.1 Stormwater Management Plan (SWMP)

A SWMP will be required for construction of this project. The SWMP addresses the construction and post-construction erosion control measures proposed for this project.

A copy of the proposed SWMP for this project (per the CDPHE-WQCD SWMP Guidance document⁶) is included in Appendix J. The selected Contractor needs to update this SWMP document with the most recent guidance information and specific information pertaining to the construction of the site no later than 10 days prior to construction. The Contractor must also apply for coverage under the Construction General Permit and comply with all terms and conditions no later than ten (10) days prior to construction. A copy of the SWMP will be kept on site during construction.

⁶ <http://www.colorado.gov/cs/Satellite?blobcol=urldata&blobheadname1=Content-Disposition&blobheadname2=Content-Type&blobheadvalue1=inline%3B+filename%3D%22SWMP+Guidance.pdf%22&blobheadvalue2=application%2Fpdf&blobkey=id&blobtable=MungoBlobs&blobwhere=1251807331931&ssbinary=true>

Appendix A

City Review Comments

To: Jill Peterson

From: David M. Kotz, P. E. 

Date: April 17, 2013 (Revised May 14, 2013)

Re: Stoney River Assisted Living
Response to Staff Comments



As a follow-up to the meeting held Thursday, April 11, 2013, this memo responds to the written Staff comments furnished to date. Upon review and discussion of the comments, we believe that all issues raised can be satisfactorily resolved on the Staff level prior to the council meeting May 16.

The final resolution of all comments will be incorporated into the "Approved for Construction" plan set that accompanies the Development Agreement. Our goal here is to state how the comment is or will be resolved and minimize the transmission of intermediate plans. Of course, some items will require graphic presentation ahead of time to facilitate proper review by Staff.

Our response to each comment is provided below in blue. May 14 revisions are shown in red. We request that Staff review each response and inform us of any exceptions or additional information that is necessary.

PLANNING ITEM: 01-13
SUBJECT: Stoney River – Evergreen Housing
Major Dev.; Minor Subdivision –
Memory Care and Senior Living

CITY ATTORNEY (Jan Shute)

CITY MANAGER (Jeff Hecksel) – No comment.

POLICE DEPARTMENT (Terry Wilson) – No concerns with subdivision.

Parking seems too minimal for staffing and snow storage. Ingress plan seems OK. Think exit may need to be a "right only" for safety and back-up.

SGM 4-17-13: Additional parking is provided in the lower level of the Assisted Living facility. Snow removal will be by contract to haul off-site as necessary. The "right only" comment

applies to the exit of the Roaring Fork Skilled Nursing Facility and will be addressed under separate correspondence. **SGM 5-14-13: Exit to 27th St. has been eliminated**

PUBLIC WORKS DIRECTOR (Robin Millyard) See attached memo dated March 30, 2013.

MEMORANDUM

TO: PLANNING-JILL PETERSON

FROM: ROBIN MILLYARD

DATE: MARCH 30, 2013

SUBJECT: PLANNING ITEM 1-2013 STONEY RIVER SUBDIVISION AND STONEY RIVER ASSISTED LIVING

PLAT SHEET:

1. There are some minor differences on the outer boundary of Lot 1 of the proposed Stoney River Minor Subdivision and the outer boundary of Lot 2 of the Glenwood Springs Racquet Club PUD, As Amended.

COURSE	COMPONENT	Lot 1 Stoney River Minor Subdivision	Lot 2 G.S. Racquet Club PUD, As Amended
C1	DELTA	7° 44' 48"	7° 44' 47"
C1	CHORD LENGTH	122.26'	122.25'
C2	DELTA	56° 51' 03"	56° 51' 06"
C2	CHORD BEARING	N 11° 41' 26" E	N 11° 41' 27"E
C3	DELTA	16° 31' 16"	16° 31' 17"
C3	CHORD DIRECTION	N 48° 22' 35"E	N 48° 22' 39"E

The radius length varies on curves C7 (421.00') and C8 (419.25'), which are segments of curve C2 (421.09'). Presumably, these minor differences are the result of more accurate calculations and rounding of numbers associated with those calculations. Is that correct? The curves that describe parts of the same line should have a consistent radius.

SGM 4-17-13: A revised "Minor Subdivision Plat" will be submitted prior to the City Council meeting. The SGM surveyor will discuss all changes with the PWD. The PWD is correct in the assertion that may of the differences are due to revised calcs and rounding.

2. The basis of bearing appears to reference the Glenwood Springs Racquet Club PUD, As Amended. Provide a rotation note on the plat to orient this plat to the City's grid-I believe it would be 0.1306° or 00° 07' 50" counter-clock-wise.

SGM 4-17-13: A note will be included on the revised plat.

SHEET 1 OF 10 – Existing Conditions & Demolition Plan:

3. It is difficult to see clearly, but it appears the Atkinson Trail may encroach outside the westerly line of the dedicated easement at a point about 90-feet ± from the southerly line of the proposed Lot 1. At other points, the constructed trail appears to be with a foot or so of the easement boundary. Should the 20-foot trail easement be re-described and re-dedicated to more closely align the centerline of the constructed trail to the centerline of the easement?

SGM 4-17-13: Yes. Will be shown on the revised plat.

4. There are drainage facilities under the Atkinson Trail that discharge onto private property and it does not appear there is an easement for that purpose.

SGM 4-17-13: 10' wide easements for the existing drainage facilities will be shown on the revised plat.

SHEET 3 OF 10 – Grading & Drainage Plan:

5. There is not a 12" water main running from 27th Street into this property as indicated on the plan (several sheets incorrectly show a 12" line). I believe there is a 10" line stubbed into the proposed Lot 1.

SGM 4-17-13: The 12" W will be removed from all plans. The design shown utilizes the 10" line.

6. It is not clear how the entry driveway aligns with the existing features of the roundabout. Provide additional, detailed information regarding this configuration, as it appears the entrance drive to this parcel will be very close the point north bound Midland Avenue traffic enters the roundabout.

SGM 4-17-13: The attached exhibit shows the existing roundabout and proposed entryway. The geometry of the entry and exit drive, as well as the proximity of the entry to the NB leg of Midland all fall within typical roundabout design guidelines. SGM 5-14-13: Roundabout has been added to base mapping and appears on all site plans. No separate exhibit is attached.

7. Show the 15" Ø storm drain adjacent to this property, after it leaves proposed inlet #12.

SGM 4-17-13: This is an existing inlet w/ a new valley pan grate. The 15" outflow pipe has been revised to match record drawings.

8. All of the on-site storm drainage infrastructure associated with this development will remain privately owned and maintained.

SGM 4-17-13: Understood.

SHEET 4 OF 10 – Utility Plan:

9. Why is a 10" water main necessary on this site? Would a 6" or an 8" be adequate?

SGM 4-17-13: We are awaiting final determination of required fireflows and will inform the City or the required line size. We expect that an 8" line will suffice and be shown on the final plans.

10. The City's responsibility on the water service will end at the discharge side of the existing valve on the existing 10" stub.

SGM 4-17-13: Understood.

11. The Municipal Code suggests one property shall not serve another property with water. The proposed 10" service line provides service to proposed Lot 2 and continues on to provide service to Lot 1. As noted above, the City's ownership and maintenance responsibilities for the 10" service shall end at the discharge side of the existing valve in 27th Street. Is some sort of ownership and maintenance agreement being developed that addresses these issues on both water and wastewater service?

SGM 4-17-13: Yes. A DRAFT shared use agreement will be furnished for City review. Necessary easements will be shown on the Minor Subdivision Plat.

11. The utility plans seem to envision a continued shared use between the proposed developments on Lot 1 and Lot 2. There is a potential for split ownership in the future, so the infrastructure should be configured to independently serve each lot. If this configuration moves forward as presented, some type of joint ownership and maintenance agreement should be developed and recorded.

SGM 4-17-13: Agreed. A DRAFT shared use agreement will be furnished for City review.

12. The proposed retaining wall encroaches into the 30-foot sewer easement. Existing manhole MH AA-32-5 appears to be only 10-feet± from this wall-the sewer main at this point is 17.8-feet± deep at this point. Maintenance and excavation access need to be preserved for this sewer main.

SGM 4-17-13: We agree and sewer maintenance concerns were the major factor in placing the wall where it is. As discussed, this wall height, at 5.33', is slightly higher than envisioned the last time we looked at maintenance considerations. To facilitate City review, SGM prepared the attached plan and cross section w/ no vertical exaggeration. The soils report recommends temporary slopes no steeper than 1H: 1V. Given this criteria, a 12' high trench box would be appropriate for excavation of the sewer to avoid disturbing the Midland Ave sidewalk. Use of the trench box will allow the wall to remain undisturbed. MH AA-32-5 is located only 12' from the edge of Midland sidewalk, but is down a 2:1 slope. Jetting of this reach upstream to Hagar Lane would most likely occur from the downstream manhole located 135' to the north. We believe that this is satisfactory for anticipated future maintenance. If deemed necessary, the Development Agreement could include a clause stating that the City is not responsible for the wall should maintenance operations affect it. SGM 5-14-13: The Memory Care finished floor elevation has been raised 2.58' and the wall is now less than 3' high.

13. Typically, private sewer services do not enter the public mains in a manhole; the connection is made upstream or downstream of the public manhole. Are there unusual conditions that would suggest the connection into the public manhole is the most appropriate?

SGM 4-17-13: Since the 8" line has 3 gravity connections and one force main connection, SGM treated it as more of a main than service line. The connection to the manhole was OK'd in the meeting and a follow-up phone call w/ the WWW Superintendent.

14. The lift station, associated force main, and sewer main and services on this development will remain a private responsibility.

SGM 4-17-13: Understood

15. What is the source of construction water for this project?

SGM 4-17-13: Contractor will most likely use existing Gould hydrant on proposed Lot 2. We understand potable water must be metered and that the hydrant may not be used as one of the proposed hydrants on-site. Hydrant will be delivered to City yard as directed at end of construction.

16. As there benefits to a larger area associated with the proposed fire hydrant installations. As such, the City typically accepts ownership and maintenance responsibilities for fire hydrants. An easement for that purpose will need to be dedicated, providing for an area 7.5 feet on each side and to the front and back of each hydrant. Bollards may be requested for protection of a hydrant, as determined by the City.

SGM 4-17-13: The Minor Subdivision Plat will show these hydrant easements.

SHEET 10 of 10 – Stormwater Management & Erosion Control Plan

17. The vehicle tracking pads should be maintained throughout the project to keep them effective. Any materials tracked onto the adjacent public roadways shall be removed in a timely manner to avoid it being tracked and becoming fugitive dust by normal traffic using Midland Avenue or 27th Street.

SGM 4-17-13: Understood. These provisions will be included in the SWMP.

ASSISTANT PUBLIC WORKS DIRECTOR(Dave Betley)

Memo

To: Jill Peterson
From: Dave Betley
Date: 4/8/2013
Re: Roaring Fork Assisted Living Facility

Jill,

In reviewing the plans for this project, I have the following comments:

- The plans for the project do not show the proposed contours for the Midland/27th Street Roundabout. The plans should show the street grades and call out the existing tie in points to show that there is no impact to the right of way.

SGM 4-17-13: The attached exhibit shows the existing roundabout and proposed entryway. The proposed valley pan/ curb & gutter connection matches existing grades. SGM 5-14-13: Roundabout has been added to base mapping and appears on all site plans. No separate exhibit is attached.

- There is access that needs to be maintained to the existing sewer along the west edge of the property. Is it discussed as to how this will be maintained? There appears to be a thirty foot sewer easement along this west edge. The proposed retaining wall appears that it may encroach into this easement. Please show the easement in relation to the retaining wall. Please discuss the impact of this wall on the sewer easement, and the maintenance obligations of the wall.

SGM 4-17-13: We agree and sewer maintenance concerns were the major factor in placing the wall where it is. As discussed, this wall height, at 5.33', is slightly higher than envisioned the last time we looked at maintenance considerations. To facilitate City review, SGM prepared the attached plan and cross section w/ no vertical exaggeration. The soils report recommends temporary slopes no steeper than 1H: 1V. Given this criteria, a 12' high trench box would be appropriate for excavation of the sewer to avoid disturbing the Midland Ave sidewalk. Use of the trench box will allow the wall to remain undisturbed. MH AA-32-5 is located only 12' from the edge of Midland sidewalk, but is down a 2:1 slope. Jetting of this reach upstream to Hagar Lane would most likely occur from the downstream manhole located 135' to the north. We believe that this is satisfactory for anticipated future maintenance. If deemed necessary, the Development Agreement could include a clause stating that the City is not responsible for the wall should maintenance operations affect it. SGM 5-14-13: The Memory Care finished floor elevation has been raised 2.58' and the wall is now less than 3' high.

- The proposed storm drain outlets crossing the Atkinson Ditch trail do not appear to have any erosion protection at the outlets. Please discuss how the trail will be protected from such erosion. The engineer needs to provide a detail as to the compaction, thickness, and bedding on the proposed drain location and patching requirements of the utility cuts to the path. The compaction and cuts should be doweled in if the path in this area is concrete. The bedding should be compacted beyond a certain threshold to ensure that water does not infiltrate at these locations and create sinkage to the path bedding at these locations.

SGM 4-17-13: A 5' x 10' x 18" D50 = 12" rip rap outfall is indicated on sheet 3 of 10 (lower rt). The "As Directed" note is intended to provide for a best fit into the existing rocky, river bank. Backfill will be full-depth class 6 aggregate compacted to 95% per the "Trench Cross Section" detail sheet 9 of 10. A new note will list the concrete patch req'ts. It shall be in-kind thickness w/ #4 dowels embedded 6" @ 12" spacing w/ 18" min. overlap.

- The City does not agree with the assumption that the site is not impacted by offsite flow. Has the engineer provided any documentation to support this assumption? The drainage from the hills to the west drains to Midland Avenue. Midland Avenue drains to the 27 Street roundabouts. Water at this point drains past the driveways towards the Roaring Fork River. Has adequate calculations been performed to show that the runoff will stay in the right of way? How much runoff is intercepted by the existing storm drain system? Catch basins located on steeper grades tend to not be very efficient at catchment and can have larger amounts of bypass. Also, the soils from the upstream basins are extremely erosive. Offsite runoff would tend to carry a large amount of sediment which would have the capacity to clog catch basins.

SGM 4-17-13: A clarification was presented in the meeting that the primary concern was from offsite basins west of Midland and south of the Terraces.

SGM developed the Stoney River drainage design based on information from drainage reports for the Roaring Fork Lodge (former development this site) and The Terraces (opposite Midland). We also reviewed record drawings from the City for the roundabout and conducted site visits to ascertain drainage conditions in the field. A roundabout specific drainage report was not provided. SGM requests that any roundabout drainage design be provided to us and that it be concurrently reviewed by City Staff.

Additional field and office review was conducted in an effort to address this comment. We continue to conclude that the infrastructure for the Terraces and Roundabout does deflect the appreciable off-site drainage away from the project.

The concern for potential offsite drainage impacts from areas south of the Terraces and west of Midland stems from a lack of cross drainage features on a 3000 lf + length of roadway extending southward to a highpoint near the CR 154 intersection. The nearest cross culvert is located about 1100' south of the Hagar Lane intersection. The upstream end of this 18" culvert is blocked by sediment in the lower half and the upper side has been crushed by vehicle load. The flowline of the ditch is low enough that it appears to convey flow right past the culvert entrance. [SGM recommends that proper function of this 18" culvert and downstream system be restored this spring.]

With minimal functioning cross drainage features, the west side ditch could convey flows from the entire 133.5 acre basin northward towards our project. (See attached exhibit for delineation of the basin.). 25-year total flow is estimated to be about 70 cfs based on a WinTR-55 analysis.

The west side ditch is poorly defined and has limited capacity in places. Based on an aerial topo cross section located south of the intersection of Hagar Lane, SGM estimated that only about 20 cfs could be directed northward towards the project area. The rest would overtop Midland at some point and flow eastward to the river.

Rick Barth, P.E. of Red Mountain Civil designed the Roundabout. He states that he and former City Engineer Mike McDill developed the roundabout drainage plan. The intent was for the 30" pipe system to intercept all flows from the Westside ditch. That currently does not happen due to lack of a ditch and or culvert at the southern emergency access road for the Terraces. High levels of flow will tend to spread out back into the pavement. Constructing the ditch to the 30" culvert will reduce potential impacts on traffic and on Stoney River. It would be the optimal solution for resolving this review comment. The Fire Dept should be consulted as to drivability of the ditch section. Ditch depth may be limited by depth of the gas line.



SGM's primary concern for Stoney River is at the west side of the memory care building. That area is protected by a 6" vertical curb and wide road section of Midland Ave. The diversion capacity there is estimated at 44 cfs which is >> than the 20 cfs potential from the west side ditch of Midland Ave.

The site design for Stoney River provides the necessary protection from potential offsite drainage impacts on the South and north side of the buildings. Drainage flowing out of the ROW and down the entry drive seems to be the concern on the north side of the buildings. While SGM's application Grading and Drainage Plan Sheet 3 of 10 notes that the pan is to be constructed in a manner that keeps flow in the roundabout, additional spot elevations and details are warranted. These will be added to the Construction Plan set.

The curved vane valley pan inlet is highly efficient and will remove a major portion of the gutter flow at the entry. Driveway containment elevations will be set based on resolution of the west side ditch to 30" matter and city input on the gutter flow to be analyzed.

In the unlikely event that drainage is ever diverted down the driveway, it will have minimal impacts. The steep grades and numerous inlets will keep flow confined within the roadway. The Construction Plans will restore the original design intent of preserving an overflow route past the trash enclosure.

We look forward to discussing this matter w/ Staff and resolving the City's concerns. SGM 5-14-13: A site meeting was held Monday April 22. Attendees were Terri Partch, Dave Betley, Terry Claassen, Angie Fowler and Dave Kotz. The above info was discussed in detail and reviewed in the field. Absent roundabout design info to the contrary, SGM's opinion is that the site is adequately protected from offsite drainage. The additional protection measures discussed have been incorporated into the revised site design. Subsequent investigation by SGM surveyors indicates that ample space exists in the ROW for a connection from the Midland Ave ditch to the 30" driveway culvert at the Terraces.

- The trash receptacle is located directly at the end of the overland flow path to the site. How will runoff be protected from stormwater contamination with this design from the dumpster?

SGM 4-17-13: The Construction Plans will restore the original design intent of preserving an overflow route past the trash enclosure and any bypass flow will have minimal impacts.

- It did not appear that the high water marks were provided along the Roaring Fork River. Are they pertinent? Is there enough change in elevation that the site is protected?

SGM 4-17-13: The Existing Conditions & Demolition Plan Sheet 1 of 10 shows the 10-yr and 100-yr floodplains of the RFR. They intersect the bank below the trail and will not impact the site design.

- Please show the existing alignment of the round-a-bout and the location of the driveway within the round-a-bout.

SGM 4-17-13: Refer to the attached exhibit SGM 5-14-13: Roundabout has been added to base mapping and appears on all site plans. No separate exhibit is attached.

- Does existing 27th Street have enough capacity to keep offsite flows from entering the site?

SGM 4-17-13: Yes. Refer to answer to 4th bullet.

- Do the proposed catch basins have enough capacity to catch the onsite runoff impacting the site? Catch basins on steep grades tend to have bypass. If the system is not collecting all the onsite runoff, it appears that the runoff would flow towards the Roaring Fork River causing bank erosion that would impact the Atkinson Ditch Trail.

SGM 4-17-13: Yes. Adequate inlet capacity is provided.

- The hydraulic grade should be checked on the onsite storm drain to show that it will not heave the manhole covers off near the Atkinson Ditch Trail.

SGM 4-17-13: Adequate freeboard is provided as both manholes (CBs) are about 4' deep. The 25-yr flowrate in the South 15" is 5.7 cfs. HGL in CB is 1.63'. The 25-yr flowrate in the North 15" is 6.2 cfs. HGL in CB is 1.88'.

- Discussion of Stacking and the entrance to the Skilled Nursing facility should be discussed. The one way access design into the Skilled Nursing facility is very awkward. Traffic at peak hours may impact people trying to get in and out of the round-a-bout, causing delays. There should be some form of onsite signage to alert drivers from the Assisted Living that they should not block the entrance to the Skilled Nursing facility. This could also have impacts for emergency vehicles.

SGM 4-17-13: We agree this is an "awkward" intersection design and our traffic engineer shared these same concerns. For safety, the ped crosswalk is located so there is room for a vehicle to stop when entering from or exiting to the roundabout. Review of the volume and timing of site generated traffic leads us to conclude that any delays should be minimal. Due to timing of shift changes, site peak hour traffic does not coincide with that of the roundabout. The suggested signage is a good solution to reduce the chance of traffic

backing up into the roundabout. It will read "DO NOT BLOCK INTERSECTION" and will be placed east of the one way drive to RFSN. SGM 5-14-13: The entrance to the Skilled Nursing has been eliminated.

BUILDING DEPARTMENT (Patrick Seydel) – I-1 occupancy for assisted living/ind. living building;

I-2 occupancy for memory care facility. Construction to comply with 2009 IBC, IMC, IPC, IFGC, IECC. Comply with recommendations of soils report by Yeh & Assoc. dated 3/21/13, Prov. No. 213-036. SGM 4-17-13: OK

CITY ENGINEER (Terri Partch)

April 8, 2013

Engineering comments on the Stony River Assisted Living development project
Drainage plan

- Please clearly identify all potentially contributing upstream basins and all structures and pipes with sizing that divert the offsite flow around the project. Verify that no bypass of these upstream facilities occurs in a 25 year storm.

SGM 4-17-13: Please refer to the response for the 4th bullet of Dave Betley's comments.

- Show the 25 year hydraulic grade line on the system. Look at the energy grade line at the final manhole and determine whether to lock the catch basin cover.

SGM 4-17-13: Adequate freeboard is provided as both manholes(CBs) are about 4' deep. The 25-yr flowrate in the South 15" is 5.7 cfs. HGL in CB is 1.63'. The 25-yr flowrate in the North 15" is 6.2 cfs. HGL in CB is 1.88'.

- Please provide your rip rap sizing. Size the rip rap for a 25 year event.

SGM 4-17-13: The N 15" will flow at a velocity of 6.44fps at the 25-yr peak flow of 6.2 cfs. The end section will disperse that flow onto a 5' x 10' x 18" D50 = 12" rip rap outfall as indicated on sheet 3 of 10 (lower rt). The "As Directed" note is intended to provide for a best fit into the existing rocky, river bank. 12" size was chosen to replicate existing river bank in area of outfalls. Ancient HEC-11 Fig. 2 indicates 12" spherical stones will resist velocities up to 8.2 fps on a 1:1 slope.

- Check bypass on the entry driveway catch basins. If bypass occurs, the flow path will be through the dumpster enclosure and down the steep embankment to the river.

SGM 4-17-13: There is adequate capacity for a 25-yr event. The Construction Plans will restore the original design intent of preserving an overflow route past the trash enclosure.

- This project will need a construction stormwater management plan from CDPHE.

SGM 4-17-13: The contractor will be required to secure the permit from CDPHE using the SWMP prepared by SGM.

Driveways, turning radii and sight distance

- Verify that no landscaping or signs over 42" in height will be in the 30'x30' sight distance triangle of either the new drive or the existing access

SGM 4-17-13: There are no signs or landscaping over 42" in the sight triangles.

- The driveway width is approximately 60'. City municipal code does not allow driveways over 35 feet in width. Please narrow the driveway, or request a variance for the wider entry.

SGM 4-17-13: As we discussed in the meeting, we believe the design width is appropriate for this connection to a roundabout. We also believe the Code did not contemplate connections to roundabout and Staff may rule this section as not applicable. Please advise if a formal design variance request is required.

COMMUNITY DEVELOPMENT DIRECTOR (Andrew McGregor)

CITY PLANNER (Jill Peterson)

CITY ELECTRIC (Doug Hazzard) – 1. No comments on subdividing lots. 2. If major development is approved, developer will need to follow our "line extension policy" – attached.

SGM 4-17-13: We will need the line extension policy as I could not locate a record copy.

WATER/WASTEWATER (Buddy Burns) – See Attached (2 pages)

The following are conditions or comments I would offer regarding this item:

1. The water and wastewater utilities should be designed to stand alone should the development on lot #2 not occur.

SGM 4-17-13: Understood. The design presented is meant to work with either lot going first.

2. Adequate cross connection control devices shall be installed on the proposed domestic water service, on the proposed fire suppression system and on the proposed landscape irrigation system.

SGM 4-17-13: Understood. These will be included in the mechanical design of the buildings.

3. There is currently a 10" water service stubbed into this general area. The City will lose ownership of this line on the discharge side of the 10" valve in 27'h St. From the discharge side of this valve into the development will be considered private and will not be maintained by the City. The proposed fire hydrants within this development will not be considered private. They will be owned and maintained by the City. Easements around the fire hydrants shall extend a minimum of 7.5' to the sides and the front and rear of the hydrant location.

SGM 4-17-13: Understood. Easements to be included on revised Minor Subdivision Plat.

4. A maintenance agreement shall be developed between lot #1 and lot #2 for the shared water and wastewater utilities.

SGM 4-17-13: Understood.

5. All water usage, except the proposed fire suppression system, shall be metered. The only acceptable meter is the Badger automated meter, no exceptions.

SGM 4-17-13: Understood. These will be included in the mechanical design of the buildings.

6. No unacceptable wastes, excessive grease, etc., shall be allowed to enter into the sanitary sewer system.

SGM 4-17-13: Understood. These will be included in the mechanical design of the buildings.

7. A construction meeting shall be held between the City and the developer/contractor prior to the start of construction to ensure that all concerns and comments have been adequately addressed.

SGM 4-17-13: Understood. Should be part of the Development Agreement.

8. A minimum of 4' horizontal separation shall be maintained between the water and wastewater utilities and the other utilities such as gas, telephone, cable, storm sewer and electric.

SGM 4-17-13: Agreed. We believe the design complies.

9. All installations shall be as per the City of Glenwood Springs Standards and Specifications.

SGM 4-17-13: Understood. Construction also per SGM technical specs.

10. The developer is responsible for pressure testing, sterilization and bacT testing of all water utilities prior to them being placed into service.

SGM 4-17-13: Understood. This will be assigned to the contractor.

11. The proposed wastewater utilities will be considered private and will not be maintained by the City. It is understood that all of the wastewater flows will tie into an existing City manhole in 27th St. and will not tie into the existing private Racquet Club Condos lift station.

SGM 4-17-13: Understood. Correct.

12. No profiles were shown for the proposed wastewater utilities.

SGM 4-17-13: Sorry for the omission. Profiles will be included in the Construction Drawings that accompany the Development Agreement.

13. Contact the water department at 384-6389 concerning their construction water policy.

SGM 4-17-13: We understand that all water will be metered and the hydrant used (existing on Lot 2) cannot be incorporated into the system. It will be turned over to the City at the end of construction. The Contractor will be directed to contact water dept. by note on utility plan.

14. As-builts are required from the developer for all water and wastewater utilities.

SGM 4-17-13: SGM will survey as-built infrastructure as part of the required construction admin and certification of public improvements.

15. Whenever water and wastewater lines cross each other or run in the same proximity, they shall do so in a manner that is acceptable to the Colorado Department of Health.

SGM 4-17-13: Understood.

16. Line locates shall be requested at 811 prior to the start of any construction.

SGM 4-17-13: Understood. Contractor requirement by law and note on plans.

17. There is no 12" water crossing on 27th St. near the Racquet Club Condos. as shown on the utility drawings.

SGM 4-17-13: This line will be removed from all drawings.

18. The proposed 8" sewer and manholes shall be tested and televised by the developer prior to them being placed into service.

SGM 4-17-13: Understood. Contractor requirement included in SGM technical specs.

19. All existing water and wastewater easements shall be maintained for future maintenance and repairs.

SGM 4-17-13: Understood.

20. The proposed force main for the assisted living building shall tie in downstream of the proposed manhole, not directly into the manhole. This lift station will be considered private and will not be maintained by the City.

SGM 4-17-13: I believe the City backed off of this requirement as these are private facilities. Please advise. SGM 5-14-13: The force main will connect directly to a full-body wye on the pipe.

21. An additional valve shall be installed on the 8" water line in the vicinity of

where it reduces from 10" to 8". SGM 4-17-13: An 8" gate valve will be added to the Construction Plans that accompany the Development Agreement.

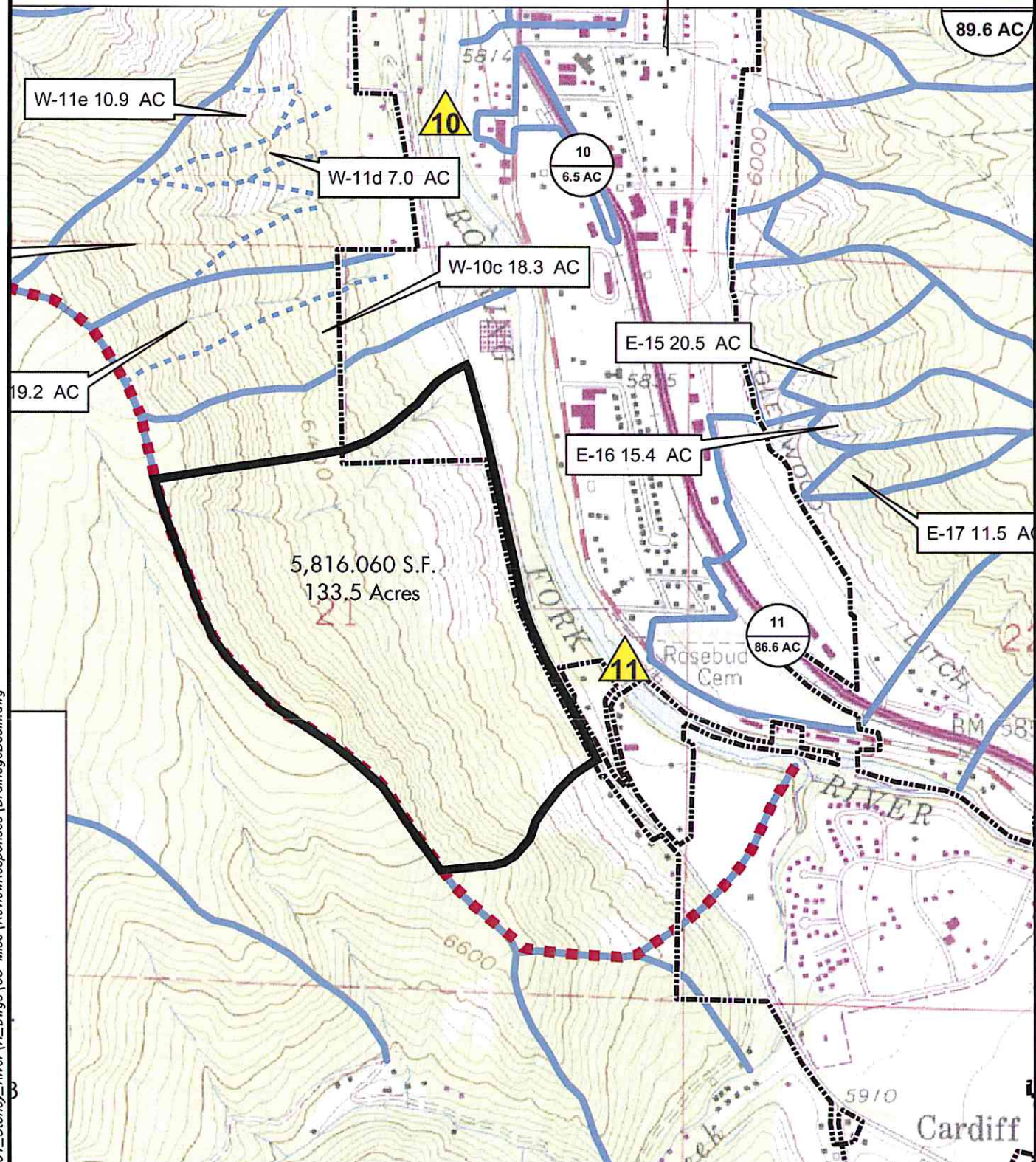
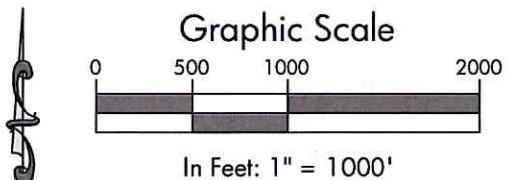
FIRE DEPARTMENT (Ronald Biggers) SGM 5-14-13: SGM believes that all site plan related items have been addressed by our revised plan set.

RE-1 SCHOOL DISTRICT



**Sewer Line / Retaining
Wall Section**

**Preliminary
Not For
Construction**



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SGM
 118 West Sixth Street, Suite 200
 Glenwood Springs, CO 81601
 970.945.1004 www.sgm-inc.com

Stoney River Assisted Living
 Glenwood Springs, Colorado

Job No.	2012-469.001
Drawn by:	RM
Date:	04/15/13
QC:	PE: DMK
File:	DrainageBasin

Drainage Basins

Sht. 1
 of .

May 22, 2013

Engineering comments on the Stony River Assisted Living development project – 2nd Review

Drainage plan- Response to SGM comments dated May 14th, 2013

We understand that you have reviewed drainage design information from the Roaring Fork Lodge and the Terraces and have concluded that storm drainage systems within these developments and within the roundabout divert off site drainage away from your project. However, we will need you to provide a stamped drainage study that verifies your conclusions through engineering calculations. Please provide a stamped study that includes the following information at a minimum:

- Show and label all contributing basins, both on site and off site. **Completed.**
- Determine the run off from these basins for a 25 year storm using the Rational Method, Win TR-55, or some other commonly accepted methodology. **Completed.**
- Show and label all drainage facilities, including streets and ditch sections, both on site and off site which will carry or divert flow around your project site. **Completed.**
- Provide capacity calculations for all pipe systems, ditch systems and inlets. Determine whether the pipe, ditch or inlets will accommodate the 25 year design flow, or whether flow will be bypassed. Also assess the capacity and bypass of the trench drain in front of the Assisted Living Building garage. **The grading in front of the garage has been revised to direct a majority of the bypass flows from inlet #5 to inlet #3. Are there drains in the garage? Yes. Discharge to sanitary sewer.** Provide sizing calculations for the rip rap sections. **Included in the Appendix of the revised June 2013 Drainage Report.**
- Verify and provide calculations to show that no bypass occurs past the inlet next to the trash enclosure. Show ponding depth and limits if the inlet is to be placed in a sump condition. **The inlet (#3) has been relocated to avoid possible contamination in a ponded situation with the trash receptacle. Inlet #3 is in a sump condition and will have ponding less than the curb height for a 25-year peak flow event (~4 inches of ponding is estimated). See On-Site Calculations Appendix in the June 2013 Drainage Report.**
- Include the profile of the proposed storm drainage system in the roadway profiles. Show the system hydraulic grade line and the energy grade line. **See the June 2013 Drainage Report.**

Other Site Plan Comments:

Please provide top and bottom of wall elevations at 20' intervals along each proposed retaining wall. Article 070.150 requires that no retaining wall exceed 6' in height and that all retaining walls over 4' are designed and stamped by a licensed engineer. In addition, walls over 30' in length must include elements to minimize the wall mass. Please see the applicable section of the municipal code. **Done. All walls with the exception of the one by the trash are less than 4 feet in height.**

Verify that the ADS storm drain pipe will not fail prematurely under the heated concrete driveway. **No. The ADS storm drain pipe will maintain integrity at temperatures up to 140 degrees (F). The temperature of the concrete with the heating elements will not exceed 140 degrees F DAVE.**

Show the delivery and trash truck turning radii for the Skilled Nursing Center. If trucks will be backing into the delivery/trash area, verify that they will be allowed to use the Racquet Club Driveway, and that they will be able to back up the steep driveway. Ensure that all trucks will enter and exit the site in forward drive. **Plans have been modified to accommodate forward truck entry/exit of the site.**

Please change Note 9 on Sheet 2 of the Site Plan to include that dust control will be required by the City if the City receives complaints about the project. **Completed.**

The driveway grade down to the Assisted Living Building exceeds 10%. Article 070.040.030 requires that grades in excess of 10% if approved by the Fire Chief and Building Official. **DAVE.**

The site plan shows a 30'x14' delivery truck parking space in front of the parking garage. Will trucks need to back up the steep drive to get out of this space? **DAVE.**

Memo



To: Jill Peterson
From: Dave Betley
Date: 5/28/13
Re: Offsite Basin analysis

Information stamped and signed by Dave Kotz, PE was submitted in support of the opinions stated in the April 17th letter addressing City comments. The City has performed a review of the information and offer the following comments:

- 1) It is assumed that the hydrologic analysis is sound. The offsite drainage analysis was requested in original comment letter dated April 8, 2013 and iterated in the field meeting on either April 11 or April 22 (There is confusion as to the exact date. City staff calendars represent April 11, SGM recollects April 22). The supporting documentation was submitted on May 24th via email at approximately 2:00 PM in the afternoon. A detailed review of the hydrology was not performed because of the limited time given to review the document before the Planning and Zoning Commission meeting. **SGM has provided detailed off-site and on-site hydrology in the June 2013 Drainage and Erosion Control Report.**
- 2) Please label basin 1A on the drainage basin map. Please provide concentration points and areas of diversion on the drainage map. **Drainage basins have been redelineated and assigned new identification numbers.**
- 3) The assumptions made in the hydraulic analysis are somewhat confusing. One hundred and thirty-three cubic feet per second (cfs) are generated by basin 1A (according to TR-55 analysis). The engineer then provides a series of cross-sections from two through five with the following flow rates:
 - Xsec 2 – 20.75 cfs
 - Xsec 3 – 44.33 cfs
 - Xsec 4 – 30.85 cfs
 - Grate Inlet 5 – intercepted flow 5.5 cfs, total discharge – 20 cfs

It is not clear how the flow rate increases from 20.75 cfs to 44.33 cfs from cross section two to cross section three. The Cross Sections above represent the capacity of the roadway at these locations, not necessarily the 25-year peak flows. The cross sections of the roadway vary in length and configuration (i.e., presence/lack of a curb and gutter), therefore the capacity changes. Specifically, Cross Section 2 does not have a curb as is present in Cross Section 3. In looking at the information provided, the flow rate from cross section three to cross section four is the catch basin reducing the flow at section five. No, the roadway capacities are reflected and change. The flow rate analyzed at catch basin is twenty cfs, not the forty-four cfs from cross section three. The hydraulic calculations state that the runoff intercepted by the catch basin is five cfs. Yes.

It is not clear as to how the engineer came to the reduction in flow rate from the submitted information. The June 2013 Drainage Report has included additional clarification and will hopefully clear up any confusion that these Cross Sections represent the capacity of the roadway at these locations.

- 4) As the engineer has requested within the field meeting, the ditch located on the west side of Midland Avenue has been cleaned out and recut to establish the efficiency decreased by sedimentation from the winter and spring runoff. City staff is researching the maintenance responsibilities of the culvert located to the west of the round-a-bout. We support your efforts to address the connection of the ditch to the culvert.

Please keep in mind that maintenance is performed on a regular basis, but weather and freezing restrict maintenance in the winter time. The capacity of the ditch fluctuates. Understood.

- 5) If the flow rate at cross section three is forty-four cfs, is the engineer assuming that all this flow will cross Midland to the northeast and flow towards the catch basin in section five? Yes, however, not all of this flow is intercepted as the existing storm sewer system in the Roundabout is not designed too. The bypassed flows will be conveyed to the northeast, following the existing drainage path to the Roaring Fork River. Please clarify the assumptions made in the engineering design. If this is the case, the assumption of thirty cfs impacting the valley gutter may not be valid. The depth would be higher and may overtop the valley gutter, causing runoff to drain into the site. The site has been regraded at the entrance to avoid the 25-year peak event to flow onto the site. If flow does enter the site the on-site storm water system has the capacity to intercept flows and therefore avoid impacting any buildings. Would this runoff impact any of the buildings? The engineer needs to further explain his assumptions and calculations. The June 2013 Drainage Report has included additional clarification and will hopefully clear up any confusion regarding this issue.
- 6) Could the engineer please consolidate the submittal and calculations into a report addressing the drainage comments? See the updated June 2013 Drainage Report. The engineer should include the latest round of comments into the report. See Appendix A of the June 2013 Drainage Report. Please provide clear explanations as

to the design assumptions and the how they apply to the site design. There were also comments in relation to the hydraulic capacity of the onsite storm drain in the original comments on April 8th. The engineer states that the designed storm drain has adequate capacity, but does not provide any calculations supporting these assumptions. **The June 2013 Drainage Report includes hydraulic analyses for both the off-site and on-site storm sewer systems.**

Please note that Public Works does not issue permits. Through the review process, Public Works is required to finish up the department review process by Planning and Zoning approval. This ensures that the characteristics of the site including drainage, traffic, finished floor elevations and overall site design does not change. **Understood.**

The engineer's opinions are noted in the review process. To avoid future misunderstandings, it is greatly appreciated if these issues are resolved before final approval for the Planning and Zoning Commission. **Understood.**

- 7) Please note that the time given for review of this document was extremely short do to the fact that the document was submitted on Friday afternoon and Monday was a holiday. There may be additional comments once the engineer has combined all calculations and assumptions into a single document. **Understood.**

David Kotz

From: David Kotz
Sent: Tuesday, May 21, 2013 6:19 PM
To: Angie Fowler
Cc: Terri Patch; 'Dave J. Betley'; Jill N Peterson
Subject: Stoney River Drainage

Angie,

Dave B. called and was inquiring about back-up calcs for our verbal and written representations. I think we have general agreement on our approach and Dave is just looking for the confirming calculations. (Note the City did not find any roundabout file info that would change anything.)

At this point, I expect Dave and Terri would like to see:

1. WInTR-55 Hydrologic Calcs for Midland Basin (Basis for Q25 = 70 cfs)
2. Flowmaster Midland ditch cross section capacity (for 20 cfs max diversion towards project assumption) [Note our survey dept did confirm adequate ROW on west side of Midland from ditch to 30" culvert.]
3. Flowmaster Midland curb and gutter capacity above Memory Care (for 44 cfs interception)
4. Flowmaster Valley Pan Capacity at revised entrance (this is a new calc as we have increased the containment)
5. Interception capacity of the curved vane valley pan inlet at revised entrance (this is also a new calc)
6. A plan view exhibit illustrating locations of cross section for 2. – 5. above

Can you locate the computer files you did for the first 3 and make a new calcs for 4. and 5. and exhibit for 6.?

Dave and Terry,

Are there other calculations/exhibits you require?

Thank you,

David M. Kotz, PE, CFM
Civil Engineer



118 W Sixth St, Suite 200
Glenwood Springs, CO 81601
970.384.9008 / 970.379.9792 cell
www.sgm-inc.com



SEE
ATTACHED
DK

1

WinTR-55 Current Data Description

--- Identification Data ---

User: DMK Date: 4/15/2013
Project: Stoney River Units: English
SubTitle: Midland Ave- CR 154 to Terraces Areal Units: Acres
State: Colorado
County: Garfield
Filename: I:\2012\469.001_Stoney_River\L_MDR-Application\Post-AppStaffComments\MidlandDrainage.w55

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
1a	Midland	Outlet	133.5	78	0.330

Total area: 133.50 (ac)

--- Storm Data ---

Rainfall Depth by Rainfall Return Period						
2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.0	1.4	1.6	2.0	2.2	2.5	1.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>



#1

DMK

Stoney River
Midland Ave- CR 154 to Terraces
Garfield County, Colorado

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.0	1.4	1.6	2.0	2.2	2.5	1.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>



1

DMK

Stoney River
Midland Ave- CR 154 to Terraces
Garfield County, Colorado

Watershed Peak Table

Sub-Area or Reach Identifier	ANALYSIS: (cfs)	Peak Flow (cfs)	by Rainfall (cfs)	Return Period (cfs)
		10-Yr (cfs)	25-Yr (cfs)	100-Yr (cfs)

SUBAREAS

1a	19.08	32.00	63.71	110.34
----	-------	-------	-------	--------

REACHES

OUTLET	19.08	32.00	63.71	110.34
--------	-------	-------	-------	--------



#1

DMK

Stoney River
Midland Ave- CR 154 to Terraces
Garfield County, Colorado

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow ANALYSIS: (cfs) (hr)	10-Yr (cfs) (hr)	25-Yr (cfs) (hr)	100-Yr (cfs) (hr)
---------------------------------	---	------------------------	------------------------	-------------------------

SUBAREAS

1a	19.08	32.00	63.71	110.34
	12.14	12.13	12.12	12.11

REACHES

OUTLET	19.08	32.00	63.71	110.34
--------	-------	-------	-------	--------



#1

DMK

Stoney River
Midland Ave- CR 154 to Terraces
Garfield County, Colorado

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
1a	133.50	0.330	78	Outlet	Midland

Total Area:	133.50 (ac)				



#1

DMK

Stoney River
Midland Ave- CR 154 to Terraces
Garfield County, Colorado

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)

1a							
User-provided							0.330
Time of Concentration							0.330
							=====



1

DMK

Stoney River
Midland Ave- CR 154 to Terraces
Garfield County, Colorado

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
1a	Herbaceous	(good) D	93.5	85
	Oak - aspen	(fair) D	40	63
Total Area / Weighted Curve Number			133.5 =====	78 ==



#2

STONEY RIVER/RFSN Worksheet for Triangular Channel

Project Description	
Worksheet	#2 West Ditch
Flow Element	Triangular Char
Method	Manning's Form
Solve For	Discharge

Input Data	
Mannings Coeff	0.035
Channel Slope	008700 ft/ft
Depth	1.00 ft
Left Side Slope	3.75 H : V
Right Side Slope	13.00 H : V

Results	
Discharge	20.75 cfs
Flow Area	8.4 ft ²
Wetted Perim	16.92 ft
Top Width	16.75 ft
Critical Depth	0.82 ft
Critical Slope	0.024287 ft/ft
Velocity	2.48 ft/s
Velocity Head	0.10 ft
Specific Energ	1.10 ft
Froude Numb	0.62
Flow Type	Subcritical

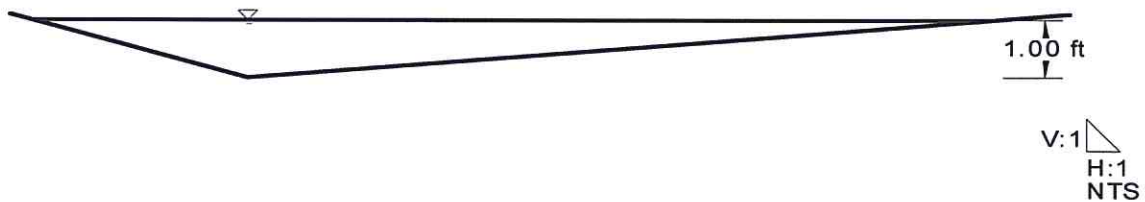


Cross Section
Cross Section for Triangular Channel

#2

Project Description	
Worksheet	#2 West Ditch
Flow Element	Triangular Char
Method	Manning's Form
Solve For	Discharge

Section Data	
Mannings Coeff	0.035
Channel Slope	008700 ft/ft
Depth	1.00 ft
Left Side Slope	3.75 H : V
Right Side Slope	13.00 H : V
Discharge	20.75 cfs



#3

STONEY RIVER/RFSN Worksheet for Irregular Channel

Project Description

Worksheet	#3 Roadway Capacity at S
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data

Channel Slope	030000 ft/ft
Water Surface Elev	5,831.13 ft

Options

Current Roughness Method	aved Lotter's Method
Open Channel Weighting	aved Lotter's Method
Closed Channel Weighting	Horton's Method

Results

Mannings Coeff	0.013
Elevation Range	30.62 to 5,831.18
Discharge	44.33 cfs
Flow Area	7.0 ft²
Wetted Perimeter	38.14 ft
Top Width	37.91 ft
Actual Depth	0.51 ft
Critical Elevation	5,831.29 ft
Critical Slope	0.003565 ft/ft
Velocity	6.37 ft/s
Velocity Head	0.63 ft
Specific Energy	5,831.76 ft
Froude Number	2.62
Flow Type	Supercritical

Calculation Messages:

Water elevation exceeds lowest end station by 0.095 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+38	0.013

Natural Channel Points

Station (ft)	Elevation (ft)
0+00	5,831.03
0+10	5,831.02
0+20	5,831.01
0+30	5,830.85
0+35	5,830.70
0+36	5,830.66
0+37	5,830.62
0+38	5,831.18



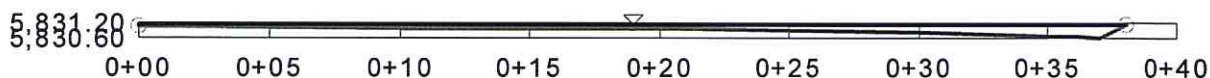
Cross Section

Cross Section for Irregular Channel

3

Project Description	
Worksheet	#3 Roadway Capacity at S
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.013
Channel Slope	0.030000 ft/ft
Water Surface Elev	5,831.13 ft
Elevation Range	30.62 to 5,831.18
Discharge	44.33 cfs



V:1
H:1
NTS



STONEY RIVER/RFSN Worksheet for Irregular Channel

#4

Project Description	
Worksheet	#4 VPan @ En
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Input Data	
Channel Slope	018500 ft/ft
Water Surface Elev	13.90 ft

Options	
Current Roughness Method	oved Lotter's Method
Open Channel Weighting	oved Lotter's Method
Closed Channel Weighting	Horton's Method

Results	
Mannings Coeff	0.013
Elevation Range	1.48 to 14.17
Discharge	30.85 cfs
Flow Area	5.7 ft²
Wetted Perimeter	28.32 ft
Top Width	28.00 ft
Actual Depth	0.42 ft
Critical Elevation	14.03 ft
Critical Slope	0.003636 ft/ft
Velocity	5.37 ft/s
Velocity Head	0.45 ft
Specific Energy	14.35 ft
Froude Number	2.09
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+38	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	14.10
0+10	14.10
0+10	13.60
0+12	13.48
0+14	13.60
0+38	13.84
0+38	14.17



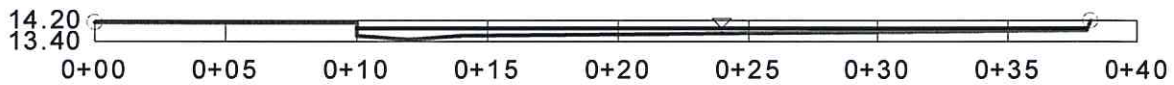
Cross Section

Cross Section for Irregular Channel

#4

Project Description	
Worksheet	#4 VPan @ En
Flow Element	Irregular Chan
Method	Manning's For
Solve For	Discharge

Section Data	
Mannings Coefficient	0.013
Channel Slope	0.018500 ft/ft
Water Surface Elev	13.90 ft
Elevation Range	13.48 to 14.17
Discharge	30.85 cfs



V:1
H:1
NTS



STONEY RIVER/RFSN Worksheet for Grate Inlet On Grade

5

Project Description	
Worksheet	#5 Grate Inlet Capa
Type	Grate Inlet On Grad
Solve For	Efficiency

Input Data	
Discharge	20.00 cfs
Channel Slope	0.034000 ft/ft
Gutter Width	1.83 ft
Gutter Cross Slope	0.020 ft/ft
Road Cross Slope	0.020 ft/ft
Mannings Coeff	0.013
Grate Width	1.83 ft
Grate Length	3.25 ft
Grate Type	ripped Vane
Clogging	20.0 %

Options	
Grate Flow Options	Include None

Results	
Efficiency	0.28
Total Intercepted Flow	5.50 cfs
Bypass Flow	14.50 cfs
Spread	16.30 ft
Depth	0.33 ft
Flow Area	2.7 ft²
Gutter Depression	0.0 in
Total Depression	0.0 in
Velocity	7.53 ft/s
Splash Over Velocity	6.71 ft/s
Frontal Flow Factor	0.93
Side Flow Factor	0.03
Grate Flow Ratio	0.27
Active Grate Length	2.60 ft



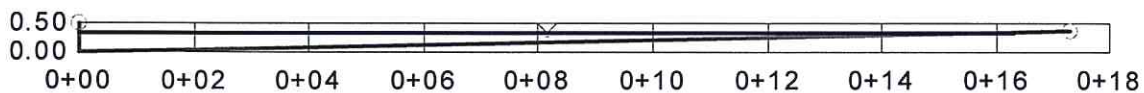
Cross Section

Cross Section for Grate Inlet On Grade

#5

Project Description	
Worksheet	#5 Grate Inlet Capa
Type	Grate Inlet On Grad
Solve For	Efficiency

Section Data	
Discharge	20.00 cfs
Efficiency	0.28
Channel Slope	0.034000 ft/ft
Gutter Width	1.83 ft
Gutter Cross Slope	0.020 ft/ft
Road Cross Slope	0.020 ft/ft
Mannings Coefficient	0.013
Grate Width	1.83 ft
Grate Length	3.25 ft
Grate Type	curved Vane
Clogging	20.0 %



V:1
H:1
NTS



Appendix B

Soil Reports



United States
Department of
Agriculture



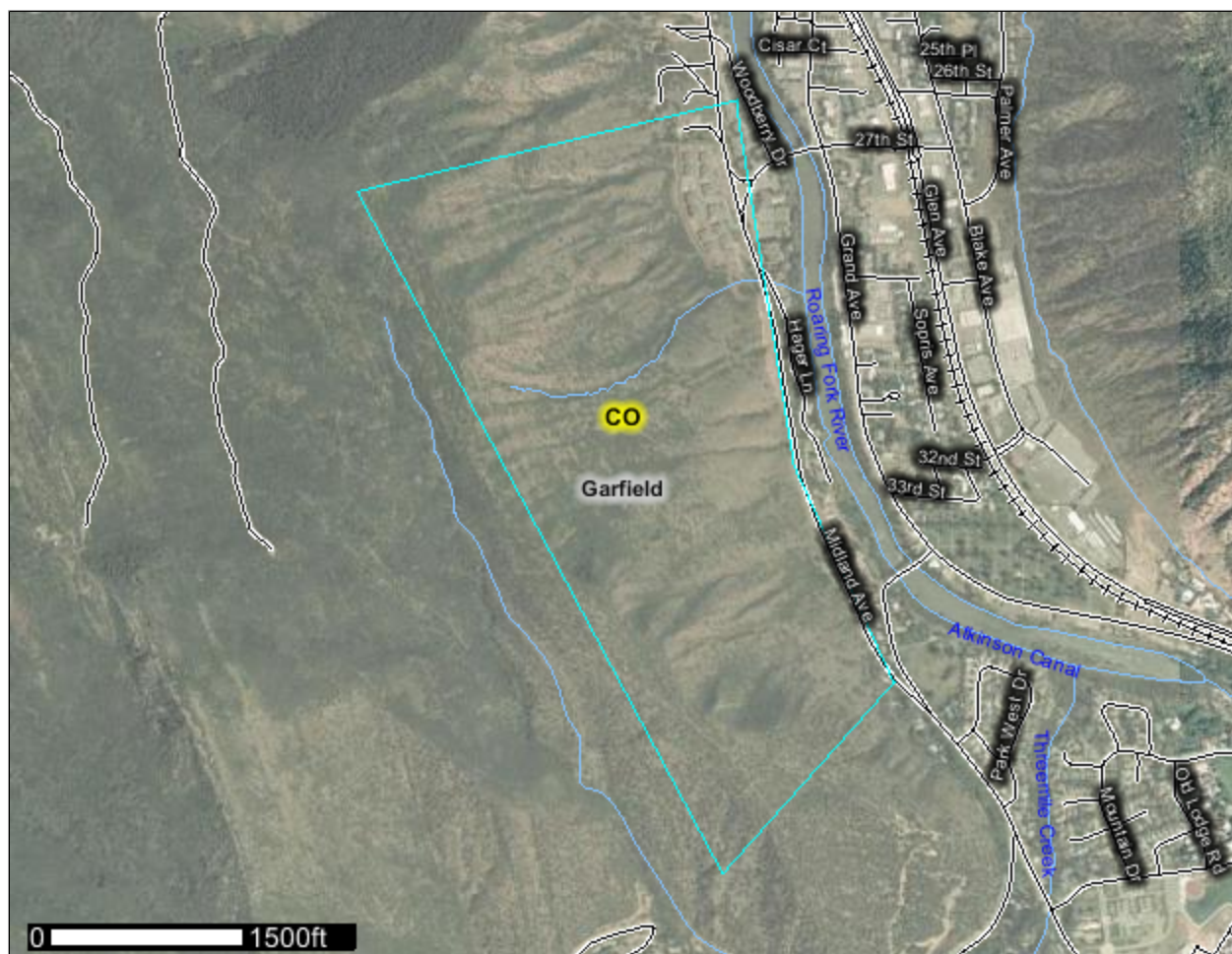
NRCS

Natural
Resources
Conservation
Service

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

Custom Soil Resource Report for Rifle Area, Colorado, Parts of Garfield and Mesa Counties

Off-Site Drainage Basins



June 8, 2013

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://soils.usda.gov/sqi/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<http://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

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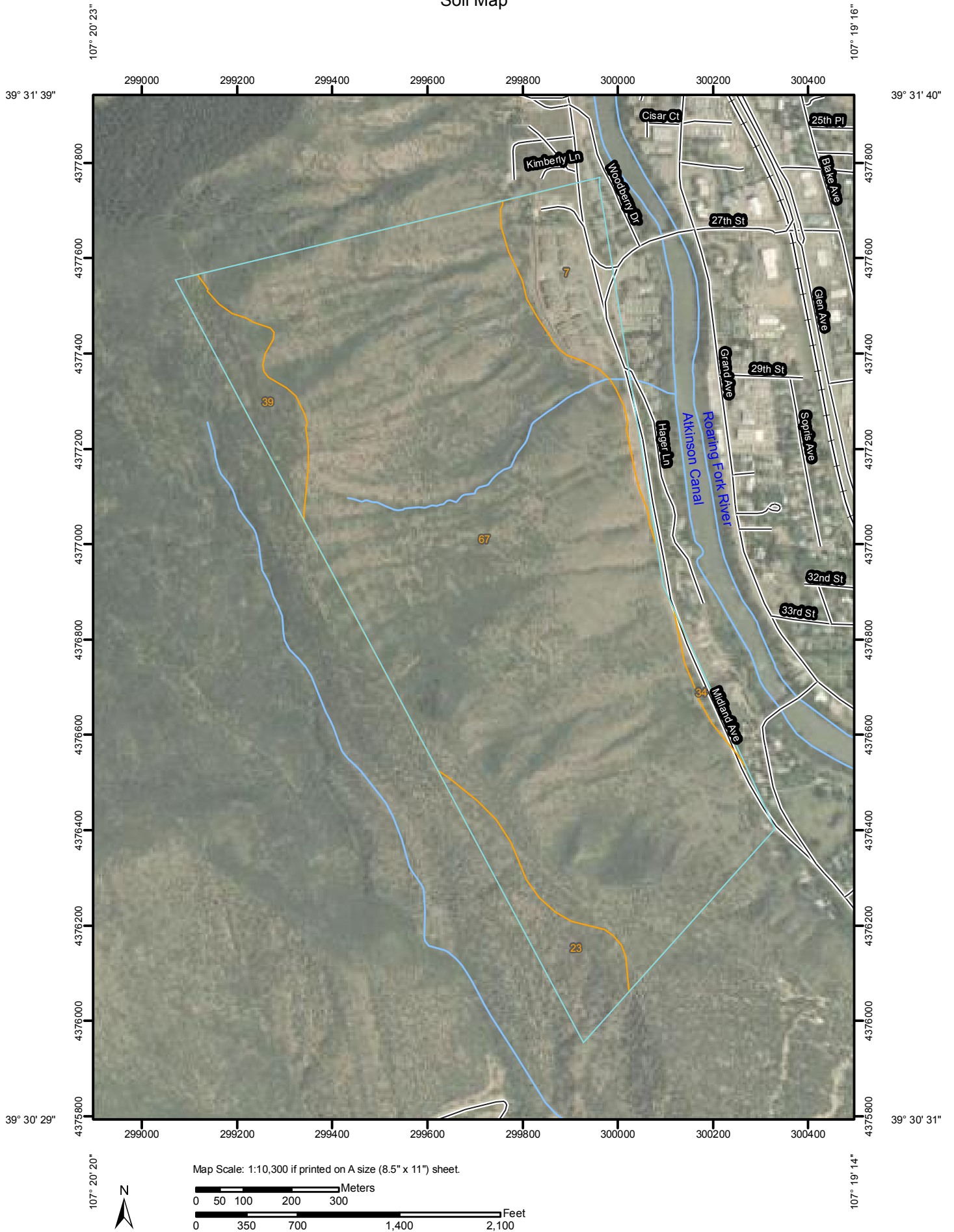
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Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Special Point Features

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

-  Very Stony Spot
-  Wet Spot
-  Other

Special Line Features

-  Gully
-  Short Steep Slope
-  Other

Political Features

-  Cities

Water Features

-  Streams and Canals

Transportation

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

MAP INFORMATION

Map Scale: 1:10,300 if printed on A size (8.5" x 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 13N NAD83

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

Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 6, Mar 25, 2008

Date(s) aerial images were photographed: 7/19/2005; 8/6/2005

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

Map Unit Legend

Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
7	Ascalon-Pena complex, 6 to 25 percent slopes	19.0	7.0%
23	Detra fine sandy loam, 12 to 25 percent slopes	13.1	4.9%
34	Ildefonso stony loam, 25 to 45 percent slopes	1.7	0.6%
39	Jerry loam, 12 to 50 percent slopes	10.6	3.9%
67	Torriorthents-Rock outcrop complex, steep	225.9	83.5%
Totals for Area of Interest		270.4	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments

on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Rifle Area, Colorado, Parts of Garfield and Mesa Counties

7—Ascalon-Pena complex, 6 to 25 percent slopes

Map Unit Setting

Elevation: 5,000 to 6,500 feet

Map Unit Composition

Ascalon and similar soils: 65 percent

Pena and similar soils: 25 percent

Description of Ascalon

Setting

Landform: Alluvial fans, valley sides

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Parent material: Alluvium derived from sandstone and shale

Properties and qualities

Slope: 6 to 12 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 10 percent

Available water capacity: High (about 9.5 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: Deep Loam (R048AY292CO)

Typical profile

0 to 5 inches: Fine sandy loam

5 to 30 inches: Sandy clay loam

30 to 60 inches: Sandy clay loam

Description of Pena

Setting

Landform: Alluvial fans, valley sides

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Calcareous alluvium derived from sandstone and shale

Properties and qualities

Slope: 6 to 25 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 6.00 in/hr)

Custom Soil Resource Report

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Loamy Slopes (R048AY303CO)

Typical profile

0 to 6 inches: Stony loam
6 to 12 inches: Very stony loam
12 to 60 inches: Very stony sandy loam

23—Detra fine sandy loam, 12 to 25 percent slopes

Map Unit Setting

Elevation: 6,500 to 8,000 feet

Map Unit Composition

Detra and similar soils: 85 percent

Description of Detra

Setting

Landform: Mountainsides
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Properties and qualities

Slope: 12 to 25 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water capacity: Moderate (about 7.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6e
Hydrologic Soil Group: B

Ecological site: Mountain Loam (R048AY228CO)

Typical profile

0 to 7 inches: Fine sandy loam
7 to 12 inches: Sandy loam
12 to 33 inches: Sandy clay loam
33 to 57 inches: Sandy clay loam
57 to 61 inches: Unweathered bedrock

34—Ildefonso stony loam, 25 to 45 percent slopes

Map Unit Setting

Elevation: 5,000 to 6,500 feet

Map Unit Composition

Ildefonso and similar soils: 90 percent

Description of Ildefonso

Setting

Landform: Alluvial fans, valley sides, breaks
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Mixed alluvium derived from basalt

Properties and qualities

Slope: 25 to 45 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Available water capacity: Low (about 5.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: B

Typical profile

0 to 8 inches: Stony loam
8 to 60 inches: Very stony loam

39—Jerry loam, 12 to 50 percent slopes

Map Unit Setting

Elevation: 7,000 to 9,500 feet

Map Unit Composition

Jerry and similar soils: 90 percent

Description of Jerry

Setting

Landform: Mountainsides

Landform position (three-dimensional): Mountainflank

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Alluvium derived from basalt and/or alluvium derived from sandstone and shale

Properties and qualities

Slope: 12 to 50 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Available water capacity: Moderate (about 8.5 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability (nonirrigated): 7e

Hydrologic Soil Group: C

Ecological site: Brushy Loam (R048AY238CO)

Typical profile

0 to 3 inches: Loam

3 to 10 inches: Clay loam

10 to 40 inches: Cobbly clay loam

40 to 60 inches: Cobbly clay

67—Torriorthents-Rock outcrop complex, steep

Map Unit Setting

Landscape: Foothills

Elevation: 5,800 to 8,500 feet

Custom Soil Resource Report

Mean annual precipitation: 10 to 15 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 80 to 105 days

Map Unit Composition

Torriorthents, steep, and similar soils: 60 percent
Rock outcrop, steep: 25 percent

Description of Torriorthents, Steep

Setting

Landform: Mountainsides
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Mountainflank, base slope
Down-slope shape: Concave, convex
Across-slope shape: Concave, convex
Parent material: Stony, basaltic alluvium derived from sandstone and shale

Properties and qualities

Slope: 15 to 70 percent
Depth to restrictive feature: 4 to 30 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 2.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: D

Typical profile

0 to 4 inches: Variable
4 to 30 inches: Fine sandy loam
30 to 34 inches: Unweathered bedrock

Description of Rock Outcrop, Steep

Setting

Landform: Mountainsides
Landform position (three-dimensional): Free face
Down-slope shape: Convex
Across-slope shape: Convex

Properties and qualities

Slope: 15 to 70 percent
Depth to restrictive feature: 0 inches to paralithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Available water capacity: Very low (about 0.0 inches)

Interpretive groups

Farmland classification: Not prime farmland

Custom Soil Resource Report

Land capability (nonirrigated): 8s

Hydrologic Soil Group: D

Typical profile

0 to 60 inches: Unweathered bedrock

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United States
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agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Rifle Area, Colorado, Parts of Garfield and Mesa Counties

On-Site Drainage Basins



June 8, 2013

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://soils.usda.gov/sqi/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<http://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Special Point Features

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



Very Stony Spot



Wet Spot



Other

Special Line Features



Gully



Short Steep Slope



Other

Political Features



Cities

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

MAP INFORMATION

Map Scale: 1:988 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 13N NAD83

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

Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties

Survey Area Data: Version 6, Mar 25, 2008

Date(s) aerial images were photographed: 7/19/2005

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

Map Unit Legend

Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
7	Ascalon-Pena complex, 6 to 25 percent slopes	3.9	100.0%
Totals for Area of Interest		3.9	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Rifle Area, Colorado, Parts of Garfield and Mesa Counties

7—Ascalon-Pena complex, 6 to 25 percent slopes

Map Unit Setting

Elevation: 5,000 to 6,500 feet

Map Unit Composition

Ascalon and similar soils: 65 percent

Pena and similar soils: 25 percent

Description of Ascalon

Setting

Landform: Alluvial fans, valley sides

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Parent material: Alluvium derived from sandstone and shale

Properties and qualities

Slope: 6 to 12 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 10 percent

Available water capacity: High (about 9.5 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: Deep Loam (R048AY292CO)

Typical profile

0 to 5 inches: Fine sandy loam

5 to 30 inches: Sandy clay loam

30 to 60 inches: Sandy clay loam

Description of Pena

Setting

Landform: Alluvial fans, valley sides

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Calcareous alluvium derived from sandstone and shale

Properties and qualities

Slope: 6 to 25 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 6.00 in/hr)

Custom Soil Resource Report

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Loamy Slopes (R048AY303CO)

Typical profile

0 to 6 inches: Stony loam
6 to 12 inches: Very stony loam
12 to 60 inches: Very stony sandy loam

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Appendix C

Off-Site Drainage Calculations

STONEY RIVER/RFSN Cross Section #2

Worksheet for Triangular Channel

Project Description

Worksheet	#2 West Ditch
Flow Element	Triangular Char
Method	Manning's Form
Solve For	Discharge

Input Data

Mannings Coeffic	0.035
Channel Slope	008700 ft/ft
Depth	1.00 ft
Left Side Slope	3.75 H : V
Right Side Slope	13.00 H : V

Results

Discharge	20.75 cfs
Flow Area	8.4 ft²
Wetted Perim	16.92 ft
Top Width	16.75 ft
Critical Depth	0.82 ft
Critical Slope	0.024287 ft/ft
Velocity	2.48 ft/s
Velocity Head	0.10 ft
Specific Energ	1.10 ft
Froude Numb	0.62
Flow Type	Subcritical

STONEY RIVER/RFSN Cross Section #3 **Worksheet for Irregular Channel**

Project Description	
Worksheet	#3 Roadway Capacity at S
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	0.003565 ft/ft
Water Surface Elev.	5,831.18 ft

Options	
Current Roughness Method	Selected: Manning's Method
Open Channel Weighting	Selected: Manning's Method
Closed Channel Weighting	Selected: Horton's Method

Results	
Mannings Coefficient	0.013
Elevation Range	5,830.62 to 5,831.18
Discharge	44.33 cfs
Flow Area	7.0 ft²
Wetted Perimeter	38.14 ft
Top Width	37.91 ft
Actual Depth	0.51 ft
Critical Elevation	5,831.29 ft
Critical Slope	0.003565 ft/ft
Velocity	6.37 ft/s
Velocity Head	0.63 ft
Specific Energy	5,831.76 ft
Froude Number	2.62
Flow Type	Supercritical

Calculation Messages:
 Water elevation exceeds lowest end station by 0.095 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+38	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	5,831.03
0+10	5,831.02
0+20	5,831.01
0+30	5,830.85
0+35	5,830.70
0+36	5,830.66
0+37	5,830.62
0+38	5,831.18

Section 4A

Project Description	
Worksheet	Section-4A
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	0.008 ft/ft 200
Water Surface Elevation	5,814. ft 17

Options		
Current Roughness Method	Improved Lotter's Method	
Open Channel Weighting Method	Improved Lotter's Method	
Closed Channel Weighting Method	Horton's Method	

Results	
Mannings Coefficient	0.013
Elevation Range	5,813.68 to 5,815.43
Discharge	55.46 cfs
Flow Area	12.0 ft ²
Wetted Perimeter	39.92 ft
Top Width	39.84 ft
Actual Depth	0.49 ft
Critical Elevation	5,814.26 ft
Critical Slope	0.003413 ft/ft
Velocity	4.64 ft/s
Velocity Head	0.33 ft
Specific Energy	5,814.50 ft
Froude Number	1.49
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+41	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	5,814.17
0+08	5,813.68
0+10	5,813.81
0+34	5,813.81
0+35	5,814.06
0+40	5,814.18
0+41	5,814.18
0+41	5,815.43

Section 4B

Project Description		
Worksheet	Section-4B	
Flow Element	Irregular Channel	
Method	Manning's Formula	
Solve For	Discharge	
Input Data		
Channel Slope	0.008 ft/ft 200	
Water Surface Elevation	5,813. ft 99	
Options		
Current Roughness Method	Improved Lotter's Method	
Open Channel Weighting Method	Improved Lotter's Method	
Closed Channel Weighting Method	Horton's Method	
Results		
Mannings Coefficient	0.013	
Elevation Range	5,813.49 to 5,816.70	
Discharge	46.83 cfs	
Flow Area	10.0 ft²	
Wetted Perimeter	32.80 ft	
Top Width	32.74 ft	
Actual Depth	0.50 ft	
Critical Elevation	5,814.08 ft	
Critical Slope	0.003373 ft/ft	
Velocity	4.69 ft/s	
Velocity Head	0.34 ft	
Specific Energy	5,814.33 ft	
Froude Number	1.50	
Flow Type	Supercritical	

Section 4B

Roughness Segments		
Start Station	End Station	Mannings Coefficient n
0+00	0+39	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	5,813.99
0+08	5,813.49
0+10	5,813.62
0+21	5,813.62
0+33	5,813.84
0+33	5,814.09
0+39	5,814.21
0+39	5,814.21
0+39	5,816.70

Section 4C

Project Description	
Worksheet	Section-4C
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	0.012 ft/ft 300
Water Surface Elevation	5,813. ft 90

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Elevation Range	5,813.18 to 5,815.35
Discharge	89.04 cfs
Flow Area	13.3 ft ²
Wetted Perimeter	34.79 ft
Top Width	34.72 ft
Actual Depth	0.72 ft
Critical Elevation	5,814.13 ft
Critical Slope	0.003088 ft/ft
Velocity	6.68 ft/s
Velocity Head	0.69 ft
Specific Energy	5,814.59 ft
Froude Number	1.90
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+41	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	5,813.90
0+11	5,813.18
0+13	5,813.31
0+34	5,813.74
0+35	5,813.99
0+41	5,814.11
0+41	5,814.11
+41	5,815.35

Section 4D

Project Description	
Worksheet	Section-4D
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	0.012 ft/ft 300
Water Surface Elevation	5,813. ft 75

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Elevation Range	5,813.07 to 5,815.23
Discharge	77.46 cfs
Flow Area	12.2 ft ²
Wetted Perimeter	34.62 ft
Top Width	34.56 ft
Actual Depth	0.68 ft
Critical Elevation	5,813.95 ft
Critical Slope	0.003131 ft/ft
Velocity	6.33 ft/s
Velocity Head	0.62 ft
Specific Energy	5,814.37 ft
Froude Number	1.88
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+41	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	5,813.75
0+11	5,813.07
0+13	5,813.20
0+34	5,813.62
0+35	5,813.87
0+40	5,813.99
0+41	5,813.99
0+41	5,815.23

Section 5 Roadway Capacity

Project Description	
Worksheet	Section-5
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Channel Slope	0.034 ft/ft 000
Water Surface Elevation	5,814. ft 79

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Elevation Range	5,814.29 to 5,815.25
Discharge	48.55 cfs
Flow Area	5.9 ft²
Wetted Perimeter	24.05 ft
Top Width	23.55 ft
Actual Depth	0.50 ft
Critical Elevation	5,815.04 ft
Critical Slope	0.003531 ft/ft
Velocity	8.25 ft/s
Velocity Head	1.06 ft
Specific Energy	5,815.85 ft
Froude Number	2.91
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+40	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	5,814.89
0+06	5,814.79
0+06	5,814.29
0+39	5,815.00
0+40	5,815.25

Stony River Development Project
Peak Flow Calculations to Support the Inlet and Pipe Sizing

Purpose: Calculate the Peak Flow for the 25-year storm frequency from Off-Site Basin 3 using the Rational Method. Conveyed to Inlet #16.

Rational Method since Drainage Basin < 90 acres (ABF; 6/10/2013)	Values
Percent Impervious	100
Hydrologic Soil Group	B
Runoff Coeff, C, 25-year	0.94
Runoff Coeff, C, 5-year	0.9
Runoff Coeff, C, 100-year	0.96
Drainage Basin Area to Inlet (ft ²)	17424
Drainage Basin Area to Inlet (acres)	0.40
Peak Flow (Q _p) = CIA	
Runoff Volume (V _R) = (C/12)*P*A	
Rainfall Depth (P) = T _d /60*I	
Overland flow, (T _o) = [(0.395)*(1.1-C ₅)*(√L _o)]/(S _o ^{0.33})	
(Channel) flow (T _f) = (L _f)/(60*V _f)	
Flow velocity (V _f) = K*√S _f	
Where,	
Q _p = peak flow (peak runoff) in cubic feet per second (cfs),	See Table Below
I = rainfall intensity in inch/hour	See Table Below
A = drainage area in acres	
C = runoff coefficient	
V _R = runoff volume in acre-ft	See Table Below
P = rainfall depth in inches, and	See Table Below
T _d = rainfall duration (or time of concentration, T _c) in minutes.	
T _c = T _o + T _f in minutes	3.17
T _o = overland flow (max 300 feet) in minutes	3.17
T _f = channel/gutter flow in minutes	0.00
T _R = regional formula for time of concentration in minutes	11.50
L _o = overland flow length in feet	270
S _o = overland slope in ft/ft	0.07
C ₅ = 5-year runoff coefficient	0.9
L _f = flow length in feet	0
V _f = flow velocity in feet/second	0.00
K = conveyance coefficient	20
S _f = reach slope in feet/feet	0.000
	25-Year*
I inch/hour (P1 = 1.4 inches per Table 2.2 URMP for a 25-year storm)	4.79
P in inches	0.40
V _R (acre-feet)	0.013
V _R (ft ³)	545.13
Q _p (cfs)	1.80

WinTR-55 Current Data Description

--- Identification Data ---

User: ABF Date: 8/27/2013
 Project: Stoney Units: English
 SubTitle: Offsite Basins Areal Units: Acres
 State: Colorado
 County: Garfield
 Filename: I:\2012\469.001_Stoney_River\B_Calcs\Drainage\PostMay17\TR55 Calcs\Combined Off Site Basins to 0

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
OS1	South Midland Basin and	WR1	133.5	79	0.433
OS2	Basin S of Terraces	R1	25.9	80	.204
TS	Terraces South Basin	R1	3.3	91	0.100
W9A	Historical Upper Basin 9A	R2	40	80	.259
RS	Midland S into Roundabout	R3	0.9	90	0.100
W10A	Historical Upper Basin 10A	R4	22.1	78	.239
TN	Terraces North Basin	R4	3.2	92	0.100
OS4	Basin N of Terraces	R4	12.2	77	.19
RE	E Section of Midland Roun	R5	0.3	98	0.100
RW	W Section of Roundabout	R6	0.7	87	0.100

Total area: 242.10 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.18	1.54	1.72	2.12	2.32	2.52	1.0

Storm Data Source: User-provided custom storm data
 Rainfall Distribution Type: Type II
 Dimensionless Unit Hydrograph: <standard>

ABF

Stoney
Offsite Basins
Garfield County, Colorado

Storm Data

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
1.18	1.54	1.72	2.12	2.32	2.52	1.0

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type II
Dimensionless Unit Hydrograph: <standard>

ABF

Stoney
Offsite Basins
Garfield County, Colorado
Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 25-Yr (cfs)

SUBAREAS	
OS1	69.27
OS2	20.99
TS	6.44
W9A	29.72
RS	1.66
W10A	14.36
TN	6.58
OS4	7.84
RE	0.80
RW	1.07
REACHES	
R1	83.93
Down	83.93
R2	111.97
Down	111.96
R3	112.55
Down	112.55
R4	26.92
Down	26.90
R5	136.88
Down	136.87
R6	137.42
Down	137.42
OUTLET	137.42

ABF

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Offsite Basins
Garfield County, Colorado

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier Peak Flow and Peak Time (hr) by Rainfall Return Period
25-Yr
(cfs)
(hr)

SUBAREAS

OS1 69.27
12.18

OS2 20.99
12.04

TS 6.44
11.93

W9A 29.72
12.06

RS 1.66
11.94

W10A 14.36
12.06

TN 6.58
11.93

OS4 7.84
12.04

RE 0.80
11.92

RW 1.07
11.94

REACHES

R1 83.93
12.12
Down 83.93
12.12

R2 111.97
12.09
Down 111.96
12.10

R3 112.55
12.09
Down 112.55
12.10

R4 26.92
12.03
Down 26.90
12.04

R5 136.88
12.07
Down 136.87
12.07

R6 137.42
12.07

WinTRoss, Vers 10.1200.10
12.07

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OUTLET 137.42

ABF

Stoney
Offsite Basins
Garfield County, Colorado

Hydrograph Peak/Peak Time Table (continued)

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 25-Yr (cfs) (hr)
------------------------------------	--

ABF

Stoney
Offsite Basins
Garfield County, Colorado

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
OS1	133.50	0.433	79	R1	South Midland Basin and W
OS2	25.90	0.204	80	R1	Basin S of Terraces
TS	3.30	0.100	91	R1	Terraces South Basin
W9A	40.00	0.259	80	R2	Historical Upper Basin 9A
RS	.90	0.100	90	R3	Midland S into Roundabout
W10A	22.10	0.239	78	R4	Historical Upper Basin 10
TN	3.20	0.100	92	R4	Terraces North Basin
OS4	12.20	0.190	77	R4	Basin N of Terraces
RE	.30	0.100	98	R5	E Section of Midland Roun
RW	.70	0.100	87	R6	W Section of Roundabout

Total Area: 242.10 (ac)

ABF

Stoney
Offsite Basins
Garfield County, Colorado

Reach Summary Table

Reach Identifier	Receiving Reach Identifier	Reach Length (ft)	Routing Method
R1	R2	80	CHANNEL
R2	R3	124	CHANNEL
R3	R5	144	CHANNEL
R4	R5	232	CHANNEL
R5	R6	104	CHANNEL
R6	Outlet	140	CHANNEL

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Stoney
Offsite Basins
Garfield County, Colorado

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)

OS1							
User-provided							0.433
						Time of Concentration	0.433 =====
OS2							
SHEET	100	0.5400	0.400				0.158
SHALLOW	350	0.6000	0.050				0.008
SHALLOW	1375	0.6300	0.050				0.030
CHANNEL	560	0.2500	0.030	4.50	6.70	19.444	0.008
						Time of Concentration	.204 =====
TS							
User-provided							0.100
						Time of Concentration	0.100 =====
W9A							
SHEET	100	0.3000	0.400				0.200
SHALLOW	1665	0.7400	0.050				
CHANNEL	285	0.5000	0.030	4.50	607.00	1.342	0.059
						Time of Concentration	.259 =====
RS							
User-provided							0.100
						Time of Concentration	0.100 =====
W10A							
SHEET	100	0.3000	0.400				0.200
SHALLOW	1700	0.7300	0.050				0.034
CHANNEL	415	0.3900	0.030	4.50	6.70	23.056	0.005
						Time of Concentration	.239 =====
TN							
User-provided							0.100
						Time of Concentration	0.100 =====
OS4							
SHEET	100	0.4000	0.400				0.178
SHALLOW	1900	0.7000	0.050				
CHANNEL	780	0.2100	0.030	4.50	6.70	18.056	0.012
						Time of Concentration	.19 =====
RE							
User-provided							0.100
WinTR-55, Version 1.00.10						Time of Concentration	0.500 =====
RW							
User-provided							0.100

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Offsite Basins
Garfield County, Colorado

Sub-Area Time of Concentration Details (continued)

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)

Time of Concentration							0.100 =====

ABF

Stoney
Offsite Basins
Garfield County, Colorado

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
OS1	Herbaceous	(good)	D	100	85
	Oak - aspen	(fair)	D	33.5	63
	Total Area / Weighted Curve Number			133.5 =====	79 ==
OS2	Herbaceous	(good)	D	20	85
	Oak - aspen	(fair)	D	5.9	63
	Total Area / Weighted Curve Number			25.9 =====	80 ==
TS	Open space; grass cover > 75%	(good)	B	.6	61
	Paved parking lots, roofs, driveways		B	2.7	98
	Total Area / Weighted Curve Number			3.3 ===	91 ==
W9A	Herbaceous	(good)	D	30	85
	Oak - aspen	(fair)	D	10	63
	Total Area / Weighted Curve Number			40 ==	80 ==
RS	Open space; grass cover > 75%	(good)	B	.2	61
	Paved parking lots, roofs, driveways		B	.7	98
	Total Area / Weighted Curve Number			.9 ==	90 ==
W10A	Herbaceous	(good)	D	15	85
	Oak - aspen	(fair)	D	7.1	63
	Total Area / Weighted Curve Number			22.1 =====	78 ==
TN	Open space; grass cover > 75%	(good)	B	.5	61
	Paved parking lots, roofs, driveways		B	2.7	98
	Total Area / Weighted Curve Number			3.2 ===	92 ==
OS4	Herbaceous	(good)	D	8	85
	Oak - aspen	(fair)	D	4.2	63
	Total Area / Weighted Curve Number			12.2 =====	77 ==
RE	Paved; curbs and storm sewers		B	.3	98
	Total Area / Weighted Curve Number			.3 ==	98 ==
RW	Open space; grass cover > 75%	(good)	B	.2	61
	Paved; curbs and storm sewers		B	.5	98
	Total Area / Weighted Curve Number			.7 ==	87 ==

ABF

Stoney
Offsite Basins
Garfield County, Colorado

Reach Channel Rating Details

Reach Identifier	Reach Length (ft)	Reach Manning's n	Friction Slope (ft/ft)	Bottom Width (ft)	Side Slope
R1	80	0.013	0.01	2	1 :1
R2	124	0.013	0.045	2	1 :1
R3	144	0.013	0.048	2	1 :1
R4	232	0.013	0.06	2	1 :1
R5	104	0.013	0.06	2	1 :1
R6	140	0.013	0.06	2	1 :1

Reach Identifier	Stage (ft)	Flow (cfs)	End Area (sq ft)	Top Width (ft)	Friction Slope (ft/ft)
R1	0.0	0.000	0	2	0.01
	0.5	7.312	1.3	3	
	1.0	24.969	3	4	
	2.0	94.158	8	6	
	5.0	670.216	35	12	
	10.0	3434.784	120	22	
	20.0	19292.432	440	42	
R2	0.0	0.000	0	2	0.045
	0.5	15.512	1.3	3	
	1.0	52.968	3	4	
	2.0	199.740	8	6	
	5.0	1421.743	35	12	
	10.0	7286.277	120	22	
	20.0	40925.428	440	42	
R3	0.0	0.000	0	2	0.048
	0.5	16.021	1.3	3	
	1.0	54.705	3	4	
	2.0	206.290	8	6	
	5.0	1468.370	35	12	
	10.0	7525.235	120	22	
	20.0	42267.600	440	42	
R4	0.0	0.000	0	2	0.06
	0.5	17.912	1.3	3	
	1.0	61.162	3	4	
	2.0	230.640	8	6	
	5.0	1641.688	35	12	
	10.0	8413.469	120	22	
	20.0	47256.614	440	42	
R5	0.0	0.000	0	2	0.06
	0.5	17.912	1.3	3	
	1.0	61.162	3	4	
	2.0	230.640	8	6	
	5.0	1641.688	35	12	
	10.0	8413.469	120	22	
	20.0	47256.614	440	42	
R6	0.0	0.000	0	2	0.06
	0.5	17.912	1.3	3	
	1.0	61.162	3	4	
	2.0	230.640	8	6	
	5.0	1641.688	35	12	
	10.0	8413.469	120	22	
	20.0	47256.614	440	42	

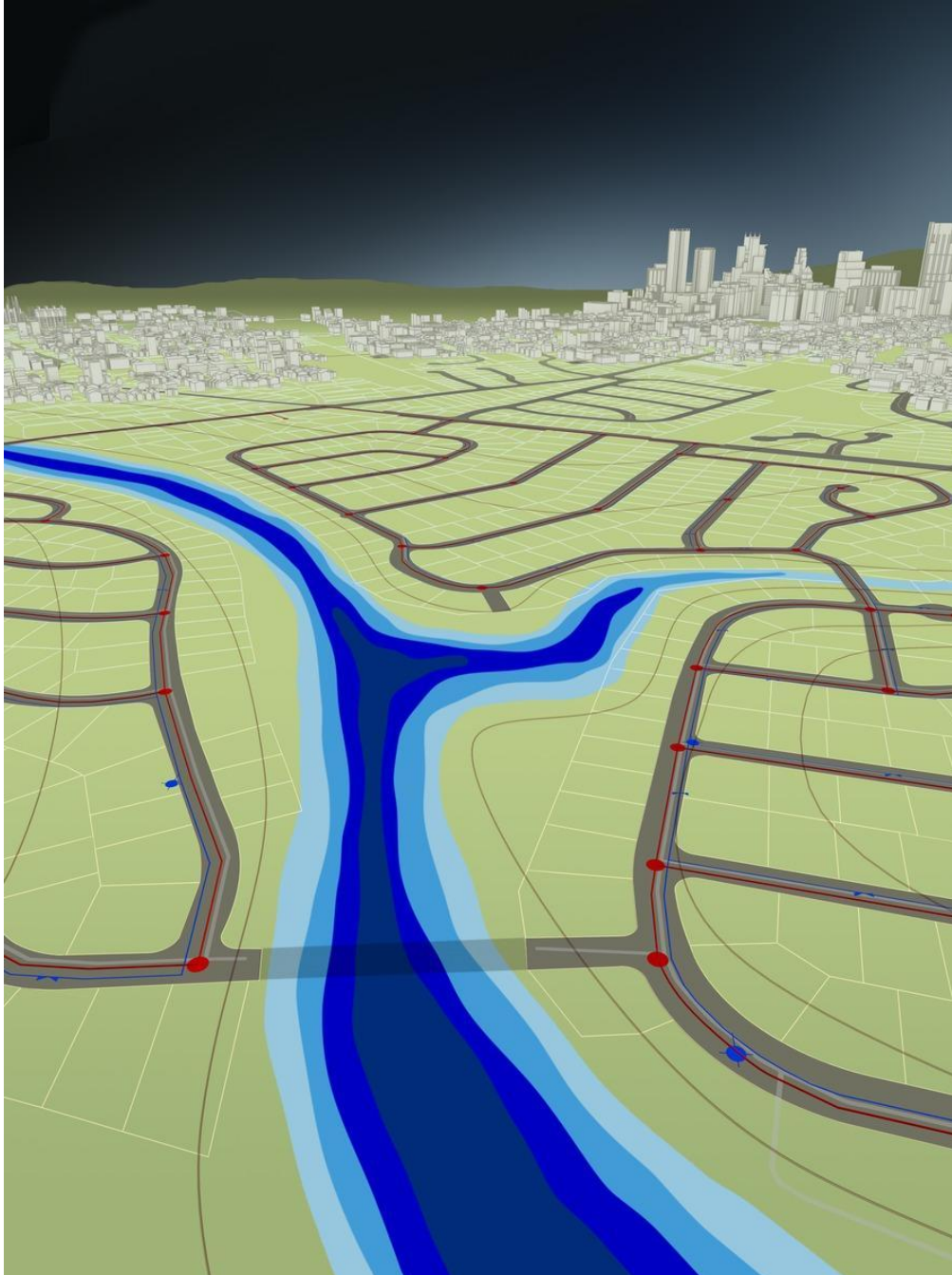
Appendix D

Storm and Sanitary Analysis Information

Autodesk® Storm & Sanitary Analysis 2012 Technical Capabilities and Functionalities

Autodesk® Storm & Sanitary Analysis 2012

Technical Capabilities and Functionalities



Autodesk®

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Autodesk SSA Technical Capabilities and Functionalities

Autodesk® Storm and Sanitary Analysis 2012 Extension is a comprehensive hydrology and hydraulic analysis application for planning and designing urban drainage systems, highway drainage systems, storm sewers, and sanitary sewers.

Major technical capabilities and functionalities include:

- Bidirectional exchange of data with AutoCAD® Map 3D 2012 and AutoCAD® Civil 3D® 2012 software
- Widely accepted hydrology analysis methods, including NRCS (SCS) TR-20/TR-55, Rational Method, Modified Rational, HEC-1, EPA SWMM, UK Modified Rational (Wallingford Procedure), and more
- Hydraulic analysis of pipes, open channels, streams, bridges, culverts, roadway inlet catch basins, and more
- Advanced hydrodynamic routing that can handle backwater, surcharging, flow splits, and more
- Support of networks of unlimited size
- Compare pre- and post-development conditions
- Analysis and design of detention and retention ponds
- Analysis of stormwater best management practices (BMPs)
- Water quality modeling
- Sophisticated graphical output providing detailed plan view plots, profile plots, and time series plots
- Customizable reports and templates for agency regulatory review
- Geographic information system (GIS) interoperability
- Support for both U.S. and metric (SI) units

Overall Capabilities

Autodesk Storm and Sanitary Analysis can simultaneously model complex hydrology, hydraulics, and water quality. This software can be used for designing and analyzing:

- Highway drainage systems (including curb and gutter stormwater inlets)
- Stormwater sewer networks and interconnected detention ponds
- Subdivision drainage systems
- Design and sizing of detention ponds and outlet structures
- Bridges and culverts, including roadway overtopping
- Water quality studies
- Sanitary sewers, lift stations, force mains, combined sewer overflows (CSOs), and sanitary sewer overflows (SSOs)

Typical Applications

The software has been used in thousands of sewer and stormwater studies throughout the world. Typical applications include:

- Design and sizing of drainage system components for better flood control
- Design and sizing of detention facilities for better flood control and water quality protection
- Floodplain mapping of natural channel systems
- Designing control strategies for minimizing CSOs
- Evaluating the impact of inflow and infiltration on SSOs
- Generating non–point source pollutant loadings for waste load allocation studies
- Evaluating the effectiveness of BMPs for reducing wet weather pollutant loadings

AutoCAD Map 3D and Civil 3D Support

Autodesk Storm and Sanitary Analysis easily shares data with AutoCAD Map 3D and Civil 3D software. Using GIS shapefiles, Hydraflow Storm Sewers Extension, or LandXML files, the software can share subbasin, sewer pipe, and structure entity data with AutoCAD Map 3D. In addition, AutoCAD drawings can be loaded as a background layer, enabling you to quickly digitize a network model, confirm the network layout, or enhance the output modeling results.

The software can automatically create plan and profile drawings. This helps speed up the creation of final deliverables associated with your engineering project. Profile sheets include:

- Maximum HGL and EGL
- Critical depth
- Maximum discharge
- Maximum flow depth
- Maximum flow velocity
- Pipe dimensions (sizes, inverts, etc.)
- Minimum pipe cover
- Sump and rim elevations

All elements are stored on their own individual drawing layers, so you can quickly change colors, line styles, text styles, and more. You can change the default settings, such as colors and annotations, to fit your corporate CAD standards.

Model Development

Simulation models can be more quickly developed using a variety of different sources. Network components can be directly imported from CAD and GIS. The network model can be interactively created using a mouse by pointing and clicking. Graphical symbols are used to represent network elements, such as manholes, pipes, pumps, weirs, ditches, channels, catch basin inlets, and detention ponds. The software enables you, at any time, to interactively add, insert, delete, or move any network element, automatically updating the model. For example, selecting and moving a manhole automatically moves all connected pipes, ditches, channels, and pumps.

Pipes can be curvilinear and lengths can be automatically computed. Scanned aerial orthophoto TIFF images and maps, as well as GIS and CAD files of streets, parcels, and buildings can be imported and displayed as background images. This enables you to more quickly digitize a network model, confirm the network layout, or enhance the output modeling results. Moreover, you can point to or click any graphical symbol from the plan view to quickly determine the defined input data and output modeling results.

Network Modeling Elements

Autodesk Storm and Sanitary Analysis provides a variety of network elements that can construct a model containing:

- Watershed subbasins (catchments)
- Stormwater and wastewater sewers
- Manholes and junctions
- Inlets and catch basins
- Rivers, streams, and ditches
- Culverts and bridges
- Detention ponds, underground storage structures, and wet wells
- Complex outlet structures
- Pumps and lift stations
- Spillways, weirs, flow dividers, standpipes, orifices, inflatable rubber dams, and valves

Model Representation

Autodesk Storm and Sanitary Analysis is a subbasin-node-link-based model that performs hydrology, hydraulic, and water quality analysis of stormwater and wastewater drainage systems, including sewage treatment plants and water quality control devices. Subbasins contribute rainfall runoff and water quality pollutants, which then enter nodes. A node can represent the junction of two or more links (a manhole, for example), a storm drain catch basin inlet, the location of a flow or pollutant input into the system, or a storage element (such as a detention pond, retention pond, treatment structure, or lake). From nodes, flow is then routed (or conveyed) along links. A link represents a hydraulic element (for example, a pipe, open channel stream, swale, pump, standpipe, culvert, or weir) that transports water and water quality pollutants.

Analysis Output

Autodesk Storm and Sanitary Analysis software's graphical capabilities can provide detailed plan view plots, profile plots, and time series plots. On the plan view, the software provides automatic color-coding of links and nodes based on any input or output property, allowing the network to be color-coded based on pipe sizes, pipe slope, flow rates, velocities, capacity, water quality concentrations, or any other attribute. Directional flow arrows can be plotted on top of pipes to show the flow direction for any time step. Furthermore, pipes can be plotted with variable width and nodes with variable radius, so you can more quickly identify those areas of the network experiencing the most surcharge, flooding, pollutant concentration, and so on.

The software will automatically generate graphical animations for plan view plots and profile plots to show output result values that change with respect to time. These animations can be recorded as AVI or WMV movie files that can be viewed independent of the software.

Multiple time-series plots can be generated for various network elements, such as pipe flow, velocity, junction water surface elevation, pollutant concentration, or any other analysis output attribute. In addition, you can display and compare multiple result files simultaneously, enabling direct comparison between different simulation models.

Custom Reports

Comprehensive input data and output analysis reports can be generated using the built-in report generator. The software allows full customization of input and output reporting. This gives you greater flexibility and functionality in developing specialized user-defined reports. These reports can be fully customized to help meet any combination of modeling criteria.

GIS Support

Autodesk Storm and Sanitary Analysis can share spatial data and visual representation of the stormwater and wastewater sewer network with most GIS spatial databases, allowing the software to be part of the stormwater and wastewater management and planning system. These capabilities can greatly assist the decision-making processes for network asset inventory, rehabilitation requirements, and financial planning.

The software can intelligently import most any GIS database structure, using attribute mapping and geocoding. Also, the analysis solution results can be exported back to the GIS database, so locations of CSO and SSO spills, manhole overflows, pipe surcharging, and floodplain flooding can be more quickly identified.

Hydrology Modeling Capabilities

Autodesk Storm and Sanitary Analysis accounts for various hydrologic processes that produce runoff from urban areas, including:

- Time-varying rainfall
- Evaporation of standing surface water
- Snow accumulation and melting
- Rainfall interception from depression storage
- Infiltration of rainfall into unsaturated soil layers
- Percolation of infiltrated water into groundwater layers
- Interflow between groundwater and the drainage system
- Nonlinear reservoir routing of overland flow

Spatial variability in all of these processes is achieved by dividing a study area into a collection of smaller, homogeneous subcatchment areas, each containing its own fraction of pervious and impervious sub-areas. Overland flow can be routed between sub-areas, between subcatchments, or between entry points of a drainage system.

The following matrix correlates typical project types with available hydrology methods.

	Hydrology Method Supported						
	EPA SWMM	NRCS (SCS) TR-20/TR-55	Rational Method	Modified Rational Method	US Army Corps HEC-1	UK Modified Rational	Continuous Simulation
Project Type							
Highway Drainage	X	X	X			X	
Municipal Stormwater	X	X	X	X		X	X
Regional Stormwater	X	X			X		X
Land Development	X	X	X	X	X	X	
Stormwater BMPs	X	X	X	X	X	X	X
Water Quality	X						X
FEMA Flood Control	X						
Detention Facilities	X	X		X	X		
Culverts & Bridges	X	X	X	X	X		
Rivers, Streams, and Ditches	X	X	X	X	X		
Municipal Wastewater	X						X
CSOs & SSOs	X						X
Pumps & Force Mains	X	X		X	X		X
CMOM Compliance	X						X

The software includes the following hydrology models to help determine surface drainage runoff:

- USEPA SWMM 5.0 (also imports and exports XPSWMM models)

- NRCS (SCS) TR-20 and TR-55
- U.S. Army Corps HEC-1
- Rational Method
- Modified Rational Method
- U.K. Modified Rational (Wallingford Procedure)
- DeKalb Rational Method
- Santa Barbara Unit Hydrograph
- Delmarva Unit Hydrograph
- Long-Term Continuous Simulation
- Maricopa and Pima Counties (Arizona) Papadakis-Kazan Method
- Harris County (Texas) Method

The following hydrology methods and models are not directly supported. However, the output from these different hydrology models may be imported into the software and then hydraulically routed.

- SWMHYMO—Used in some parts of Canada
- CUHP—Colorado Urban Hydrograph Procedure
- WWHM—Western Washington Hydrology Method (King County and western Washington State)
- MODRAT (LA County, CA, for drainage areas greater than 40 acres)
- Kern County, CA
- Orange County, CA
- Riverside County, CA
- Sacramento County, CA
- San Bernardino County, CA
- Ventura County, CA
- Wallingford Hydrograph Method (used in U.K. for catchments larger than 150 ha)

Time of Concentration

The software includes the following time of concentration methods:

- SCS TR-55
- Carter
- FAA
- Kirpich
- User-defined
- Kinematic Wave (EPA SWMM only)
- Eagleson
- Harris County, TX
- Papadakis-Kazan (Maricopa and Pima Counties, AZ)

Time of concentration is only selectable when the EPA SWMM subbasin hydrology method is not selected. When the EPA SWMM subbasin hydrology method is used, the time of concentration is computed by the Kinematic Wave method and cannot be changed.

EPA SWMM Infiltration Methods

The following infiltration methods are provided with the EPA SWMM hydrology method:

- SCS Curve Number
- Horton
- Green-Ampt

HEC-1 Unit Hydrograph Methods

The following unit hydrograph methods are provided with the HEC-1 hydrology method:

- Clark (default)
- Kinematic Wave
- User Defined
- SCS Dimensionless
- Snyder

HEC-1 Loss Methods

The following loss methods are provided with the HEC-1 hydrology method:

- Uniform (default)
- Exponential
- Green Ampt
- Holtan
- SCS Curve Number

Rainfall Designer

Autodesk Storm and Sanitary Analysis includes a Rainfall Designer which, after you select any location within the U.S., will provide the design rainfall for the specified storm frequency. Alternatively, a user-defined rainfall can be specified. Then the appropriate storm distribution can be selected and the design storm is created. Multiple design storms can be created and analyzed.

- Site-specific storm distribution database with over 3,500 up-to-date rainfall recording stations across the United States
- Automatically determines design rainfall (based on study location) for 1, 2, 5, 10, 25, 50, and 100 year return frequencies
- Define any storm duration, multiple storm events
- Numerous storm distributions, including SCS, Huff, Eastern Washington, Florida, Chicago Storm, Hurricane Hazel, and user-defined

For Rational and Modified Rational methods, rainfall intensity data can be defined by either:

- IDF—Table Rainfall intensity data is defined by a table of storm durations (in minutes) versus return periods (in years). This is the most commonly used option.
- BDE—Table Rainfall intensity data is defined by a table of B-D-E coefficients versus return periods (in years) using the FWHA intensity equation.
- ABCD—Table Rainfall intensity data is defined by a table of third-degree polynomial coefficients A, B, C, and D versus return periods (in years).
- Intensity Direct Entry—A single rainfall intensity is defined that is to analyzed.

Hydraulic Modeling Capabilities

Autodesk Storm and Sanitary Analysis contains a flexible set of hydraulic modeling capabilities used to help route runoff and external inflows through the drainage system network of pipes, channels, storage/treatment units, and diversion structures. The software can simultaneously simulate dual drainage networks (stormwater sewer network and city streets as separate but connected conveyance pathways) and inlet capacity. It can quickly determine the amount of stormwater flow that is intercepted by the stormwater network inlets and the amount of stormwater flow that bypasses and is then routed further downstream to other inlets. Hydraulic network modeling is performed by the Kinematic Wave or Hydrodynamic (in other words, Saint Venant equation) routing methods. The software can account for:

- Storm sewers, sanitary sewers, and combined sewers
- Open channels
- Streams
- Bridges and culverts
- Roadway storm drain inlets
- Detention ponds and outlet structures
- Force mains (using either Hazen-Williams or Darcy-Weisbach equations)
- Flood overflow routing

Kinematic wave routing provides a nonlinear reservoir formulation for channels and pipes, including translation and attenuation effects that assume the water surface is parallel to the invert slope. This method cannot simulate backwater or reverse flow. Hydrodynamic routing solves the complete St. Venant equation throughout the drainage network and includes modeling of backwater effects, flow reversal, surcharging, looped connections, pressure flow, tidal outfalls, and interconnected ponds. Flow can also be routed through a variety of different storage elements, such as detention ponds, settling ponds, and lakes.

The hydraulic grade line (HGL) is computed at nodal points (manholes, junctions, storage structures, etc.) and along each hydraulic link element (pipes, ditches, open channel reaches). The hydraulic link HGL profile is computed by segmenting the link into ten smaller segments and then using the direct step solution method to compute the HGL for each segment. This allows the software to simulate a more accurate water surface profile along the hydraulic link, which can better account for subcritical and supercritical flow, partial and complete surcharging, moving hydraulic jumps, critical depth locations, flow transitions, and other hydraulic flow phenomena.

After computing the HGL for a pipe, the maximum entrance and exit velocities are calculated. From these velocities, the corresponding velocity heads are determined which are then used to compute the energy grade line (EGL).

The software can model simple to complex networks, including the ability to:

- Handle networks of unlimited size
- Simultaneously account for dual drainage pathways and networks

The software can model various flow regimes, such as:

- Subcritical, critical, and supercritical flow regimes
- Gravity and pressurized (surcharged) flow
- Flow reversals
- Flow splits and combines
- Branched, dendritic, and looped systems
- Tailwater submergence (backwater) effects
- Interconnected ponds
- Surface ponding at manholes
- Tidal outfalls

In addition to standard network elements, the software can model special elements such as:

- Storage and treatment units
- Flow dividers
- Curb openings, gutter inlets, and median inlets
- Pumps (including user-defined controlled pumps)
- Weirs (including compound weirs and spillways)
- Orifices and standpipes
- Inflatable rubber dams (including user-defined controlled rubber dams)
- Valves (including user-defined controlled valves)

Finally, the software is capable of:

- Using a wide variety of standard pipe shapes, custom pipe shapes, open channel shapes, as well as natural channel (HEC-RAS like) cross section geometry
- Applying external flows and water quality inputs from surface runoff, groundwater interflow, rainfall-dependent infiltration/inflow (RDII), dry weather sanitary flow, and user-defined inflows
- Applying user-defined dynamic control rules to simulate the operation of pumps, orifice openings, and weir crest levels

Supported Pipe Shapes

The following pipe shapes are supported (derived from EPA SWMM):

- | | | |
|--------------------------|--------------------------|------------------------------|
| • Circular | • Rectangular | • Filled Circular (sediment) |
| • Rectangular-Triangular | • Rectangular-Circular | • Horizontal Ellipse |
| • Vertical Ellipse | • Semi-Elliptical | • Arch |
| • Basket Handle | • Modified Basket Handle | • Egg |
| • Horseshoe | • Gothic | • Catenary |
| • Semi-Circular | • User-Defined Custom | |

Supported Open Channel Cross Section Shapes

The following open channel cross section shapes are supported (derived from EPA SWMM):

- | | | |
|---------------|------------------|----------------------------------|
| • Rectangular | • Trapezoidal | • Triangular |
| • Parabolic | • Power Function | • User-Defined
(HEC-RAS like) |

Culvert Modeling

Autodesk Storm and Sanitary Analysis incorporates the culvert hydraulic equations from the FHWA (Federal Highway Administration) Hydraulic Design Series No. 5 (HDS-5) publication *Hydraulic Design of Highway Culverts* (2005). The following standard culvert shapes are supported:

- Circular
- Vertical Ellipse
- Box
- Arch
- Horizontal Ellipse
- Pipe arch

Flow Routing Assumptions

The software computes the cross sectional area, hydraulic radius, and free surface width as a function of flow depth for each time step in the hydraulic routing. The primary dependent variable for hydraulic routing in a link is flow discharge, which is assumed to be constant (averaged) during a time step.

Surface Ponding

When flow into a junction (for example, a manhole) exceeds the capacity of the system to transport it further downstream, the excess volume overflows the system and is lost. If the surface ponding storage area is defined at a junction, the excess volume be stored atop the junction, in a ponded fashion, and will be reintroduced into the system as capacity permits.

Interconnected Detention Pond Modeling

Autodesk Storm and Sanitary Analysis enables more accurate routing in complex detention pond situations. In some situations, downstream conditions can cause backwater effects that influence the performance of a detention pond outlet structure. For example, an upstream pond may discharge to another downstream pond that is similar in elevation or influenced by downstream flooding. Such situations can result in a decrease in outlet discharges or flow reversal back into the upstream pond and can be difficult to model properly. Most approaches attempt to simplify the problem using overly conservative assumptions about the downstream water surface conditions that result in oversized detention facilities and increased costs. Other methods ignore the downstream effects, thereby resulting in overtopping of the resulting undersized ponds. However, the comprehensive network definition and fully hydrodynamic solution method provided by Autodesk Storm and Sanitary Analysis enables you to more easily model these complex situations with greater confidence.

The software can handle simple to complex detention pond designs:

- Handles single pond, multiple ponds, and interconnected ponds
- Provides constant feedback on how the detention pond design is progressing
- Uses industry-standard FHWA Hydraulic Design Series (HDS-5) equations for outlet calculations
- Handles variable tailwater conditions, including tailwater submergence effects
- Models ponds with multiple outlets and flow diversions

For detention pond structures, both simple and complex outlet structures can be considered, including:

- Inlet boxes
- Multiple orifices
- Compound spillways
- Culverts

- User-defined outflow structures

Orifice Outlet Structures

Both circular and rectangular shaped orifices are supported, and can be located vertically (like in a riser pipe) or horizontally (like in a side-flow orifice). In addition, an orifice can have a flap gate to prevent backflow. The software provides a lookup table of typical orifice coefficients.

An unsubmerged orifice will initially act as a weir until the top of the orifice is submerged. The discharge through the orifice for unsubmerged orifice flow is computed using the weir equation. The flow then transitions to a fully submerged orifice flow using the classical orifice equation. When the orifice is not completely submerged, a modified weir equation is employed that considers the orifice fraction that is submerged.

Spillway and Weir Outlet Structures

The following shapes are supported for spillways and weirs:

- Sharp-crested and broad-crested trapezoidal and rectangular
- V-notch triangular
- Side flow rectangular
- Transverse rectangular

The software provides a lookup table of typical weir coefficients. The weir crest elevation can be controlled dynamically through user-defined control rules, allowing it to simulate inflatable rubber dams.

When a weir structure is highly submerged due to high tailwater conditions, the flow over the weir no longer acts like weir flow and the carrying capacity is reduced. In this situation, the weir flow computations automatically switch to the Villemonte equation. The submergence coefficient is automatically computed, taken from *Roessert's Handbook of Hydraulics* (German).

Pumps

Pumps can be represented as either an in-line lift station or an off-line node representing a wet well, from which water is pumped to another node in the system according to a programmed rule curve or step function. Pump performance can be defined by either:

- Volume vs. Flow
- Flow vs. Depth
- Flow vs. Head Difference
- Variable Speed Pump vs. Depth
- Design Mode (all inflow is pumped out at the same flow rate, useful for preliminary design)

The on/off status of pumps can be controlled dynamically by specifying startup and shutoff water depths at the inlet node or through user-defined control rules. Rules can also be used to simulate variable speed pumps that modulate pump flow.

Underground Stormwater Detention

On-site, underground stormwater retention/detention can be incorporated into your network model. Subsurface vaults or systems of large diameter interconnected storage pipes, arched pipes, or

manufactured storage chambers can be modeled. The software includes standard storage chambers from leading manufacturers. Choose the storage chamber model from a selection list, define the quantity, backfill dimensions, stone void space, and the software will automatically compute the available storage capacity.

Storage Node Exfiltration (Infiltration)

The software can model exfiltration (sometimes called infiltration) at storage nodes, accounting for both stormwater reduction and pollutant removal. Wet and dry retention ponds can be modeled.

The following exfiltration methods are provided:

- None (default)
- Constant Rate, Free Surface Area
- Constant Rate, Projected Area
- Constant Rate, Wetted Area
- Constant Flow
- Horton, Free Surface Area
- Horton, Projected Area
- Horton, Wetted Area

Highway Drainage Design

Autodesk Storm and Sanitary Analysis helps simplify your highway drainage design work. The software can simulate dual drainage systems (stormwater sewer network and city streets as dual conveyance pathways) and inlet capacity. It can more quickly determine the amount of stormwater flow that is intercepted by the stormwater network inlets and the amount of stormwater flow that bypasses and is then routed further downstream to other inlets.

Highway drainage capabilities include:

- Select from standard curb openings, grated inlets, slotted inlets, median ditch inlets, and combination inlets
- Account for on-sag and on-grade conditions
- Look up standard curb openings and grated inlets from major foundry manufacturers and agencies
- Use industry-standard FHWA (Federal Highway Administration) HEC-22 computations
- Compute gutter spread, depth of flow, inlet efficiency, inlet spacing, velocity of flow for gutter and pavement sections

The hydraulics of storm drain inlets is computed based on the procedures and equations defined in the FHWA Hydraulic Engineering Circular No. 22 (HEC-22), *Urban Drainage Design Manual*, Third Edition, 2009. The capacity of storm drain inlets on roadway sag is computed by both the weir and orifice equations (FHWA Report, *Hydraulic Characteristics of Slotted Drain Inlets*, 1980). Flow into the storm drain inlet initially operates as a weir having a crest length equal to the length of drain perimeter that the flow crosses. The storm drain inlet operates under weir conditions to a depth of about 4 inches (100 mm) and then begins to switch to orifice flow.

Water Quality Modeling Capabilities

Autodesk Storm and Sanitary Analysis can perform urban stormwater water quality modeling:

- Account for rain gardens, green roofs, rain barrels, bioswales, dry detention ponds, wet ponds, retention ponds, wetlands, and more
- Model particulate settling, water cleanup, water quality best management practices, and total maximum daily loads (TMDL)

Water quality routing within channel and pipe links assume that the link behaves as a continuously stirred tank reactor (CSTR). Although a plug flow reactor assumption is more realistic, the differences are small if the travel time through the link is on the same order as the routing time step.

Water quality routing through detention ponds follows the same approach used for links. For nodes that have no storage volume (for example, junctions, inlets, and flow diversions), the water quality exiting the node is simply the mixture concentration of all water entering the node.

NPDES

As part of the NPDES (National Pollutant Discharge Elimination System) permitting process, modeling of stormwater quality and quantity may be required. The software can model all aspects of stormwater quality and quantity, and can incorporate best management practices directly within the model.

The following processes can be modeled for any number of user-defined water quality constituents:

- Dry-weather pollutant buildup over different land uses
- Pollutant washoff from specific land uses during storm events
- Direct contribution of rainfall deposition
- Reduction in dry-weather buildup due to street cleaning
- Reduction in washoff load due to BMPs
- Entry of dry weather sanitary flows and user-specified external inflows at any point in the drainage system
- Routing of water quality constituents through the drainage system
- Reduction in constituent concentration through treatment in storage units or by natural processes in pipes and channels

Pollutant Buildup and Washoff

Water quality pollutant buildup accumulates within a land type by either a mass per unit of subbasin area or per unit of street curb length. The amount of buildup is a function of the number of preceding dry weather days (prior to the storm event) and can be computed using one of the following numerical functions.

- | | |
|-------------|--|
| None | - No pollutant buildup occurs |
| Power | - Pollutant buildup accumulates proportionally to time, until a maximum limit is achieved |
| Exponential | - Pollutant buildup follows an exponential growth curve that approaches a maximum limit asymptotically |

- Saturation - Pollutant buildup begins at a linear rate that continuously declines with time until a saturation value is reached

Water quality pollutant washoff from a given land type occurs during wet weather periods (for example, during a storm event) and can be described in one of the following methods. Note that buildup is continuously depleted as washoff proceeds, and washoff ceases when there is no more pollutant buildup available.

- None - No pollutant washoff occurs
- Exponential - Pollutant washoff is proportional to the runoff and the amount of buildup remaining
- Rating Curve - Pollutant washoff is proportional to the runoff
- Event Mean - Pollutant washoff is proportional to the runoff based on an event mean concentration

Typical pollutant buildup and washoff parameters are provided in a lookup table within the software.

Washoff loads for a given pollutant and land type can be reduced by a fixed percentage by specifying a BMP removal efficiency that reflects the effectiveness of any BMP controls associated with the land type.

Pollutant Treatment

Water quality pollutant treatment and removal is simulated by assigning a treatment function to a node. A treatment function is defined using a mathematical expression that describes the pollutant reduction. The mathematical expression can be simple, such as a direct concentration reduction, or sophisticated, in which various process variables can be analyzed (for example, flow rate into the node, node water depth, node surface area, hydraulic resident time, and so on).

Sanitary Sewer Modeling Capabilities

Autodesk Storm and Sanitary Analysis can analyze both simple and complex sanitary and combined sewer systems.

- Use for master planning, rehabilitation, new design, and include future growth in your sewer model
- Model looped networks, flow splits, combines, overflows, and storage capacity
- Analyze sanitary or combined sewer systems
- Include manholes, inlets, sewer networks, pumps, lift stations, storage structures, control structures, force mains, inverted siphons, overflow diversions, relief sewers, and other elements within a single model
- Construct network sewer models from CAD drawings or GIS geodatabases
- Check CMOM (Capacity, Management, Operation, and Maintenance) capacity requirements for compliance
- Find and fix sewer bottlenecks, optimize control rules, and help reduce overflow occurrences
- Regulate flow to treatment facilities by determining storage within the sewer system and designing new storage structures
- Perform CSO and SSO mitigation studies while accounting for RDII (rainfall derived inflows and infiltration)

The software includes a comprehensive table of typical daily average flows, which can be used to determine sanitary loadings based on land use and population density.

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Appendix E

Off-Site Storm Sewer Analysis

1.0 27th Street/Midland Avenue Roundabout Storm Sewer Analysis

1.1 General Scope

To determine the amount of off-site street flow that may have an impact on the Stoney River Project Site from the 27th Street/Midland Avenue roundabout, Autodesk's® Storm and Sanitary Analysis (SSA) 2012 software (see Appendix D for software's capabilities) was used. The model was developed to analyze the conveyance capacity for the existing storm drainage system located in the 27th Street/Midland Avenue roundabout, both upstream of and adjacent to the project, associated with drainage generated by the 25 year design storm. Modeling of the existing storm drainage system is for the sole purpose of determining potential street flow and is not intended to determine, or suggest, improvements to the existing storm sewer network.

The Storm and Sanitary Analysis software uses a basin/node/link relationship to model storm drainage system networks. Drainage basins are connected to nodes, which represent actual collection or storage structures. Collection/storage nodes are connected to downstream nodes representing either manholes or inlet basins. Nodes are connected using links, which represents the system's conduit.

1.2 Storm and Sanitary Analysis Software

1.2.1 Software Hydrologic Method

When developing a storm analysis model and there is more than one basin contributing drainage runoff to the storm system, two hydrologic parameters are necessary for the software to accurately model the drainage capacity for the system. They are the peak runoff rate and the time to peak for the peak runoff rate to enter the system. The importance of the peak runoff rate is self explanatory. The time to peak is important because the peak runoff rate associated with each basin does not impact the system simultaneously. When one basin is contributing its peak runoff rate to the system, the other basin(s) may be contributing a runoff rate lower than their peak, either on the rising or falling limb of the runoff hydrograph associated with the basin. The SSA software has the capability to use several hydrologic methods to determine drainage runoff from a basin, but because the SCS TR-55 hydrograph method provides not only a peak runoff rate, but also a time to peak for this runoff rate to reach a specific point, this method was selected as the hydrologic method to determine basin runoff. Parameters used in the SCS TR-55 analysis can be found in Appendix C. Basin peak runoff summary tables and time to peak hydrographs can be found in this Appendix.

1.2.2 Software Routing Method

The SSA software has several methods available for routing drainage flows. The more advanced method available in the software is the hydrodynamic routing method. This method allows for representation of pressurized flows when a closed conduit becomes full, so flows can exceed the full-flow value determined when using the Manning's equation. With this method, flooding at a node occurs when the depth of water exceeds the node's maximum elevation. Flooded volumes are either lost from the system or allowed to pond above the flooded node and re-enter the system when the system once again has available capacity. In order for the flooded volume to re-enter the system, a

parameter in the software associated with the flooded node must be set. If this parameter is set, ponding above the node will be allowed and the flooded volume will re-enter the system and continue to be analyzed within the system. However, since the scope of this model is to determine potential street flow volume rates, this parameter was not set and drainage volumes at flooded nodes were considered lost to the system. Lost drainage volumes were considered to be conveyed as street flow that could potentially impact the project site. The software continues to model the remaining drainage flow volume in the system downstream of the flooded node, less the volume lost at the flooded node.

In addition to modeling pressurized flows when a conduit's full-flow value is exceeded, hydrodynamic routing can account for reverse flows. This is an important feature when modeling a system that contains links with flatter grades. The tail water height at downstream nodes could interfere with a link's ability to discharge its drainage flow into a node. This "refusal" of entry into a node could cause a flow reversal, which in turn could cause flooding at the upstream node to a link.

Based on the hydrodynamic routing capabilities described above, the hydrodynamic routing method was used for this model.

1.2.3 Software Determination of the HGL and EGL

The HGL (hydraulic grade line) is computed at every node (storage structures, manholes and inlets) connected by hydraulic links (piping or open channel). The software computes the HGL profile by segmenting the connecting link between nodes into ten smaller segments and using the direct step method to compute the HGL for each segment. After the software calculates the HGL for a conduit's segment, the maximum entrance and exit velocities are calculated. These velocities are then used to determine the velocity head, which is added to the HGL to determine the corresponding EGL (energy grade line) for that same segment of conduit.

In determining the HGL and EGL elevations, the software accounts for major energy losses as head loss due to conduit friction. Junction losses in English Units are accounted for by using entrance and exit loss coefficients in the equation $H_e = (K/2gL) \times V_e \times (Q/A)$, where:

H_e = exit (or entrance) head loss

K = loss coefficient

L = conduit length

V_e = exit (or entrance) velocity

Q = conduit flow rate

A = conduit flow area

Entrance and exit losses were accounted for in this model and are shown in the pipe input portion of the model's analysis report.

The HGL and EGL profile elevations for this model are based on the maximum flow elevation reached during model simulation. As such, the HGL elevation for flooded nodes is above the rim elevation associated with the flooded node. Under new design, or a design to improve an existing system, this would be a concern. An HGL elevation equal to or greater than a node's rim elevation would indicate the system is sufficiently surcharged and displacement the surcharged manhole's lid is possible, which could cause property damage or injury/harm to the public. As such, the HGL elevation for new

design, or a design to improve an existing system, would be lowered by either increasing the conduit area, increasing the conduit's grade, providing more detention at inlets to the system, or some combination. However, since this is an existing system and the scope of the model is to determine potential street flow volumes, HGL elevations equal to or higher than a node's rim elevation were not addressed.

1.2.4 Software Storage Nodes and Outlets

The capacity of storage nodes used in the software is determined by one of two methods. The first is the functional method, which is used to define standard shapes like rectangular and circular entities in combination with a depth. The second is with a stage/storage curve, which was the method used for this model. Information to develop the storage curves associated with storage nodes was obtained from aerial topography.

When storage nodes are used, an outlet device is necessary for the software to accurately model the storage node. There are three outlet entities available in the software for modeling discharge from a storage entity; a weir, an orifice and an outlet. Of the three, the outlet entity is applicable for more complex modeling and was the outlet method used for this model. Discharge rating curves were developed for the outlets using Haestad Method's Flowmaster software in combination with data obtained from areal topography and entered into the SSA software.

1.3 Model Analysis

1.3.1 Input Data

Input data used to develop the pipe and manhole sizes, elevations, grades, roughness coefficients, entity type and entity locations used in the model were obtained from several sources: The 27th Street Roundabout Record Set (Red Mountain Civil, Inc., 2007, R4); data gathered during field visits to the area; the Natural Resources Conservation Service (NRCS) Soil Report; and the Riverview Terrace Drainage Study.

1.3.2 Model Setup

Figure 4, shown in the main body of the report and reproduced here as Figure 1 for ease of reading, was used as the template for setting up basins and the hydrologic model. To develop the hydraulic model, nodes and links were placed in an alignment duplicating the existing storm drainage system's features that are shown on sheet R4 (Red Mountain civil, Inc., 2004). Data from sheet R4 was used to develop inverts in and out, grades, manhole depths and manhole sizes. Basins were connected to storage nodes representing existing inlet features developed from aerial topography and data collected during field visits to the area. Table 1 shows the model's entity association with Figures 1 and 2.

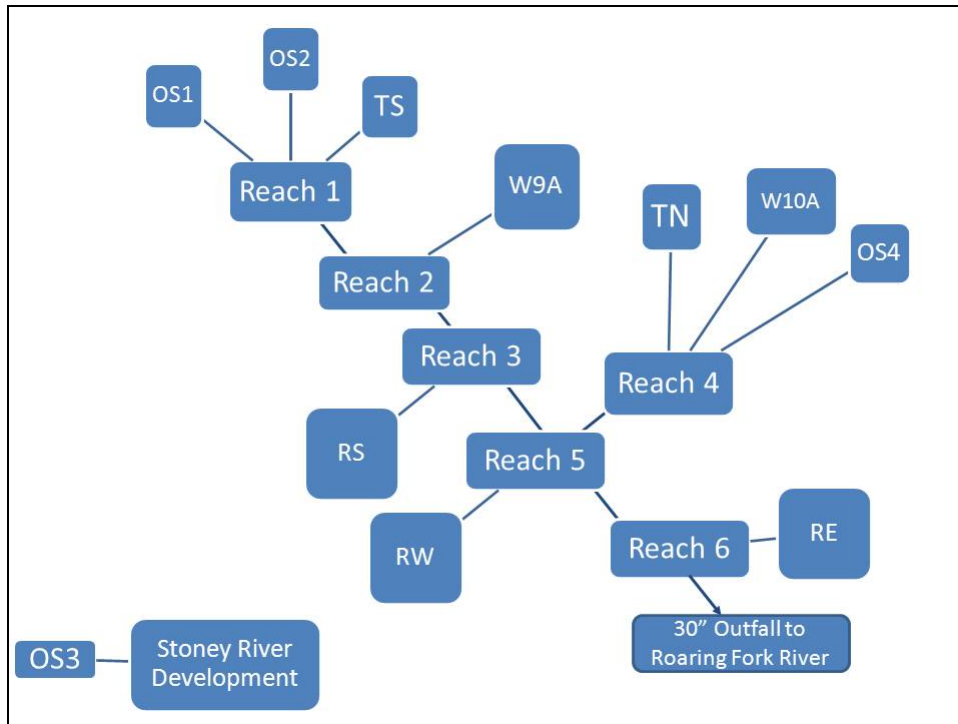


Figure 1 - Off-Site Basin Flow Schematic

Table 1 - Model Entity Association with Figures 1 and 2

Associated Off-site Basins(s)	Reach ID	Associated Nodes	Type of Entity	Basin Peak Drainage Flow
OS1/OS2 TS	1	OS1/OS2 TS2	Storage Junction	40.99 6.44
W9A	2	W-9A and MHR3	Storage and Junction, respectively	29.72
RS	3	I1	Storage	1.66
W10A TN OS4	4	W10A TN-2 W10A	Junction Junction Junction	14.36 6.58 7.84
RW	5	I2	Junction	1.07
RE	6	RE	Junction	0.8

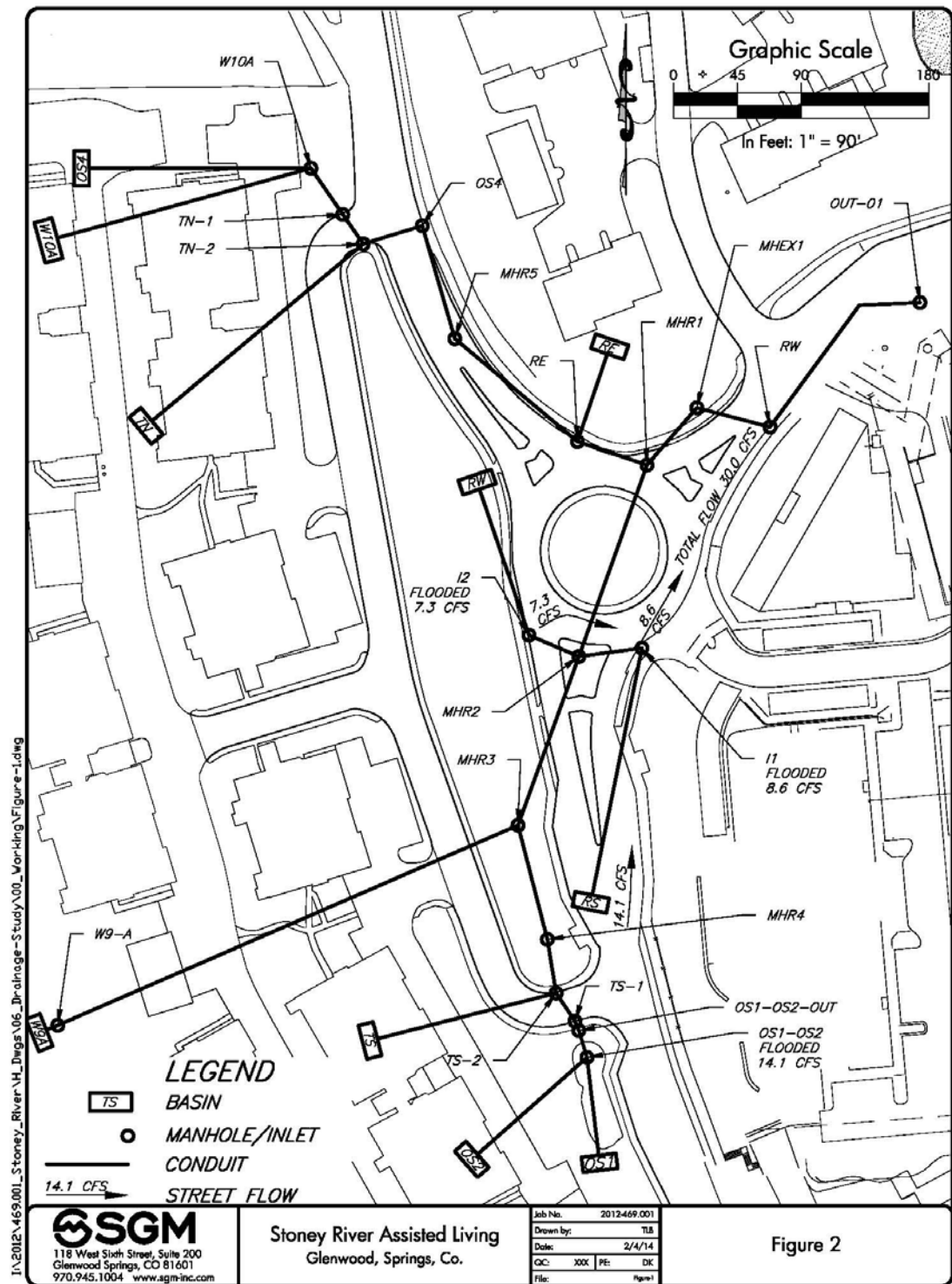


Figure 2 - Model Setup

1.3.3 Model Results

Model results indicate there is insufficient storage at node OS1-OS2, the detention inlet where drainage from basins OS1 and OS2 enter the existing storm drainage system. At this point, results indicate 14.1 cfs of drainage is lost from the system and overflows to the street.

In addition, the model indicates the existing drainage system becomes surcharged at node MHR3 and remains surcharged to a point between node RE2-RW and the outfall, node Out-01. The surcharge in this area causes a head differentiation between nodes I1/MHR2 and I2/MHR2. This head differentiation prevents drainage collected in nodes I1 and I2 from entering the system and causes a reversal of flow in the links connecting them to node MHR2. This reversal of flow causes 8.6 cfs from node I1 and 7.3 cfs from node I2 to be lost from the system. These lost flows were considered as street flow. It should be noted that drainage flows lost from nodes I1 and I2 include drainage generated in basins RS and RW.

According to the model, it is expected that a total of 30 cfs of drainage flow associated with the 25 year storm event has the potential to become street flow. To prevent adverse impact to the Stoney River Assisted Living Facility from drainage flows generated by the 25 year design storm, the 27th Street roundabout at the Facility's entry should be capable of conveying at least 30 cfs of drainage flow. Or, the Facility's on-site storm system should be designed to collect and convey excess flows over the maximum street capacity at the entryway to the Facility. The maximum street capacity at the entryway to the site is 46.8 cfs and is shown in Section 4B on sheet 9 found in Appendix I.

Model results can be found in appendix E. Profiles of the existing system can be found in Appendix I.

Project Description

File Name 2012-369-001-Off-Site-Drainage-Study-20130806.SPF
Description
Midland Ave. Existing Storm Sewer Analysis

Project Options

Flow Units CFS
Elevation Type Elevation
Hydrology Method SCS TR-55
Time of Concentration (TOC) Method User-Defined
Link Routing Method Hydrodynamic
Enable Overflow Ponding at Nodes YES
Skip Steady State Analysis Time Periods ... NO

Analysis Options

Start Analysis On Jul 23, 2013 00:00:00
End Analysis On Jul 24, 2013 00:00:00
Start Reporting On Jul 23, 2013 00:00:00
Antecedent Dry Days 0 days
Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
Runoff (Wet Weather) Time Step 0 00:05:00 days hh:mm:ss
Reporting Time Step 0 00:05:00 days hh:mm:ss
Routing Time Step 30 seconds

Number of Elements

	Qty
Rain Gages	4
Subbasins.....	10
Nodes.....	20
<i>Junctions</i>	15
<i>Outfalls</i>	1
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	4
Links.....	19
<i>Channels</i>	0
<i>Pipes</i>	17
<i>Pumps</i>	0
<i>Orifices</i>	0
<i>Weirs</i>	0
<i>Outlets</i>	2
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	10-yr	Time Series	10-yr	Cumulative	inches	Colorado	Garfield	10	1.72	SCS Type II 24-hr
2	25-yr	Time Series	25-yr	Cumulative	inches	Colorado	Garfield	25	2.12	SCS Type II 24-hr
3	2-yr	Time Series	2-yr	Cumulative	inches	Colorado	Garfield	2	1.18	SCS Type II 24-hr
4	5-yr	Time Series	5-yr	Cumulative	inches	Colorado	Garfield	5	1.54	SCS Type II 24-hr

Node Summary

SN Element ID	Element Type	Invert Elevation	Ground/Rim (Max) Elevation	Initial Water Elevation	Surcharge Elevation	Ponded Area	Peak Inflow	Max HGL Elevation Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
		(ft)	(ft)	(ft)	(ft)	(ft²)	(cfs)	(ft)	(ft)	(ft)	(days hh:mm)	(ac-in)	(min)
1 MHEX1	Junction	5805.50	5814.33	5805.50	5814.33	0.00	55.56	5810.41	0.00	3.92	0 00:00	0.00	0.00
2 MHR1	Junction	5807.60	5815.20	5807.60	5815.20	0.00	55.56	5813.88	0.00	1.32	0 00:00	0.00	0.00
3 MHR2	Junction	5810.40	5815.80	5810.40	5815.80	0.00	46.99	5815.30	0.00	0.50	0 00:00	0.00	0.00
4 MHR3	Junction	5816.10	5828.50	5816.10	5828.50	0.00	46.51	5818.67	0.00	9.83	0 00:00	0.00	0.00
5 MHR4	Junction	5824.10	5828.50	5824.10	5828.50	0.00	28.24	5826.20	0.00	2.30	0 00:00	0.00	0.00
6 MHR5	Junction	5820.10	5825.02	5820.10	5825.02	0.00	25.76	5821.04	0.00	3.98	0 00:00	0.00	0.00
7 OS1-OS2-OUT	Junction	5826.28	5831.00	5826.28	5831.00	0.00	22.87	5828.43	0.00	2.57	0 00:00	0.00	0.00
8 OS4	Junction	5824.20	5828.50	5824.20	5828.50	0.00	25.75	5825.39	0.00	3.11	0 00:00	0.00	0.00
9 RE	Junction	5813.10	5817.30	5813.10	5817.30	0.00	26.44	5814.65	0.00	2.65	0 00:00	0.00	0.00
10 RW	Junction	5803.61	5809.76	5803.61	5809.76	0.00	55.56	5807.42	0.00	2.34	0 00:00	0.00	0.00
11 TN-1	Junction	5827.90	5830.90	5827.90	5830.90	0.00	21.12	5828.97	0.00	1.93	0 00:00	0.00	0.00
12 TN-2	Junction	5824.70	5829.85	5824.70	5829.85	0.00	25.78	5826.77	0.00	3.08	0 00:00	0.00	0.00
13 TS-1	Junction	5825.58	5829.29	5825.58	5829.29	0.00	22.87	5827.76	0.00	1.53	0 00:00	0.00	0.00
14 TS-2	Junction	5825.00	5829.51	5825.00	5829.51	0.00	28.27	5827.08	0.00	2.43	0 00:00	0.00	0.00
15 W10A	Junction	5836.00	5839.00	5836.00	5839.00	134.00	21.12	5836.81	0.00	2.19	0 00:00	0.00	0.00
16 Out-01	Outfall	5799.62					55.56	5801.25					
17 I1	Storage Node	5810.71	5813.90	5810.71		0.00	8.58	5813.90				2.98	29.00
18 I2	Storage Node	5811.10	5814.30	5811.10		0.00	7.26	5814.30				2.06	24.00
19 OS1-OS2	Storage Node	5826.28	5831.00	5826.28		0.00	36.80	5831.00				2.62	19.00
20 W-9A	Storage Node	5860.50	5866.50	5860.50		0.00	29.36	5862.90				0.00	0.00

Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/Total Depth Ratio	Total Time Reported Surcharged Condition
				(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)
1 I1-R2	Pipe	I1	MHR2	42.00	5810.71	5810.40	0.7400	15.000	0.0120	7.63	6.01	1.27	6.22	1.25	1.00	51.00 SURCHARGED
2 I2-R2	Pipe	I2	MHR2	30.00	5811.10	5810.50	2.0000	15.000	0.0120	6.80	9.90	0.69	5.54	1.25	1.00	42.00 SURCHARGED
3 MH3-MH2	Pipe	MHR3	MHR2	124.00	5816.10	5810.50	4.5200	30.000	0.0120	46.99	94.43	0.50	9.68	2.41	1.00	2.00 SURCHARGED
4 MHEX1-RE2-RW	Pipe	MHEX1	RW	51.67	5805.50	5803.61	3.6600	30.000	0.0120	55.56	84.98	0.65	11.32	2.50	1.00	14.00 SURCHARGED
5 MHR1-MHEX1	Pipe	MHR1	MHEX1	51.20	5809.60	5808.66	1.8400	30.000	0.0120	55.56	60.21	0.92	12.15	2.19	0.88	0.00 Calculated
6 MHR2-MHR1	Pipe	MHR2	MHR1	144.00	5810.40	5809.70	0.4900	30.000	0.0120	35.29	30.98	1.14	7.19	2.50	1.00	29.00 SURCHARGED
7 MHR4-MHR3	Pipe	MHR4	MHR3	80.00	5824.10	5823.30	1.0000	30.000	0.0120	28.24	44.44	0.64	7.59	1.77	0.71	0.00 Calculated
8 MHR5-RE1	Pipe	MHR5	RE	109.00	5820.10	5813.30	6.2400	30.000	0.0120	25.82	110.99	0.23	14.65	1.09	0.46	0.00 Calculated
9 OS1-TS1	Pipe	OS1-OS2-OUT	TS-1	24.00	5826.28	5825.58	2.9200	30.000	0.0190	22.87	47.93	0.48	5.25	2.16	0.87	0.00 Calculated
10 OS4-MHR5	Pipe	OS4	MHR5	78.00	5824.20	5820.30	5.0000	30.000	0.0120	25.76	99.36	0.26	13.50	1.02	0.41	0.00 Calculated
11 RE1-MHR1	Pipe	RE	MHR1	45.00	5813.10	5809.70	7.5600	30.000	0.0120	26.30	122.14	0.22	6.18	1.98	0.81	0.00 Calculated
12 RE2-RW-OUT-01	Pipe	RW	Out-01	147.25	5803.61	5799.62	2.7100	30.000	0.0120	55.56	73.15	0.76	12.81	2.06	0.83	0.00 Calculated
13 TN1-TN2	Pipe	TN-1	TN-2	27.61	5827.90	5824.80	11.2300	30.000	0.0190	21.11	94.04	0.22	7.08	1.50	0.60	0.00 Calculated
14 TN2-OS4	Pipe	TN-2	OS4	38.00	5824.70	5824.30	1.0500	30.000	0.0120	25.75	45.59	0.56	7.20	1.70	0.68	0.00 Calculated
15 TS1-TS2	Pipe	TS-1	TS-2	18.90	5825.58	5825.20	2.0100	30.000	0.0190	22.87	39.79	0.57	6.13	2.02	0.81	0.00 Calculated
16 TS2-MHR4	Pipe	TS-2	MHR4	35.23	5825.00	5824.30	1.9900	30.000	0.0120	28.24	62.64	0.45	6.78	1.98	0.80	0.00 Calculated
17 W10A-TN1	Pipe	W10A	TN-1	38.10	5836.00	5827.90	21.2600	30.000	0.0190	21.12	129.40	0.16	12.51	0.94	0.38	0.00 Calculated
18 OS1-OS2-Outlet	Outlet	OS1-OS2	OS1-OS2-OUT		5826.28	5826.28				22.87						
19 W-9A	Outlet	W-9A	MHR3		5860.50	5816.10				22.16						

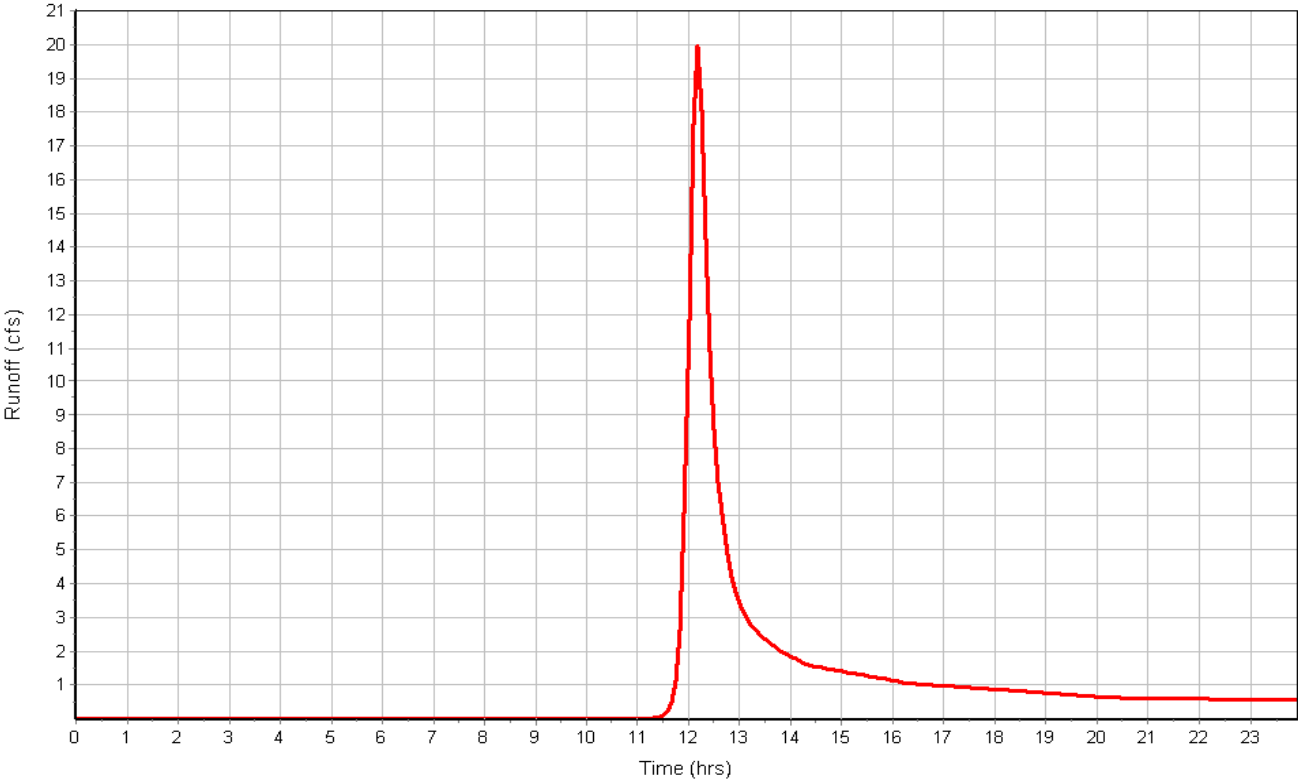
Subbasin Hydrology

Subbasin : OS1

Subbasin Runoff Results

Total Rainfall (in)	2.12
Total Runoff (in)	0.61
Peak Runoff (cfs)	20.00
Weighted Curve Number	79.48
Time of Concentration (days hh:mm:ss)	0 00:26:00

Runoff Hydrograph

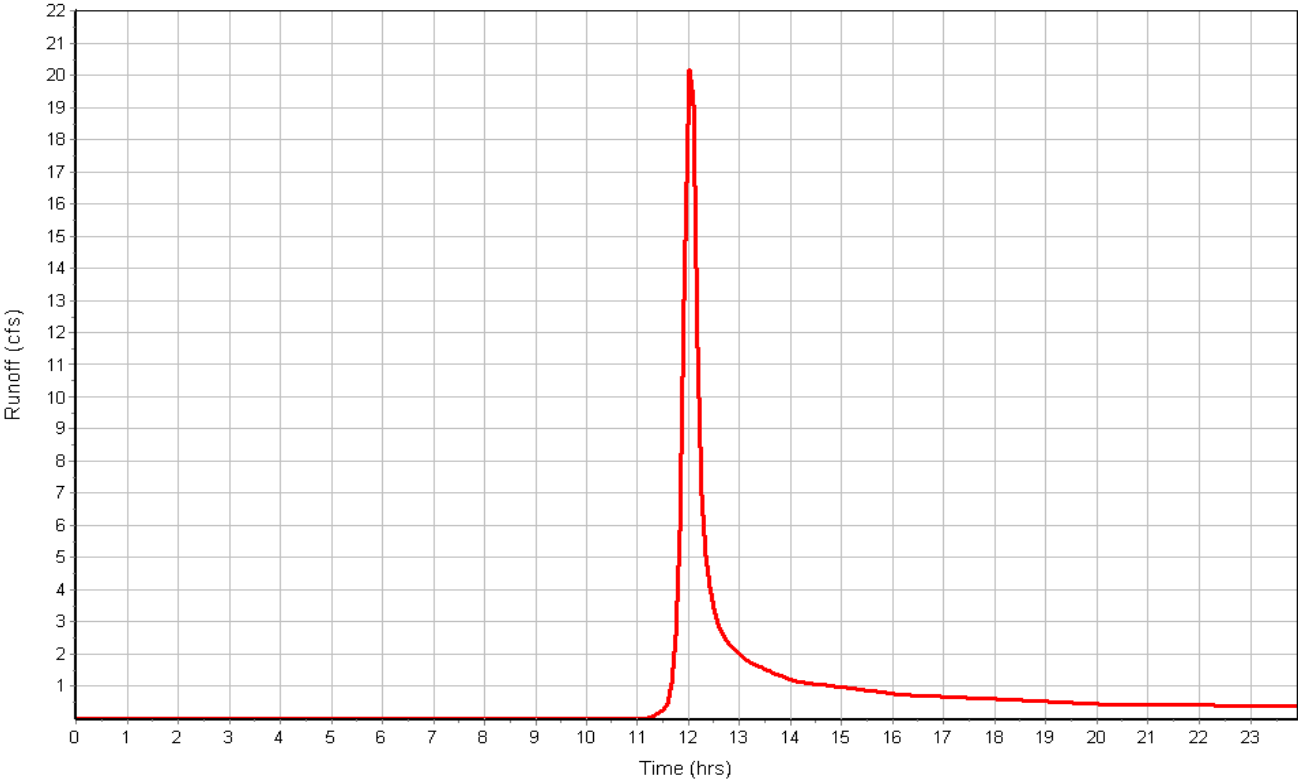


Subbasin : OS2

Subbasin Runoff Results

Total Rainfall (in)	2.12
Total Runoff (in)	0.64
Peak Runoff (cfs)	20.98
Weighted Curve Number	79.99
Time of Concentration (days hh:mm:ss)	0 00:12:14

Runoff Hydrograph

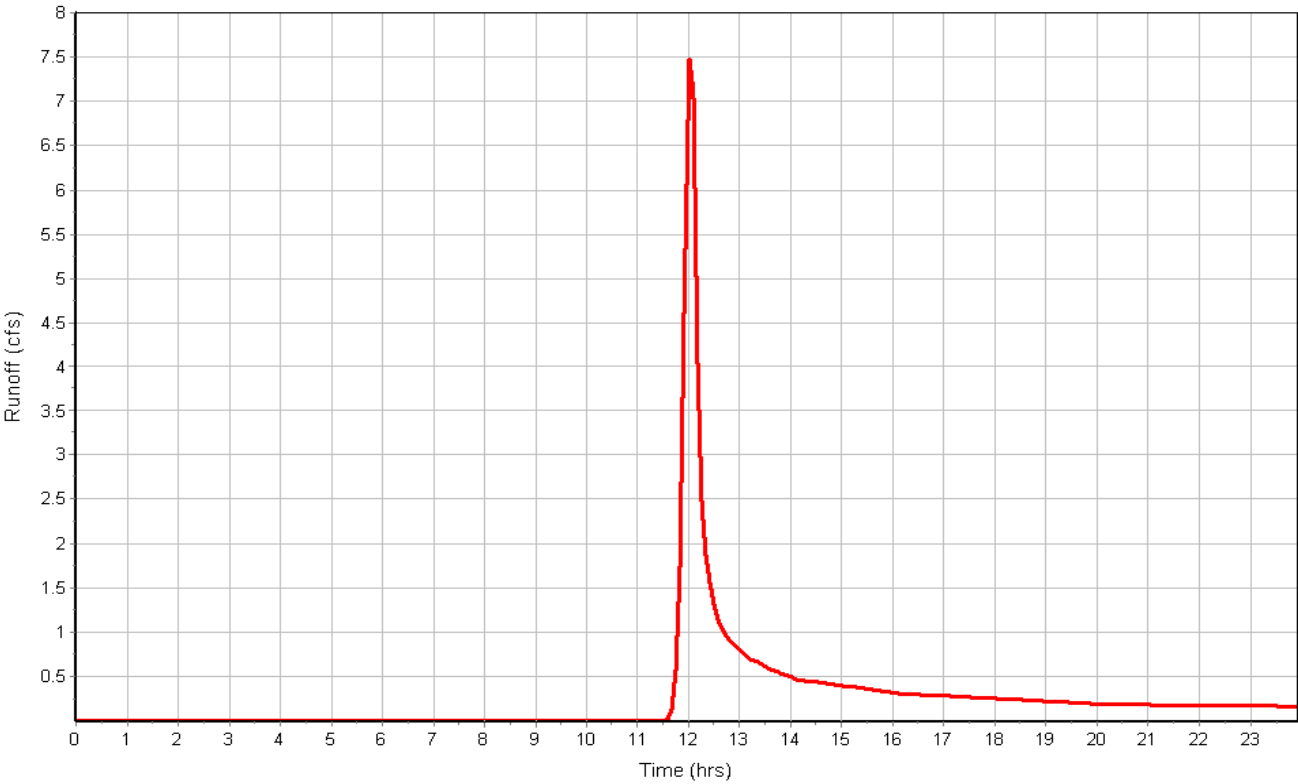


Subbasin : OS-4

Subbasin Runoff Results

Total Rainfall (in)	2.12
Total Runoff (in)	0.51
Peak Runoff (cfs)	7.84
Weighted Curve Number	77.00
Time of Concentration (days hh:mm:ss)	0 00:11:24

Runoff Hydrograph

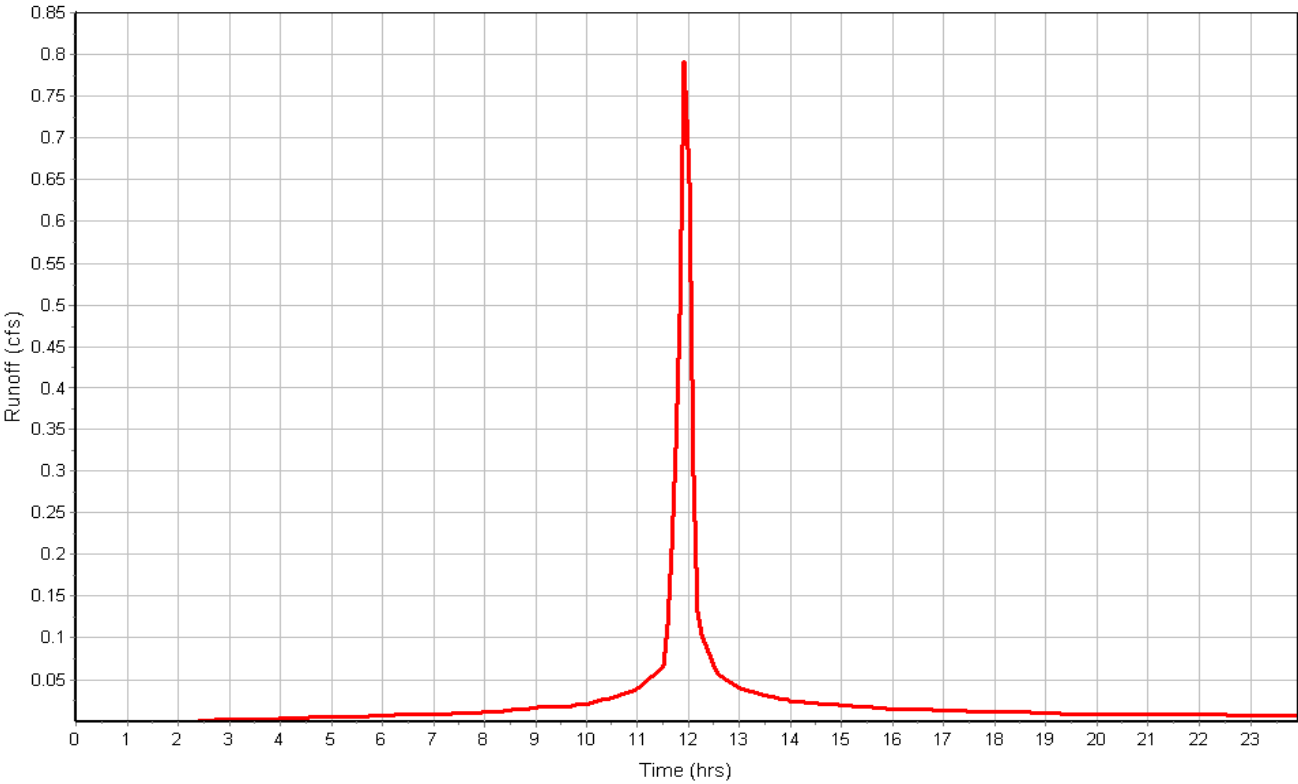


Subbasin : R-E

Subbasin Runoff Results

Total Rainfall (in)	2.12
Total Runoff (in)	1.89
Peak Runoff (cfs)	0.80
Weighted Curve Number	98.00
Time of Concentration (days hh:mm:ss)	0 00:06:00

Runoff Hydrograph



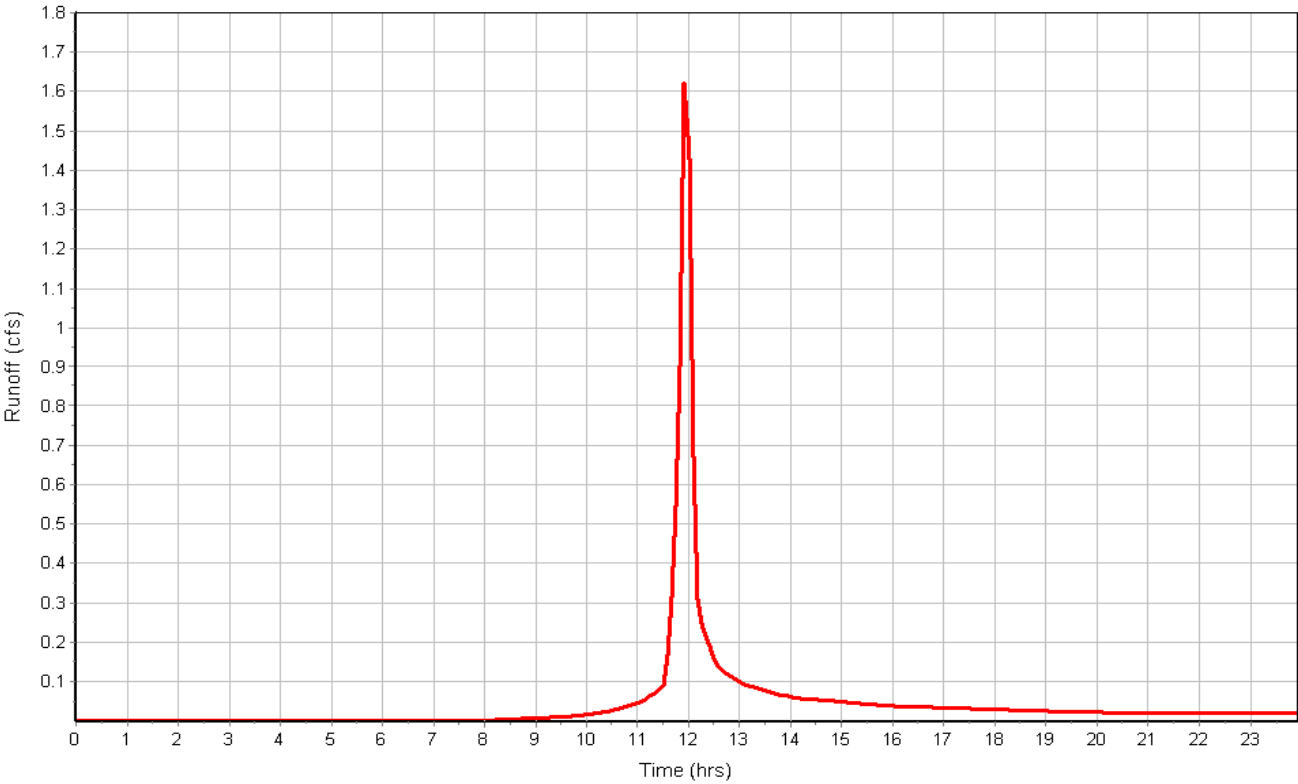
Subbasin : RS

Subbasin Runoff Results

Total Rainfall (in)	2.12
Total Runoff (in)	1.18
Peak Runoff (cfs)	1.66
Weighted Curve Number	89.78
Time of Concentration (days hh:mm:ss)	0 00:06:00

Subbasin : RS

Runoff Hydrograph

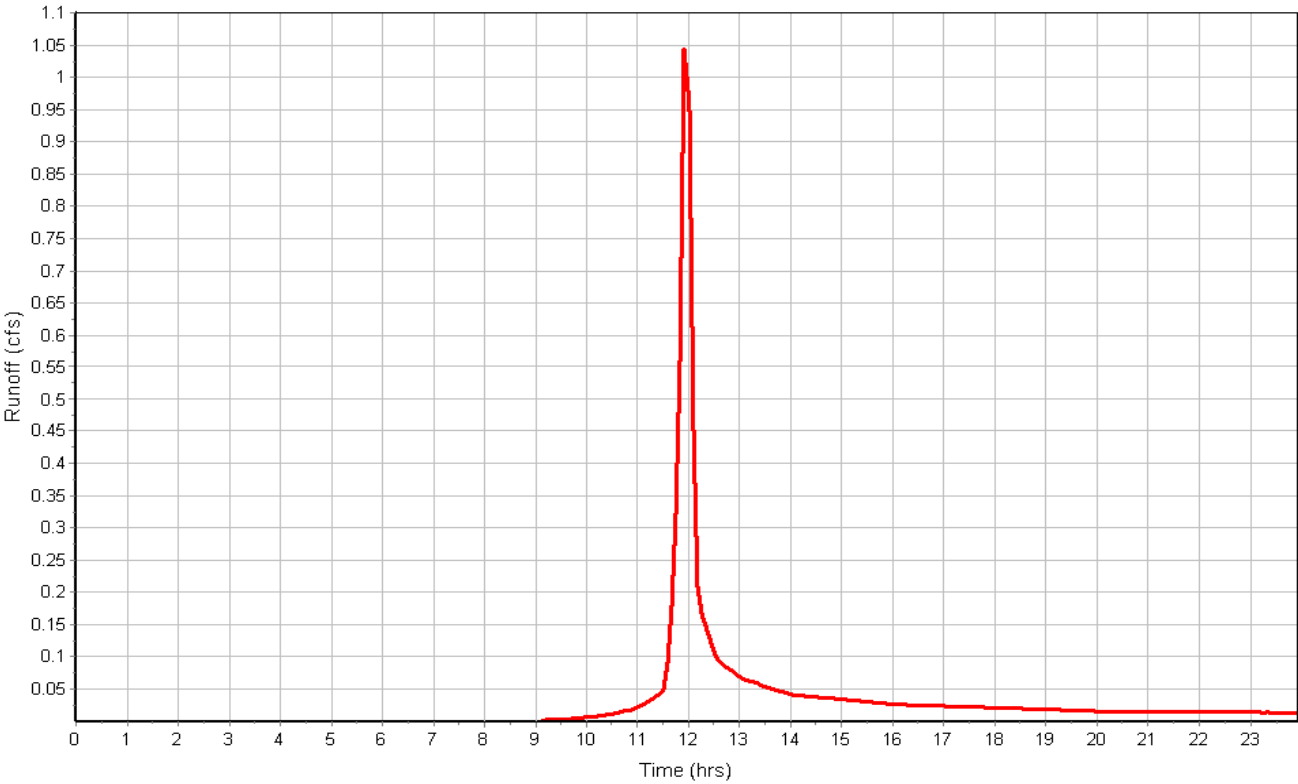


Subbasin : R-W

Subbasin Runoff Results

Total Rainfall (in)	2.12
Total Runoff (in)	1.00
Peak Runoff (cfs)	1.07
Weighted Curve Number	87.00
Time of Concentration (days hh:mm:ss)	0 00:06:00

Runoff Hydrograph



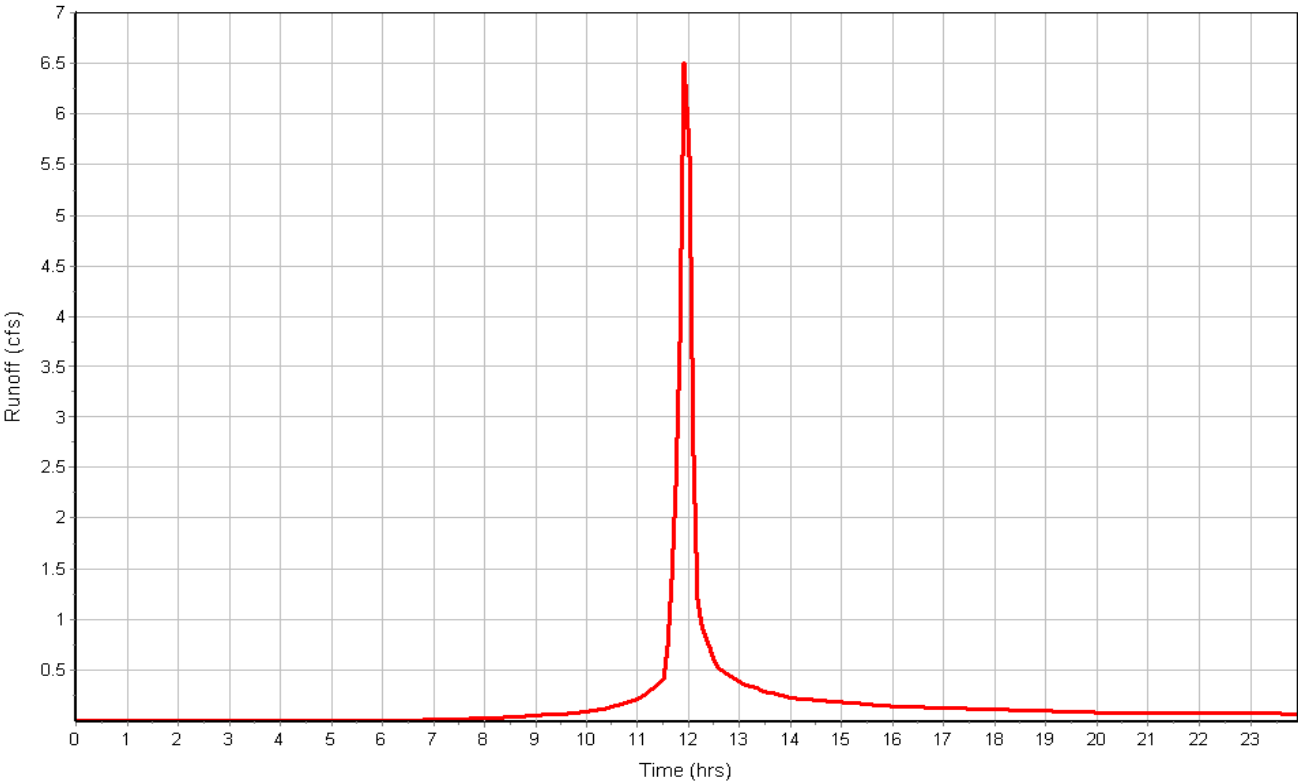
Subbasin : TN

Subbasin Runoff Results

Total Rainfall (in)	2.12
Total Runoff (in)	1.35
Peak Runoff (cfs)	6.58
Weighted Curve Number	92.00
Time of Concentration (days hh:mm:ss)	0 00:06:00

Subbasin : TN

Runoff Hydrograph

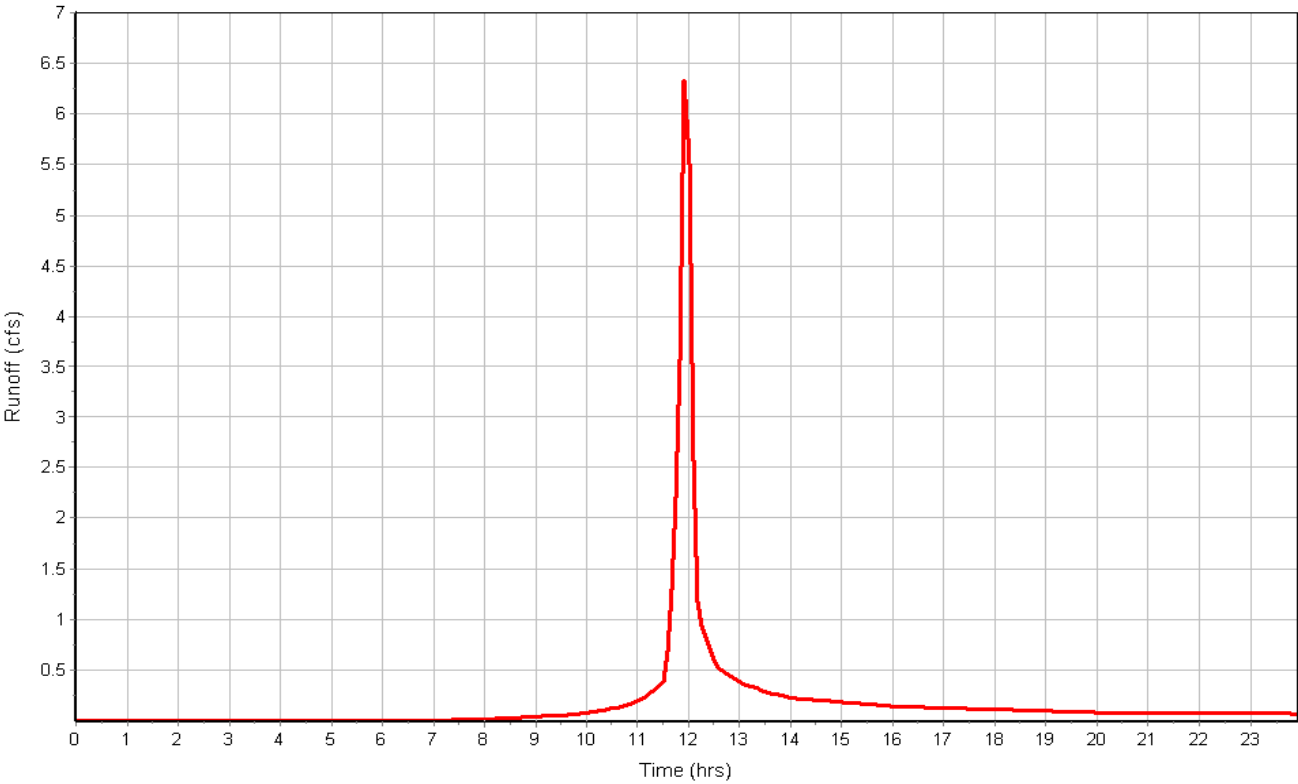


Subbasin : TS

Subbasin Runoff Results

Total Rainfall (in)	2.12
Total Runoff (in)	1.27
Peak Runoff (cfs)	6.44
Weighted Curve Number	91.00
Time of Concentration (days hh:mm:ss)	0 00:06:00

Runoff Hydrograph

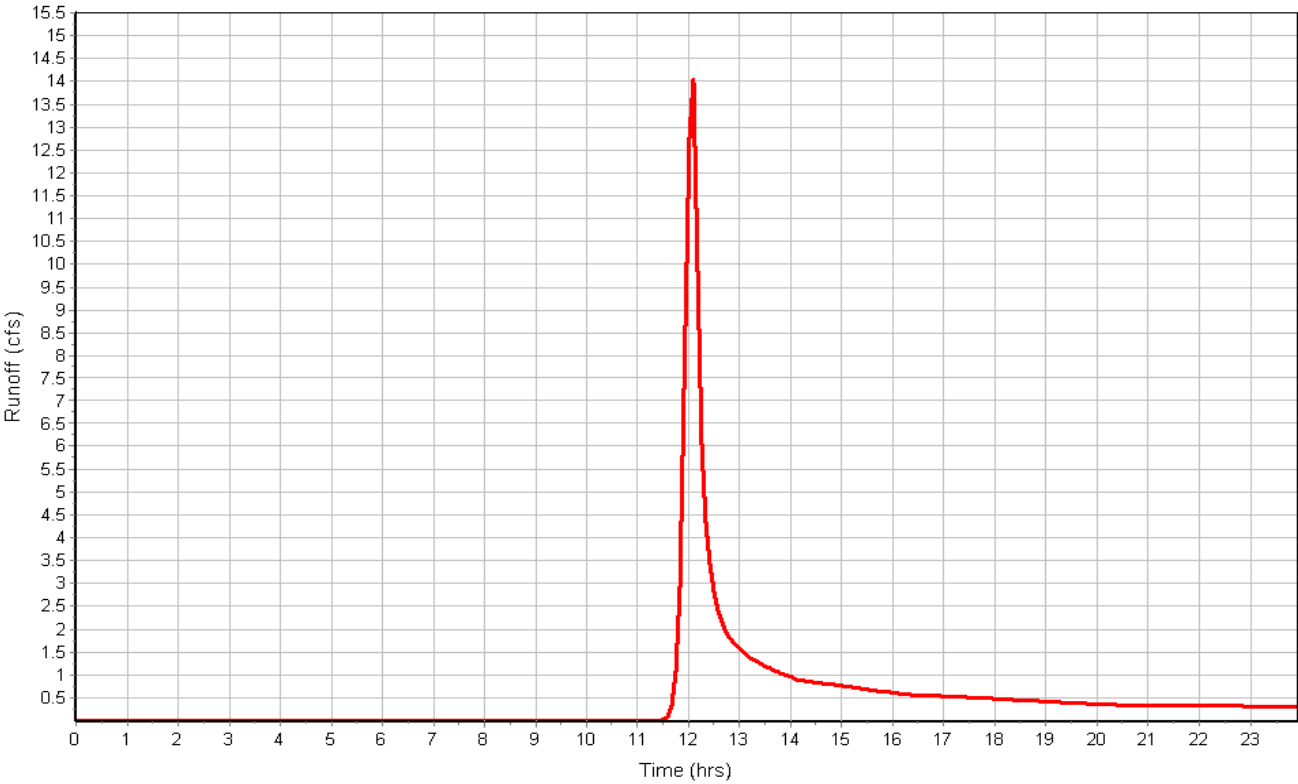


Subbasin : W-10A

Subbasin Runoff Results

Total Rainfall (in)	2.12
Total Runoff (in)	0.55
Peak Runoff (cfs)	14.36
Weighted Curve Number	78.00
Time of Concentration (days hh:mm:ss)	0 00:14:20

Runoff Hydrograph

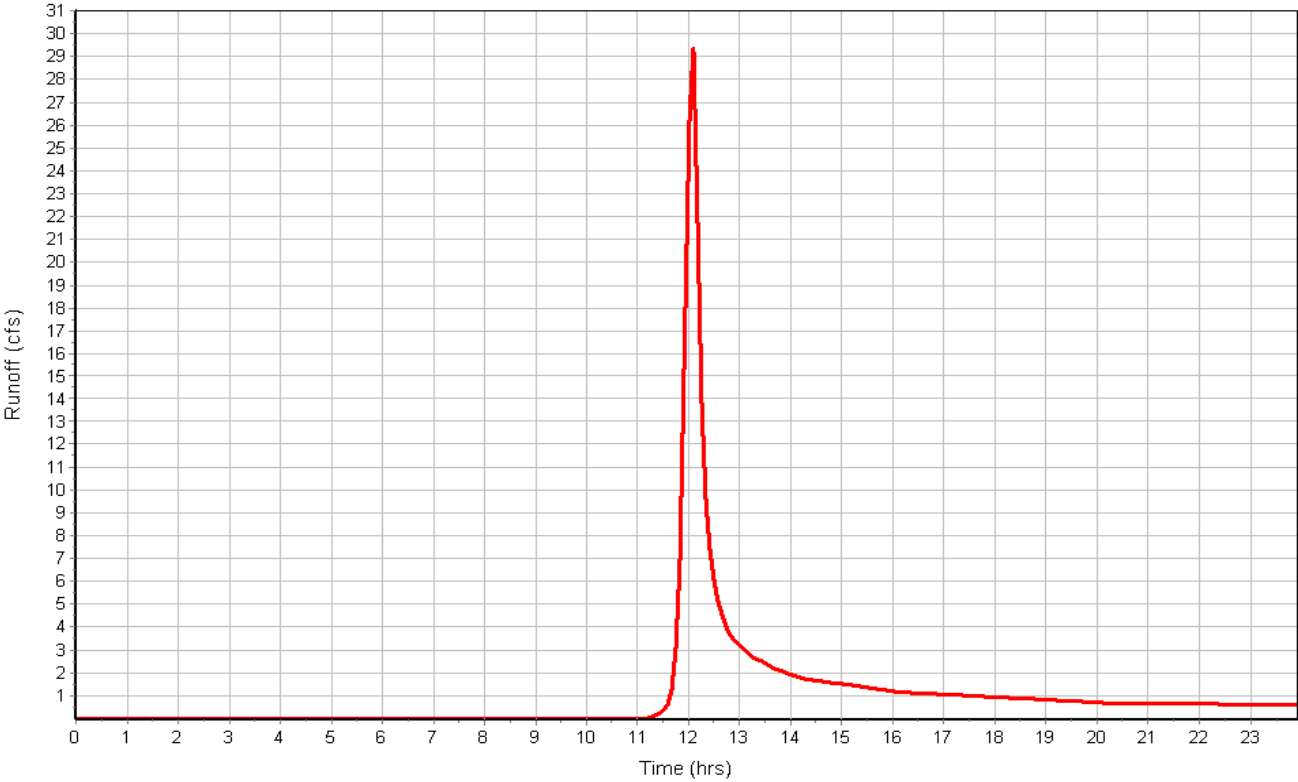


Subbasin : W9A

Subbasin Runoff Results

Total Rainfall (in)	2.12
Total Runoff (in)	0.64
Peak Runoff (cfs)	29.72
Weighted Curve Number	80.00
Time of Concentration (days hh:mm:ss)	0 00:15:32

Runoff Hydrograph



Junction Input

SN Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1 MHEX1	5805.50	5814.33	8.83	5805.50	0.00	5814.33	0.00	0.00	0.00
2 MHR1	5807.60	5815.20	7.60	5807.60	0.00	5815.20	0.00	0.00	0.00
3 MHR2	5810.40	5815.80	5.40	5810.40	0.00	5815.80	0.00	0.00	0.00
4 MHR3	5816.10	5828.50	12.40	5816.10	0.00	5828.50	0.00	0.00	0.00
5 MHR4	5824.10	5828.50	4.40	5824.10	0.00	5828.50	0.00	0.00	0.00
6 MHR5	5820.10	5825.02	4.92	5820.10	0.00	5825.02	0.00	0.00	0.00
7 OS1-OS2-OUT	5826.28	5831.00	4.72	5826.28	0.00	5831.00	0.00	0.00	0.00
8 OS4	5824.20	5828.50	4.30	5824.20	0.00	5828.50	0.00	0.00	0.00
9 RE	5813.10	5817.30	4.20	5813.10	0.00	5817.30	0.00	0.00	0.00
10 RW	5803.61	5809.76	6.15	5803.61	0.00	5809.76	0.00	0.00	0.00
11 TN-1	5827.90	5830.90	3.00	5827.90	0.00	5830.90	0.00	0.00	0.00
12 TN-2	5824.70	5829.85	5.15	5824.70	0.00	5829.85	0.00	0.00	0.00
13 TS-1	5825.58	5829.29	3.71	5825.58	0.00	5829.29	0.00	0.00	0.00
14 TS-2	5825.00	5829.51	4.51	5825.00	0.00	5829.51	0.00	0.00	0.00
15 W10A	5836.00	5839.00	3.00	5836.00	0.00	5839.00	0.00	134.00	0.00

Junction Results

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 MHEX1	55.56	0.00	5810.41	4.91	0.00	3.92	5806.39	0.89	0 12:06	0 00:00	0.00	0.00
2 MHR1	55.56	0.00	5813.88	6.28	0.00	1.32	5810.57	2.97	0 12:05	0 00:00	0.00	0.00
3 MHR2	46.99	0.00	5815.30	4.90	0.00	0.50	5811.59	1.19	0 12:10	0 00:00	0.00	0.00
4 MHR3	46.51	0.00	5818.67	2.57	0.00	9.83	5816.66	0.56	0 12:12	0 00:00	0.00	0.00
5 MHR4	28.24	0.00	5826.20	2.10	0.00	2.30	5824.77	0.67	0 12:03	0 00:00	0.00	0.00
6 MHR5	25.76	0.00	5821.04	0.94	0.00	3.98	5820.37	0.27	0 12:05	0 00:00	0.00	0.00
7 OS1-OS2-OUT	22.87	0.00	5828.43	2.15	0.00	2.57	5826.94	0.66	0 12:03	0 00:00	0.00	0.00
8 OS4	25.75	0.00	5825.39	1.19	0.00	3.11	5824.50	0.30	0 12:05	0 00:00	0.00	0.00
9 RE	26.44	0.79	5814.65	1.55	0.00	2.65	5813.37	0.27	0 12:05	0 00:00	0.00	0.00
10 RW	55.56	0.00	5807.42	3.81	0.00	2.34	5804.44	0.83	0 12:06	0 00:00	0.00	0.00
11 TN-1	21.12	0.00	5828.97	1.07	0.00	1.93	5828.16	0.26	0 12:10	0 00:00	0.00	0.00
12 TN-2	25.78	6.50	5826.77	2.07	0.00	3.08	5825.20	0.50	0 12:05	0 00:00	0.00	0.00
13 TS-1	22.87	0.00	5827.76	2.18	0.00	1.53	5826.27	0.69	0 12:03	0 00:00	0.00	0.00
14 TS-2	28.27	6.33	5827.08	2.08	0.00	2.43	5825.61	0.61	0 12:03	0 00:00	0.00	0.00
15 W10A	21.12	21.12	5836.81	0.81	0.00	2.19	5836.22	0.22	0 12:09	0 00:00	0.00	0.00

Pipe Input

SN Element ID	Length	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Pipe Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1 I1-R2	42.00	5810.71	0.00	5810.40	0.00	0.31	0.7400	CIRCULAR	15.000	15.000	0.0120	0.5000	1.0000	0.0000	0.00	No	1
2 I2-R2	30.00	5811.10	0.00	5810.50	0.10	0.60	2.0000	CIRCULAR	15.000	15.000	0.0120	0.5000	1.0000	0.0000	0.00	No	1
3 MH3-MH2	124.00	5816.10	0.00	5810.50	0.10	5.60	4.5200	CIRCULAR	30.000	30.000	0.0120	0.5000	1.0000	0.0000	0.00	No	1
4 MHEX1-RE2-RW	51.67	5805.50	0.00	5803.61	0.00	1.89	3.6600	CIRCULAR	30.000	30.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
5 MHR1-MHEX1	51.20	5809.60	2.00	5808.66	3.16	0.94	1.8400	CIRCULAR	30.000	30.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
6 MHR2-MHR1	144.00	5810.40	0.00	5809.70	2.10	0.70	0.4900	CIRCULAR	30.000	30.000	0.0120	0.5000	0.7000	0.0000	0.00	No	1
7 MHR4-MHR3	80.00	5824.10	0.00	5823.30	7.20	0.80	1.0000	CIRCULAR	30.000	30.000	0.0120	0.5000	0.8000	0.0000	0.00	No	1
8 MHR5-RE1	109.00	5820.10	0.00	5813.30	0.20	6.80	6.2400	CIRCULAR	30.000	30.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
9 OS1-TS1	24.00	5826.28	0.00	5825.58	0.00	0.70	2.9200	CIRCULAR	30.000	30.000	0.0190	0.9000	0.5000	0.0000	0.00	No	1
10 OS4-MHR5	78.00	5824.20	0.00	5820.30	0.20	3.90	5.0000	CIRCULAR	30.000	30.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
11 RE1-MHR1	45.00	5813.10	0.00	5809.70	2.10	3.40	7.5600	CIRCULAR	30.000	30.000	0.0120	0.5000	0.7000	0.0000	0.00	No	1
12 RE2-RW-OUT-01	147.25	5803.61	0.00	5799.62	0.00	3.99	2.7100	CIRCULAR	30.000	30.000	0.0120	0.5000	0.5000	0.5000	0.00	No	1
13 TN1-TN2	27.61	5827.90	0.00	5824.80	0.10	3.10	11.2300	CIRCULAR	30.000	30.000	0.0190	0.5000	0.8000	0.0000	0.00	No	1
14 TN2-OS4	38.00	5824.70	0.00	5824.30	0.10	0.40	1.0500	CIRCULAR	30.000	30.000	0.0120	0.5000	0.8000	0.0000	0.00	No	1
15 TS1-TS2	18.90	5825.58	0.00	5825.20	0.20	0.38	2.0100	CIRCULAR	30.000	30.000	0.0190	0.5000	0.6000	0.0000	0.00	No	1
16 TS2-MHR4	35.23	5825.00	0.00	5824.30	0.20	0.70	1.9900	CIRCULAR	30.000	30.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
17 W10A-TN1	38.10	5836.00	0.00	5827.90	0.00	8.10	21.2600	CIRCULAR	30.000	30.000	0.0190	0.9000	0.5000	0.0000	0.00	No	1

Pipe Results

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Travel Time	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number	Reported Condition
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(min)	(ft)		(min)		
1 I1-R2	7.63	0 12:10	6.01	1.27	6.22	0.11	1.25	1.00	51.00		SURCHARGED
2 I2-R2	6.80	0 12:10	9.90	0.69	5.54	0.09	1.25	1.00	42.00		SURCHARGED
3 MH3-MH2	46.99	0 12:14	94.43	0.50	9.68	0.21	2.41	1.00	2.00		SURCHARGED
4 MHEX1-RE2-RW	55.56	0 12:06	84.98	0.65	11.32	0.08	2.50	1.00	14.00		SURCHARGED
5 MHR1-MHEX1	55.56	0 12:05	60.21	0.92	12.15	0.07	2.19	0.88	0.00		Calculated
6 MHR2-MHR1	35.29	0 12:20	30.98	1.14	7.19	0.33	2.50	1.00	29.00		SURCHARGED
7 MHR4-MHR3	28.24	0 12:03	44.44	0.64	7.59	0.18	1.77	0.71	0.00		Calculated
8 MHR5-RE1	25.82	0 12:05	110.99	0.23	14.65	0.12	1.09	0.46	0.00		Calculated
9 OS1-TS1	22.87	0 12:21	47.93	0.48	5.25	0.08	2.16	0.87	0.00		Calculated
10 OS4-MHR5	25.76	0 12:05	99.36	0.26	13.50	0.10	1.02	0.41	0.00		Calculated
11 RE1-MHR1	26.30	0 12:05	122.14	0.22	6.18	0.12	1.98	0.81	0.00		Calculated
12 RE2-RW-OUT-01	55.56	0 12:06	73.15	0.76	12.81	0.19	2.06	0.83	0.00		Calculated
13 TN1-TN2	21.11	0 12:10	94.04	0.22	7.08	0.06	1.50	0.60	0.00		Calculated
14 TN2-OS4	25.75	0 12:05	45.59	0.56	7.20	0.09	1.70	0.68	0.00		Calculated
15 TS1-TS2	22.87	0 12:22	39.79	0.57	6.13	0.05	2.02	0.81	0.00		Calculated
16 TS2-MHR4	28.24	0 12:03	62.64	0.45	6.78	0.09	1.98	0.80	0.00		Calculated
17 W10A-TN1	21.12	0 12:10	129.40	0.16	12.51	0.05	0.94	0.38	0.00		Calculated

Storage Nodes

Storage Node : I1

Input Data

Invert Elevation (ft)	5810.71
Max (Rim) Elevation (ft)	5813.90
Max (Rim) Offset (ft)	3.19
Initial Water Elevation (ft)	5810.71
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	8.58
Peak Lateral Inflow (cfs)	1.62
Peak Outflow (cfs)	1.13
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	5813.90
Max HGL Depth Attained (ft)	3.19
Average HGL Elevation Attained (ft)	5811.52
Average HGL Depth Attained (ft)	0.81
Time of Max HGL Occurrence (days hh:mm)	0 11:59
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	2.98
Total Time Flooded (min)	29
Total Retention Time (sec)	0.00

Storage Node : I2

Input Data

Invert Elevation (ft)	5811.10
Max (Rim) Elevation (ft)	5814.30
Max (Rim) Offset (ft)	3.20
Initial Water Elevation (ft)	5811.10
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Output Summary Results

Peak Inflow (cfs)	7.26
Peak Lateral Inflow (cfs)	1.04
Peak Outflow (cfs)	1.13
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	5814.30
Max HGL Depth Attained (ft)	3.2
Average HGL Elevation Attained (ft)	5811.67
Average HGL Depth Attained (ft)	0.57
Time of Max HGL Occurrence (days hh:mm)	0 12:00
Total Exfiltration Volume (1000-ft ³)	0.000
Total Flooded Volume (ac-in)	2.06
Total Time Flooded (min)	24
Total Retention Time (sec)	0.00

Storage Node : OS1-OS2

Input Data

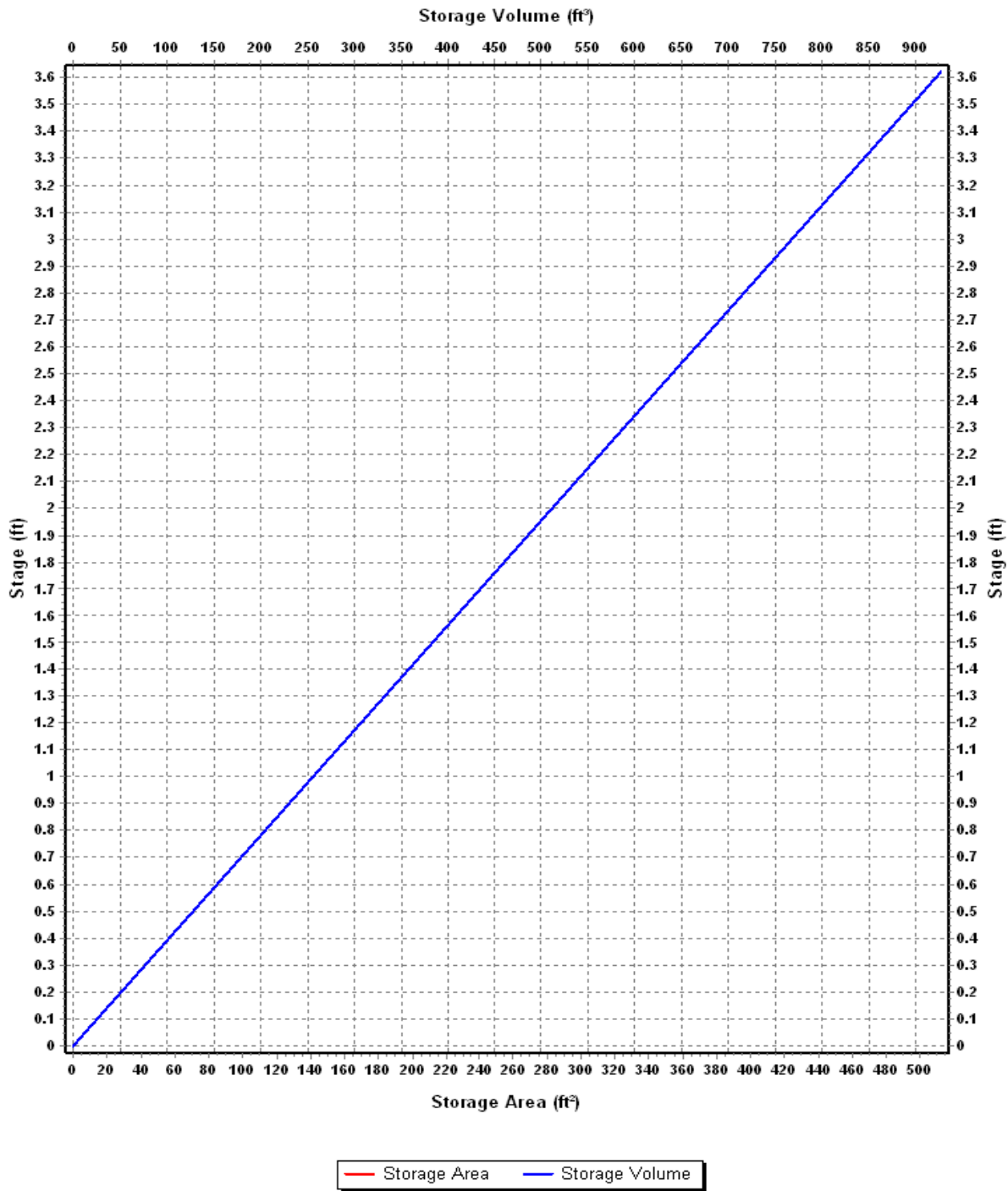
Invert Elevation (ft)	5826.28
Max (Rim) Elevation (ft)	5831.00
Max (Rim) Offset (ft)	4.72
Initial Water Elevation (ft)	5826.28
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : OS1-OS2

Stage	Storage Area	Storage Volume
(ft)	(ft²)	(ft³)
0	0	0
3.62	511.99	926.7

Storage Area Volume Curves



Storage Node : OS1-OS2 (continued)

Output Summary Results

Peak Inflow (cfs)	36.80
Peak Lateral Inflow (cfs)	36.80
Peak Outflow (cfs)	22.87
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	5831.00
Max HGL Depth Attained (ft)	4.72
Average HGL Elevation Attained (ft)	5828.04
Average HGL Depth Attained (ft)	1.76
Time of Max HGL Occurrence (days hh:mm)	0 12:03
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	2.62
Total Time Flooded (min)	19
Total Retention Time (sec)	0.00

Storage Node : W-9A

Input Data

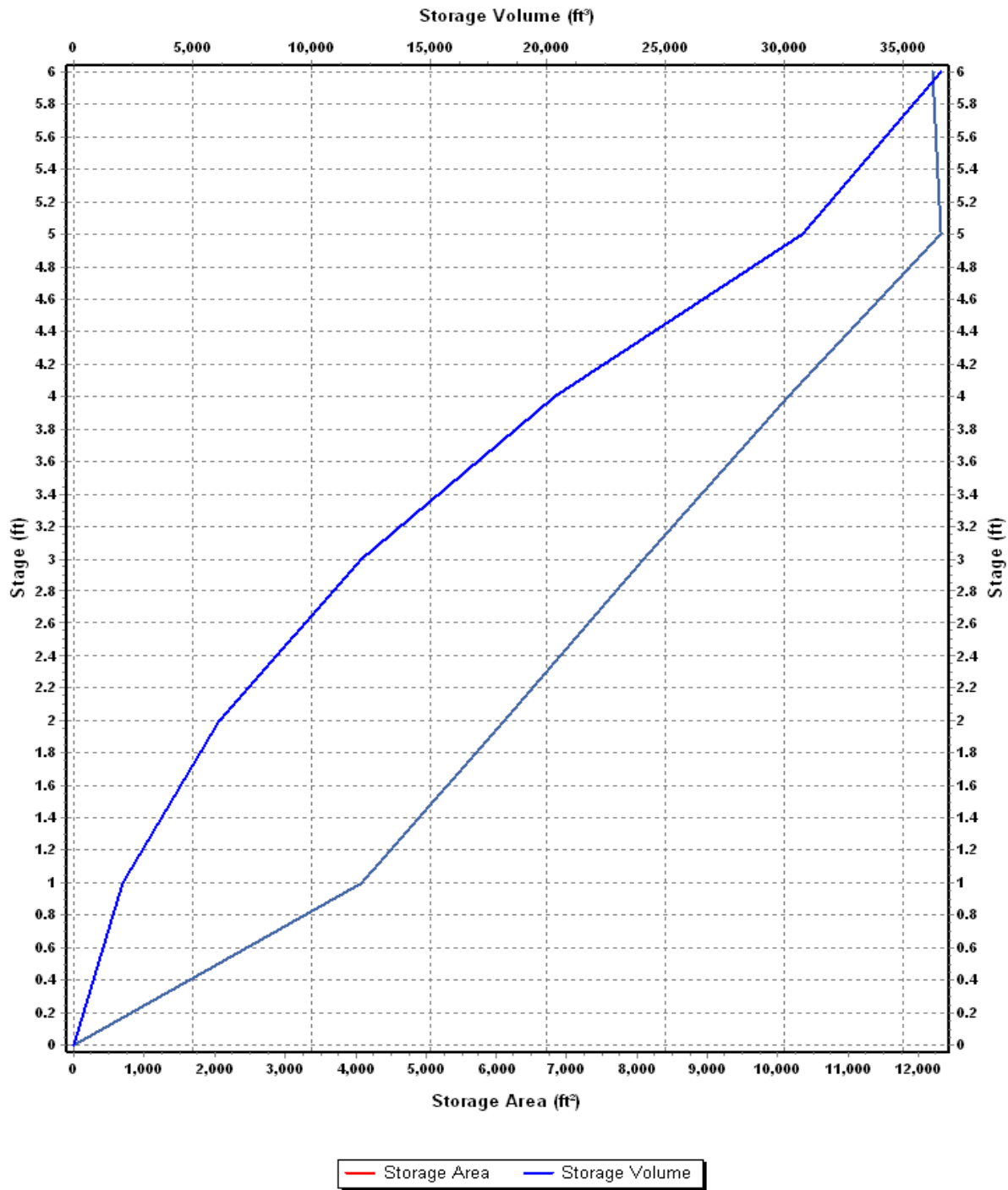
Invert Elevation (ft)	5860.50
Max (Rim) Elevation (ft)	5866.50
Max (Rim) Offset (ft)	6.00
Initial Water Elevation (ft)	5860.50
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : W-9A-Storage

Stage	Storage Area	Storage Volume
(ft)	(ft²)	(ft³)
0	0	0
1	4075.20	2037.6
2	6111.30	6111.3
3	8090.60	12135.9
4	10152.30	20304.6
5	12311.76	30779.4
6	12194.90	36584.7

Storage Area Volume Curves



Storage Node : W-9A (continued)

Output Summary Results

Peak Inflow (cfs)	29.36
Peak Lateral Inflow (cfs)	29.36
Peak Outflow (cfs)	22.16
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	5862.90
Max HGL Depth Attained (ft)	2.4
Average HGL Elevation Attained (ft)	5860.99
Average HGL Depth Attained (ft)	0.49
Time of Max HGL Occurrence (days hh:mm)	0 12:14
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Appendix F

On-Site Storm Sewer Analysis

Project Description

File Name	2012-369-001-On-Site-Drainage-Study.SPF
Description	Stoney River Storm Sewer Analysis - OnSite

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	User-Defined
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	Jun 10, 2013	00:00:00
End Analysis On	Jun 10, 2013	02:00:00
Start Reporting On	Jun 10, 2013	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins.....	0
Nodes.....	24
<i>Junctions</i>	1
<i>Outfalls</i>	2
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	21
Links.....	22
<i>Channels</i>	0
<i>Pipes</i>	22
<i>Pumps</i>	0
<i>Orifices</i>	0
<i>Weirs</i>	0
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Node Summary

SN	Element ID	Element Type	Invert Elevation	Ground/Rim (Max) Elevation	Initial Water Elevation	Surcharge Elevation	Ponded Area	Peak Inflow	Max HGL Elevation Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
			(ft)	(ft)	(ft)	(ft)	(ft²)	(cfs)	(ft)	(ft)	(ft)	(days hh:mm)	(ac-in)	(min)
1	Trench-Drain	Junction	5795.35	5796.68	5795.35	5796.68	0.00	0.00	5795.35	0.00	1.33	0 00:00	0.00	0.00
2	NE-Outfall	Outfall	5773.80					7.10	5774.58					
3	SE Outfall	Outfall	5777.22					7.51	5777.98					
4	#1	Storage Node	5773.70	5778.00	5773.70		0.00	7.10	5775.47				0.00	0.00
5	#10	Storage Node	5805.60	5809.15	5805.60		0.00	1.02	5806.56				0.00	0.00
6	#11	Storage Node	5806.20	5809.15	5806.20		0.00	0.74	5806.98				0.00	0.00
7	#12	Storage Node	5805.18	5808.18	5805.18		0.00	1.97	5806.31				0.00	0.00
8	#13	Storage Node	5804.76	5808.44	5804.76		0.00	2.27	5805.82				0.00	0.00
9	#14	Storage Node	5803.96	5807.58	5803.96		0.00	2.62	5804.93				0.00	0.00
10	#16	Storage Node	5801.00	5806.87	5801.00		0.00	5.00	5802.07				0.00	0.00
11	#17	Storage Node	5791.75	5801.47	5791.75		0.00	7.58	5797.99				0.00	0.00
12	#18	Storage Node	5788.50	5799.00	5788.50		0.00	7.57	5789.35				0.00	0.00
13	#19	Storage Node	5777.27	5781.40	5777.27		0.00	7.57	5779.02				0.00	0.00
14	#2	Storage Node	5785.50	5793.70	5785.50		0.00	7.10	5786.34				0.00	0.00
15	#21	Storage Node	5803.95	5808.00	5803.95		0.00	0.63	5804.64				0.00	0.00
16	#3	Storage Node	5788.62	5796.12	5788.62		0.00	7.10	5793.07				0.00	0.00
17	#4	Storage Node	5793.88	5798.88	5793.88		0.00	5.46	5795.07				0.00	0.00
18	#5	Storage Node	5800.66	5805.90	5800.66		0.00	4.68	5801.56				0.00	0.00
19	#6	Storage Node	5801.38	5807.53	5801.38		0.00	2.47	5802.50				0.00	0.00
20	#7	Storage Node	5802.22	5811.06	5802.22		0.00	2.00	5803.32				0.00	0.00
21	#8	Storage Node	5802.71	5808.44	5802.71		0.00	0.98	5803.59				0.00	0.00
22	#9	Storage Node	5805.44	5808.44	5805.44		0.00	0.98	5806.34				0.00	0.00
23	#15	Storage Node	5801.55	5808.02	5801.55		0.00	0.96	5801.98				0.00	0.00
24	20	Storage Node	5801.08	5804.60	5801.08		0.00							

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	B10-B9	Pipe	#10	#9	16.00	5806.10	5805.94	1.0000	12.000	0.0120	0.98	3.86	0.25	3.44	0.43	0.43	0.00	Calculated
2	B12-B11	Pipe	#11	#10	15.00	5806.70	5806.10	4.0000	12.000	0.0120	0.78	7.72	0.10	4.65	0.36	0.36	0.00	Calculated
3	B12-B13	Pipe	#12	#13	42.00	5805.68	5805.26	1.0000	12.000	0.0120	1.99	3.86	0.52	4.18	0.59	0.59	0.00	Calculated
4	B13-B14	Pipe	#13	#14	40.00	5805.26	5804.46	2.0000	12.000	0.0120	2.28	5.46	0.42	5.76	0.50	0.52	0.00	Calculated
5	B14-B15	Pipe	#14	#15	55.00	5804.46	5802.05	4.3800	12.000	0.0120	2.80	8.08	0.35	6.88	0.60	0.61	0.00	Calculated
6	B15-B16	Pipe	#15	#16	54.60	5802.05	5801.50	1.0100	12.000	0.0120	2.63	3.87	0.68	4.52	0.69	0.70	0.00	Calculated
7	B17-B18	Pipe	#17	#18	35.00	5797.35	5793.00	12.4300	15.000	0.0120	7.57	24.67	0.31	14.25	0.55	0.45	0.00	Calculated
8	B18-B19	Pipe	#18	#19	22.50	5789.00	5777.77	49.9100	15.000	0.0120	7.57	49.44	0.15	19.11	0.78	0.64	0.00	Calculated
9	B19-SEOut	Pipe	#19	SE Outfall	22.00	5777.77	5777.22	2.5000	15.000	0.0120	7.51	11.06	0.68	7.21	0.98	0.80	0.00	Calculated
10	B1-NEO	Pipe	#1	NE-Outfall	20.00	5774.20	5773.80	2.0000	15.000	0.0120	7.10	9.90	0.72	6.64	1.02	0.81	0.00	Calculated
11	B20-B5	Pipe	20	#5	42.00	5801.58	5801.16	1.0000	12.000	0.0120	0.97	3.86	0.25	3.64	0.40	0.40	0.00	Calculated
12	B21-B16	Pipe	#21	#16	63.63	5804.45	5801.50	4.6400	12.000	0.0120	0.63	8.31	0.08	4.12	0.37	0.38	0.00	Calculated
13	B2-B1	Pipe	#2	#1	31.50	5786.00	5774.20	37.4600	15.000	0.0120	7.10	42.83	0.17	17.85	0.80	0.64	0.00	Calculated
14	B3-B2	Pipe	#3	#2	18.00	5792.37	5789.70	14.8300	15.000	0.0120	7.10	26.95	0.26	13.13	0.57	0.45	0.00	Calculated
15	B4-B3	Pipe	#4	#3	47.40	5794.38	5792.37	4.2400	15.000	0.0120	5.46	14.41	0.38	7.85	0.69	0.55	0.00	Calculated
16	B5-B4	Pipe	#5	#4	61.60	5801.16	5794.38	11.0100	15.000	0.0120	4.68	23.22	0.20	9.19	0.54	0.43	0.00	Calculated
17	B16-B17	Pipe	#16	#17	103.00	5801.50	5797.35	4.0300	15.000	0.0120	2.46	5.68	0.43	5.71	0.54	0.54	0.00	Calculated
18	B6-B5	Pipe	#6	#5	33.22	5801.88	5801.16	2.1700	12.000	0.0120	2.00	3.88	0.52	4.03	0.60	0.61	0.00	Calculated
19	B7-B6	Pipe	#7	#6	83.00	5802.72	5801.88	1.0100	12.000	0.0120	0.98	3.86	0.25	3.67	0.37	0.37	0.00	Calculated
20	B8-B7	Pipe	#8	#7	49.00	5803.21	5802.72	1.0000	12.000	0.0120	0.00	10.54	0.00	0.00	0.47	0.47	0.00	Calculated
21	B9-B8	Pipe	#9	#8	51.00	5805.94	5805.43	1.0000	12.000	0.0120								
22	TD-I3	Pipe	Trench #3		43.30	5795.35	5792.12	7.4600	12.000	0.0120								

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	Trench-Drain	5795.35	5796.68	1.33	5795.35	0.00	5796.68	0.00	0.00	3.96

Junction Results

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 Trench-Drain	0.00	0.00	5795.35	0.00	0.00	1.33	5795.35	0.00	0 00:00	0 00:00	0.00	0.00

Pipe Input

SN	Element ID	Length	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Pipe Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	B10-B9	16.00	5806.10	0.50	5805.94	0.50	0.16	1.0000	CIRCULAR	12.000	12.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
2	B12-B11	15.00	5806.70	0.50	5806.10	0.50	0.60	4.0000	CIRCULAR	12.000	12.000	0.0120	0.5000	0.8000	0.0000	0.00	No	1
3	B12-B13	42.00	5805.68	0.50	5805.26	0.50	0.42	1.0000	CIRCULAR	12.000	12.000	0.0120	0.5000	0.6000	0.0000	0.00	No	1
4	B13-B14	40.00	5805.26	0.50	5804.46	0.50	0.80	2.0000	CIRCULAR	12.000	12.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
5	B14-B15	55.00	5804.46	0.50	5802.05	0.50	2.41	4.3800	CIRCULAR	12.000	12.000	0.0120	0.5000	0.9000	0.0000	0.00	No	1
6	B15-B16	54.60	5802.05	0.50	5801.50	0.50	0.55	1.0100	CIRCULAR	12.000	12.000	0.0120	0.5000	0.9000	0.0000	0.00	No	1
7	B17-B18	35.00	5797.35	5.60	5793.00	4.50	4.35	12.4300	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
8	B18-B19	22.50	5789.00	0.50	5777.77	0.50	11.23	49.9100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
9	B19-SEOut	22.00	5777.77	0.50	5777.22	0.00	0.55	2.5000	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
10	B1-NEO	20.00	5774.20	0.50	5773.80	0.00	0.40	2.0000	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
11	B20-B5	42.00	5801.58	0.50	5801.16	0.50	0.42	1.0000	CIRCULAR	12.000	12.000	0.0120	0.5000	0.7000	0.0000	0.00	No	1
12	B21-B16	63.63	5804.45	0.50	5801.50	0.50	2.95	4.6400	CIRCULAR	12.000	12.000	0.0120	0.5000	0.9000	0.0000	0.00	No	1
13	B2-B1	31.50	5786.00	0.50	5774.20	0.50	11.80	37.4600	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
14	B3-B2	18.00	5792.37	3.75	5789.70	4.20	2.67	14.8300	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
15	B4-B3	47.40	5794.38	0.50	5792.37	3.75	2.01	4.2400	CIRCULAR	15.000	15.000	0.0120	0.5000	0.7000	0.0000	0.00	No	1
16	B5-B4	61.60	5801.16	0.50	5794.38	0.50	6.78	11.0100	CIRCULAR	15.000	15.000	0.0120	0.5000	0.8000	0.0000	0.00	No	1
17	B16-B17	103.00	5801.50	0.50	5797.35	5.60	4.15	4.0300	CIRCULAR	12.000	12.000	0.0120	0.5000	0.7000	0.0000	0.00	No	1
18	B6-B5	33.22	5801.88	0.50	5801.16	0.50	0.72	2.1700	CIRCULAR	12.000	12.000	0.0120	0.5000	0.7000	0.0000	0.00	No	1
19	B7-B6	83.00	5802.72	0.50	5801.88	0.50	0.84	1.0100	CIRCULAR	12.000	12.000	0.0120	0.5000	0.8000	0.0000	0.00	No	1
20	B8-B7	49.00	5803.21	0.50	5802.72	0.50	0.49	1.0000	CIRCULAR	12.000	12.000	0.0120	0.5000	0.8000	0.0000	0.00	No	1
21	B9-B8	51.00	5805.94	0.50	5805.43	2.72	0.51	1.0000	CIRCULAR	12.000	12.000	0.0120	0.5000	0.8000	0.0000	0.00	No	1
22	TD-I3	43.30	5795.35	0.00	5792.12	3.50	3.23	7.4600	CIRCULAR	12.000	12.000	0.0120	0.5000	0.7000	1.0000	0.00	No	1

Pipe Results

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Travel Time	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number	Reported Condition
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(min)	(ft)		(min)		
1 B10-B9	0.98	0 00:01	3.86	0.25	3.44	0.08	0.43	0.43	0.00		Calculated
2 B12-B11	0.78	0 00:00	7.72	0.10	4.65	0.05	0.36	0.36	0.00		Calculated
3 B12-B13	1.99	0 00:00	3.86	0.52	4.18	0.17	0.59	0.59	0.00		Calculated
4 B13-B14	2.28	0 00:00	5.46	0.42	5.76	0.12	0.50	0.52	0.00		Calculated
5 B14-B15	2.80	0 00:01	8.08	0.35	6.88	0.13	0.60	0.61	0.00		Calculated
6 B15-B16	2.63	0 00:01	3.87	0.68	4.52	0.20	0.69	0.70	0.00		Calculated
7 B17-B18	7.57	0 00:01	24.67	0.31	14.25	0.04	0.55	0.45	0.00		Calculated
8 B18-B19	7.57	0 00:01	49.44	0.15	19.11	0.02	0.78	0.64	0.00		Calculated
9 B19-SEOut	7.51	0 00:02	11.06	0.68	7.21	0.05	0.98	0.80	0.00		Calculated
10 B1-NEO	7.10	0 00:03	9.90	0.72	6.64	0.05	1.02	0.81	0.00		Calculated
11 B20-B5	0.97	0 00:00	3.86	0.25	3.64	0.19	0.40	0.40	0.00		Calculated
12 B21-B16	0.63	0 00:00	8.31	0.08	4.12	0.26	0.37	0.38	0.00		Calculated
13 B2-B1	7.10	0 00:02	42.83	0.17	17.85	0.03	0.80	0.64	0.00		Calculated
14 B3-B2	7.10	0 00:02	26.95	0.26	13.13	0.02	0.57	0.45	0.00		Calculated
15 B4-B3	5.46	0 00:02	14.41	0.38	7.85	0.10	0.69	0.55	0.00		Calculated
16 B5-B4	4.68	0 00:02	23.22	0.20	9.19	0.11	0.54	0.43	0.00		Calculated
17 B16-B17	2.46	0 00:02	5.68	0.43	5.71	0.10	0.54	0.54	0.00		Calculated
18 B6-B5	2.00	0 00:02	3.88	0.52	4.03	0.34	0.60	0.61	0.00		Calculated
19 B7-B6	0.98	0 00:02	3.86	0.25	3.67	0.23	0.37	0.37	0.00		Calculated
20 B8-B7	0.00	0 00:00	10.54	0.00	0.00		0.47	0.47	0.00		Calculated
21 B9-B8											
22 TD-I3											

Storage Nodes

Storage Node : #1

Input Data

Invert Elevation (ft)	5773.70
Max (Rim) Elevation (ft)	5778.00
Max (Rim) Offset (ft)	4.30
Initial Water Elevation (ft)	5773.70
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #10

Input Data

Invert Elevation (ft)	5805.60
Max (Rim) Elevation (ft)	5809.15
Max (Rim) Offset (ft)	3.55
Initial Water Elevation (ft)	5805.60
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #11

Input Data

Invert Elevation (ft)	5806.20
Max (Rim) Elevation (ft)	5809.15
Max (Rim) Offset (ft)	2.95
Initial Water Elevation (ft)	5806.20
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #12

Input Data

Invert Elevation (ft)	5805.18
Max (Rim) Elevation (ft)	5808.18
Max (Rim) Offset (ft)	3.00
Initial Water Elevation (ft)	5805.18
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #13

Input Data

Invert Elevation (ft)	5804.76
Max (Rim) Elevation (ft)	5808.44
Max (Rim) Offset (ft)	3.68
Initial Water Elevation (ft)	5804.76
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #14

Input Data

Invert Elevation (ft)	5803.96
Max (Rim) Elevation (ft)	5807.58
Max (Rim) Offset (ft)	3.62
Initial Water Elevation (ft)	5803.96
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #16

Input Data

Invert Elevation (ft)	5801.00
Max (Rim) Elevation (ft)	5806.87
Max (Rim) Offset (ft)	5.87
Initial Water Elevation (ft)	5801.00
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #17

Input Data

Invert Elevation (ft)	5791.75
Max (Rim) Elevation (ft)	5801.47
Max (Rim) Offset (ft)	9.72
Initial Water Elevation (ft)	5791.75
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #18

Input Data

Invert Elevation (ft)	5788.50
Max (Rim) Elevation (ft)	5799.00
Max (Rim) Offset (ft)	10.50
Initial Water Elevation (ft)	5788.50
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #19

Input Data

Invert Elevation (ft)	5777.27
Max (Rim) Elevation (ft)	5781.40
Max (Rim) Offset (ft)	4.13
Initial Water Elevation (ft)	5777.27
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #2

Input Data

Invert Elevation (ft)	5785.50
Max (Rim) Elevation (ft)	5793.70
Max (Rim) Offset (ft)	8.20
Initial Water Elevation (ft)	5785.50
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #21

Input Data

Invert Elevation (ft)	5803.95
Max (Rim) Elevation (ft)	5808.00
Max (Rim) Offset (ft)	4.05
Initial Water Elevation (ft)	5803.95
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #3

Input Data

Invert Elevation (ft)	5788.62
Max (Rim) Elevation (ft)	5796.12
Max (Rim) Offset (ft)	7.50
Initial Water Elevation (ft)	5788.62
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #4

Input Data

Invert Elevation (ft)	5793.88
Max (Rim) Elevation (ft)	5798.88
Max (Rim) Offset (ft)	5.00
Initial Water Elevation (ft)	5793.88
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #5

Input Data

Invert Elevation (ft)	5800.66
Max (Rim) Elevation (ft)	5805.90
Max (Rim) Offset (ft)	5.24
Initial Water Elevation (ft)	5800.66
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #6

Input Data

Invert Elevation (ft)	5801.38
Max (Rim) Elevation (ft)	5807.53
Max (Rim) Offset (ft)	6.15
Initial Water Elevation (ft)	5801.38
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #7

Input Data

Invert Elevation (ft)	5802.22
Max (Rim) Elevation (ft)	5811.06
Max (Rim) Offset (ft)	8.84
Initial Water Elevation (ft)	5802.22
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #8

Input Data

Invert Elevation (ft)	5802.71
Max (Rim) Elevation (ft)	5808.44
Max (Rim) Offset (ft)	5.73
Initial Water Elevation (ft)	5802.71
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #9

Input Data

Invert Elevation (ft)	5805.44
Max (Rim) Elevation (ft)	5808.44
Max (Rim) Offset (ft)	3.00
Initial Water Elevation (ft)	5805.44
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : #15

Input Data

Invert Elevation (ft)	5801.55
Max (Rim) Elevation (ft)	5808.02
Max (Rim) Offset (ft)	6.47
Initial Water Elevation (ft)	5801.55
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Node : 20

Input Data

Invert Elevation (ft)	5801.08
Max (Rim) Elevation (ft)	5804.60
Max (Rim) Offset (ft)	3.52
Initial Water Elevation (ft)	5801.08
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Appendix G

On-Site Runoff and Inlet Calculations

Stony River Development Project
Peak Flow Calculations to Support the Inlet and Pipe Sizing

Purpose: Calculate the Peak Flow for the 25-year storm frequency from Basin 1 using the Rational Method.
 CONVEYED OFF-SITE VIA SHEET FLOW.

Rational Method since Drainage Basin < 90 acres (ABF; 6/10/2013)	Values
Percent Impervious	95
Hydrologic Soil Group	B
Runoff Coeff, C, 25-year	0.85
Runoff Coeff, C, 5-year	0.81
Runoff Coeff, C, 100-year	0
Drainage Basin Area to Inlet (ft ²)	8712
Drainage Basin Area to Inlet (acres)	0.20
Peak Flow (Q _p) = CIA	
Runoff Volume (V _R) = (C/12)*P*A	
Rainfall Depth (P) = T _d /60*I	
Overland flow, (T _o) = [(0.395)*(1.1-C ₅)*(√L _o)]/(S _o ^{0.33})	
(Channel) flow (T _f) = (L _f)/(60*V _f)	
Flow velocity (V _f) = K*√S _f	
Where,	
Q _p = peak flow (peak runoff) in cubic feet per second (cfs),	See Table Below
I = rainfall intensity in inch/hour	See Table Below
A = drainage area in acres	
C = runoff coefficient	
V _R = runoff volume in acre-ft	See Table Below
P = rainfall depth in inches, and	See Table Below
T _d = rainfall duration (or time of concentration, T _c) in minutes.	
T _c = T _o + T _f in minutes	2.21
T _o = overland flow (max 300 feet) in minutes	2.21
T _f = channel/gutter flow in minutes	0.00
T _R = regional formula for time of concentration in minutes	11.00
L _o = overland flow length in feet	180
S _o = overland slope in ft/ft	0.33
C ₅ = 5-year runoff coefficient	0.81
L _f = flow length in feet	0
V _f = flow velocity in feet/second	0.00
K = conveyance coefficient	20
S _f = reach slope in feet/feet	0.000

	25-Year*
I inch/hour (P1 = 1.4 inches per Table 2.2 URMP for a 25-year storm)	4.79
P in inches	0.40
V _R (acre-feet)	0.006
V _R (ft ³)	246.47
Q _p (cfs)	0.81

*Based on T_c = 5 min

Stony River Development Project
Peak Flow Calculations to Support the Inlet and Pipe Sizing

Purpose: Calculate the Peak Flow for the 25-year storm frequency from Basin 2 using the Rational Method. **Conveyed to Inlet #16.**

Rational Method since Drainage Basin < 90 acres (ABF; 6/10/2013)	Values
Percent Impervious	95
Hydrologic Soil Group	B
Runoff Coeff, C, 25-year	0.85
Runoff Coeff, C, 5-year	0.81
Runoff Coeff, C, 100-year	0
Drainage Basin Area to Inlet (ft ²)	56342
Drainage Basin Area to Inlet (acres)	1.29
Peak Flow (Q _p) = CIA	
Runoff Volume (V _R) = (C/12)*P*A	
Rainfall Depth (P) = T _d /60*I	
Overland flow, (T _o) = [(0.395)*(1.1-C ₅)*(√L _o)]/(S _o ^{0.33})	
(Channel) flow (T _f) = (L _f)/(60*V _f)	
Flow velocity (V _f) = K*√S _f	
Where,	
Q _p = peak flow (peak runoff) in cubic feet per second (cfs),	See Table Below
I = rainfall intensity in inch/hour	See Table Below
A = drainage area in acres	
C = runoff coefficient	
V _R = runoff volume in acre-ft	See Table Below
P = rainfall depth in inches, and	See Table Below
T _d = rainfall duration (or time of concentration, T _c) in minutes.	
T _c = T _o + T _f in minutes	3.97
T _o = overland flow (max 300 feet) in minutes	0.92
T _f = channel/gutter flow in minutes	3.06
T _R = regional formula for time of concentration in minutes	12.72
L _o = overland flow length in feet	35
S _o = overland slope in ft/ft	0.40
C ₅ = 5-year runoff coefficient	0.81
L _f = flow length in feet	455
V _f = flow velocity in feet/second	2.48
K = conveyance coefficient	20
S _f = reach slope in feet/feet	0.015

	25-Year
I inch/hour (P1 = 1.4 inches per Table 2.2 URMP for a 25-year storm)	4.79
P in inches	0.40
V _R (acre-feet)	0.037
V _R (ft ³)	1593.96
Q _p (cfs)	5.27

*Based on T_c = 5 min

Stony River Development Project
Peak Flow Calculations to Support the Inlet and Pipe Sizing

Purpose: Calculate the Peak Flow for the 25-year storm frequency from Basin 2A using the Rational Method.

Conveyed to Inlet #17.

Rational Method since Drainage Basin < 90 acres (ABF; 6/10/2013)	Values
Percent Impervious	95
Hydrologic Soil Group	B
Runoff Coeff, C, 25-year	0.85
Runoff Coeff, C, 5-year	0.81
Runoff Coeff, C, 100-year	0
Drainage Basin Area to Inlet (ft ²)	4184
Drainage Basin Area to Inlet (acres)	0.10
Peak Flow (Q _p) = CIA	
Runoff Volume (V _R) = (C/12)*P*A	
Rainfall Depth (P) = T _d /60*I	
Overland flow, (T _o) = [(0.395)*(1.1-C ₅)*(√L _o)]/(S _o ^{0.33})	
(Channel) flow (T _f) = (L _f)/(60*V _f)	
Flow velocity (V _f) = K*vS _f	
Where,	
Q _p = peak flow (peak runoff) in cubic feet per second (cfs),	See Table Below
I = rainfall intensity in inch/hour	See Table Below
A = drainage area in acres	
C = runoff coefficient	
V _R = runoff volume in acre-ft	See Table Below
P = rainfall depth in inches, and	See Table Below
T _d = rainfall duration (or time of concentration, T _c) in minutes.	
T _c = T _o + T _f in minutes	3.97
T _o = overland flow (max 300 feet) in minutes	0.92
T _f = channel/gutter flow in minutes	3.06
T _R = regional formula for time of concentration in minutes	12.72
L _o = overland flow length in feet	35
S _o = overland slope in ft/ft	0.40
C ₅ = 5-year runoff coefficient	0.81
L _f = flow length in feet	455
V _f = flow velocity in feet/second	2.48
K = conveyance coefficient	20
S _f = reach slope in feet/feet	0.015

	25-Year
I inch/hour (P1 = 1.4 inches per Table 2.2 URMP for a 25-year storm)	4.79
P in inches	0.40
V _R (acre-feet)	0.003
V _R (ft ³)	118.37
Q _p (cfs)	0.39

*Based on T_c = 5 min

Stony River Development Project
Peak Flow Calculations to Support the Inlet and Pipe Sizing

Purpose: Calculate the Peak Flow for the 25-year storm frequency from Basin 3 using the Rational Method. Only a portion (See Subbasin 3A) CONVEYED VIA SURFACE RUNOFF TO INLET #6

Rational Method since Drainage Basin < 90 acres (ABF; 6/10/2013)	Values
Percent Impervious	95
Hydrologic Soil Group	B
Runoff Coeff, C, 25-year	0.85
Runoff Coeff, C, 5-year	0.81
Runoff Coeff, C, 100-year	0
Drainage Basin Area to Inlet (ft ²)	20972
Drainage Basin Area to Inlet (acres)	0.48
Peak Flow (Q _p) = CIA	
Runoff Volume (V _R) = (C/12)*P*A	
Rainfall Depth (P) = T _d /60*I	
Overland flow, (T _o) = [(0.395)*(1.1-C ₅)*(√L _o)]/(S _o ^{0.33})	
(Channel) flow (T _f) = (L _f)/(60*V _f)	
Flow velocity (V _f) = K*√S _f	
Where,	
Q _p = peak flow (peak runoff) in cubic feet per second (cfs),	See Table Below
I = rainfall intensity in inch/hour	See Table Below
A = drainage area in acres	
C = runoff coefficient	
V _R = runoff volume in acre-ft	See Table Below
P = rainfall depth in inches, and	See Table Below
T _d = rainfall duration (or time of concentration, T _c) in minutes.	
T _c = T _o + T _f in minutes	4.12
T _o = overland flow (max 300 feet) in minutes	2.75
T _f = channel/gutter flow in minutes	1.36
T _R = regional formula for time of concentration in minutes	12.13
L _o = overland flow length in feet	100
S _o = overland slope in ft/ft	0.07
C ₅ = 5-year runoff coefficient	0.81
L _f = flow length in feet	283
V _f = flow velocity in feet/second	3.46
K = conveyance coefficient	20
S _f = reach slope in feet/feet	0.030

	25-Year
I inch/hour (P1 = 1.4 inches per Table 2.2 URMP for a 25-year storm)	4.79
P in inches	0.40
V _R (acre-feet)	0.014
V _R (ft ³)	593.32
Q _p (cfs)	1.96

*Based on T_c = 5 min

Stony River Development Project
Peak Flow Calculations to Support the Inlet and Pipe Sizing

Purpose: Calculate the Peak Flow for the 25-year storm frequency from Subbasin 3A using the Rational Method.
 CONVEYED TO INLET # 6.

Rational Method since Drainage Basin < 90 acres (ABF; 6/10/2013)	Values
Percent Impervious	95
Hydrologic Soil Group	B
Runoff Coeff, C, 25-year	0.85
Runoff Coeff, C, 5-year	0.81
Runoff Coeff, C, 100-year	0
Drainage Basin Area to Inlet (ft ²)	5073
Drainage Basin Area to Inlet (acres)	0.12
Peak Flow (Q _p) = CIA	
Runoff Volume (V _R) = (C/12)*P*A	
Rainfall Depth (P) = T _d /60*I	
Overland flow, (T _o) = [(0.395)*(1.1-C ₅)*(√L _o)]/(S _o ^{0.33})	
(Channel) flow (T _f) = (L _f)/(60*V _f)	
Flow velocity (V _f) = K*√S _f	
Where,	
Q _p = peak flow (peak runoff) in cubic feet per second (cfs),	See Table Below
I = rainfall intensity in inch/hour	See Table Below
A = drainage area in acres	
C = runoff coefficient	
V _R = runoff volume in acre-ft	See Table Below
P = rainfall depth in inches, and	See Table Below
T _d = rainfall duration (or time of concentration, T _c) in minutes.	
T _c = T _o + T _f in minutes	3.03
T _o = overland flow (max 300 feet) in minutes	2.98
T _f = channel/gutter flow in minutes	0.04
T _R = regional formula for time of concentration in minutes	10.72
L _o = overland flow length in feet	100
S _o = overland slope in ft/ft	0.06
C ₅ = 5-year runoff coefficient	0.81
L _f = flow length in feet	30
V _f = flow velocity in feet/second	11.82
K = conveyance coefficient	20
S _f = reach slope in feet/feet	0.349

	25-Year
I inch/hour (P1 = 1.4 inches per Table 2.2 URMP for a 25-year storm)	4.79
P in inches	0.40
V _R (acre-feet)	0.003
V _R (ft ³)	143.52
Q _p (cfs)	0.47

*Based on Tc = 5 min

Stony River Development Project
Peak Flow Calculations to Support the Inlet and Pipe Sizing

Purpose: Calculate the Peak Flow for the 25-year storm frequency from Basin 4 using the Rational Method.
 CONVEYED TO INLET # 5.

Rational Method since Drainage Basin < 90 acres (ABF; 6/10/2013)	Values
Percent Impervious	95
Hydrologic Soil Group	B
Runoff Coeff, C, 25-year	0.85
Runoff Coeff, C, 5-year	0.81
Runoff Coeff, C, 100-year	0
Drainage Basin Area to Inlet (ft ²)	20084
Drainage Basin Area to Inlet (acres)	0.46
Peak Flow (Q _p) = CIA	
Runoff Volume (V _R) = (C/12)*P*A	
Rainfall Depth (P) = T _d /60*I	
Overland flow, (T _o) = [(0.395)*(1.1-C ₅)*(√L _o)]/(S _o ^{0.33})	
(Channel) flow (T _f) = (L _f)/(60*V _f)	
Flow velocity (V _f) = K*√S _f	
Where,	
Q _p = peak flow (peak runoff) in cubic feet per second (cfs),	See Table Below
I = rainfall intensity in inch/hour	See Table Below
A = drainage area in acres	
C = runoff coefficient	
V _R = runoff volume in acre-ft	See Table Below
P = rainfall depth in inches, and	See Table Below
T _d = rainfall duration (or time of concentration, T _c) in minutes.	
T _c = T _o + T _f in minutes	1.90
T _o = overland flow (max 300 feet) in minutes	0.39
T _f = channel/gutter flow in minutes	1.51
T _R = regional formula for time of concentration in minutes	11.15
L _o = overland flow length in feet	20
S _o = overland slope in ft/ft	2.30
C ₅ = 5-year runoff coefficient	0.81
L _f = flow length in feet	187
V _f = flow velocity in feet/second	2.07
K = conveyance coefficient	20
S _f = reach slope in feet/feet	0.011

	25-Year
I inch/hour (P1 = 1.4 inches per Table 2.2 URMP for a 25-year storm)	4.79
P in inches	0.40
V _R (acre-feet)	0.013
V _R (ft ³)	568.19
Q _p (cfs)	1.88

*Based on T_c = 5 min

Stony River Development Project
Peak Flow Calculations to Support the Inlet and Pipe Sizing

Purpose: Calculate the Peak Flow for the 25-year storm frequency from Basin 5 using the Rational Method. Assumed CONVEYED TO INLET # 3, most likely sheet flow off-site.

Rational Method since Drainage Basin < 90 acres (ABF; 6/10/2013)	Values
Percent Impervious	95
Hydrologic Soil Group	B
Runoff Coeff, C, 25-year	0.85
Runoff Coeff, C, 5-year	0.81
Runoff Coeff, C, 100-year	0
Drainage Basin Area to Inlet (ft ²)	7538
Drainage Basin Area to Inlet (acres)	0.17
Peak Flow (Q _p) = CIA	
Runoff Volume (V _R) = (C/12)*P*A	
Rainfall Depth (P) = T _d /60*I	
Overland flow, (T _o) = [(0.395)*(1.1-C ₅)*(√L _o)]/(S _o ^{0.33})	
(Channel) flow (T _f) = (L _f)/(60*V _f)	
Flow velocity (V _f) = K*vS _f	
Where,	
Q _p = peak flow (peak runoff) in cubic feet per second (cfs),	See Table Below
I = rainfall intensity in inch/hour	See Table Below
A = drainage area in acres	
C = runoff coefficient	
V _R = runoff volume in acre-ft	See Table Below
P = rainfall depth in inches, and	See Table Below
T _d = rainfall duration (or time of concentration, T _c) in minutes.	
T _c = T _o + T _f in minutes	2.46
T _o = overland flow (max 300 feet) in minutes	2.07
T _f = channel/gutter flow in minutes	0.39
T _R = regional formula for time of concentration in minutes	10.99
L _o = overland flow length in feet	62
S _o = overland slope in ft/ft	0.08
C ₅ = 5-year runoff coefficient	0.81
L _f = flow length in feet	116
V _f = flow velocity in feet/second	4.91
K = conveyance coefficient	20
S _f = reach slope in feet/feet	0.060

	25-Year
I inch/hour (P1 = 1.4 inches per Table 2.2 URMP for a 25-year storm)	4.79
P in inches	0.40
V _R (acre-feet)	0.005
V _R (ft ³)	213.26
Q _p (cfs)	0.70

*Based on T_c = 5 min

Stony River Development Project
Peak Flow Calculations to Support the Inlet and Pipe Sizing

Purpose: Calculate the Peak Flow for the 25-year storm frequency from Basin 5A using the Rational Method.
 CONVEYED TO INLET # 3.

Rational Method since Drainage Basin < 90 acres (ABF; 6/10/2013)	Values
Percent Impervious	95
Hydrologic Soil Group	B
Runoff Coeff, C, 25-year	0.85
Runoff Coeff, C, 5-year	0.81
Runoff Coeff, C, 100-year	0
Drainage Basin Area to Inlet (ft ²)	3453
Drainage Basin Area to Inlet (acres)	0.08
Peak Flow (Q _p) = CIA	
Runoff Volume (V _R) = (C/12)*P*A	
Rainfall Depth (P) = T _d /60*I	
Overland flow, (T _o) = [(0.395)*(1.1-C ₅)*(√L _o)]/(S _o ^{0.33})	
(Channel) flow (T _f) = (L _f)/(60*V _f)	
Flow velocity (V _f) = K*√S _f	
Where,	
Q _p = peak flow (peak runoff) in cubic feet per second (cfs),	See Table Below
I = rainfall intensity in inch/hour	See Table Below
A = drainage area in acres	
C = runoff coefficient	
V _R = runoff volume in acre-ft	See Table Below
P = rainfall depth in inches, and	See Table Below
T _d = rainfall duration (or time of concentration, T _c) in minutes.	
T _c = T _o + T _f in minutes	2.46
T _o = overland flow (max 300 feet) in minutes	2.07
T _f = channel/gutter flow in minutes	0.39
T _R = regional formula for time of concentration in minutes	10.99
L _o = overland flow length in feet	62
S _o = overland slope in ft/ft	0.08
C ₅ = 5-year runoff coefficient	0.81
L _f = flow length in feet	116
V _f = flow velocity in feet/second	4.91
K = conveyance coefficient	20
S _f = reach slope in feet/feet	0.060

	25-Year
I inch/hour (P1 = 1.4 inches per Table 2.2 URMP for a 25-year storm)	4.79
P in inches	0.40
V _R (acre-feet)	0.002
V _R (ft ³)	97.69
Q _p (cfs)	0.32

*Based on T_c = 5 min

Stony River Development Project
Peak Flow Calculations to Support the Inlet and Pipe Sizing

Purpose: Calculate the Peak Flow for the 25-year storm frequency from Basin 6 using the Rational Method.
 CONVEYED TO RIPRAP RUNDOWN AT NORTHEAST PORTION OF SITE.

Rational Method since Drainage Basin < 90 acres (ABF; 6/10/2013)	Values
Percent Impervious	95
Hydrologic Soil Group	B
Runoff Coeff, C, 25-year	0.85
Runoff Coeff, C, 5-year	0.81
Runoff Coeff, C, 100-year	0
Drainage Basin Area to Inlet (ft ²)	22409
Drainage Basin Area to Inlet (acres)	0.51
Peak Flow (Q _p) = CIA	
Runoff Volume (V _R) = (C/12)*P*A	
Rainfall Depth (P) = T _d /60*I	
Overland flow, (T _o) = [(0.395)*(1.1-C ₅)*(√L _o)]/(S _o ^{0.33})	
(Channel) flow (T _f) = (L _f)/(60*V _f)	
Flow velocity (V _f) = K*VS _f	
Where,	
Q _p = peak flow (peak runoff) in cubic feet per second (cfs),	See Table Below
I = rainfall intensity in inch/hour	See Table Below
A = drainage area in acres	
C = runoff coefficient	
V _R = runoff volume in acre-ft	See Table Below
P = rainfall depth in inches, and	See Table Below
T _d = rainfall duration (or time of concentration, T _c) in minutes.	
T _c = T _o + T _f in minutes	2.70
T _o = overland flow (max 300 feet) in minutes	1.92
T _f = channel/gutter flow in minutes	0.78
T _R = regional formula for time of concentration in minutes	11.55
L _o = overland flow length in feet	35
S _o = overland slope in ft/ft	0.04
C ₅ = 5-year runoff coefficient	0.81
L _f = flow length in feet	244
V _f = flow velocity in feet/second	5.20
K = conveyance coefficient	20
S _f = reach slope in feet/feet	0.068

	25-Year
I inch/hour (P1 = 1.4 inches per Table 2.2 URMP for a 25-year storm)	4.79
P in inches	0.40
V _R (acre-feet)	0.015
V _R (ft ³)	633.97
Q _p (cfs)	2.10

*Based on Tc = 5 min

Stony River Development Project
Peak Flow Calculations to Support the Inlet and Pipe Sizing

Purpose: Calculate the Peak Flow for the 25-year storm frequency from Basin 7 using the Rational Method.
 CONVEYED TO INLET # 4.

Rational Method since Drainage Basin < 90 acres (ABF; 6/10/2013)	Values
Percent Impervious	95
Hydrologic Soil Group	B
Runoff Coeff, C, 25-year	0.85
Runoff Coeff, C, 5-year	0.81
Runoff Coeff, C, 100-year	0
Drainage Basin Area to Inlet (ft ²)	8304
Drainage Basin Area to Inlet (acres)	0.19
Peak Flow (Q _p) = CIA	
Runoff Volume (V _R) = (C/12)*P*A	
Rainfall Depth (P) = T _d /60*I	
Overland flow, (T _o) = [(0.395)*(1.1-C ₅)*(√L _o)]/(S _o ^{0.33})	
(Channel) flow (T _f) = (L _f)/(60*V _f)	
Flow velocity (V _f) = K*√S _f	
Where,	
Q _p = peak flow (peak runoff) in cubic feet per second (cfs),	See Table Below
I = rainfall intensity in inch/hour	See Table Below
A = drainage area in acres	
C = runoff coefficient	
V _R = runoff volume in acre-ft	See Table Below
P = rainfall depth in inches, and	See Table Below
T _d = rainfall duration (or time of concentration, T _c) in minutes.	
T _c = T _o + T _f in minutes	2.70
T _o = overland flow (max 300 feet) in minutes	1.92
T _f = channel/gutter flow in minutes	0.78
T _R = regional formula for time of concentration in minutes	11.55
L _o = overland flow length in feet	35
S _o = overland slope in ft/ft	0.04
C ₅ = 5-year runoff coefficient	0.81
L _f = flow length in feet	244
V _f = flow velocity in feet/second	5.20
K = conveyance coefficient	20
S _f = reach slope in feet/feet	0.068

	25-Year
I inch/hour (P1 = 1.4 inches per Table 2.2 URMP for a 25-year storm)	4.79
P in inches	0.40
V _R (acre-feet)	0.005
V _R (ft ³)	234.93
Q _p (cfs)	0.78

*Based on T_c = 5 min

Combination Inlet 4

Worksheet for Combination Inlet On Grade

Project Description

Worksheet	Combination Inlet - 4
Type	Combination Inlet On Grade
Solve For	Efficiency

Input Data

Discharge	0.78 cfs
Local Depression	1.1 in
Local Depression Width	1.46 ft
Channel Slope	0.04000 ft/ft
Gutter Width	0
Gutter Cross Slope	1.46 ft
Road Cross Slope	0.083 ft/ft
Mannings Coefficient	0.020 ft/ft
Curb Opening Length	0.016
Grate Width	2.75 ft
Grate Length	1.46 ft
Grate Type	1.75 ft
Clogging	Curved Vane
	50.0 %

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	0.98
Total Intercepted Flow	0.76 cfs
Bypass Flow	0.02 cfs
Spread	3.75 ft
Depth	0.14 ft
Flow Area	0.1 ft ²
Gutter Depression	1.1 in
Total Depression	2.2 in
Velocity	3.63 ft/s
Splash Over Velocity	3.64 ft/s
Frontal Flow Factor	1.00
Side Flow Factor	0.01
Grate Flow Ratio	0.97
Equivalent Cross Slope	0.130 ft/ft
Active Grate Length	694
Length Factor	0.88 ft
Total Interception Length	0.22
	8.34 ft

Combination Inlet 5

Worksheet for Combination Inlet On Grade

Project Description

Worksheet	Combination Inlet - 5
Type	Combination Inlet On Grade
Solve For	Efficiency

Input Data

Discharge	1.88 cfs
Local Depression	1.1 in
Local Depression Width	1.46 ft
Channel Slope	0.04000 ft/ft
Gutter Width	1.46 ft
Gutter Cross Slope	0.083 ft/ft
Road Cross Slope	0.020 ft/ft
Mannings Coefficient	0.016
Curb Opening Length	2.75 ft
Grate Width	1.46 ft
Grate Length	2.75 ft
Grate Type	Curved Vane
Clogging	50.0 %

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	0.76
Total Intercepted Flow	1.43 cfs
Bypass Flow	0.45 cfs
Spread	6.17 ft
Depth	0.20 ft
Flow Area	0.4 ft ²
Gutter Depression	1.1 in
Total Depression	2.2 in
Velocity	4.08 ft/s
Splash Over Velocity	4.89 ft/s
Frontal Flow Factor	1.00
Side Flow Factor	0.02
Grate Flow Ratio	0.71
Equivalent Cross Slope	0.103 ft/ft
Active Grate Length	1.38 ft
Length Factor	0.10
Total Interception Length	13.91 ft

Combination Inlet 16

Worksheet for Combination Inlet On Grade

Project Description

Worksheet	Combination Inlet - 16
Type	Combination Inlet On Grade
Solve For	Efficiency

Input Data

Discharge	3.86 cfs
Local Depression	1.1 in
Local Depression Width	1.46 ft
Channel Slope	0.02000 ft/ft
Gutter Width	0
Gutter Cross Slope	1.46 ft
Road Cross Slope	0.083 ft/ft
Mannings Coefficient	0.020 ft/ft
Curb Opening Length	0.016
Grate Width	2.75 ft
Grate Length	1.46 ft
Grate Type	2.75 ft
Clogging	Curved Vane
	50.0 %

Options

Calculation Option	Use Both
Grate Flow Option	Exclude None

Results

Efficiency	0.54
Total Intercepted Flow	2.10 cfs
Bypass Flow	1.76 cfs
Spread	9.95 ft
Depth	0.28 ft
Flow Area	0.9 ft ²
Gutter Depression	1.1 in
Total Depression	2.2 in
Velocity	3.54 ft/s
Splash Over Velocity	4.89 ft/s
Frontal Flow Factor	1.00
Side Flow Factor	0.03
Grate Flow Ratio	0.46
Equivalent Cross Slope	0.074 ft/ft
Active Grate Length	811
Length Factor	1.38 ft
Total Interception Length	0.07
	18.53 ft

Inlet #3

Worksheet for Grate Inlet In Sag

Project Description

Worksheet	Grate Inlet - 3
Type	Grate Inlet In Sag
Solve For	Spread

Input Data

Discharge	1.49 cfs
Gutter Width	1.46 ft
Gutter Cross Slope	0.083 ft/ft
Road Cross Slope	0.020 ft/ft
Grate Width	1.46 ft
Grate Length	2.75 ft
Local Depression	0.0 in
Local Depression Width	0.00 ft
Grate Type	Curved Vane
Clogging	50.0 %

Results

Spread	12.3 ft 9
Depth	0.34 ft
Gutter Depression	1.1 in
Total Depression	1.1 in
Open Grate Area	0.7 ft ²
Active Grate Weir Length	4.21 ft

Inlet #6

Worksheet for Grate Inlet On Grade

Project Description

Worksheet	Grate Inlet - 6
Type	Grate Inlet On Grade
Solve For	Efficiency

Input Data

Discharge	0.47 cfs
Channel Slope	0.04000 ft/ft
	0
Gutter Width	1.72 ft
Gutter Cross Slope	0.083 ft/ft
Road Cross Slope	0.020 ft/ft
Mannings Coefficient	0.016
Grate Width	1.72 ft
Grate Length	3.11 ft
Grate Type	Curved Vane
Clogging	50.0 %

Options

Grate Flow Option	Exclude None
----------------------	-----------------

Results

Efficiency	1.0
	0
Total Intercepted Flow	0.4 cfs
	7
Bypass Flow	0.0 cfs
	0
Spread	1.7 ft
	4
Depth	0.1 ft
	4
Flow Area	0.1 ft ²
Gutter Depression	1.3 in
Total Depression	1.3 in
Velocity	3.8 ft/s
	1
Splash Over Velocity	5.2 ft/s
	4
Frontal Flow Factor	1.0
	0
Side Flow Factor	0.0
	3
Grate Flow Ratio	1.0
	0
Active Grate Length	1.5 ft
	5

Inlet #17

Worksheet for Grate Inlet In Sag

Project Description

Worksheet	Grate Inlet - 17
Type	Grate Inlet In Sag
Solve For	Spread

Input Data

Discharge	2.15 cfs
Gutter Width	1.46 ft
Gutter Cross Slope	0.083 ft/ft
Road Cross Slope	0.050 ft/ft
Grate Width	1.46 ft
Grate Length	2.75 ft
Local Depression	0.0 in
Local Depression Width	0.00 ft
Grate Type	Curved Vane
Clogging	0.0 %

Results

Spread	5.8 ft
	5
Depth	0.3 ft
	4
Gutter Depression	0.6 in
Total Depression	0.6 in
Open Grate Area	1.4 ft ²
Active Grate Weir Length	5.6 ft
	7

Stony River Development Project
Peak Flow Calculations to Support the Inlet and Pipe Sizing

Purpose: Calculate the Peak Flow for the 25-year storm frequency from the Roaring Fork Skilled Nursing Facility (North) using the Rational Method.

Rational Method since Drainage Basin < 90 acres (ABF; 6/10/2013)	Values
Percent Impervious	95
Hydrologic Soil Group	B
Runoff Coeff, C, 25-year	0.85
Runoff Coeff, C, 5-year	0.81
Runoff Coeff, C, 100-year	0
Drainage Basin Area to Inlet (ft ²)	1795.8248
Drainage Basin Area to Inlet (acres)	0.04
Peak Flow (Q _p) = CIA	
Runoff Volume (V _R) = (C/12)*P*A	
Rainfall Depth (P) = T _d /60*I	
Overland flow, (T _o) = [(0.395)*(1.1-C ₅)*(√L _o)]/(S _o ^{0.33})	
(Channel) flow (T _f) = (L _f)/(60*V _f)	
Flow velocity (V _f) = K*V _{Sf}	
Where,	
Q _p = peak flow (peak runoff) in cubic feet per second (cfs),	See Table Below
I = rainfall intensity in inch/hour	See Table Below
A = drainage area in acres	
C = runoff coefficient	
V _R = runoff volume in acre-ft	See Table Below
P = rainfall depth in inches, and	See Table Below
T _d = rainfall duration (or time of concentration, T _c) in minutes.	
T _c = T _o + T _f in minutes	2.44
T _o = overland flow (max 300 feet) in minutes	2.12
T _f = channel/gutter flow in minutes	0.32
T _R = regional formula for time of concentration in minutes	11.15
L _o = overland flow length in feet	140
S _o = overland slope in ft/ft	0.26
C ₅ = 5-year runoff coefficient	0.81
L _f = flow length in feet	67
V _f = flow velocity in feet/second	3.46
K = conveyance coefficient	20
S _f = reach slope in feet/feet	0.030

	25-Year
I inch/hour (P1 = 1.4 inches per Table 2.2 URMP for a 25-year storm)	4.79
P in inches	0.40
V _R (acre-feet)	0.001
V _R (ft ³)	50.81
Q _p (cfs)	0.17

*Based on Tc = 5 min

Stony River Development Project
Peak Flow Calculations to Support the Inlet and Pipe Sizing

Purpose: Calculate the Peak Flow for the 25-year storm frequency from the Roaring Fork Skilled Nursing Facility (South) using the Rational Method.

Rational Method since Drainage Basin < 90 acres (ABF; 6/10/2013)	Values
Percent Impervious	95
Hydrologic Soil Group	B
Runoff Coeff, C, 25-year	0.85
Runoff Coeff, C, 5-year	0.81
Runoff Coeff, C, 100-year	0
Drainage Basin Area to Inlet (ft ²)	10251
Drainage Basin Area to Inlet (acres)	0.24
Peak Flow (Q _p) = CIA	
Runoff Volume (V _R) = (C/12)*P*A	
Rainfall Depth (P) = T _d /60*I	
Overland flow, (T _o) = [(0.395)*(1.1-C ₅)*(√L _o)]/(S _o ^{0.33})	
(Channel) flow (T _f) = (L _f)/(60*V _f)	
Flow velocity (V _f) = K*√S _f	
Where,	
Q _p = peak flow (peak runoff) in cubic feet per second (cfs),	See Table Below
I = rainfall intensity in inch/hour	See Table Below
A = drainage area in acres	
C = runoff coefficient	
V _R = runoff volume in acre-ft	See Table Below
P = rainfall depth in inches, and	See Table Below
T _d = rainfall duration (or time of concentration, T _c) in minutes.	
T _c = T _o + T _f in minutes	2.44
T _o = overland flow (max 300 feet) in minutes	2.12
T _f = channel/gutter flow in minutes	0.32
T _R = regional formula for time of concentration in minutes	11.15
L _o = overland flow length in feet	140
S _o = overland slope in ft/ft	0.26
C ₅ = 5-year runoff coefficient	0.81
L _f = flow length in feet	67
V _f = flow velocity in feet/second	3.46
K = conveyance coefficient	20
S _f = reach slope in feet/feet	0.030
	25-Year
I inch/hour (P1 = 1.4 inches per Table 2.2 URMP for a 25-year storm)	4.79
P in inches	0.40
V _R (acre-feet)	0.007
V _R (ft ³)	290.01
Q _p (cfs)	0.96

Appendix H

Riprap Sizing Calculations



HEC 14 Eqn 10.4

$$D_{50} = 0.2 D \left(\frac{Q}{\sqrt{g} D^{2.5}} \right)^{4/3} \left(\frac{D}{TW} \right)$$

$$D' = \frac{D + Y_n}{2} = \frac{1.25 + 1.02}{2} = 1.14'$$

$$= 0.2 (1.14) \left(\frac{7}{\sqrt{32.2} (1.14)^{2.5}} \right)^{4/3} \left(\frac{1.14}{0.4 (1.14)} \right)$$

$$D_{50} = 0.487'$$

USE 12" D₅₀ 18" THICK
W/ 4" CL 6 FILLER

Appendix I

Drawings

I:\2012\469.001_Stoney_River_VA_Drains\06_Drainage_Study\Drainage-BM.dwg Plotted: 2/7/2014 10:47 AM By: Terry Benetti



OFF-SITE BASINS

Basin ID	Area (Acres)	TC (min)	Q25 (cfs) Generated Within the Basin
OS1	133.5	25.98	69.27
OS2	25.9	12.24	20.99
OS3	0.4	5.0	1.80
OS4	12.2	11.40	7.84
RE	0.3	6.00	0.80
RW	0.7	6.00	1.07
RS	0.9	6.00	1.66
TN	3.2	6.00	6.58
TS	3.3	6.00	6.44
Historic Drainage Basin W-9A	40.0	15.54	29.72
Historic Drainage Basin W-10A	22.1	14.34	14.36

ON-SITE BASINS

Basin ID	Area (Acres)	TC (min)	Q25 (cfs) Generated Within the Basin
1	0.2	5.0	0.81
2	1.3	5.0	5.27
2A	0.1	5.0	0.39
3	0.5	5.0	1.96
3A	0.1	5.0	0.47
4	0.5	5.0	1.88
5	0.2	5.0	0.70
5A	0.1	5.0	0.32
6	0.5	5.0	2.10
7	0.2	5.0	0.78
Roaring Fork Skilled Nursing Facility (South)	0.24	5.0	0.96
Roaring Fork Skilled Nursing Facility (North)	0.04	5.0	0.17



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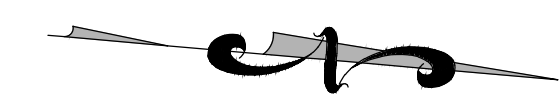
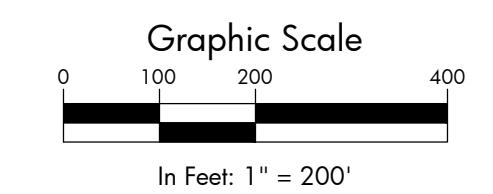
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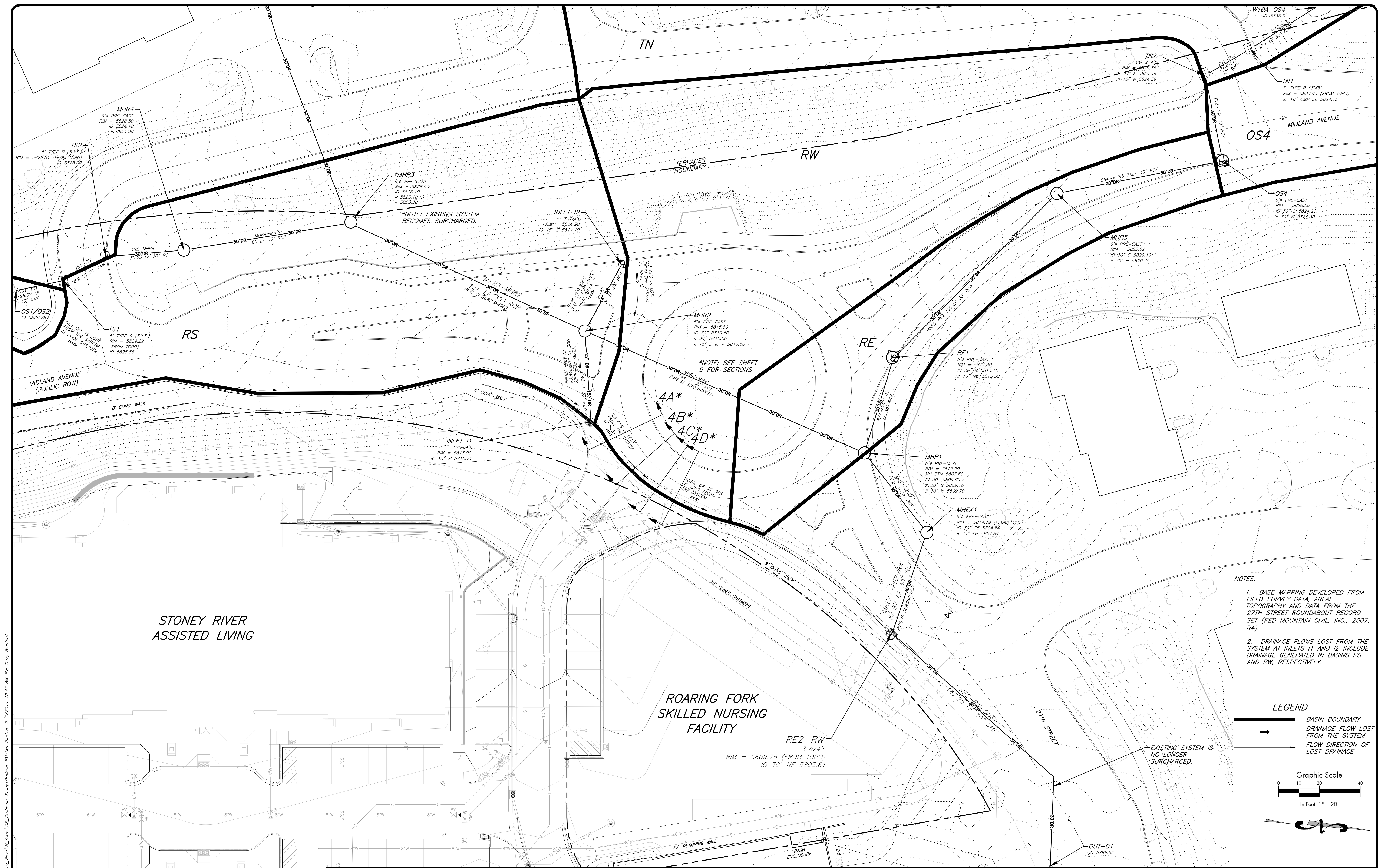
#	Revision	Date	By

On and Off Site Drainage Basins

Job No.	2012-469.001
Drawn by:	TLB
Date:	8/21/13
QC:	PE: DMK
File:	Drawing-BM

1
9





- NOTES:
1. BASE MAPPING DEVELOPED FROM FIELD SURVEY DATA, AREAL TOPOGRAPHY AND DATA FROM THE 27TH STREET ROUNDABOUT RECORD SET (RED MOUNTAIN CIVIL, INC., 2007, R4).
 2. DRAINAGE FLOWS LOST FROM THE SYSTEM AT INLETS 11 AND 12 INCLUDE DRAINAGE GENERATED IN BASINS RS AND RW, RESPECTIVELY.

LEGEND

- BASIN BOUNDARY
- DRAINAGE FLOW LOST FROM THE SYSTEM
- FLOW DIRECTION OF LOST DRAINAGE

Graphic Scale

0 10 20 40

In Feet: 1" = 20'

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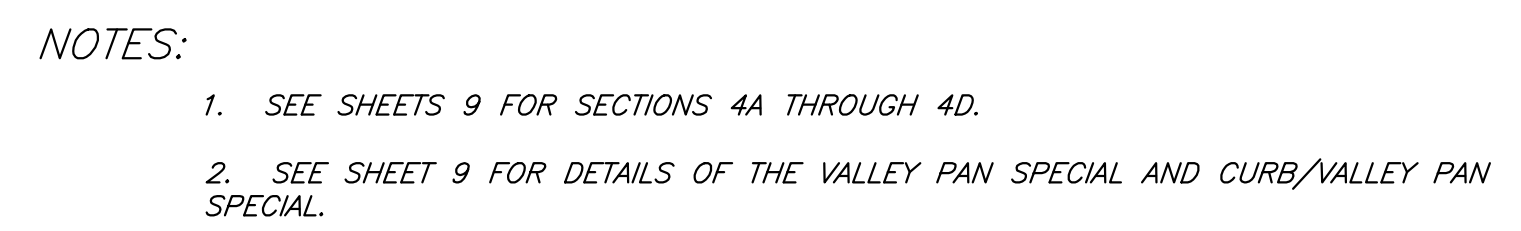
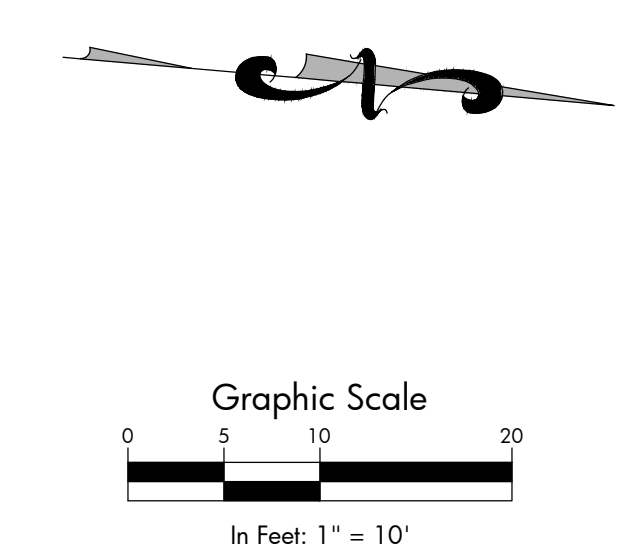
#	Revision	Date	By

Off-Site Existing Storm Sewer Plan
View

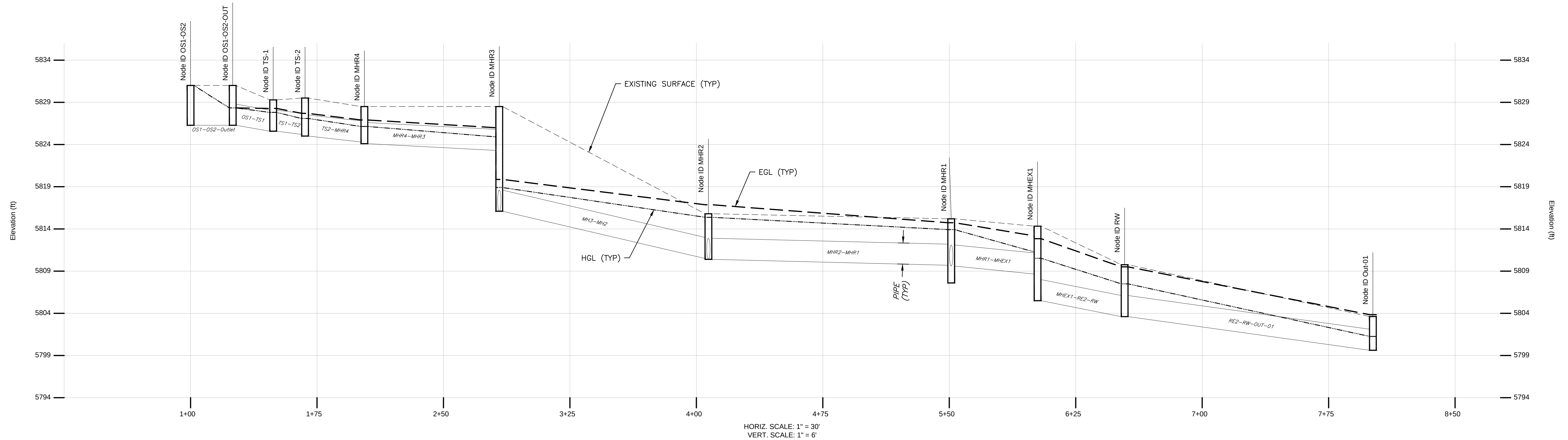
Job No. 2012-469.001
Drawn by: TLB
Date: 8/21/13
QC: PE: DMK Of
File: Draining-BM

2
9

L:\2012\469.001_Stoney_River_VA_Drains\06_Drainage-Study\Draining-BM.dwg Plotted: 8/27/2014 10:47 AM By: Terry Burelli



Midland Avenue Roundabout
Existing Storm Sewer from OS1/OS2 to Outlet



Node ID:	OS1-OS2	OS1-OS2-OUT	TS-1	TS-2	MHR4	MHR3	MHR2	MHR1	MHEX1	RW	Out-01
Rim (ft):	5831.00	5831.00	5829.29	5829.51	5828.50	5828.50	5815.80	5815.20	5814.33	5809.76	
Invert (ft):	5826.28	5826.28	5825.58	5825.00	5824.10	5816.10	5810.40	5807.60	5805.50	5803.61	5799.62
Max EGL (ft):	5831.00	5828.43	5828.23	5827.68	5826.97	5819.63	5816.79	5814.70	5812.72	5809.43	5803.83
Max HGL (ft):	5831.00	5828.43	5827.76	5827.08	5826.20	5818.67	5815.30	5813.88	5810.41	5807.42	5801.25
Length (ft):		OS1-OS2-Outlet	OS1-TS1	TS1-TS2	TS2-MHR4	MHR4-MHR3	MH3-MH2	MHR2-MHR1	MHR1-MHEX1	MHEX1-RE2-RW	RE2-RW-OUT-01
Dia (in):		0.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Slope (ft/ft):			0.0292	0.0201	0.0199	0.0100	0.0452	0.0049	0.0184	0.0366	0.0271
Up Invert (ft):		5826.28	5826.28	5825.58	5825.00	5824.10	5816.10	5810.40	5809.60	5805.50	5803.61
Dn Invert (ft):		5826.28	5825.58	5825.20	5824.30	5823.30	5810.50	5809.70	5808.66	5803.61	5799.62
Max Q (cfs):		23.80	23.80	23.80	29.08	29.09	47.55	35.58	55.93	55.92	55.92
Max Vel (ft/s):		0.00	5.51	6.21	7.05	7.88	9.78	7.25	12.21	11.39	12.88
Max Depth (ft):		0.00	2.14	2.05	1.96	1.75	2.50	2.50	2.20	2.50	2.07



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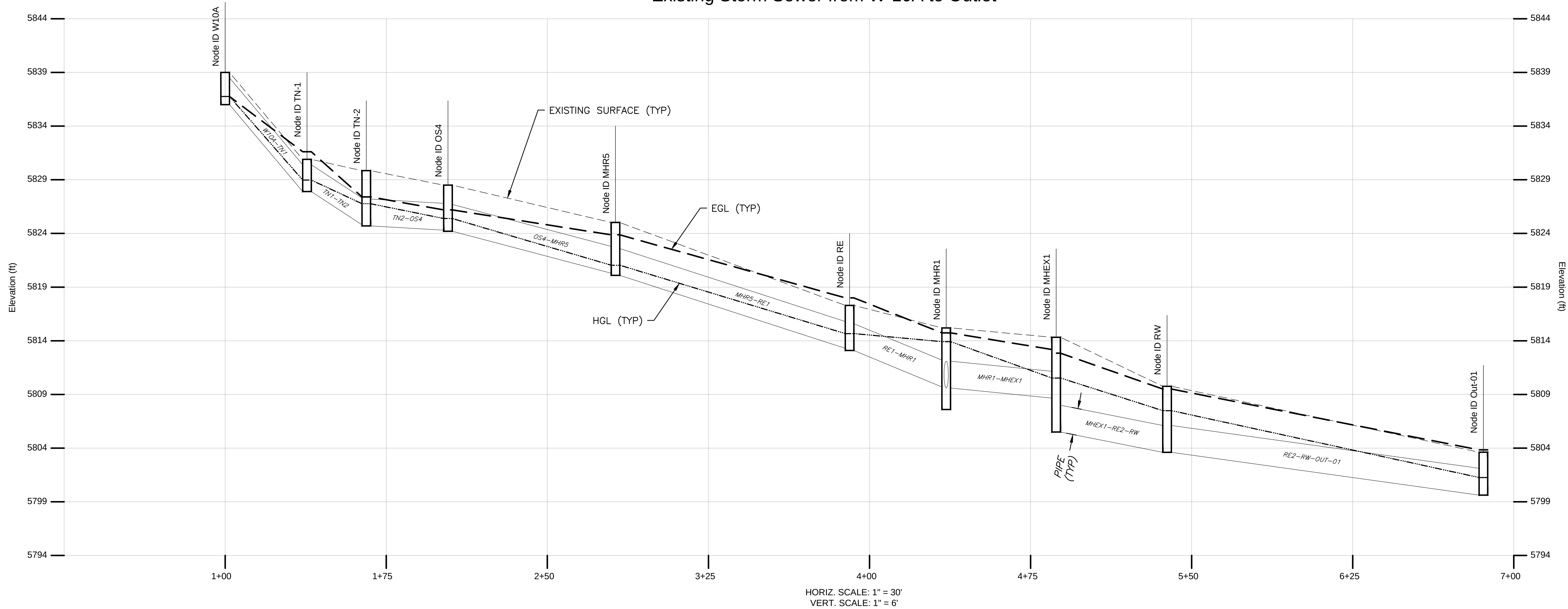
#	Revision	Date	By
1			

Midland Ave. Existing Storm Sewer
Profile - South to Outlet

Job No.	2012-469-001
Drawn by:	TLB
Date:	8/21/13
QC:	XXX
PE:	DMK
File:	Storm Sewer Profile-Off Site

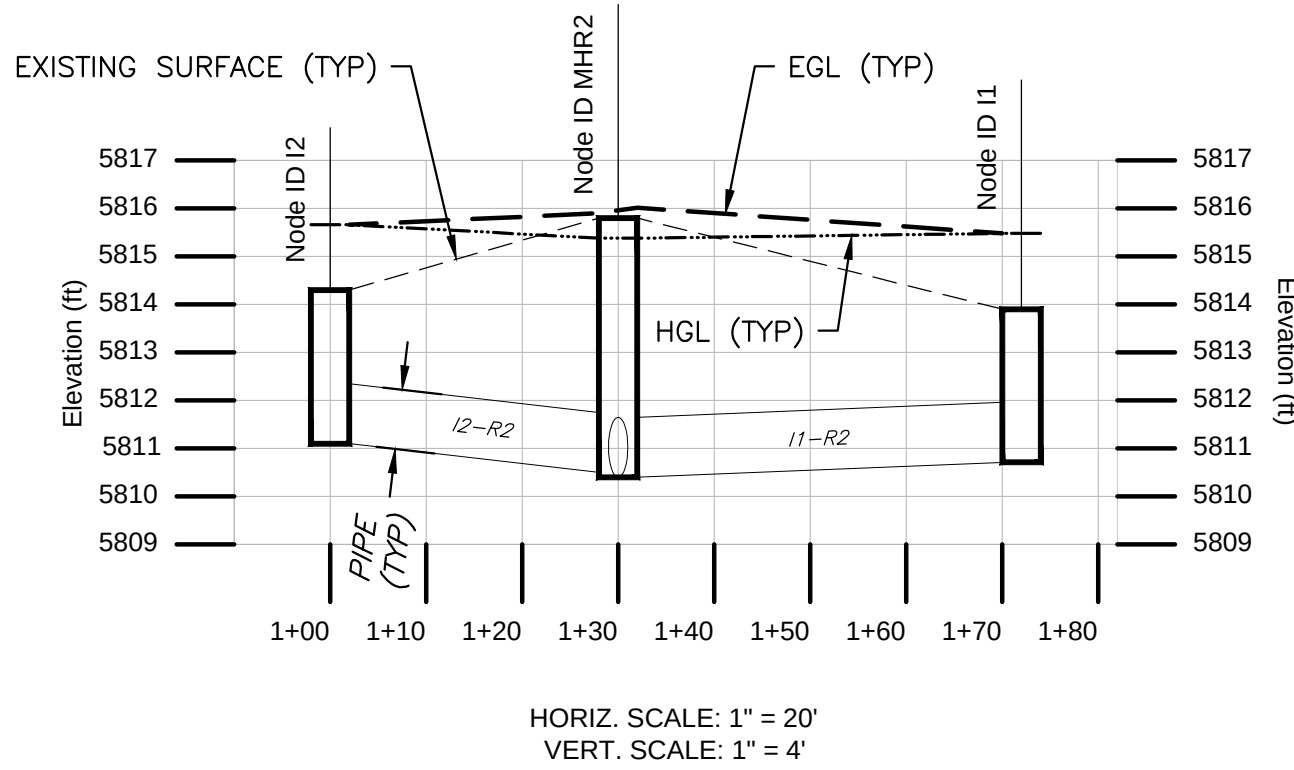
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Midland Avenue Roundabout
Existing Storm Sewer from W-10A to Outlet



Node ID:	W10A	TN-1	TN-2	OS4	MHR5	RE	MHR1	MHEX1	RW	Out-01
Rim (ft):	5839.00	5830.90	5829.85	5828.50	5825.02	5817.30	5815.20	5814.33	5809.76	
Invert (ft):	5836.00	5827.90	5824.70	5824.20	5820.10	5813.10	5807.60	5805.50	5803.61	5799.62
Max EGL (ft):	5836.81	5831.61	5827.55	5826.20	5823.87	5817.98	5814.47	5812.72	5809.43	5803.83
Max HGL (ft):	5836.81	5828.97	5826.77	5825.39	5821.04	5814.65	5813.88	5810.41	5807.42	5801.25
:	W10A-TN1	TN1-TN2	TN2-OS4	OS4-MHR5	MHR5-RE1	RE1-MHR1	MHR1-MHEX1	MHEX1-RE2-RW	RE2-RW-OUT-01	
Length (ft):	38.10	27.61	38.00	78.00	109.00	45.00	51.20	51.67	147.25	
Dia (in):	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	
Slope (ft/ft):	0.2126	0.1123	0.0105	0.0500	0.0624	0.0756	0.0184	0.0366	0.0271	
Up Invert (ft):	5836.00	5827.90	5824.70	5824.20	5820.10	5813.10	5809.60	5805.50	5803.61	
Dn Invert (ft):	5827.90	5824.80	5824.30	5820.30	5813.30	5809.70	5808.66	5803.61	5799.62	
Max Q (cfs):	21.12	21.11	25.76	25.76	25.82	26.30	55.93	55.92	55.92	
Max Vel (ft/s):	13.04	7.08	7.20	13.50	14.65	6.15	12.21	11.39	12.88	
Max Depth (ft):	0.91	1.50	1.70	1.02	1.10	1.99	2.20	2.50	2.07	

Midland Avenue Roundabout
Existing Storm Sewer Branches from I1 to R2
and I2 to R2



Node ID:	I2	MHR2	I1
Rim (ft):	5814.30	5815.80	5813.90
Invert (ft):	5811.10	5810.40	5810.71
Max EGL (ft):	5815.66	5815.90/5816.02	5815.48
Max HGL (ft):	5815.66	5815.30	5815.48
NODE ID:	I2-R2	I1-R2	
Length (ft):	30.00	42.00	
Dia (in):	15.00	15.00	
Slope (ft/ft):	0.0200	0.0074	
Up Invert (ft):	5811.10	5810.71	
Dn Invert (ft):	5810.50	5810.40	
Max Q (cfs):	7.08	7.85	
Max Vel (ft/s):	5.77	6.40	
Max Depth (ft):	1.25	1.25	



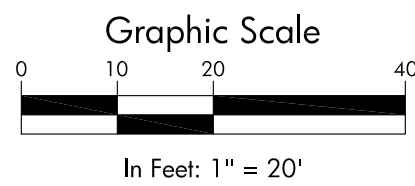
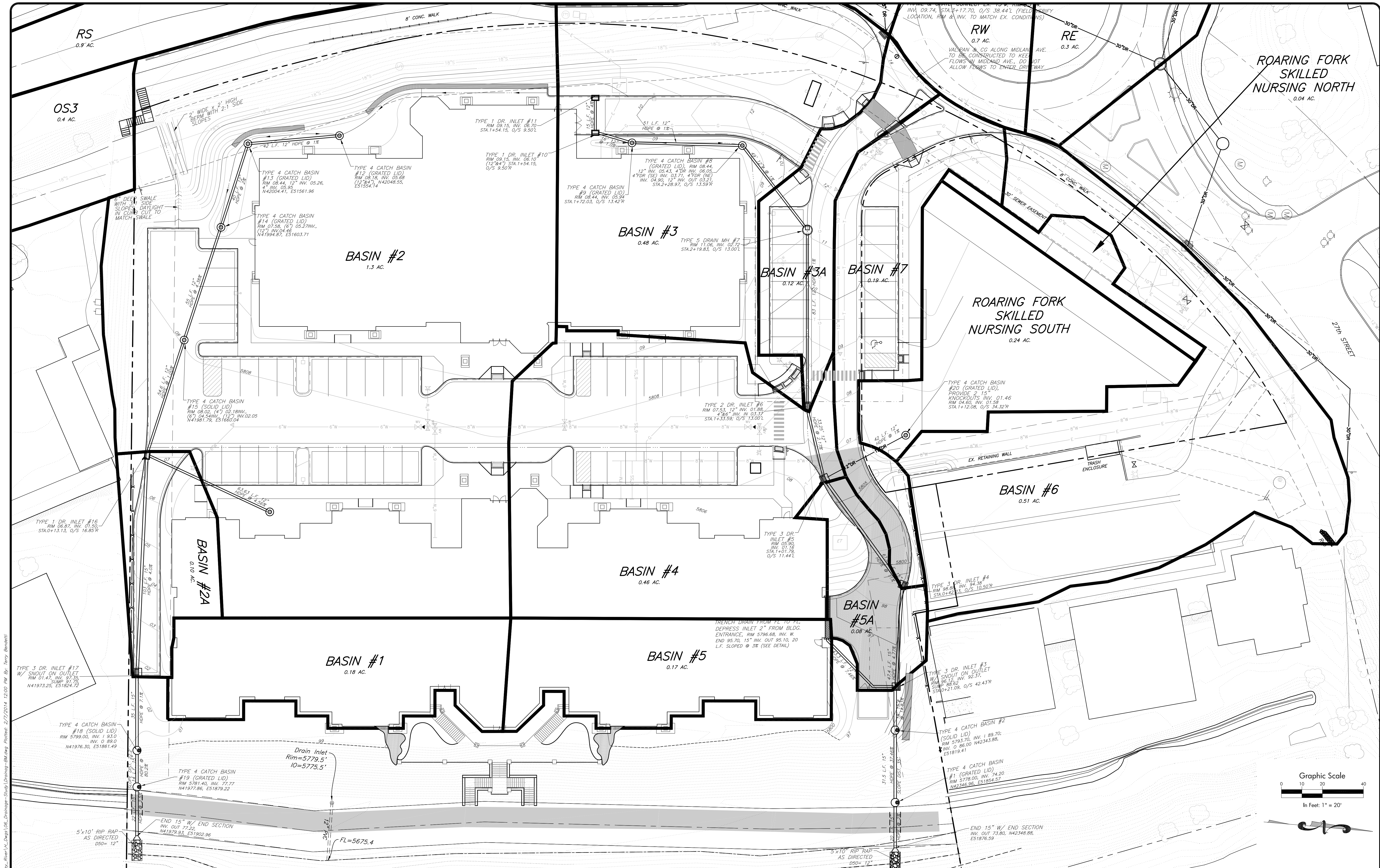
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#	Revision	Date	By
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Midland Ave. Existing Storm Sewer
Profile - South to Outlet and
Branches I1/I2 to R2

Job No.	2012-469-001
Drawn by:	TLB
Date:	8/21/13
QC:	XXX
PE:	DMK
File:	Storm-Sewer_Profile-Off-Site



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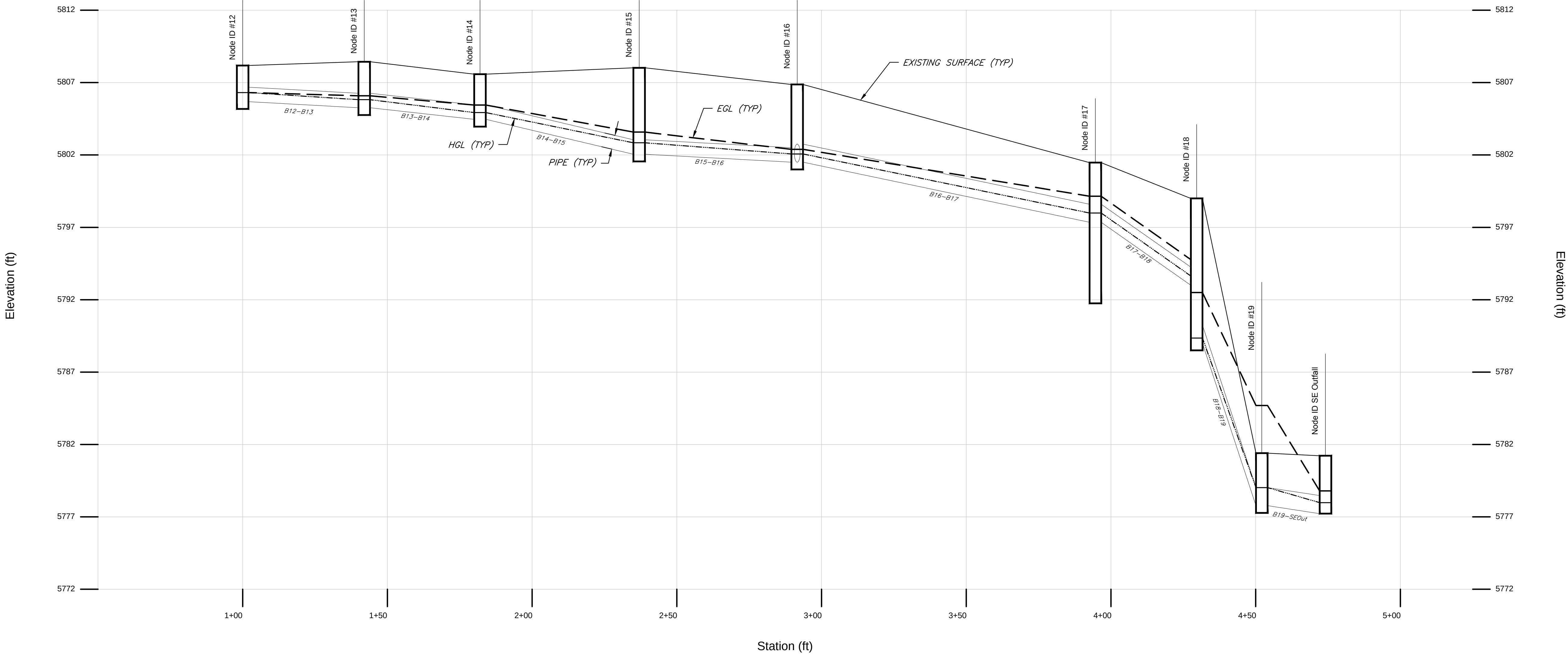
#	Revision	Date	By

On-Site Drainage Basins and Storm
Sewer System

Job No.	2012-469.001	6 9
Drawn by:	TLB	
Date:	8/21/13	
QC:	PE: DMK	
File:	Drainag&M	

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Stoney River On-Site Storm Drain System - South Trunk



Node ID:	#12	#13	#14	#15	#16	#17	#18	#19	SE Outfall
Rim (ft):	5808.18	5808.44	5807.58	5808.02	5806.87	5801.47	5799.00	5781.40	
Invert (ft):	5805.18	5804.76	5803.96	5801.55	5801.00	5791.75	5788.50	5777.27	5777.22
Max EGL (ft):	5806.31	5806.09	5805.45	5803.58	5802.39	5799.15	5792.50	5784.69	5778.79
Max HGL (ft):	5806.31	5805.82	5804.93	5802.84	5802.07	5797.99	5789.35	5779.02	5777.98
:	B12-B13	B13-B14	B14-B15	B15-B16	B16-B17	B17-B18	B18-B19	B19-SEOut	
Length (ft):	42.00	40.00	55.00	54.60	103.00	35.00	22.50	22.00	
Dia (in):	12.00	12.00	12.00	12.00	15.00	15.00	15.00	15.00	
Slope (ft/ft):	0.0100	0.0200	0.0438	0.0101	0.0403	0.1243	0.4991	0.0250	
Up Invert (ft):	5805.68	5805.26	5804.46	5802.05	5801.50	5797.35	5789.00	5777.77	
Dn Invert (ft):	5805.26	5804.46	5802.05	5801.50	5797.35	5793.00	5777.77	5777.22	
Max Q (cfs):	1.99	2.28	2.80	2.63	5.07	7.57	7.57	7.51	
Max Vel (ft/s):	4.18	5.76	6.88	4.52	8.64	14.25	19.11	7.21	
Max Depth (ft):	0.59	0.50	0.60	0.69	0.60	0.55	0.78	0.98	



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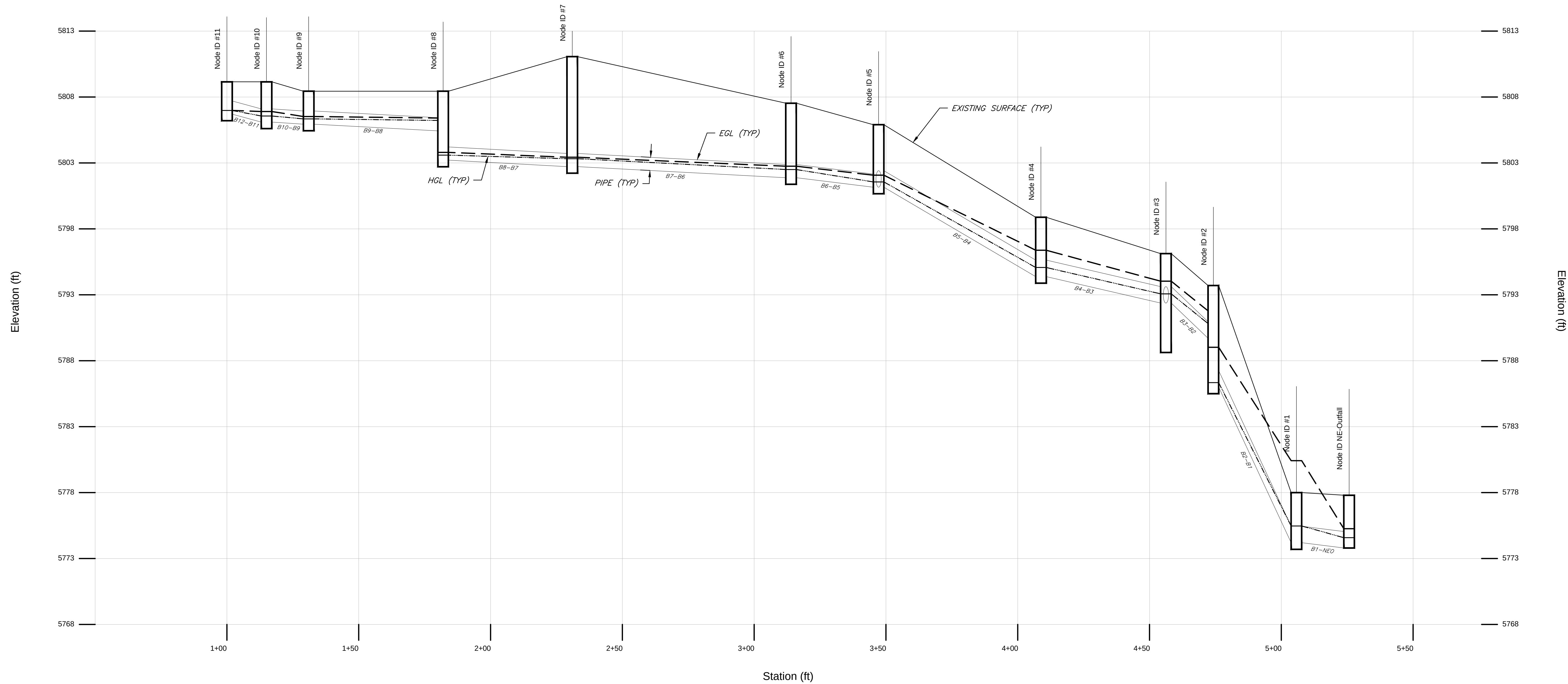
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Glenwood Springs, Co.

#	Revision	Date	By
1			

Proposed Drainage System
Profile - South Trunk

Job No.	2012-469-001
Drawn by:	TLB
Date:	8/21/13
QC:	XXX
PE:	DMK
File:	StormSewerProfileOnSite

Stoney River On-Site Storm Drain System - North Trunk



Node ID:	#11	#10	#9	#8	#7	#6	#5	#4	#3	#2	#1	NE-Outfall
Rim (ft):	5809.15	5809.15	5808.44	5808.44	5811.06	5807.53	5805.90	5798.88	5796.12	5793.70	5778.00	
Invert (ft):	5806.20	5805.60	5805.44	5802.71	5802.22	5801.38	5800.66	5793.88	5788.62	5785.50	5773.70	5773.80
Max EGL (ft):	5806.98	5806.90	5806.52	5803.80	5803.43	5802.75	5802.07	5796.38	5794.03	5789.02	5780.42	5775.26
Max HGL (ft):	5806.98	5806.56	5806.34	5803.59	5803.32	5802.50	5801.56	5795.07	5793.07	5786.34	5775.47	5774.58
:	B12-B11	B10-B9		B9-B8	B8-B7	B7-B6	B6-B5	B5-B4	B4-B3	B3-B2	B2-B1	B1-NEO
Length (ft):	15.00	16.00		51.00	49.00	83.00	33.22	61.60	47.40	18.00	31.50	20.00
Dia (in):	12.00	12.00		12.00	12.00	12.00	12.00	15.00	15.00	15.00	15.00	15.00
Slope (ft/ft):	0.0400	0.0100		0.0100	0.0100	0.0101	0.0217	0.1101	0.0424	0.1483	0.3746	0.0200
Up Invert (ft):	5806.70	5806.10		5805.94	5803.21	5802.72	5801.88	5801.16	5794.38	5792.37	5786.00	5774.20
Dn Invert (ft):	5806.10	5805.94		5805.43	5802.72	5801.88	5801.16	5794.38	5792.37	5789.70	5774.20	5773.80
Max Q (cfs):	0.78	0.98		0.98	1.00	2.00	2.46	4.68	5.46	7.10	7.10	7.10
Max Vel (ft/s):	4.65	3.44		3.67	2.71	4.03	5.71	9.19	7.85	13.13	17.85	6.64
Max Depth (ft):	0.36	0.43		0.37	0.48	0.60	0.54	0.54	0.69	0.57	0.80	1.02

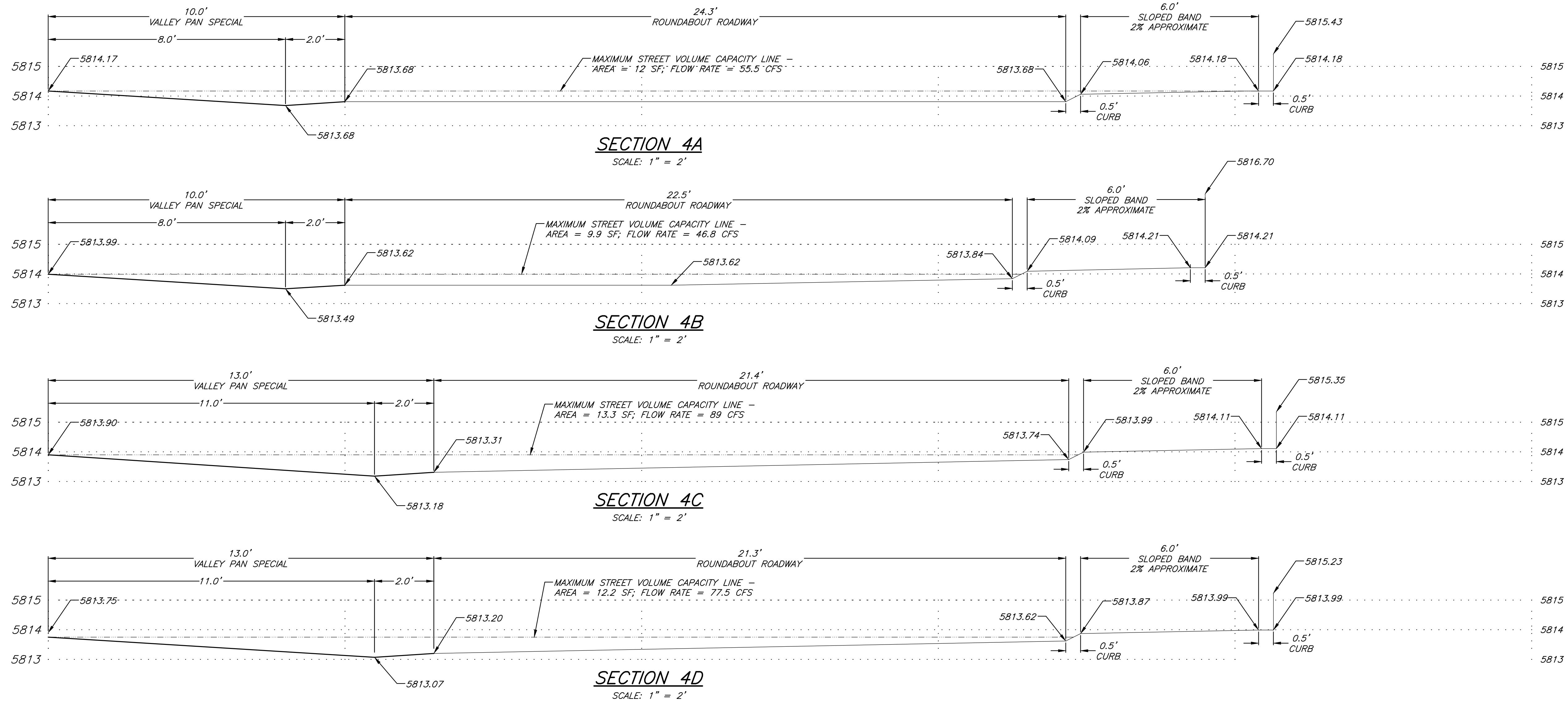


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#	Revision	Date	By
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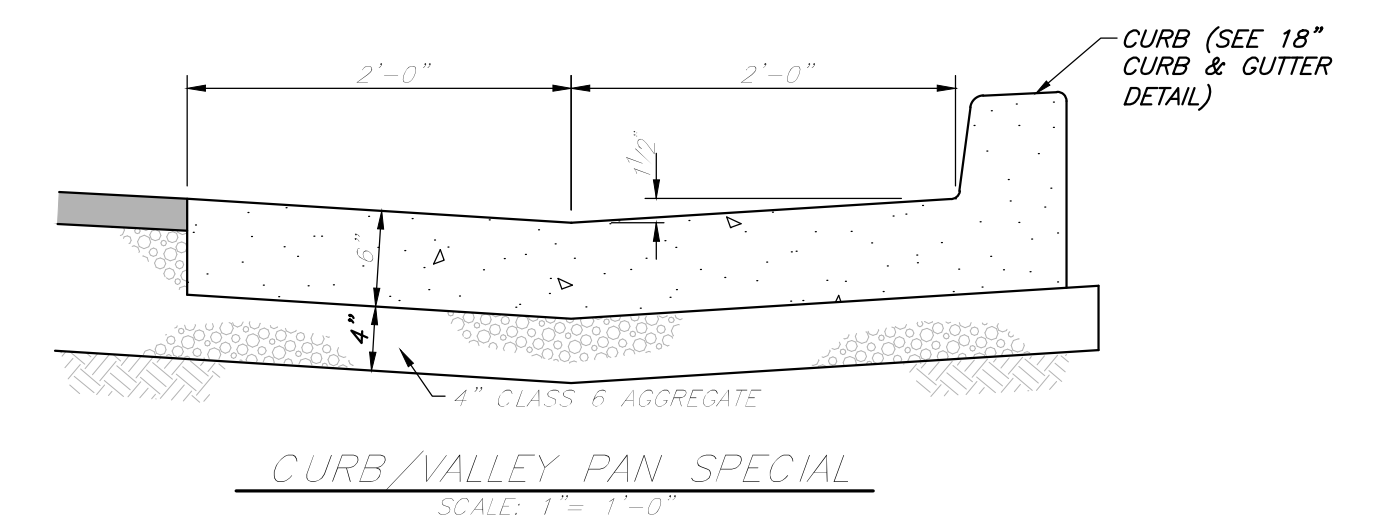
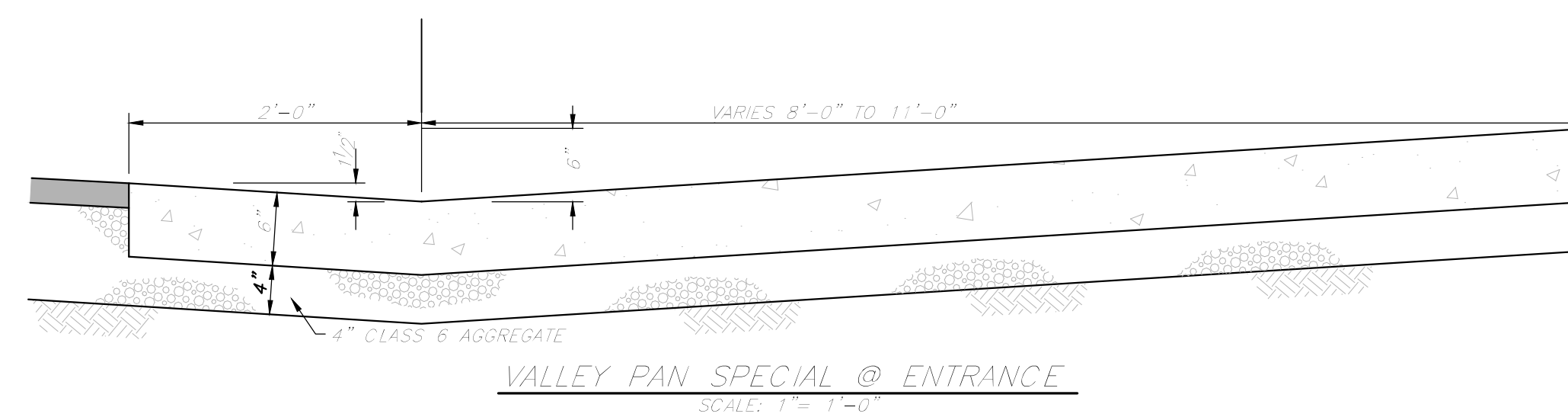
Proposed Drainage System
Profile - North Trunk

Job No.	2012-469-001
Drawn by:	TLB
Date:	8/21/13
QC:	XXX
PE:	DMK
File:	Storm Sewer Profile-On-Site



NOTES:

1. SECTIONS 4A THROUGH 4D WERE DEVELOPED USING PROPOSED DESIGN INFORMATION FOR THE STONEY RIVER ASSISTED LIVING FACILITY'S ENTRY WAY, TOPOGRAPHICAL MAPPING AND FIELD DATA COLLECTED FROM SITE VISITS.
2. SEE SHEETS 2 AND 3 FOR THE LOCATION OF SECTIONS 4A THROUGH 4D.
3. SEE SHEET 3 FOR THE PLAN AND PROFILE OF THE VALLEY PAN SPECIAL AND CURB/VALLEY PAN SPECIAL.



Appendix J

Stormwater Management Plan (SWMP)

STORMWATER MANAGEMENT PLAN (SWMP)

PREPARED FOR:
FIRST PHOENIX GROUP
STONEY RIVER DEVELOPMENT &
TERRY CLAASSEN, ROARING FORK LODGE, LLC
SKILLED NURSING FACILITY

PREPARED BY:
SGM
118 WEST SIXTH STREET, SUITE 200
GLENWOOD SPRINGS, CO 81601
PHONE: 970-945-1004
FAX: 970-945-5948

September 2013

Prepared by



118 West Sixth Street, Suite 200
Glenwood Springs, CO 81601
970.945.1004
970.945.5948 fax

1.0 Introduction

This Stormwater Management Plan (SWMP) is required for compliance with the Colorado Discharge Permit System (CDPS) general permit for Stormwater Discharges Associated with Construction Activities¹ (the Stormwater Construction Permit) for the Stoney River Development project located at 27th Street and Midland Avenue in Glenwood Springs, Colorado. This document addresses the construction and post-construction control measures [i.e., Best Management Practices (BMPs)] that are best suited to this site during construction. A copy of this SWMP will be kept on site during construction.

The overall goals of this SWMP are to identify possible pollutant sources that may contribute pollutants to stormwater, and identify BMPs that, when implemented, will reduce or eliminate any possible water quality impacts.

A copy of the SWMP **must be kept on site by the Contractor**, readily available to the operator, and to Division or EPA personnel for review during inspections. City, county, and local agencies may also request the SWMP as part of a local oversight program. If an office location is not available at the site, the SWMP must be managed so that it is available at the site when construction activities are occurring (e.g., by keeping the SWMP in a superintendent's vehicle.)

2.0 Project Description

Stoney River at Glenwood Springs will be an assisted living facility with a separate memory care building which will exclusively serve those with Alzheimer's disease and dementia. The two-story assisted living building is expected to have some residents that would be classified as independent living residents that require very limited assisted living services such as assistance with one ADL or medication reminders.

The Stoney River project is comprised of two primary buildings: a two-story Assisted Living/Independent Living Facility and a one story Memory Care Facility. The Assisted Living/Independent Living Facility will have approximately 57,900 square feet on the two resident levels and a lower level of approximately 16,700 square feet. It will be of wood frame construction over a lower level poured concrete and pre-cast slab floor/ceiling assembly. The lower level parking area will also have various support spaces including the main kitchen and parking for 20 vehicles. The Memory Care Facility is approximately 20,000 square feet; concrete slab-on-grade and wood. The site will be accessed from a primary drive from the recently constructed roundabout at the intersection of Midland Avenue and 27th Street. The two buildings will share a parking lot for visitors and staff. There will be a minimum of 20 parking spaces in the lower level of the Assisted Living/Independent Living facility for independent residents, bringing the total parking spaces to 61 on site.

3.0 Site Description

This section of the SWMP provides an overview of the anticipated construction activities for the Stoney River Senior Housing project.

3.1 Nature of the Construction Activity

¹ Administered by the Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division (WQCD).

The development of the project will require excavation, rough and final grading, utility trenching, construction of two new buildings, parking lots, access roads and driveways.

3.2 Proposed Sequence for Major Activities

The proposed sequence for major activities is as follows:

- Secure the site with construction fencing
- Install perimeter BMPs (silt fence, erosion logs, vehicle tracking pads, etc.)
- Stabilize stockpile/staging/concrete wash areas with BMPs
- Conduct overlot grading
- Install utilities
- Building construction
- Road and parking lot paving
- Landscaping

3.3 Project Area/Construction Disturbance

The total area of the site is 3.8 acres of which will all be disturbed by construction activities.

3.4 Soils

The existing soils at the site are classified as hydrologic soil group B (Ascalon-Pena complex), which are characterized as having a moderate infiltration rate when thoroughly wet, with 6 to 25 percent slopes. These soils are moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture.

Yeh and Associates conducted a subsurface investigation to provide recommendations for foundation design and construction of a commercial structure and pavements for drives and parking areas². The subsoils encountered in the borings consisted of 4 to 16 feet of fill, natural silt, clay and gravel underlain by very dense gravel, cobble and boulder materials. Bedrock was not encountered to the maximum explored depth of 50 feet. Fill was encountered in the parking lot areas. The materials appeared to be ancient colluvial and/or landslide deposits. To reduce water accumulation outside foundation walls, foundation drain should be installed around the exterior of the foundation walls and the ground surface surrounding the building should be sloped to drain away from any buildings and structures.

See Appendix A for the Natural Resources Conservation Service (NRCS) Soil Report.

3.5 Vegetation

The site has very little vegetation as it was graded for a project that was not constructed. The estimated percent ground cover is 5%.

3.6 Potential Pollution Sources

See Section 3.5 for a list of potential pollutant sources.

3.7 Non-stormwater Discharges

² Geotechnical Investigation and Pavement Recommendations, Roaring Fork Lodge, March 27, 2007.

The only non-stormwater that will be present during construction is the water used for the concrete wash. The Contractor will implement proper concrete wash procedures so as to avoid the release or discharge of this water from the concrete wash. No dewatering during construction is anticipated at this time; however, if dewatering is needed, the Contractor will apply for coverage and comply with the conditions set forth in the CDPHE-WQCD CDPS General Permit for Discharges Associated with Subterranean Dewatering or Well Development (COG07000).

3.8 Receiving Water

The Roaring Fork River is the ultimate receiving water for runoff from the project area. Although the City of Glenwood Springs (City) is not a regulated Municipal Separate Storm Sewer System (MS4), stormwater from portions of this project area will be conveyed into the City's existing stormwater system, which discharges to the Roaring Fork River.

4.0 Site Map

Appendix B includes a copy of the Site Map with the following features identified:

- a) construction site boundaries;
- b) all areas of ground surface disturbance;
- c) areas of cut and fill;
- d) areas used for storage of building materials, equipment, soil, or waste;
- e) locations of dedicated asphalt or concrete batch plants;
- f) locations of all structural BMPs;
- g) locations of non-structural BMPs as applicable; and
- h) locations of springs, streams, wetlands and other surface waters.

The Site Map will be marked up by the Contractor in the field every time there is a variation from what is included on this Site Map. The most recent version of the Site Map (with mark-ups) will be kept on-site with the SWMP document at all times.

5.0 Stormwater Management Controls

The overall structural, non-structural and materials handling and spill prevention BMPs selected for this project are based upon the potential pollutant sources and site conditions and will be effective if installed and maintained properly. If for some reason the suggested BMPs below turn out to be impractical or ineffective, it will be up to the Contractor to select a more appropriate BMP than the one listed in the SWMP if needed. The Contractor/SWMP Administrator **must update this SWMP and Site Map accordingly to maintain compliance with the CDPS Construction General Permit.**

6.0 SWMP Administrator

The SWMP Administrator will be identified by the Contractor prior to construction. The SWMP Administrator should be a person with authority to adequately manage and direct day-to-day stormwater quality management activities at the site. The SWMP Administrator will be responsible for the implementation, maintenance, revision of and continued compliance with all aspects of the project site's SWMP.

Table 1. SWMP Administrator Contact Information.

<i>Name, Title</i>
<i>Address</i>
<i>Phone Number</i>

7.0 Identification of Potential Pollutant Sources

The potential pollutant sources, including materials and activities, at this project have been evaluated for the potential to contribute pollutants to stormwater discharges. Table 2 provides a summary of the potential pollutant sources for this project. All identified pollutant sources will be mitigated with the specific BMPs listed in Tables 3-5. In general these potential pollutant sources will be mitigated by:

- o Controlling the timing (dry vs wet weather) and frequency of the activity;
- o Identifying flat areas that will minimize the conveyance of these pollutants downstream (away from the Roaring Fork River);
- o Stored using primary and secondary containment (fuel tanks, drum storage, etc.) at product storage and loading/unloading facilities to prevent and contain spills and leaks;

Table 2. Potential Pollutant Sources.

Potential Pollutant Source/Activity	Potential Pollutant(s)	Applicable to Project
Disturbed and stored/stockpiled soils (grading, clearing, access roads, staging areas)	Sediment	Yes
Vehicle tracking of soils (on pavement)	(Tracked) Sediment	Yes
Contaminated soils	Sediment, Chemicals	
Loading/unloading operations	Chemicals	Yes
Outdoor storage activities (building materials, fertilizers, chemicals)	Chemicals	Yes
Vehicle and equipment maintenance and fueling	Chemicals, Oil & Grease, Diesel, Gasoline	
Dust-generating processes	Particulates, Sediment	Yes
Use of fertilizers and pesticides	Fertilizers, Pesticides, Herbicides,	
Use of fuels, solvents, oils, etc.	Detergents, Fuels, Solvents, Oil	Yes
On-site waste management (dumpsters, waste piles, liquid wastes)	Construction Waste, Chemicals	Yes
Concrete washout	Concrete, Sediment	Yes
On-site equipment washing	Detergents, Oil	Yes
On-site asphalt batch plant	Asphaltic Cement, Sediment	
On-site concrete batch plant	Cement, Sediment	
Portable toilets	Domestic Sewage	Yes
Trash	Trash	Yes
Other		

8.0 Best Management Practices

This section outlines the specific stormwater management controls (BMPs) that will be implemented at the site to adequately control each identified pollutant source. The ***Contractor will need to include the estimated dates for BMP implementation and maintenance per the construction schedule.*** All BMPs will be installed prior to construction and maintained per the frequency included in Appendix C (BMP Details).

8.1 Structural Practices for Erosion and Sediment Control

All structural practices implemented at the site have been selected to minimize erosion and sediment transport and are identified on the Site Map included in Appendix B. Table 3 provides a summary of the structural BMPs (erosion and sediment controls) suggested for this project.

8.2 Non-Structural Practices for Erosion and Sediment Control

All non-structural practices implemented at the site have been selected to minimize erosion and sediment transport. Table 4 provides a summary of the non-structural BMPs suggested for this project.

8.3 Phased BMP Implementation

The identified BMPs for this project shall be implemented throughout all phases of the project until final stabilization (70% vegetative cover) has occurred and are not limited to, clearing and grubbing; road construction; utility and infrastructure installation; vertical construction; final grading; and final stabilization.

8.4 Materials Handling and Spill Prevention

All materials handling and spill prevention BMPs have been selected to minimize impacts from procedures or significant materials that could contribute pollutants to runoff. Such procedures or significant materials could include: exposed storage of building materials; paints and solvents; fertilizers or chemicals; waste material; and equipment maintenance or fueling procedures. To the extent practicable, materials will be stored and handled in covered areas to prevent contact with stormwater, and chemicals will be stored using secondary containment devices to prevent leaks and spills.

The Contractor will post the spill prevention and response procedures for this project and include, at a minimum the following:

- o Notification of the SWMP Administrator
- o Notification of the City emergency response/Fire Department
- o Depending on the nature of the spill and the material involved, notification of the Colorado Department of Public Health and Environment (24-hour spill reporting line – 877-518-5608)
- o Notification of downstream water users and other agencies;
- o Instructions for clean-up procedures;
- o Location and identification of spill kit(s);
- o Provisions for absorbents to be made available for use in fuel areas, and for containers to be available for used absorbents;

- o Procedures for properly washing out concrete truck chutes and other equipment in a manner and location so that the materials and wash water cannot discharge from the site, and never into a storm drain system or stream.

Table 5 provides a summary of the materials handling and spill prevention BMPs suggested for this project.

Table 3. Structural BMPs.

Structural BMP	Approximate Location on Project	Installation Date	Applicable to Project
Silt fence	Portions of the perimeter of project		Yes
Straw bale dams			
Straw wattles/erosion logs	Portions of the perimeter of project, base of soil stockpiles		Yes
Earthen diversion berms			
Vegetated swales			
Sediment trap/pond			
Pipe slope drains			
Geogrids			
Inlet protection	At all existing and new inlets (as constructed), gravel bags within the gutter along 27 th Street, upstream of the existing vegetated swale near the southwest corner of the bridge		Yes
Outlet protection			
Culverts			
Vehicle tracking pads	2; one at each point of access to the site from 27 th Street.		Yes
Rip-rap			
Erosion control blanket			

Table 4. Non-Structural BMPs.

Non-Structural BMP	Approximate Location on Project	Installation Date	Applicable to Project
Surface roughening	Entire site as applicable to phase.		Yes
Soil stockpile height limit (no greater than 10 feet)	Proposed at northern portion of site.		Yes
Perimeter vegetative buffer			
Minimize site disturbance	Entire site as applicable to phase.		Yes
Mulch			
Seed and mulch stockpiles if unused for more than 30 days	As applicable to all stockpiles.		Yes
Stockpile toe protection (ditches/silt fence/straw and/or erosion logs)	As applicable to all stockpiles.		Yes
Preservation and protection of vegetation or trees			
Good housekeeping practices including street sweeping at a minimum of daily (more if needed); routine cleanup of trash, waste, and debris	Throughout all phases of construction for the entire site.		Yes
Heavy equipment and vehicles staged on-site, properly maintained and inspected daily (no vehicle or equipment maintenance to occur on-site)	Throughout all phases of construction for the entire site.		Yes
Informal on-site erosion control training/awareness by the SWMP Administrator	Periodic throughout all phases of construction.		Yes

Table 5. Materials Handling and Spill Prevention BMPs.

Materials Handling and Spill Prevention BMP	Approximate Location on Project	Installation Date	Applicable to Project
Portable toilets – anchored, located away from drainages	To Be Determined		Yes
Fuel storage in bulk tank(s) provided with secondary containment and spill kit			
Mobile fueling performed at least 200-feet away from drainages and attended full-time	Staging area		Yes
Fertilizers, form oil, solvents, cleaners, detergents stored in 55-gallon containers or smaller kept inside storage units	Staging area		Yes
Dumpsters containing used chemical containers or liquid wastes kept covered	Staging area		Yes
Equipment cleaning, if performed on-site, uses no detergents and flows to on-site retention basin			
In case of an accidental release of fuel or other chemicals, absorbent booms or earthen berms will be immediately constructed to contain the spill and prevent runoff to adjacent surface waters. The City's emergency response team/Fire Department will be contacted to assist with the cleanup of the released materials.			Yes
Material Safety Data Sheets (MSDSs) for on-site chemicals will be kept at the construction trailer to facilitate spill response and cleanup.	Contractor's trailer		Yes

8.5 Dedicated Concrete or Asphalt Batch Plants

There will not be a concrete or asphalt batch plant on site for this project.

8.6 Vehicle Tracking Control

Two vehicle tracking control pads will be used at each access point off of 27th Street for this project. Additional non-structural BMPs will be implemented to ensure there is minimal

access to the site other than equipment and Contractor trucks and vehicles; street sweeping will occur at a minimum daily and more frequent if needed.

8.7 Waste Management, Concrete Washout

A dedicated concrete washout will be installed prior to the placement of any concrete. A location for the concrete washout has been identified as shown on the Site Map included in Appendix B.

8.8 Groundwater and Stormwater Dewatering

No dewatering during construction is anticipated at this time.

9.0 Final Stabilization and Long-term Stormwater Management

The proposed final stabilization practices anticipated for this project include:

- o Buildings and paved access roads and driveways;
- o Storm drainage system with riprap protection at the outfall;
- o Landscaping.

For those areas to be landscaped the proper soil preparation, amendments and stabilization practices will be implemented in the interim period and until vegetation is planted. Final stabilization is reached when all ground surface disturbing activities at the site have been completed, and uniform vegetative cover has been established with an individual plant density of at least 70 percent of pre-disturbance levels, or equivalent permanent, physical erosion reduction methods have been employed.

10.0 Inspection and Maintenance

The Contractor will perform a thorough inspection of the stormwater management system at least every 14 days and within 24 hours of any precipitation or snowmelt event that causes surface erosion (i.e., that result in stormwater running across the ground). If more frequent inspections are required to ensure that BMPs are properly maintained and operated, the inspection schedule must be modified to meet this need. All inspections will be documented.

The SWMP Administrator must modify the SWMP to accurately reflect the actual field conditions. Examples include, but are not limited to, removal of BMPs, identification of new potential pollutant sources, addition of BMPs, modification of BMP installation and implementation criteria or maintenance procedures, and changes in items included in the site map and/or description. SWMP revisions must be made prior to changes in site conditions, except for Responsive SWMP Changes, as follows:

- o SWMP revisions must be made immediately after changes are made in the field to address BMP installation and/or implementation issues; or
- o SWMP revisions must be made as soon as practicable, but in no case more than 72 hours, after change(s) in BMP installation and/or implementation occur at the site that requires development of materials to modify the SWMP (e.g., design of retention pond capacity).

10.1 Inspection Procedures

The inspection must include observation of:

- o Construction site perimeter and discharge points (including discharges into a storm sewer system);
- o All disturbed areas;
- o Areas used for material/waste storage that are exposed to precipitation;
- o Other areas determined to have a significant potential for stormwater pollution, such as demolition areas or concrete washout locations, or locations where vehicles enter or leave the site;
- o Erosion and sediment control measures identified in the SWMP; and
- o Any other structural BMPs that may require maintenance, such as secondary containment around fuel tanks, or the condition of spill response kits.

Once stormwater maintenance issues are identified, the SWMP Administrator will direct the Contractor and appropriate subcontractors to execute the appropriate maintenance and mitigation immediately.

10.2 Inspection Documentation and Recordkeeping

The Contractor/Owner must document inspection results and maintain a record of the results for a period of 3 years following expiration or inactivation of permit coverage. These records must be made available to the CDPHE-WQCD or EPA upon request. The following items must be documented as part of the site inspections:

- i. The inspection date;
- ii. Name(s) and title(s) of personnel making the inspection;
- iii. Location(s) of discharges of sediment or other pollutants from the site;
- iv. Location(s) of BMPs that need to be maintained;
- v. Location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;
- vi. Location(s) where additional BMPs are needed that were not in place at the time of inspection;
- vii. Deviations from the minimum inspection schedule as provided in Section C.6.a (of the Permit) ;
- viii. Description of corrective action for items iii, iv, v, and vi, above, dates corrective action(s) taken, and measures taken to prevent future violations, including requisite changes to the SWMP, as necessary; and
- ix. After adequate corrective action(s) has been taken, or where a report does not identify any incidents requiring corrective action, the report shall contain a signed statement indicating the site is in compliance with the permit to the best of the signer's knowledge and belief.

An example inspection form is included in Appendix D. In addition to the inspection records, the SWMP Administrator may opt to keep a log book for use in tracking other items related to the SWMP such as those listed below. Additional information such as dated photographs, field notebooks, drawings and maps, and the items below, etc. can also be included where appropriate.

- o BMP operation and maintenance

- o Stormwater contamination
- o Contacts with suppliers
- o Notes on the need for and performance of preventive maintenance and other repairs
- o Implementation of specific items in the SWMP
- o Training events (given or attended)
- o Events involving materials handling and storage
- o Contacts with regulatory agencies and personnel
- o Notes of employee activities, contact, notifications, etc.

Records of spills, leaks, or overflows that result in the discharge of pollutants must also be documented and maintained. Information that should be recorded for all occurrences includes the time and date, weather conditions, reasons for the spill, etc. Some spills may need to be reported to the CDPHE-WQCD immediately. Specifically, a release of any chemical, oil, petroleum product, sewage, etc., which may enter waters of the State of Colorado (which include surface water, ground water and dry gullies or storm sewers leading to surface water) must be reported. More guidance is available on the CDPHE-WQCD's web at www.cdphe.state.co.us/hm/spillsandreleased.htm. The Division's toll-free 24-hour number for environmental hazards and chemical spills and releases is 1-877-518-5608.

Appendix A
NRCS Soils Report



United States
Department of
Agriculture



NRCS

Natural
Resources
Conservation
Service

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

Custom Soil Resource Report for Rifle Area, Colorado, Parts of Garfield and Mesa Counties

On-Site Drainage Basins



June 8, 2013

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://soils.usda.gov/sqi/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<http://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Special Point Features

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

-  Very Stony Spot
-  Wet Spot
-  Other

Special Line Features

-  Gully
-  Short Steep Slope
-  Other

Political Features

-  Cities

Water Features

-  Streams and Canals

Transportation

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

MAP INFORMATION

Map Scale: 1:988 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 13N NAD83

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

Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties

Survey Area Data: Version 6, Mar 25, 2008

Date(s) aerial images were photographed: 7/19/2005

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

Map Unit Legend

Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
7	Ascalon-Pena complex, 6 to 25 percent slopes	3.9	100.0%
Totals for Area of Interest		3.9	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Rifle Area, Colorado, Parts of Garfield and Mesa Counties

7—Ascalon-Pena complex, 6 to 25 percent slopes

Map Unit Setting

Elevation: 5,000 to 6,500 feet

Map Unit Composition

Ascalon and similar soils: 65 percent

Pena and similar soils: 25 percent

Description of Ascalon

Setting

Landform: Alluvial fans, valley sides

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Parent material: Alluvium derived from sandstone and shale

Properties and qualities

Slope: 6 to 12 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 10 percent

Available water capacity: High (about 9.5 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: Deep Loam (R048AY292CO)

Typical profile

0 to 5 inches: Fine sandy loam

5 to 30 inches: Sandy clay loam

30 to 60 inches: Sandy clay loam

Description of Pena

Setting

Landform: Alluvial fans, valley sides

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Calcareous alluvium derived from sandstone and shale

Properties and qualities

Slope: 6 to 25 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.60 to 6.00 in/hr)

Custom Soil Resource Report

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Loamy Slopes (R048AY303CO)

Typical profile

0 to 6 inches: Stony loam
6 to 12 inches: Very stony loam
12 to 60 inches: Very stony sandy loam

References

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United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. <http://soils.usda.gov/>

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.glti.nrcs.usda.gov/>

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. <http://soils.usda.gov/>

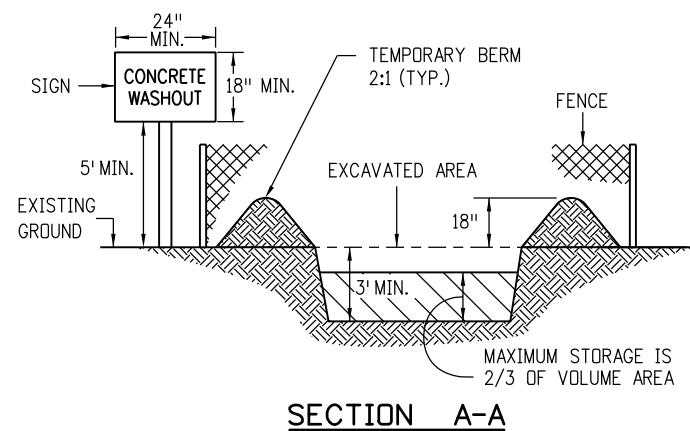
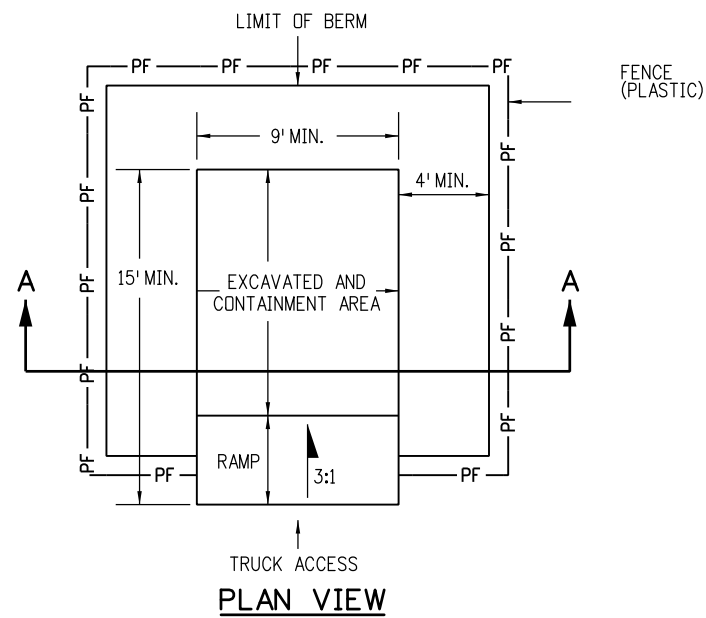
United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. <http://soils.usda.gov/>

Custom Soil Resource Report

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.

Appendix B
Site Map

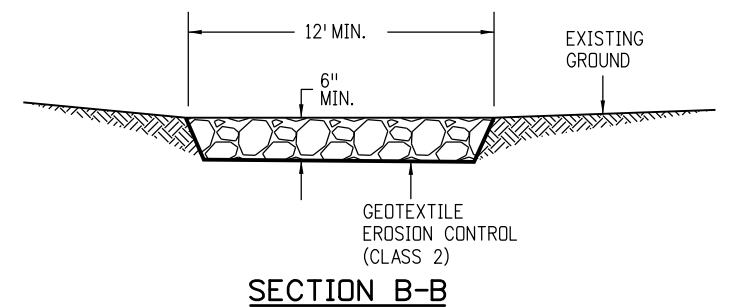
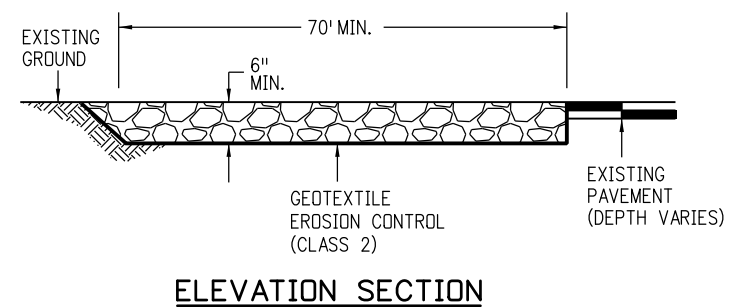
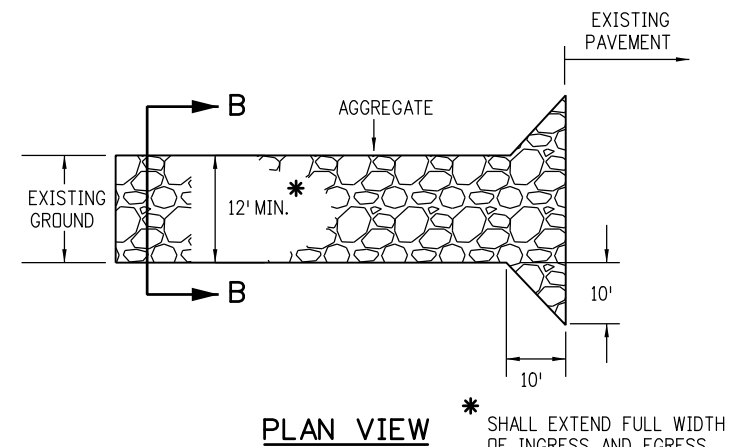
Appendix C
BMP Details



NOTES:

1. EROSION BALES MAY BE USED AS AN ALTERNATIVE FOR THE BERM.
2. A FENCE (PLASTIC) CONFORMING TO SUBSECTION 607.02 SHALL BE INSTALLED AROUND THE CONCRETE WASHOUT AREA, EXCEPT AT THE OPENING.
3. THE CONCRETE WASHOUT SIGN SHALL HAVE LETTERS AT LEAST 3 INCHES HIGH AND CONFORM TO SUBSECTION 630.02.

CONCRETE WASHOUT STRUCTURE

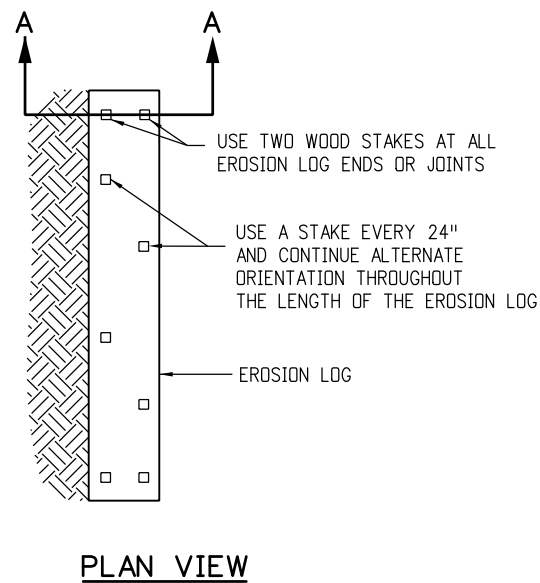


NOTES:

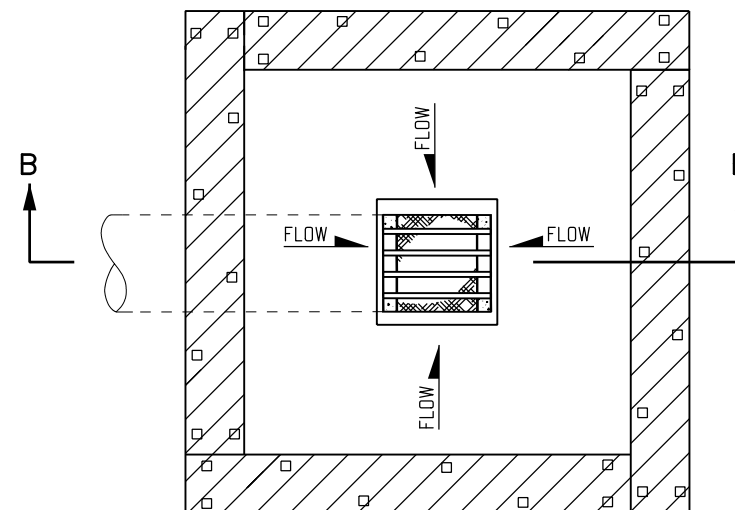
1. AGGREGATE FOR THE CONSTRUCTION ENTRANCE SHALL CONFORM TO SUBSECTION 208.02 (K).
2. THE CONTRACTOR SHALL PROTECT CURB AND GUTTER THAT CROSSES THE ENTRANCE FROM DAMAGE. PROTECTION OF THE CURB AND GUTTER WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE WORK.

VEHICLE TRACKING PAD

Computer File Information		Sheet Revisions		Colorado Department of Transportation  4201 East Arkansas Avenue Denver, Colorado 80222 Phone: (303) 757-9083 Fax: (303) 757-9820 Project Development Branch DD/LTA	TEMPORARY EROSION CONTROL Issued By: Project Development Branch on July 4, 2012	STANDARD PLAN NO.	
Creation Date: 07/04/12	Initials: DD	Date:	Comments			M-208-1	
Last Modification Date: 07/04/12	Initials: LTA	(R-X)				Sheet No. 1 of 12	
Full Path: www.coloradodot.info/business/designsupport		(R-X)					
Drawing File Name: 2080101012.dgn		(R-X)					
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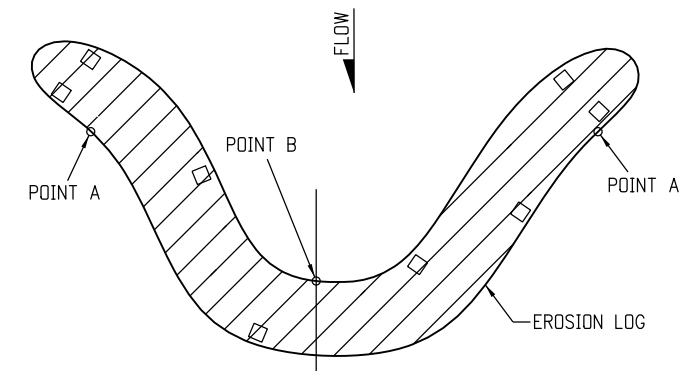


PLAN VIEW

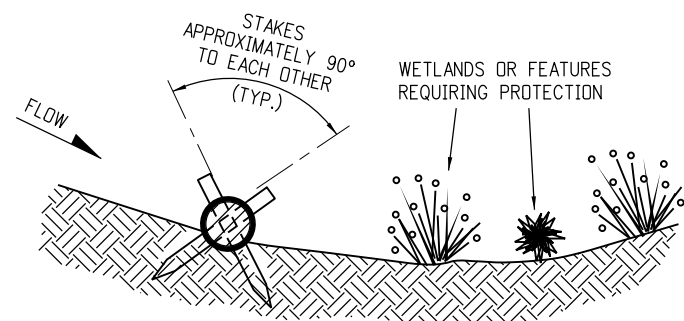


PLAN VIEW

- NOTES**
1. EROSION LOGS SHALL BE EMBEDDED 2 INCHES INTO THE SOIL.
 2. STAKES SHALL BE EMBEDDED TO A MINIMUM DEPTH OF 12 INCHES.
 3. EROSION LOGS SHALL BE TIGHTLY ABUTTED WITH NO GAPS.

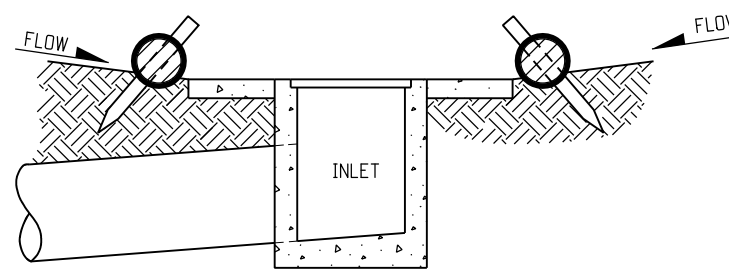


PLAN VIEW



SECTION A-A

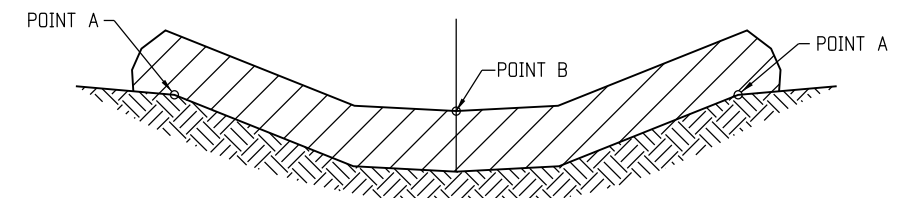
TYPICAL STAKE INSTALLATION



SECTION B-B

NOTE: LOCATE EROSION LOGS AT THE OUTSIDE
EDGE OF THE CONCRETE APRON.

EROSION LOG FILTER AT DROP INLET

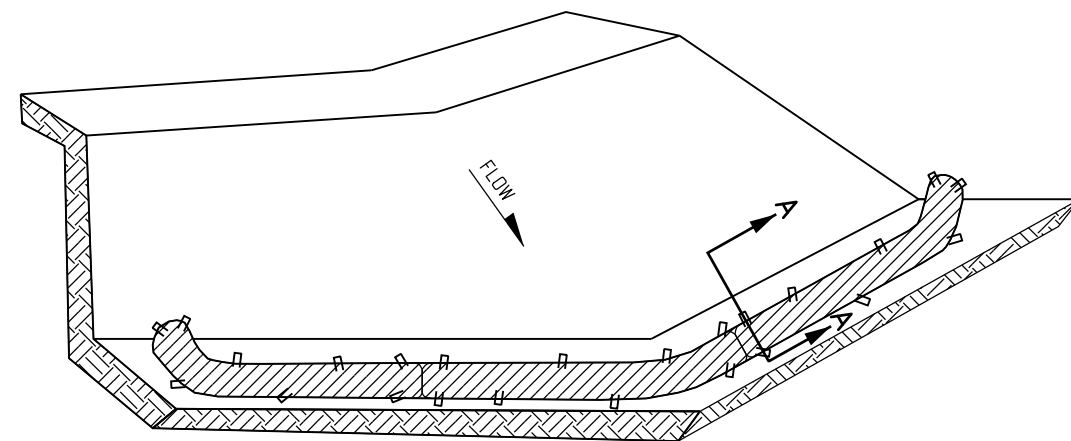


ELEVATION

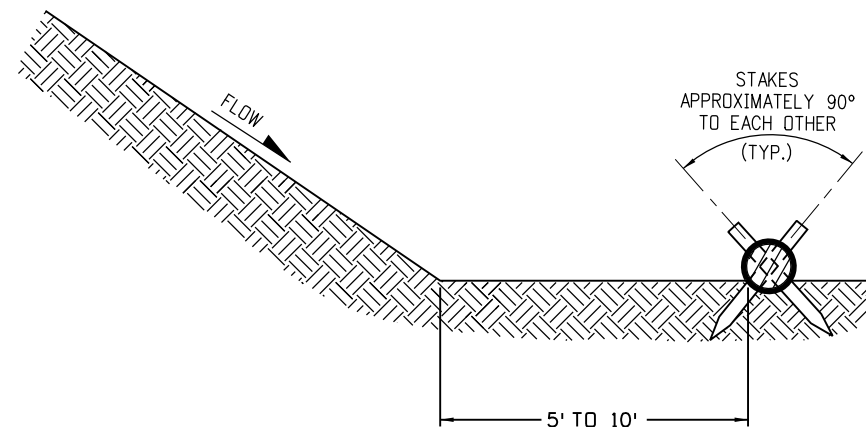
EROSION LOG DITCH INSTALLATION

EROSION LOG APPLICATIONS

Computer File Information		Sheet Revisions		Colorado Department of Transportation  4201 East Arkansas Avenue Denver, Colorado 80222 Phone: (303) 757-9083 Fax: (303) 757-9820 Project Development Branch DD/LTA	TEMPORARY EROSION CONTROL	STANDARD PLAN NO.	
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ISOMETRIC VIEW

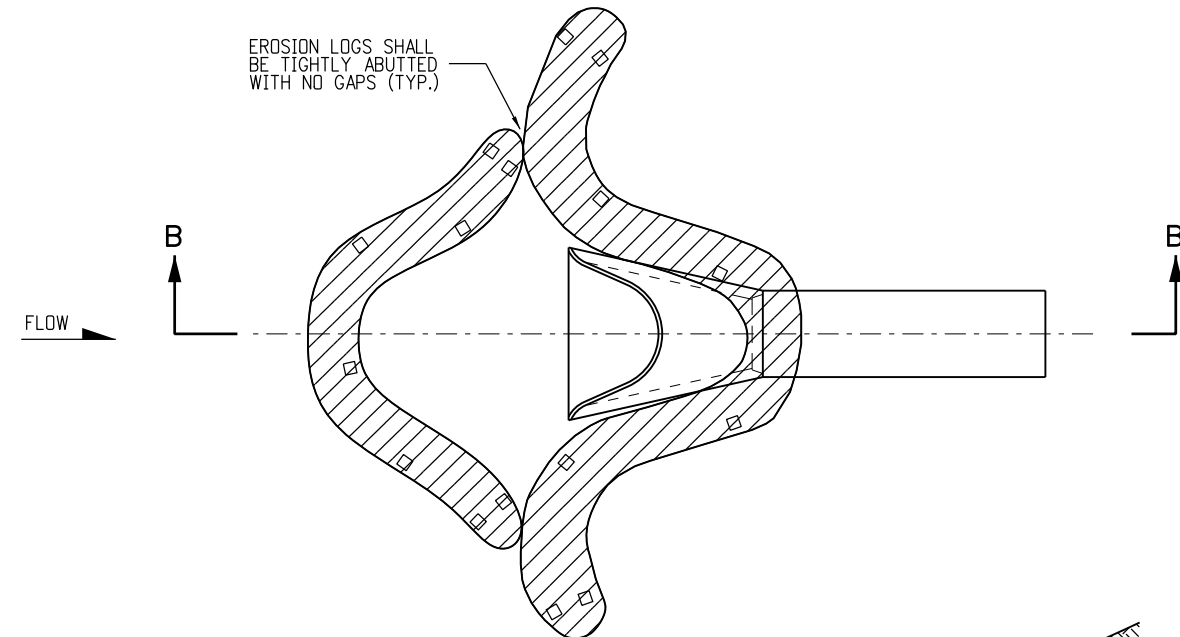


SECTION A-A

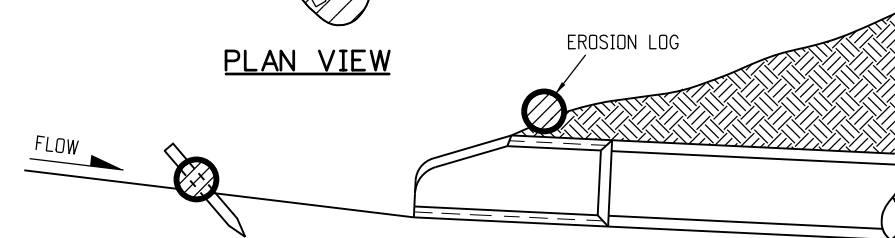
NOTES:

1. EROSION LOGS USED AT TOE OF SLOPE SHALL BE PLACED 5 TO 10 FEET BEYOND TOE OF SLOPE TO PROVIDE STORAGE CAPACITY.
2. EROSION LOGS SHALL BE PLACED ON THE CONTOUR, WITH ENDS FLARED UP SLOPE.

EROSION LOG TOE OF SLOPE PROTECTION

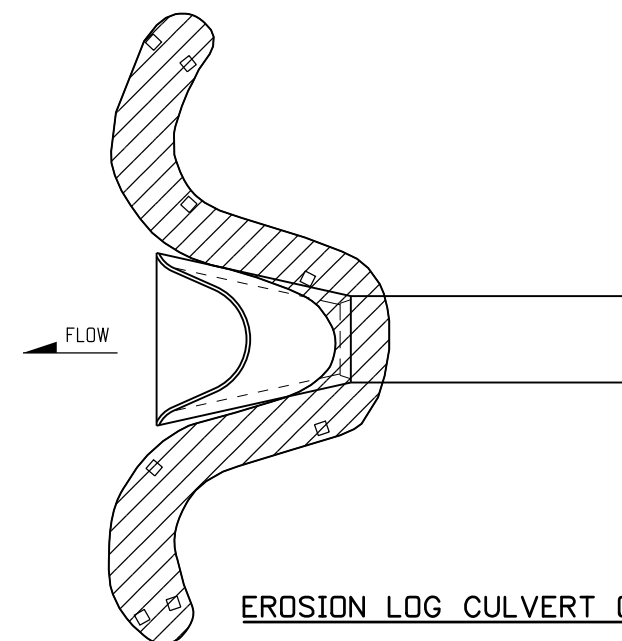


PLAN VIEW



SECTION B-B

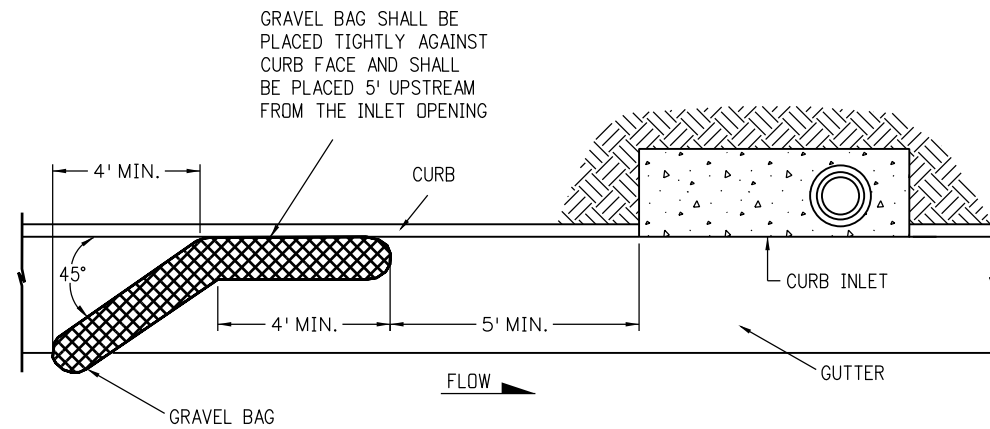
EROSION LOG CULVERT INLET PROTECTION



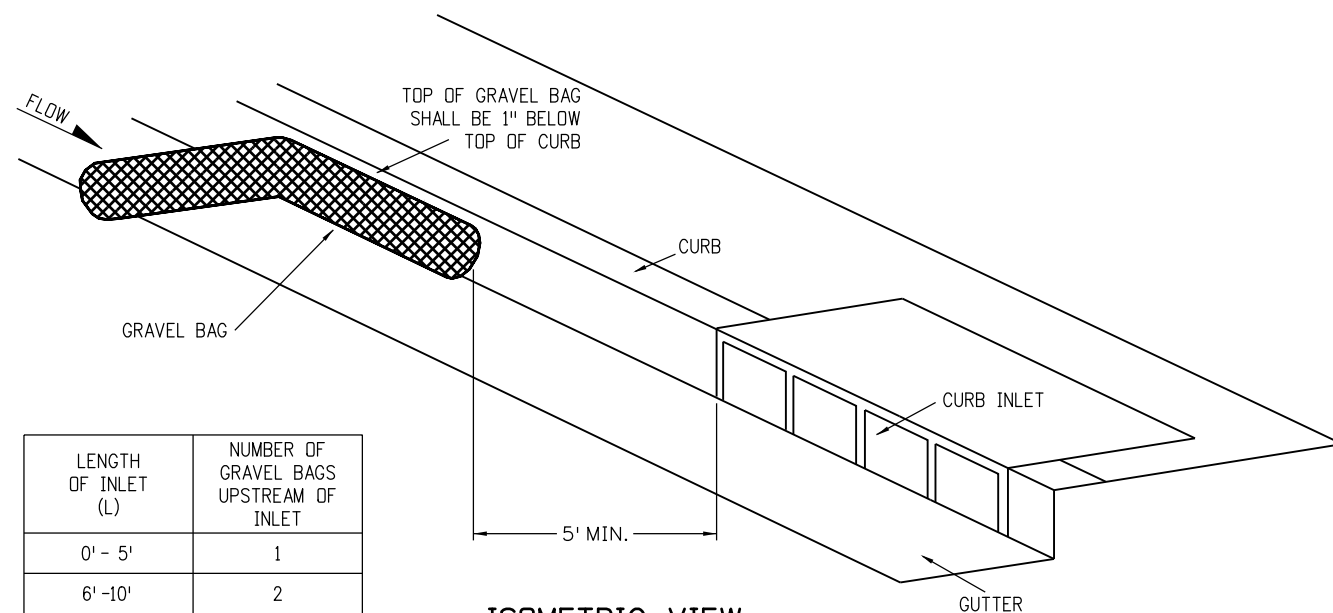
EROSION LOG CULVERT OUTLET PROTECTION

EROSION LOG APPLICATIONS

Computer File Information		Sheet Revisions		 Colorado Department of Transportation 4201 East Arkansas Avenue Denver, Colorado 80222 Phone: (303) 757-9083 Fax: (303) 757-9820 Project Development Branch DD/LTA	TEMPORARY EROSION CONTROL Issued By: Project Development Branch on July 4, 2012	STANDARD PLAN NO.	
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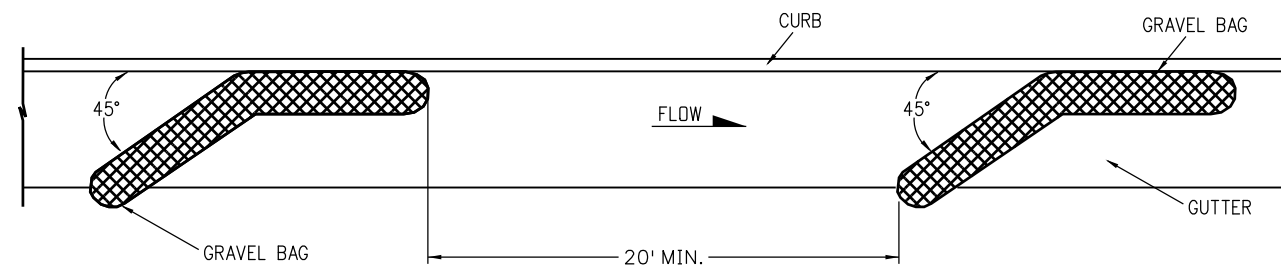


PLAN VIEW



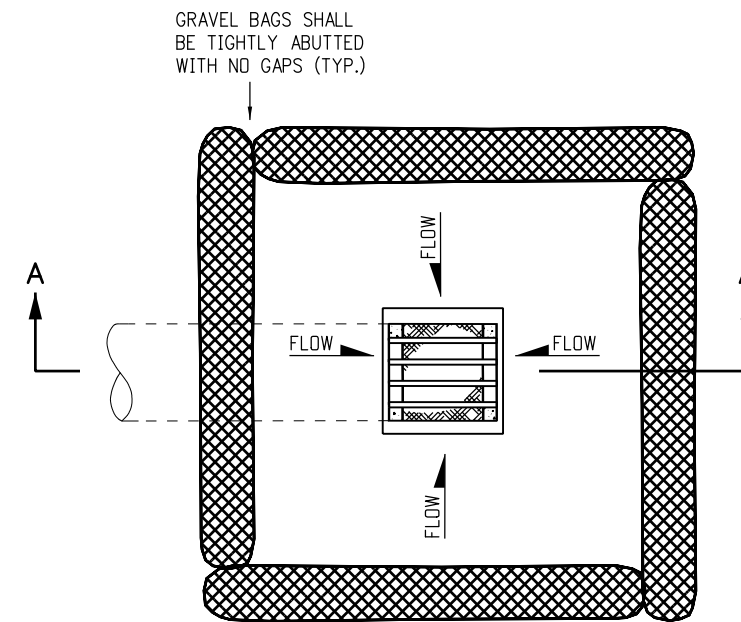
ISOMETRIC VIEW

LENGTH OF INLET (L)	NUMBER OF GRAVEL BAGS UPSTREAM OF INLET
0' - 5'	1
6' - 10'	2
L > 10'	3

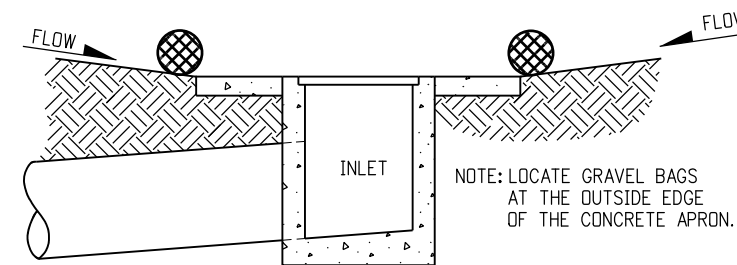


PLAN VIEW FOR MULTIPLE GRAVEL BAGS

GRAVEL BAG CURB CHECK



PLAN VIEW

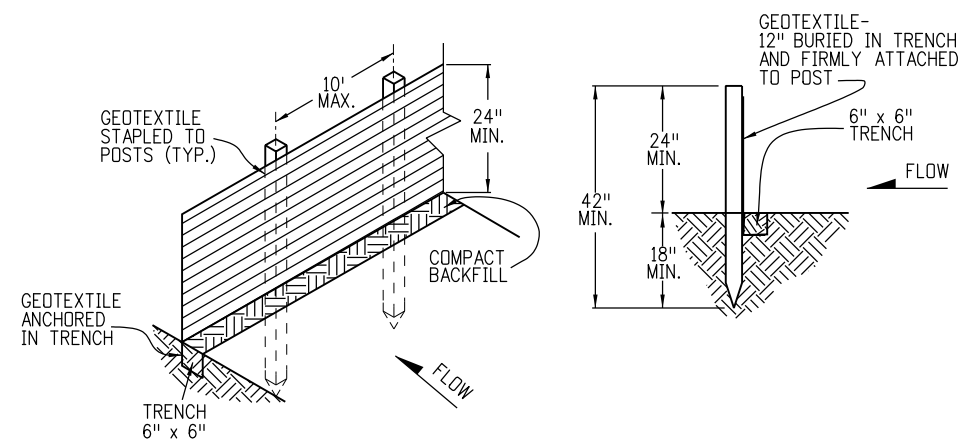


SECTION A-A

GRAVEL BAG FILTER AT DROP INLET

GRAVEL BAG APPLICATIONS

Computer File Information			Sheet Revisions		Colorado Department of Transportation DOT DEPARTMENT OF TRANSPORTATION 4201 East Arkansas Avenue Denver, Colorado 80222 Phone: (303) 757-9083 Fax: (303) 757-9820 Project Development Branch DD/LTA	TEMPORARY EROSION CONTROL		STANDARD PLAN NO.	
Creation Date: 07/04/12	Initials: DD		Date:	Comments		M-208-1			
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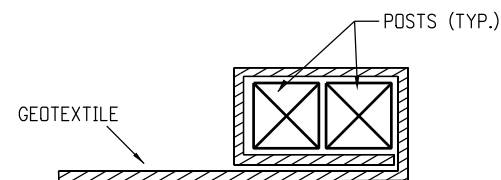


SILT FENCE

GEOTEXTILE SHALL BE ATTACHED TO WOOD POSTS WITH THREE OR MORE STAPLES PER POST.

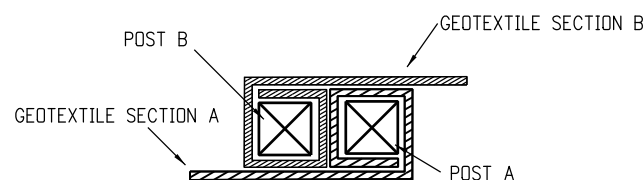
STAPLES SHALL BE 1/2"

WOOD POST SHALL BE 1 1/2" X 1 1/2" NOMINAL.



END SECTION DETAIL (PLAN VIEW)

GEOTEXTILE SHALL BE FOLDED AROUND TWO POSTS ONE FULL TURN. SECURE GEOTEXTILE TO POST WITH THREE STAPLES MINIMUM.



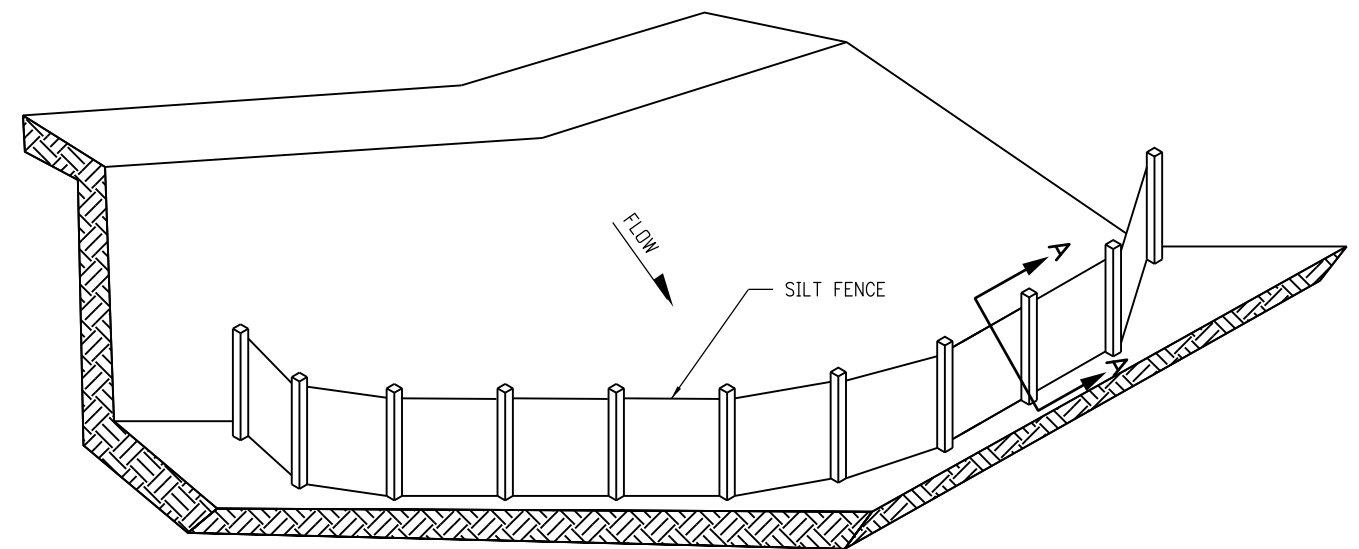
JOINING SECTION DETAIL (PLAN VIEW)

FOLD GEOTEXTILE AROUND EACH POST ONE FULL TURN. SECURE GEOTEXTILE TO POST WITH THREE STAPLES MINIMUM.

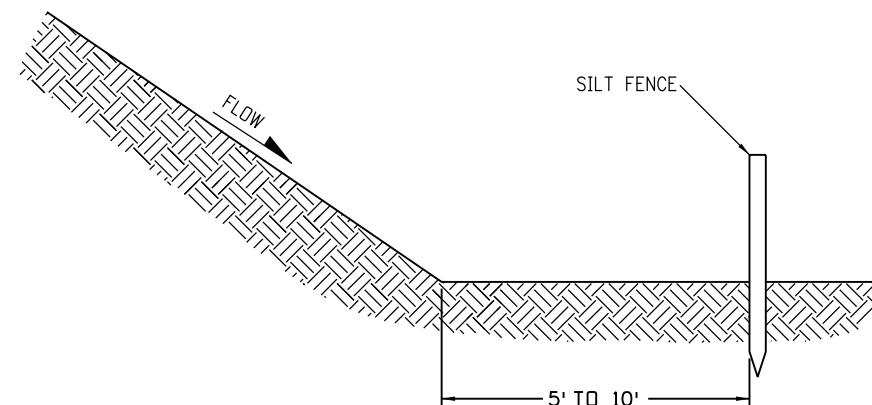
POSTS SHALL BE TIGHTLY ABUTTED WITH NO GAPS TO PREVENT POTENTIAL FLOW-THROUGH OF SEDIMENT AT JOINT.

NOTES

1. SILT FENCE SHALL HAVE A MAXIMUM DRAINAGE AREA OF ONE-QUARTER ACRE PER 100 FEET OF SILT FENCE LENGTH; MAXIMUM SLOPE LENGTH BEHIND BARRIER IS 100 FEET; MAXIMUM GRADIENT BEHIND THE BARRIER IS 2:1.
2. SILT FENCE USED AT TOE OF SLOPE SHALL BE PLACED 5 TO 10 FEET BEYOND TOE OF SLOPE TO PROVIDE STORAGE CAPACITY.
3. SILT FENCE SHALL BE PLACED ON THE CONTOUR, WITH ENDS FLARED UP SLOPE.



ISOMETRIC VIEW



SECTION A-A

TOE OF SLOPE PROTECTION

SILT FENCE APPLICATION

Computer File Information		Sheet Revisions		Colorado Department of Transportation  4201 East Arkansas Avenue Denver, Colorado 80222 Phone: (303) 757-9083 Fax: (303) 757-9820 Project Development Branch DD/LTA	TEMPORARY EROSION CONTROL Issued By: Project Development Branch on July 4, 2012	STANDARD PLAN NO.	
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Appendix D
Example Inspection Form

COLORADO DEPARTMENT OF TRANSPORTATION

STORMWATER FIELD INSPECTION REPORT - ACTIVE CONSTRUCTION

(1) Project Name:	(2) Project Contractor:	(3) Erosion Control Supervisor/SWMP Administrator:	
(4) CDOT Project Engineer/Representative:	(5) Inspector(s) (Name and Title):	(6) CDOT Project Number:	
(7) Project Code (Sub Account #):	(8) CDPS-SCP Certification#:	(9) CDOT Region:	(10) Date of Project Inspection:
(11) Weather at Time of Inspection:			

(12) REASON FOR INSPECTION / EXCLUSION

- ☐ Routine Inspection: (minimum every 14 Calendar Days)
- ☐ Runoff Event: (Post-storm event inspections must be conducted within 24 hours after the end of any precipitation or snowmelt event that causes surface erosion. If no construction activities will occur following a storm event, post-storm event inspections shall be conducted prior to re-commencing construction activities, but no later than 72 hours following the storm event. The occurrence of any such delayed inspection must be documented in the inspection record.) Routine inspections still must be conducted every 14 calendar days.
- Storm Start Date: _____ Approximate End Time of Storm (hrs): _____
- ☐ Third Party Request:
- ☐ Winter Conditions Inspections Exclusion: Inspections are not required at sites where construction activities are temporarily halted, snow cover exists over the **entire site** for an extended period, and melting conditions posing a risk of surface erosion do not exist. This exception is applicable only during the period where **melting conditions do not exist**, and applies to the routine 14-day inspections, as well as the post-storm-event inspections. If **visual inspection** of the site verifies that all of these conditions are satisfied, document the conditions in section 18 (General Notes) and proceed to section 19 (Inspection Certification). Documentation must include: dates when snow cover occurred, date when construction activities ceased, and date when melting conditions began.
- ☐ Other:

(13) SWMP MANAGEMENT

(14) CURRENT CONSTRUCTION ACTIVITIES:

	Yes	No	NA	
(a) Is the SWMP notebook located on site?	☐	☐	☐	Estimate of disturbed area at the time of the inspection: _____ Acres
(b) Are changes to the SWMP documents noted and approved?	☐	☐	☐	
(c) Are the inspection reports retained in the SWMP notebook?	☐	☐	☐	
(d) Are corrective actions from the last inspection completed?	☐	☐	☐	
(e) Is a Spill Prevention Control and Countermeasure Plan retained at the project site?	☐	☐	☐	
(f) Is a list of potential pollutants retained at the site?	☐	☐	☐	

(15) BMPs ON SITE AT TIME OF INSPECTION

*See Inspection Report Instructions for more detail.

	In SWMP	Used	Not Needed at this time		In SWMP	Used	Not Needed at this time
(a) EROSION CONTROL BMPs ON SITE				(b) SEDIMENT CONTROL BMPs ON SITE			
Seeding	☐	☐	☐	Stabilized Const. Entrance	☐	☐	☐
Mulching/Mulch Tackifier	☐	☐	☐	Sediment Trap	☐	☐	☐
Soil Binder	☐	☐	☐	Inlet Protection*	☐	☐	☐
Soil Retention Blankets	☐	☐	☐	Sediment Basin	☐	☐	☐
Embankment Protector*	☐	☐	☐	Perimeter Control*	☐	☐	☐
Grading Techniques*	☐	☐	☐	Other:	☐	☐	☐
Berm/Diversion	☐	☐	☐	(d) MATERIALS HANDLING, SPILL PREVENTION, WASTE MANAGEMENT AND GENERAL POLLUTION PREVENTION			
Check Dams*	☐	☐	☐				
Outlet Protection*	☐	☐	☐				
(c) BMPs FOR SPECIAL CONDITIONS				Stockpile Management*	☐	☐	☐
Dewatering Structure	☐	☐	☐	Materials Management*	☐	☐	☐
Temp. Stream Crossing	☐	☐	☐	Concrete Waste Management*	☐	☐	☐
Clear Water Diversion	☐	☐	☐	Saw Water Management*	☐	☐	☐
Sensitive Area Fencing	☐	☐	☐	Solid Waste/Trash Management	☐	☐	☐
Other:	☐	☐	☐	Street Sweeping	☐	☐	☐
				Sanitary Facility*	☐	☐	☐
				Vehicle and Equip. Management	☐	☐	☐
				Other:	☐	☐	☐

page 2 of 5

Continuous maintenance is required on all BMPs. **BMPs that are not operating effectively, have proven to be inadequate, or have failed must be addressed as soon as possible, immediately in most cases.**

Stormwater Management Field Inspection Report Instructions

State waters are defined to be any and all surface and subsurface waters which are contained in or flow through the state, including, streams, rivers, lakes, drainage ditches, storm drains, ground water, and wetlands, but not including waters in sewage systems, waters in treatment works or disposal systems, waters in potable water distribution systems, and all water withdrawn for use until use and treatment have been completed. (Per subsection 107.25 and 25-8-103 (19) CRS)

(3) Erosion Control Supervisor/SWMP Administrator: Indicate the name of the individual responsible for implementing, maintaining and revising the SWMP.

(4) CDOT Project Engineer/Representative: Indicate the name of the CDOT representative performing the inspection with the ECS/SWMP Administrator. This person should be the Project Engineer or an authorized representative.

(9) CDPS-SCP Certification #: Indicate the Colorado Discharge Permit System (CDPS) Stormwater Construction Permit (SCP) (for Stormwater Discharges Associated with Construction Activities) certification number, issued by CDPHE, for the project which the report is being completed. Certification number can be found on the first page of the SCP.

(12) Reason(s) for Inspection / Exclusion: Indicate the purpose for the inspection or exclusion. These inspections are required to comply with the CDOT Specifications and the CDPS-SCP.

☐ Routine Inspections. These inspections are required at least every 14 calendar days during active construction. Suspended projects require the 14 calendar day inspection unless snow cover exists over the entire site for an extended period of time, and melting conditions do not exist (see, Winter Conditions Inspections Exclusions).

☐ Runoff Event Inspection for Active Sites. See page 1 for definition.

☐ Third Party Request. Indicate the name of the third party requesting the inspection and, if known, the reason the request was made.

☐ Winter Conditions Inspections Exclusions. See page 1 for definition. An inspection does not need to be completed, but use this form to document the conditions that meet the Exclusion.

☐ Other. Specify any other reason(s) that resulted in the inspection.

(13) SWMP Management: Review the SWMP records and documents and use a ✓ to answer the question. To comply with CDOT Standard Specifications and the CDPS-SCP, all of the items identified must be adhered to. If No is checked, document the reason and indicate the necessary corrective action in section 16 (Construction Site Assessment & Corrective Actions). If NA is checked, indicate why in the space provided or indicate in section 18 (General Notes).

(a) Is the SWMP notebook located on site? A copy of the SWMP notebook must be retained on site, unless another location, specified by the permit, is approved by the Division.

(b) Are changes to the SWMP documents noted and approved? Indicate all changes that have been made to any portion of the SWMP notebook documents during construction. Changes shall be dated and signed at the time of occurrence. Amendments may include items listed in subsection 208.03(c).

(c) Are the inspection reports retained in the SWMP notebook? The ECS/Engineer shall keep a record of inspections. Inspection reports must identify any incidents of non-compliance with the terms and conditions of the CDOT specifications or the CDPS-SCP. Inspection records must be retained for three years from expiration or inactivation of permit coverage.

(d) Are corrective actions from the last inspection completed? Have corrective actions from the last inspection been addressed? Is a description of the corrective action(s), the date(s) of the corrective action(s), and the measure(s) taken to prevent future violations (including changes to the SWMP, as necessary) documented?

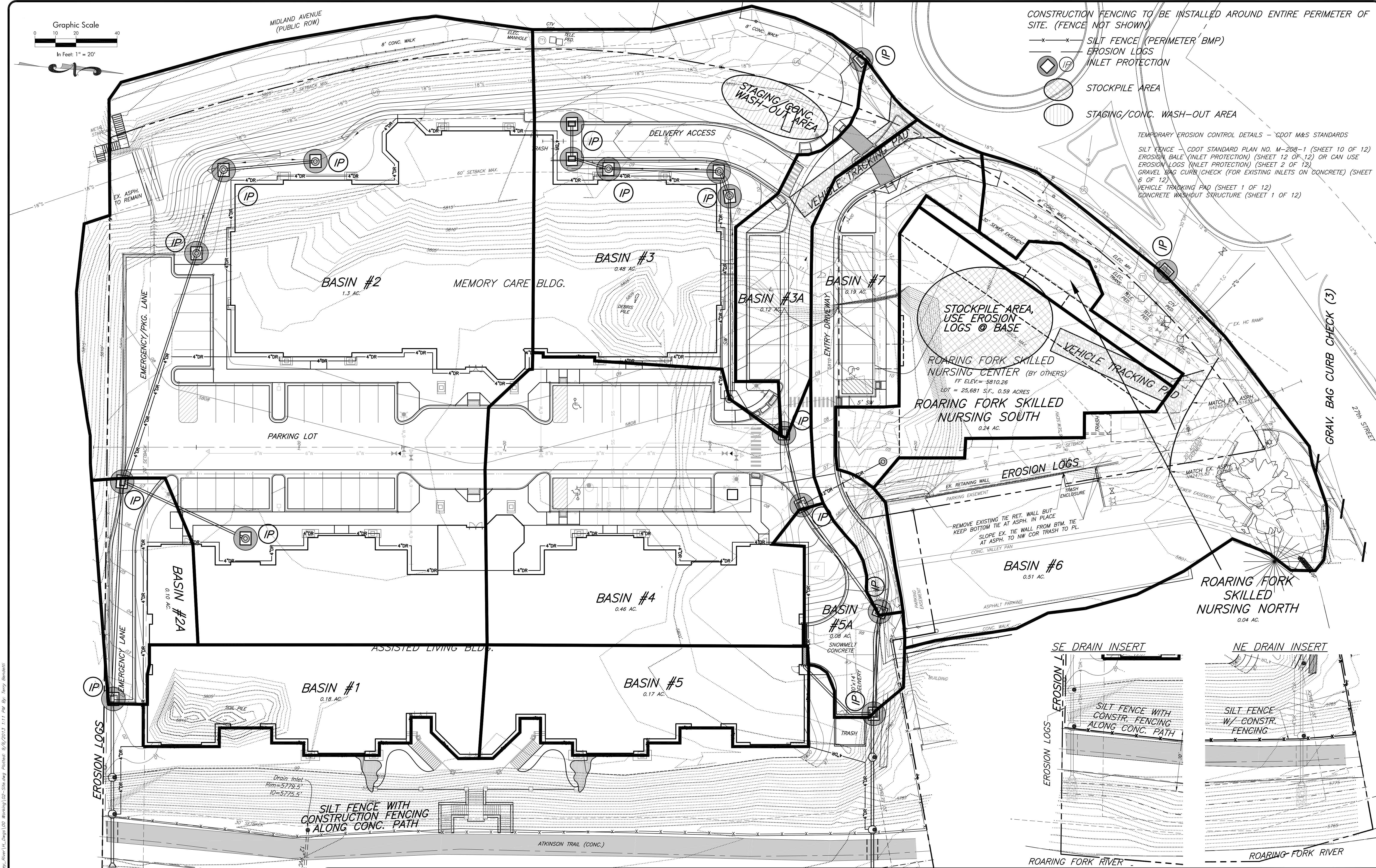
(e) Is a Spill Prevention Control and Countermeasure (SPCC) Plan retained in the SWMP notebook? Subsection 208.06(c) requires that a SPCC plan be developed and implemented to establish operating procedures and that the necessary employee training be provided to minimize accidental releases of pollutants that can contaminate stormwater runoff. Records of spills, leaks or overflows that result in the discharge of pollutants must be documented and maintained. Information that should be recorded for all occurrences include the time and date, weather conditions, reasons for spill, etc. Some spills may need to be reported to the Water Quality Control Division immediately.

(f) Is a list of potential pollutants retained at the site? Subsection 107.25(b)6 requires the Erosion Control Supervisor to identify and describe all potential pollutant sources, including materials and activities, and evaluate them for the potential to contribute pollutants to stormwater discharge.

(14) Current Construction Activities: Provide a short description of the current construction activities/phase at the project site; include summary of grading activities, installation of utilities, paving, excavation, landscaping, etc.

- Estimate the acres of disturbed area at the time of the inspection. Include clearing, grading, excavation activities, areas receiving overburden (e.g. stockpiles), demolition areas and areas with heavy equipment/vehicle traffic, installation of new or improved haul roads and access roads, staging areas, borrow areas and storage that will disturb existing vegetative cover.

(15) BMPs On Site at Time of Inspection: Indicate the BMPs that are installed on-site at the time of inspection. All BMP details (e.g., Standard Plan M-208-1) shall be included with the SWMP documents.



11/20/21 4:59:01 PM Stoney River Assisted Living - Stormwater Management - Erosion Control - Sheet 12 of 12 - 11/17/21 PM By: Terry Bandell

Release For
Construction



118 West Sixth Street, Suite 200
Glenwood Springs, CO 81601
970.945.1004 www.sgm-inc.com

Stoney River Assisted Living
Glenwood Springs, Co.

#	Revision	Date	By
1	Completeness Review	3/19/13	RM
2	Release For Construction	8/10/13	RM

Stormwater Management
& Erosion Control Plan

Job No.	2012-469.001
Drawn by:	RM
Date:	MARCH 7, 2013
QC:	AF PE: DMK
File:	02 Site

12
12



LAND USE APPLICATION

City of Glenwood Springs
Economic and Community Development Dept.
101 West 8th Street
Glenwood Springs, CO 81601
970-384-6411

Ordinance Amendments		Development Permits	
☐	Rezoning	☐	Site/Architectural Plan Review
☐	Rezoning to Planned Unit Development (PUD)	☐	Administrative
☐	Annexation	☐	Minor
☐	Condominiumization	☒	Major
☐	Annexation	☐	Master Plan
☐	Street Vacation	☐	Construction Plans
☐		☐	Location & Extent
Subdivisions		☐	Right of Way Encroachment License
☐	Minor Subdivision	☐	Floodplain Development Permit
☐	Preliminary Plat	☐	Special Use Permit
☐	Final Plat	Flexibility and Relief Procedures	
☐	Vacation of Right-of-Way	☐	Variance
☐		☐	Administrative Adjustment
Other Land Use Applications		☐	Appeal
☐	Outdoor Seating	☐	

Applicant/Property Owner Information:			
Kyle Mead, Shopworks Architecture		Justin Raddatz, Catholic Charities Housing	
Applicant		Owner	
Consultant			
Relationship to Owner		Owner	
301 W. 45th Ave., Denver, CO 80216		6240 Smith Road, Denver, CO 80216	
Applicant Address		Owner Address	
Phone 303-433-4094 x. 105	Email Address kyle@shopworksarc.com	Phone 720-639-7608	Email Address jraddatz@ccdenver.org

Property Information:	
2800 Midland Ave., Glenwood Springs, CO	
Address	Parcel Number
Subdivision	Lot and Block Number
Zone District RE (Resort)	Existing Land Use Vacant

General Project Description:
34 multifamily units

Signatures:		
The owner or applicant must be present at the hearing. All public hearings must be properly noticed according to G.S.M.C. Section 070.010.030. Signatures of all owners of the property must appear before the application is accepted. Partnerships or corporations may have the authorized general partner or corporate officer sign the	Kyle Mead	10/13/23
	Applicant	Date
	Justin Raddatz	
	Owner	Date

application. (Attach additional incorporation documents if necessary.) I declare under the penalty of perjury that the above information is true and correct to the best of my knowledge.		
	Owner	Date



October 17, 2023

Mr. Watkins Fulk-Gray
City of Glenwood Springs
Community Development Department
101 W. 8th Street
Glenwood Springs, CO 81601

Re: The Benedict Apartments – Neighborhood Meeting Summary

Dear Watkins,

In preparation for the submittal of a new Major Site Architectural Plan application for the Benedict Apartments project, the development team hosted a Neighborhood Meeting on Wednesday from 5:00 – 6:00 PM at the Glenwood Springs Community Center. Four neighbors attended, and although not all signed in, a sign-in sheet is attached to this letter for reference. Also attached to this letter is a copy of the notice letter that was sent to neighbors within 300' of the property line, along with the addresses and a notice vicinity map.

The meeting was conducted in an open-house format, with 7 foam boards portraying the project's concept and related information displayed on easels across the room. A .PDF copy of these boards are attached to this letter for reference. Members of the development team were available for questions and comments throughout the meeting, and comment cards were provided at the final table in the room. At the end of the meeting, no comment cards were returned; however, the neighbors in attendance expressed concerns over traffic congestion and views of Mt. Sopris being obstructed. Neighbors were offered business cards for the development team and the opportunity to leave their information to be added to a distribution list for future information on the project.

Sincerely,
Norris Design

Mallory Redmon
Planner

Notice of Neighborhood Meeting
The Benedict Apartments
2800 Midland Ave., Glenwood Springs, CO 81601
Major Site and Architectural Plan Review

Dear Neighbor,

On behalf of Catholic Charities Housing and its partners, we would like to invite you to an open house neighborhood meeting, on **Wednesday, September 27, 2023**, regarding a proposed multifamily residential community in the City of Glenwood Springs.

The proposed community includes approximately 34 for-rent apartments, all of which are proposed to be affordable. Tuck-under parking with additional surface parking across the site is proposed. Additionally, sidewalk improvements, as well as enhanced landscaping are included as part of the community.

This proposal requires a Major Site and Architectural Plan Review with the City, which will include public hearings (Planning Commission and City Council) at a later date. This neighborhood meeting is for informational purposes and aimed at answering questions and soliciting feedback from the community. The meeting will be an open house format, and you are welcome to attend at any time from 5-6pm to learn more about the project. You are receiving this notice because you own property within 300 feet of the subject property. A vicinity map is included with this notice. Representatives from the design team will be in attendance to present information and answer questions. Below are the specific details regarding the time and location of the meeting.

Meeting Information
Wednesday, September 27, 2023 from 5:00 – 6:00 PM
Glenwood Springs Community Center
Sopris Rooms (A + B)
100 Wulfsohn Road
Glenwood Spring, Colorado 81601

The Design Team Includes:

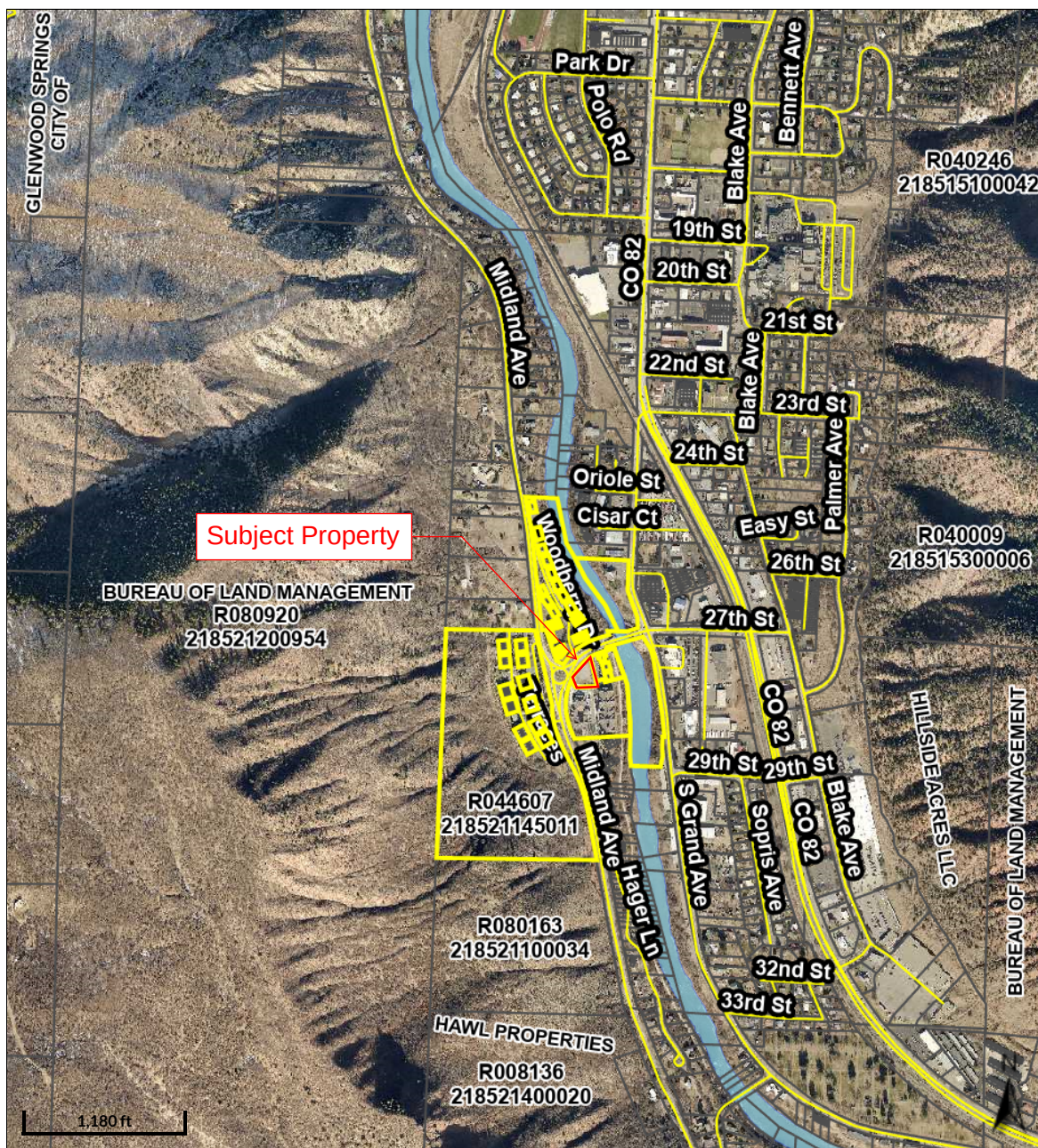
Catholic Charities Housing – Applicant / Developer
Sopris Engineering – Civil / Traffic Engineering
Shopworks Architecture – Architect
Norris Design – Planning / Landscape Architecture

We appreciate your interest and look forward to meeting local community members and hearing feedback on the proposal. If you have any questions or comments prior to the meeting, please contact Mallory Redmon at 303.892.1166 or mredmon@norris-design.com.

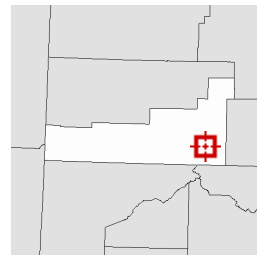
Sincerely,
Norris Design

Mallory Redmon

Mallory Redmon
Planner



Overview



Legend

- Parcels
- Roads
- Parcel/Account Numbers
- Owner Name
- Lakes & Rivers
- County Boundary Line

Date created: 8/24/2023
Last Data Uploaded: 8/24/2023 2:09:00 AM

Developed by  **Schneider**
GEOSPATIAL

OwnerName	OwnerAddress1	OwnerCityStZip
2800 MIDLAND LLC	6240 SMITH ROAD	DENVER CO 80216
ROARING FORK SENIOR REALTY LLC	155 W CENTRAL AVENUE	SPRINGBORO OH 45066
DALEY RF PROPERTY OWNER LLC	565 SANCTUARY DRIVE APT 8305	LONGBOAT KEY FL 34228
ROSS, GREGORY M	PO BOX 24754	SILVERTHORNE CO 80497
ORTNER, AVA K & THORPE, DONALD A JR	25289 SUTTON COURT	NOVI MI 48374
APODACA, ANTHONY	2685 WOODBERRY DRIVE	GLENWOOD SPRINGS CO 81601
BROCHIER, LUBA M G KOHN	2687 WOODBERRY DRIVE	GLENWOOD SPRINGS CO 81601
CHESLIK, JILL E	2665 WOODBERRY DRIVE	GLENWOOD SPRINGS CO 81601
VANDERHOOF, LINDA YOUNG LIVING TRUST	2663 WOODBERRY DIVE	GLENWOOD SPRINGS CO 81601
1315 GRAND LLC	PO BOX 2478	GLENWOOD SPRINGS CO 81602
POMEROY, FLINN & BOUGHTON, WOODSON HAGOO	2662 WOODBERRY DRIVE	GLENWOOD SPRINGS CO 81601
WALTER, JARED A	68 BEAVER COURT	GLENWOOD SPRINGS CO 81601
JONES, COURTNEY	2664 WOODBERRY DRIVE	GLENWOOD SPRINGS CO 81601
CASTRO, YOLANDA & ANTONIO GEOVANNI	2666 WOODBERRY DRIVE	GLENWOOD SPRINGS CO 81601
STANFIELD, TRACY A	87 W SUNLIGHT COURT	GLENWOOD SPRINGS CO 81601
FIEDLER, GRANT L & JENSENA L I	PO BOX 588	RIFLE CO 81650
ARNHOLD, RICK A	PO BOX 5785	EAGLE CO 81631
LAROCHE, BEATRICE SANDRINA	PO BOX 1755	GLENWOOD SPRINGS CO 81602
RICHARDSON SINGER TRUST	PO BOX 181	GLENWOOD SPRINGS CO 81602
KORTHALS, CATHERINE	42WO46 RETREAT COURT	SAINT CHARLES IL 60175
FLOTTMEYER, WENDY	2642 WOODBERRY DRIVE #2	GLENWOOD SPRINGS CO 81601
SALUGA, FAITH & ESQUIVEL, CARLOS A	2644 WOODBERRY DRIVE	GLENWOOD SPRINGS CO 81601
FIGUEROA, DEBRA M & DYLAN T	2646 WOODBERRY DRIVE	GLENWOOD SPRINGS CO 81601
RIVERS LLC	730 15TH STREET	BOULDER CO 80302
GLENWOOD SPRINGS, CITY OF	101 W 8TH STREET	GLENWOOD SPRINGS CO 81601
TERRACE GROUP LLC	1732 WAZEE # 206	DENVER CO 80202
GLENWOOD SPRINGS RACQUET CLUB ASSOCIATIO	PO BOX 1107	GLENWOOD SPRINGS CO 81602
COTTONWOOD LANDING TOWNHOUSE ASSOCIATION	1512 GRAND AVENUE SUITE 109	GLENWOOD SPRINGS CO 81601

**PROOF OF PUBLIC NOTICE
PRE-APPLICATION NEIGHBORHOOD MEETING**

I hereby affirm that Public Notice requirements of the Municipal Code of Glenwood Springs have been met for the Pre-Application Neighborhood Meeting held:

at 100 Wulfsohn Rd., Glenwood Springs, CO 81601

(Location)

on September 27, 2023

(Date)

Attached are:

1. A list of names and addresses of owners of record of all property within 300 feet of the subject property and registered neighborhood groups that have boundaries including the proposed project site.

Date mailed: 9/11/23;

2. A list of the meeting attendees;
3. A summary of the meeting.

Name: Mallory Redmon
Applicant

Date: September 27, 2023

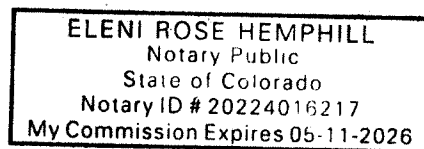
Subscribed and sworn to before me, a notary public in and for the County of
Denver, State of Colorado, this 27th day of
September 2023, A.D.

Witness my hand and official seal

(SEAL)

Eleni Rose Hemphill
Notary Public

My commission expires: 5/11/26





Certificate of Mailing — Firm

Name and Address of Sender Norris Design, Inc 1101 Bannock Street Denver, CO 80204 <i>The Benedict</i> <i>0249-01-3445</i>		TOTAL NO. of Pieces Listed by Sender <i>6</i> <i>(28 TOTAL)</i>	TOTAL NO. of Pieces Received at Post Office™	Affix Stamp Here <i>Postmark with Date of Receipt.</i>  0000 U.S. POSTAGE PAID DENVER, CO 80204 SEP 11, 23 AMOUNT \$12.85 R2303S104340-15			
USPS® Tracking Number Firm-specific Identifier		Address (Name, Street, City, State, and ZIP Code™)		Postage	Fee	Special Handling	Parcel Airlift
1.		COTTONWOOD LANDING TOWNHOUSE ASSOCIATION 1512 GRAND AVENUE SUITE 109 GLENWOOD SPRINGS CO 81601					
2.		GLENWOOD SPRINGS RACQUET CLUB ASSOCIATION PO BOX 1107 GLENWOOD SPRINGS CO 81602					
3.		TERRACE GROUP LLC 1732 WAZEE # 206 DENVER CO 80202					
4.		GLENWOOD SPRINGS, CITY OF 101 W 8TH STREET GLENWOOD SPRINGS CO 81601					
5.		RIVERS LLC 730 15TH STREET BOULDER CO 80302					
6.		FIGUEROA, DEBRA M & DYLAN T 2646 WOODBERRY DRIVE GLENWOOD SPRINGS CO 81601					



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USPS® Tracking Number Firm-specific Identifier		Address (Name, Street, City, State, and ZIP Code™)		Postage	Fee	Special Handling	Parcel Airlift
1.		SALUGA, FAITH & ESQUIVEL, CARLOS A 2644 WOODBERRY DRIVE GLENWOOD SPRINGS CO 81601					
2.		FLOTTMEYER, WENDY 2642 WOODBERRY DRIVE #2 GLENWOOD SPRINGS CO 81601					
3.		KORTHALS, CATHERINE 42WO46 RETREAT COURT SAINT CHARLES IL 60175					
4.		RICHARDSON SINGER TRUST PO BOX 181 GLENWOOD SPRINGS CO 81602					
5.		LAROCHE, BEATRICE SANDRINA PO BOX 1755 GLENWOOD SPRINGS CO 81602					
6.		ARNHOLD, RICK A PO BOX 5785 EAGLE CO 81631					



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	Postmaster, per (name of receiving employee)					

USPS® Tracking Number Firm-specific Identifier	Address (Name, Street, City, State, and ZIP Code™)	Postage	Fee	Special Handling	Parcel Airlift
1.	FIEDLER, GRANT L & JENSEN L I PO BOX 588 RIFLE CO 81650				
2.	STANFIELD, TRACY A 87 W SUNLIGHT COURT GLENWOOD SPRINGS CO 81601				
3.	CASTRO, YOLANDA & ANTONIO GEOVANNI 2666 WOODBERRY DRIVE GLENWOOD SPRINGS CO 81601				
4.	JONES, COURTNEY 2664 WOODBERRY DRIVE GLENWOOD SPRINGS CO 81601				
5.	WALTER, JARED A 68 BEAVER COURT GLENWOOD SPRINGS CO 81601				
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	Postmaster, per (name of receiving employee)					



USPS® Tracking Number Firm-specific Identifier	Address (Name, Street, City, State, and ZIP Code™)	Postage	Fee	Special Handling	Parcel Airlift
1.	1315 GRAND LLC PO BOX 2478 GLENWOOD SPRINGS CO 81602				
2.	VANDERHOOF, LINDA YOUNG LIVING TRUST 2663 WOODBERRY DIVE GLENWOOD SPRINGS CO 81601				
3.	CHESLIK, JILL E 2665 WOODBERRY DRIVE GLENWOOD SPRINGS CO 81601				
4.	BROCHIER, LUBA M G KOHN 2687 WOODBERRY DRIVE GLENWOOD SPRINGS CO 81601				
5.	APODACA, ANTHONY 2685 WOODBERRY DRIVE GLENWOOD SPRINGS CO 81601				
6.	ORTNER, AVA K & THORPE, DONALD A JR 25289 SUTTON COURT NOVI MI 48374				



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Postmaster, per (name of receiving employee)						
USPS® Tracking Number Firm-specific Identifier	Address (Name, Street, City, State, and ZIP Code™)		Postage	Fee	Special Handling	Parcel Airlift
1.	ROSS, GREGORY M PO BOX 24754 SILVERTHORNE CO 80497					
2.	DALEY RF PROPERTY OWNER LLC 565 SANCTUARY DRIVE APT 8305 LONGBOAT KEY FL 34228					
3.	ROARING FORK SENIOR REALTY LLC 155 W CENTRAL AVENUE SPRINGBORO OH 45066					
4.	2800 MIDLAND LLC 6240 SMITH ROAD DENVER CO 80216					
5.						
6.						

Welcome!

Development Team:



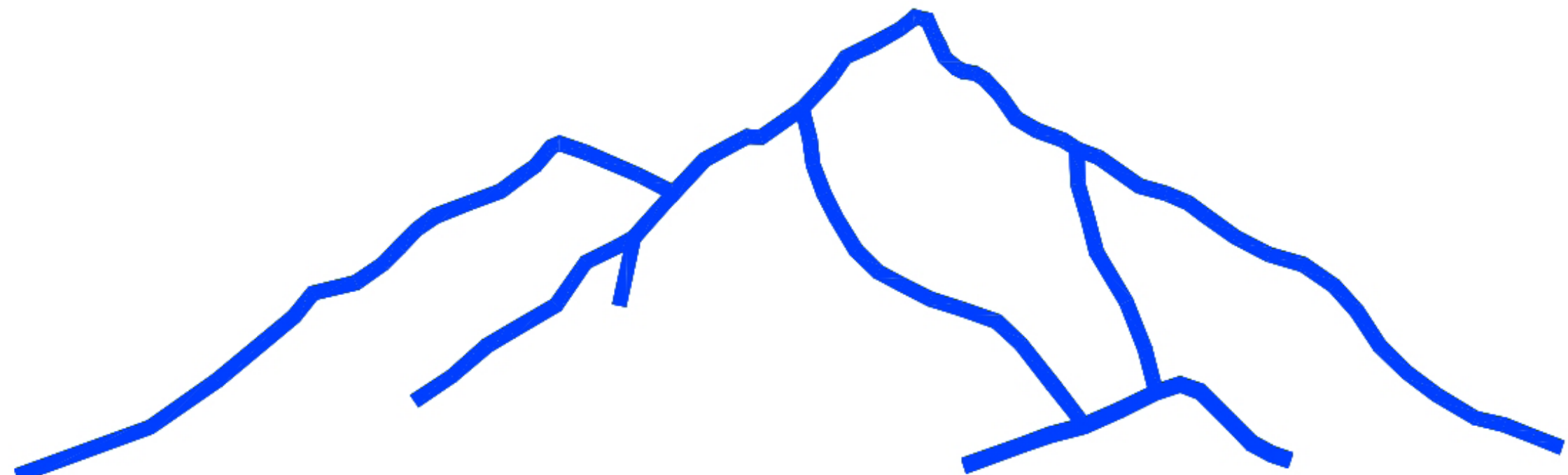
Applicant/Developer



Architecture



Planning Services and Landscape Architecture



SOPRIS ENGINEERING LLC

Engineering Services

How to Participate:

- 1. Boards around the room are numbered to help guide you.
- 2. The development team is here to answer questions.
- 3. Comment cards are provided at the end. Please feel free to send additional comments or questions to Mallory Redmon at Norris Design: mredmon@norris-design.com

History

Fritz Benedict was a prolific architect from the 1940's-1980's in Aspen, CO. He is best known for setting buildings into the landscape in a harmonious way, which reflects his landscape training and Frank Lloyd Wright's influence. He pioneered in passive solar and earth shelter design, exemplified in his own solar and sod-roofed residence at Stillwater Ranch (1958). His masterwork, the Edmundson Waterfall House, an homage to Wright's Fallingwater, shared many of the characteristics of Wrightian design - above all, an intimate and specific relation to its site.



Fritz Benedict
1914-1995

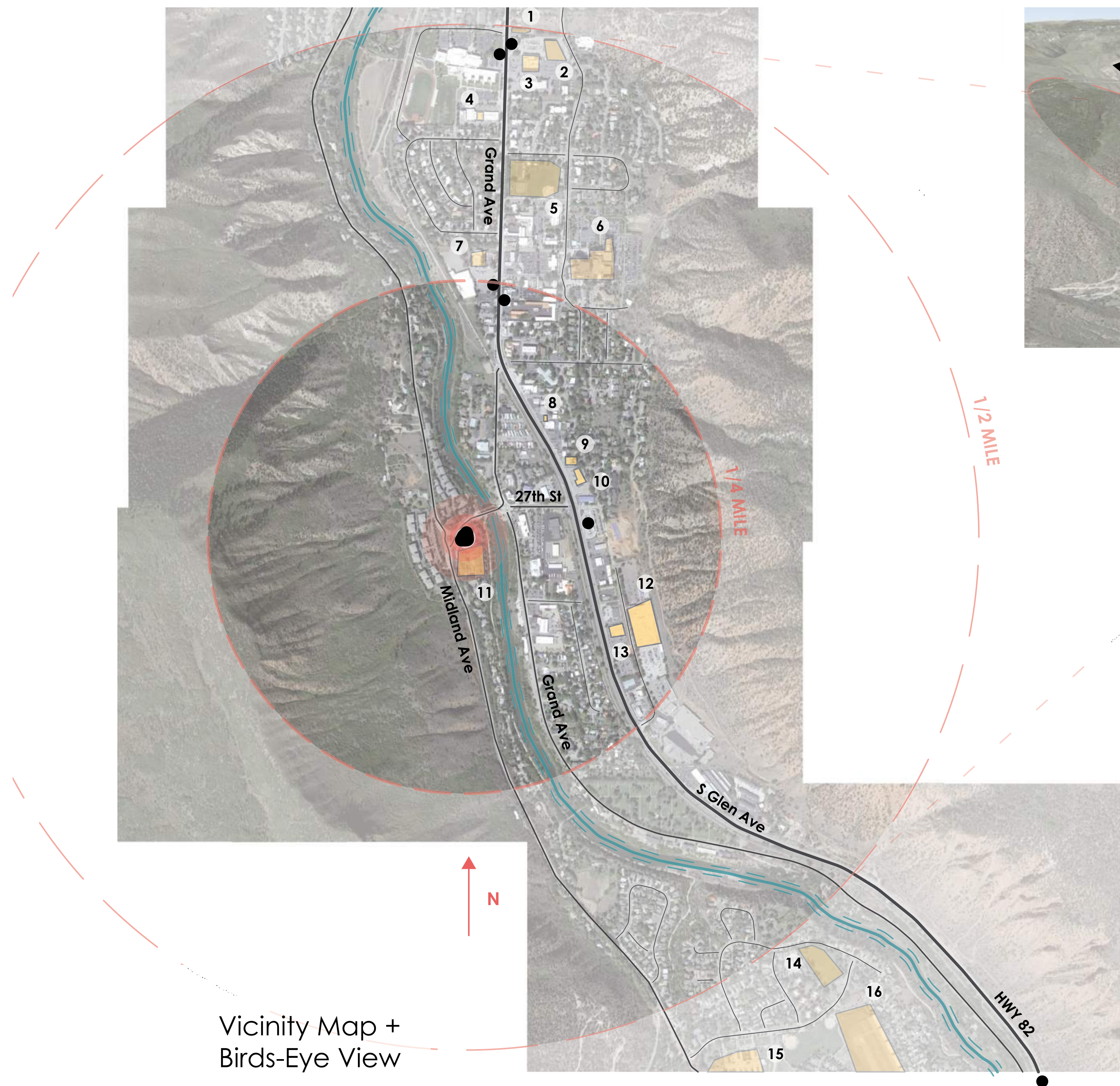


Bidwell-Mountain Plaza Building (1965)

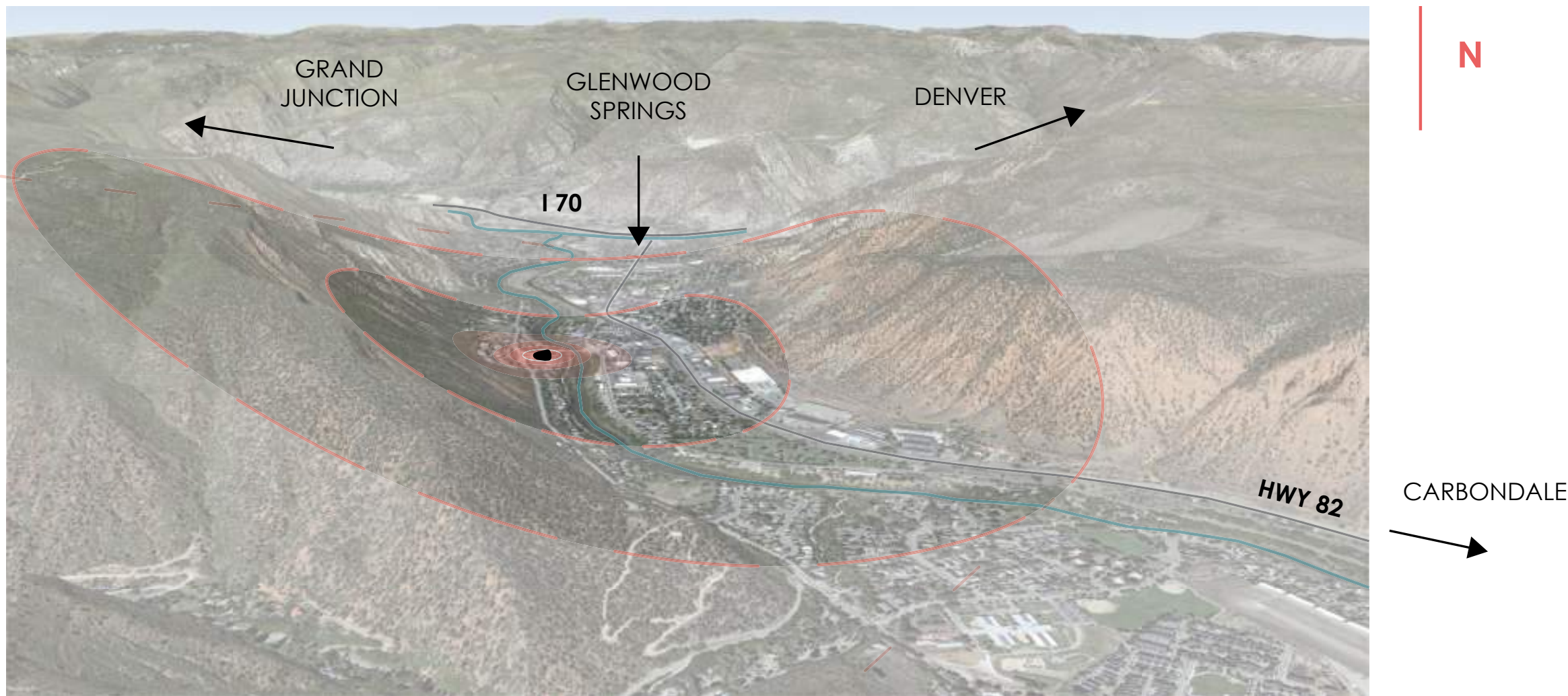


Aspen - Pitkin County Library (1966)

Vicinity Map



Vicinity Map +
Birds-Eye View



Main Roads	—
Secondary Roads	—
Side Roads	—
Bus Stops	●
River	—

1	The UPS Store	9	Community Thrift
2	City Market	10	Ace Hardware
3	Walgreens	11	Roaring Fork Senior Living
4	ZA Pizza	12	Walmart
5	Sayre Park	13	AutoZone
6	Glenwood Springs Hospital	14	Sullivan Park
7	US Banks	15	Mountain Valley
8	Sweet Coloradough Donuts		Developmental Services
		16	Glenwood Springs Airport

Proposed Site Plan

THE BENEDICT APARTMENTS

LOT SIZE	±0.548 ACRES (28,879.80 SF)
LOT COVERAGE	37%
BUILDING FOOTPRINT	10,841 SF
CONSTRUCTION TYPE	TYPE V
SPRINKLER SYSTEM	NFPA 13
NUMBER OF STORIES	4-STORIES
TOTAL BUILDING HEIGHT	APPROX. 55'-0" (60' MAX)
DWELLING UNITS TOTAL	34 1-BED UNITS
SURFACE PARKING STALLS	17
TUCK-UNDER PARKING STALLS	25
TOTAL PARKING STALLS	39
ACCESSIBLE PARKING	3
JURISDICTION	GARFIELD COUNTY
BUILDING CODES	2021 - INTERNATIONAL BUILDING CODE 2021 - INTERNATIONAL MECHANICAL CODE 2021 - INTERNATIONAL PLUMBING CODE 2021 - INTERNATIONAL ENERGY CODE 2021 - INTERNATIONAL FIRE CODE 2020 - NATIONAL ELECTRICAL CODE
LOCAL AMENDMENTS	2022 - ORDINANCE NO. 06
ZONING	RE (RESORT)
PRIMARY STREET	27TH STREET
SIDE STREET	MIDLAND AVENUE
FRONT SETBACK	5'-0"
SIDE SETBACK	5'-0"
REAR SETBACK	10'-0"
MAXIMUM HEIGHT	60'-0"
ENERGY COMPLIANCE	NGBS BRONZE

PROJECT SUMMARY:
NEW CONSTRUCTION OF A 4-STORY APARTMENT BUILDING WITH 35 UNITS, RESIDENTIAL AMENITIES, AND COURTYARD ACCESS ON LEVEL 2. THERE ARE (39) TOTAL (STANDARD AND COMPACT) PARKING STALLS IN ADDITION TO (3) ACCESSIBLE PARKING STALLS. TUCK-UNDER PARKING IS ROUGHLY AT GRADE ON THE WEST, AND SURFACE PARKING TO THE SOUTH.



LOBBY LEVEL

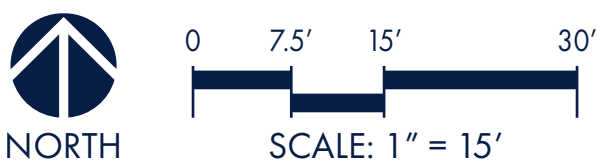


AMENITY LEVEL



LEVELS 3-4

Preliminary Site Plan



4

Elevations



View fromRoaring Fork Senior Living



Max 60' from lowest grade

5

Site Plan Compliance with the Comprehensive Plan

- 1. Promote long-term, sustainable, and diverse economic development.
- 2. Provide equitable and diverse housing for the entire community.
- 3. Encourage redevelopment and prioritize public investment in identified revitalized areas to spur private investment.





The Benedict Apartments – Public Art Plan

The Benedict Apartments will pay a fee-in-lieu in the approximate amount of \$1336.56 for the Public Art Plan. This fee-in-lieu satisfies the requirements outlined in the Glenwood Springs Municipal Code Section 090.080. The fee will be paid upon issuance of the building permit.



Kumar & Associates, Inc.®
Geotechnical and Materials Engineers
and Environmental Scientists

5020 County Road 154
Glenwood Springs, CO 81601
phone: (970) 945-7988
fax: (970) 945-8454

email: kaglenwood@kumarusa.com

www.kumarusa.com

An Employee Owned Company

Office Locations: Denver (HQ), Parker, Colorado Springs, Fort Collins, Glenwood Springs, and Summit County, Colorado

**SUBSOIL STUDY
FOR FOUNDATION DESIGN
PROPOSED RESIDENTIAL BUILDING
2800 MIDLAND AVENUE
GLENWOOD SPRINGS, COLORADO**

PROJECT NO. 21-7-881

JANUARY 6, 2022

PREPARED FOR:

**ARCHDIOCESAN HOUSING
ATTN: JUSTIN RADDATZ
6240 SMITH ROAD
DENVER, COLORADO 80216
jraddatz@archhousing.com**

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PURPOSE AND SCOPE OF STUDY

This report presents the results of a subsoil study for a proposed residential building to be located at 2800 Midland Avenue, Glenwood Springs, Colorado. The project site is shown on Figure 1. The purpose of the study was to develop recommendations for the foundation design. The study was conducted in accordance with our proposal for geotechnical engineering services to Archdiocesan Housing dated October 22, 2021.

A field exploration program consisting of exploratory borings was conducted to obtain information on the subsurface conditions. Samples of the subsoils obtained during the field exploration were tested in the laboratory to determine their classification, compressibility or swell and other engineering characteristics. The results of the field exploration and laboratory testing were analyzed to develop recommendations for foundation types, depths and allowable pressures for the proposed building foundation. This report summarizes the data obtained during this study and presents our conclusions, design recommendations and other geotechnical engineering considerations based on the proposed construction and the subsurface conditions encountered.

PROPOSED CONSTRUCTION

The proposed development plan was conceptual at the time of our study. In general, the building will be a multi-level structure located within the majority of the building envelope area shown on Figure 1. Ground floor will be slab-on-grade or structural above crawlspace with an elevation near the existing site grade. Grading for the structure is assumed to be relatively minor with cut depths between about 2 to 5 feet. We assume relatively light foundation loadings, typical of the proposed type of construction.

When building location, grading and loading information have been developed, we should be notified to re-evaluate the recommendations presented in this report.

SITE CONDITIONS

The lot was vacant at the time of our study and had been used for construction staging or parking. The ground surface slopes gently down to the northeast at around 5 to 8% grade and about 5 feet of elevation difference across the general building area. The lot was mostly devoid of vegetation with road gravel surface except for the perimeter with landscape bushes and relatively small trees.

GEOLOGY REPORT

The subject property is mapped as being in an area potentially impacted by debris flow and rockfall (Lincoln-DeVore, 1978). The debris flow potential is from a series of coalescing ephemeral drainages and the rockfall is from the steep valley side several hundred feet west of the property. Considering the past grading of the property, existing uphill structure development and location across Midland Avenue, in our opinion, mitigation of a potential debris flow or rockfall event is not warranted. Proper grading to not adversely impact adjacent properties from potential storm runoff should be provided as described in the “Surface Drainage” section of this report.

The subsoils at the site are mapped as alluvial fan deposits with a moderate potential for hydro-compression (Lincoln-DeVore, 1978). Based on the subsoil information obtained for this study, the hydro-compression potential is low considering the deposit depth of around 20 feet and our evaluation of the soil compressibility potential. Foundation design recommendations provided below should be followed to mitigate the risk of foundation settlement and distress.

FIELD EXPLORATION

The field exploration for the project was conducted on December 20, 2021. Three exploratory borings were drilled at the approximate locations shown on Figure 1 to evaluate the subsurface conditions. The borings were advanced with 4-inch diameter continuous flight augers powered by a truck-mounted CME-45B drill rig. The borings were logged by a representative of Kumar & Associates.

Samples of the subsoils were taken with 1⅜ inch and 2-inch I.D. spoon samplers. The samplers were driven into the subsoils at various depths with blows from a 140 pound hammer falling 30 inches. This test is similar to the standard penetration test described by ASTM Method D-1586. The penetration resistance values are an indication of the relative density or consistency of the subsoils. Depths at which the samples were taken and the penetration resistance values are shown on the Logs of Exploratory Borings, Figure 2. The samples were returned to our laboratory for review by the project engineer and testing.

SUBSURFACE CONDITIONS

Graphic logs of the subsurface conditions encountered at the site are shown on Figure 2. The subsoils encountered, below about 6 to 7 feet of man-placed fill, consist of very stiff to medium stiff with depth, sandy clay and silt with scattered gravel overlying dense, silty sandy gravel and cobbles with probable boulders below about 25 feet. Drilling in the coarse granular soils with

auger equipment was difficult due to the cobbles and boulders and drilling refusal was encountered in the deposit. The fill material varied in gradation and consistency but was mainly granular soil and medium dense.

Laboratory testing performed on samples obtained from the borings included natural moisture content and density, finer than sand size gradation analyses, liquid and plastic limits and unconfined compressive strength. Results of swell-consolidation testing performed on relatively undisturbed drive samples of the clay and silt soils, presented on Figure 4, indicate low to moderate compressibility under conditions of loading and wetting. Results of unconfined compressive strength testing indicate the clay and silt soil to be stiff to very stiff. The liquid and plastic limits testing indicates low plasticity. The laboratory testing is summarized in Table 1.

No free water was encountered in the borings at the time of drilling and the subsoils were slightly moist to moist.

FOUNDATION BEARING CONDITIONS

The natural clay and silt soils have low bearing capacity and low to moderate compressibility under loading with low additional collapse potential when wetted. The existing fill soils appear relatively well compacted but their suitability for building support should be further evaluated at the time of construction and the need for sub-excavation and replacement with structural fill. Lightly loaded spread footings placed on suitable compacted fill soils or the natural clay and silt soils can be used for the building support with a risk of settlement depending mainly on the building loading and potential subsurface wetting. If relatively heavy foundation loads are proposed, deep foundation support, such as with driven piles or drilled piers extending down into the dense gravel and cobbles soils should be used.

Presented below are recommendations for a shallow foundation bearing within the upper soils. If a deep foundation is desired, we should be contacted for additional analysis and recommendations.

DESIGN RECOMMENDATIONS

FOUNDATIONS

Considering the subsurface conditions encountered in the exploratory borings and the nature of the proposed construction, we recommend the building be founded with spread footings bearing on adequately compacted structural fill or the natural soils.

The design and construction criteria presented below should be observed for a spread footing foundation system.

- 1) Footings placed on structural fill or the undisturbed natural soils should be designed for an allowable bearing pressure of 2,000 psf. Based on experience, we expect settlement of footings designed and constructed as discussed in this section will be about 1 inch or less with up to around 1 inch of additional differential settlement if the bearing soils are wetted. When the building foundation loadings have been determined, we should perform foundation settlement analysis.
- 2) The footings should have a minimum width of 18 inches for continuous walls and 2 feet for isolated pads.
- 3) Exterior footings and footings beneath unheated areas should be provided with adequate soil cover above their bearing elevation for frost protection. Placement of foundations at least 36 inches below exterior grade is typically used in this area.
- 4) Continuous foundation walls should be heavily reinforced top and bottom to span local anomalies such as by assuming an unsupported length of at least 14 feet. Foundation walls acting as retaining structures should also be designed to resist lateral earth pressures as discussed in the "Foundation and Retaining Walls" section of this report.
- 5) Loose or disturbed soils should be removed and the footing bearing level extended down to the relatively dense fill soils or firm natural soils. The exposed soils in footing area should then be evaluated for relative compaction of at least 98% standard Proctor density and removed and replaced compacted as need to achieve the minimum recommended density.
- 6) A representative of the geotechnical engineer should observe all footing excavations prior to concrete placement to evaluate bearing conditions.

FOUNDATION AND RETAINING WALLS

Foundation walls and retaining structures which are laterally supported and can be expected to undergo only a slight amount of deflection should be designed for a lateral earth pressure computed on the basis of an equivalent fluid unit weight of at least 50 pcf for backfill consisting of the on-site predominantly granular soils. Cantilevered retaining structures which are separate from the building and can be expected to deflect sufficiently to mobilize the full active earth pressure condition should be designed for a lateral earth pressure computed on the basis of an equivalent fluid unit weight of at least 40 pcf for backfill consisting of the on-site predominantly granular soils. Backfill should not contain organics, debris or rock larger than about 6 inches.

All foundation and retaining structures should be designed for appropriate hydrostatic and surcharge pressures such as adjacent footings, traffic, construction materials and equipment. The pressures recommended above assume drained conditions behind the walls and a horizontal backfill surface. The buildup of water behind a wall or an upward sloping backfill surface will increase the lateral pressure imposed on a foundation wall or retaining structure. An underdrain should be provided to prevent hydrostatic pressure buildup behind walls.

Backfill should be placed in uniform lifts and compacted to at least 90% of the maximum standard Proctor density at near optimum moisture content. Backfill placed in pavement and walkway areas should be compacted to at least 95% of the maximum standard Proctor density. Care should be taken not to overcompact the backfill or use large equipment near the wall, since this could cause excessive lateral pressure on the wall. Some settlement of deep foundation wall backfill should be expected, even if the material is placed correctly, and could result in distress to facilities constructed on the backfill.

The lateral resistance of foundation or retaining wall footings will be a combination of the sliding resistance of the footing on the foundation materials and passive earth pressure against the side of the footing. Resistance to sliding at the bottoms of the footings can be calculated based on a coefficient of friction of 0.40. Passive pressure of compacted backfill against the sides of the footings can be calculated using an equivalent fluid unit weight of 400 pcf. The coefficient of friction and passive pressure values recommended above assume ultimate soil strength. Suitable factors of safety should be included in the design to limit the strain which will occur at the ultimate strength, particularly in the case of passive resistance. Fill placed against the sides of the footings to resist lateral loads should be a granular material compacted to at least 95% of the maximum standard Proctor density at a moisture content near optimum.

FLOOR SLABS

The natural on-site soils and adequately compacted fill materials are suitable to support lightly loaded slab-on-grade construction. To reduce the effects of some differential movement, floor slabs should be separated from all bearing walls and columns with expansion joints which allow unrestrained vertical movement. Floor slab control joints should be used to reduce damage due to shrinkage cracking. The requirements for joint spacing and slab reinforcement should be established by the designer based on experience and the intended slab use. A minimum 4-inch layer of relatively well graded sand and gravel, such as road base, should be placed beneath slabs for support. This material should consist of minus 2-inch aggregate with at least 50% retained on the No. 4 sieve and less than 12% passing the No. 200 sieve.

All fill materials for support of floor slabs should be compacted to at least 95% of maximum standard Proctor density at a moisture content near optimum. Required fill can consist of the onsite predominantly granular soils devoid of vegetation, topsoil and oversized rock.

UNDERDRAIN SYSTEM

It is our understanding the proposed finished floor elevation at the lowest level is at or above the surrounding grade and the crawlspace (if provided) is relatively shallow. Therefore, a foundation drain system is not required. It has been our experience in the area that local perched groundwater can develop during times of heavy precipitation or seasonal runoff. Frozen ground during spring runoff can create a perched condition. We recommend below-grade construction, such as retaining walls and basement areas, be protected from wetting and hydrostatic pressure buildup by an underdrain and wall drain system.

If the finished floor elevation of the proposed structure is revised to have a floor level below the surrounding grade, we should be contacted to provide recommendations for an underdrain system. All earth retaining structures should be properly drained.

SURFACE DRAINAGE

The following drainage precautions should be observed during construction and maintained at all times after the building has been completed:

- 1) Inundation of the foundation excavations and underslab areas should be avoided during construction.
- 2) Exterior backfill should be adjusted to near optimum moisture and compacted to at least 95% of the maximum standard Proctor density in pavement and slab areas and to at least 90% of the maximum standard Proctor density in landscape areas.
- 3) The ground surface surrounding the exterior of the building should be sloped to drain away from the foundation in all directions. We recommend a minimum slope of 6 inches in the first 10 feet in unpaved areas and a minimum slope of 2 inches in the first 10 feet in paved areas.
- 4) Roof downspouts and drains should discharge well beyond the limits of all backfill.
- 5) Landscaping which requires regular heavy irrigation should be located at least 5 feet from foundation walls. Consideration should be given to use of xeriscape to reduce the potential for wetting of soils below the building caused by irrigation.

LIMITATIONS

This study has been conducted in accordance with generally accepted geotechnical engineering principles and practices in this area at this time. We make no warranty either express or implied. The conclusions and recommendations submitted in this report are based upon the data obtained from the exploratory borings drilled at the locations indicated on Figure 1, the proposed type of construction and our experience in the area. Our services do not include determining the presence, prevention or possibility of mold or other biological contaminants (MOBC) developing in the future. If the client is concerned about MOBC, then a professional in this special field of practice should be consulted. Our findings include interpolation and extrapolation of the subsurface conditions identified at the exploratory borings and variations in the subsurface conditions may not become evident until excavation is performed. If conditions encountered during construction appear different from those described in this report, we should be notified so that re-evaluation of the recommendations may be made.

This report has been prepared for the exclusive use by our client for design purposes. We are not responsible for technical interpretations by others of our information. As the project evolves, we should provide continued consultation and field services during construction to review and monitor the implementation of our recommendations, and to verify that the recommendations have been appropriately interpreted. Significant design changes may require additional analysis or modifications to the recommendations presented herein. We recommend on-site observation of excavations and foundation bearing strata and testing of structural fill by a representative of the geotechnical engineer.

Respectfully Submitted,

Kumar & Associates, Inc.

Steven L. Pawlak, P.E.

Reviewed by:



Daniel E. Hardin, P.E.

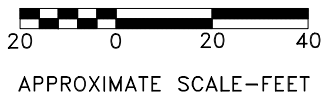
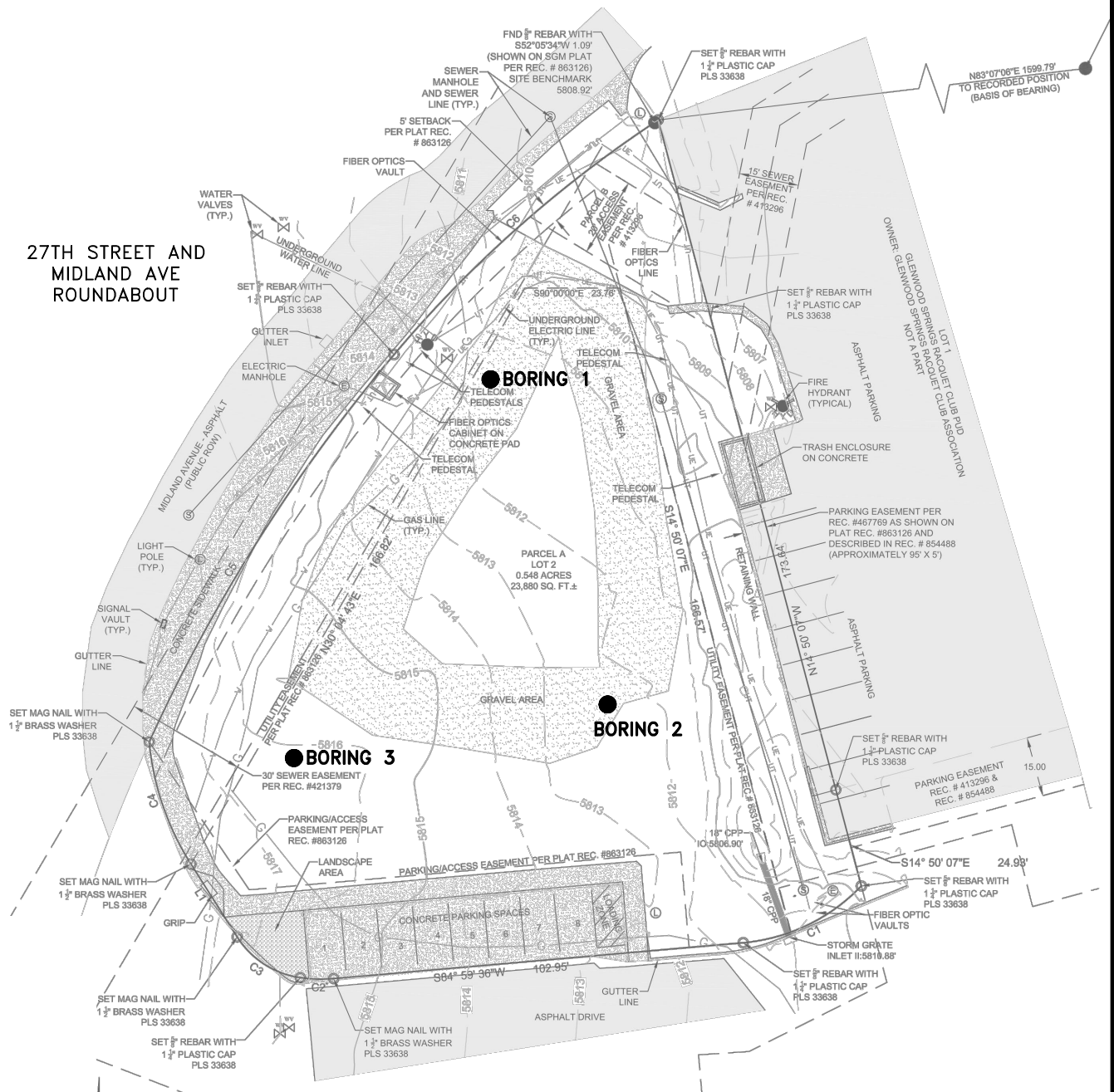
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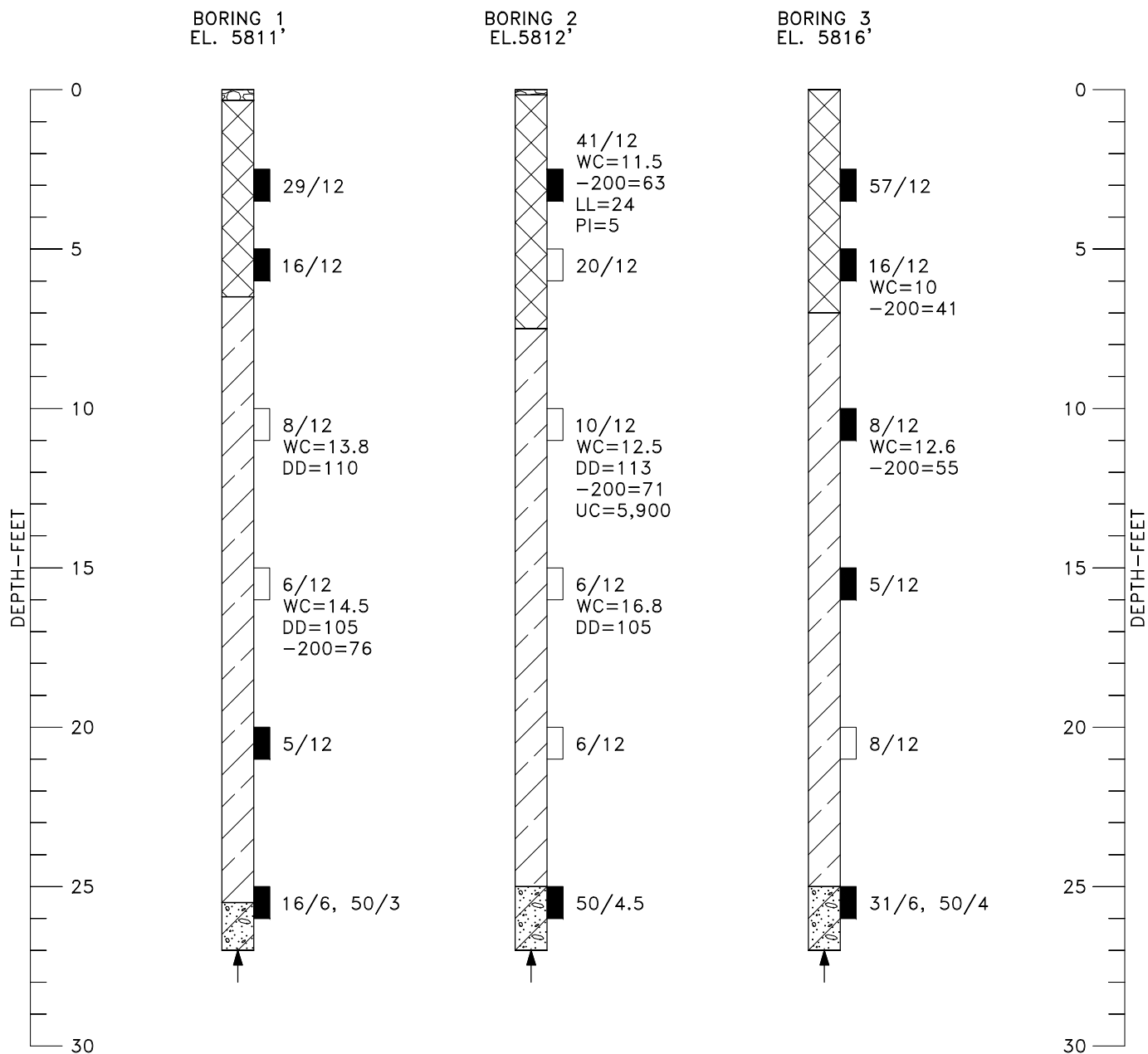


REFERENCE

Lincoln-DeVore, 1978. *Geologic Hazards of the Glenwood Springs Metropolitan Area, Garfield County, Colorado*. Colorado Geological Survey Open File Report 78-10.

27TH STREET AND MIDLAND AVE ROUNDBOUT





LEGEND



ROAD BASE; 2 TO 4 INCHES THICK.



FILL: MIXED SILT, CLAY AND SAND, WITH GRAVEL AND COBBLES, SOME DEBRIS AND ASPHALT FRAGMENTS, MEDIUM DENSE, SLIGHTLY MOIST TO MOIST, MIXED GRAY-BROWN.



CLAY AND SILT (CL-ML); SANDY TO VERY SANDY, SCATTERED GRAVEL, VERY STIFF TO MEDIUM STIFF WITH DEPTH, SLIGHTLY MOIST TO MOIST WITH DEPTH, RED, BROWN-RED, TRACE CALCAREOUS.



GRAVEL AND COBBLES (GM); SILTY, SANDY, PROBABLE BOULDERS, DENSE, SLIGHTLY MOIST, MIXED LIGHT GRAY-BROWN, ROUNDED ROCK.



DRIVE SAMPLE, 2-INCH I.D. CALIFORNIA LINER SAMPLE.



DRIVE SAMPLE, 1 3/8-INCH I.D. SPLIT SPOON STANDARD PENETRATION TEST.

29/12

DRIVE SAMPLE BLOW COUNT. INDICATES THAT 29 BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES WERE REQUIRED TO DRIVE THE SAMPLER 12 INCHES.



PRACTICAL AUGER REFUSAL.

NOTES

1. THE EXPLORATORY BORINGS WERE DRILLED ON DECEMBER 20, 2021 WITH A 4-INCH DIAMETER CONTINUOUS-FLIGHT POWER AUGER.
2. THE LOCATIONS OF THE EXPLORATORY BORINGS WERE MEASURED APPROXIMATELY BY PACING FROM FEATURES SHOWN ON THE SITE PLAN PROVIDED.
3. THE ELEVATIONS OF THE EXPLORATORY BORINGS WERE OBTAINED BY INTERPOLATION BETWEEN CONTOURS ON THE SITE PLAN PROVIDED.
4. THE EXPLORATORY BORING LOCATIONS AND ELEVATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
5. THE LINES BETWEEN MATERIALS SHOWN ON THE EXPLORATORY BORING LOGS REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN MATERIAL TYPES AND THE TRANSITIONS MAY BE GRADUAL.
6. GROUNDWATER WAS NOT ENCOUNTERED IN THE BORINGS AT THE TIME OF DRILLING.
7. LABORATORY TEST RESULTS:
 - WC = WATER CONTENT (%) (ASTM D2216);
 - DD = DRY DENSITY (pcf) (ASTM D2216);
 - 200 = PERCENTAGE PASSING NO. 200 SIEVE (ASTM D1140);
 - LL = LIQUID LIMIT (ASTM D4318);
 - PI = PLASTICITY INDEX (ASTM D4318);
 - UC = UNCONFINED COMPRESSIVE STRENGTH (psf) (ASTM D 2166).

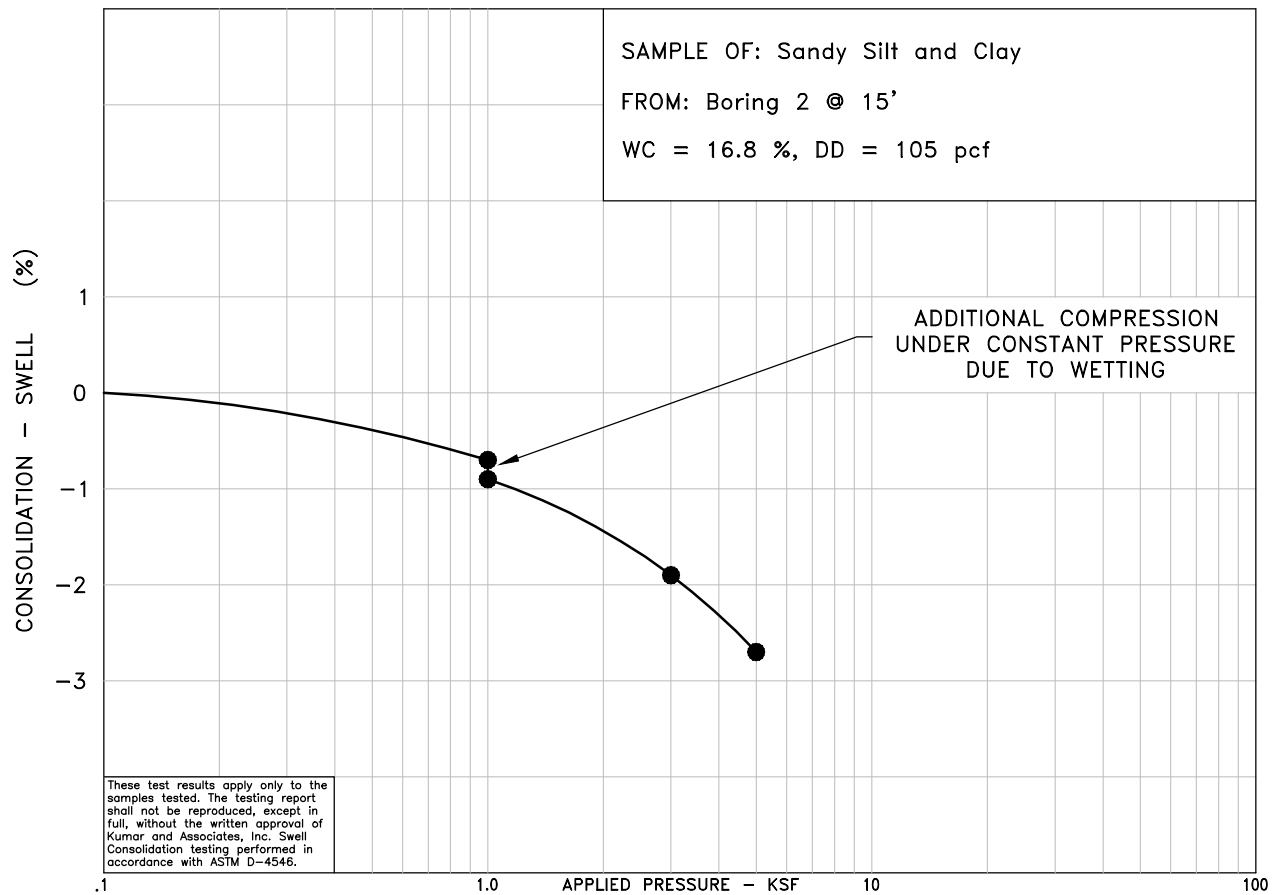
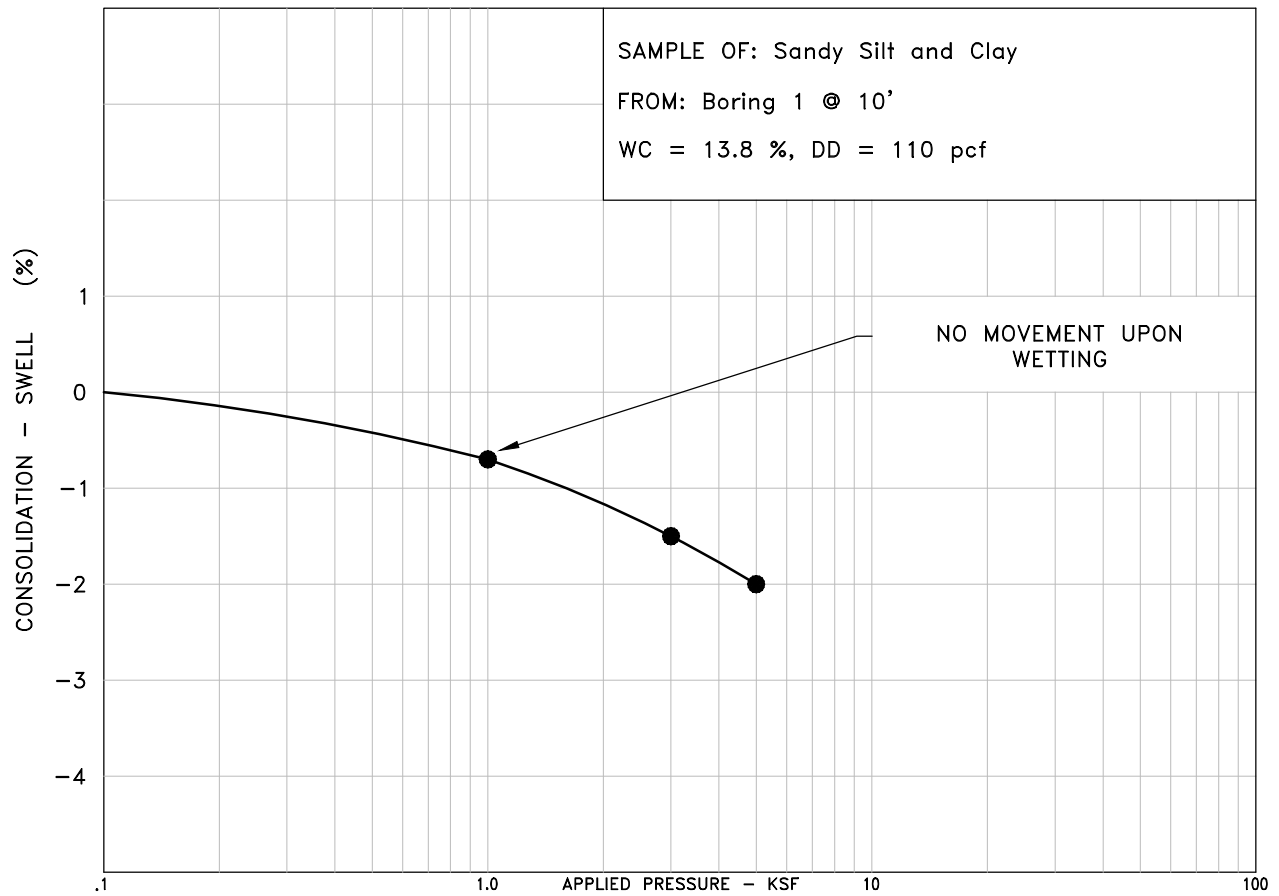


TABLE 1
SUMMARY OF LABORATORY TEST RESULTS

Project No. 21-7-881

SAMPLE LOCATION		NATURAL MOISTURE CONTENT	NATURAL DRY DENSITY	GRADATION		PERCENT PASSING NO. 200 SIEVE	ATTERBERG LIMITS		UNCONFINED COMPRESSIVE STRENGTH		SOIL TYPE
BORING	DEPTH (ft)			GRAVEL (%)	SAND (%)		LIQUID LIMIT (%)	PLASTIC INDEX (%)			
1	10	13.8	110								Sandy Silt and Clay
	15	14.5	105			76					Sandy Silt and Clay
2	2½	11.5				63	24	5			Sandy Silt and Clay with Gravel (Fill)
	10	12.5	113			71			5,900		Sandy Silt and Clay
	15	16.8	105								Sandy Silt and Clay
3	5	10.0				41					Silty Clayey Sand with Gravel (Fill)
	10	12.6				55					Sandy Silt and Clay with Gravel



Customer Distribution



Prevent fraud - Please call a member of our closing team for wire transfer instructions or to initiate a wire transfer. Note that our wiring instructions will never change.

Order Number: **ABS63020781**

Date: **09/08/2023**

Property Address: **2800 MIDLAND AVENUE, GLENWOOD SPRINGS, CO 81601**

For Closing Assistance

Charles Ottinger
3033 EAST FIRST AVENUE,
SUITE 600
DENVER, CO 80206
(303) 331-6216 (Work)
(303) 393-3870 (Work Fax)
cottinger@ltgc.com
Company License: CO44565

Closer's Assistant

Emily Musselman
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(303) 331-6266 (Work)
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emusselman@ltgc.com
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For Title Assistance

George Rietsch
5975 GREENWOOD PLAZA
BLVD
GREENWOOD VILLAGE, CO
80111
(303) 850-4151 (Work)
grietsch@ltgc.com

BLUELINE DEVELOPMENT
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MISSOULA, MT 59801
(406) 926-1401 (Work)
darcy@bluelinedevelopment.com
Delivered via: Electronic Mail

RBC CAPITAL MARKETS
Attention: ROSS KAUFMAN
1801 CALIFORNIA ST #3840
DENVER, CO 80202
(303) 778-5555 (Work)
ross.kaufman@rbccm.com
Delivered via: Electronic Mail

BLUELINE DEVELOPMENT
Attention: GABBY MASUCCI
1004 SOUTH AVENUE WEST
MISSOULA, MT 59801
gabby@bluelinedevelopment.com
Delivered via: Electronic Mail

ROCKY MOUNTAIN COMMUNITY REINVESTMENT
CORP
Attention: NICHOLAS BERGER
64 E WINCHESTER STREET, SUITE 230
SALT LAKE CITY, UT 84107
(801) 366-0400 (Work)
nberger@rmcra.org
Delivered via: Electronic Mail

WINTHROP & WEINSTINE PA
Attention: JASON HARBY
225 S SIXTH ST #3500
MINNEAPOLIS, MN 55402
JHarby@winthrop.com
Delivered via: Electronic Mail

LAND TITLE GUARANTEE COMPANY
Attention: TOM KIMBALL
3033 EAST FIRST AVENUE SUITE 600
DENVER, CO 80206
(303) 877-2127 (Cell)
(303) 877-2127 (Work)
tkimball@ltgc.com
Delivered via: Electronic Mail

CATHOLIC CHARITIES HOUSING
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DENVER, CO 80216
(720) 639-7608 (Work)
jraddatz@ccdenvver.org
Delivered via: Electronic Mail



Estimate of Title Fees

Order Number: ABS63020781

Date: 09/08/2023

Property Address: 2800 MIDLAND AVENUE, GLENWOOD SPRINGS, CO 81601

Seller(s): 2800 MIDLAND LLC, A COLORADO LIMITED LIABILITY COMPANY

Buyer(s): BENEDICT LLLP, A COLORADO LIMITED LIABILITY LIMITED PARTNERSHIP

Thank you for putting your trust in Land Title. Below is the estimate of title fees for the transaction. The final fees will be collected at closing. Visit ltgc.com to learn more about Land Title.

Estimate of Title Insurance Fees	
"ALTA" Owner's Policy 07-30-21 Reissue Rate	\$16,368.00
"ALTA" Loan Policy 07-30-21 Concurrent Loan Rate	\$175.00
TOTAL	\$16,543.00

Note: The documents linked in this commitment should be reviewed carefully. These documents, such as covenants conditions and restrictions, may affect the title, ownership and use of the property. You may wish to engage legal assistance in order to fully understand and be aware of the implications of the documents on your property.

Chain of Title Documents:

[Garfield county recorded 11/15/2018 under reception no. 914187](#)

[Garfield county recorded 02/22/2022 under reception no. 971255](#)

Plat Map(s):

[Garfield county recorded 05/27/2015 under reception no. 863126](#)

ALTA COMMITMENT
Old Republic National Title Insurance Company
Schedule A

Order Number: ABS63020781

Property Address:

2800 MIDLAND AVENUE, GLENWOOD SPRINGS, CO 81601

1. Commitment Date:

08/25/2023 at 5:00 P.M.

2. Policy to be Issued and Proposed Insured:

"ALTA" Owner's Policy 07-30-21 Reissue Rate \$23,766,564.00

Proposed Insured:
BENEDICT LLLP, A COLORADO LIMITED LIABILITY LIMITED
PARTNERSHIP

"ALTA" Loan Policy 07-30-21 Concurrent Loan Rate \$4,000,000.00

Proposed Insured:
CATHOLIC CHARITIES HOUSING, ITS SUCCESSORS AND/OR
ASSIGNS

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

FEE SIMPLE AS TO PARCEL A AND AN EASEMENT AS TO PARCEL B

4. The Title is, at the Commitment Date, vested in:

2800 MIDLAND LLC, A COLORADO LIMITED LIABILITY COMPANY

5. The Land is described as follows:

PARCEL A:

LOT 2, STONEY RIVER MINOR SUBDIVISION, ACCORDING TO THE RECORDED PLAT THEREOF
RECORDED MAY 27, 2015 UNDER RECEPTION NO. [863126](#), COUNTY OF GARFIELD, STATE OF
COLORADO.

PARCEL B:

A NON-EXCLUSIVE EASEMENT FOR VEHICULAR AND PEDESTRIAN INGRESS AND EGRESS, AND AN
EXCLUSIVE EASEMENT FOR PARKING, AS SET FORTH AND GRANTED IN DECLARATION OF
EASEMENTS RECORDED MAY 27, 2015 UNDER RECEPTION NO. [863128](#).

This page is only a part of a 2021 ALTA® Commitment for Title Insurance. This
Commitment is not valid without the Notice; the Commitment to Issue Policy; the
Commitment Conditions; Schedule A; Schedule B, Part I—Requirements; Schedule B, Part
II—Exceptions; and a counter-signature by the Company or its issuing agent that may be in
electronic form.



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ALTA COMMITMENT
Old Republic National Title Insurance Company
Schedule B, Part I
(Requirements)

Order Number: ABS63020781

All of the following Requirements must be met:

This proposed Insured must notify the Company in writing of the name of any party not referred to in this Commitment who will obtain an interest in the Land or who will make a loan on the Land. The Company may then make additional Requirements or Exceptions.

Pay the agreed amount for the estate or interest to be insured.

Pay the premiums, fees, and charges for the Policy to the Company.

Documents satisfactory to the Company that convey the Title or create the Mortgage to be insured, or both, must be properly authorized, executed, delivered, and recorded in the Public Records.

1. CERTIFICATE OF GOOD STANDING OF 2800 MIDLAND LLC, A COLORADO LIMITED LIABILITY COMPANY, ISSUED BY THE SECRETARY OF STATE OF COLORADO.

NOTE: SAID 2800 MIDLAND LLC, A COLORADO LIMITED LIABILITY COMPANY IS CURRENTLY LISTED AS DELINQUENT IN SAID SECRETARY OF STATE RECORDS.

2. A FULL COPY OF THE FULLY EXECUTED OPERATING AGREEMENT AND ANY AND ALL AMENDMENTS THERETO FOR 2800 MIDLAND LLC, A COLORADO LIMITED LIABILITY COMPANY MUST BE FURNISHED TO LAND TITLE GUARANTEE COMPANY. SAID AGREEMENT MUST DISCLOSE WHO MAY CONVEY, ACQUIRE, ENCUMBER, LEASE OR OTHERWISE DEAL WITH INTERESTS IN REAL PROPERTY FOR SAID ENTITY.

NOTE: ADDITIONAL REQUIREMENTS MAY BE NECESSARY UPON REVIEW OF THIS DOCUMENTATION.

3. DULY EXECUTED AND ACKNOWLEDGED STATEMENT OF AUTHORITY SETTING FORTH THE NAME OF 2800 MIDLAND LLC, A COLORADO LIMITED LIABILITY COMPANY AS A LIMITED LIABILITY COMPANY. THE STATEMENT OF AUTHORITY MUST STATE UNDER WHICH LAWS THE ENTITY WAS CREATED, THE MAILING ADDRESS OF THE ENTITY, AND THE NAME AND POSITION OF THE PERSON(S) AUTHORIZED TO EXECUTE INSTRUMENTS CONVEYING, ENCUMBERING, OR OTHERWISE AFFECTING TITLE TO REAL PROPERTY ON BEHALF OF THE ENTITY AND OTHERWISE COMPLYING WITH THE PROVISIONS OF SECTION 38-30-172, CRS.

NOTE: THE STATEMENT OF AUTHORITY MUST BE RECORDED WITH THE CLERK AND RECORDER.

4. A FULL COPY OF THE PARTNERSHIP AGREEMENT AND ANY AND ALL AMENDMENTS THERETO FOR BENEDICT LLLP, A COLORADO LIMITED LIABILITY LIMITED PARTNERSHIP MUST BE FURNISHED TO LAND TITLE GUARANTEE COMPANY.

NOTE: ADDITIONAL REQUIREMENTS MAY BE NECESSARY UPON REVIEW OF THIS DOCUMENT.

5. DULY EXECUTED AND ACKNOWLEDGED STATEMENT OF AUTHORITY SETTING FORTH THE NAME OF BENEDICT LLLP, A COLORADO LIMITED LIABILITY LIMITED PARTNERSHIP AS A PARTNERSHIP. THE STATEMENT OF AUTHORITY MUST STATE UNDER WHICH LAWS THE ENTITY WAS CREATED, THE MAILING ADDRESS OF THE ENTITY, AND THE NAME AND POSITION OF THE PERSON(S) AUTHORIZED TO EXECUTE INSTRUMENTS CONVEYING, ENCUMBERING, OR OTHERWISE AFFECTING TITLE TO REAL PROPERTY ON BEHALF OF THE ENTITY AND OTHERWISE COMPLYING WITH THE PROVISIONS OF SECTION 38-30-172, CRS.

NOTE: THE STATEMENT OF AUTHORITY MUST BE RECORDED WITH THE CLERK AND RECORDER.

6. WARRANTY DEED FROM 2800 MIDLAND LLC, A COLORADO LIMITED LIABILITY COMPANY TO BENEDICT LLLP, A COLORADO LIMITED LIABILITY LIMITED PARTNERSHIP CONVEYING SUBJECT PROPERTY.

NOTE: THE ISSUANCE OF THE POLICIES AND/OR ENDORSEMENTS REFERENCED IN THIS COMMITMENT ARE SUBJECT TO THE APPROVAL OF THE UNDERWRITER OF SAID POLICIES AND/OR ENDORSEMENTS. THIS COMMITMENT MAY BE REVISED AS REQUIRED BY THE UNDERWRITER TO ISSUE THE POLICIES AND/OR ENDORSEMENTS REQUESTED. THIS NOTE WILL BE DELETED UPON THE RECEIPT OF SAID APPROVAL.

ALTA COMMITMENT
Old Republic National Title Insurance Company
Schedule B, Part II
(Exceptions)

Order Number: ABS63020781

Some historical land records contain Discriminatory Covenants that are illegal and unenforceable by law. This Commitment and the Policy treat any Discriminatory Covenant in a document referenced in Schedule B as if each Discriminatory Covenant is redacted, repudiated, removed, and not republished or recirculated. Only the remaining provisions of the document will be excepted from coverage.

1. Any facts, rights, interests, or claims thereof, not shown by the Public Records but that could be ascertained by an inspection of the Land or that may be asserted by persons in possession of the Land.
2. Easements, liens or encumbrances, or claims thereof, not shown by the Public Records.
3. Any encroachment, encumbrance, violation, variation, or adverse circumstance affecting the Title that would be disclosed by an accurate and complete land survey of the Land and not shown by the Public Records.
4. Any lien, or right to a lien, for services, labor or material heretofore or hereafter furnished, imposed by law and not shown by the Public Records.
5. Defects, liens, encumbrances, adverse claims or other matters, if any, created, first appearing in the public records or attaching subsequent to the effective date hereof but prior to the date of the proposed insured acquires of record for value the estate or interest or mortgage thereon covered by this Commitment.
6. (a) Taxes or assessments that are not shown as existing liens by the records of any taxing authority that levies taxes or assessments on real property or by the Public Records; (b) proceedings by a public agency that may result in taxes or assessments, or notices of such proceedings, whether or not shown by the records of such agency or by the Public Records.
7. (a) Unpatented mining claims; (b) reservations or exceptions in patents or in Acts authorizing the issuance thereof; (c) water rights, claims or title to water.
8. EXISTING LEASES AND TENANCIES, IF ANY.
9. RIGHT OF PROPRIETOR OF A VEIN OR LODGE TO EXTRACT AND REMOVE HIS ORE THEREFROM SHOULD THE SAME BE FOUND TO PENETRATE OR INTERSECT THE PREMISES AS RESERVED IN UNITED STATES PATENT RECORDED MARCH 14, 1891, IN BOOK 12 AT PAGE [72](#) AND RECORDED APRIL 14, 1896 IN BOOK 12 AT PAGE [415](#)
10. RIGHT OF WAY FOR DITCHES OR CANALS CONSTRUCTED BY THE AUTHORITY OF THE UNITED STATES AS RESERVED IN UNITED STATES PATENT RECORDED MARCH 14, 1891, IN BOOK 12 AT PAGE [72](#) AND RECORDED APRIL 14, 1896 IN BOOK 12 AT PAGE [415](#)
11. EASEMENT AND RIGHT OF WAY FOR THE ATKINSON CANAL, TOGETHER WITH FREE INGRESS AND EGRESS AT ALL TIMES TO MAINTAIN AND KEEP SAID CANAL IN REPAIR AS SET FORTH IN INSTRUMENT RECORDED JULY 15, 1909 IN BOOK 79 AT PAGE [80](#).
12. RIGHT OF WAY FOR IRRIGATION DITCH LEADING FROM THREE MILE CREEK ONTO SUBJECT PROPERTY AS REFERRED TO IN INSTRUMENT RECORDED NOVEMBER 15, 1892 IN BOOK 20 AT PAGE [241](#) IN WHICH SPECIFIC LOCATION OF SAID EASEMENT IS NOT DEFINED.
13. THIRTY FOOT SANITARY SEWER EASEMENT ALONG THE WESTERLY SIDE OF SUBJECT PROPERTY AS SHOWN ON THE PLAT OF SAID PLANNED UNIT DEVELOPMENT RECORDED OCTOBER 3, 1979 AS RECEPTION NO. [298203](#), AND AS AMENDED IN INSTRUMENT RECORDED MAY 22, 1981 UNDER RECEPTION NO. [315113](#), AND AS SET FORTH IN INSTRUMENT RECORDED FEBRUARY 20, 1991 IN BOOK 799 AT PAGE [230](#).

ALTA COMMITMENT
Old Republic National Title Insurance Company
Schedule B, Part II
(Exceptions)

Order Number: ABS63020781

14. AGREEMENTS AND EASEMENTS AS SET FORTH IN TERMINATION OF AGREEMENT AND AGREEMENT REGARDING EASEMENTS AND LIFT STATION OWNERSHIP RECORDED OCTOBER 08, 2014 UNDER RECEPTION NO. [854488](#).
15. TERMS, CONDITIONS AND PROVISIONS OF ORDINANCE NO 39 RECORDED JANUARY 08, 1988 IN BOOK 727 AT PAGE [430](#).
16. TERMS, CONDITIONS, AND PROVISIONS CONTAINED IN ORDINANCE NO. 10-79 RECORDED MARCH 12, 1982, IN BOOK 894 AT PAGE [509](#).
17. TERMS, CONDITIONS, PROVISIONS, BURDENS, OBLIGATIONS AND EASEMENTS AS SET FORTH AND GRANTED IN AGREEMENT TO PLAT AND RECONVEY RECORDED SEPTEMBER 05, 2012, UNDER RECEPTION NO. [823720](#) AND AMENDMENT RECORDED JANUARY 28, 2015 AT RECEPTION NO. [858695](#).
18. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN AGREEMENT RECORDED MARCH 07, 2014 UNDER RECEPTION NO. [846979](#).
19. EASEMENTS, CONDITIONS, COVENANTS, RESCROW SHORTAGE, RESERVATIONS AND NOTES ON THE PLAT OF STONEY RIVER MINOR SUBDIVISION RECORDED MAY 27, 2015 UNDER RECEPTION NO. [863126](#).
20. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH IN SUBDIVISION AND DEVELOPMENT AGREEMENT RECORDED MAY 27, 2015 UNDER RECEPTION NO. [863127](#).
21. TERMS, CONDITIONS, PROVISIONS, BURDENS AND OBLIGATIONS AS SET FORTH AND GRANTED IN DECLARATION OF RECIPROCAL EASEMENTS AND MAINTENANCE RECORDED MAY 27, 2015 UNDER RECEPTION NO. [863128](#).



ALTA Commitment For Title Insurance

issued by Old Republic National Title Insurance Company

NOTICE

IMPORTANT—READ CAREFULLY: THIS COMMITMENT IS AN OFFER TO ISSUE ONE OR MORE TITLE INSURANCE POLICIES. ALL CLAIMS OR REMEDIES SOUGHT AGAINST THE COMPANY INVOLVING THE CONTENT OF THIS COMMITMENT OR THE POLICY MUST BE BASED SOLELY IN CONTRACT.

THIS COMMITMENT IS NOT AN ABSTRACT OF TITLE, REPORT OF THE CONDITION OF TITLE, LEGAL OPINION, OPINION OF TITLE, OR OTHER REPRESENTATION OF THE STATUS OF TITLE. THE PROCEDURES USED BY THE COMPANY TO DETERMINE INSURABILITY OF THE TITLE, INCLUDING ANY SEARCH AND EXAMINATION, ARE PROPRIETARY TO THE COMPANY, WERE PERFORMED SOLELY FOR THE BENEFIT OF THE COMPANY, AND CREATE NO EXTRACONTRACTUAL LIABILITY TO ANY PERSON, INCLUDING A PROPOSED INSURED.

THE COMPANY'S OBLIGATION UNDER THIS COMMITMENT IS TO ISSUE A POLICY TO A PROPOSED INSURED IDENTIFIED IN SCHEDULE A IN ACCORDANCE WITH THE TERMS AND PROVISIONS OF THIS COMMITMENT. THE COMPANY HAS NO LIABILITY OR OBLIGATION INVOLVING THE CONTENT OF THIS COMMITMENT TO ANY OTHER PERSON. .

COMMITMENT TO ISSUE POLICY

Subject to the Notice; Schedule B, Part I—Requirements; Schedule B, Part II—Exceptions; and the Commitment Conditions, Old Republic National Title Insurance Company, a Minnesota corporation (the "Company"), commits to issue the Policy according to the terms and provisions of this Commitment. This Commitment is effective as of the Commitment Date shown in Schedule A for each Policy described in Schedule A, only when the Company has entered in Schedule A both the specified dollar amount as the Proposed Amount of insurance and the name of the Proposed Insured. If all of the Schedule B, Part I—Requirements have not been met within 6 months after the Commitment Date, this Commitment terminates and the Company's liability and obligation end.

COMMITMENT CONDITIONS

1. DEFINITIONS

- (a) "Discriminatory Covenant": Any covenant, condition, restriction, or limitation that is unenforceable under applicable law because it illegally discriminates against a class of individuals based on personal characteristics such as race, color, religion, sex, sexual orientation, gender identity, familial status, disability, national origin, or other legally protected class.
- (b) "Knowledge" or "Known": Actual knowledge or actual notice, but not constructive notice imparted by the Public Records.
- (c) "Land": The land described in item 5 of Schedule A and affixed improvements located on that land that by State law constitute real property. The term "Land" does not include any property beyond that described in Schedule A, nor any right, title, interest, estate, or easement in any abutting street, road, avenue, alley, lane, right-of-way, body of water, or waterway, but does not modify or limit the extent that a right of access to and from the Land is to be insured by the Policy.
- (d) "Mortgage": A mortgage, deed of trust, trust deed, security deed, or other real property security instrument, including one evidenced by electronic means authorized by law.
- (e) "Policy": Each contract of title insurance, in a form adopted by the American Land Title Association, issued or to be issued by the Company pursuant to this Commitment.
- (f) "Proposed Amount of Insurance": Each dollar amount specified in Schedule A as the Proposed Amount of Insurance of each Policy to be issued pursuant to this Commitment.
- (g) "Proposed Insured": Each person identified in Schedule A as the Proposed Insured of each Policy to be issued pursuant to this Commitment.
- (h) "Public Records": The recording or filing system established under State statutes in effect at the Commitment Date under which a document must be recorded or filed to impart constructive notice of matters relating to the Title to a purchaser for value without Knowledge. The term "Public Records" does not include any other recording or filing system, including any pertaining to environmental remediation or protection, planning, permitting, zoning, licensing, building, health, public safety, or national security matters.
- (i) "State": The state or commonwealth of the United States within whose exterior boundaries the Land is located. The term "State" also includes the District of Columbia, the Commonwealth of Puerto Rico, the U.S. Virgin Islands, and Guam.
- (j) "Title": The estate or interest in the Land identified in Item 3 of Schedule A.

2. If all of the Schedule B, Part I—Requirements have not been met within the time period specified in the Commitment to Issue Policy, Commitment terminates and the Company's liability and obligation end.

3. The Company's liability and obligation is limited by and this Commitment is not valid without:

- (a) the Notice;
- (b) the Commitment to Issue Policy;
- (c) the Commitment Conditions;
- (d) Schedule A;
- (e) Schedule B, Part I—Requirements; and
- (f) Schedule B, Part II—Exceptions; and
- (g) a counter-signature by the Company or its issuing agent that may be in electronic form.

4. COMPANY'S RIGHT TO AMEND

The Company may amend this Commitment at any time. If the Company amends this Commitment to add a defect, lien, encumbrance, adverse claim, or other matter recorded in the Public Records prior to the Commitment Date, any liability of the Company is limited by Commitment Condition 5. The Company is not liable for any other amendment to this Commitment.

5. LIMITATIONS OF LIABILITY

- (a) The Company's liability under Commitment Condition 4 is limited to the Proposed Insured's actual expense incurred in the interval between the Company's delivery to the Proposed Insured of the Commitment and the delivery of the amended Commitment, resulting from the Proposed Insured's good faith reliance to:
 - i. comply with the Schedule B, Part I—Requirements;
 - ii. eliminate, with the Company's written consent, any Schedule B, Part II—Exceptions; or
 - iii. acquire the Title or create the Mortgage covered by this Commitment.
- (b) The Company is not liable under Commitment Condition 5(a) if the Proposed Insured requested the amendment or had Knowledge of the matter and did not notify the Company about it in writing.
- (c) The Company is only liable under Commitment Condition 4 if the Proposed Insured would not have incurred the expense had the Commitment included the added matter when the Commitment was first delivered to the Proposed Insured.
- (d) The Company's liability does not exceed the lesser of the Proposed Insured's actual expense incurred in good faith and described in Commitment Condition 5(a) or the Proposed Amount of Insurance.
- (e) The Company is not liable for the content of the Transaction Identification Data, if any.
- (f) The Company is not obligated to issue the Policy referred to in this Commitment unless all of the Schedule B, Part I—Requirements have been met to the satisfaction of the Company.

(g) The Company's liability is further limited by the terms and provisions of the Policy to be issued to the Proposed Insured.

6. LIABILITY OF THE COMPANY MUST BE BASED ON THIS COMMITMENT. CHOICE OF LAW AND CHOICE OF FORUM

- (a) Only a Proposed Insured identified in Schedule A, and no other person, may make a claim under this Commitment.
- (b) Any claim must be based in contract under the State law of the State where the Land is located and is restricted to the terms and provisions of this Commitment. Any litigation or other proceeding brought by the Proposed Insured against the Company must be filed only in a State or federal court having jurisdiction.
- (c) This Commitment, as last revised, is the exclusive and entire agreement between the parties with respect to the subject matter of this Commitment and supersedes all prior commitment negotiations, representations, and proposals of any kind, whether written or oral, express or implied, relating to the subject matter of this Commitment.
- (d) The deletion or modification of any Schedule B, Part II—Exception does not constitute an agreement or obligation to provide coverage beyond the terms and provisions of this Commitment or the Policy.
- (e) Any amendment or endorsement to this Commitment must be in writing and authenticated by a person authorized by the Company.
- (f) When the Policy is issued, all liability and obligation under this Commitment will end and the Company's only liability will be under the Policy.

7. IF THIS COMMITMENT IS ISSUED BY AN ISSUING AGENT

The issuing agent is the Company's agent only for the limited purpose of issuing title insurance commitments and policies. The issuing agent is not the Company's agent for the purpose of providing closing or settlement services.

8. PRO-FORMA POLICY

The Company may provide, at the request of a Proposed Insured, a pro-forma policy illustrating the coverage that the Company may provide. A pro-forma policy neither reflects the status of Title at the time that the pro-forma policy is delivered to a Proposed Insured, nor is it a commitment to insure.

9. CLAIMS PROCEDURES

This Commitment incorporates by reference all Conditions for making a claim in the Policy to be issued to the Proposed Insured. Commitment Condition 9 does not modify the limitations of liability in Commitment Conditions 5 and 6.

10. CLASS ACTION

ALL CLAIMS AND DISPUTES ARISING OUT OF OR RELATING TO THIS COMMITMENT, INCLUDING ANY SERVICE OR OTHER MATTER IN CONNECTION WITH ISSUING THIS COMMITMENT, ANY BREACH OF A COMMITMENT PROVISION, OR ANY OTHER CLAIM OR DISPUTE ARISING OUT OF OR RELATING TO THE TRANSACTION GIVING RISE TO THIS COMMITMENT, MUST BE BROUGHT IN AN INDIVIDUAL CAPACITY. NO PARTY MAY SERVE AS PLAINTIFF, CLASS MEMBER, OR PARTICIPANT IN ANY CLASS OR REPRESENTATIVE PROCEEDING. ANY POLICY ISSUED PURSUANT TO THIS COMMITMENT WILL CONTAIN A CLASS ACTION CONDITION.

11. ARBITRATION

The Policy contains an arbitration clause. All arbitrable matters when the Proposed Amount of insurance is \$2,000,000 or less may be arbitrated at the election of either the Company or the Proposed Insured as the exclusive remedy of the parties. A Proposed Insured may review a copy of the arbitration rules at <http://www.alta.org/arbitration>

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

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



Craig B. Rants, Senior Vice President



OLD REPUBLIC NATIONAL TITLE INSURANCE COMPANY
A Stock Company
400 Second Avenue South, Minneapolis, Minnesota 55401
(612) 371-1111

By



President

Attest



Secretary

This page is only a part of a 2021 ALTA® Commitment for Title Insurance issued by Old Republic National Title Insurance Company. This Commitment is not valid without the Notice; the Commitment to Issue Policy; the Commitment Conditions; Schedule A; Schedule B, Part I—Requirements; and Schedule B, Part II—Exceptions; and a counter-signature by the Company or its issuing agent that may be in electronic form.

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Land Title Guarantee Company

Disclosure Statements

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

- (A) The Subject real property may be located in a special taxing district.
- (B) A certificate of taxes due listing each taxing jurisdiction will be obtained from the county treasurer of the county in which the real property is located or that county treasurer's authorized agent unless the proposed insured provides written instructions to the contrary. (for an Owner's Policy of Title Insurance pertaining to a sale of residential real property).
- (C) The information regarding special districts and the boundaries of such districts may be obtained from the Board of County Commissioners, the County Clerk and Recorder, or the County Assessor.

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

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

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

- (A) The land described in Schedule A of this commitment must be a single family residence which includes a condominium or townhouse unit.
- (B) No labor or materials have been furnished by mechanics or material-men for purposes of construction on the land described in Schedule A of this Commitment within the past 6 months.
- (C) The Company must receive an appropriate affidavit indemnifying the Company against un-filed mechanic's and material-men's liens.
- (D) The Company must receive payment of the appropriate premium.
- (E) If there has been construction, improvements or major repairs undertaken on the property to be purchased within six months prior to the Date of Commitment, the requirements to obtain coverage for unrecorded liens will include: disclosure of certain construction information; financial information as to the seller, the builder and or the contractor; payment of the appropriate premium fully executed Indemnity Agreements satisfactory to the company, and, any additional requirements as may be necessary after an examination of the aforesaid information by the Company.

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

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

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

- (A) That there is recorded evidence that a mineral estate has been severed, leased, or otherwise conveyed from the surface estate and that there is substantial likelihood that a third party holds some or all interest in oil, gas, other minerals, or geothermal energy in the property; and
- (B) That such mineral estate may include the right to enter and use the property without the surface owner's permission.

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

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

Note: Pursuant to CRS 24-21-514.5, Colorado notaries may remotely notarize real estate deeds and other documents using real-time audio-video communication technology. You may choose not to use remote notarization for any document.



**Joint Notice of Privacy Policy of
Land Title Guarantee Company
Land Title Guarantee Company of Summit
County
Land Title Insurance Corporation and
Old Republic National Title Insurance Company**

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

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

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

- applications or other forms we receive from you, including communications sent through TMX, our web-based transaction management system;
- your transactions with, or from the services being performed by us, our affiliates, or others;
- a consumer reporting agency, if such information is provided to us in connection with your transaction;
- and
- The public records maintained by governmental entities that we obtain either directly from those entities, or from our affiliates and non-affiliates.

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

- We restrict access to all Personal Information about you to those employees who need to know that information in order to provide products and services to you.
- We may share your Personal Information with affiliated contractors or service providers who provide services in the course of our business, but only to the extent necessary for these providers to perform their services and to provide these services to you as may be required by your transaction.
- We maintain physical, electronic and procedural safeguards that comply with federal standards to protect your Personal Information from unauthorized access or intrusion.
- Employees who violate our strict policies and procedures regarding privacy are subject to disciplinary action.
- We regularly assess security standards and procedures to protect against unauthorized access to Personal Information.

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

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

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

PROOF OF PUBLIC NOTICE

I hereby affirm that Public Notice requirements of the Municipal Code of Glenwood Springs have been met for the Public Hearing before the

Planning and Zoning Commission

(Planning and Zoning Commission or City Council)

to be held on December 12, 2023.

Attached are:

1. Notarized Proof of Publication from the Glenwood Springs Post Independent.

Dates Published: 11/29/23 and 12/6/23

2. A list of names and addresses of owners of record of all property within 300 feet of the subject property.

Date mailed: 11/17/23

The property was posted with a sign or signs meeting the specifications of the City of Glenwood Springs Community Development Department.

Date posted: 11/20/23

Mallory Redmon, on behalf of
Name: Catholic Charities Housing
Applicant

Mallory Redmon

Date: 12/6/23

Subscribed and sworn to before me, a notary public in and for the County of
Denver, State of Colorado, this 6th day of
December 2023, A.D.

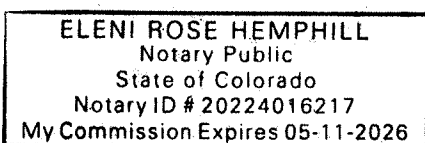
Witness my hand and official seal

(SEAL)

Eleni Rose Hemphill

Notary Public

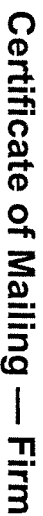
My commission expires: 5/11/26





Certificate of Mailing — Firm

Name and Address of Sender Norris Design 1101 Bannock St. Denver, CO 80204		TOTAL NO. of Pieces Listed by Sender 28	TOTAL NO. of Pieces Received at Post Office™ 28	Affix Stamp Here Postmark with Date of Receipt.			
USPS® Tracking Number Firm-specific Identifier		Postmaster, per (name of receiving employee) <i>Carla Zelnick</i>		 U.S. POSTAGE PAID AURORA, CO 80014 NOV 17, 23 AMOUNT \$15.96 R2305H130536-09			
1.	COTTONWOOD LANDING TOWNHOUSE ASSOCIATION 1512 GRAND AVENUE SUITE 109 GLENWOOD SPRINGS CO 81601			Postage	Fee	Special Handling	Parcel Airlift
2.	GLENWOOD SPRINGS, CITY OF 101 W 8TH STREET GLENWOOD SPRINGS CO 81601						
3.	TERRACE GROUP LLC 1732 WAZEE # 206 DENVER CO 80202						
4.	GLENWOOD SPRINGS RACQUET CLUB ASSOCIATION PO BOX 1107 GLENWOOD SPRINGS CO 81602						
5.	SALUGA, FAITH & ESQUIVEL, CARLOS A 2644 WOODBERRY DRIVE GLENWOOD SPRINGS CO 81601						
6.	FIGUEROA, DEBRA M & DYLAN T 2646 WOODBERRY DRIVE GLENWOOD SPRINGS CO 81601						



Affix Stamp Here
Postmark with Date of Receipt.



Postmaster, per (name of receiving employee)

Parcel Airlift

(Name, Street, City, State, and ZIP Code™)

502

01

17



Certificate of Mailing — Firm

Name and Address of Sender		TOTAL NO. of Pieces Listed by Sender		TOTAL NO. of Pieces Received at Post Office™		Affix Stamp Here Postmark with Date of Receipt.					
Norris Design 1101 Bannock St. Denver, CO 80204		28		Postmaster, per (name of receiving employee)							
USPS® Tracking Number		Address (Name, Street, City, State and ZIP+4)		Postage		Fee		Special Handling		Parcel Airlift	
Firm-specific Identifier											
1.		DALEY RE PROPERTY OWNER LLC 565 SANCTUARY DRIVE APT 8305 LONGBOAT KEY FL 34228									
2.		2800 MIDLAND LLC 6240 SMITH ROAD DENVER CO 80216									
3.		ROARING FORK SENIOR REALTY LLC 155 W CENTRAL AVENUE SPRINGBORO OH 45066									
4.		CHESLIK, JILL E 2665 WOODBERRY DRIVE GLENWOOD SPRINGS CO 81601									
5.		VANDERHOOF, LINDA YOUNG LIVING TRUST 2663 WOODBERRY DIVE GLENWOOD SPRINGS CO 81601									
6.		BROCHIER, LUBA M G KOHN 2687 WOODBERRY DRIVE GLENWOOD SPRINGS CO 81601									



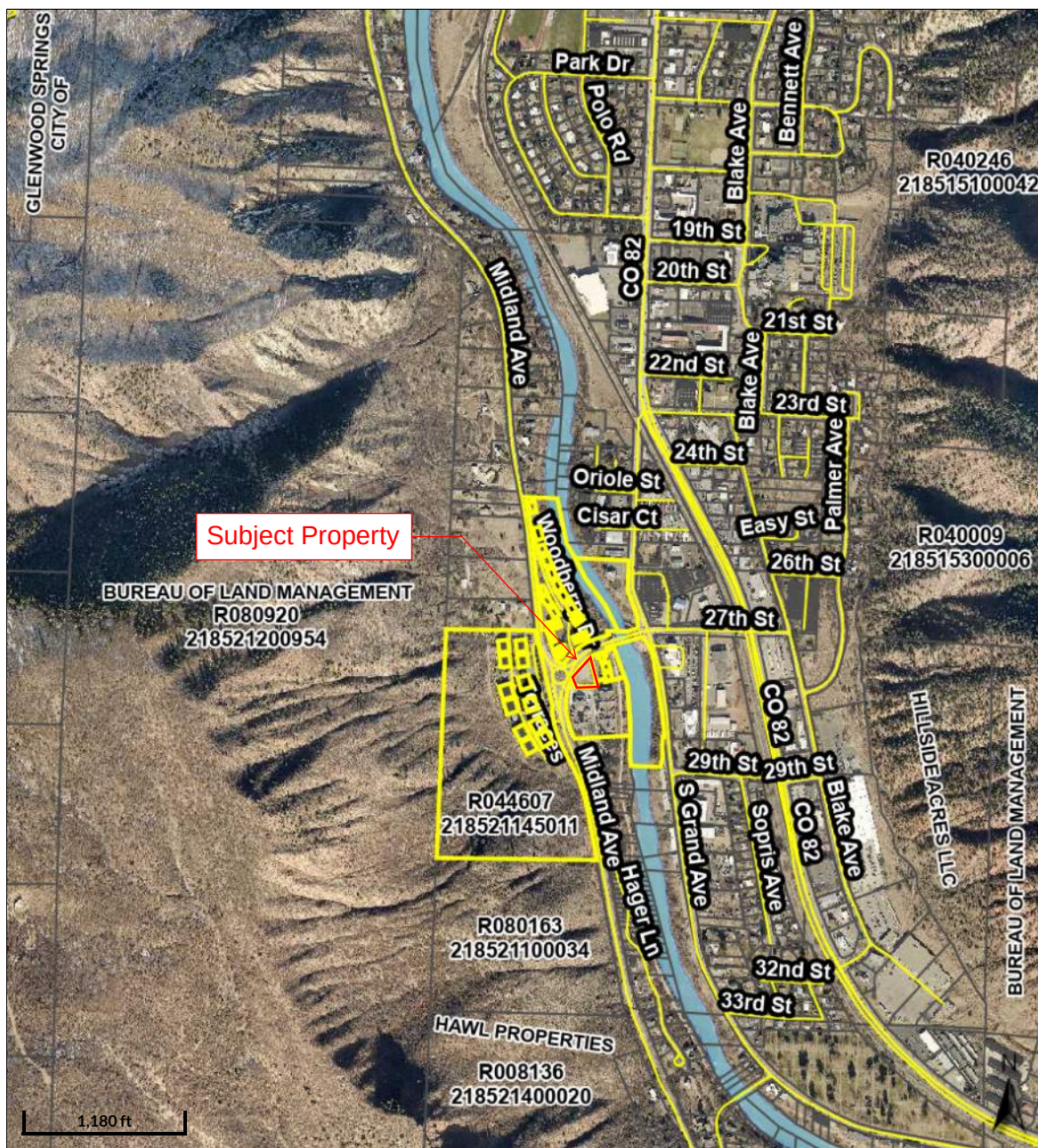
Certificate of Mailing — Firm

Name and Address of Sender Norris Design 1101 Bannock St. Denver, CO 80204		TOTAL NO. of Pieces Listed by Sender 28	TOTAL NO. of Pieces Received at Post Office™ <i>Postmaster, per (name of receiving employee)</i>	Affix Stamp Here <i>Postmark with Date of Receipt.</i>				
USPS® Tracking Number Firm-Specific Identifier		Address (Name, Street, City, State, and ZIP Code™)		Postage	Fee	Special Handling	Parcel Airift	
1.		ROSS, GREGORY M PO BOX 24754 SILVERTHORNE CO 80497						
2.		APODACA, ANTHONY 2685 WOODBERRY DRIVE GLENWOOD SPRINGS CO 81601						
3.		ORTNER, AVA K & THORPE, DONALD A JR 25289 SUTTON COURT NOVI MI 48374						
4.		STANFIELD, TRACY A 87 W SUNLIGHT COURT GLENWOOD SPRINGS CO 81601						
5.		1315 GRAND LLC PO BOX 2478 GLENWOOD SPRINGS CO 81602						
6.		POMEROY, FLINN & BOUGHTON, WOODSON HAGOO 2662 WOODBERRY DRIVE GLENWOOD SPRINGS CO 81601						

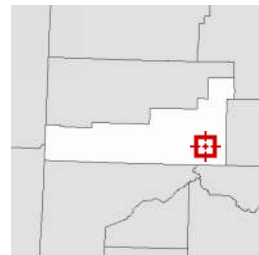


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Norris Design 1101 Bannock St. Denver, CO 80204		28		Postmaster, per (name of receiving employee)							
USPS® Tracking Number Firm-specific Identifier		Address (Name, Street, City, State, and ZIP Code™)		Postage		Fee		Special Handling		Parcel Airlift	
1.		JONES, COURTNEY 2664 WOODBERRY DRIVE GLENWOOD SPRINGS CO 81601									
2.		LAROCHÉ, BEATRICE SANDRINA PO BOX 1755 GLENWOOD SPRINGS CO 81602									
3.		CASTRO, YOLANDA & ANTONIO GEOVANNI 2666 WOODBERRY DRIVE GLENWOOD SPRINGS CO 81601									
4.		WALTER, JARED A 68 BEAVER COURT GLENWOOD SPRINGS CO 81601									
5.											
6.											



Overview



Legend

- Parcels
- Roads
- Parcel/Account Numbers
- Owner Name
- Lakes & Rivers
- County Boundary Line

Date created: 8/24/2023
Last Data Uploaded: 8/24/2023 2:09:00 AM

Developed by  **Schneider**
GEOSPATIAL

PROOF OF PUBLICATION
GLENWOOD SPRINGS POST INDEPENDENT

STATE OF COLORADO } SS
COUNTY OF GARFIELD }

See Proof on Next Page

I, Peter Baumann, do solemnly swear that I am Publisher of , says: The Glenwood Springs Post Independent, that the same weekly newspaper printed, in whole or in part and published in the County of Garfield, State of Colorado, and has a general circulation therein; that said newspaper has been published continuously and uninterruptedly in said County of Garfield for a period of more than fifty-two consecutive weeks next prior to the first publication of the annexed legal notice or advertisement; that said newspaper has been admitted to the United States mails as a periodical under the provisions of the Act of March 3, 1879, or any amendments thereof, and that said newspaper is a weekly newspaper duly qualified for publishing legal notices and advertisements within the meaning of the laws of the State of Colorado.

That the annexed legal notice or advertisement was published in the regular and entire issue of every number of said weekly newspaper for the period of 2 insertions; and that the first publication of said notice was in the issue of said newspaper dated 29 Nov 2023, 6 Dec 2023 in the issue of said newspaper.

Total cost for publication: **\$51.92**

That said newspaper was regularly issued and circulated on those dates.



Publisher

Subscribed to and sworn to me this 6th day of December, 2023



Notary Public, Garfield County, Colorado

My commission expires: February, 22, 2026



Advertiser:
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Please take notice that the Glenwood Springs Planning and Zoning Commission will conduct a public hearing to consider an application for a Major Site Architectural Plan for the property located at 2800 Midland Avenue in the City of Glenwood Springs, Colorado, and is zoned RE (Resort). The proposed project includes 34 for-rent apartments, all of which are proposed to be affordable. Tuck-under parking with additional surface parking across the site is proposed. Additionally, sidewalk improvements, as well as enhanced landscaping are included as part of the community. The application is submitted by Catholic Charities Housing and its partners, and the property is owned by Catholic Charities Housing. The public hearing will be held on Tuesday, December 12, 2023 at 6:00 PM in the Council Chambers, Glenwood Springs City Hall, 101 W. 8th Street, Glenwood Springs, Colorado. Additional information on the application is available for review at the Community Development Department at City Hall, or by calling (970) 384-6411.

**PUBLISHED IN THE GLENWOOD SPRINGS
POST INDEPENDENT ON WEDNESDAY,
NOVEMBER 29, 2023 AND WEDNESDAY,
DECEMBER 6, 2023.**



Planning and Zoning Commission Report

Date: December 12, 2023
To: Planning and Zoning Commission
From: Hannah Klausman, Director, Economic & Community Development
Subject: Planning File #45-23, Matters of State Interest 1041 Permit Application, and Location and Extent, Xcel Energy Mitchel Creek Line Rebuild

Applicant: Xcel Energy, Public Service Company of Colorado
1800 Larimer Street, Suite 400
Denver, CO 80202
Parcel: Multiple parcels in north and west Glenwood Springs
Surrounding Uses: Residential, Open Space, Commercial
Zone Districts: Multiple Zone Districts

ACTION ITEMS

Consideration of a Matters of State Interest application to replace two miles of existing 69-Kilovolt electric transmission line between the Glenwood Springs and Mitchell Creek Substations.

BACKGROUND

In March 2022, City Council passed a Code Amendment adopting ARTICLE 070.080 - GUIDELINES AND REGULATIONS FOR MATTERS OF STATE INTEREST. The purpose and intent of the regulations is to facilitate the identification, designation, and administration of matters of state interest consistent with the statutory requirements in C.R.S. § 24-65.1-101 and the guidelines established in the Comprehensive Plan.

The standards are designed to prevent unsuitable site selection for public utilities, protect scenic and recreational assets, minimize environmental impacts, avoid incompatible uses, avoid conflict with other land use plans, protect the character of the City, promote efficient economic use of public resources, and preserve the health and welfare of the citizens of the City.

These standards apply to regulate the site selection and construction of major facilities of public utilities, domestic water and sewage treatment systems, and/or major extensions of such facilities and systems in order to ensure that the same are conducted in areas which will result in the proper utilization of existing facilities and the orderly development of the same within the City and adjacent communities.

Staff has determined that Xcel Energy's proposal to upgrade and replace their existing electric line is subject to Article 070.080 Matters of State Interest.

PROJECT SUMMARY

The transmission line project is a 2.25-mile segment of electric transmission line located between the existing Glenwood Springs Substation (northeast of the Glenwood Hot Springs Resort) and the existing Mitchell Creek Substation (northwest of the Glenwood Meadows shopping center). The existing transmission line was originally built in the 1940s, and a portion was rebuilt in the 1960s. The line segment requires rebuilding as it has reached the end of useful operation. Approximately 2 miles of the existing line are within City jurisdiction and the remaining segment is within unincorporated Garfield County. Transmission poles will be placed in 31 locations in Glenwood Springs and 4 locations in unincorporated Garfield County. This project is part of a larger line replacement project that extends beyond Glenwood Springs to the west and east. This proposal is only for the line from the Glenwood Springs Substation to the Mitchell Creek Substation. A map of the line is provided below.



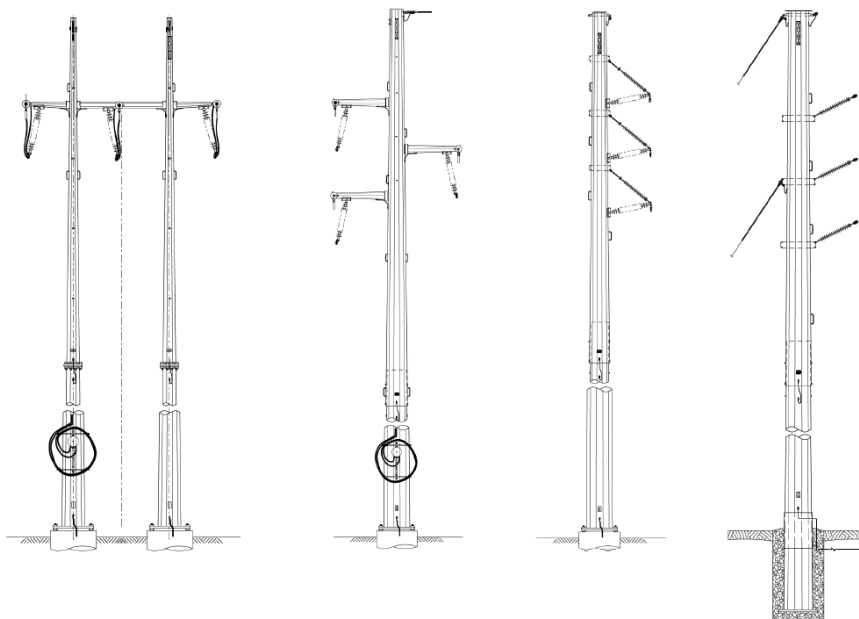
The applicant has provided a detailed description of the differences between the existing line and the proposed project on page 27 of their application in Table 3 which is included for reference below.

Table 3: Existing and Rebuild Characteristic Comparison

Characteristic	Existing Poles	Rebuild Poles	Additional Information
Material, Color	Wood, brown	Steel monopole (weathering), brown/rust	Steel poles comply with updated design standards and wildfire protection
Right-of-way Width	30' for transmission line	60' for transmission line	Additional right-of-way will be needed to provide sufficient clearance to existing buildings, for construction and maintenance activities, and to reduce number and height of poles
Height of Poles	26' to 101.5', average 47'	54.8' to 101.5', average 66'	Increased height needed to comply with current design standards (including lightning protection) and to provide for future increase in operating voltage of the transmission line
Access Required	Ground access for maintenance	Ground and helicopter access for construction, ground access for maintenance	Where access is difficult, helicopters will be used to limit ground disturbance from new access road construction
Additional Easements	Existing easements	Up to an additional 30' for transmission line, ground access for construction, and maintenance and helicopter fly zones	The existing easements date back to as early as the 1920s

The applicant has provided an example of the proposed new poles in their application materials included below.

Example Pole Diagrams



Appendix B compares the height of each existing pole to the new pole heights which is included below for easy reference.

NEW POLE HEIGHTS AND TYPES

New Pole Number	Existing Height (feet)	New Height (feet)	Height Change (feet)
110	101.5	101.5	0
113	46	83.5	37.5
114	31	81.5	50.5
115	32	55	23
116	41	61.5	20.5
117	39	62.25	23.25
118	42	74.65	32.65
119	42	57.5	15.5
120	30	57.5	27.5
121	30	55.5	25.5
122	35	70.5	35.5
123	83	97.5	14.5
124	30	67	37
125	30	61.5	31.5
126	30	57	27
127	31	57	26
128	60	75.5	15.5
129	58	57	-1
130	57	77	20
131	66	68	2
132	68	68	0
133	60	65	5
134	62	58.5	-3.5
135	55	64	9
136	62	59	-3
137	55	57.5	2.5
138	30	62.5	32.5
139	32	54.8	22.8
140	26	57.5	31.5
141	35	55	20
142	43	60	17
143	55	65	10
144	57	70	13
145	45	70	25
146	42	72.5	30.5
147	52	80	28
6584-MITC-SUB1	56	56	0

The project requires the applicant to work with numerous private property owners along the line to obtain the necessary land area for the expanded sixty (60) foot easement width. The City of Glenwood Springs is an identified landowner for 14 parcels and is working with the applicant for the necessary land rights. Staff has included a condition that prior to issuance of any City permit including, building, Right of way, or grading permit, the applicant shall finalize all necessary agreements between all property owners impacted by the new easement width.

REVIEW CRITERIA AND STAFF ANALYSIS

070.080.320 Review Criteria for All Applications.

All applications under these regulations shall be evaluated against the following general criteria. Staff review and analysis is included in **bold**. Where such terms as "reasonable," "feasible" and "adequate" are used in the foregoing criteria, the Community Development Department Director shall determine in each case what is or is not reasonable, feasible, or adequate.

(1) The health, welfare, and safety of the residents of this City will be protected and served.

Access to reliable electricity will help protect the health and welfare of residents. In addition, reduced wildfire risk adds to resident safety.

(2) The project is in general conformance with the Comprehensive Plan and other duly adopted plans and permit

criteria.

The Comprehensive plan includes the following goals that are supported by the project proposal:

- Promote long-term, sustainable, and diverse economic development
- Maintain Glenwood Springs as the regional tourism, retail, commercial, and governmental center of Garfield County

These goals are further supported by strategies to direct growth to areas where utilities and services can be provided efficiently, as well as work to mitigate wildfire hazards.

The project will support the efficient service of electricity and according to application materials, reduce the risk of wildfire associated with electric lines with the improvements.

Staff finds the proposal to be in general conformance with the Comprehensive Plan and other adopted City plans.

(3) The project is financially feasible. The determination of financial feasibility of the project may include but is not limited to the following considerations:

The applicant has submitted documentation as part of their application detailing the financial stability of Xcel Energy to undertake the project.

(4) The project is not subject to significant risk from natural hazards. The determination of risk from natural hazards to the project may include but is not limited to the following considerations:

The current electrical line is over sixty (60) years old and in need of upgrades to ensure safety from natural hazard risks. The transmission poles will be equipped with shield wires above the energized line; this equipment adds to the pole height but also provides protection against lightning strikes. The transmission poles will be made of a weathering steel instead of wood. The weathering steel poles will comply with updated design standards and wildfire protection, as they perform better in the event of a wildfire compared to wood. Other risks including the possibility of unstable slopes and evaporative soils will be mitigated through City and State permit requirements for construction.

(5) The project will not have a significant adverse effect on the capability of local governments affected by the project to provide local infrastructure and services, or exceed the capacity of service delivery systems.

Staff believes the ability for the City of Glenwood Springs to provide electricity services will be improved with a more reliable power supply. Staff does not find an adverse effect on City services associated with the project.

The need for temporary roads to access the project for construction and maintenance will be handled through other City permits and requirements.

(6) The project will not have a significant adverse effect on the quality or quantity of recreational opportunities and experience.

The majority of the project areas occurs on private property without any established recreational opportunities. No significant impact is expected.

There is a conservation easement that exists on one of the properties but will have no significant change to how it functions with the expanded line easement.

The new pole structures and heights will have an increased impact on the visual experience of that area. believe these impacts are low given the existing structures.

(7) The project will not significantly degrade air quality.

Air quality will not be impacted by the project. Construction activities that may include the creation of dust will be managed by Construction management requirements.

(8) The project will not significantly degrade existing visual quality.

This project will have some visual impacts to the area including the disturbance of ground vegetation, and interference with some viewsheds with the increased pole heights. The weathered steel poles are meant to be compatible with natural colors to reduce these impacts.

(9) The project will not significantly degrade surface water quality. The determination of effects of the project on surface water quality may include, but is not limited to, the following considerations:

A grading permit will be required for each pole placement and has requirements and best management practices included to manage impacts to surface water quality. In addition, the applicant will be required to obtain a State Stormwater Management plan permit which is sufficient to mitigate any impacts.

(10) The project will not significantly degrade groundwater quality. The determination of effects of the project on groundwater quality may include, but is not limited to, the following considerations:

Within the Geo-technical Engineering report, the geothermal aquifer interactions are discussed. It states: “In the event that artesian conditions are encountered during the construction of the transmission line structure foundations, the contractor should be prepared with a contingency plan to manage the artesian conditions and seal the pier hole. Prior to construction, the contingency plan should be reviewed by the owner and any other entities with jurisdiction.”

Staff has included this recommendation from the technical report as a condition of approval to provide a written contingency plan for review and approval.

(11) The project will not significantly degrade wetlands and riparian areas, terrestrial or aquatic plant or animal life.

The project area does not include wetlands or riparian areas. While the transmission line crosses the Colorado River in West Glenwood, the pole placements are outside the riparian areas and separated by existing streets from the river.

Per the application materials, Xcel Energy requested Environmental Reviews from Colorado Parks and Wildlife and United States Fish and Wildlife Service on March 22, 2022 but did not receive a response from either agency. Xcel Energy followed up with CPW, requesting another Environmental Review on August 11, 2023 and is awaiting a response.

(12) The project will not significantly deteriorate soils and geologic conditions.

The applicant will be required to obtain grading permits for each of the pole placements which have requirements including erosion control to mitigate any deterioration of soils and geologic conditions. The applicant also points out in item 20.a of their application that “Any land disturbed during construction will be restored in a manner generally similar to its condition prior to construction and as may be provided for in private agreements.

(13) The project will not cause a nuisance. The determination of nuisance effects of the project may include, but is not limited to, the following considerations: Increase in odors, dust, fumes, glare, heat, noise, vibration or artificial light.

There are some nuisances associated with construction, including dust and noise, however, staff do not believe there are long-term nuisance impacts. The 69kV transmission line is not proposed to change at this time. However, it is the staff’s understanding that a possible upgrade in the future to a 115kV line will not increase noise emitted from the current electrical line.

(14) The project will not result in an unreasonable risk of releases of hazardous materials.

Best Management Plans included in construction management include mitigation of these possibilities. The applicant has stated that the project does not involve transportation of any hazardous materials, and there will be an enclosed containment provided for trash disposal.

(15) Urban development, population densities, and site layout and design of storm water and sanitation systems shall be accomplished in a manner that will prevent the pollution of aquifer recharge areas.

Staff does not find this applicable to this project proposal and the applicant will have detailed mitigation plans for any aquifer interaction as detailed in other sections.

(16) The project shall be reasonably necessary to meet projected community development and population demands in the areas to be served by the project, or to comply with regulatory or technological requirements.

The project is in compliance with City electric service plans and will help to facilitate increases in electric service capacity.

(17) The project shall be constructed in areas which will result in the proper utilization of existing facilities or systems to ensure the orderly and sustainable development of infrastructure in the City and adjacent communities, including the following considerations:

The project will minimize disruption of utility services and preserve desirable existing community patterns.

The project does not create or encourage incompatible growth or place a burden on existing systems.

(18) Economic impacts including, but not limited to, taxable property, licensed and permitted facilities, and recreation related to the proposed project have been identified and will be compensated for or mitigated.

The applicant is responsible for acquiring all necessary easements and property acquisitions as part of this project. A condition of approval is that the applicant completes all necessary property owner negotiations prior to the issuance of a building permit. This includes properties owned by the City of Glenwood Springs.

(19) The project shall emphasize the most efficient use of water, including the recycling, reuse, and conservation of water, including the following considerations:

This project does not utilize any water resources and therefore this criterion is not applicable.

070.080.340 - Special Review Criteria for Site Selection and Construction of Major Facilities of a Public Utility.

[SHARE LINK TO SECTION](#)[PRINT SECTION](#)[DOWNLOAD \(DOCX\) OF SECTION](#)[EMAIL SECTION](#)

(a) No permit shall issue for a project related to the site selection and construction of major facilities of a public utility unless it contains conditions tailored to mitigate the environmental, infrastructure, and financial impacts to the City described in Subsection (b) below. Conditional permits shall issue at the discretion of the Permit Authority, pursuant to [Section 070.080.360](#) of this article.

(b) Applications for a project related to the site selection and construction of major facilities of a public utility shall be subject to the following mandatory special review criteria.

(1) The project will not increase the potential for fires and wildfires.

The project reduces the risk of wildfires due to upgrades in the design of the line. The project will not increase the potential for fires or wildfires.

(2) The project will not conflict with any local, regional, or state comprehensive plans.

The project is in compliance with the City of Glenwood Springs plans.

REVIEWING AGENCY COMMENTS

The City of Glenwood Springs referral agencies were forwarded application materials. The Engineering, Public Works, and Electrical Department comments are provided as attachments to this report. All comments have been incorporated as conditions of approval for the project.

Additionally, as part of the application requirements, the applicant submitted requests for comment from key agencies including: Colorado Department of Transportation, Union Pacific Railroad, Colorado Parks and Wildlife, and United States Fish and Wildlife Services.

ACTION ITEMS & STAFF RECOMMENDATIONS Staff recommends approval of the Xcel Line Rebuild application with the following suggested conditions:

Recommended Conditions:

1. The development shall comply with the requirements of the Code. Any future physical changes or improvements to the property or buildings are subject to the review and approval of the Community Development Director for compliance with applicable requirements of the Glenwood Springs Municipal Code.
2. The applicant shall comply with all verbal representations made in the public hearings, as outlined in all application materials, and/or as revised per conditions herein and approved by the Community Development Director.
3. The applicant shall comply with recommendations identified in the technical reports submitted as part of the application including but not limited to Geo-technical and Drainage.
4. Prior to submitting a building and/or grading permit application, the owner shall -

- a. Submit a Final Plans application in accordance with Municipal Code section 070.060.050(c).
 - b. Submit an Engineer's Estimate of all public improvements and provide security for completing said improvements per requirements of the Engineering Standards.
 - c. Provide detail and design of "Guard Structures" identified in the grading plan for approval of the Community Development Director. This should include any access grading, excavation, or restoration needed to maintain structures.
 - d. Provide a written contingency plan for encountering artesian groundwater conditions, for review and approval by the City Engineer.
 - e. Enter into a Development Agreement that memorializes the development approvals.
 - f. Provide all other permits from outside jurisdictions necessary for the project.
5. At the time of Final Plans review the applicant shall submit all required civil and architectural plans and related reports that demonstrate compliance with Code requirements and the Engineering Standards, including all applicable comments provided by the City staff.
 6. Prior to issuance of the building permit, the applicant shall –
 - a. Provide evidence of approved and recorded land rights agreements with all involved property owners including the City of Glenwood Springs.
 7. Prior to issuance of the Certificate of Completion, owner shall
 - a. Provide as-built plans and an Improvement Survey Plat per the Engineering Standards.

Suggested Findings:

- (1) The health, welfare, and safety of the residents of this City will be protected and served.
- (2) The project is in general conformance with the Comprehensive Plan and other duly adopted plans and permit criteria.
- (3) The project is financially feasible.
- (4) The project is not subject to significant risk from natural hazards.
- (5) The project will not have a significant adverse effect on the capability of local governments affected by the project to provide local infrastructure and services, or exceed the capacity of service delivery systems.
- (6) The project will not have a significant adverse effect on the quality or quantity of recreational opportunities and experience.
- (7) The project will not significantly degrade air quality.
- (8) The project will not significantly degrade existing visual quality.
- (9) The project will not significantly degrade surface water quality.
- (10) The project will not significantly degrade groundwater quality.
- (11) The project will not significantly degrade wetlands and riparian areas, terrestrial or aquatic plant or animal life.
- (12) The project will not significantly deteriorate soils and geologic conditions.

(13) The project will not cause a nuisance.

(14) The project will not result in unreasonable risk of releases of hazardous materials.

(15) Urban development, population densities, and site layout and design of storm water and sanitation systems shall be accomplished in a manner that will prevent the pollution of aquifer recharge areas.

(16) The project shall be reasonably necessary to meet projected community development and population demands in the areas to be served by the project, or to comply with regulatory or technological requirements.

(17) The project shall be constructed in areas which will result in the proper utilization of existing facilities or systems to ensure the orderly and sustainable development of infrastructure in the City and adjacent communities.

(18) Economic impacts including, but not limited to, taxable property, licensed and permitted facilities, and recreation related to the proposed project have been identified and will be compensated for or mitigated.



LAND USE APPLICATION

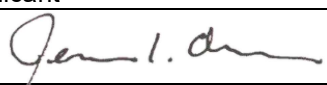
City of Glenwood Springs
Economic and Community Development Dept.
101 West 8th Street
Glenwood Springs, CO 81601
970-384-6411

Ordinance Amendments		Development Permits	
☐	Rezoning	Site/Architectural Plan Review	
☐	Rezoning to Planned Unit Development (PUD)	☐	Administrative
☐	Annexation	☐	Minor
☐	Condominiumization	☐	Major
☐	Annexation	☐	Master Plan
☐	Street Vacation	☐	Construction Plans
		☐	Location & Extent
Subdivisions			Right of Way Encroachment License
☐	Minor Subdivision	☐	Floodplain Development Permit
☐	Preliminary Plat	☐	Special Use Permit
☐	Final Plat		Flexibility and Relief Procedures
☐	Vacation of Right-of-Way	☐	Variance
		☐	Administrative Adjustment
Other Land Use Applications		☐	Appeal
☐	Outdoor Seating	☐	Landmark Alteration Certificate
☒	Matters of State Interest (1041)		

Applicant/Property Owner Information:			
Applicant		Owner	
Public Service Company of Colorado, a Colorado corporation conducting business as Xcel Energy		See 1041 Application, Appendix E	
Relationship to Owner		Owner	
Public utility			
Applicant Address		Owner Address	
1800 Larimer Street, Suite 400		See Appendix E	
Denver, CO 80202			
Phone 303.285.6533	Email Address jennifer.l.chester@xcelenergy.com	Phone	Email Address

Property Information:	
Address	Parcel Number
See Figure 1	See Appendix E
Subdivision	Lot and Block Number
Not applicable	
Zone District I2, M1, RM1, RM2, RL, PUD, HP, I1, RR, RT, RH	Existing Land Use Transmission Line

General Project Description:
Replacement of approximately 2 miles of existing 69-kilovolt electric transmission line between the Glenwood Springs and Mitchell Creek substations. See Project Narrative and Figure 1.

Signatures:		
The owner or applicant must be present at the hearing. All public hearings must be properly noticed according to G.S.M.C. Section 070.010.030. Signatures of all owners of the property must appear before the application is accepted. Partnerships or corporations may have the authorized general partner or corporate officer sign the		
	Applicant	Date
		9/15/23
	Owner	Date

application. (Attach additional incorporation documents if necessary.) I declare under the penalty of perjury that the above information is true and correct to the best of my knowledge.	Please see text in red below	
	Owner	Date

PSCo has easements along the existing transmission line and is working with landowners to review those easements and acquire additional right-of-way along the transmission line, as needed for access, and temporary construction easements. Any necessary easements will be acquired before construction begins on any parcel.

September 15, 2023

Via electronic file transfer to Hannah.Klausman@cogs.us

Hannah Klausman: Director, Economic and Community Development
City of Glenwood Springs
101 W 8th Street
Glenwood Springs, CO 81601

RE: Glenwood Springs–Mitchell Creek Electric Transmission Line Rebuild Project—
Municipal Code, (“Code”), Article 070.080 Guidelines and Regulations of Matters of
State Interest – Major Facilities of a Public Utility (“1041 Regulations”) – 1041
Permit Application (“1041 Application”)

Dear Hannah:

Public Service Company of Colorado (PSCo), a Colorado corporation conducting business as Xcel Energy, is seeking approval a 1041 Application from the City of Glenwood Springs (City) to rebuild the existing Glenwood Springs to Mitchell Creek 69-kilovolt transmission line (Project) located in the City. The transmission line (a 2.25-mile segment) is located between the existing Glenwood Springs Substation (northeast of the Glenwood Hot Springs Resort) and the existing Mitchell Creek Substation (northwest of the Glenwood Meadows shopping center).

Project representatives met with City staff on September 14, 2020, for the Location and Extent (L&E) Permit Pre-Application meeting where Xcel Energy provided information about the Project and responded to questions from City representatives. On September 21, 2021, Xcel Energy submitted a L&E Permit application in accordance with the L&E Review Application Checklist provided by the City and the City of Glenwood Springs Municipal Code, Article 070.060.050(d). Xcel Energy received verbal comments from the City on the L&E Permit application on October 19, 2021 during a meeting with City representatives to discuss the application. On October 27, 2021, Xcel Energy received additional comments from the City's Engineering Department by email. Xcel Energy resubmitted a revised L&E Permit package on March 30, 2022, to address all comments received by the City.

Xcel Energy resubmitted a revised L&E Permit package on August 8, 2023, to amend the previous L&E Permit application package to account for an updated alignment. In that submittal, Xcel Energy included a Request for Administrative Determination that the Project qualifies as an exemption from the 1041 permitting requirements. On August 15, 2023, the City provided Xcel Energy with a Determination of 1041 Regulation Applicability and determined that the Project is subject to the 1041 Regulations (1041 Determination).

Xcel Energy respectfully disagrees with the analysis and conclusion in the 1041 Determination given the Project is a rebuild of aging existing infrastructure in the same alignment. Nevertheless, Xcel Energy has decided to accommodate the City in this matter and are submitting a 1041 Application concurrently with this letter. This decision to proceed is largely due to the immediate need to serve important public interests, including continued utility service reliability and facilities safety through this rebuild Project. Accordingly, please process the 1041 Application together with the L&E Permit Application previously submitted for the Project pursuant to the Code, Section 070.080.260.

Submittal of this 1041 Application is not meant to be construed as a submission by Xcel Energy to the City's 1041 Regulations for any future utility projects, nor is it intended to establish a precedent regarding 1041 permit matters in any other jurisdiction. Furthermore, nothing in this letter shall be deemed a waiver of Xcel Energy's rights or remedies, and all such rights are expressly reserved.

The enclosed 1041 Application is being submitted pursuant to the 1041 Determination. On July 25, 2022, the City provided Xcel Energy with an annotated and modified version of the submission requirements outlined in the 1041 Regulations to be used solely for the Xcel Energy Glenwood Springs – Mitchell Creek Electric Transmission Line Rebuild Project. The 1041 Application is formatted based on that annotated and modified version of the 1041 Regulations.

We look forward to working with you during the ongoing permit process. Please feel free contact me by telephone at (303) 285-6533 or email at jennifer.l.chester@xcelenergy.com.

Sincerely,

Jennifer Chester
Xcel Energy
Siting and Land Rights, Manager
1800 Larimer St
Denver, CO, 80202



Glenwood Springs–Mitchell Creek Electric Transmission Line Rebuild Project



Submitted to
City of Glenwood Springs
101 W 8th Street
Glenwood Springs, CO 81601



TETRA TECH

Prepared by
Tetra Tech, Inc.
1580 Broadway, Suite 1400
Denver, CO 80202

**Areas and Activities of State
Interest Permit Application**

September 15, 2023

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**Glenwood Springs–Mitchell Creek Electric Transmission Line Rebuild Project
Areas and Activities of State Interest Permit Application**

Application Submittal Requirements (Sec. 070.080.250)	
Requirement	Location in this Permit Application
1) Cover page. Completed application cover page in the format approved and maintained by the Community Development Department.	Cover Page
2) Information Describing the Applicant a) The names, addresses, including email address and fax number, organizational form, and business of the applicant and, if different, the owner of the project. b) The names, addresses and qualifications, including those areas of expertise and experience with projects directly related or similar to that proposed in the application package, of individuals who are or will be responsible for constructing and operating the project. c) Written authorization of the application package by the project owner, if different than the applicant. d) Documentation of the applicant's financial and technical capability to develop and operate the project, including a description of the applicant's experience developing and operating similar projects. e) Written qualifications of report preparers.	Section 2
3) Information describing the project proposal a) A description of the proposed facilities and site. b) A description of the present or most recent use and zoning. c) Vicinity map showing the proposed site, including proposed zoning designation, and the surrounding area. d) Executive summary of the proposal indicating the scope and need for the project. e) Plans and specifications of the project in sufficient detail to evaluate the application against the applicable review criteria. f) Descriptions of alternatives to the project considered by the applicant. If the Community Development Director determines that the nature or extent of the proposal involves the potential for significant damage and warrants examination of other specific, less damaging alternatives, the Community Development Director may require the applicant to evaluate and present information on such additional alternatives as part of the application. g) Schedules for designing, permitting, constructing and operating the project, including the estimated life of the project.	Section 3

Areas and Activities of State Interest Permit Application
Glenwood Springs–Mitchell Creek Electric Transmission Line Rebuild Project

Application Submittal Requirements (Sec. 070.080.250)	
Requirement	Location in this Permit Application
h) The need for the project, including a discussion of alternatives to the project that were considered and rejected; existing/proposed facilities that perform the same or related function; and population projections or growth trends that form the basis of demand projections justifying the project. i) Description of relevant conservation techniques to be used in the construction and operation of the project. j) Description of demands that this project expects to meet and basis for projections of that demand. k) List of adjacent property owners and their mailing addresses.	
4) Scope of proposed project relevant to specific designated area and/or activity. a) Domestic water or sewage treatment systems and/or major extensions thereof. i) Detailed plans of the proposal, including not less than thirty (30) percent engineering plans and specifications prepared by a registered professional engineer, and proposed system capacity and service area plans mapped at a scale acceptable to the Department. ii) A description of all existing or approved proposed domestic water or sewage treatment systems within the proposed project area. iii) A description the design capacity of each domestic water or sewage treatment system facility proposed and the distribution or collection network proposed in the proposed project area. iv) A description the excess capacity of each treatment system and distribution or collection network in the affected community or proposed project area. v) A description the operational efficiency of each existing system in the proposed project area, including the age, state of repair, and level of treatment. vi) A description the existing water utilization, including the historic yield from rights and use by category such as agricultural, municipal, and industrial supply obligations to other systems. vii) A description of any impacts to the City's water resources used to serve the City's water service area.	Section 4a
b) Major facilities of a public utility. i) Specifications of approximate floor space of any office building, storage facility, or other enclosed structure. ii) Voltage and length of transmission lines. iii) The power source and generating capacity iv) The function and size of any substation. v) The diameter and length of any gas pipeline. vi) The capacity of storage tanks, and type of petroleum derivative to be stored. vii) The proposed service area.	Section 4b

Application Submittal Requirements (Sec. 070.080.250)	
Requirement	Location in this Permit Application
viii) The resource area (e.g. source of power being generated or transmitted, source of petroleum derivative being transported). ix) A computer modeled electromagnetic field measurement within the proposed transmission line easement for that portion of the transmission line between substations or transition sites. x) Measures taken to comply with the concept of prudent avoidance with respect to planning, siting, construction, and operation of transmission lines, which may be those steps taken to comply with CCR 723-3 § 3206(9)(b) or similar authority, for projects where other similar authority is applicable. xi) Any impacts to vegetation and wildlife in the City. xii) Possible alternatives to achieve underground transmission lines associated with the facility. xiii) Visuals demonstrating impact to scenic resources.	
c) Efficient utilization of municipal and industrial water projects. i) A description of efficient water use, recycling and reuse technology intended for the project. Such description shall include estimated stream transit losses of water, reservoir evaporation losses, and power and energy requirements of the project and project alternatives. ii) Map and description of other municipal and industrial water projects in the City and vicinity, including capacity and service levels, location of intake and discharge points, debt structure, fees and rates, and service plan boundaries. iii) A description of the water to be used, including the applicant's right to use the water, adjudicated decrees or determinations, quantity, and comments from reviewing authorities.	On July 25, 2022, the City of Glenwood Springs (City) provided Xcel Energy with an annotated version of the Article 070.080 of the City's Municipal Code to be used for the Xcel Energy Glenwood Springs – Mitchell Creek Electric Transmission Line Rebuild Project. This section was struck from the annotated version of the 1041 Regulations. Therefore, information to address this requirement is not included in this application package.
d) Development in areas containing, or having a significant impact upon, historical, natural, or archaeological resources of statewide importance. i) A description of the existing natural environment and an analysis of the impacts of the project on the natural environment and natural resources, including water resources, wildlife, and air quality, to include maps and engineering analyses regarding the surface water quality, groundwater quality, water quantity, flood lands, wetlands, and riparian areas. ii) A description of proposals to mitigate any impact to the natural environment and natural resources, including to the watershed, wildlife, or air quality. iii) A description of the existing historical and archaeological resources in the proposed project area and a description of proposals to mitigate any impact to the existing historical and archaeological resources.	On July 25, 2022, the City provided Xcel Energy with an annotated version of the Article 070.080 of the City's Municipal Code to be used for the Xcel Energy Glenwood Springs – Mitchell Creek Electric Transmission Line Rebuild Project. This section was struck from the annotated version of the 1041 Regulations. Therefore, information to address this requirement is not included in this application package.
e) Development in areas around key facilities in which development may have a material effect upon the key facility or the surrounding community.	On July 25, 2022, the City provided Xcel Energy with an annotated version of the Article 070.080 of the City's Municipal Code to be used for the Xcel Energy

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i) A description of the existing key facilities and an analysis of the impacts of the project on the key facilities and the surrounding community to include maps showing the key facilities and including traffic and use studies. ii) A description of proposals to mitigate the impact on the key facilities and surrounding communities.	Glenwood Springs – Mitchell Creek Electric Transmission Line Rebuild Project. This section was struck from the annotated version of the 1041 Regulations. Therefore, information to address this requirement is not included in this application package.
5) Proof of notice as provided under Section 070.080.280.	Section 5
6) Comments of other agencies. Any commentary received by other agencies with review authority over the proposal, including, without limitation, the state Department of Natural Resources, the state Department of Public Health and Environment, and any other federal, state, or local agency.	Section 6
7) Demonstration of need. a) Population trends for the project area, including present population, population growth, and growth rates document the sources used. b) The predominant types of developments to be served by the proposed new systems and/or facilities or extensions thereof. c) The percentage of design capacity at which the current system is now operating. d) A description of conditions and projections that prohibit present facilities from being upgraded to adequately accommodate increased demand. e) Potential alternatives.	Section 7
8) Property rights, other permits, and approvals. a) Description of property rights that are necessary for or that will be affected by the project, including easements and property rights proposed to be acquired through negotiation or condemnation. b) A list of all other federal, state, and local permits and approvals that will be required for the project, together with any proposal for coordinating these approvals with the City permitting process. Copies of any permits or approvals related to the project that have been granted. c) Copies of relevant official federal and state consultation correspondence prepared for the project; a description of all mitigation required by federal, state, and local authorities; and copies of any draft or final environmental assessments or impact statements required for the project. d) Details of the source and rights for the water supplies for the system, including any permits, decrees, or contracts for such rights, or the application submitted for change of water rights, appropriation of water, or augmentation plans. e) Proof of ownership or a contractual right to develop the property.	Section 8 On July 25, 2022, the City provided Xcel Energy with an annotated version of the Article 070.080 of the City's Municipal Code to be used for the Xcel Energy Glenwood Springs – Mitchell Creek Electric Transmission Line Rebuild Project. Section 8(d) was struck from the annotated version of the 1041 Regulations. Therefore, information to address this requirement is not included in this application package.
9) Land Use	Section 9

Application Submittal Requirements (Sec. 070.080.250)	
Requirement	Location in this Permit Application
a) Provide a map at a scale relevant to the project and acceptable to the Community Development Department describing existing land uses and existing zoning of the proposed project area and the project service area, including peripheral lands which may be impacted. The land use map shall include but need not necessarily be limited to the following categories: Residential, commercial, industrial, extractive, transportation, communication and utility, institutional, open space, outdoor recreation, agricultural, forest land and water bodies. Show all special districts (school, fire, water, sanitation, etc.) within the project area. b) All immediately affected public land boundaries should be indicated on the map. Potential impacts of the proposed development upon public lands will be visually illustrated on the map as well as described in the text. c) Specify whether and how the proposed project conforms to the Comprehensive Plan. d) Specify whether and how the proposed project conforms to applicable regional and state planning policies. e) Specify whether and how the proposed project conforms to applicable federal land management policies. f) Specify how the proposed project will utilize existing easements or right-of-way to achieve project objectives. g) If relevant to the project design, describe the agricultural productivity capability of the land in the project area, using Soils Conservation Service soils classification data. h) Describe the probability that the project may be significantly affected by earthquakes, floods, fires, snow, slides, avalanches, rockslides or landslides and any measures that will be taken to reduce the impact of such events upon the project. i) Specify if excess service capabilities created by the proposed project will prove likely to generate sprawl or strip development. j) Specify whether the demand for the project is associated with development within or contiguous to existing service areas.	On July 25, 2022, the City provided Xcel Energy with an annotated version of the Article 070.080 of the City's Municipal Code to be used for the Xcel Energy Glenwood Springs – Mitchell Creek Electric Transmission Line Rebuild Project. Sections 9(d), (e), (g) and (i) were struck from the annotated version of the 1041 Regulations. Therefore, information to address this requirement is not included in this application package.
10) The Community Development Department Director may require submission of any plan, study, survey, or other information, in addition to the information required by this section, at the applicant's expense, as in the Director's judgment is necessary to enable it to review and act upon the application.	Section 10
11) Any application which requires compliance with C.R.S. § 24-65.5-101 et seq. (Notification to Mineral Owners of Surface Development), shall not be considered to have been submitted as complete until the applicant has provided a certification signed by the applicant confirming that the applicant or its agent has examined the records of the County Clerk and Recorder for the existence of any mineral estate owners or lessees that own less than full fee title in the property which is the subject of the application,	Section 11

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and stating whether or not any such mineral estate owners or lessees exist. In addition, for purposes of the City convening its initial public hearing on any application involving property which mineral estate owners or lessees owning less than full fee title in the property have been certified by the applicant to exist, the application shall not be considered to have been submitted as complete until the applicant has provided an additional signed certification confirming that the applicant has, at least thirty (30) days prior to the initial public hearing, transmitted to the City and to the affected mineral estate owners and lessees the notices required by C.R.S. § 24-65.5-101 et seq.	
12) Projected development schedule. a) An estimate of the maximum number of employees, number of shifts and employees per shift during the following phases: Construction, operation, and maintenance. b) Information regarding any future phases or extensions of the facility and relationship of the facility (if currently foreseen) to larger programs and plans. c) A timetable for planning (e.g., federal permits, state permits, local zoning, etc.). d) An estimate beginning and completion of construction and beginning of operation of facility or system. e) A description of any support facilities (e.g., pollution control parking areas, landscaping, etc.) to be provided. f) A description of any feasible "non-structural" alternatives to meet the objectives of the proposed site selection and construction.	Section 12
13) Financial information. a) Relevant bond issue, loan and other financing approvals or certifications (ex: approved bond issues; bond counsel opinion). b) A description of the intended financial/economic impacts on the proposed project on the City and surrounding area. c) Business plan that generally describes the financial feasibility of the project. d) A plan to offset increased demand on the City's existing facilities, systems, or public utilities.	On July 25, 2022, the City provided Xcel Energy with an annotated version of the Article 070.080 of the City's Municipal Code to be used for the Xcel Energy Glenwood Springs – Mitchell Creek Electric Transmission Line Rebuild Project. This section was struck from the annotated version of the 1041 Regulations. Therefore, information to address this requirement is not included in this application package.
14) Local infrastructure and services impacts. An impact analysis that addresses the manner in which the applicant will comply with the relevant permit application review criteria. The impact analysis shall include the following information: description of existing capacity of and demand for local government services including, but not limited to, roads, schools, water and wastewater treatment, water supply, emergency services, transportation, infrastructure, and other services necessary to accommodate the project within the City.	Section 13

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15) Recreational opportunities. Description of the impacts and net effect of the project on present and potential recreational opportunities.	On July 25, 2022, the City provided Xcel Energy with an annotated version of the Article 070.080 of the City's Municipal Code to be used for the Xcel Energy Glenwood Springs – Mitchell Creek Electric Transmission Line Rebuild Project. This section was struck from the annotated version of the 1041 Regulations. Therefore, information to address this requirement is not included in this application package.
16) Social impacts. A description of other intended social impacts of the proposed project, including, by way of illustration, increased access to relevant services.	On July 25, 2022, the City provided Xcel Energy with an annotated version of the Article 070.080 of the City's Municipal Code to be used for the Xcel Energy Glenwood Springs – Mitchell Creek Electric Transmission Line Rebuild Project. This section was struck from the annotated version of the 1041 Regulations. Therefore, information to address this requirement is not included in this application package.
17) Areas of paleontological, historic, or archaeological importance. Description of the impacts and net effect of the project on sites of paleontological, historic, or archaeological interest.	Section 14
18) Nuisance. Descriptions of noise, glare, dust, fumes, vibration, and odor levels anticipated to be caused by the project.	Section 15
19) Air quality. Description of the impacts and net effect that the project would have on air quality during both construction and operation, and under both average and worst case conditions, considering particulate matter and aerosols, oxides, hydrocarbons, oxidants, and other chemicals, temperature effects and atmospheric interactions.	Section 16
20) Visual quality. Description of the impacts and net effect that the project would have on visual quality, considering viewsheds, scenic vistas, unique landscapes or land formations within view of the project area.	Section 17 Appendix G
21) Surface Water Quality a) Map and/or description of all surface waters relevant to the project, including description of provisions of Region XII's regional water quality management plan, and NPDES Phase II Permit and necessary Erosion and Stormwater Quality Control Permit ("ESQCP"), Section 404 Federal	Section 18

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Clean Water Act Permit that applies to the project and assessment of whether the project would comply with those provisions. b) Existing data monitoring sources. c) Descriptions of the immediate and long-term impact and net effects that the project would have on the quantity and quality of surface water under both average and worst case conditions.	
22) Groundwater quality. a) Map and/or description of all groundwater, including any and all aquifers relevant to the project. At a minimum, the description should include: i) Seasonal water levels in each portion of the aquifer affected by the project. ii) Artesian pressure in said aquifers. iii) Groundwater flow directions and levels. iv) Existing aquifer recharge rates and methodology used to calculate recharge to the aquifer from any recharge sources. v) For aquifers to be used as part of a water storage system, methodology and results of tests used to determine the ability of the aquifer to impound groundwater and aquifer storage capacity. vi) Seepage losses expected at any subsurface dam and at stream-aquifer interfaces and methodology used to calculate seepage losses in the affected streams, including description and location of measuring devices. vii) Existing groundwater quality and classification. viii) Location of all water wells potentially affected by the project and their uses. b) Description of the impacts and net effect of the project on groundwater.	Section 19
23) Water quantity. a) Map and/or description of existing stream flows and reservoir levels relevant to the project. b) Map and/or description of existing minimum stream flows held by the state Water Conservation Board. c) Descriptions of the impacts and net effect that the project would have on water quantity. d) Statement of methods for efficient utilization of water, including recycling and reuse. e) Descriptions on the impacts to riparian vegetation and fisheries.	On July 25, 2022, the City provided Xcel Energy with an annotated version of the Article 070.080 of the City's Municipal Code to be used for the Xcel Energy Glenwood Springs – Mitchell Creek Electric Transmission Line Rebuild Project. This section was struck from the annotated version of the 1041 Regulations. Therefore, information to address this requirement is not included in this application package.
24) Floodplains, wetlands, and riparian areas; terrestrial and aquatic animals, plant life, and habitat. Applicant shall only provide description of foregoing natural conditions, animal and plant life at, but not	On July 25, 2022, the City provided Xcel Energy with an annotated version of the Article 070.080 of the City's Municipal Code to be used for the Xcel Energy

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to exceed, the level of detail required by other federal or state permits or reviews which are applicable to the project.	Glenwood Springs – Mitchell Creek Electric Transmission Line Rebuild Project. This section was struck from the annotated version of the 1041 Regulations. Therefore, information to address this requirement is not included in this application package.
25) Soils, geologic conditions, and natural hazards. a) Map and/or description of soils, geologic conditions, and natural hazards including, but not limited to, soil types, drainage areas, slopes, avalanche areas, debris fans, mud flows, rock slide areas, faults and fissures, seismic history, and wildfire hazard areas, all as relevant to the project area. b) Descriptions of the risks to the project from natural hazards. c) Descriptions of the impacts and net effect of the project on soil and geologic conditions in the area.	Section 20
26) Hazardous materials. a) Description of all solid waste, hazardous waste, petroleum products, hazardous, toxic, and explosive substances to be used, stored, transported, disturbed or produced in connection with the project, including the type and amount of such substances, their location, and the practices and procedures to be implemented to avoid accidental release and exposure. b) Location of storage areas designated for equipment, fuel, lubricants, and chemical and waste storage with an explanation of spill containment plans and structures.	Section 21
27) Monitoring and mitigation plan. a) Description of all mitigation that is proposed to avoid, minimize or compensate for adverse impacts of the project and to maximize positive impacts of the project. i) Describe how and when mitigation will be implemented and financed. ii) Describe impacts that are unavoidable that cannot be mitigated. b) Description of methodology used to measure impacts of the project and effectiveness of proposed mitigation measures. c) Description, location, and intervals of proposed monitoring to ensure that mitigation will be effective. d) Emergency procedures to be used in the event of a fire, explosion, or other event which may endanger the public health, safety, and welfare.	Section 22
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additional information. Such additional information may include applicant's written responses to comments by a referral agency.	
29) 070.080.320. Review criteria for all applications. All applications under these regulations shall be evaluated against the following general criteria. Each subsection below constitutes a "criterion". Within each subsection are further guidelines to be considered for each criterion. Where such terms as "reasonable," "feasible" and "adequate" are used in the foregoing criteria, the Community Development Department Director and/or the Permit Authority shall determine in each case what is or is not reasonable, feasible, or adequate.	Section 24
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1. Introduction

Public Service Company of Colorado (PSCo), a Colorado corporation conducting business as Xcel Energy, is proposing to rebuild the existing 2.25-mile Glenwood Springs to Mitchell Creek 69-kilovolt (kV) transmission line (Project), segments of which are located in the City of Glenwood Springs (Glenwood Springs or City) and unincorporated Garfield County. The existing transmission line must be rebuilt because it has reached the end of its safe and useful operational life. The rebuilt transmission line will be in the same alignment as the existing route that connects the Glenwood Springs Substation, located northeast of the Glenwood Hot Springs Resort, to the existing Mitchell Creek Substation, located northwest of the Glenwood Meadows shopping center (Figure 1).

Approximately 2 miles of the existing line are within City jurisdiction and the remaining segment is within unincorporated Garfield County (Figure 1). Transmission poles will be placed in 31 locations in Glenwood Springs and 4 locations in unincorporated Garfield County. This Major Facilities of a Public Utility (1041) Permit application will only address the portion of the transmission line and related poles located within the City. Xcel Energy is currently coordinating with Garfield County officials on the portion of the Project located in the County.

On July 25, 2022, the City provided Xcel Energy with an annotated version of the submission requirements outlined in Article 070.080.250 of the City's Municipal Code (1041 Regulations) to be used for the Xcel Energy Glenwood Springs – Mitchell Creek Electric Transmission Line Rebuild Project. This 1041 Permit application package was prepared per the requirements outlined in that annotated version of the 1041 Regulations and addresses the approval criteria in Articles 070.080.320 and 070.080.340.

2. Information Describing the Applicant (070.080.250)(2)

2a. The names, addresses, including email address and fax number, organizational form, and business of the applicant and, if different, the owner of the project. (070.080.250)(2)(a)

Xcel Energy serves as the project owner and applicant. Xcel Energy's authorized representative is:

Jennifer Chester
Manager, Siting and Land Rights
Xcel Energy
1800 Larimer Street, Suite 400
Denver, CO 80202
303-285-6533
Jennifer.L.Chester@xcelenergy.com

2b. The names, addresses and qualifications, including those areas of expertise and experience with projects directly related or similar to that proposed in the application package, of individuals who are or will be responsible for constructing and operating the project. (070.080.250)(2)(b)

The names, addresses, and qualifications of individuals responsible for constructing and operating the Project are provided in Table 1.

Table 1: Names, Addresses and Qualifications of Individuals Constructing and Operating the Project

Name	Address	Qualifications
XCEL ENERGY		
Jennifer Chester Manger, Siting and Land Rights	1800 Larimer Street, Suite 400, Denver, CO 80202	Jennifer Chester is the Manager of Siting and Land Rights responsible for overseeing routing/siting, permitting, and public outreach activities for Xcel Energy projects in Colorado. Ms. Chester has 22 years of experience working in the utility planning industry as a consultant and utility employee routing and siting facilities, working with project stakeholders in public outreach forums, land use permitting activities, as well as other state and federal processes required for the construction and operation of electric transmission facilities.
Braileigh Jay Principal Agent, Siting and Land Rights	1800 Larimer Street, Suite 400, Denver, CO 80202	Braileigh Jay is a Principal Agent in the Siting & Land Rights Department at Xcel Energy and has over 20 years of experience in right-of-way/acquisition and federal permitting in the electric utility industry.
Josh Peterson Principal Transmission Line Engineer	1800 Larimer Street, Suite 400, Denver, CO 80202	Josh Peterson is a Principal Transmission Line Engineer with 15 years of experience designing transmissions lines between 69kV and 345kV.
Julie Stencel Assistant General Counsel	1800 Larimer Street, Suite 1400, Denver, CO 80202	Julie Stencel is Assistant General Counsel for Xcel Energy and has over 25 years of legal experience in land use and real estate development matters. Ms. Stencel is responsible for managing all legal support necessary for the acquisition and land use permitting for all transmission projects in Colorado, Texas and New Mexico.
Alan Masters Director, Transmission Regional Field Operations	Xcel Energy Golden, CO	Alan Masters is the Transmission Regional Director responsible for transmission and substation construction departments. Mr. Masters has 22 years of experience working for Xcel Energy as a Substation Design Engineer, Principal Commissioning Engineer, and Principal Outage Coordination Engineer with in depth knowledge of the transmission system in Colorado.

Name	Address	Qualifications
Brett Gruesner Senior Manager, Transmission Control Center	Xcel Energy Golden, CO	Brett Gruesner is responsible for the Transmission Control Center which monitors ongoing operations of PSCo transmission facilities.

2c. Written authorization of the application package by the project owner, if different than the applicant. (070.080.250)(2)(c)

Xcel Energy serves as the project owner and applicant. Section 2a provides the contact information for Xcel Energy's authorized representative.

2d. Documentation of the applicant's financial and technical capability to develop and operate the project, including a description of the applicant's experience developing and operating similar projects. (070.080.250)(2)(d)

Xcel Energy is a major U.S. electric and natural gas company with annual revenues of \$15.3 billion (Xcel Energy 2022). The applicant has both the financial and technical ability to develop and operate the Project. Xcel Energy has experience rebuilding multiple electric transmission lines in Colorado. All necessary land use, environmental, and construction permits, approvals and authorizations will be obtained prior to the start of and during construction as required, and best management practices (BMPs) will be implemented to address public health, safety, and welfare and in accordance with permit conditions.

2e. Written qualifications of report preparers. (070.080.250)(2)(e)

The qualifications of the report preparers are provided in Table 2.

Table 2: Qualifications of Report Preparers

Name	Address	Qualifications
XCEL ENERGY		
Jennifer Chester Manger, Siting and Land Rights	1800 Larimer Street, Suite 400, Denver, CO 80202	Jennifer Chester is the Manager of Siting and Land Rights responsible for overseeing routing/siting, permitting, and public outreach activities for Xcel Energy projects in Colorado. Ms. Chester has 22 years of experience working in the utility planning industry as a consultant and utility employee routing and siting facilities, working with project stakeholders in public outreach forums, land use permitting activities, as well as other state and federal processes required for the construction and operation of electric transmission facilities.
Julie Stencel Assistant General Counsel	1800 Larimer Street, Suite 1400, Denver, CO 80202	Julie Stencel is Assistant General Counsel for Xcel Energy with over 25 years of legal experience in land use and real estate development matters. Ms. Stencel is responsible for managing all legal support

Name	Address	Qualifications
		necessary for the acquisition and land use permitting for all transmission projects in Colorado, Texas, and New Mexico.
TETRA TECH, INC.		
Taylor Michel Consultant, Routing & Permitting	390 Union Boulevard, Suite 400, Lakewood, CO 80228	Ms. Michel is an environmental planner and project manager with 5 years of experience. She works with clients and Tetra Tech's team of technical specialists to meet environmental requirements and obtain permits at the local levels. Ms. Michel has experience working through land use permitting processes in Colorado. Her experience includes electric transmission lines, substations, natural gas distribution infrastructure, and other energy projects.
Sarah McCall Consultant, Permitting	390 Union Boulevard, Suite 400, Lakewood, CO 80228	Ms. McCall has over 14 years of experience in land use permitting of utility-scale renewable energy facilities and other energy projects. Ms. McCall has been responsible for development of all aspects of land use permits, including budgeting, writing and reviewing permit applications, client and agency coordination, and public involvement and coordination.
Amy Sherman Consultant, Permitting & Environmental	390 Union Boulevard, Suite 400, Lakewood, CO 80228	Ms. Sherman is a project manager with over 15 years of experience in the environmental field, predominantly focused on permitting of renewable energy facilities and transmission. Her technical expertise includes CWA Section 404, NEPA, USFWS Section 7, state utility permits, and county discretionary permitting.

3. Information Describing the Project Proposal (070.080.250)(3)

3a. A description of the proposed facilities and site. (070.080.250)(3)(a)

Xcel Energy is proposing to rebuild a section of an existing 69-kV transmission line in Glenwood Springs to replace aging infrastructure and to ensure continued delivery of economical, safe and reliable electric service to customers in the Glenwood Springs area and western Colorado. The existing transmission line was originally built in the 1940s, and a portion was rebuilt in the 1960s. The transmission line segment between the existing Glenwood Springs and Mitchell Creek substations needs to be rebuilt because it has reached the end of its safe and useful operational life.

Xcel Energy studied alternatives for the transmission line location and evaluated technical design requirements and potential impacts on the environment, community, residents and businesses in

Glenwood Springs (Appendix A). Rebuilding the line in its existing alignment was identified as the preferred alternative (Appendix A, pg. 2-9).

3.a.1 Transmission Line Facilities and Route

The existing transmission line route connects the Mitchell Creek Substation, located northwest of the Glenwood Meadows shopping center, to the existing Glenwood Springs Substation, located northeast of the Glenwood Hot Springs Resort (Figure 1). Approximately 2 miles of the Project occur within City jurisdiction, with the remaining segment within unincorporated Garfield County jurisdiction. The existing route crosses the Colorado River near the Mitchell Creek Substation, runs north of Interstate 70 (I-70) through commercial and residential areas, and scales varying terrain and slopes to the Glenwood Springs Substation. The rebuilt transmission line will follow the same route as the existing transmission line (Figure 1).

The rebuilt transmission line will be constructed utilizing transmission structures that meet current design standards and will be strung with new conductor and optical ground wire. The rebuilt line will be operated at 69-kV, but the design standards would allow for future operation at 115-kV. The need to operate at 115-kV will be determined through an electric system planning study and in coordination with interconnected utilities such as Glenwood Springs Electric. Operation at 115-kV will require additional equipment or modifications at several electric substations which would be subject to permit requirements as applicable at that time.

The rebuilt transmission line will be constructed mostly with steel monopoles. Table 3 compares the existing facilities' characteristics with those proposed in the rebuild and provides an explanation for any proposed changes.

Table 3: Existing and Rebuild Characteristic Comparison

Characteristic	Existing Poles	Rebuild Poles	Additional Information
Material, Color	Wood, brown	Steel monopole (weathering), brown/rust	Steel poles comply with updated design standards and wildfire protection
Right-of-way Width	30' for transmission line	60' for transmission line	Additional right-of-way will be needed to provide sufficient clearance to existing buildings, for construction and maintenance activities, and to reduce number and height of poles
Height of Poles	26' to 101.5', average 47'	54.8' to 101.5', average 66'	Increased height needed to comply with current design standards (including lightning protection) and to provide for future increase in operating voltage of the transmission line
Access Required	Ground access for maintenance	Ground and helicopter access for construction, ground access for maintenance	Where access is difficult, helicopters will be used to limit ground disturbance from new access road construction
Additional Easements	Existing easements	Up to an additional 30' for transmission line, ground access for construction, and maintenance and helicopter fly zones	The existing easements date back to as early as the 1920s

Existing transmission poles along the transmission line vary from 26 to 101.5 feet in height. To ensure compliance with Xcel Energy design standards and the National Electric Safety Code (NESC) clearance requirements, the new pole heights along the transmission line will vary from 54.8 feet to 101.5 feet. Topography, span length, and adjacent land uses influence the necessary height of transmission poles. The new poles will be equipped with shield wires above the energized conductor lines; this equipment adds to the pole height but also provides protection against lightning strikes. Appendix B compares the height of each existing pole to the new pole heights. Example pole diagrams are also included in Appendix B. The configuration of the insulators on the new poles will vary and each will be monopole except for the two proposed H-frame pole locations necessary at the Colorado River crossing that are replacing two existing H-frame pole locations.

Two of the three existing pole locations along the northern side of Midland Avenue were constructed with guy wire anchors extending to the southern side of Midland Avenue. These guy wires were required at the time of installation to properly support the poles. The new poles will be self-supporting and will not require guy wire anchors, resulting in the removal of the existing guy wires on the southern side of Midland Avenue. The new poles will be taller than the existing poles in this location due to clearance requirements; however, the removal of the guy wires will result in an improved visual appearance for travelers along Midland Avenue and the adjacent trail to the south.

To ensure safe and reliable access for future construction and operation and maintenance and to rebuild the line to current industry design standards, the rebuilt transmission line will be constructed in a 60-foot-wide right-of-way (ROW). There are some areas where existing buildings are within the proposed expanded ROW and a smaller easement may be agreed upon with individual landowners in those areas. Xcel Energy is engaged in negotiations with landowners along the existing route to obtain additional ROW width where the existing easement does not meet 60 feet. Existing and new ROW will require vegetation management to create a safe working and operational space around the rebuilt transmission line.

Work at the Glenwood Springs and Mitchell Creek substations will be limited to activities needed to connect the rebuilt transmission line to each facility. Major improvements or new equipment are not planned to be installed at the substations.

3.a.2 Permanent Access Roads and Improvements

Where practicable, existing public roads and private roads will be utilized during Project construction and operation. Some private roads may require improvements and some new access roads will need to be constructed to accommodate construction equipment and long-term maintenance of the rebuilt transmission line.

Improved access roads within the City will be constructed to meet City requirements and standards, including those related to the Hillside Preservation zoning district outlined in the City's Municipal Code Section 070.020.170. Along the Project route, areas within the Hillside Preservation district occur north of I-70 along Traver Trail (Figure 2). Where road improvements are needed, Xcel Energy will obtain any necessary grading, stormwater, and erosion control permits and comply with permit requirements. Xcel Energy will engage in landowner negotiations where access roads traverse private property and will address any associated required impact mitigation measures as applicable.

Some access roads may remain post-construction to maintain access to the rebuilt transmission line for operation and maintenance activities. A detailed Grading Plan showing the locations and level of improvements needed for access roads is provided in Appendix C.

3.a.3 Construction Methods

Project work is expected to occur in phases that will generally include the following: construction access and vegetation clearing, equipment mobilization and material delivery, foundation construction, pole placement, conductor stringing, and land restoration.

Construction access road improvements, grading, and setup of temporary construction easements (TCEs), along with vegetation work will need to be conducted prior to construction. Proposed access roads will allow construction crews and vehicles to access transmission line pole locations, TCEs and the material staging area. TCEs will be used to stage construction equipment and materials including temporary construction trailers, cranes and steel poles. TCEs are also necessary when stringing the conductor wire. Additional details about TCEs and access roads are discussed in the following sections.

Vegetation management within the existing and expanded ROW will be required prior to, or in conjunction with, construction. Trees and vegetation growing within and near the Project ROW can cause downed lines, power outages, and wildfire. Vegetation management crews will work to prevent these situations from occurring. Vegetation management involves the use of various types of treatments including removing, pruning, and mowing vegetation and the treatment of vegetation with herbicides to ensure safe operations. The extent of this work will vary along the rebuilt transmission line depending on level of vegetation encroachment and additional ROW needs. The Vegetation Management Plans, consisting of the Revegetation Plan and the Noxious Weed Management Plan, are included in Appendix D.

After the preparation work has been completed, work on the transmission poles will begin. The new pole foundations will consist of concrete reinforced with steel that can range in diameter and depth based upon the subsurface conditions. Once construction crews have drilled the hole for the new pole, the foundation is installed and the hole is backfilled.

Transmission poles will then be placed using either cranes or a helicopter. Helicopter installation will be used in areas with steep terrain and involves assembling the transmission poles in the material staging area then transporting the poles by helicopter to installation locations to be lowered into place. Helicopter installation enables access to areas that are difficult for construction vehicles to traverse, minimizes construction impacts such as erosion, and expedites construction. This type of installation improves construction efficiency and helps protect the environment in areas of steep terrain. Due to the nature of helicopter installation and Federal Aviation Administration (FAA) safety requirements, residents located near the transmission poles will be required to evacuate during helicopter installation. Xcel Energy and the construction contractor will coordinate with the FAA during helicopter operations and obtain all required permits. Xcel Energy and the construction contractor will coordinate with the City on the evacuation plan and provide residents with prior notice if evacuation is required.

The remaining poles will be installed using the traditional crane installation method. Conventional crane installation will first involve assembling the transmission poles in the material staging area. Once

assembled, poles will be transported by truck to installation locations and cranes will lift the poles into place. Table 4 describes the installation methods for each new transmission pole location.

Table 4: Installation Method by Pole Location

Pole Locations ¹	Installation Method
113-140	Helicopter
141-147	Crane

¹ Pole locations 133-136 occur in unincorporated Garfield County

Once all the transmission poles have been put in place, the conductor wire is strung using a temporary pulley system attached to the insulators. TCEs will be required at specific angles to ensure the conductor wire is pulled in line with the poles, remaining in alignment. The existing poles will be removed by crane, or in areas of steep terrain, by helicopter and the Project will be energized. After construction, the work areas and ROW will be restored. The Revegetation Plan for all areas disturbed during construction and a Noxious Weed Mitigation Plan are included in Appendix D.

Construction is expected to begin in spring 2024 pending permit approvals. Construction and restoration activities are expected to be completed and the Project will be put into service by summer 2024. See Table 5 below for a detailed Project schedule.

Table 5: Anticipated Project Schedule

Timeline	Activity
Spring 2024	Permanent Improvements
Winter 2021 (Complete)	Construction Material Delivery
Spring 2024	Vegetation Management
Spring 2024/Summer 2024	Construction of Transmission Poles
Spring 2024/Summer 2024	Removal of Existing Transmission Poles
Summer 2024	In Service
Summer 2024/Fall 2024	Restoration

3.a.4 Temporary Access Roads and Improvements

Proposed construction access roads will allow construction crews and vehicles to access transmission line pole locations, TCEs and the material staging area. Traffic controls may be required near the TCEs during construction to ensure the safety of crews and the travelling public.

As discussed in Section 3.a.2 of this application, Xcel Energy will utilize existing public and private roads during Project construction where practicable. Where road improvements are needed, Xcel Energy will obtain any necessary grading, stormwater, and erosion control permits and will engage in landowner negotiations where access roads traverse private property. Temporary access roads will be required during construction to access the existing transmission poles and install new poles. Some temporary access will only be required for crews to walk in and access the pole locations with light machinery. A detailed Grading Plan, outlining the locations of proposed temporary access and levels of improvements needed, is provided in Appendix C.

3.a.5 Temporary Construction Easements

Xcel Energy will utilize up to 36 TCEs during construction of the Project (Figure 1). TCEs will be used to stage construction equipment and materials including temporary construction trailers, cranes, and steel poles. TCEs are also necessary for construction crew parking and materials setup or when stringing the conductor wire. TCEs will also be used for construction access. The Grading Plan, included in Appendix C, outlines the locations of the staging/fly yard TCEs and areas that will be used for the pull sites. The TCE located near pole locations 133 and 134 is within unincorporated Garfield County but will be used during the construction and installation of Project components within Glenwood Springs.

Some TCEs may require grading to level the area for equipment placement and materials storage. Xcel Energy will obtain permits for this work as required. At the end of the construction phase, all equipment will be removed from the TCEs. Some proposed improvements at the TCEs will be permanent; these locations are shown in the Grading Plan in Appendix C. The remaining TCEs will be restored to reasonably the same conditions as pre-construction or as may be provided for in private agreements (including by re-seeding in accordance with Xcel Energy's vegetation management standards).

Two TCEs will be used as helicopter fly yards during construction including the area north of Traver Trail near pole locations 124-126, and an area within unincorporated Garfield County, west of Highlands Drive near pole locations 133-134. These areas will also be used for material staging, helicopter fly yards, and for conductor wire pulling as needed.

3b. A description of the present or most recent use and zoning. (070.080.250)(3)(b)

The current use of the Project is the existing transmission line. The Project will cross several zoning districts throughout the City including Hillside Prevention, Light Industrial, River Industrial, Mixed Use Corridor, Planned Unit Development, Residential High Density, Residential Low Density, Residential Medium Density, Rural Residential, and Residential Transitional (Figure 2). Article 070.020 of the City's Municipal Code outlines the types of zoning districts and Section 070.030.020 provides a table of allowed uses within each zoning district (Glenwood Springs 2022). Rebuilding the transmission line through these zoning districts is consistent with the City's Municipal Code as the Code allows the routing of transmission lines through any identified zoning designations (Glenwood Springs 2022). Some areas that will be traversed by the transmission line do not have zoning districts, such as open water areas, railroad, local road ROW and Colorado Department of Transportation (CDOT) ROW (Figure 2).

3c. Vicinity map showing the proposed site, including proposed zoning designation, and the surrounding area. (070.080.250)(3)(c)

A Vicinity Map and Zoning Map are included as Figures 1 and 2, respectively.

3d. Executive summary of the proposal indicating the scope and need for the project. (070.080.250)(3)(d)

A summary of the Project scope and need is provided in Sections 1 and Section 3a of this application.

3e. Plans and specifications of the project in sufficient detail to evaluate the application against the applicable review criteria. (070.080.250)(3)(e)

A plan set including a Utility Plan (Plan and Profiles) and Grading Plan is provided as Appendix C.

3f. Descriptions of alternatives to the project considered by the applicant. (070.080.250)(3)(f)

Xcel Energy studied alternatives for the transmission line location and evaluated technical design requirements and potential impacts on the environment, community, residents, and businesses in Glenwood Springs (Appendix A). Rebuilding the line in its existing alignment was identified as the preferred alternative (Appendix A).

Installing the transmission line underground will not be financially practicable and doing so will require approval by the Public Utilities Commission (PUC) and/or negotiated contracts that specify a responsible party to cover the incremental cost difference. The PUC will generally find sufficient justification for undergrounding when the cost variance is small. In this case, installing the rebuilt transmission line underground could be more than 10 times the cost of installing it overhead, and the construction impacts will be much greater due to the wide excavation trenches and underground vaults required for high-voltage underground transmission lines. The existing transmission line traverses steep slopes and the Hillside Preservation zoning district. These areas have limited access already posing construction and engineering challenges. Additionally, PUC Decision No. C15-0473 states that “utilities cannot use undergrounding of transmission lines as prudent avoidance measures absent atypical circumstances” (PUC 2015). Underground transmission lines are less accessible, creating longer delays in diagnosing and fixing outage issues. Underground transmission lines also require specialized structures or stations to connect the underground line to existing overhead lines. These structures will be required at each endpoint and will increase the visual impact on the surrounding area. Based on these challenges, the rebuilt transmission line will remain overhead.

3g. Schedules for designing, permitting, constructing and operating the project, including the estimated life of the project. (070.080.250)(3)(g)

Construction is expected to begin in spring 2024 pending permit approvals. Construction and restoration activities are expected to be completed and the Project will be put into service by summer 2024. A detailed Project schedule is provided in Table 5.

3h. The need for the project, including a discussion of alternatives to the project that were considered and rejected; existing/proposed facilities that perform the same or related function; and population projections or growth trends that form the basis of demand projections justifying the project. (070.080.250)(3)(h)

The existing transmission line was originally built in the 1940s, and a portion was rebuilt in the 1960s. The transmission line segment between the existing Glenwood Springs and Mitchell Creek substations needs to be rebuilt because it has reached the end of its safe and useful operational life. The Project will rebuild aging infrastructure to meet current design standards. The rebuilt line will be operated at 69-kV, but the

design standards would allow for future operation at 115-kV. The need to operate at 115-kV will be determined through an electric system planning study and in coordination with interconnected utilities such as Glenwood Springs Electric. Operation at 115-kV will require additional equipment or modifications at several electric substations that would be subject to permit requirements as applicable at that time. This Project will ensure continued delivery of economical, safe, and reliable electric service to customers in Western Colorado, including Glenwood Springs. See Section 3f for a discussion of alternatives to the Project.

3i. Description of relevant conservation techniques to be used in the construction and operation of the project. (070.080.250)(3)(i)

BMPs will be used during construction to control sediment and runoff from work areas. Required construction and waste management procedures will prevent accidental spills or runoff of sediment or contaminants to waterbodies or groundwater. Once construction has been completed, all areas not needed for operations and maintenance will be reclaimed in a manner generally similar to their condition prior to construction or as may be provided for in private agreements (including by re-seeding in accordance with Xcel Energy's vegetation management standards). All applicable land use, environmental, and construction permits will be obtained prior to the start of and during construction of the Project as required. Proposed mitigation measures are described in Section 22.

Helicopter installation will be used in areas with steep terrain and involves assembling the transmission poles in the material staging area then transporting the poles by helicopter to installation locations to be lowered into place. Helicopter installation enables access to areas that are difficult for construction vehicles to traverse, minimizes construction impacts such as erosion, and expedites construction. This type of installation improves construction efficiency, reduces the overall construction schedule, and helps protect the environment in areas of steep terrain.

3j. Description of demands that this project expects to meet and basis for projections of that demand. (070.080.250)(3)(j)

This Project will ensure continued delivery of economical, safe, and reliable electric service to customers in Western Colorado, including Glenwood Springs. This Project will be operated at 69-kV, but the design standards would allow for future operation at 115-kV. The need to operate at 115-kV will be determined through an electric system planning study and in coordination with interconnected utilities such as Glenwood Springs Electric. Operation at 115-kV will require additional equipment or modifications at several electric substations that would be subject to permit requirements as applicable at that time.

3k. List of adjacent property owners and their mailing addresses. (070.080.250)(3)(k)

A list of adjacent property owners and their mailing addresses is provided as Appendix E.

4. Scope of Proposed Project Relevant to Specific Designated Area and/or Activity (070.080.250)(4)

4a. Domestic water or sewage treatment systems and/or major extensions thereof. (070.080.250)(4)(a)

Water to be used during construction will be obtained from a local, permitted source. The Project will not require water use during operation.

The Project will not create any wastewater nor have any facilities requiring wastewater treatment. Portable temporary bathrooms that will be serviced on a regular basis will be on site during the construction period. The Project does not involve a domestic water or sewage system or the extension of one.

4b. Major facilities of a public utility. (070.080.250)(4)(b)

4.b.1 Specifications of approximate floor space of any office building, storage facility, or other enclosed structure. (070.080.250)(4)(b)(1)

No office buildings, storage facilities, or other enclosed structures are proposed.

4.b.2 Voltage and length of transmission lines. (070.080.250)(4)(b)(2)

The Project will rebuild the existing 2.25-mile Glenwood Springs to Mitchell Creek 69-kV transmission line, approximately 2 miles of which are located in the City of Glenwood Springs. This Project will be operated at 69-kV, but the design standards would allow for future operation at 115-kV.

4.b.3 The power source and generating capacity. (070.080.250)(4)(b)(3)

No generation is proposed as part of the Project.

4.b.4 The function and size of any substation. (070.080.250)(4)(b)(4)

Work at Glenwood Springs and Mitchell Creek substations will be limited to activities needed to connect the rebuilt transmission line to each facility. Major improvements or new equipment are not planned to be installed at the substations as part of this Project.

4.b.5 The diameter and length of any gas pipeline. (070.080.250)(4)(b)(5)

Gas pipelines are not proposed as part of the Project.

4.b.6 The capacity of storage tanks, and type of petroleum derivative to be stored. (070.080.250)(4)(b)(6)

No petroleum derivative will be stored, and no storage tanks will be needed during construction or operation of the Project.

4.b.7 The proposed service area. (070.080.250)(4)(b)(7)

In Glenwood Springs, transmission lines owned by Xcel Energy deliver electricity to the Glenwood Springs Electric Department's substations and distribution system, which then serves local users. Glenwood Springs Electric Department purchases wholesale wind power from the Municipal Energy Agency of Nebraska (MEAN) to serve the City's power needs. Replacing this aging infrastructure will ensure continued delivery of economical, safe, and reliable electric service to customers in the Glenwood Springs area and western Colorado.

4.b.8 The resource area (e.g. source of power being generated or transmitted, source of petroleum derivative being transported). (070.080.250)(4)(b)(8)

The Project will replace aging infrastructure to ensure continued delivery of economical, safe, and reliable electric service to customers in the Glenwood Springs area and western Colorado. A change in the source of the power being transmitted is not proposed as part of the Project. The electric grid is a complex network of independently owned and operated power generation facilities and transmission lines that deliver energy to local communities. As discussed in Section 4.b.7, in Glenwood Springs, transmission lines owned by Xcel Energy deliver electricity to the Glenwood Springs Electric Department's substations and distribution system, which then serves local users. Glenwood Springs Electric Department purchases wholesale wind power from the MEAN to serve the City's power needs.

4.b.9 A computer modeled electromagnetic field measurement within the proposed transmission line easement for that portion of the transmission line between substations or transition sites. (070.080.250)(4)(b)(9)

The Project will replace aging infrastructure and support continued delivery of economical, safe, and reliable electric service to customers in the Glenwood Springs area and western Colorado. The rebuilt transmission line will continue to be operated at 69-kV. The PUC sets standards for the reasonableness of noise levels and electromagnetic fields (EMF). Xcel Energy is required to meet state standards for both as outlined in the Code of Colorado Regulations (Section 4 CCR 723-3). The Project will operate within the magnetic field parameters set by the PUC. An EMF Study is provided as Appendix F.

4.b.10 Measures taken to comply with the concept of prudent avoidance with respect to planning, siting, construction, and operation of transmission lines, which may be those steps taken to comply with CCR 723-3 § 3206(9)(b) or similar authority, for projects where other similar authority is applicable. (070.080.250)(4)(b)(10)

The Project will replace aging infrastructure to support continued delivery of economical, safe, and reliable electric service to customers in the Glenwood Springs area and western Colorado. The new pole heights and ROW width will ensure compliance with current design standards and the NESC clearance requirements. The rebuilt transmission line will continue to be operated at 69-kV. The PUC sets standards for the reasonableness of noise levels and EMF. Xcel Energy is required to meet state standards for both as outlined in the Code of Colorado Regulations (Section 4 CCR 723-3). The Project will operate within

the magnetic field parameters set by the Colorado Public Utilities Commission. An EMF Study is provided as Appendix F.

Xcel Energy studied alternatives for the transmission line location and evaluated technical design requirements and potential impacts on the environment, community, residents, and businesses in Glenwood Springs (Appendix A). Xcel Energy considered an alternative with one deviation in the existing route that did not follow the original alignment. This deviation was in the area northwest of Glenwood Springs Substation and would have avoided a garage built within the existing transmission line ROW. However, this deviation and the necessary access roads would have resulted in the need for retaining walls along the hillside to maintain slope stability. Ultimately, based on concerns with building outside the existing alignment and anticipated impacts to the hillside, Xcel Energy determined that the deviation in the route could be removed to rebuild the transmission line completely within the existing alignment. Rebuilding the line in its existing alignment was identified as the preferred alternative (Appendix A).

4.b.11 Any impacts to vegetation and wildlife in the City. (070.080.250)(4)(b)(11)

Xcel Energy has coordinated with CPW and U.S. Fish and Wildlife Service (USFWS) regarding potential biological resources that may be impacted by the Project. The rebuilt transmission line will be in the same alignment as the existing route; therefore, minimal impacts to vegetation and wildlife are anticipated. Existing undisturbed trees, shrubs, and native vegetation will be preserved to the extent possible. Following construction, the ROW will be restored in a manner generally similar to pre-construction conditions or as may be provided for in private agreements.

Most of the Project is located in developed areas along I-70 that experience human activity and traffic. The Colorado River will be spanned by the Project in its current alignment; no impacts to fish or riparian areas are anticipated. A biological resources assessment was completed for the Project in November 2020. The Project and vicinity contain habitat for nesting raptors, including eagles, peregrine falcon, and burrowing owl. These species may be impacted by Project construction within their respective breeding seasons.

To avoid or minimize potential impacts to migratory birds and raptors, including eagles, Xcel Energy will conduct tree/vegetation clearing during the nonbreeding season for birds (September 1 – April 15) if feasible. If vegetation clearing cannot occur during the nonbreeding season, vegetation clearance surveys, raptor nest surveys, and burrowing owl surveys may be conducted per USFWS and CPW guidance to identify avian nesting activity and determine appropriate avoidance buffers (CPW 2020, CPW 2021) or monitor activities at nest sites until determined to be inactive and/or will not be impacted from construction. In addition, electrical components of the transmission lines will be separated to minimize the risk of avian contact and will follow Avian Power Line Interaction Committee (APLIC) guidelines (APLIC 2006). Xcel Energy has also implemented Avian Protection Plans, developed in collaboration with the USFWS. Under these plans, new and modified facilities are designed to meet industry standards to prevent or reduce the likelihood of avian incidents. Bird flight or swan diverters or other marking devices may be used as determined necessary for specific locations.

A Colorado Parks and Wildlife (CPW)-mapped bighorn sheep (*Ovis canadensis*) production area is located north and east of the eastern half of the Project but does not intersect the Project. The eastern

half of the Project also intersects the southern boundary of a bighorn sheep winter concentration area. Xcel Energy requested Environmental Reviews from CPW and USFWS on March 22, 2022 but did not receive a response from either agency. Xcel Energy followed up with CPW, requesting another Environmental Review on August 11, 2023 and is awaiting a response. Xcel Energy will continue to coordinate with CPW and USFWS through permitting, construction, and operation of the Project as needed to ensure compliance with all applicable federal and state regulations.

Vegetation management within the existing and expanded ROW will be required prior to, or in conjunction with, construction. Trees and vegetation growing within and near the Project ROW can cause downed lines, power outages and wildfire. Vegetation management crews will work to minimize the risk of these situations occurring. Vegetation management involves the use of various types of treatments including removing, pruning, and mowing vegetation and the treatment of vegetation with herbicides to ensure safe operations. The extent of this work will vary along the rebuilt transmission line depending on level of vegetation encroachment and additional ROW needs. Vegetation management crews will work directly with landowners regarding the extent of work needed within the easement on each property. Areas disturbed during construction will be restored in a manner generally similar to their condition prior to construction and as may be provided for in private agreements. A Revegetation Plan and Noxious Weed Management Plan are included in Appendix D.

4.b.12 Possible alternatives to achieve underground transmission lines associated with the facility. (070.080.250)(4)(b)(12)

Installing the transmission line underground for this Project will not be financially practicable and doing so will require PUC approval and/or negotiated contracts that specify a responsible party to cover the incremental cost difference. The PUC will generally find sufficient justification for undergrounding when the cost variance is small. In this case, installing the rebuilt transmission line underground could be more than 10 times the cost of installing it overhead, and the construction impacts will be much greater due to the wide excavation trenches and underground vaults required for high-voltage underground transmission lines. The existing transmission line traverses steep slopes and the Hillside Preservation zoning district. These areas have limited access already posing construction and engineering challenges. Additionally, PUC Decision No. C15-0473 states that “utilities cannot use undergrounding of transmission lines as prudent avoidance measures absent atypical circumstances” (PUC 2015). Underground transmission lines are less accessible, creating longer delays in diagnosing and fixing outage issues. Underground transmission lines also require specialized structures or stations to connect the underground line to existing overhead lines. These structures will be required at each endpoint and will increase the visual impact on the surrounding area. Based on these challenges, the rebuilt transmission line will remain overhead.

4.b.13 Visuals demonstrating impact to scenic resources. (070.080.250)(4)(b)(13)

Existing transmission poles along the transmission line vary from 26 to 101.5 feet in height. To ensure compliance with Xcel Energy design standards and the NESC clearance requirements, the new pole heights along the transmission line will vary from 54.8 feet to 101.5 feet. Appendix B provides a table comparing the height of each existing pole to the new pole heights. Topography, span length, and adjacent land uses influence the necessary height of transmission poles. The new poles will be equipped

with shield wires above the energized conductor lines; this equipment adds to the pole height but also provides protection against lightning strikes. It is not anticipated that the new poles will be of a height that will impair aerial firefighting. The new transmission poles will not require FAA marking for aircraft avoidance.

In addition to the change in height, the poles will be made of a weathering steel instead of wood. The weathering steel poles will comply with updated design standards and wildfire protection, as they perform better in the event of a wildfire compared to wood poles. Compared to the existing transmission line, the rebuilt transmission line will have a wider ROW width that is needed to provide sufficient clearance to existing buildings and for construction and maintenance activities. Given the presence of existing transmission poles, the new poles along the rebuilt line won't create a change in the nature of the visual impact, but rather a change in degree.

Additionally, vegetation removal required for construction of the Project and maintenance activities will be limited given that the existing ROW is already maintained for vegetation. Improvements related to access routes to and along the centerline will be limited in extent to only what is necessary to accommodate the construction equipment and meet City requirements. Therefore, no significant impact on visual quality is anticipated.

Visual simulations are included in Appendix G and provide a before and after visual of how the transmission poles will look against the landscape. Once construction is complete, the casual observer is not likely to notice the change in degree of visual impact. Visual quality is addressed in Section 17.

5. Proof of Notice as Provided Under Section 070.080.280 (070.080.250)(5)

The state statute commonly known as “The Surface Development Notification Act” (CRS 24-65.5-101 et seq.) provides that not less than 30 days before the date scheduled for the initial public hearing by a local government on an application for development, the applicant must send a notice of that hearing by certified mail to mineral estate owners (owners or lessees of the mineral estate under the property which is the subject of the application). Pursuant to the Act, the definition of an “Application for Development” covers a wide range of surface development land use approvals, but certain named development activities are specifically exempt from that definition. One exemption includes applications with respect to utility electric lines which includes Xcel Energy’s transmission lines. Thus, due to the nature and scope of the Project, the transmission line rebuild is exempt from the statutory mineral estate owner mailing notification requirements. Accordingly, Xcel Energy will not be providing a Proof of Notice.

6. Comments of other agencies. (070.080.250)(6)

The Project does not require a CPCN, therefore the Colorado PUC was not engaged during the planning stages of the Project. The existing transmission line crosses the Union Pacific Railroad (UPRR), the

Colorado River, and I-70 near the Mitchell Creek substation, and the rebuilt transmission line will continue to utilize these existing crossings. Xcel Energy previously received approval from UPRR and CDOT for the Project and will continue to coordinate with these agencies on any necessary approvals in addition to the existing crossing agreements.

Xcel Energy requested Environmental Reviews from CPW and USFWS on March 22, 2022 but did not receive a response from either agency. Xcel Energy followed up with CPW, requesting another Environmental Review on August 11, 2023 and is awaiting a response. No federal listed species are anticipated to be impacted by the Project. However, Xcel Energy will continue to coordinate with CPW and USFWS through permitting, construction, and operation of the Project as needed to ensure compliance with all applicable federal and state regulations.

7. Demonstration of Need (070.080.250)(7)

7a. Population trends for the project area, including present population, population growth, and growth rates document the sources used. (070.080.250)(7)(a)

The existing line was built in the 1940s, more than 70 years ago, when about 10,000 people lived in Garfield County, compared to about 60,000 today (U.S. Census 1942, 2022). A portion of the line was rebuilt in the 1960s; however, Xcel Energy determined that the line must now be rebuilt because it has reached the end of its useful life. This Project supports providing adequate infrastructure throughout the City through the proposed replacement of aging infrastructure to ensure continued delivery of economical, safe, and reliable electric service to customers in Glenwood Springs. Upgrading the existing transmission line will support current and future demand of the City and western Colorado.

7b. The predominant types of developments to be served by the proposed new systems and/or facilities or extensions thereof. (070.080.250)(7)(b)

The electric grid is a complex network of independently owned and operated power generation facilities and transmission lines that deliver energy to local communities. In Glenwood Springs, transmission lines owned by Xcel Energy deliver electricity to the Glenwood Springs Electric Department's substations and distribution system, which then serve local users. Glenwood Springs Electric Department purchases wholesale wind power from the Municipal Energy Agency of Nebraska to serve the city's power needs.

7c. The percentage of design capacity at which the current system is now operating. (070.080.250)(7)(c)

Typically, the existing transmission line operates under 50% usage and is only operated at higher levels in contingency situations. No change in design capacity is proposed as part of the Project, however more capacity would be available if operated at 115-kV in the future. The need to operate at 115-kV will be determined through an electric system planning study and in coordination with interconnected utilities such as Glenwood Springs Electric. Operation at 115-kV will require additional equipment or

modifications at several electric substations that would be subject to permit requirements as applicable at that time.

7d. A description of conditions and projections that prohibit present facilities from being upgraded to adequately accommodate increased demand. (070.080.250)(7)(d)

The Project proposes to upgrade the existing transmission line facilities in the current alignment to project public health and safety and increase the reliability of the transmission line, which is effectively an upgrade of the present facilities to accommodate increased demand. The rebuilt transmission line will be constructed utilizing transmission structures that meet Xcel Energy's current design standards and will be strung with new conductor and optical ground wire. The rebuilt line will be operated at 69-kV, but the design standards would allow for future operation at 115-kV. The need to operate at 115-kV will be determined through an electric system planning study and in coordination with interconnected utilities such as Glenwood Springs Electric. Operation at 115-kV will require additional equipment or modifications at several electric substations that would be subject to permit requirements as applicable at that time.

7e. Potential alternatives. (070.080.250)(7)(e)

Xcel Energy studied alternatives for the transmission line location and evaluated technical design requirements and potential impacts on the environment, community, residents, and businesses in Glenwood Springs (Appendix A). Rebuilding the line in its existing alignment was identified as the preferred alternative.

8. Property rights, other permits, and approvals. (070.080.250)(8)

8a. Description of property rights that are necessary for or that will be affected by the project, including easements and property rights proposed to be acquired through negotiation or condemnation. (070.080.250)(8)(a)

To ensure safe and reliable access for future construction and operation and maintenance and to rebuild the line to current industry design standards, the rebuilt transmission line will be constructed in a 60-foot-wide ROW. The new transmission poles are expected to be placed within existing easements or ROWs, but additional or expanded easements are required in some areas to ensure construction and operational safety and to provide access to the transmission line. There are some areas where existing buildings are within the proposed expanded ROW and a smaller easement may be agreed upon with individual landowners in those areas. Xcel Energy is engaged in negotiations with landowners along the existing route to obtain additional ROW width where the existing easement does not meet 60-feet. Every effort will be made to reach a fair and reasonable settlement with landowners. When negotiations are unsuccessful, which is rare, Xcel Energy may have to exercise its eminent domain authority to acquire the necessary land rights to safely construct, maintain, and operate the rebuilt transmission line.

8b. A list of all other federal, state, and local permits and approvals that will be required for the project, together with any proposal for coordinating these approvals with the City permitting process. Copies of any permits or approvals related to the project that have been granted. (070.080.250)(8)(b)

County regulations and state statutes apply to the Project in addition to City land use permit regulations. The regulatory requirements are described in the following sections and Table 6. All applicable land use, environmental, and construction permits will be obtained prior to the start of and during construction of the Project as required. Xcel Energy will provide the City with copies of the permit approvals if necessary.

Table 6: Land Use Permit Requirements and Applicability to Project

Jurisdiction	Title	Trigger	Statutory Reference	Status
State of Colorado	Notification of Intention to Submit Permit Application for Major Electrical Facilities	Filing permit application for location, construction, or improvement of major electrical or natural gas facilities	CRS 29-20-108 (4) (a)	On September 3, 2020, Xcel Energy submitted a Notification of Intention to Submit Permit Application for Major Electrical Facilities with the Pre-Application Consultation Meeting Request.
City of Glenwood Springs	Location and Extent (L&E) Permit	Project proposed by a publicly owned utility	City of Glenwood Springs Code of Ordinances 070.060.050(d)	Xcel Energy submitted an L&E permit to the City on August 7, 2023, and will comply with subsequent process for approval.
City of Glenwood Springs	1041 Permit	Site selection of major facilities of any public utility to be located within the City of Glenwood Springs	City of Glenwood Springs Code of Ordinances 070.080.030	Xcel Energy is complying through this permit application and subsequent process for approval.
Garfield County	L&E Permit	Project proposed by a public utility, unless the public utility Project is a designated activity of a State interest	Garfield County Land Use and Development Code, Article 4-111	Xcel Energy resubmitted this permit application on August 9, 2023, and will comply with subsequent process for approval.

8.b.1 State of Colorado

Multiple Colorado Statutory Provisions apply to the Project, including a notice and consultation with local permitting jurisdictions.

8.b.2 City of Glenwood Springs

Project representatives met with City representatives multiple times throughout the Project development process to provide status updates on the Project, discuss permitting requirements for the portion of the Project within City jurisdiction and review any changes to the proposed design. Feedback provided during these meetings was incorporated into the current Project plans. The Project's Pre-Application conference was held on September 14, 2020, at which time Xcel Energy provided information about the Project and responded to questions from City representatives. The requirement for an L&E Permit was confirmed at this meeting. On September 21, 2021, Xcel Energy submitted a L&E Permit application in accordance with the L&E Review Application Checklist provided by the City and the City of Glenwood Springs Municipal Code, Article 070.060.050(d). Xcel Energy received verbal comments from the City on the L&E

Permit application on October 19, 2021 during a meeting with City representatives to discuss the application. On October 27, 2021, Xcel Energy received additional comments from the City's Engineering Department by email. Xcel Energy resubmitted a revised L&E Permit package on March 30, 2022, to address all comments received by the City. Xcel Energy resubmitted a revised L&E Permit package on August 8, 2023, to amend the previous L&E Permit application package to account for an updated alignment. In that submittal, Xcel Energy included a request for Administrative Decision regarding the applicability of the 1041 regulations to the Project. The requirement for a 1041 Permit was confirmed by Hannah Klausman of City of Glenwood Springs on August 15, 2023, in response to this request. This application only addresses the portion of the transmission line and related poles located in City jurisdiction.

8.b.3 Garfield County

Project representatives met with County representatives multiple times throughout the Project development process to provide status updates on the Project, discuss permitting requirements for the portion of the Project in County jurisdiction and review any changes to the proposed design. Feedback provided during these meetings was incorporated into the current Project plans. A Garfield County L&E Permit application was resubmitted on August 9, 2023, for the 0.22-mile portion of the line that traverses County jurisdiction, just north of Donegan Road. Transmission poles will be placed in four locations in unincorporated Garfield County (pole locations 133-136).

8.b.4 Other Permitting

The existing transmission line crosses the UPRR, the Colorado River, and I-70 near the Mitchell Creek substation, and the rebuilt transmission line will continue to utilize these existing crossings. Xcel Energy will coordinate with UPRR and Colorado Department of Transportation (CDOT) on any necessary approvals in addition to the existing crossing agreements.

The section of the Colorado River crossed by the existing line is not considered a traditionally navigable water and is therefore not subject to Section 10 permitting under the Rivers and Harbors Act. Additionally, it is unlikely that the Project would require a Section 404 permit under the Clean Water Act based on the proposed transmission line pole locations and lack of anticipated impact to wetlands or other waters of the United States.

8c. Copies of relevant official federal and state consultation correspondence prepared for the project; a description of all mitigation required by federal, state, and local authorities; and copies of any draft or final environmental assessments or impact statements required for the project. (070.080.250)(8)(c)

The existing transmission line crosses the UPRR, the Colorado River, and I-70 near the Mitchell Creek substation, and the rebuilt transmission line will continue to utilize these existing crossings. Xcel Energy will coordinate with UPRR and CDOT on any necessary approvals in addition to the existing crossing agreements.

Xcel Energy requested Environmental Reviews from CPW and USFWS on March 22, 2022 but did not receive a response from either agency. Xcel Energy followed up with CPW, requesting another Environmental Review on August 11, 2023 and is awaiting a response. No federal listed species are anticipated to be impacted by the Project. However, Xcel Energy will continue to coordinate with CPW and USFWS through permitting, construction, and operation of the Project as needed to ensure compliance with all applicable federal and state regulations.

**8d. Proof of ownership or a contractual right to develop the property.
(070.080.250)(8)(e)**

The Project includes the rebuild of an existing electric transmission line between the Glenwood Springs and Mitchell Creek substations. The original line was constructed in the 1940s within a utility easement corridor held by PSCo. Since PSCo controls the easement area underlying the existing transmission line, it holds a recognized property interest in the land on which the development is proposed. Section 8a provides additional detail on the easements. Necessary easements will be secured and recorded prior to the start of construction on each individual parcel. Xcel Energy may provide notice to the City of recorded easements prior to construction as a condition of approval of the 1041 permit.

9. Land Use (070.080.250)(9)

9a. Provide a map at a scale relevant to the project and acceptable to the Community Development Department describing existing land uses and existing zoning of the proposed project area and the project service area, including peripheral lands which may be impacted. The land use map shall include but need not necessarily be limited to the following categories: residential, commercial, industrial, extractive, transportation, communication and utility, institutional, open space, outdoor recreation, agricultural, forest land and water bodies. Show all special districts (school, fire, water, sanitation, etc.) within the project area. (070.080.250)(9)(a)

Zone districts, including residential, commercial, and industrial, along and adjacent to the Project are shown on Figure 2. Recreation, communication, transportation and hydrology resources are shown on Figure 3.

**9b. All immediately affected public land boundaries should be indicated on the map. Potential impacts of the proposed development upon public lands will be visually illustrated on the map as well as described in the text.
(070.080.250)(9)(b)**

Xcel Energy provided the City with detailed information regarding the City ROWs and parcels to be utilized for the Project in the L&E submittal package on August 7, 2023. An up-to-date list of all City ROWs and parcels to be utilized for the Project is included in Appendix I. It is not anticipated that the Project will have any materially adverse impact to public lands as the transmission line will be rebuilt

along the existing alignment. Any land disturbed during construction will be restored in a manner generally similar to its condition prior to construction and as may be provided for in private agreements.

9c. Specify whether and how the proposed project conforms to the Comprehensive Plan. (070.080.250)(9)(c)

In Glenwood Springs, transmission lines owned by Xcel Energy deliver electricity to the Glenwood Springs Electric Department's substations and distribution system, which then serves local users. The Project includes rebuilding one of these transmission lines to Xcel Energy's current design standards that include additional measures to reduce wildfire risk.

Xcel Energy studied alternatives for the electric line location and evaluated technical design requirements and potential impacts on the environment, community, residents, and businesses in Glenwood Springs. Rebuilding the transmission line along the current route was identified as the preferred alternative as it resulted in the fewest new impacts along the line.

The rebuilt transmission line will be constructed with mostly steel monopoles. The rebuilt line will be operated at 69-kV but the design standards would allow for future operation at 115-kV. The need to operate at 115-kV will be determined through an electronic system planning study and in coordination with interconnected utilities such as Glenwood Springs Electric. Operation at 115-kV will require additional equipment or modifications at several electric substations that would be subject to permit requirements as applicable at that time.

The height and design of the poles depends on location and conditions such as slope, soil conditions and distance between poles. The new transmission poles are expected to be placed within existing easements or ROWs, but additional or expanded easements are required in some areas to ensure construction and operational safety and to provide access to the transmission line.

The Glenwood Springs Comprehensive Plan, adopted in 2011, identifies the following Community Goals:

- Promote long-term, sustainable, diverse economic development
- Maintain Glenwood Springs as the regional tourism, retail, commercial and governmental center of Garfield County
- Preserve the small town character while maintaining the livability of Glenwood Springs and increasing the vibrancy and commercial success of the Downtown
- Address transportation needs and provide multiple convenient travel choices
- Direct development to locations and building forms that are cost-effective to serve
- Provide housing for the entire community
- Support social diversity
- Preserve cultural resources
- Preserve natural resources

The Project supports these goals by rebuilding aging infrastructure to current design standards and providing the ability to operate at a higher voltage to meet future customer demand resulting from development within Glenwood Springs. By rebuilding along the existing transmission line corridor, the

Project is providing electric infrastructure that reduces new impacts to cultural and natural resources. This Project will ensure continued delivery of economical, safe, and reliable electric service to customers in Western Colorado, including Glenwood Springs.

Chapter 7 of the City’s Comprehensive Plan is dedicated to the values and vision for Public Utilities and Services. Chapter 7 outlines several goals, policies, and strategies to enhance and promote public utilities (Glenwood Springs 2014). Table 7 outlines how the Project supports these:

Table 7: Comprehensive Plan and Project Compliance

Action Type	Action1	Project Compliance
Goal	Maintain Glenwood's role as a regional center	This Project supports maintaining the City's role as a regional center through the continued provision of electric service to the area and by designing with the ability to upgrade the transmission line to 115-kV to meet future demand. The need to operate at 115-kV will be determined through an electric system planning study and in coordination with interconnected utilities such as Glenwood Springs Electric. Operation at 115-kV will require additional equipment or modifications at several electric substations that would be subject to permit requirements as applicable at that time.
Policy	The City acknowledges that there are areas within the Urban Growth Boundary, such as south and west of town, where utilities and infrastructure are not adequate to service additional development. Developers of any properties in these areas are expected to make any and all infrastructure and utility improvements necessary to support the development.	This Project supports the continued development and success of the City by designing with the ability to upgrade the transmission line to 115-kV to meet future demand. The need to operate at 115-kV will be determined through an electric system planning study and in coordination with interconnected utilities such as Glenwood Springs Electric. Operation at 115-kV will require additional equipment or modifications at several electric substations that would be subject to permit requirements as applicable at that time. Specifically, this Project includes upgrades to infrastructure on the western side of the City, resulting in a strengthened electric system able to accommodate future growth.
	The City should encourage the development of equitable and adequate infrastructure throughout the City.	This Project supports providing adequate infrastructure throughout the City through the proposed replacement of aging infrastructure to ensure continued delivery of economical, safe, and reliable electric service to customers in Glenwood Springs. Upgrading the existing transmission line will support current and future demand of the City and western Colorado.

Action Type	Action1	Project Compliance
Strategy	Allocate Land for Utility Expansion. The City is responsible for setting aside sufficient land for future necessary public facilities. As the City evolves, grows and redevelops over time, land for utility facilities will need to be included in development plans.	This Project largely utilizes existing ROW. Additionally, the Project will be designed with the ability to upgrade the transmission line to 115-kV to meet future demand, without the need for additional land acquisition associated with the transmission line. The need to operate at 115-kV will be determined through an electric system planning study and in coordination with interconnected utilities such as Glenwood Springs Electric. Operation at 115-kV will require additional equipment or modifications at several electric substations that would be subject to permit requirements as applicable at that time.
	Plan and Budget for Electrical System Improvements. Though there is adequate electric service capacity, improvements to the City's electric facilities will be needed as parcels are redeveloped and infill occurs. This will be especially true if the intensity of the development increases over current conditions.	The Project will be built in the same alignment as the existing route, minimizing impacts to current and future land use. Rebuilding the existing infrastructure will support current and future demand while utilizing an existing infrastructure corridor.

1 From Chapter 7: Public Utilities and Services Glenwood Springs Comprehensive Plan (Glenwood Springs 2014)

9d. Specify how the proposed project will utilize existing easements or right-of-way to achieve project objectives. (070.080.250)(9)(f)

Section 8a provides a discussion regarding utilization of existing easements.

9e. Describe the probability that the project may be significantly affected by earthquakes, floods, fires, snow, slides, avalanches, rockslides or landslides and any measures that will be taken to reduce the impact of such events upon the project. (070.080.250)(9)(h)

Sections 20, 21, and 22 provide a discussion on anticipated impacts to the Project by natural hazards and associated mitigation measures.

9f. Specify whether the demand for the project is associated with development within or contiguous to existing service areas. (070.080.250)(9)(j)

The existing transmission line must be rebuilt because it has reached the end of its safe and useful operational life. The rebuilt line will be operated at 69-kV, but the design standards would allow for future operation at 115-kV. The need to operate at 115-kV will be determined through an electric system planning study and in coordination with interconnected utilities such as Glenwood Springs Electric. Operation at 115-kV will require additional equipment or modifications at several electric substations that would be subject to permit requirements as applicable at that time.

10. Additional Information Required By The Community Development Department Director (070.080.250)(10)

No additional information has been requested by the Community Development Department Director. Xcel Energy will provide any additional information upon request.

11. Notification to Mineral Owners of Surface Development (070.080.250)(11)

The state statute commonly known as “The Surface Development Notification Act” (CRS 24-65.5-101 et seq.) provides that not less than 30 days before the date scheduled for the initial public hearing by a local government on an application for development, the applicant must send a notice of that hearing by certified mail to mineral estate owners (owners or lessees of the mineral estate under the property which is the subject of the application). Pursuant to the Act, the definition of an “Application for Development” covers a wide range of surface development land use approvals, but certain named development activities are specifically exempt from that definition. One exemption includes applications with respect to utility electric lines which includes Xcel Energy’s transmission lines. Thus, due to the nature and scope of the Project, the transmission line rebuild is exempt from the statutory mineral estate owner mailing notification requirements. Accordingly, Xcel Energy will not be providing a Proof of Notice.

12. Projected development schedule. (070.080.250)(12)

12a. An estimate of the maximum number of employees, number of shifts and employees per shift during the following phases: construction, operation, and maintenance. (070.080.250)(12)(a)

It is anticipated that one 12-hour shift per day (Monday through Saturday) will be worked during transmission line construction; however, additional hours may be required. This would be during daylight hours, early morning to early evening. If additional hours are anticipated for shift work, a 24-hour work permit will be obtained from the City. The maximum number of construction workers on site during a single shift will be approximately 30 to 40. Xcel Energy can provide the City with a construction contact closer to construction, if necessary. No employees will be required on site during the operation of the Project except during regular operation and maintenance activities. The Project will continue to be operated and monitored remotely 24 hours a day, 7 days a week, 365 days a year to provide safe and reliable electric service.

12b. Information regarding any future phases or extensions of the facility and relationship of the facility (if currently foreseen) to larger programs and plans. (070.080.250)(12)(b)

The rebuilt line will be operated at 69-kV but the design standards would allow for future operation at 115-kV. The need to operate at 115-kV will be determined through an electric system planning study and in coordination with interconnected utilities such as Glenwood Springs Electric. Operation at 115-kV will require additional equipment or modifications at several electric substations that would be subject to permit requirements as applicable at that time.

12c. A timetable for planning (e.g., federal permits, state permits, local zoning, etc.). (070.080.250)(12)(c)

Construction is expected to begin in spring 2024 pending permit approvals. Section 8b of this application provides a discussion on other anticipated permits for the Project. Section 3g provides additional information on Project schedule.

12d. An estimate beginning and completion of construction and beginning of operation of facility or system. (070.080.250)(12)(d)

Construction and restoration activities are expected to be completed and the Project will be put into service by fall 2024. Section 3g provides additional information on Project schedule.

12e. A description of any support facilities (e.g. pollution control parking areas, landscaping, etc.) to be provided. (070.080.250)(12)(e)

No support facilities are proposed as part of the Project.

12f. A description of any feasible "non-structural" alternatives to meet the objectives of the proposed site selection and construction. (070.080.250)(12)(f)

The existing transmission line provides electric power to the City. The existing line must be rebuilt because it has reached the end of its safe and useful operational life. There are no viable non-structural alternatives.

13. Local infrastructure and services impacts. (070.080.250)(14)

The Project will not require additional community or local government services beyond those currently provided in the area. The Project creates no additional demand for transportation infrastructure, educational facilities, housing, water (other than trucked-in water for construction), sewage or wastewater treatment, or public transportation. Existing businesses and social services are adequate to support the Project due to the small size of the construction crew and temporary nature of the construction activities. Given the relatively small size of the crews needed for construction of the Project, no impacts to emergency health care facilities or law enforcement services are anticipated.

Where practicable, existing public roads and private roads will be utilized during Project construction and operation. Some private roads may require improvements, and some new access will need to be constructed to accommodate construction equipment and long-term maintenance of the rebuilt transmission line.

Improved access within the City will be constructed to meet City standards and requirements, including those related to the Hillside Preservation zoning district outlined in the City's Municipal Code Section 070.020.170. Along the Project route, areas within the Hillside Preservation district occur north of I-70 along Traver Trail (Figure 2). Where road improvements are needed, Xcel Energy will obtain any necessary grading, stormwater, and erosion control permits and comply with permit requirements. Xcel Energy will engage in landowner negotiations where access roads traverse private property and will address any associated impact mitigation measures.

Some access may remain post-construction to maintain access to the rebuilt transmission line for operation and maintenance activities.

14. Areas of paleontological, historic, or archaeological importance. (070.080.250)(17)

A qualified Tetra Tech archaeologist performed a Class I cultural resources desktop analysis for the Project through the Colorado Historic Society Office of Archaeology and Historic Preservation Colorado Cultural Resource Online Database (Compass). The search revealed two sites intersecting the Project that have been determined eligible for listing in the National Register of Historic Places (NRHP): the Glenwood Hot Springs Historic District (5GF.1050), and the Denver and Rio Grande Western Railroad Aspen Branch (5GF.1661). Three additional sites intersecting the Project are segments of linear sites that support the eligible status of the site as a whole: a segment of the Denver and Rio Grande Western Railroad Aspen Branch (5GF.1661.6), a segment of U.S. Highway 6 (5GF.2935.5) and a segment of the Shoshone-Palisade Transmission Line (5GF.4554.13).

The Project is not anticipated to have an adverse impact on areas of paleontological, historic, or archaeological importance. The existing transmission line currently intersects the resources identified above. The transmission line is being rebuilt in place and will therefore not have new permanent disturbance to pole locations and will otherwise span all NRHP-eligible resources intersecting the Project.

15. Nuisance (070.080.250)(18)

Short-term effects are anticipated from a temporary increase in construction vehicles, which may increase fumes and fugitive dust from construction equipment exhaust (fumes) and from clearing and preparing areas for construction (dust). The short-term effects are not expected to cause a public nuisance. If a nuisance arises during construction, the nuisance will be mitigated in coordination with the City of Glenwood Springs.

Construction-related noise will result in temporary short-term increases in noise in areas where construction and staging are taking place. Short-term noise may result during foundation construction and assembly and erection of the transmission line structures. Short-term noise is anticipated from construction equipment such as auguring machines, helicopters, cranes, heavy machinery, and trucks. Construction vehicles and equipment will be maintained in proper operating condition and equipped with manufacturers' standard noise control devices (e.g., mufflers or engine enclosures).

Indirect effects from post-construction activities, which include the noise from transmission line inspections and maintenance activities, are anticipated to be negligible because of their short duration and infrequency.

16. Air Quality (070.080.250)(19)

Garfield County is in attainment with National Ambient Air Quality Standards for all criteria pollutants, i.e., ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide, and lead (EPA 2023).

Short-term effects are anticipated from a temporary increase in construction vehicles, which may increase fumes and fugitive dust from construction equipment exhaust (fumes) and from clearing and preparing areas for construction (dust). The short-term effects are not expected to cause a public nuisance. If a nuisance arises during construction, the nuisance will be mitigated in coordination with the City of Glenwood Springs.

Water trucks will be utilized during construction activities around roadway access points to suppress dust from vehicles and equipment as necessary within the ROW and local roads.

During operation, the Project will not generate trips in excess of those currently experienced as the transmission line facilities represent a passive use and will not be staffed. Transmission line operations will not require on-site staff and will be monitored remotely. Visits from personnel will be limited to emergencies or maintenance and inspection activities and increased fumes, exhaust, and dust during operations are not expected.

17. Visual Quality (070.080.250)(20)

Since the Project is a rebuild of the existing transmission line in the same alignment, the Project will result in minimal impacts to visual quality. Existing transmission poles along the transmission line vary from 26 to 101.5 feet in height. To ensure compliance with Xcel design standards and the NESC clearance requirements, the new pole heights along the transmission line will vary from 54.8 feet to 101.5 feet. Topography, span length, and adjacent land uses influence the necessary height of transmission poles. The new poles will be equipped with shield wires above the energized conductor lines; this equipment adds to the pole height but also provides protection against lightning strikes. Appendix B compares the height of each existing pole to the new pole heights and Appendix G provides visual simulations of the existing and rebuilt line. Example pole diagrams are also included in Appendix B. The configuration of the insulators on the new poles will vary and each will be monopole except for the two proposed H-frame pole locations necessary at the Colorado River crossing that are replacing two existing H-frame pole locations.

In addition to the change in height, the poles will be made of a weathering steel instead of wood. The weathering steel poles will comply with updated design standards and wildfire protection, as they perform better in the event of a wildfire compared to wood poles. Compared to the existing transmission line, the rebuilt transmission line will have a wider ROW width that is needed to provide sufficient clearance to existing buildings and for construction and maintenance activities. Given the presence of existing transmission poles, the new poles along the rebuilt line won't create a change in the nature of the visual impact, but rather a change in degree. Therefore, no significant impact on visual quality is anticipated.

Two of the three existing pole locations along the northern side of Midland Avenue were constructed with guy wire anchors extending to the southern side of Midland Avenue. These guy wires were required at the time of installation to properly support the poles. The new poles will be self-supporting and will not require guy wire anchors, resulting in the removal of the existing guy wires on the southern side of Midland Avenue. The new poles will be taller than the existing poles in this location due to clearance requirements; however, the removal of the guy wires will result in an improved visual appearance for travelers along Midland Avenue and the adjacent trail to the south.

18. Surface Water Quality (070.080.250)(21)

18a. Map and/or description of all surface waters relevant to the project, including description of provisions of Region XII's regional water quality management plan, and NPDES Phase II Permit and necessary Erosion and Stormwater Quality Control Permit ("ESQCP"), Section 404 Federal Clean Water Act Permit that applies to the project and assessment of whether the project would comply with those provisions. (070.080.250)(21)(a)

Surface waters are shown on Figures 3 and 4 and floodplains are shown on Figure 4. The Project will cross the Colorado River, Oasis Creek and four unnamed tributaries to the Colorado River.

The section of the Colorado River crossed by the existing line is not anticipated to be impacted during construction or operation of the Project. Additionally, it is unlikely that the Project would require a Section 404 permit under the Clean Water Act based on the proposed transmission line pole locations and lack of anticipated impact to wetlands or other waters of the United States (WOTUS). The Project will avoid impacts to wetlands and WOTUS features to the extent practicable. The transmission line poles will be sited to avoid pole placement within and to span across wetlands and other WOTUS features to avoid permanent impacts. Associated access roads, laydown yards, and other appurtenant features of the Project will also be sited to avoid permanent impacts to wetlands and WOTUS features.

The Project will avoid regulated floodplains to the extent practicable. The transmission line will span floodplain areas with overhead conductors where feasible.

Prior to construction, a Stormwater Management Plan (SWMP) will be developed, and a Storm Water Permit for Construction Activities will be obtained from the Colorado Department of Public Health and Environment (CDPHE). Xcel Energy will comply with permit application requirements, City of Glenwood

Springs standards, and construction protocols to ensure that the Project does not violate water quality standards. Xcel Energy can provide copies of the stormwater permits to the City, as necessary, closer to the start of construction.

18b. Existing data monitoring sources. (070.080.250)(21)(b)

The nearest U.S. Geological Survey stream gauge downstream of the Project's Colorado River crossing is located approximately 3 miles west (site identification number: 09085150; USGS 2023a). The nearest USGS stream gauge upstream of the Project's Colorado River crossing is located approximately 1 mile east (site identification number: 09085100; USGS 2023b).

18c. Descriptions of the immediate and long-term impact and net effects that the project would have on the quantity and quality of surface water under both average and worst-case conditions. (070.080.250)(21)(c)

It is not anticipated that the Project will result in any permanent impacts to wetlands or other WOTUS features. Temporary impacts to wetlands and WOTUS during construction of the Project will be avoided to the extent practicable. If wetlands cannot be avoided, matting and other protective temporary measures will be used. Depending on the condition of the wetland soil and hydrology, matting may be used in some cases to protect wetlands from rutting. To avoid potential indirect impacts from construction-related erosion and sediment movement during construction, Project construction will adhere to BMPs outlined in the SWMP, which will include erosion control and revegetation measures.

The Project will not generate pollutant loads. Construction of the transmission line will not create runoff in excess of previous site levels and will not change existing topography or adversely affect drainage. There will be no alteration in the pattern or intensity of surface drainage as a result of construction or operation of the transmission line. A Drainage Letter is provided in Appendix H.

19. Groundwater Quality (070.080.250)(22)

19a. Map and/or description of all groundwater, including any and all aquifers relevant to the project. (070.080.250)(22)(a)

No materially adverse impacts to groundwater are anticipated from the Project because the embedded portion of the transmission poles will not be deep enough to affect an aquifer. Additionally, during construction, the excavation holes for the transmission poles will not be left open for a long period of time, avoiding impacts to aquifers. BMPs will be used during construction to control sediment and runoff from work areas. Compliance with applicable federal, state, and county construction and waste management procedures will prevent accidental spills or runoff of sediment or contaminants to waterbodies or groundwater.

Impacts to groundwater aquifers and wells are not anticipated. During the planning and design stages, a Geotechnical Engineering Report was conducted to understand the subsurface conditions where facilities will be built. This report along with a Drainage Letter is included as Appendix H.

**19.a.1 Seasonal water levels in each portion of the aquifer affected by the project.
(070.080.250)(22)(a)(1)**

See Section 19a for the discussion on groundwater impacts.

19.a.2 Artesian pressure in said aquifers. (070.080.250)(22)(a)(2)

See Section 19a for the discussion on groundwater impacts.

19.a.3 Groundwater flow directions and levels. (070.080.250)(22)(a)(3)

See Section 19a for the discussion on groundwater impacts.

19.a.4 Existing aquifer recharge rates and methodology used to calculate recharge to the aquifer from any recharge sources. (070.080.250)(22)(a)(4)

See Section 19a for the discussion on groundwater impacts.

19.a.5 For aquifers to be used as part of a water storage system, methodology and results of tests used to determine the ability of the aquifer to impound groundwater and aquifer storage capacity. (070.080.250)(22)(a)(5)

See Section 19a for the discussion on groundwater impacts.

**19.a.6 Seepage losses expected at any subsurface dam and at stream-aquifer interfaces and methodology used to calculate seepage losses in the affected streams, including description and location of measuring devices.
(070.080.250)(22)(a)(6)**

See Section 19a for the discussion on groundwater impacts.

19.a.7 Existing groundwater quality and classification. (070.080.250)(22)(a)(7)

See Section 19a for the discussion on groundwater impacts.

**19.a.8 Location of all water wells potentially affected by the project and their uses.
(070.080.250)(22)(a)(8)**

See Section 19a for the discussion on groundwater impacts.

**19b. Description of the impacts and net effect of the project on groundwater.
(070.080.250)(22)(b)**

See Section 19a for the discussion on groundwater impacts.

20. Soils, geologic conditions, and natural hazards. (070.080.250)(25)

20a. Map and/or description of soils, geologic conditions, and natural hazards including but not limited to soil types, drainage areas, slopes, avalanche areas, debris fans, mud flows, rock slide areas, faults and fissures, seismic history, and wildfire hazard areas, all as relevant to the project area. (070.080.250)(25)(a)

It is not anticipated that the Project will have any materially adverse impact to soils, geologic conditions, or natural hazards as the transmission line will be rebuilt along the existing alignment. Any land disturbed during construction will be restored in a manner generally similar to its condition prior to construction and as may be provided for in private agreements. The Project is not anticipated to divert debris flow or floodwaters.

Professional engineers who will guide construction do not foresee any unusual risks. Xcel Energy electric facilities, including transmission poles, are specifically designed for the locations where they are placed. A Geotechnical Engineering Report and Drainage Letter are included in Appendix H.

20b. Descriptions of the risks to the project from natural hazards. (070.080.250)(25)(b)

The Project will be designed to minimize the risks from natural hazards, such as high winds and avalanches. Transmission lines are built and maintained to meet or exceed safety standards, such as those specified by the NESC) and the North American Electric Reliability Corporation. Every effort is made to ensure safety in construction and operation and maintenance of transmission lines. Transmission lines are designed to withstand extreme weather conditions and protective devices at line terminals stop the electricity flow under abnormal operating circumstances. The transmission poles will be equipped with shield wires above the energized line; this equipment adds to the pole height but also provides protection against lightning strikes. The transmission poles will be made of a weathering steel instead of wood. The weathering steel poles will comply with updated design standards and wildfire protection, as they perform better in the event of a wildfire compared to wood poles. Xcel Energy developed a Wildfire Mitigation Plan in 2020 that identified eight 69kV transmission lines to be replaced by 2025 as a part of its Major Transmission Line Rebuild Plan (Xcel Energy 2020). This Project is within a portion of one of the eight transmission lines identified for replacement. This Project will mitigate the wildfire risk by rebuilding the existing aging infrastructure.

Xcel Energy's transmission lines are monitored 24/7/365 for line contact, the term describing when an object comes in contact with the transmission line conductors. If there is an unanticipated event in the line, the line is isolated from the system to protect the public and the line from operating under unsafe conditions. Xcel Energy's transmission lines are inspected annually to check for line connections and damage. For the safety of the general public, unauthorized personnel are not permitted to come in contact with the transmission line conductor wire.

Xcel Energy's facilities are designed, constructed, operated, and maintained to meet or exceed all applicable requirements of the Institute of Electrical and Electronics Engineers (IEEE) standards and accepted industry standards and practices including IEEE 979, Guide for Substation Fire Protection. All applicable fire laws and regulations, as outlined in CRS 31-15-601, will be observed during construction and normal operation of the Project.

In the rare event of a fire emergency, Xcel Energy will likely be aware of an issue before the general public or emergency responders. Nevertheless, the public is encouraged to contact Xcel Energy's emergency number: 800-895-1999. In the event of an outage or equipment failure, the affected equipment is immediately de-energized and Xcel Energy personnel are dispatched to the site. Xcel Energy personnel receive safety training for emergency situations relating to high-voltage electrical equipment. Xcel Energy also coordinates closely with local fire departments and first responders and consults with them to discuss any concerns within their response area. Xcel Energy offers free online safety training to fire departments and first responders that is based on national standards through its Responding to Utility Emergencies Program.

20c. Descriptions of the impacts and net effect of the project on soil and geologic conditions in the area. (070.080.250)(25)(c)

No impacts to soil and geologic conditions in the area are anticipated. A Geotechnical Engineering Report is included as Appendix H. To avoid construction-related erosion and sediment movement during construction, the Project will adhere to BMPs outlined in the SWMP, which will include erosion control and revegetation measures.

21. Hazardous materials. (070.080.250)(26)

21a. Description of all solid waste, hazardous waste, petroleum products, hazardous, toxic, and explosive substances to be used, stored, transported, disturbed or produced in connection with the project, including the type and amount of such substances, their location, and the practices and procedures to be implemented to avoid accidental release and exposure. (070.080.250)(26)(a)

Chemicals that may be used during construction and operation are those found in diesel fuel, gasoline, coolant (ethylene glycol), and lubricants in machinery. Hazardous materials will not be drained onto the ground or into streams or drainage areas. Enclosed containment will be provided for trash disposal. Construction waste, including trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials, will be removed and taken to a disposal facility authorized to accept such materials. No hazardous materials will be used, stored, or generated on site. The Project will not require transportation of hazardous materials.

Construction, operation, and maintenance activities will comply with applicable federal, state, and local laws and regulations regarding the use of hazardous substances. Construction activities will be performed using methods that prevent entrance or accidental spillage of solid matter, contaminants, debris, or other pollutants and wastes into flowing streams or dry watercourses, lakes, and underground water sources.

Activities will follow BMPs for the management of wastes to avoid and minimize effects from potential spills or other releases to the environment.

21b. Location of storage areas designated for equipment, fuel, lubricants, and chemical and waste storage with an explanation of spill containment plans and structures. (070.080.250)(26)(b)

Chemicals that may be used during construction and operation are those found in diesel fuel, gasoline, coolant (ethylene glycol), and lubricants in machinery, and if any such chemicals are used, they will be stored within the TCEs pursuant to appropriate storage protocols and applicable regulatory controls.

22. Monitoring and mitigation plan. (070.080.250)(27)

22a. Description of all mitigation that is proposed to avoid, minimize or compensate for adverse impacts of the project and to maximize positive impacts of the project. (070.080.250)(27)(a)

A summary of proposed mitigation measures is included in Table 8.

Table 8: Proposed Mitigation Measures

Resource	Description of Proposed Mitigation
Air Quality	Water trucks will be utilized during construction activities to suppress dust from vehicles and equipment as necessary.
Biological Resources	The Project will avoid or minimize impacts to habitat as practicable. Impacts to most vegetation will be temporary and limited to the ROW and TCEs. The ROW will be cleared of tall vegetation for ongoing maintenance, though since the existing transmission line corridor is already maintained for vegetation, vegetation removal for construction of the Project will be limited.. Measures will be implemented to minimize the spread of noxious weeds in the ROW. The Project will adhere to BMPs and erosion control measures outlined in the SWMP. A Revegetation Plan and Noxious Weed Management Plan are included in Appendix D. To avoid or minimize potential impacts to migratory birds and raptors, including eagles, Xcel Energy will conduct tree/vegetation clearing during the nonbreeding season for birds (September 1 – April 15) if feasible. If vegetation clearing cannot occur during the nonbreeding season, vegetation clearance surveys, raptor nest surveys, and burrowing owl surveys may be conducted per USFWS and CPW guidance to identify avian nesting activity and determine appropriate avoidance buffers (CPW 2020, CPW 2021) or monitor activities nest sites until determined to be inactive. In addition, electrical components of the transmission lines will be separated to minimize the risk of avian contact and will follow Avian Power Line Interaction Committee (APLIC) guidelines (APLIC 2006). Bird flight or swan diverters or other marking devices may be used as determined necessary for specific locations.
Cultural Resources	The Project will be built in the same alignment as the existing route, thereby minimizing impacts to cultural resources. The Project will avoid identified cultural resource locations to the extent practicable.
Electric and Magnetic Fields	All facilities will be designed, constructed, operated, and maintained to meet or exceed applicable standards of design and performance set forth in the NESC. An EMF Study is provided as Appendix F.
Land Use	The Project will be built in the same alignment as the existing route, thereby minimizing impacts to current and future land use.
Noise	Construction vehicles and equipment will be maintained in proper operating condition and equipped with manufacturer's standard noise control devices (e.g., mufflers or engine enclosures).

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Resource	Description of Proposed Mitigation
Natural Hazards	Transmission lines are designed to withstand extreme weather conditions and protective devices at line terminals stop the electricity flow under abnormal operating circumstances. The transmission poles will be equipped with shield wires above the energized line; this equipment adds to the pole height but also provides protection against lightning strikes. Xcel Energy's transmission lines are monitored 24/7 for line contact, the term describing when an object comes in contact with the transmission line conductors. If there is an unanticipated event in the line, the line is isolated from the system to protect the public and the line from operating under unsafe conditions. Xcel Energy's transmission lines are inspected annually to check for line connections and damage. Xcel Energy's facilities are designed, constructed, operated, and maintained to meet or exceed all applicable requirements of the IEEE standards and accepted industry standards and practices including IEEE 979, Guide for Substation Fire Protection. All applicable fire laws and regulations as outlined in CRS 31-15-601 will be observed during construction and normal operation of the Project. In the rare event of a fire emergency, Xcel Energy will likely be aware of an issue before the general public or emergency responders. Nevertheless, the public is encouraged to contact Xcel Energy's emergency number: 800-895-1999. In the event of an outage or equipment failure, the affected equipment is immediately de-energized and Xcel Energy personnel are dispatched to the site. Xcel Energy personnel receive safety training for emergency situations relating to high-voltage electrical equipment. Xcel Energy also coordinates closely with local fire departments and first responders and consults with them to discuss any concerns within their response area. Xcel Energy offers free online safety training to fire departments and first responders that is based on national standards through its Responding to Utility Emergencies Program.
Socioeconomic	Given the relatively small size of the crews needed for construction and the temporary of the construction activities, no impacts to availability of public resources and services are anticipated. During construction, revenue may moderately increase for some local businesses, such as restaurants, gas stations, grocery stores, and hotels as well as other local businesses due to spending by Xcel Energy's contractors or employees.
Soils and Geology	The Project will be constructed based on the Geotechnical Engineering Report, provided as Appendix H. The Geotechnical Engineering Report was used to determine the size and type of foundations needed to support the transmission line poles and avoid geological hazards. During construction, Xcel Energy's contractor will minimize any soils impacts by strictly adhering to a CDPHE-regulated SWMP and will institute and maintain erosion and sediment control BMPs designed to protect soils and prevent erosion. In areas that are difficult for construction vehicles to traverse, helicopter installation will be used to minimize potential erosion impacts in areas of steep terrain or limited accessibility.
Toxic and Hazardous Substances	No hazardous materials will be permanently used, stored, or generated on site. Hazardous materials used during construction and operation will be used and disposed of in compliance with all applicable federal, state, and local regulations. Construction, operation, and maintenance activities will comply with applicable federal, state, and local laws and regulations regarding the use of hazardous substances. Construction activities will be performed by methods that prevent entrance or accidental spillage of solid matter, contaminants, debris, and other pollutants and wastes into flowing streams or dry watercourses, lakes, and underground water sources. Activities will follow BMPs for the management of wastes to avoid and minimize effects from potential spills or other releases to the environment.
Transportation	Traffic Control Plans will be developed in areas where travel on roadways could be impacted during construction. Construction updates and schedules will be discussed with the City as needed as details are determined. Necessary road use and ROW permits will be obtained from the City of Glenwood Springs, Garfield County, and from CDOT for state highway/interstate crossings as needed prior to construction.
Vegetation	The Project will avoid or minimize impacts to vegetation generally as practicable. Impacts to most vegetation will be temporary and limited to the ROW and TCEs. The ROW will be cleared of tall vegetation for ongoing maintenance, though since the existing transmission line corridor is already maintained for vegetation, vegetation removal for construction of the Project will be limited.. Measures will be implemented to minimize the spread of noxious weeds in the ROW. The Project will adhere to BMPs and erosion control measures outlined in the SWMP.

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Resource	Description of Proposed Mitigation
	Once construction has been completed, TCEs and the transmission line ROW will be restored in a manner generally similar to their condition prior to construction and as may be provided for in private agreements. This work may include fence repair, rut removal, decompaction, tilling, seeding, and stabilization measures. All areas not needed for ongoing operations and maintenance will be reclaimed (re-seeded compatible with Xcel Energy's vegetation management standards) as soon as practicable following construction in a given area. A Revegetation Plan and Noxious Weed Management Plan are included in Appendix D.
Visual Resources	Existing transmission poles along the transmission line vary from 26 to 101.5 feet in height. To ensure compliance with Xcel design standards and the NESC clearance requirements, the new pole heights along the transmission line will vary from 54.8 feet to 101.5 feet. Topography, span length, and adjacent land uses influence the necessary height of transmission poles. The new poles will be equipped with shield wires above the energized conductor lines; this equipment adds to the pole height but also provides protection against lightning strikes. Two of the three existing pole locations along the northern side of Midland Avenue were constructed with guy wire anchors extending to the southern side of Midland Avenue. These guy wires were required at the time of installation to properly support the poles. The new poles will be self-supporting and will not require guy wire anchors, resulting in the removal of the existing guy wires on the southern side of Midland Avenue. The new poles will be taller than the existing poles in this location due to clearance requirements; however, the removal of the guy wires will result in an improved visual appearance for travelers along Midland Avenue and the adjacent trail to the south. Visual simulations are included as Appendix G.
Waste	Enclosed containment will be provided for trash disposal. Construction waste, including trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials, will be removed and taken to a disposal facility authorized to accept such materials. Construction activities will be performed by methods that prevent entrance or accidental spillage of solid matter, contaminants, debris, and other pollutants and wastes into flowing streams or dry watercourses, lakes, and underground water sources. All activities will follow BMPs for the management of wastes to avoid and minimize effects from potential spills or other releases to the environment. The Project will not create any wastewater nor have any facilities requiring wastewater treatment. Portable temporary bathrooms that will be serviced on a regular basis will be on site during the construction period.
Water Resources	Temporary impacts to wetlands and WOTUS during construction will be avoided to the extent practicable. If wetlands cannot be avoided, matting and other protective temporary measures will be used. Depending on the condition of the wetland soil and hydrology, matting may be used in some cases to protect wetlands from rutting. To avoid potential indirect impacts from construction-related erosion and sediment movement during construction, the Project will adhere to BMPs outlined in the SWMP, which will include erosion control and revegetation measures. Construction activities will be performed in a manner that prevent entrance or accidental spillage of solid matter, contaminants, debris, and other pollutants and wastes into flowing streams or dry watercourses, lakes, and underground water sources. All activities will follow BMPs for the management of wastes to avoid and minimize effects from potential spills or other releases to the environment. Impacts to water quality will be minimized during construction through BMPs and the site-specific SWMP. The Project will not impact the quantity or quality of water flowing off of the site. The transmission line will span streams and waterways that cross the corridor and impacts to jurisdictional waters will be avoided to the extent practicable. Xcel Energy will comply with permit application requirements, City of Glenwood Springs and Garfield County Standards, and construction protocols to ensure that the Project does not violate water quality standards. Prior to construction, a Storm Water Permit for Construction Activities will be obtained from CDPHE and a SWMP will be developed.

**22.a.1 Describe how and when mitigation will be implemented and financed.
(070.080.250)(27)(a)(1)**

Impacts will be minimized during construction of the Project and will be financed by Xcel Energy.

**22.a.2 Describe impacts that are unavoidable that cannot be mitigated.
(070.080.250)(27)(a)(2)**

The Project will be built in the same alignment as the existing route; therefore, no impacts that are unavoidable that cannot be mitigated are identified for the Project.

22b. Description of methodology used to measure impacts of the project and effectiveness of proposed mitigation measures. (070.080.250)(27)(b)

See Table 8.

22c. Description, location, and intervals of proposed monitoring to ensure that mitigation will be effective. (070.080.250)(27)(c)

See Table 8.

**22d. Emergency procedures to be used in the event of a fire, explosion, or other event which may endanger the public health, safety, and welfare.
(070.080.250)(27)(d)**

See the Natural Hazards section in Table 8.

23. Additional information (070.080.250)(28)

To date, the Community Development Department Director has not requested any additional information. Xcel Energy will provide any additional information upon request.

24. Review Criteria for All Applications (070.080.320)

Section 070.080.320 of the City's Municipal Code outlines the 1041 approval criteria the Planning Commission considers during its review. These approval criteria and how they relate to the Project are discussed in Table 9.

Table 9. Review Criteria for All Applications (Sec. 070.080.320)

Review Criteria	Project Compliance
(1) The health, welfare, and safety of the residents of this City will be protected and served.	In Glenwood Springs, transmission lines owned by Xcel Energy deliver electricity to the Glenwood Springs Electric Department's substations and distribution system, which then serves local users. The Project includes rebuilding one of these transmission lines to current design standards that include additional measures to reduce wildfire risk.
(2) The project is in general conformance with the Comprehensive Plan and other duly adopted plans and permit criteria. The determination of conformance of the project with these plans may include, but is not limited to, the following considerations: a. Likelihood that the project will/will not cause or contribute to urban sprawl or "leapfrog" development. b. Likelihood that the project will promote growth within existing municipalities or developed areas with the preexisting institutional capacity to maintain infrastructure and provide services to the anticipated development. c. Significant changes in the amount of impervious surfaces. d. Contiguity of development associated with the project to existing growth centers. e. Changes to unique land forms. f. Changes in the amount or character of open space. g. Changes to traffic patterns, road capacity and congestion.	The Project supports the Comprehensive Plan goals by rebuilding aging infrastructure to Xcel Energy's current design standards and providing the ability to operate at a higher voltage to meet future customer demand resulting from development within Glenwood Springs. By rebuilding along the existing transmission line corridor, the Project is providing electric infrastructure that reduces new impacts to cultural and natural resources. This Project will ensure continued delivery of economical, safe, and reliable electric service to customers in Western Colorado, including Glenwood Springs. Section 9c. of this application provides additional detail regarding conformance with the Comprehensive Plan.
(3) The project is financially feasible. The determination of financial feasibility of the project may include but is not limited to the following considerations: a. The business plan submitted by the applicant. b. Relevant bond issue, loan and other financing approval or certifications (ex: approved bond issue; bond counsel opinion).	Xcel Energy is a major U.S. electric and natural gas company with annual revenues of \$15.3 billion (Xcel Energy 2022). The applicant has the financial and ability to develop and operate the Project.
(4) The project is not subject to significant risk from natural hazards. The determination of risk from natural hazards to the project may include but is not limited to the following considerations: a. Faults and fissures. b. Unstable slopes including landslides, rock slides, and avalanche areas. c. Expansive or evaporative soils and risk of subsidence. d. Wildfire hazard areas. e. Floodplains.	Any land disturbed during construction will be restored in a manner generally similar to their condition prior to construction and as may be provided for in private agreements. The Project is not anticipated to divert debris flow or floodwaters. Professional engineers who will guide construction do not foresee any unusual risks. Xcel Energy electric facilities, including transmission poles, are specifically designed for the locations where they are placed. Geotechnical Engineering Reports are conducted for transmission poles to identify subsurface conditions and determine foundation specifications. Xcel Energy's facilities are designed, constructed, operated, and maintained to meet or exceed all applicable requirements of the IEEE standards. All applicable fire laws and regulations, as outlined in CRS 31-15-601, will be observed during construction and normal operation of the Project.

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Review Criteria	Project Compliance
	In the event of an outage or equipment failure, the affected equipment is immediately de-energized and Xcel Energy personnel are dispatched to the site. Xcel Energy personnel receive safety training for emergency situations relating to high-voltage electrical equipment. Xcel Energy also coordinates closely with local fire departments and first responders and consults with them to discuss any concerns within their response area. Xcel Energy offers free online safety training to fire departments and first responders that is based on national standards through its Responding to Utility Emergencies Program. Xcel Energy developed a Wildfire Mitigation Plan in 2020 that identified eight 69kV transmission lines to be replaced by 2025 as a part of its Major Transmission Line Rebuild Plan (Xcel Energy 2020). This Project is within a portion of one of the eight transmission lines identified for replacement. This Project will mitigate the wildfire risk by rebuilding the existing aging infrastructure. The Project will avoid regulated floodplains to the extent practicable. The transmission line will span floodplain areas with overhead conductors where feasible.
(5) The project will not have a significant adverse effect on the capability of local governments affected by the project to provide local infrastructure and services, or exceed the capacity of service delivery systems. The determination of the effects of the project on local government services and infrastructure may include, but is not limited to, the following considerations: a. Current and projected capacity of roads, schools, infrastructure, drainage and/or stormwater infrastructure, housing, recreational facilities, emergency services, and other services necessary to accommodate development, and the impact of the project upon the current and projected capacity. b. Changes caused by the project in the cost of providing education, transportation networks, water treatment and wastewater treatment, stormwater drainage, channel stabilization, recreation facilities, bridges, emergency services, or other governmental services or facilities. c. Need for temporary roads to access the project for construction and maintenance. d. Change in demand for public transportation.	No new or upgraded local government services are anticipated to be needed to serve the Project. Where practicable, existing public roads and private roads will be utilized during Project construction and operation. Some private roads may require improvements and some new access roads will need to be constructed to accommodate construction equipment and long-term maintenance of the rebuilt transmission line. Improved access roads within the City will be constructed to meet City requirements. Where road improvements are needed, Xcel Energy will obtain any necessary grading, stormwater, and erosion control permits and comply with permit requirements. Xcel Energy will engage in landowner negotiations where access roads traverse private property and will address any associated impact mitigation measures. Some access roads may remain post-construction to maintain access to the rebuilt transmission line for operation and maintenance activities.
(6) The project will not have a significant adverse effect on the quality or quantity of recreational opportunities and experience. The determination of effects of the project on recreational opportunities and experience may include, but is not limited to, the following considerations: a. Changes to existing and projected visitor days. b. Changes in quality and quantity of fisheries.	The Project will not affect the long-term quality or quantity of recreational opportunities and experience. Xcel Energy will coordinate with landowners regarding any short term construction-related impacts to recreation resources.

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Review Criteria	Project Compliance
c. Changes in instream flows or reservoir levels. d. Changes in access to recreational resources. e. Changes to quality and quantity of hiking, biking, or horseback riding trails. f. Changes to hunting experiences. g. Changes to open space. h. Changes to existing conservation easements. i. Changes to regional or neighborhood parks. j. Changes to recreational scenic experience.	
(7) The project will not significantly degrade air quality. The determination of effects of the project on air quality may include, but is not limited to, the following considerations: a. Changes in visibility and microclimates. b. Applicable air quality standards.	During construction, short-term effects are anticipated from a temporary increase in construction vehicles, which may increase fumes and fugitive dust from construction equipment exhaust (fumes) and from clearing and preparing areas for construction (dust). Water trucks will be utilized during construction activities around roadway access points to suppress dust from vehicles and equipment as necessary within the ROW and local roads. During operation, visits from personnel will be limited to emergencies or maintenance and inspection activities and increased fumes, exhaust, and dust during operations are not expected.
(8) The project will not significantly degrade existing visual quality. The determination of visual effects of the project may include, but is not limited to, the following considerations: a. Visual changes to ground cover and vegetation, waterfalls and streams, or other natural features. b. Interference with viewsheds and scenic vistas. c. Changes in landscape character types of unique land formations. d. Compatibility of structure size and color with scenic vistas and view sheds. e. Changes to open space. f. Changes to existing conservation easements. g. Changes to impacts to regional or neighborhood parks.	As the Project is a rebuild of the existing transmission line in the same alignment, the Project will result in minimal impacts to visual quality. Existing transmission poles along the transmission line vary from 26 to 101.5 feet in height. To ensure compliance with Xcel design standards and the NESC clearance requirements, the new pole heights along the transmission line will vary from 54.8 feet to 101.5 feet. Topography, span length, and adjacent land uses influence the necessary height of transmission poles. The new poles will be equipped with shield wires above the energized conductor lines; this equipment adds to the pole height but also provides protection against lightning strikes. Two of the three existing pole locations along the northern side of Midland Avenue were constructed with guy wire anchors extending to the southern side of Midland Avenue. These guy wires were required at the time of installation to properly support the poles. The new poles will be self-supporting and will not require guy wire anchors, resulting in the removal of the existing guy wires on the southern side of Midland Avenue. The new poles will be taller than the existing poles in this location due to clearance requirements; however, the removal of the guy wires will result in an improved visual appearance for travelers along Midland Avenue and the adjacent trail to the south.

Review Criteria	Project Compliance
(9) The project will not significantly degrade surface water quality. The determination of effects of the project on surface water quality may include, but is not limited to, the following considerations: a. Changes to existing water quality, including patterns of water circulation, temperature, conditions of the substrate, extent and persistence of suspended particulates and clarity, odor, color or taste of water. b. Applicable narrative and numeric water quality standards. c. Changes in point and nonpoint source pollution loads. d. Increase in erosion. e. Changes in sediment loading to waterbodies. f. Changes in stream channel or shoreline stability. g. Changes in stormwater runoff flows. h. Changes in trophic status or in eutrophication rates in lakes and reservoirs. i. Changes in the capacity or functioning of streams, lakes, or reservoirs. j. Changes to the topography, natural drainage patterns, soil morphology and productivity, soil erosion potential, and floodplains. k. Changes to stream sedimentation, geomorphology, and channel stability. l. Changes to lake and reservoir bank stability and sedimentation, and safety of existing reservoirs.	Prior to construction, a SWMP will be developed, and a Storm Water Permit for Construction Activities will be obtained from CDPHE. Xcel Energy will comply with permit application requirements, City of Glenwood Springs standards, and construction protocol to ensure that the Project does not violate water quality standards.
(10) The project will not significantly degrade groundwater quality. The determination of effects of the project on groundwater quality may include, but is not limited to, the following considerations: a. Changes in aquifer recharge rates, groundwater levels and aquifer capacity including seepage losses through aquifer boundaries and at aquifer-stream interfaces. b. Changes in capacity and function of wells within the impact area. c. Changes in quality of well water within the impact area.	BMPs will be used during construction to control sediment and runoff from work areas. Compliance with applicable federal, state and county construction and waste management procedures will prevent accidental spills or runoff of sediment or contaminants to waterbodies or groundwater.
(11) The project will not significantly degrade wetlands and riparian areas, terrestrial or aquatic plant or animal life. The determination of effects of the project on these areas shall include the considerations raised in the applicable federal and/or state permits.	It is not anticipated that the Project will result in any permanent impacts to wetlands or other WOTUS features. The Project will avoid impacts to wetlands and WOTUS features to the extent practicable. The transmission line poles will be sited to avoid pole placement within and to span across wetlands and other WOTUS features to avoid permanent impacts. Associated access roads, laydown yards, and other appurtenant features of the Project will also be sited to avoid permanent impacts to wetlands and WOTUS features. The rebuilt transmission line will be in the same alignment as the existing route; therefore, minimal impacts to vegetation and wildlife are anticipated. To avoid or minimize potential impacts to migratory birds and raptors, including eagles, Xcel Energy will conduct tree/vegetation clearing during the nonbreeding season for birds (September 1 – April 15) if feasible. If vegetation clearing cannot occur during the nonbreeding season, vegetation clearance surveys, raptor nest surveys, and

Areas and Activities of State Interest Permit Application
Glenwood Springs–Mitchell Creek Electric Transmission Line Rebuild Project

Review Criteria	Project Compliance
	burrowing owl surveys may be conducted per USFWS and CPW guidance to identify avian nesting activity and determine appropriate avoidance buffers (CPW 2020, CPW 2021) or monitor activities nest sites until determined to be inactive. In addition, electrical components of the transmission lines will be separated to minimize the risk of avian contact and will follow Avian Power Line Interaction Committee (APLIC) guidelines (APLIC 2006). Bird flight or swan diverters or other marking devices may be used as determined necessary for specific locations.
(12) The project will not significantly deteriorate soils and geologic conditions. The determination of effects of the project on soils and geologic conditions may include, but is not limited to, the following considerations: a. Loss of topsoil due to wind or water forces. b. Changes in soil erodibility. c. Physical or chemical soil deterioration. d. Terrain deformation/mass wasting/subsidence. e. Compacting, sealing and crusting. f. Waterlogging. g. Soil morphology and productivity.	No impacts to soil and geologic conditions in the area are anticipated. The Geotechnical Engineering Report is provided as Appendix H. To avoid construction-related erosion and sediment movement during construction, the Project will adhere to BMPs outlined in the SWMP, which will include erosion control and revegetation measures.
(13) The project will not cause a nuisance. The determination of nuisance effects of the project may include, but is not limited to, the following considerations: Increase in odors, dust, fumes, glare, heat, noise, vibration or artificial light.	Short-term effects are anticipated from a temporary increase in construction vehicles, which may increase fumes and fugitive dust from construction equipment exhaust (fumes) and from clearing and preparing areas for construction (dust). The short-term effects are not expected to cause a public nuisance. If a nuisance arises during construction, the nuisance will be mitigated in coordination with the City of Glenwood Springs. Construction-related noise will result in temporary short-term increases in noise in areas where construction and staging are taking place. Short-term noise may result during foundation construction and assembly and erection of the transmission line structures. Short-term noise is anticipated from construction equipment such as auguring machines, cranes, heavy machinery, and trucks. Construction vehicles and equipment will be maintained in proper operating condition and equipped with manufacturer's standard noise control devices (e.g., mufflers or engine enclosures). Indirect effects from post-construction activities, which include the noise from transmission line inspections and maintenance activities, are anticipated to be negligible because of their short duration and infrequency.
(14) The project will not result in unreasonable risk of releases of hazardous materials. The determination of the risk of release of hazardous materials caused by project may include, but is not limited to, the following considerations:	No hazardous materials will be used, stored, or generated on site. The Project will not require transportation of hazardous materials.

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Review Criteria	Project Compliance
a. Plans for compliance with federal and state handling, storage, disposal, and transportation requirements. b. Use of waste minimization techniques. c. Adequacy of spill prevention and response plans.	Construction, operation, and maintenance activities will comply with applicable federal, state, and local laws and regulations regarding the use of hazardous substances. Construction activities will be performed using methods that prevent entrance or accidental spillage of solid matter, contaminants, debris, and other pollutants and wastes into flowing streams or dry watercourses, lakes, and underground water sources. Activities will follow BMPs for the management of wastes to avoid and minimize effects from potential spills or other releases to the environment.
(15) Urban development, population densities, and site layout and design of storm water and sanitation systems shall be accomplished in a manner that will prevent the pollution of aquifer recharge areas. The determination of potential for pollution of the aquifer recharge areas by the project may include, but is not limited to, the following considerations: a. Proximity of urban development and population densities to aquifer recharge areas. b. Proximity of stormwater and sanitation systems to aquifer recharge areas. c. Changes in water quality in the aquifer recharge areas.	The Project is a rebuild of the existing transmission line in the same alignment and will not require storm water and sanitation systems. BMPs will be used during construction to control sediment and runoff from work areas. Compliance with applicable federal, state, and county construction and waste management procedures will prevent accidental spills or runoff of sediment or contaminants to waterbodies or groundwater.
(16) The project shall be reasonably necessary to meet projected community development and population demands in the areas to be served by the project, or to comply with regulatory or technological requirements. The determination of whether the project is reasonably necessary may include but is not limited to the following considerations: a. Relationship to reasonable growth projections and local land use plans. b. Relationship to other providers' service areas. c. Whether the project is not in compliance with regulatory or technological requirements or will not be in compliance in the near future.	This Project supports the continued development and success of the City by designing with the ability to upgrade the transmission line to 115-kV to meet future demand. The need to operate at 115-kV will be determined through an electric system planning study and in coordination with interconnected utilities such as Glenwood Springs Electric. Operation at 115-kV will require additional equipment or modifications at several electric substations that would be subject to permit requirements as applicable at that time. Specifically, this Project results in a strengthened electric system able to accommodate future growth.
(17) The project shall be constructed in areas which will result in the proper utilization of existing facilities or systems to ensure the orderly and sustainable development of infrastructure in the City and adjacent communities, including the following considerations: a. Site selection and construction will not create or encourage growth and development which is incompatible with and cannot be accommodate by the local financial capacity of the area or residents to be served. b. New systems will not overburden existing systems and current and future demand for services can be met within existing and proposed capacity. c. The project will not create proliferation of special districts or overlapping of special districts with the boundaries of other special districts or municipalities. d. The project is the best alternative for the provision of services to the geographical area serviced. e. To the extent feasible, facilities and systems shall be consolidated with existing facilities and systems in the area. f. The project will not result in duplicative services or excessive capacity.	This Project supports providing adequate infrastructure throughout the City through the proposed replacement of aging infrastructure to ensure continued delivery of economical, safe, and reliable electric service to customers in Glenwood Springs. Replacing the existing transmission line will support current and future demand of the City and western Colorado.

Areas and Activities of State Interest Permit Application
Glenwood Springs–Mitchell Creek Electric Transmission Line Rebuild Project

Review Criteria	Project Compliance
g. The project will be administered so as to minimize disruption of utility services and preserve desirable existing community patterns.	
(18) Economic impacts including, but not limited to, taxable property, licensed and permitted facilities, and recreation related to the proposed project have been identified and will be compensated for or mitigated.	The Project is a rebuild of the existing transmission line in the current alignment, therefore no changes to taxable property are anticipated. During construction of the Project, revenue may moderately increase for some local businesses, such as restaurants, gas stations, grocery stores, and hotels as well as other local businesses. No long-term impacts to recreation resources are anticipated. Xcel Energy will coordinate with landowners regarding any short-term construction-related impacts to recreation resources.
(19) The project shall emphasize the most efficient use of water, including the recycling, reuse, and conservation of water, including the following considerations: a. Whether the project uses readily available conservation techniques. b. Whether the project recycles water to the greatest extent permissible. c. Whether the project will use raw water for exterior or irrigation use if available.	Water to be used during construction will be obtained from a local, permitted source. The Project will not require water use during operation.

25. Special Review Criteria for Site Selection and Construction of Major Facilities of a Public Utility. (070.080.340)

Section 070.080.340 of the City’s Municipal Code outlines the approval criteria for major facilities of a public utility the Planning Commission considers during its review. These approval criteria and how they relate to the Project are discussed in Table 10.

Table 10. Special Review Criteria for Site Selection and Construction of Major Facilities of a Public Utility. (Sec. 070.080.340)

Review Criteria	Project Compliance
(a) No permit shall issue for a project related to the site selection and construction of major facilities of a public utility unless it contains conditions tailored to mitigate the environmental, infrastructure, and financial impacts to the City described in Subsection (b) below. Conditional permits shall issue at the discretion of the Permit Authority, pursuant to Section 070.080.360 of this article.	Xcel Energy understands that the City of Glenwood Springs may issue this permit with conditions tailored to mitigate the environmental, infrastructure, and financial impacts to the City.
(b) Applications for a project related to the site selection and construction of major facilities of a public utility shall be subject to the following mandatory special review criteria. (1) The project will not increase the potential for fires and wildfires. (2) The project will not conflict with any local, regional, or state comprehensive plans.	(1) Xcel Energy’s facilities are designed, constructed, operated and maintained to meet or exceed all applicable requirements of the IEEE standards. All applicable fire laws and regulations, as outlined in CRS 31-15-601, will be observed during construction and normal operation of the Project. Xcel Energy developed a Wildfire Mitigation Plan in 2020 that identified eight 69kV transmission lines to be replaced by 2025 as a part of its Major Transmission Line Rebuild Plan (Xcel Energy 2020). This Project is within a portion of one of the eight transmission lines identified for replacement. This Project will mitigate the wildfire risk by rebuilding the existing aging infrastructure. In the rare event of a fire emergency, Xcel Energy will likely be aware of an issue before the general public or emergency responders. Nevertheless, the public is encouraged to contact Xcel Energy’s emergency number: 800-895-1999. In the event of an outage or equipment failure, the affected equipment is immediately de-energized and Xcel Energy personnel are dispatched to the site. Xcel Energy personnel receive safety training for emergency situations relating to high-voltage electrical equipment. Xcel Energy also coordinates closely with local fire departments and first responders and consults with them to discuss any concerns within their response area. Xcel Energy offers free online safety training to fire departments and first responders that is based on national standards through its Responding to Utility Emergencies Program. (2) The project is in general conformance with the Comprehensive Plan as described in the response to Item 2 in Section 24, Review Criteria for All Applications. All applicable land use, environmental, and construction permits will be obtained prior to the start of and during construction of the Project as required.

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Figures

Figure 1: Project Area

Figure 2: Zoning

Figure 3: Land Use

Figure 4: Water Resources

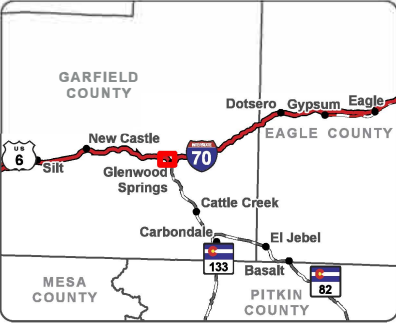
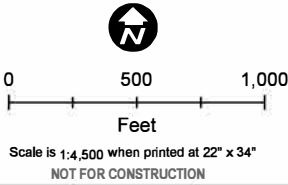
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Glenwood Springs-Mitchell Creek
Electric Transmission Line
Rebuild Project

Figure 1: Project Area

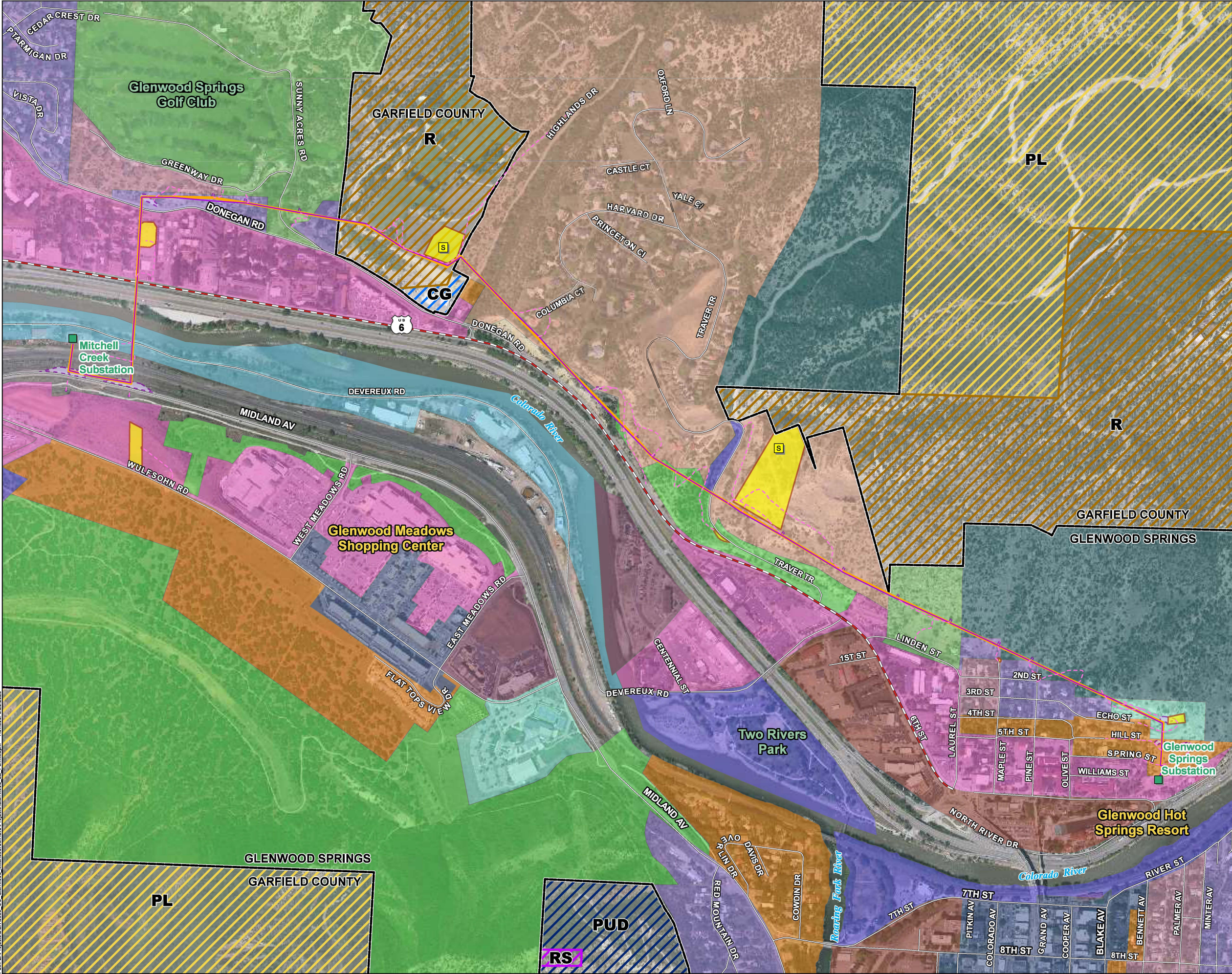


- Legend**
- Glenwood Springs City Boundary
 - Existing Electrical Infrastructure**
 - Substation
 - Existing Transmission Structure to be Removed
 - Existing Transmission Line Corridor
 - Project Features**
 - Rebuild Route (60-foot ROW)
 - Access Road
 - Existing Transmission Structure to Remain Unchanged
 - Preliminary New Transmission Structure Location (Glenwood Springs)
 - Preliminary New Transmission Structure Location (Garfield County)
 - Temporary Construction Easements**
 - Helicopter Fly Yard and Materials Staging Area
 - Temporary Construction Easement
 - Limit of Disturbance
 - Construction Method**
 - Set by Crane
 - Set by Helicopter



Glenwood Springs-Mitchell Creek
Electric Transmission Line
Rebuild Project

Figure 2: Zoning



Glenwood Springs City Boundary

Existing Electrical Infrastructure

Substation

Existing Transmission Line Corridor

Project Features

Rebuild Route (60-foot ROW)

Access Road

Temporary Construction Easements

Helicopter Fly Yard and Materials Staging Area

Temporary Construction Easement

Limit of Disturbance

Garfield County Zoning (2020)

CG - Commercial/General

RS - Residential/Suburban

PUD - Planned Unit Development

PL - Public Lands

R - Rural

Glenwood Springs Zoning (2023)

HP - Hillside Preservation

M1 - Mixed Use Corridor

M2 - Mixed Use Central Core

RH - Residential High Density

RR - Rural Residential

RL - Residential Low Density

RM1 - Residential Medium Density

RM2 - Residential Multifamily Limited

RT - Residential Transitional

PUD - Planned Unit Development

I1 - Light Industrial

I2 - River Industrial

RE - Resort

CO - Commercial

0

500

1,000

Feet

Scale is 1:4,500 when printed at 22" x 34"

NOT FOR CONSTRUCTION

GARFIELD COUNTY

EAGLE COUNTY

MESA COUNTY

PITKIN COUNTY

New Castle

Chacra

Glenwood Springs

Cardiff

Cattle Creek

Carbondale

Basalt

Woody Creek

70

133

Dotsero

Eagle

Gypsum

Catherine

El Jebel

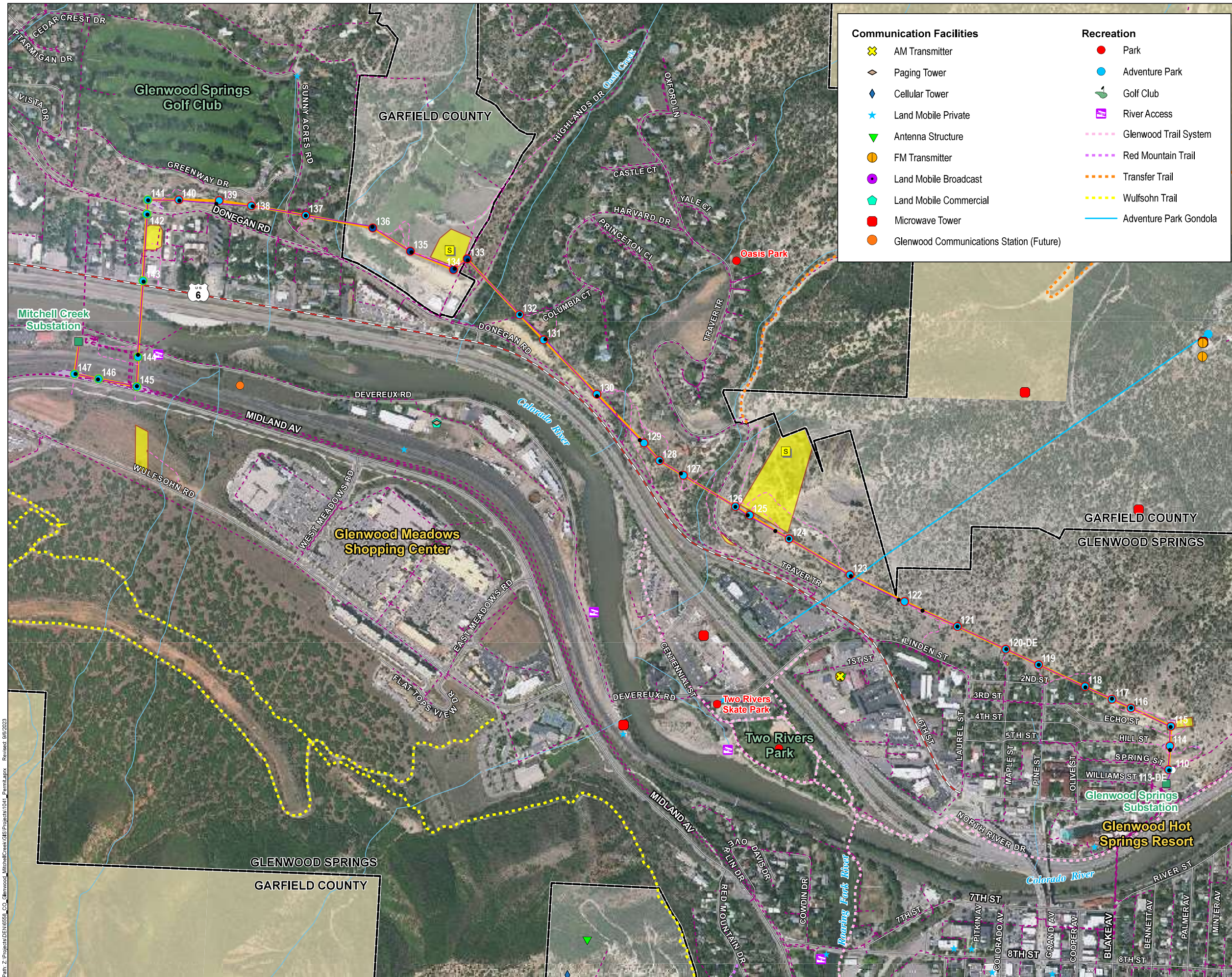
Snowmass

TETRA TECH

Xcel Energy

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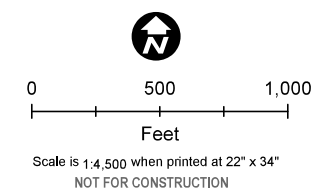
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Glenwood Springs-Mitchell Creek Electric Transmission Line Rebuild Project

Figure 3: Land Use

- Glenwood Springs City Boundary
- Bureau of Land Management
- Existing Electrical Infrastructure**
 - Substation
 - Existing Transmission Structure to be Removed
 - Existing Transmission Line Corridor
 - City of Glenwood Springs Electric Line
- Project Features**
 - Rebuild Route (60-foot ROW)
 - Access Road
 - Existing Transmission Structure to Remain Unchanged
 - Preliminary New Transmission Structure Location (Glenwood Springs)
 - Preliminary New Transmission Structure Location (Garfield County)
- Temporary Construction Easements**
 - Helicopter Fly Yard and Materials Staging Area
 - Temporary Construction Easement
 - Limit of Disturbance
- Construction Method**
 - Set by Crane
 - Set by Helicopter
- Hydrology**
 - River/Stream

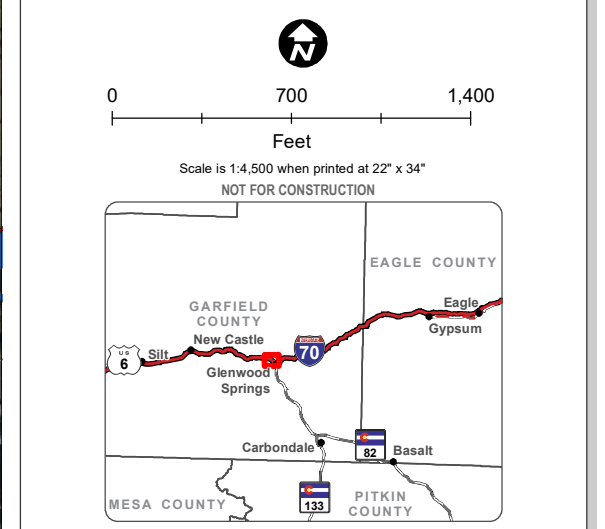




Glenwood Springs-Mitchell Creek Electric Transmission Line Rebuild Project

Figure 4: Water Resources

- Glenwood Springs City Boundary
- Existing Electrical Infrastructure**
 - Mitchell Creek-Glenwood Springs Transmission Line (69 kV)
 - Substation
 - Transmission Structure
- Transportation**
 - Interstate Highway
 - US Highway
 - State Highway
- Water Resources**
 - Well
 - Spring
- FEMA Floodplains**
 - 100-year Floodplain
 - 500-year Floodplain
- National Wetlands Inventory**
 - Freshwater Emergent Wetland
 - Freshwater Pond
 - Riverine



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Appendix A:

Routing Report: Executive Summary

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Routing Study: Executive Summary

GLENWOOD SPRINGS–MITCHELL CREEK
ELECTRIC TRANSMISSION LINE REBUILD PROJECT



September 2020

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Figure 3: BLM Route Corridor

Figure 4: Route Segments

Figure 5: Route Alternatives

1. Introduction

Public Service Company of Colorado (PSCo), a Colorado corporation doing business as Xcel Energy, is proposing to rebuild the Glenwood Springs to Mitchell Creek 69-kilovolt (kV) transmission line (Project) located in the City of Glenwood Springs (Glenwood Springs or City) and Garfield County, Colorado. This Routing Study: Executive Summary briefly describes the process and methodology used to identify alternative locations for the proposed replacement overhead transmission line and to evaluate whether the Project should be rebuilt along the existing transmission line corridor or along a new route.

The objective of this Routing Study is to evaluate alternatives that will have the least impact on the environment, community, residents, and businesses; are economically reasonable; and accomplish the purpose and need of the Project.

1.1 Project Purpose and Need

The existing transmission line must be rebuilt because it has reached the end of its operational life. The line will be rebuilt to current design standards that include additional measures improvements to reduce wildfire risk. By doing so, PSCo is ensuring the continued delivery of economic, safe and reliable, and affordable electric service to customers in the Glenwood Springs area and western Colorado.

Glenwood Springs Electric Department participates in the Municipal Energy Agency of Nebraska and relies on Xcel Energy's transmission system for delivery of power to Glenwood Springs. The Glenwood Springs to Mitchell Creek 69-kilovolt transmission line needs to be rebuilt to ensure continued reliable power delivery to customers in Glenwood Springs and Western Colorado.

1.2 Project Description

The 2.25-mile existing transmission line (referred to herein as the Existing Route) connects the Glenwood Springs Substation, located northeast of the Glenwood Hot Springs Resort to the Mitchell Creek Substation, located northwest of the Glenwood Meadows shopping center (Figure 1). The Existing Route proceeds west from the Glenwood Springs Substation, scales varying terrain and slopes, runs north of Interstate 70 (I-70) through commercial and residential areas, and crosses the Colorado River near the Mitchell Creek Substation.

Given the existing transmission line right-of-way (ROW) and easements, PSCo is considering rebuilding along the Existing Route. However, the existing line location was set more than 70 years ago, when about 10,000 people lived in Garfield County, compared to about 60,000 today. Limited access to the Glenwood Springs-Mitchell Creek transmission line makes construction and maintenance challenging. The expansion of the Glenwood Springs area, along with other challenges described in this Routing Study, presents the need to also consider alternative routes to compare against rebuilding along the Existing Route to ensure a cost-effective installation that minimizes impacts to surrounding areas and ensures a reliably accessible line.

The rebuilt overhead transmission line will be constructed with 115-kilovolt-capable transmission structures and strung with new conductor and optical ground wire. The rebuilt line will initially operate at 69 kilovolts but

could be upgraded to 115 kilovolts to meet future demand. The rebuilt transmission line will be constructed with steel monopole structures. The height and final design of the transmission structures will depend on location and conditions such as slope, soil conditions, and distance between poles. The Project must cross the Colorado River within the municipal boundaries of Glenwood Springs to reach the Mitchell Creek Substation. The ROW for the rebuilt line is expected to be 60 feet wide. The Study area is shown on Figure 1.

2. Route Selection Process

Routing an overhead transmission line requires a comprehensive approach that balances various factors including electric system planning; economics; land use; natural, cultural and environmental resources; regulatory requirements; land rights; and engineering. The Project's multi-step route selection process is shown in Exhibit 1 and described in the sections that follow.

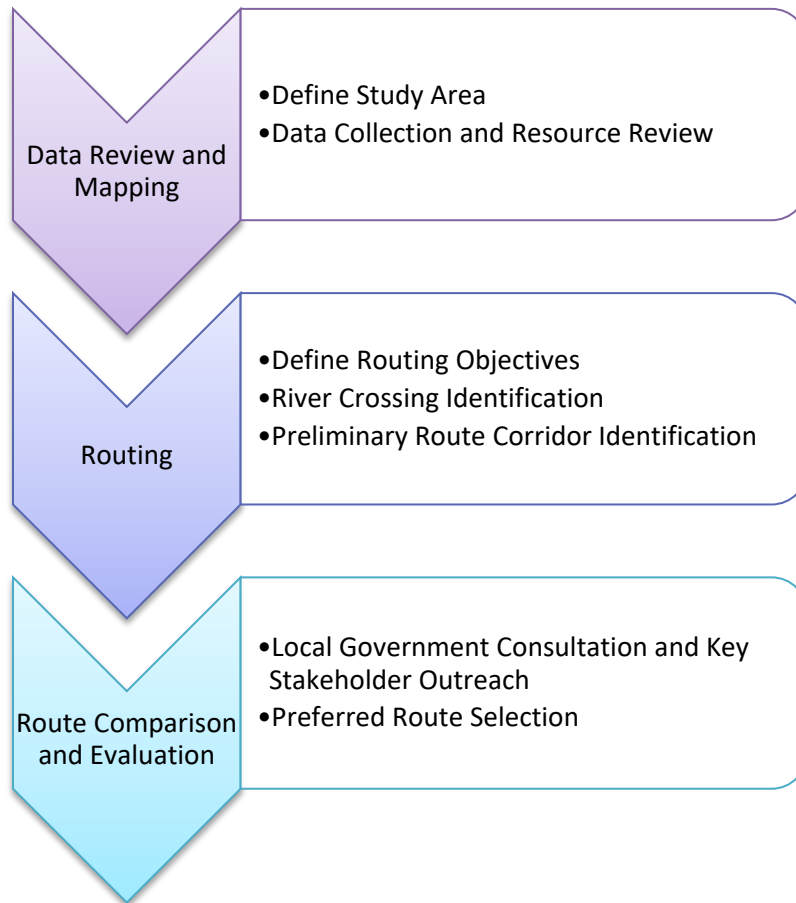


Exhibit 1: Route Selection Process

2.1 Data Review and Mapping

2.1.1 *Define Study Area*

The Project endpoints, the Glenwood Springs Substation, and the Mitchell Creek Substation, define the eastern and western extents of the Study area. The extent of the Study area from north to south is bounded by the steep slopes of the mountain valley that surround the city of Glenwood Springs. The Study area is shown on Figure 1.

2.1.2 *Data Collection and Resource Review*

Publicly available data were obtained to identify resources within the Study area, create resource maps, and populate the comparative matrix used to calculate impacts as part of the alternative analysis and route selection process. Table 1 lists evaluated resources within the Study area that contributed to the development of the routing criteria.

Table 1:
Resources in the Study Area and Resulting Routing Objectives

Resource	Description	Routing Objective
Future Land Use	Future land use near the Mitchell Creek Substation includes mixed-use and single-family residential north of the Colorado River and industrial and commercial south of the Colorado River. Land uses along the south side of the Colorado River include commercial, industrial, riverside protection, hillside protection, parks/open space, multi-family residential, and mixed-use. The Glenwood Springs Golf Club is located to the north of the Existing Route on land designated for parks/open space. Future land uses north of the Colorado River in Garfield County include urban growth area and residential.	Follow property and fence lines where possible to avoid splitting land uses or dividing parcels. Avoid new impacts to land uses such as residential developments and other high-density land uses. Avoid routing transmission line through areas of dense development and parcels slated for future development.
Proximate Buildings	A large part of the area's economy is tourism-based, and many hotels are located within the Study area. These hotels are mainly located in two clusters: between Donegan Road and U.S. Highway 6 (US-6) and near the Glenwood Hot Springs Resort. There are several hotels southeast of the Glenwood Meadows Mall. The Existing Route runs through a residential section of north Glenwood Springs. The Existing Route north of the Colorado River is adjacent to medium-density residential areas.	Avoid new impacts to homes and buildings so that the ROW is kept clear of existing buildings.
Transportation and Existing Electric Infrastructure	Transportation infrastructure in the Study area includes the Union Pacific Railroad, I-70, and US-6, all running parallel to the Colorado River. The existing 69-kilovolt transmission line currently serves Glenwood Springs via the Mitchell Creek and Glenwood Springs substations.	Parallel existing linear infrastructure (roads and transmission lines) when not constrained by existing development or sensitive resources. Favor paralleling existing and future county and local roads where possible. Avoid federal and state highway ROW where possible.
Cultural Resources	Southwest of Glenwood Springs Substation is the Hot Springs Historic Area (GSHPC). This area encompasses four sites recognized by the GSHPC as being eligible for the National Register of Historic Places (NRHP), one site eligible for both the State Register of Historic Place and NRHP, and one NRHP-listed historic property. One site listed on the State Register of Historic Places lies approximately 0.15 mile south of the Existing Route at the intersection of Maple and 5th Street.	Avoid potential degradation of NRHP-listed sites by routing transmission line away from such sites. Identify other culturally sensitive landmarks or sites by consulting with local county and municipalities and avoid routing transmission line within such sites.
Water Resources	The major water resource intersecting the Existing Route is the Colorado River. Any transmission line alternative will have to cross the Colorado River given the location of the two Project endpoints. Adjacent to Two Rivers Park lies the confluence of the Roaring Fork River and Colorado River.	Minimize pole placement in areas prone to flooding such as 100-year floodplains. Minimize impacts to sensitive resources by spanning wetlands, routing around wetlands, or through careful transmission structure placement.

Resource	Description	Routing Objective
Avian Species Habitat	Large areas of potential burrowing owl habitat in Glenwood Springs include Two Rivers Park, the Glenwood Meadows Mall, and the West Harvard Drive neighborhood. However, some of these areas may not be suitable for burrowing owl occupation due to existing development. Peregrine falcons commonly occupy areas that feature open spaces with high cliffs overlooking rivers and coastlines. A peregrine falcon nesting area can be found approximately 0.4-mile northeast of Glenwood Springs Substation. A great blue heron foraging area begins where the Colorado River the Roaring Fork River intersect; this foraging area buffers the Colorado River and encompasses the land around the Mitchell Creek Substation.	Reduce potential impacts to sensitive species habitat by identifying a Colorado River crossing with existing disturbance (e.g., near a road or transmission line crossings). Reduce potential impacts to avian species by avoiding nest locations.

2.2 Routing

The next phase of the route selection process was the development and evaluation of alternative routes. This phase included defining the routing objectives, identifying river crossing locations, identifying route segments, and eliminating preliminary routes.

2.2.1 Define Routing Objectives

Resource data were analyzed to determine objectives for the transmission line route. The resources were reviewed, and compatible and avoidance areas were considered as general guidance when selecting preliminary route locations within the Study area.

While it is not possible to avoid all incompatible areas, classification of objectives in this manner helps maximize utilization of compatible areas and minimize impacts to avoidance areas. The routing objectives are summarized in Table 1, and the preliminary route corridors that resulted from use of the objectives are shown on Figure 2.

2.2.2 River Crossing Identification

Given the location of the Project endpoints, the rebuilt transmission line must cross the Colorado River. Crossing locations were identified based on resource data collection, mapping, and field reconnaissance. Preference was also given to areas where the Colorado River narrows, allowing a shorter crossing, to areas with an existing disturbance, and to areas where development is sparse on either side. Additional factors aiding in the crossing location identification include existing linear corridors and future land use designations.

Four river crossing locations were identified in the routing process and are shown on Figure 2. Three crossings were carried forward into the comparative process.

2.2.3 Preliminary Route Corridor Identification

Preliminary route corridors were identified based on resource data, mapping, field reconnaissance, routing objectives, and river crossing locations. Other factors influencing the identification of preliminary route corridors included the presence of existing linear infrastructure and physical barriers such as buildings and residences. Linear infrastructure can be paralleled to avoid further fragmenting the surrounding Study area; and physical barriers are avoided to ensure the ROW is clear of buildings. Crossing locations for the Colorado River determined the endpoint of each route corridor. Additional routing considerations are described in Table 1.

A viable option to meet the Project need is to rebuild the transmission line in the Existing Route corridor. This corridor follows the Existing Route; however, the rebuilt line will require additional ROW width in some areas, additional vegetation clearing, and relocation of some structures that are near cliff edges and near residential buildings.

A route corridor along US-6 was identified based on the presence of an existing linear corridor. Additional route corridors that follow existing local roads and avoid residential areas include those running north and south of Midland Avenue, north and south of Devereux Road, and south of Wulfsohn Road. Preliminary route corridors identified are shown on Figures 2 and 3.

2.2.4 Preliminary Route Corridor Elimination

Routes retained for additional consideration and comparative analysis are evaluated in greater detail in Section 2.3. In most cases, if a constraint was found along a route corridor, the corridor was eliminated from further consideration.

Any other route corridors connected to the eliminated corridor became obsolete and consequently eliminated. Eliminated route corridors were not carried into the comparative analysis described in Section 2.3.

2.3 Evaluation, Consultation, and Selection

The final phase of the route selection process was the evaluation and comparison of the remaining route corridors, consultation with key stakeholders, and the selection of a preferred route. The alternatives being carried forward into this step include the Existing Route (Rebuild Alternative 1), the alternative along Midland Avenue and crossing the Colorado River near Iron Mountain Hot Springs (IMHS) (Rebuild Alternative 2), and the alternative along Midland Avenue and crossing the Colorado River along Devereux Road (Rebuild Alternative 3; Figure 4; Figure 5).

2.3.1 Route Comparison and Evaluation

A data matrix comparing end-to-end route combinations across various criteria was created using a Geographic Information System database. The matrix was used as a tool to compare the route alternatives against each other. In the comparative analysis, new impacts are defined as impacts to areas previously undisturbed by transmission line infrastructure. Impacts along segments of the Existing Route, which consists of areas with existing impacts from transmission line infrastructure, are not considered new impacts. The matrix compares the numerical results of criteria such as engineering factors, land use, residences, natural resources, and cultural resources. The results of the comparative route matrix are discussed below.

Fifteen route segments were evaluated in the segment comparison portion of the data matrix. When combined, these segments created end-to-end combinations (Figure 4) including Rebuild Alternative 1, Rebuild Alternative 2, and Rebuild Alternative 3.

The comparative matrix provides both end-to-end measurements and quantifies the incremental change and the new impacts of each alternative. Incremental change is quantified by considering only the impacts in new locations outside of the existing transmission line corridor. Rebuild Alternative 1 will have the least amount of incremental change because it uses an existing transmission line corridor. Both Rebuild Alternatives 2 and 3 result in additional incremental change since they are located primarily outside of the existing transmission line corridor.

Table 2 below shows an abbreviated version of the comparative route matrix results of the end-to-end combinations. The green highlighting shows the alternative with the least amount of new impact.

Table 2:
Comparative Analysis

Comparative Criteria**	Existing Route A, B, C, D, F, J, L, M, O	Rebuild Alternatives Comparison		
		1	2	3
		K, C, E, F, J, L, N, O	A, G, H, J, L, N, O	A, G, I, L, N, O
Engineering Factors				
General				
Overall length (miles)	2.32	2.23	2.25	2.12
Existing Electric Infrastructure				
Length along existing PSCo transmission line ROW (feet)	2.32	1.92	0.73	0.47
Length along new PSCo transmission line ROW (miles)	NA	0.32	1.51	1.66
Percent along existing PSCo transmission line ROW	100%	86%	33%	22%
Roads				
Number of US Highway 6 crossings	1	1	1	1
Number of new US Highway 6 crossings	NA	0	1	1
Number of I-70 crossings	1	1	1	1
Number of new I-70 crossings	NA	0	1	1
Rail				
Number of railroad crossings	2	0	2	2
Number of new railroad crossings	NA	0	1	1
Landowners and Parcels				
Number of parcels crossed	36	36	23	25
Number of new parcels crossed (no existing transmission line)	NA	0	12	14
Number of landowners crossed	28	28	16	18
Number of new landowners crossed (no existing transmission line)	NA	0	7	9
Other Infrastructure				
Number of Glenwood Caverns Adventure Park Gondola crossings	1	1	1	0
Jurisdiction/Land Use Factors				
Land Use				
Length adjacent to proposed mining haul route (Devereux Road) (within 75ft) (miles)	0.03	0.03	0.07	0.45
New length adjacent to proposed mining haul route (Devereux Road) (within 75ft) (miles)	NA	0.00	0.07	0.45
Length within park (miles)	0.00	0.00	0.00	0.00
New length within park (miles)	NA	0.00	0.00	0.00

Glenwood Springs – Mitchell Creek Electric Transmission Line Rebuild Project
Routing Study: Executive Summary

Comparative Criteria**	Existing Route A, B, C, D, F, J, L, M, O	Rebuild Alternatives Comparison		
		1 K, C, E, F, J, L, N, O	2 A, G, H, J, L, N, O	3 A, G, I, L, N, O
Glenwood Springs Zoning				
Length crossing Hillside Preservation (HP) (miles)	0.09	0.09	0.52	0.49
<i>New length crossing Hillside Preservation (HP) (miles)</i>	NA	0.00	0.52	0.49
Length in Resort (RE) (miles)	0.00	0.00	0.17	0.16
<i>New length in Resort (RE) (miles)</i>	NA	0.00	0.17	0.16
Length in Residential (RH, RL, RM1, RM2, RR, RT) (miles)	0.86	0.88	0.75	0.74
<i>New length in Residential (RH, RL, RM1, RM2, RR, RT) (miles)</i>	NA	0.14	0.33	0.34
Residences and Other Buildings				
Residences within 30ft of centerline*	1	1	0	0
<i>New residences within 30ft of centerline*</i>	NA	0	0	0
Residences within 30 - 200ft of centerline*	54	54	24	24
<i>New residences within 30 - 200ft of centerline*</i>	NA	0	0	0
Total residences within 200ft of centerline*	55	55	24	24
Natural Resources				
Length crossing Colorado River (feet)	153	153	154	165
<i>New length crossing Colorado River (feet)</i>	NA	0	154	165

* Residential points digitized at approximate center of building.

** The following resources were also evaluated and considered: Glenwood Springs utilities, roadways and other transportation resources, slope, parcel lines, water wells and springs, county and municipal boundaries, recreation trails, parks, county and municipal zoning, non-residential and accessory buildings (garages and sheds), wetlands and waterways, 100-year floodplains, 500-year floodplains, NRHP, and state register and local landmark sites.

*** The following criteria were not evaluated because, according to the data, no resources occurred within the Study area: total and new length adjacent to existing natural gas or oil pipeline (within 75 feet); total and new number of natural gas or oil pipeline crossings.

2.3.2 Route Selection

Rebuild Alternative 1 was selected as the preferred alternative for the Project. Several factors led to the conclusion, including avoidance of creating new impacts and obtaining all new easements. It is favorable to replace and improve the Project along the existing transmission line corridor rather than create entirely new impacts in new locations. Rebuild Alternative 1 avoids creating new impacts to the area because it will upgrade the current transmission line along the existing easement. Along with construction, other maintenance will be completed including vegetation management. Creating a new Colorado River crossing location of the transmission line would be difficult as it will cause new impacts at a new location, including visual impacts. In addition, the alternative Colorado River crossing locations that were considered are located near recreational resources that may be impacted by the Project.

Rebuild Alternative 1 avoids a proposed new mining haul route along Devereux Road. The proposed mining haul route is problematic and adding utility facilities to this corridor may cause additional impacts.

While Rebuild Alternative 1 does have the largest number of residences in proximity to the centerline and the longest length in areas zoned residential, these residences will be experiencing a replacement of existing facilities, not a new impact. The incremental change to residences in the existing corridor is preferable to new impacts to residences located elsewhere, and re-negotiating the existing ROW is preferable to obtaining new ROW with new landowners. In some cases, small adjustments to the preferred alternative final route can be made to accommodate landowner preferences. The Project, as proposed, mitigates impacts to landowners by upgrading the existing transmission line so that it is less vulnerable to starting or being damaged by a wildfire, thereby increasing the overall reliability of the electric system. Wildfires pose a significant threat to communities and this Project will proactively minimize ignition risks. Additionally, Rebuild Alternative 1 avoids new impacts to areas zoned Hillside Preservation (HP) and Resort (RE), avoiding potential restrictions on development and impacts to tourism areas.

Rebuild Alternative 1 utilizes existing crossings of I-70 and US-6. This avoids new impacts in new locations that would result from new crossings and potentially avoids the requirement for new permits and agreements with the Colorado Department of Transportation (CDOT).

3. Next Steps

3.1 Permitting

The land use permits likely to be required for the Project are listed in Table 3; ROW and construction permits are not included in Table 3. There are several permits that have been considered but will likely not be required.

The need for a Section 404 Clean Water Act permit at the Colorado River crossing for the Project is considered unlikely. The section of the Colorado River in Glenwood Springs is not considered a traditionally navigable water and is therefore not subject to Section 10 of the Rivers and Harbors Act. Wetland impacts that would trigger or require permitting under Section 404 are not anticipated. In addition, the Glenwood Springs Municipal Code (Article 070.040.040) requires a 30-foot setback from the ordinary high-water mark (Section 404 jurisdictional boundary) of a river or live stream.

The Project will be subject to Glenwood Springs and Garfield County's Location and Extent permitting requirements.

Table 3:
Expected Major Land Use Permits

Permitting Authority	Permit
Glenwood Springs Planning and Zoning Commission	Location and Extent Permitting (Glenwood Spring Municipal Code Article 070.060.050(d))
CDOT	Utility Permit for crossing I-70 and US-6 and US-24 (2 Code of Colorado Regulations 601-18)
Garfield County	Location and Extent Permitting (Garfield County Land Use and Development Code Section 4-203)

Figures

Figure 1: Study Area

Figure 2: Preliminary Route Corridors

Figure 3: BLM Route Corridor

Figure 4: Route Segments

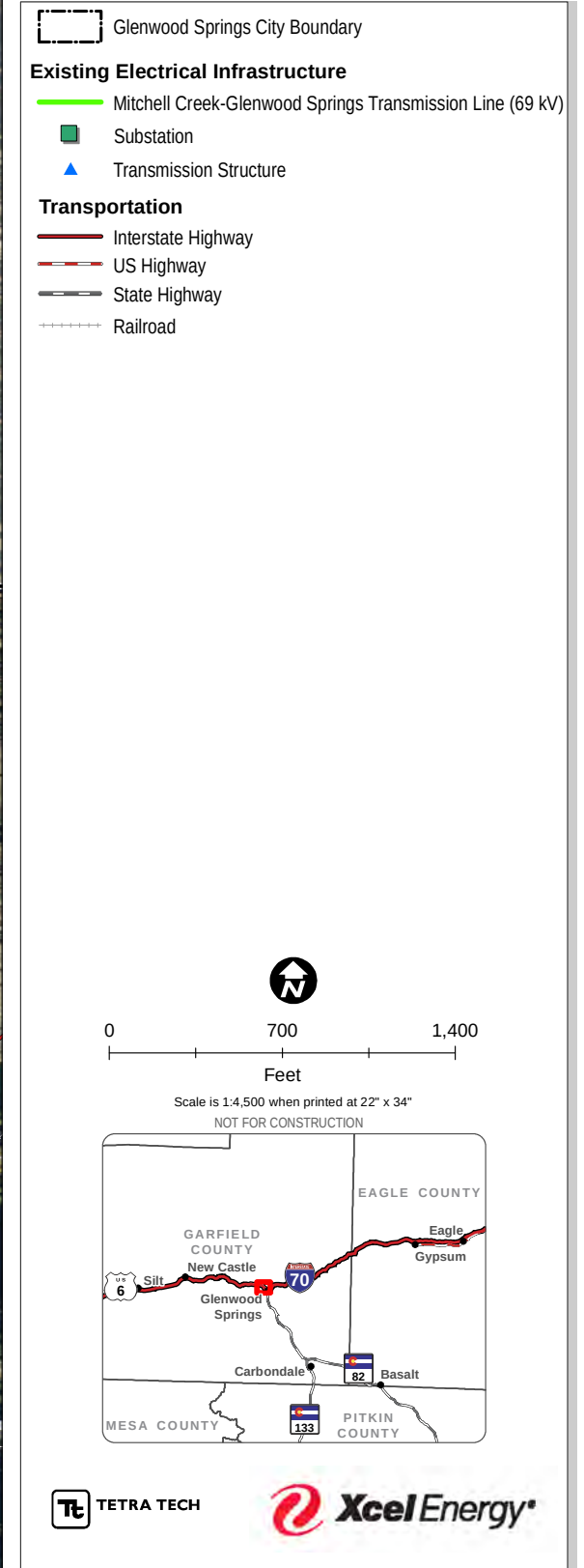
Figure 5: Route Alternatives

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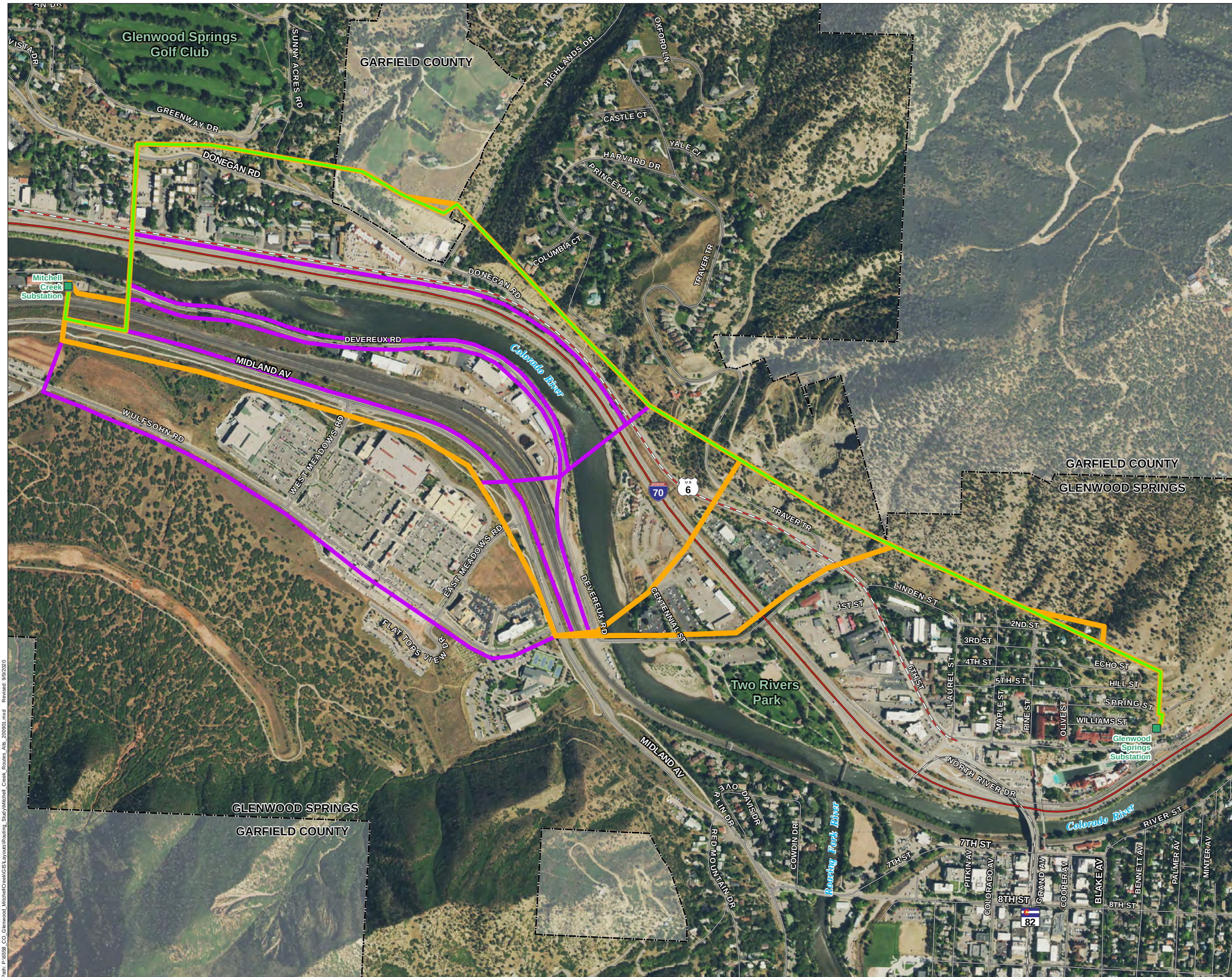


Glenwood Springs-Mitchell Creek Electric Transmission Line Rebuild Project

Figure 1: Study Area



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Glenwood Springs-Mitchell Creek Electric Transmission Line Rebuild Project

Figure 2: Preliminary Route Corridors

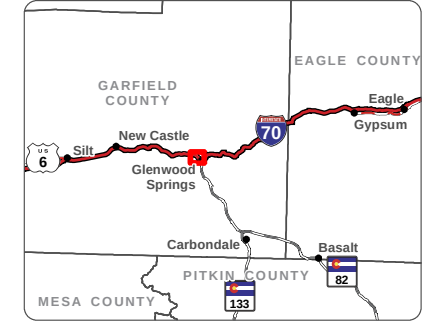
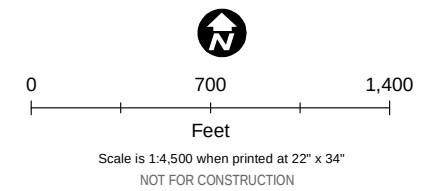
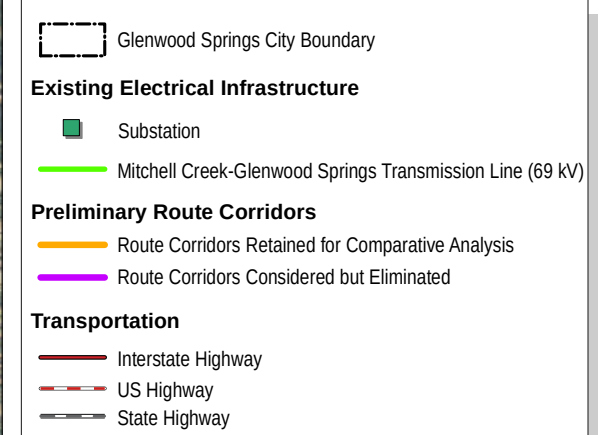
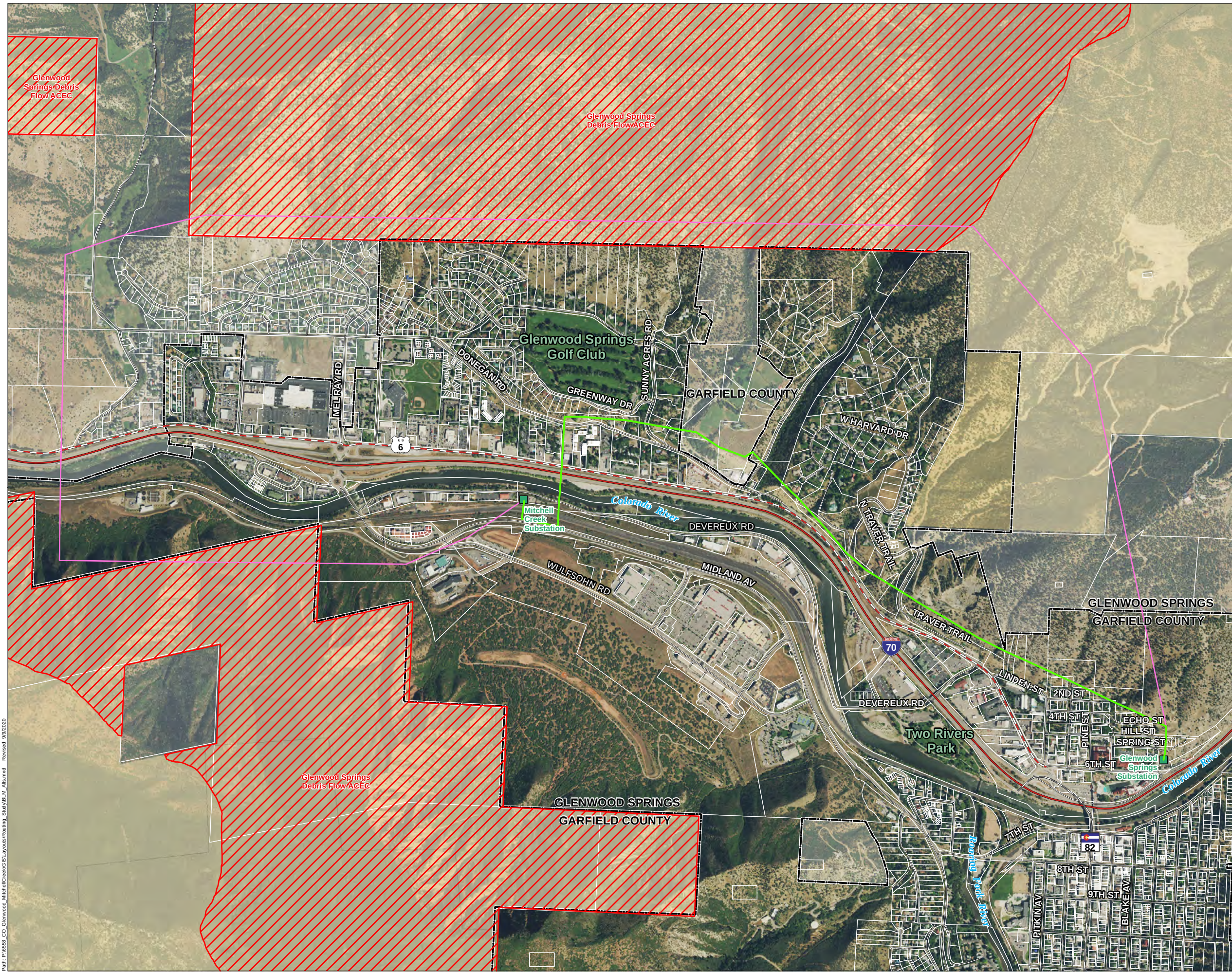
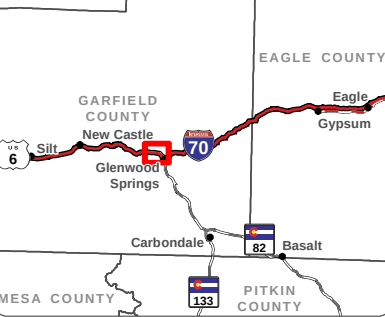
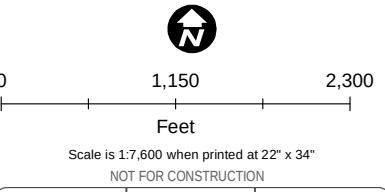
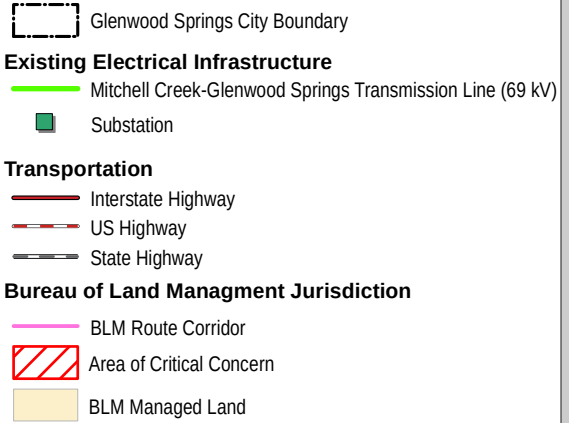


Figure 2: Preliminary Route Corridors



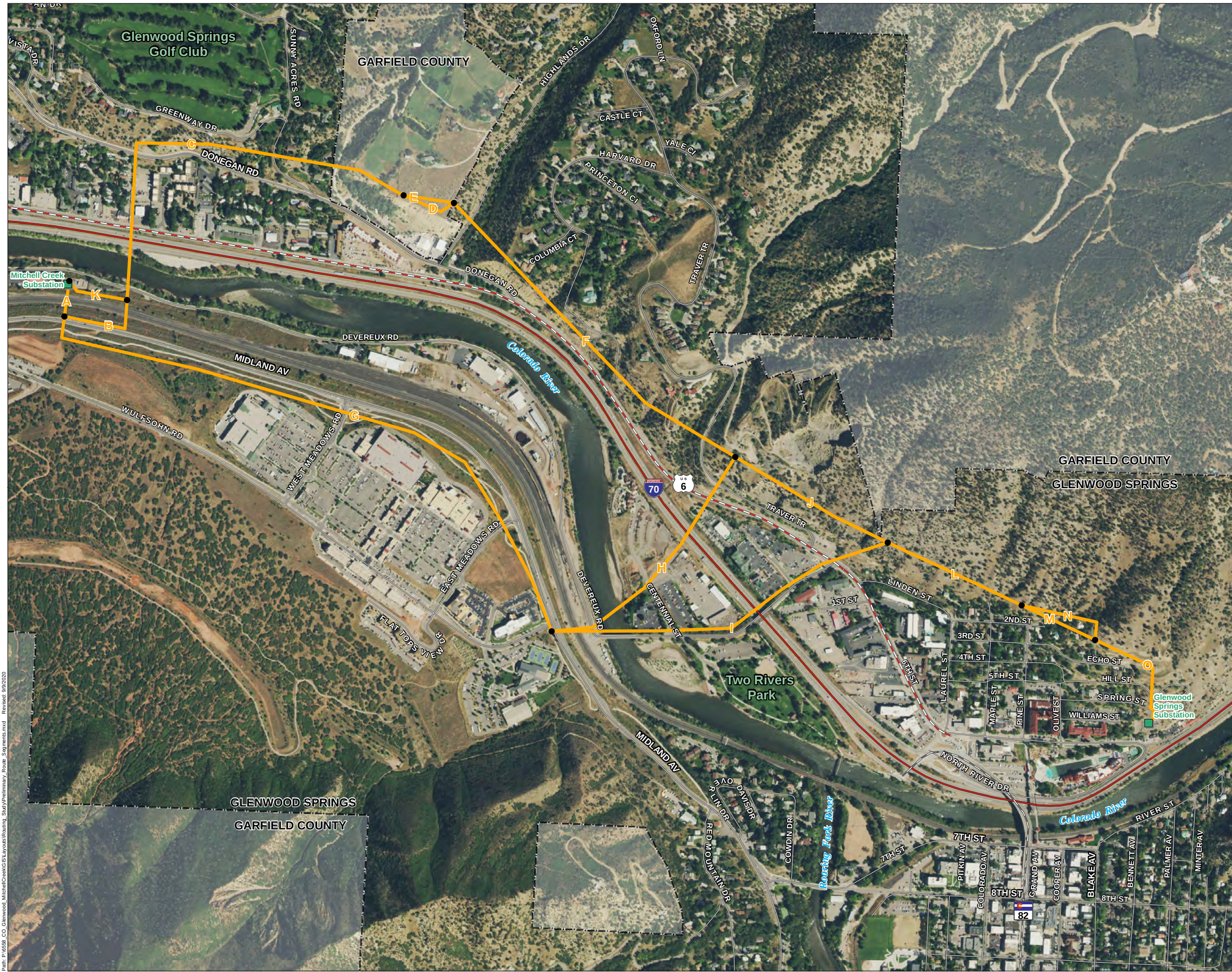
Glenwood Springs-Mitchell Creek Electric Transmission Line Rebuild Project

Figure 3: BLM Route Corridor



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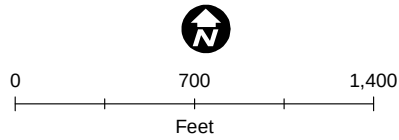
Figure 3: BLM Route Corridor



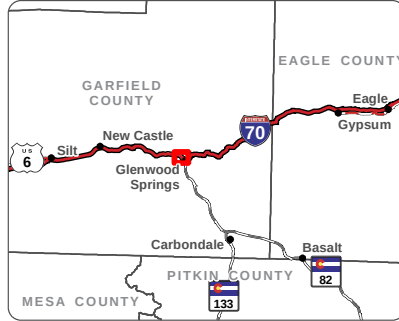
Glenwood Springs-Mitchell Creek Electric Transmission Line Rebuild Project

Figure 4: Route Segments

- Glenwood Springs City Boundary
- Existing Electrical Infrastructure**
 - Substation
- Route Segments**
 - Segment Node
 - Route Segment
- Transportation**
 - Interstate Highway
 - US Highway
 - State Highway

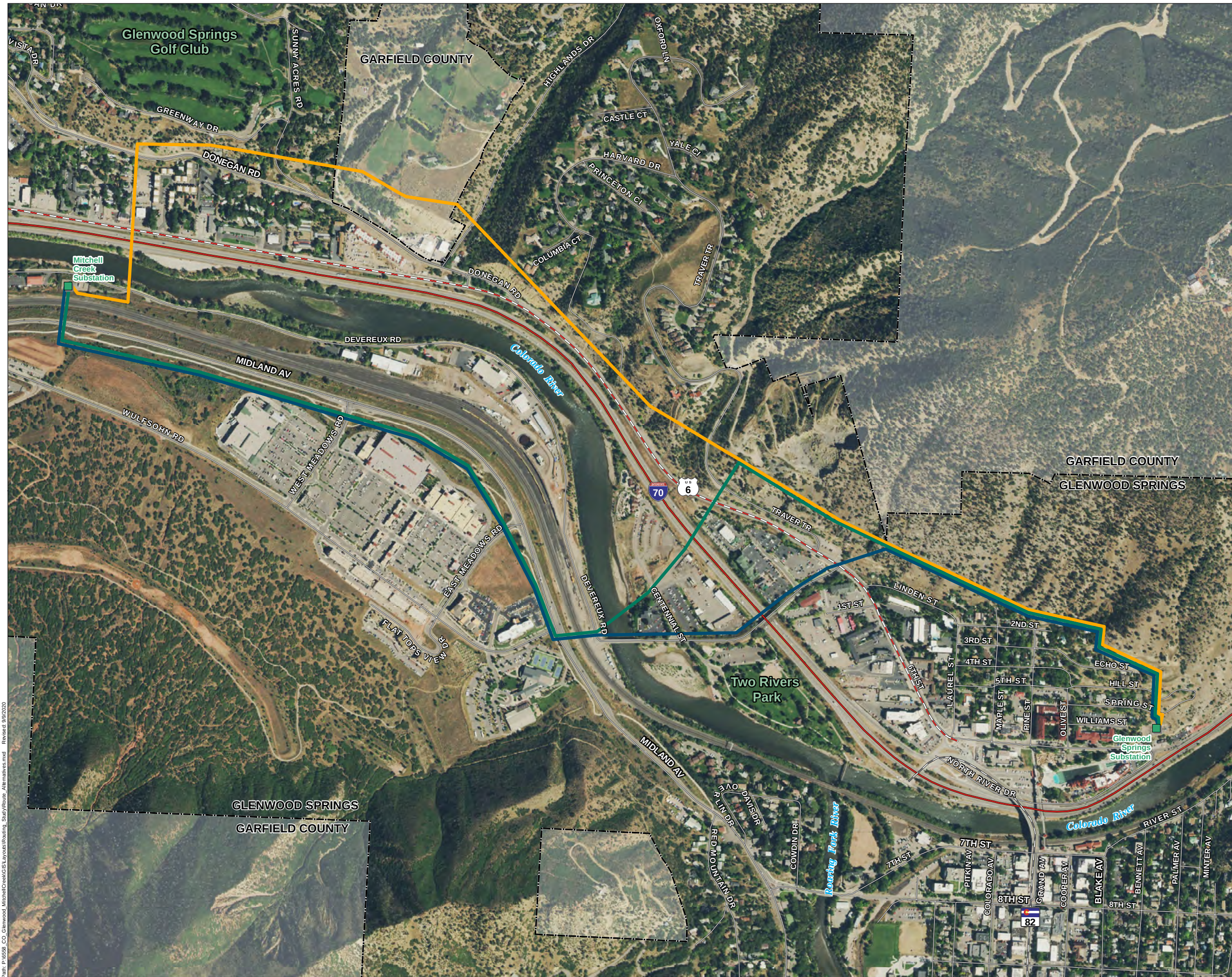


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NOT FOR CONSTRUCTION



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Figure 4: Route Segments



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Glenwood Springs-Mitchell Creek Electric Transmission Line Rebuild Project

Figure 5: Route Alternatives

Existing Electrical Infrastructure

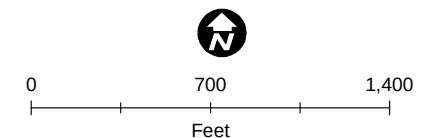
- Substation

Route Alternatives

- Rebuild Alternative 1
- Rebuild Alternative 2
- Rebuild Alternative 3

Transportation

- Interstate Highway
- US Highway
- State Highway



Scale is 1:4,500 when printed at 22" x 34"
NOT FOR CONSTRUCTION

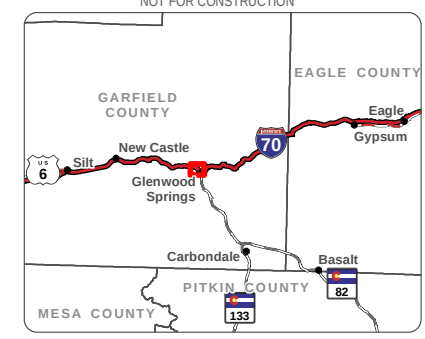


Figure 5: Route Alternatives

Appendix B: New Pole Heights and Types

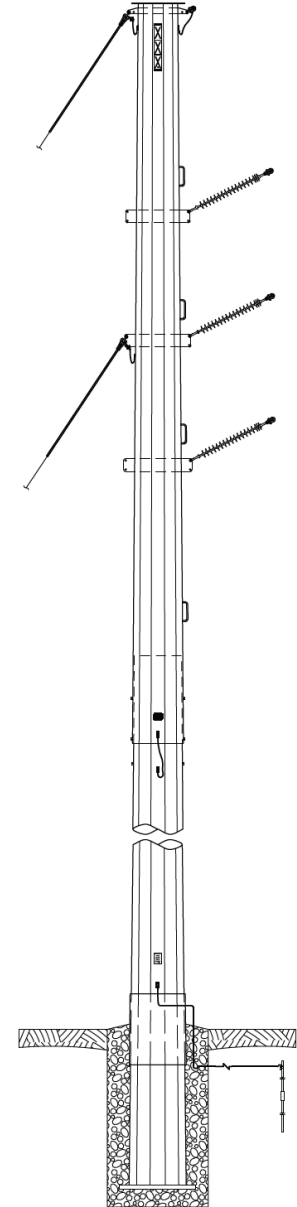
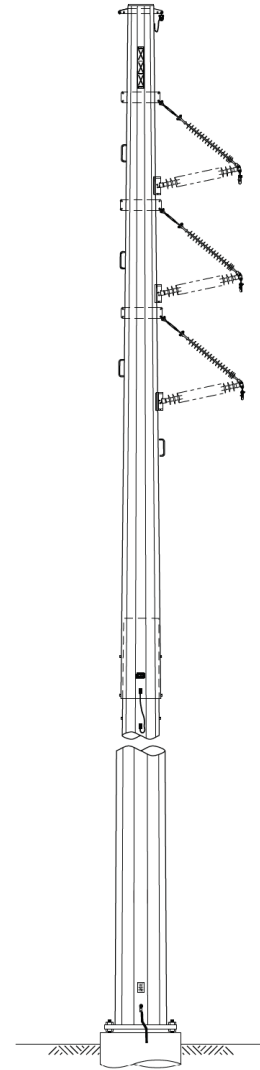
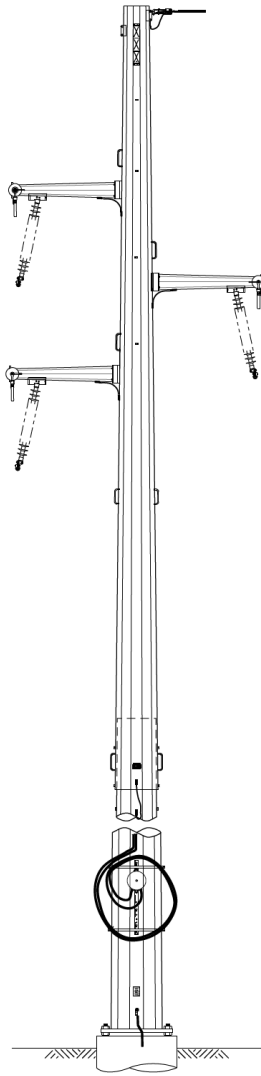
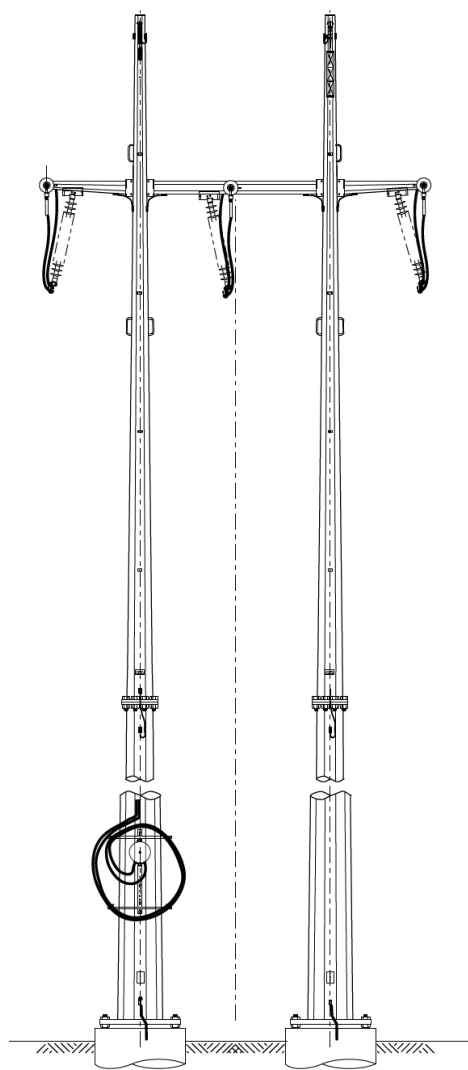
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NEW POLE HEIGHTS AND TYPES

New Pole Number	Existing Height (feet)	New Height (feet)	Height Change (feet)
110	101.5	101.5	0
113	46	83.5	37.5
114	31	81.5	50.5
115	32	55	23
116	41	61.5	20.5
117	39	62.25	23.25
118	42	74.65	32.65
119	42	57.5	15.5
120	30	57.5	27.5
121	30	55.5	25.5
122	35	70.5	35.5
123	83	97.5	14.5
124	30	67	37
125	30	61.5	31.5
126	30	57	27
127	31	57	26
128	60	75.5	15.5
129	58	57	-1
130	57	77	20
131	66	68	2
132	68	68	0
133	60	65	5
134	62	58.5	-3.5
135	55	64	9
136	62	59	-3
137	55	57.5	2.5
138	30	62.5	32.5
139	32	54.8	22.8
140	26	57.5	31.5
141	35	55	20
142	43	60	17
143	55	65	10
144	57	70	13
145	45	70	25
146	42	72.5	30.5
147	52	80	28
6584-MITC-SUB1	56	56	0

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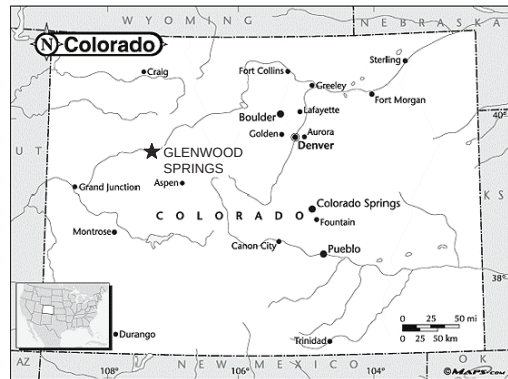
Example Pole Diagrams



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Appendix C: Plan Set

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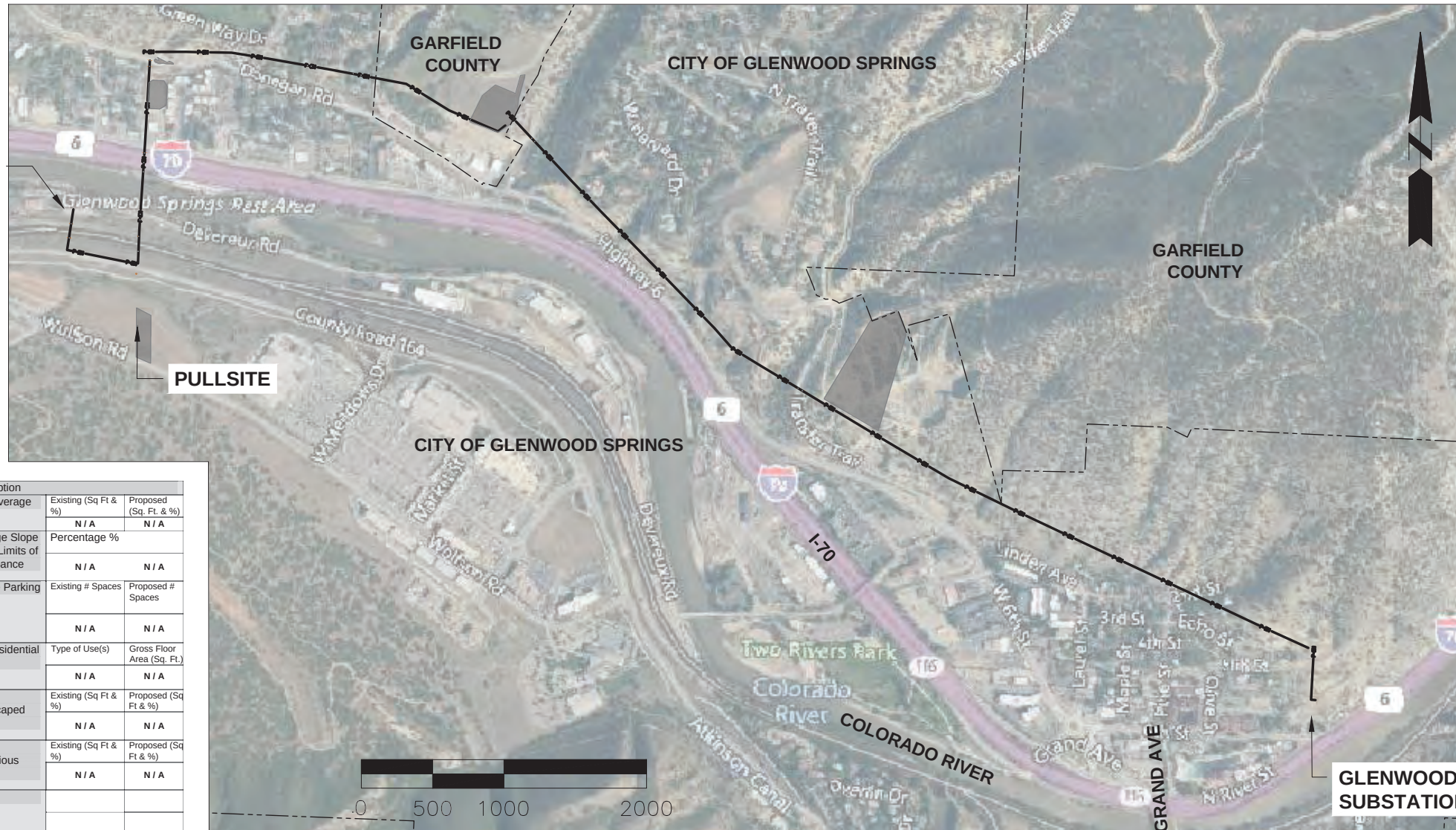


6584 GLENWOOD - MITCHELL CREEK TRANSMISSION LINE REPLACEMENT GLENWOOD SPRINGS, CO

CITY OF GLENWOOD SPRINGS SITE PLAN
JUNE 28, 2023

PROJECT VICINITY MAP

(NOT TO SCALE)



INDEX OF DRAWINGS

<u>SHEET</u>	<u>TITLE</u>
G01	COVER SHEET & LOCATION MAP

PLAN AND PROFILE

<u>SHEET</u>	<u>TITLE</u>
T117L001	COVER SHEET
T117L002	LOCATION MAP
T117L003	SECTIONS TABLE
T117L004	STRUCTURES TABLE
T117L005	STRUCTURES TABLE
T117L006	STR 110 – STR 125
T117L007	STR 125 – STR 136
T117L008	STR 136 – MITCHELL SUB

GRADING PLANS

<u>SHEET</u>	<u>TITLE</u>
G02	GENERAL NOTES & SHEET LAYOUT
CGS01	GRADING/ACCESS PLAN 1
CGS02	GRADING/ACCESS PLAN 2
CGS03	GRADING/ACCESS PLAN 3
CGS04	GRADING/ACCESS PLAN 4
CGS05	GRADING/ACCESS PLAN 5
CGS06	GRADING/ACCESS PLAN 6
CGS07	GRADING/ACCESS PLAN 7
CGS08	GRADING/ACCESS ENLARGEMENT
CGS09	GRADING/ACCESS ENLARGEMENT
CGS10	GRADING/ACCESS ENLARGEMENT
CGS11	GRADING/ACCESS ENLARGEMENT

GEOLOGIC HAZARDS DISCLOSURE

THIS AREA IS SUBJECT TO GEOLOGIC HAZARDS PER THE ADOPTED MAPPING BY THE CITY OF GLENWOOD SPRINGS. THE PROJECT WILL REQUIRE LIMITED PAD GRADING AND NO ACCESS GRADING, EXCEPTING TEMPORARY GRADING AT POLE 141. POLE PAD GRADING AT STRUCTURES 114 AND 115 WILL NOT CUT INTO THE HILLSIDE AND THEREFORE WILL NOT IMPACT LOCAL SLOPE STABILITY NOR INCREASE GEOLOGIC HAZARD RISKS. AS THE STRUCTURES ARE STEEL POLES, THERE IS LIMITED STRUCTURE CONCERN DUE TO DEBRIS FLOW AND ROCK FALL AND POLES ARE DESIGNED TO ADDRESS SUBSURFACE CONDITIONS FOR STRUCTURAL STABILITY AND SETTLEMENT. POLE 141 WILL REQUIRE PAD AND ACCESS GRADING ADJACENT A DEBRIS FLOW OF MODERATE HAZARD WITH NO OTHER MAPPED HAZARDS. AS THE CONSTRUCTION IMPACTS TO THE DEBRIS FLOW AREA IS TEMPORARY, THIS IS NOT A LONG TERM HAZARD FOR THE POLE.

A FINAL GEOLOGIC HAZARDS REPORT WILL BE SUBMITTED IF NECESSARY
UPON APPLICATION OF PROJECT GRADING PERMITS.

BASIS OF BEARINGS & BENCHMARKS

PRIMARY TOPOGRAPHIC INFORMATION FROM LIDAR SURVEY PERFORMED BY XPRS IN NOVEMBER 2014, NAD832011 UTM13 NAVD88, US SURVEY FEET AND IS PROJECTED ONTO A NAD83 COLORADO STATE PLANE, CENTRAL ZONE, US SURVEY FOOT COORDINATE SYSTEM. BOUNDARIES PROVIDED PROJECTED FROM AVAILABLE GIS INFORMATION.

FEMA FLOODPLAIN

	COMMUNITY-PANEL NO.	REVISION DATE
FEMA FIRM MAP	080205 1043 B	JANUARY 3, 1986
FEMA FIRM MAP	080205 1045 B	JANUARY 3, 1986
FEMA FIRM MAP	080205 1431 B	JANUARY 3, 1986
FEMA FIRM MAP	080071 1432 B	OCTOBER 15, 1985

THERE IS NO WORK WITHIN A FEMA REGULATED FLOODZONE AND WILL NOT REQUIRE ANY FLOODPLAIN PERMITTING.

Project Summary Table

Project Description					
Lot Size Information	Acres	Square feet	Lot Coverage	Existing (Sq Ft & %)	Proposed (Sq. Ft. & %)
	N/A	N/A		N/A	N/A
Limits of Disturbance	Existing (Sq & %)	Proposed (Sq. Ft. & %)	Average Slope within Limits of Disturbance	Percentage %	
	N/A	N/A		N/A	N/A
Off-street Parking Spaces	Existing # Vehicle Spaces	Proposed # Vehicle Spaces	Bicycle Parking	Existing # Spaces	Proposed # Spaces
	N/A	N/A		N/A	N/A
Residential Units	# Existing Units	# Proposed Units	Non-residential Uses	Type of Use(s)	Gross Floor Area (Sq. Ft.)
	N/A	N/A		N/A	N/A
Open Space	Existing (Sq ft & %)	Proposed (Sq Ft & %)	Total Landscaped area	Existing (Sq Ft & %)	Proposed (Sq Ft & %)
	N/A	N/A		N/A	N/A
Building Height	Existing	Proposed	Total Impervious Area	Existing (Sq Ft & %)	Proposed (Sq Ft & %)
	N/A	N/A		N/A	N/A
Snow Storage	Required (sq ft)	Proposed (sq ft)	Other		
	N/A	N/A			

SITE CIVIL ENGINEER
HDR ENGINEERING, INC.
1670 BROADWAY, SUITE 3400
DENVER, CO 80202 BRIAN BROWN, CO PE
BRIAN.BROWN@HDRINC.COM
970-215-4616

TRANSMISSION ENGINEER
XCEL ENERGY
1800 LARIMER ST
DENVER, CO 80202 JOSH PETERSON, CO PE
JOSHUA.G.PETERSON@XCELENERGY.COM
303-517-6559

ENGINEER

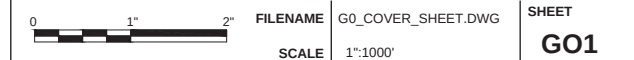
HDR ENGINEERING, INC.
1670 BROADWAY, SUITE 3400
DENVER, CO 80202
CONTACT: BRIAN BROWN
Brian.Brown@HDRInc.com
(970) 416-4404

PROJECT MANAGER BRIAN BROWN

[illegible]

 **Xcel Energy®**
6584 GLENWOOD - MITCHELL CREEK
TRANSMISSION LINE REPLACEMENT
GLENWOOD SPRINGS, CO

TITLE SHEET & LOCATION MAP



XCEL ENERGY
ELECTRICAL TRANSMISSION LINE
STRUCTURE 38(9714) TO MITCHELL CREEK SUBSTATION (MITC)
CIRCUIT NUMBER 6584 - 69kV

TRANSMISSION LINE
LEGEND

- ANCHOR
- ANCHOR REMOVE
- PUSH BRACE
- SOIL BORING
- SWITCH
- TRANSMISSION POLE
- TRANSMISSION POLE REMOVE
- TRANSMISSION TOWER
- TRANSMISSION TOWER REMOVE

WOOD POLE DESCRIPTION ON PROFILE VIEW:
PXX-XXX-XXX

- STRUCTURE HEIGHT
- CLASS = 2, 1, H1, H2, ETC.
- SPECIES = DF, SP, WC, ETC.
- POLE

STEEL POLE DESCRIPTION ON PROFILE VIEW:
PST-XXX-XXX

- STRUCTURE HEIGHT
- FND = ON FOUNDATION
- EMB = DIRECT EMBEDDED
- POLE - STEEL

GENERAL NOTES

1. COORDINATES ARE UTM ZONE 15N (WGS84)
2. PLS-CADD MODEL NAME(S) USED TO CREATE THESE P&P DRAWINGS:
6584_STR38(9714)-MITC.XYZ

DRAWING REFERENCE

PHASING DIAGRAM	T117P009
SUBASSEMBLY DRAWING INDEX	T117X005
SOIL BORING REPORT	T117V014
SAG TABLE-CONDUCTOR	T117A009
SAG TABLE-OPGW SHIELD WIRE	T117A010, T117A011

ISSUED BY ENGINEERING DEPT FOR: CONSTRUCTION

THIS MAP/DOCUMENT IS A TOOL TO ASSIST EMPLOYEES IN THE PERFORMANCE OF THEIR JOBS.YOUR PERSONAL SAFETY IS PROVIDED FOR BY USING SAFETY PRACTICES, PROCEDURES AND EQUIPMENT AS DESCRIBED IN THE SAFETY TRAINING PROGRAMS, MANUALS AND SPARS.
INTERNAL INFORMATION; DO NOT COPY OR DISTRIBUTE WITHOUT EXPRESS WRITTEN CONSENT FROM XCEL ENERGY

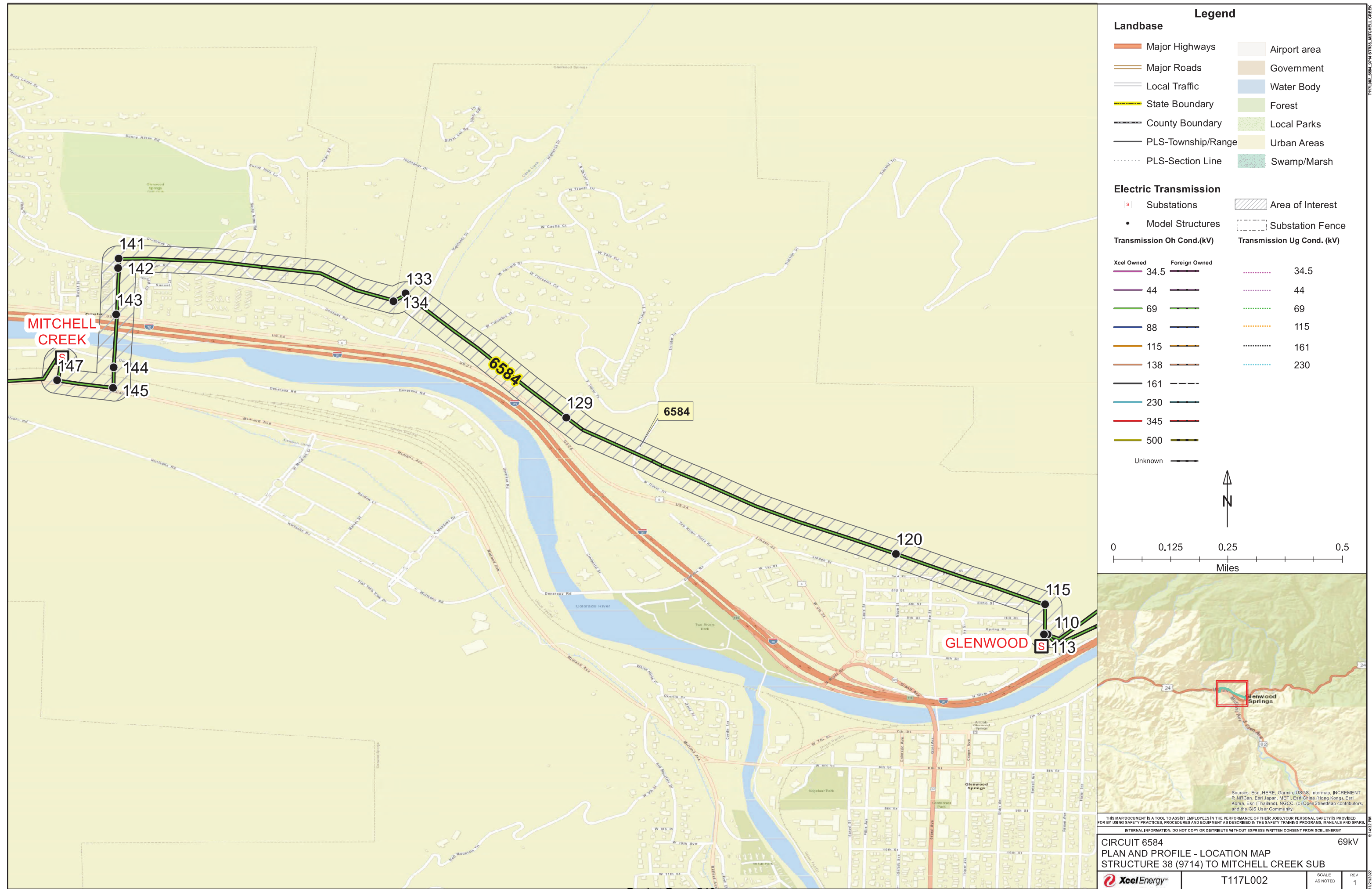
CIRCUIT 6584 69 kV
PLAN AND PROFILE - COVER SHEET
9714-38 TO MITCHELL CREEK SUBSTATION

 XcelEnergy®	T117L001	SCALE NONE	REV 1
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REV	DATE	WBS 4	REVISION DESCRIPTION
0	02/25/2021	A.0000507.027.001.002	IFC - GLENWOOD SPRINGS-MITCHELL CREEK REBUILD
1	11/04/2022	A.0000507.027.001.002	IFC - UPDATED FOR REROUTED ALIGNMENT FOR GLENWOOD SPRINGS-MITCHELL CREEK REBUILD



T117L001.DGN
3/11/2021 12:20:30 PM

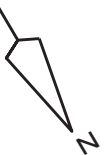


STRUCTURES									STRUCTURE COMPONENTS			
STRUCTURE NUMBER	AHEAD SPAN (FT)	STATION (FT)	LINE ANGLE (DEG)	STRUCTURE ASSEMBLY	LOAD & DESIGN DETAILS	STEEL or TOWER DETAILS	FOUNDATION DETAILS	COMMENTS	POSITION LABEL	DESCRIPTION	LENGTH (FT)	EMBEDMENT (FT)
6584-110-DE	30.9	0+0.00	---	STR SYDQBGZ1-6584	---	---	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, SWITCH	115	15.0
6584-113-DE	188.8	0+30.90	88° 3' 0.0"	STR SYDQBLZ1-6584	LD T117C008	STL T1177004-PST18070	---	WAS #111	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, VERTICAL	95	11.5
6584-114	157.3	2+19.73	---	STR SYSQCB00-6584	LD T117C009	STL T1177004-PST18098	---	WAS #112	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	95	13.5
6584-115-DE	350.0	3+77.04	-68° 40' 0.0"	STR SYDACSZ1-6584	LD T117C010	STL T1177004-PST18082	FDN T1179003-ABC2432	WAS #113	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, DAVIT ARM	55	---
6584-116	166.7	7+27.02	0° 27' 0.0"	STR SYSQCB00-6584	LD T117C009	STL T1177004-PST18079	---	WAS #114	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	75	13.5
6584-117	237.5	8+93.75	0° 31' 0.0"	STR SYSQBBZ2-6584	LD T117C011	STL T1177004-PST26301	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	75	13.6
6584-118	409.4	11+31.27	-0° 17' 0.0"	STR SYSQBBZ2-6584	LD T117C011	STL T1177004-PST26300	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	90	15.1
6584-119	289.4	15+40.66	---	STR SYSQCB00-6584	LD T117C009	STL T1177004-PST18075	---	MOVED FROM OLD #118	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	70	12.5
6584-120-DE	425.6	18+30.03	---	STR SYDQCS00-6584	LD T117C013	STL T1177004-PST18099	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, DAVIT ARM	70	12.5
6584-121	465.9	22+55.63	---	STR SYSQCB00-6584	LD T117C009	STL T1177004-PST18077	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	70	14.5
6584-122	484.9	27+21.48	0° 46' 0.0"	STR SYSQCB00-6584	LD T117C009	STL T1177004-PST18094	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	85	14.5
6584-123	562.7	32+06.41	4° 37' 0.0"	STR SYSQBBZ3-6584	LD T117C011	STL T1177004-PST18093	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	115	14.7
6584-124	366.9	37+69.13	0° 24' 0.0"	STR SYSQCB00-6584	LD T117C009	STL T1177004-PST18080	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	80	13.0
6584-125	132.7	41+36.00	---	STR SYSQCB00-6584	LD T117C009	STL T1177004-PST18079	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	75	13.5
6584-126	483.1	42+68.72	---	STR SYSQCB00-6584	LD T117C009	STL T1177004-PST18076	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	70	13.0
6584-127	224.5	47+51.76	0° 31' 0.0"	STR SYSQCB00-6584	LD T117C009	STL T1177004-PST18076	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	70	13.0
6584-128	196.9	49+76.24	14° 52' 0.0"	STR SYSQBBZ3-6584	LD T117C011	STL T1177004-PST18092	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	90	13.1
6584-129-DE	523.2	51+73.17	---	STR SYDQCS00-6584	LD T117C013	STL T1177004-PST18100	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, DAVIT ARM	70	13.0
6584-130	613.3	56+96.38	-0° 30' 0.0"	STR SYSQCB00-6584	LD T117C009	STL T1177004-PST18097	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	90	13.0
6584-131	277.5	63+09.65	0° 42' 0.0"	STR SYSQCB00-6584	LD T117C009	STL T1177004-PST18081	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	80	12.0
6584-132	611.2	65+87.15	---	STR SYSQCB00-6584	LD T117C009	STL T1177004-PST18081	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	80	12.0
6584-133-DE	139.8	71+98.31	-85° 18' 0.0"	STR SYDABLZ3-6584	LD T117C014	STL T1177004-PST18102	FDN T1179003-ABC2434	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, VERTICAL	65	---
6584-134-DE	373.5	73+38.11	61° 52' 0.0"	STR SYDQBLZ2-6584	LD T117C008	STL T1177004-PST18073	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, VERTICAL	70	11.5
6584-135	352.9	77+11.61	8° 28' 0.0"	STR SYSABBZ1-6584	LD T117C013	STL T1177004-PST18107	FDN T1179003-ABC2435	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	65	---
6584-136	543.2	80+64.50	-21° 3' 0.0"	STR SYSQBBZ4-6584	LD T117C011	STL T1177004-PST18090	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	70	11.3
6584-137	439.6	86+07.73	-0° 41' 0.0"	STR SYSQCB00-6584	LD T117C009	STL T1177004-PST18075	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	70	12.5
6584-138	260.6	90+47.29	-0° 46' 0.0"	STR SYSQCB00-6584	LD T117C009	STL T1177004-PST18078	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	75	12.5
6584-139	321.6	93+07.89	-8° 7' 0.0"	STR SYSQBBZ3-6584	LD T117C011	STL T1177004-PST18089	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	65	12.4
6584-140	247.3	96+29.53	-1° 9' 0.0"	STR SYSQCB00-6584	LD T117C009	STL T1177004-PST18075	---	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, BRACED POST	70	12.5
6584-141-DE	112.6	98+76.79	-85° 52' 0.0"	STR SYDACSZ1-6584	LD T117C010	STL T1177004-PST18086	FDN T1179003-ABC2436	---	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, DAVIT ARM	55	---
6584-142-DE	533.4	99+89.40	-0° 46' 0.0"	STR SYDACSZ1-6584	LD T117C010	STL T1177004-PST18083	FDN T1179003-ABC2431	MOVED FROM #115	CENTER	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, DAVIT ARM	60	---
6584-143-DE	609.0	105+22.81	0° 27' 0.0"	STR SYDABSZ1-6584	LD T117C016	STL T1177004-PST18110	FDN T1179003-ABC2437	---	LEFT	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, H-FRAME	65	---
	609.0								RIGHT	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, H-FRAME	65	---
6584-144-DE	235.6	111+31.86	-1° 28' 0.0"	STR SYDABSZ1-6584	LD T117C016	STL T1177004-PST18111	FDN T1179003-ABC2438	---	LEFT	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, H-FRAME	70	---
	235.6								RIGHT	POLE, STEEL, WEATHERING, SINGLE CIRCUIT, H-FRAME	70	---
NOTES: 1. ALL LINE ANGLES LESS THEN 0.25 DEGREES ARE OMITTED FROM THIS TABLE. 2. LINE ANGLES ARE DISPLAYED AS POSITIVE VALUES FOR RIGHT HAND TURNS AND NEGATIVE VALUES FOR LEFT HAND TURNS. ALIGNMENT IS DEFINED IN ASCENDING STRUCTURE ORDER.										THIS MAP/DOCUMENT IS A TOOL TO ASSIST EMPLOYEES IN THE PERFORMANCE OF THEIR JOBS. YOUR PERSONAL SAFETY IS PROVIDED FOR BY USING SAFETY PRACTICES, PROCEDURES AND EQUIPMENT AS DESCRIBED IN THE SAFETY TRAINING PROGRAMS, MANUALS AND SPARS. INTERNAL INFORMATION: DO NOT COPY OR DISTRIBUTE WITHOUT EXPRESS WRITTEN CONSENT FROM XCEL ENERGY		
										CIRCUIT 6584 PLAN AND PROFILE - STRUCTURES TABLE 6584_STR38(9714)-MITC		
											T117L004	SCALE NONE
										69KV REV 1		

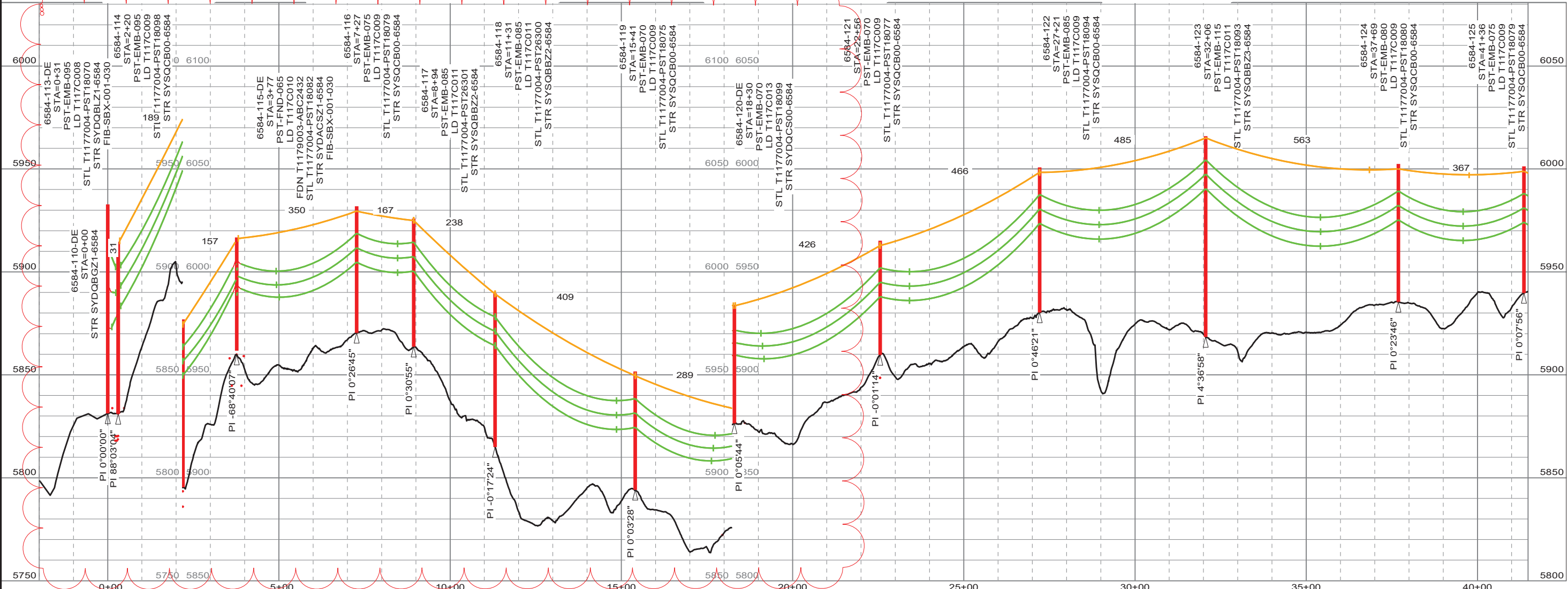
X-6584 WIRE ORDER
X-6584 EXTRA MATERIAL ORDER



THIS PE SEAL IS ONLY APPLICABLE TO
THE CURRENT CONSTRUCTION REVISION



"1"



REV	DATE	WBS4	REVISION DESCRIPTION
0	02/23/2021	A.0000507.027.001.002	IFC - GLENWOOD SPRINGS-MITCHELL CREEK REBUILD
1	11/4/2022	A.0000507.027.001.002	IFC - UPDATED FOR REROUTED ALIGNMENT FOR GLENWOOD SPRINGS-MITCHELL CREEK REBUILD

ISSUED BY ENGINEERING DEPT FOR: CONSTRUCTION

THIS MAP/DRAWING IS A TOOL TO ASSIST EMPLOYEES IN THE PERFORMANCE OF THEIR JOB'S. YOUR PERSONAL SAFETY IS PROVIDED FOR BY USING SAFETY PRACTICES, PROCEDURES AND EQUIPMENT AS DESCRIBED IN THE SAFETY TRAINING PROGRAMS, MANUALS AND SPARS.

INTERNAL INFORMATION: DO NOT COPY OR DISTRIBUTE TO OTHERS WITHOUT EXPRESS WRITTEN CONSENT FROM XCEL ENERGY.

TRANSMISSION ENGINEERING DEPARTMENT

Xcel Energy

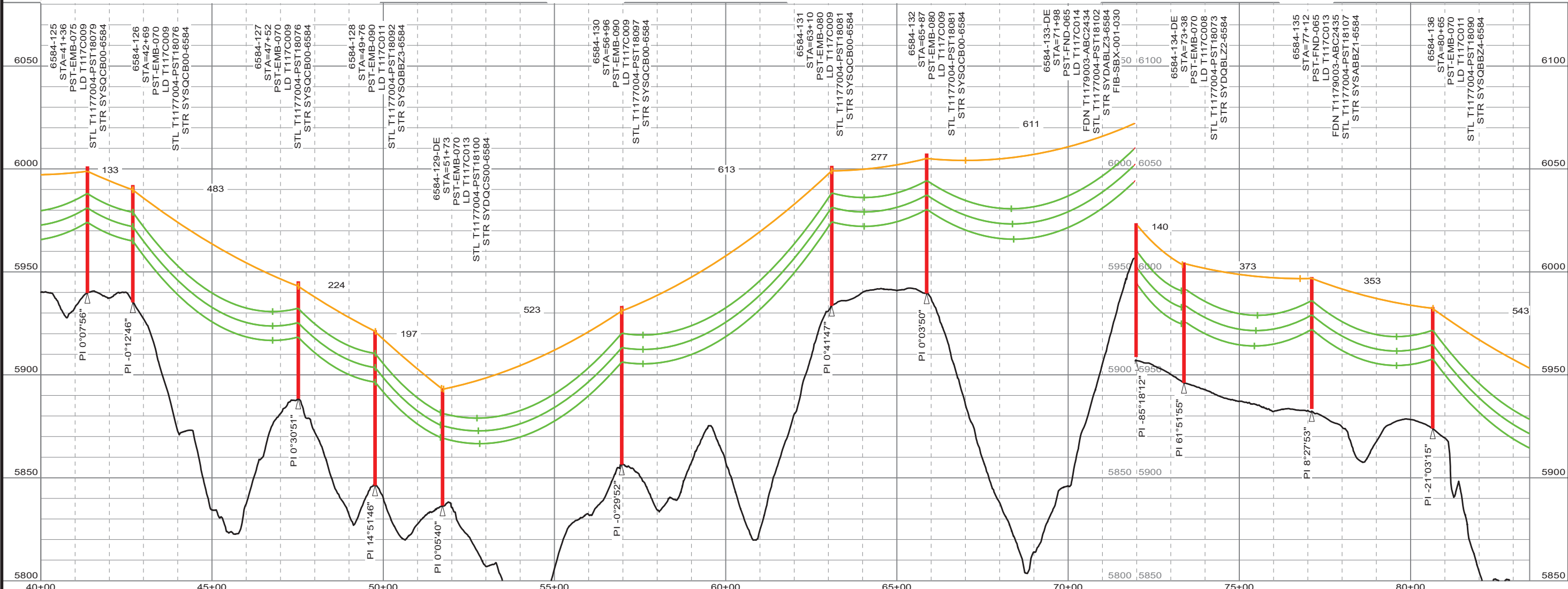
300.0 FT. HORIZ. SCALE
50.0 FT. VERT. SCALE

CIRCUIT 6584 69KV
STR38(9714)-MITC

6584-110-DE TO 6584-125
T117L006
OF 8 REV 1



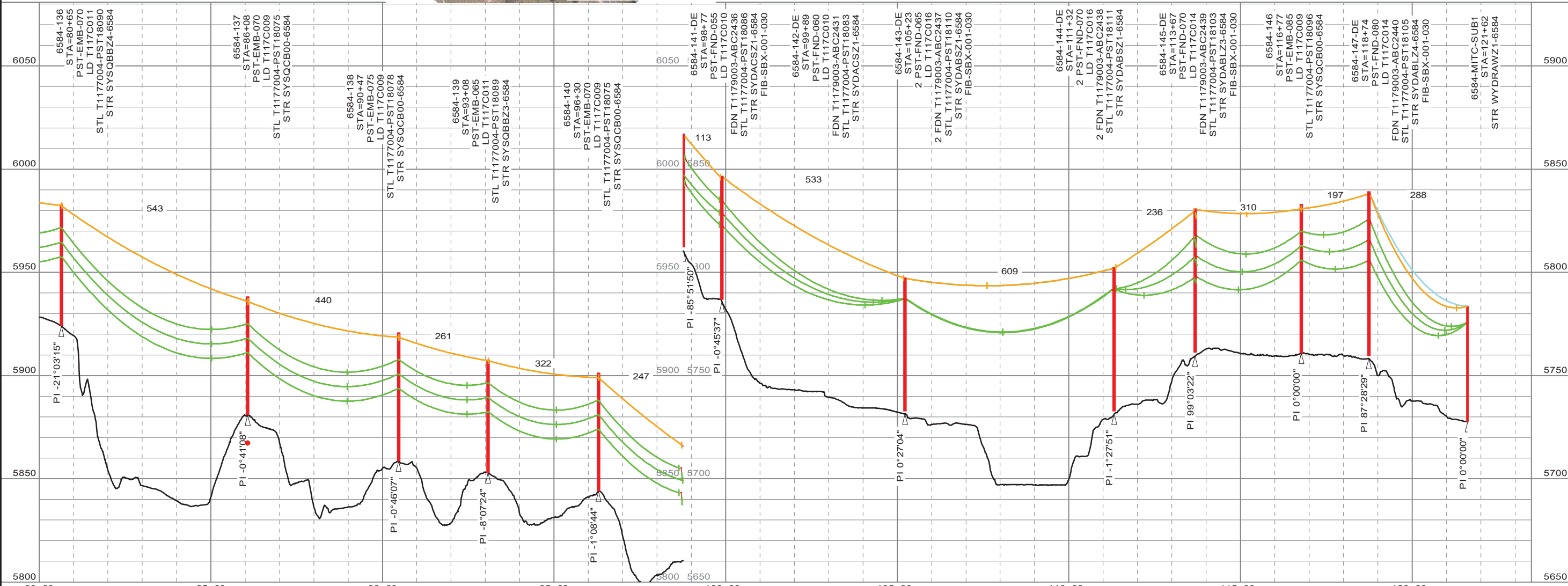
THIS PE SEAL IS ONLY APPLICABLE TO THE CURRENT CONSTRUCTION REVISION



REV	DATE	WBS4	REVISION DESCRIPTION	ISSUED BY ENGINEERING DEPT FOR: CONSTRUCTION	TRANSMISSION ENGINEERING DEPARTMENT	300.0 FT. HORIZ. SCALE	50.0 FT. VERT. SCALE	CIRCUIT 6584 STR38(9714)-MITC	69KV	6584-125 TO 6584-136
0	02/23/2021	A.0000507.027.001.002	IFC - GLENWOOD SPRINGS-MITCHELL CREEK REBUILD	THIS MAP/DRAWING IS A TOOL TO ASSIST EMPLOYEES IN THE PERFORMANCE OF THEIR JOB'S. YOUR PERSONAL SAFETY IS PROVIDED FOR BY USING SAFETY PRACTICES, PROCEDURES AND EQUIPMENT AS DESCRIBED IN THE SAFETY TRAINING PROGRAMS, MANUALS AND SPARS.	Xcel Energy			T117L007	OF 8	REV 1
1	11/4/2022	A.0000507.027.001.002	IFC - UPDATED FOR REROUTED ALIGNMENT FOR GLENWOOD SPRINGS-MITCHELL CREEK REBUILD	INTERNAL INFORMATION: DO NOT COPY OR DISTRIBUTE TO OTHERS WITHOUT EXPRESS WRITTEN CONSENT FROM XCEL ENERGY.						



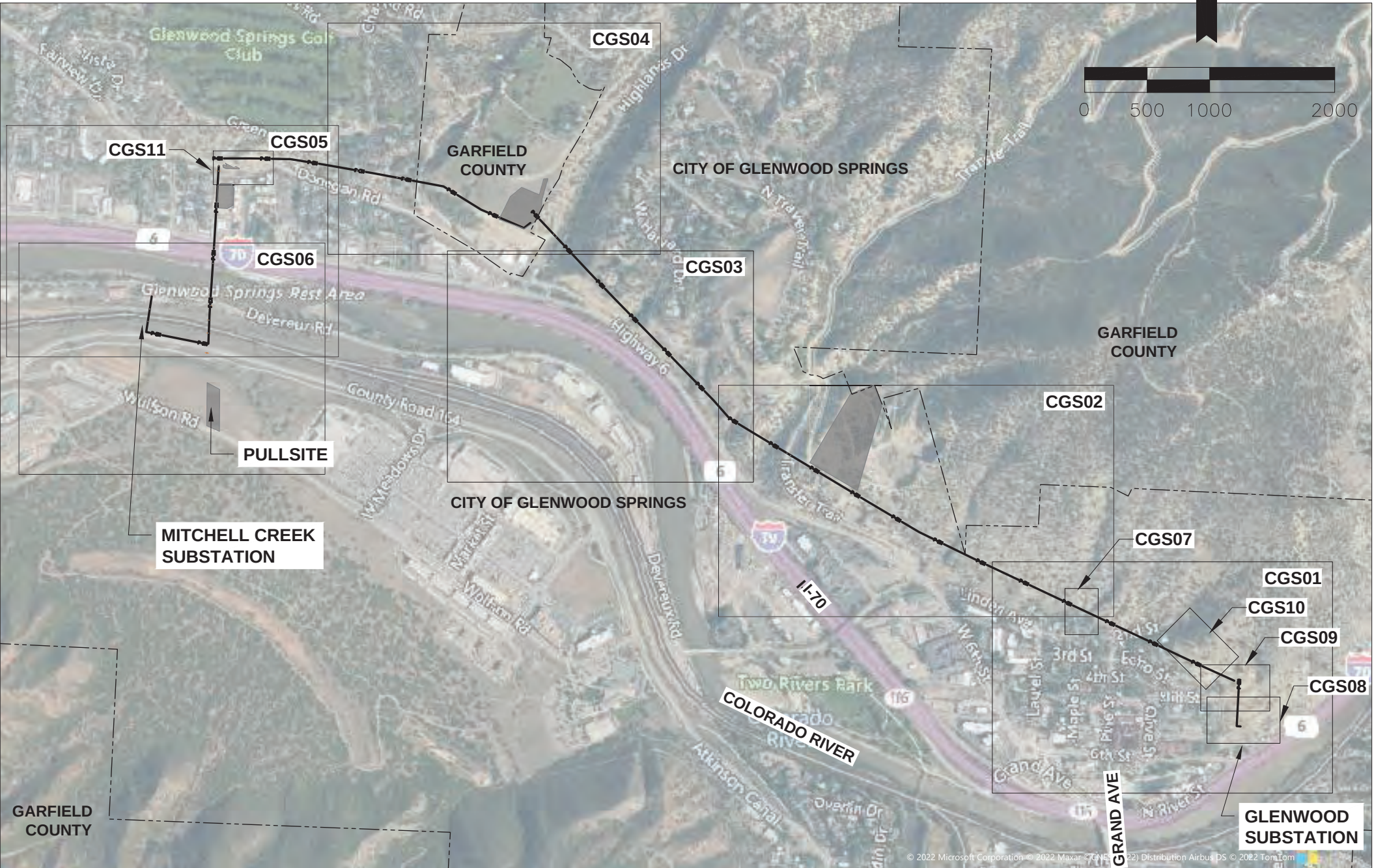
THIS PE SEAL IS ONLY APPLICABLE TO THE CURRENT CONSTRUCTION REVISION



REV	DATE	WBS4	REVISION DESCRIPTION	ISSUED BY ENGINEERING DEPT FOR: CONSTRUCTION	TRANSMISSION ENGINEERING DEPARTMENT	300.0 FT. HORIZ. SCALE	50.0 FT. VERT. SCALE	CIRCUIT 6584 STR38(9714)-MITC	69KV	6584-136 TO 6584-MITC-SUB1
0	02/23/2021	A.0000507.027.001.002	IFC - GLENWOOD SPRINGS-MITCHELL CREEK REBUILD	THIS MAP/DOCUMENT IS A TOOL TO ASSIST EMPLOYEES IN THE PERFORMANCE OF THEIR JOB'S. YOUR PERSONAL SAFETY IS PROVIDED FOR BY USING SAFETY PRACTICES, PROCEDURES AND EQUIPMENT AS DESCRIBED IN THE SAFETY TRAINING PROGRAMS, MANUALS AND SPARS.						
1	11/4/2022	A.0000507.027.001.002	IFC - UPDATED FOR REROUTED ALIGNMENT FOR GLENWOOD SPRINGS-MITCHELL CREEK REBUILD	INTERNAL INFORMATION: DO NOT COPY OR DISTRIBUTE TO OTHERS WITHOUT EXPRESS WRITTEN CONSENT FROM XCEL ENERGY.						

GRADING APPROACH NOTES:

- 1. ACCESS GRADING ON EXISTING ACCESS ROUTES ONLY REQUIRE PERMANENT OR TEMPORARY GRADING IF INDICATED ON THE PLANS. VEGETATION TRIMMING AND REMOVAL IS EXPECTED IN LIMITED AREA AND WILL ONLY BE PERFORMED WHERE REQUIRED.
- 2. XCEL ENERGY IS PROPOSING A NUMBER OF AREAS THAT REQUIRE CREATING A 'PULL PAD' TO PARK A CONDUCTOR WIRE TENSIONING TRUCK ON A RELATIVELY FLAT SURFACE. THIS TRUCK REQUIRES OUTRIGGERS TO STABILIZE THE TRUCK. IF PULL PAD GRADING IS REQUIRED, GRADING FOR SUCH IS SHOWN ON THE PLANS.
- 3. SPECIFIC GRADING DIRECTION FOR ACCESS, STAGING, AND EACH STRUCTURE IS CALLED OUT ON THE ATTACHED PLANS OR SHOWN IN PROPOSED TOPOGRAPHY.
- 4. SURVEY SHOWN ON PLAN VIEWS FROM WITHIN 150' BOTH SIDES OF THE CENTERLINE WAS PROVIDED BY PUBLIC SERVICE COMPANY OF COLORADO AND IS FLOWN LIDAR SURVEY. PROPERTY BOUNDARY, EASEMENT, AND PARCEL OWNERSHIP INFORMATION PROVIDED BY SEH SURVEYING.



6/28/23	SITE PLAN	
ISSUE	DATE	DESCRIPTION

PROJECT MANAGER BRIAN BROWN	
PROJECT NUMBER	10263652



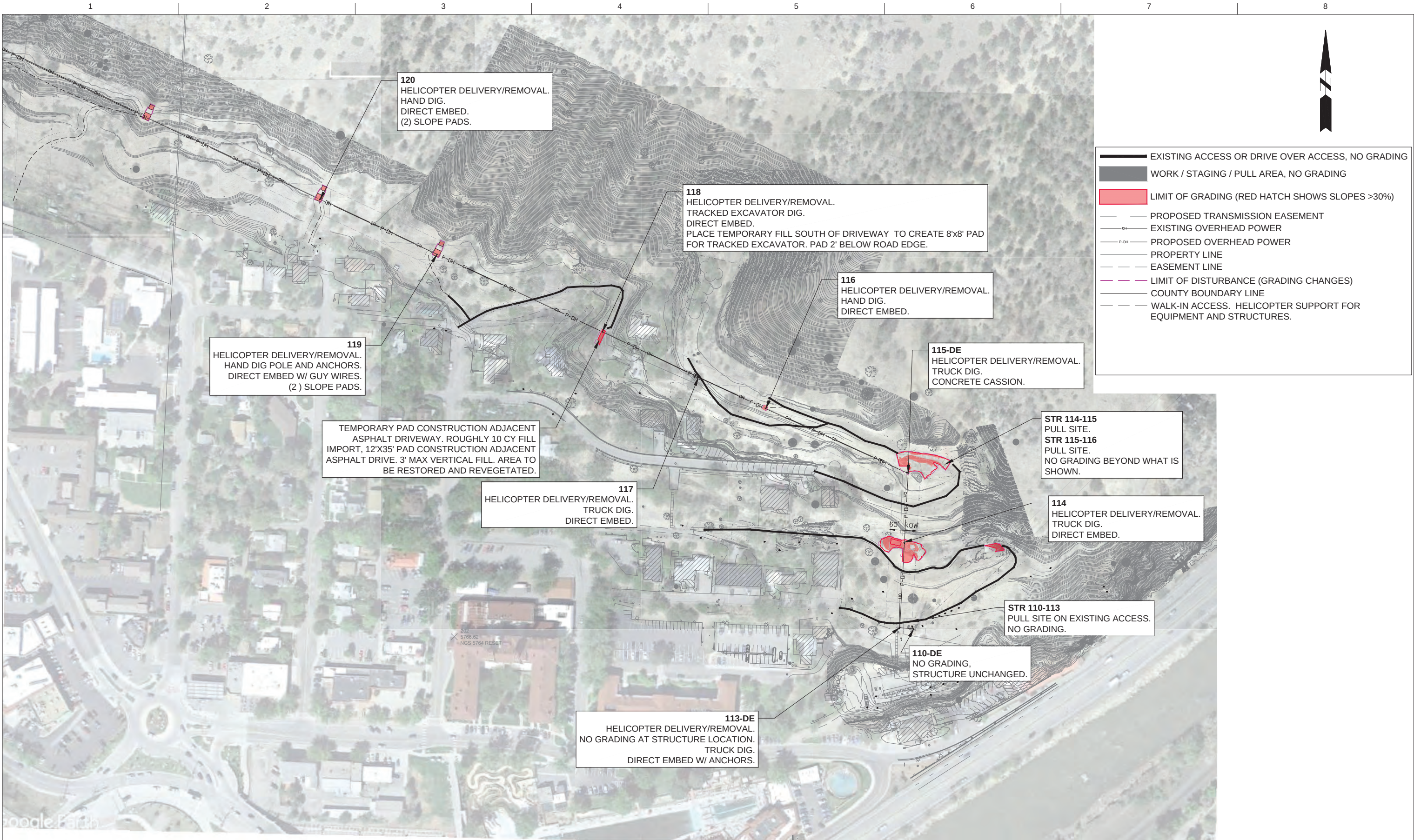
6584 GLENWOOD - MITCHELL CREEK
TRANSMISSION LINE REPLACEMENT
GLENWOOD SPRINGS, CO



GENERAL NOTES

FILENAME	G0_COVER_SHEET.DWG
SCALE	N/A

SHEET
GO2



6/28/23	SITE PLAN	
ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	BRIAN BROWN
PROJECT NUMBER	10263652

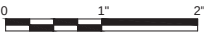


6584 GLENWOOD - MITCHELL CREEK
TRANSMISSION LINE REPLACEMENT
GLENWOOD SPRINGS, CO

GRADING/ACCESS PLAN



0 50 100 200



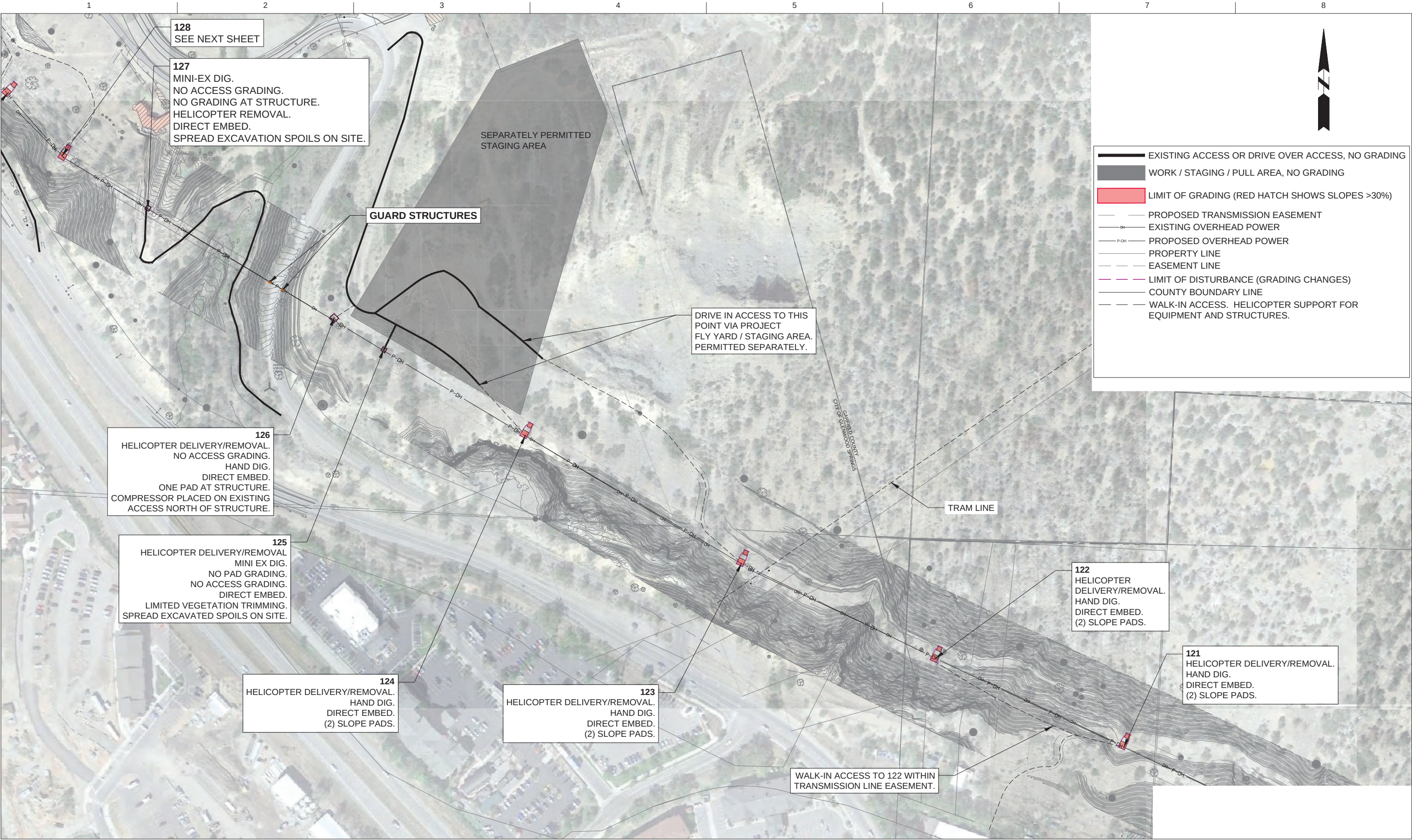
0 1" 2"

FILENAME CGS01-CGS07.DWG

SCALE 1"=100'

SHEET

CGS01



6/28/23	SITE PLAN	
ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	BRIAN BROWN
PROJECT NUMBER	10263652

6584 GLENWOOD - MITCHELL CREEK
TRANSMISSION LINE REPLACEMENT
GLENWOOD SPRINGS, CO

GRADING/ACCESS PLAN

0 50 100 200

0 1" 2"

FILENAME

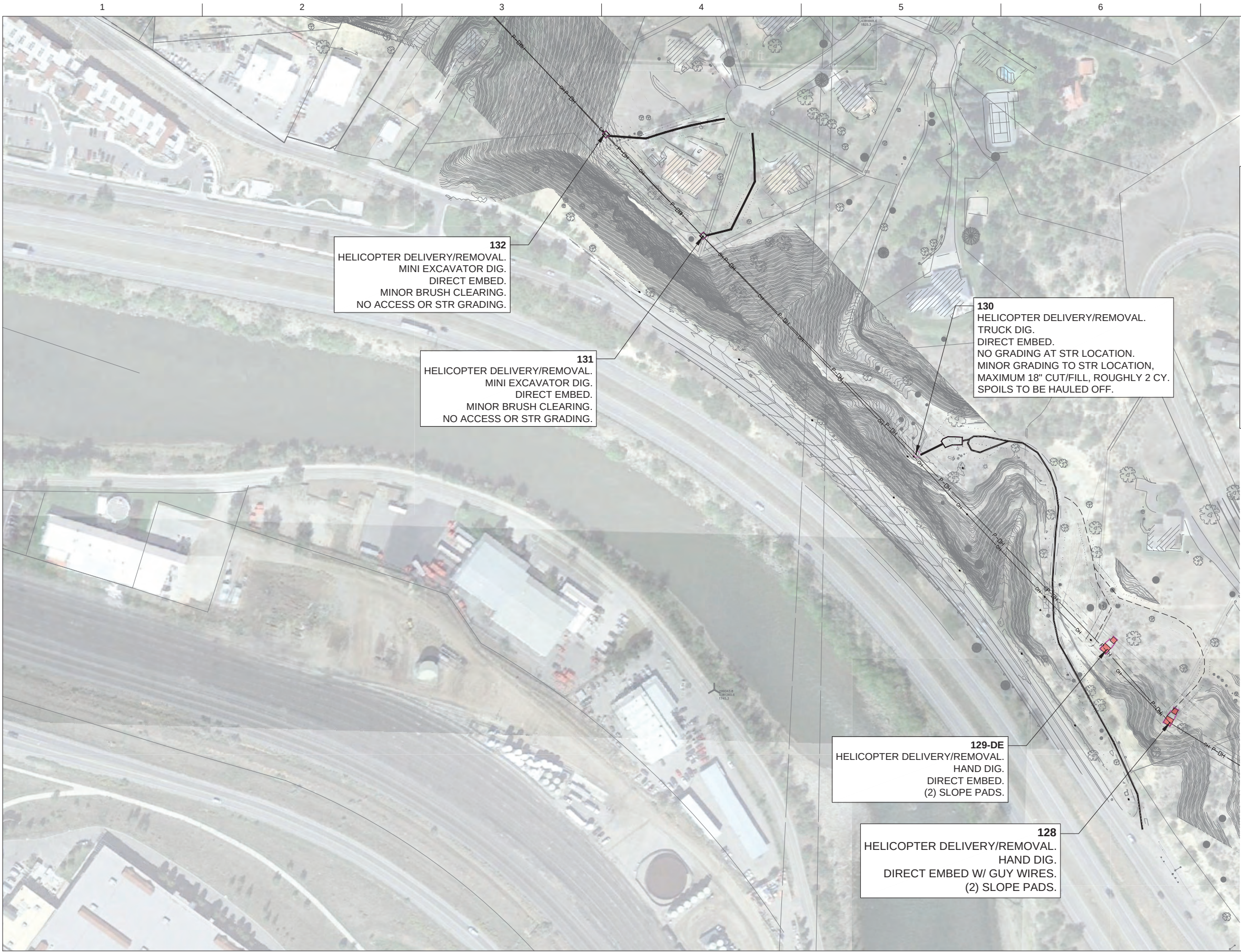
CGS01-CGS07.DWG

SCALE

1"=100'

SHEET

CGS02



- EXISTING ACCESS OR DRIVE OVER ACCESS, NO GRADING
- WORK / STAGING / PULL AREA, NO GRADING
- LIMIT OF GRADING (RED HATCH SHOWS SLOPES >30%)
- PROPOSED TRANSMISSION EASEMENT
- EXISTING OVERHEAD POWER
- PROPOSED OVERHEAD POWER
- PROPERTY LINE
- EASEMENT LINE
- LIMIT OF DISTURBANCE (GRADING CHANGES)
- COUNTY BOUNDARY LINE
- WALK-IN ACCESS. HELICOPTER SUPPORT FOR EQUIPMENT AND STRUCTURES.

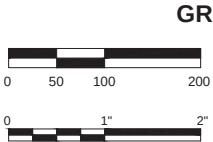


6/28/23	SITE PLAN	
ISSUE	DATE	DESCRIPTION

PROJECT MANAGER BRIAN BROWN

PROJECT NUMBER	10263652

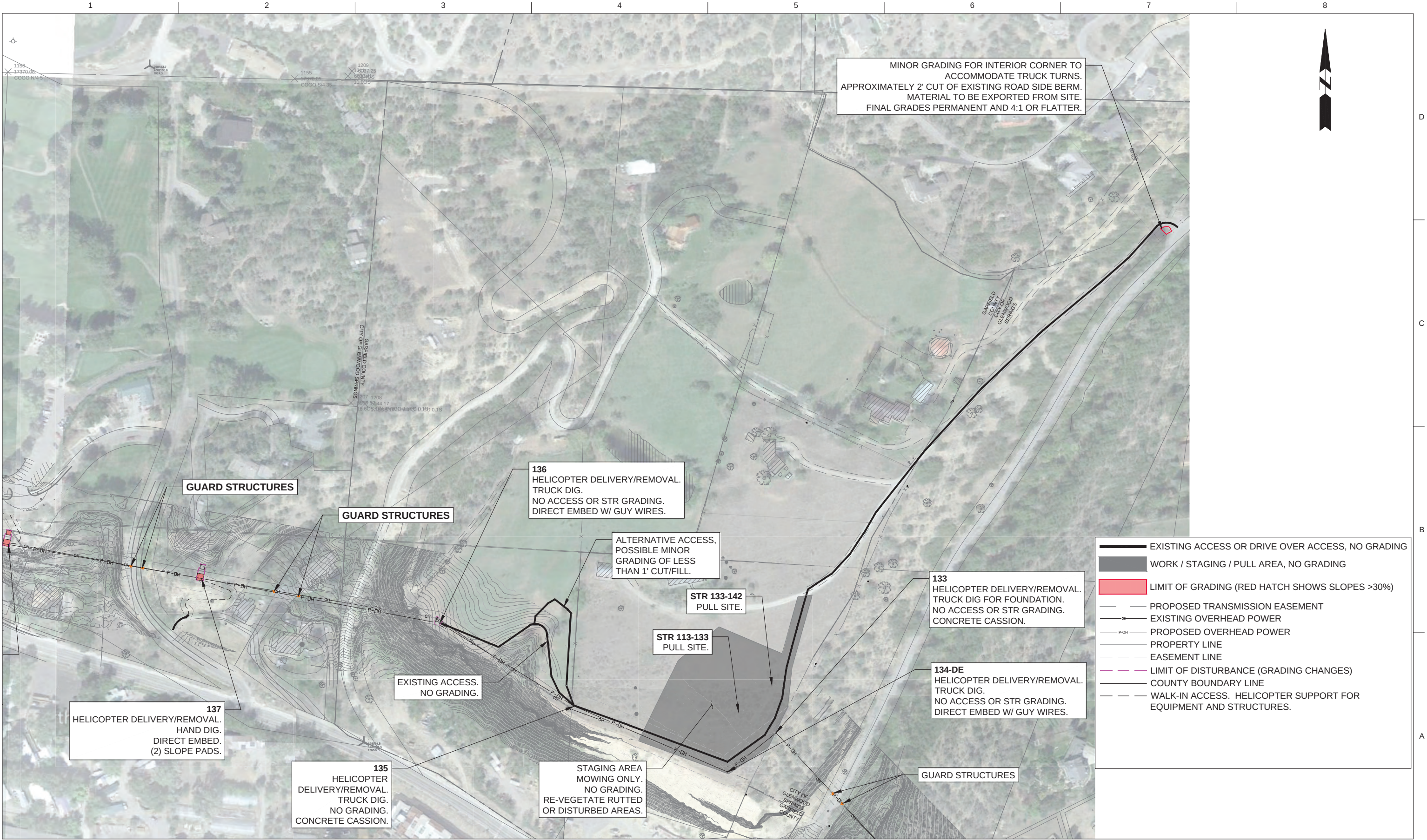
Xcel Energy
6584 GLENWOOD - MITCHELL CREEK
TRANSMISSION LINE REPLACEMENT
GLENWOOD SPRINGS, CO



GRADING/ACCESS PLAN

FILENAME CGS01-CGS07.DWG
SCALE 1"=100'

SHEET
CGS03



6/28/23	SITE PLAN	
ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	BRIAN BROWN
PROJECT NUMBER	10263652

Xcel Energy

**6584 GLENWOOD - MITCHELL CREEK
TRANSMISSION LINE REPLACEMENT
GLENWOOD SPRINGS, CO**

GRADING/ACCESS PLAN

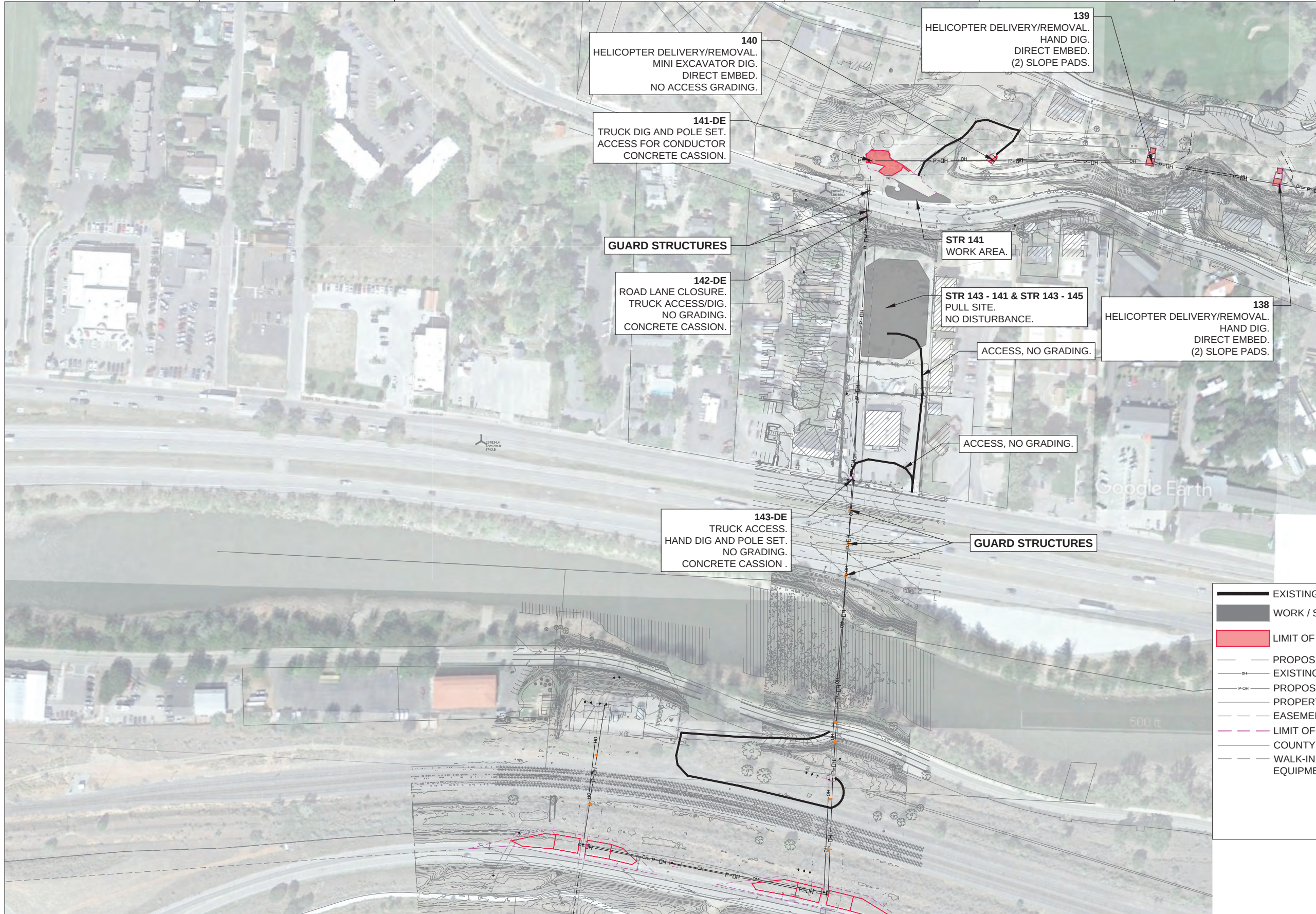
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0 1" 2"

FILENAME CGS01-CGS07.DWG

SCALE 1"=100'

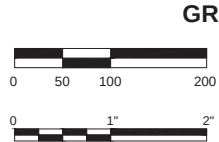
SHEET **CGS04**



6/28/23	SITE PLAN	
ISSUE	DATE	DESCRIPTION

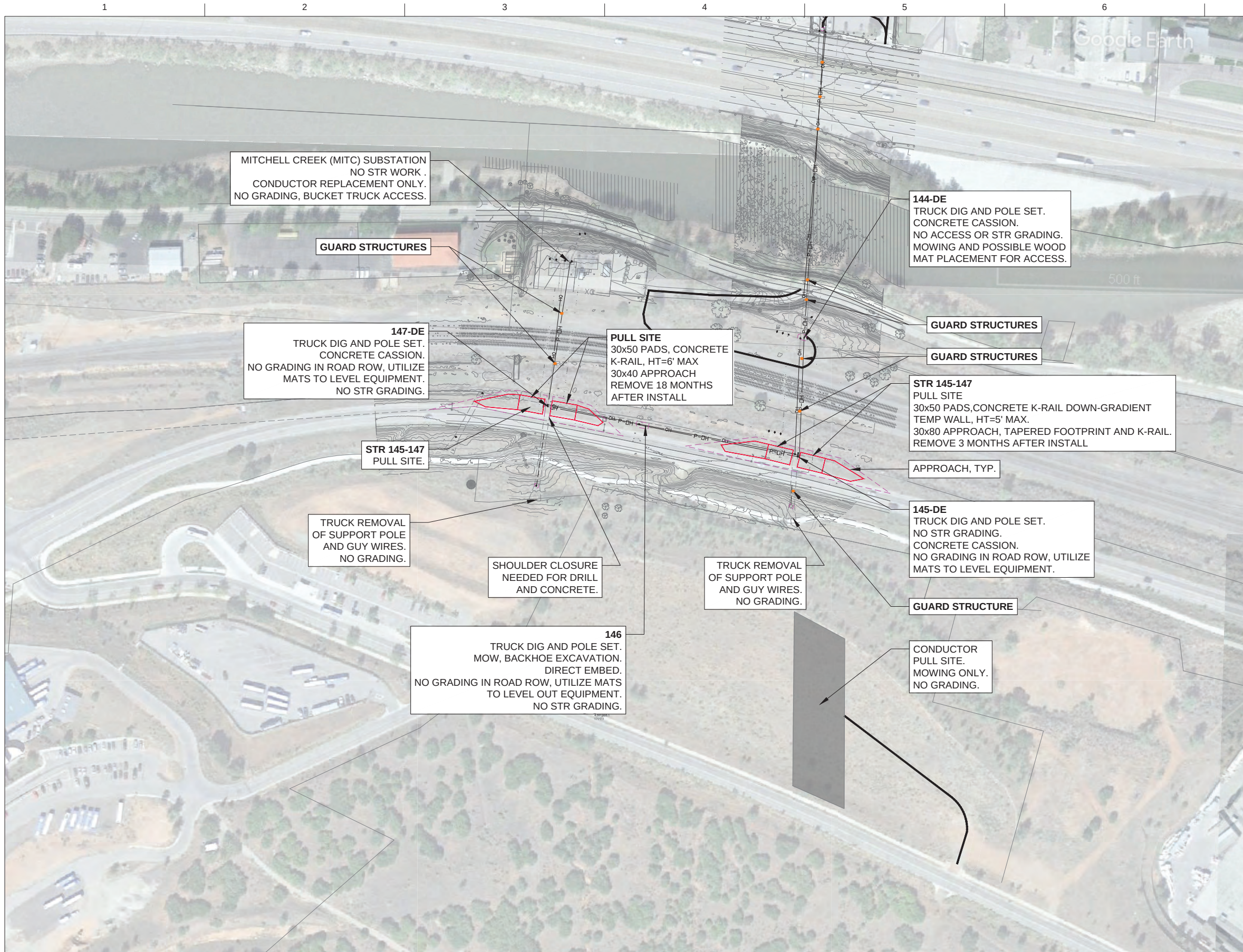
PROJECT MANAGER	BRIAN BROWN
PROJECT NUMBER	10263652

Xcel Energy
6584 GLENWOOD - MITCHELL CREEK
TRANSMISSION LINE REPLACEMENT
GLENWOOD SPRINGS, CO



GRADING/ACCESS PLAN
FILENAME CGS01-CGS07.DWG
SCALE 1"=100'

SHEET
CGS05



- EXISTING ACCESS OR DRIVE OVER ACCESS, NO GRADING
- WORK / STAGING / PULL AREA, NO GRADING
- LIMIT OF GRADING (RED HATCH SHOWS SLOPES >30%)
- PROPOSED TRANSMISSION EASEMENT
- EXISTING OVERHEAD POWER
- PROPOSED OVERHEAD POWER
- PROPERTY LINE
- EASEMENT LINE
- LIMIT OF DISTURBANCE (GRADING CHANGES)
- COUNTY BOUNDARY LINE
- WALK-IN ACCESS. HELICOPTER SUPPORT FOR EQUIPMENT AND STRUCTURES.



6/28/23	SITE PLAN	
ISSUE	DATE	DESCRIPTION

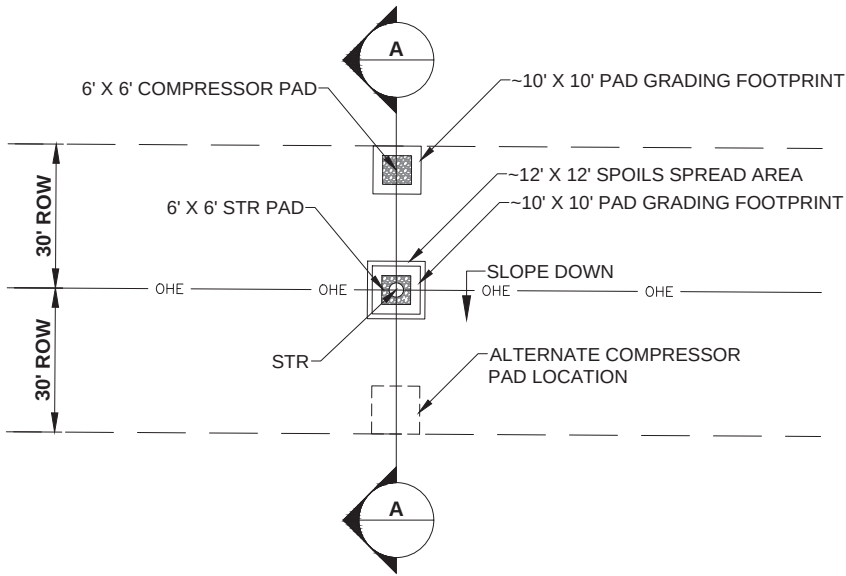
PROJECT MANAGER	BRIAN BROWN
PROJECT NUMBER	10263652

Xcel Energy
6584 GLENWOOD - MITCHELL CREEK
TRANSMISSION LINE REPLACEMENT
GLENWOOD SPRINGS, CO

GRADING/ACCESS PLAN	
0 50 100 200	
0 1" 2"	
FILENAME	CGS01-CGS07.DWG
SCALE	1"=100'
SHEET	CGS06



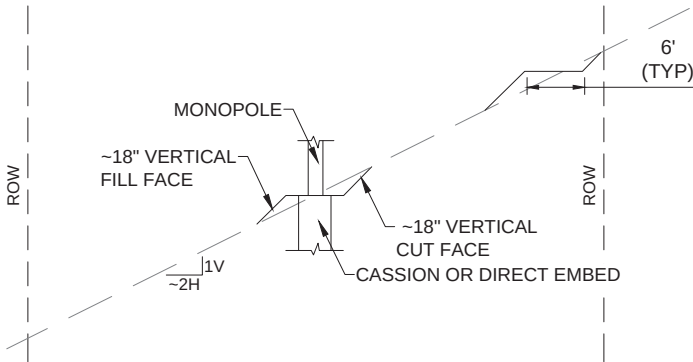
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- WORK / STAGING / PULL AREA, NO GRADING
- LIMIT OF GRADING (RED HATCH SHOWS SLOPES >30%)
- PROPOSED TRANSMISSION EASEMENT
- EXISTING OVERHEAD POWER
- PROPOSED OVERHEAD POWER
- PROPERTY LINE
- EASEMENT LINE
- LIMIT OF DISTURBANCE (GRADING CHANGES)
- COUNTY BOUNDARY LINE
- WALK-IN ACCESS. HELICOPTER SUPPORT FOR EQUIPMENT AND STRUCTURES.



NOTES:

- COMPRESSOR PAD TO BE BUILT ON UPHILL SIDE OF LINE UNLESS CONDITIONS REQUIRE PAD TO BE ON DOWNHILL SIDE.
- LEAVE PADS IN PLACE UNLESS OTHERWISE SPECIFIED. SPREAD STR SPOILS MATERIALS OVER STR PADS AT FINISH.

1 SLOPE PAD GRADING (PLAN)
Scale: 1" = 20'



NOTES:

- 2H:1V EXISTING SLOPE SHOWN FOR SCHEMATIC PURPOSES ONLY, ACTUAL GRADE VARIES.
- ON 2H:1V SLOPE, PAD CUT/FILL SLOPES TO BE 1H:1V TO CATCH GRADE.
- PERMANENT GRADING UNLESS OTHERWISE SPECIFIED.
- ~3 CY POLE FOUNDATION EXCAVATION SPOILS TO BE SPREAD WILL REQUIRE ~6" DEPTH ACROSS 12'X12' SPREAD AREA ON SITE AROUND STRUCTURE, HENCE POLE DISTURBANCE AREA IS LARGER.

2 SECTION A - A
Scale: NOT TO SCALE



6/28/23 SITE PLAN		
ISSUE	DATE	DESCRIPTION

PROJECT MANAGER BRIAN BROWN

PROJECT NUMBER	10263652



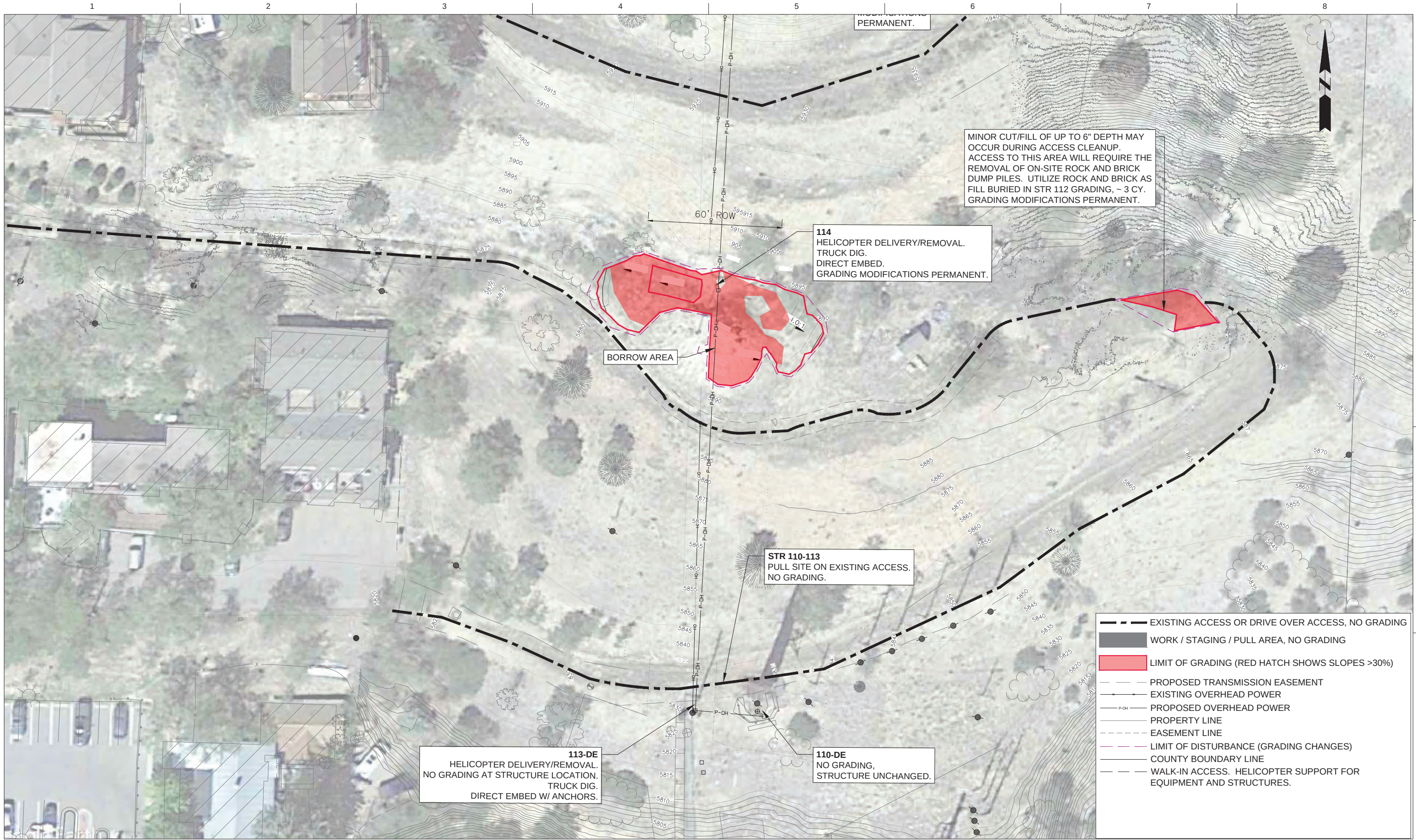
6584 GLENWOOD - MITCHELL CREEK
TRANSMISSION LINE REPLACEMENT
GLENWOOD SPRINGS, CO

GRADING/ACCESS PLAN



FILENAME CGS08-CGS11.DWG
SCALE 1"=20'

SHEET
CGS07



6/28/23	SITE PLAN	
ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	BRIAN BROWN
PROJECT NUMBER	10263652



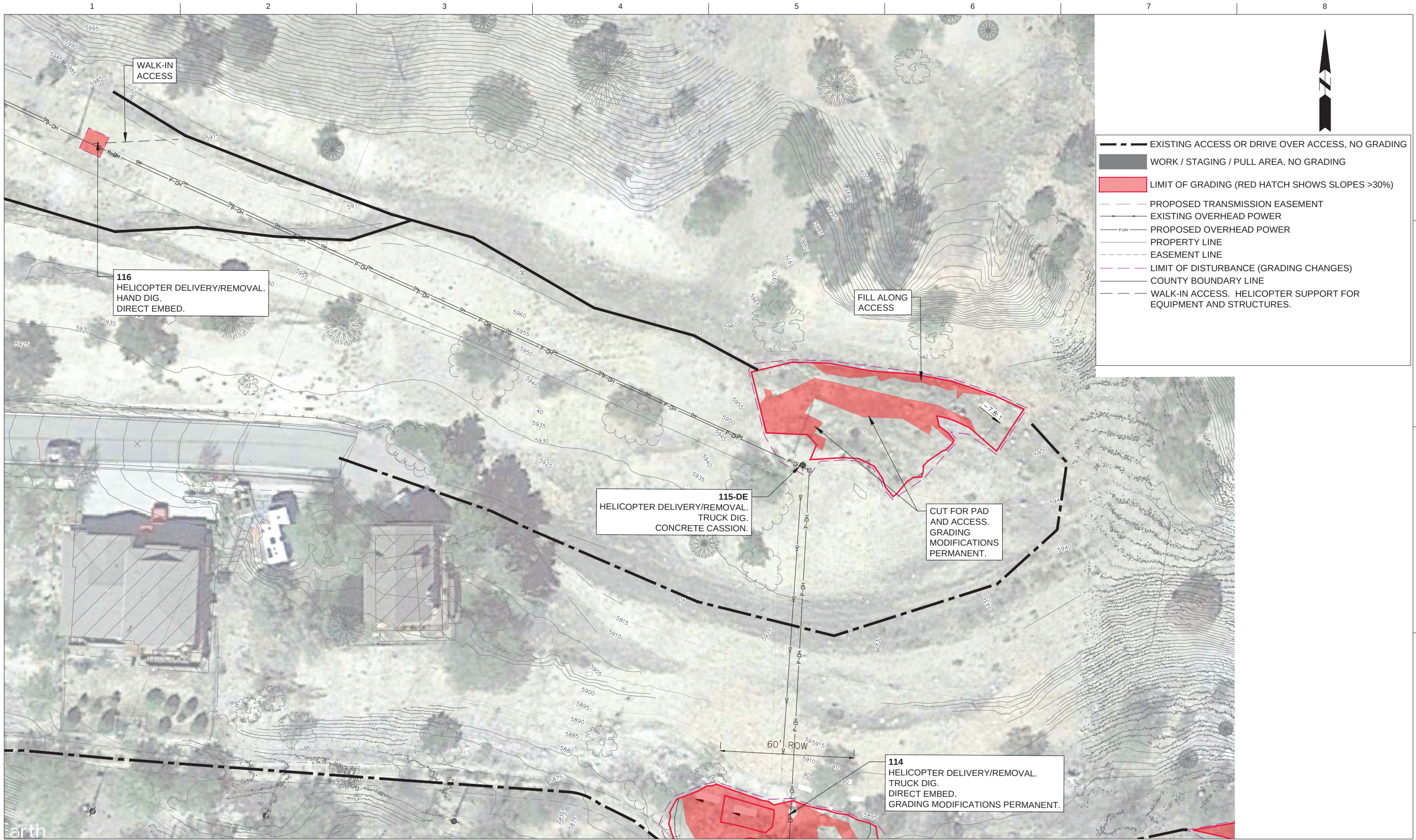
6584 GLENWOOD - MITCHELL CREEK
TRANSMISSION LINE REPLACEMENT
GLENWOOD SPRINGS, CO

GRADING ACCESS ENLARGEMENT



FILENAME CGS08-CGS11.DWG
SCALE 1"=20'

SHEET
CGS08



6/28/23	SITE PLAN	
ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	BRIAN BROWN
PROJECT NUMBER	10263652



**6584 GLENWOOD - MITCHELL CREEK
TRANSMISSION LINE REPLACEMENT
GLENWOOD SPRINGS, CO**

GRADING ACCESS ENLARGEMENT



FILENAME | CGS08-CGS11.DWG
SCALE | 1"=20'

SHEET
CGS09



6/28/23	SITE PLAN	
ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	BRIAN BROWN
PROJECT NUMBER	10263652



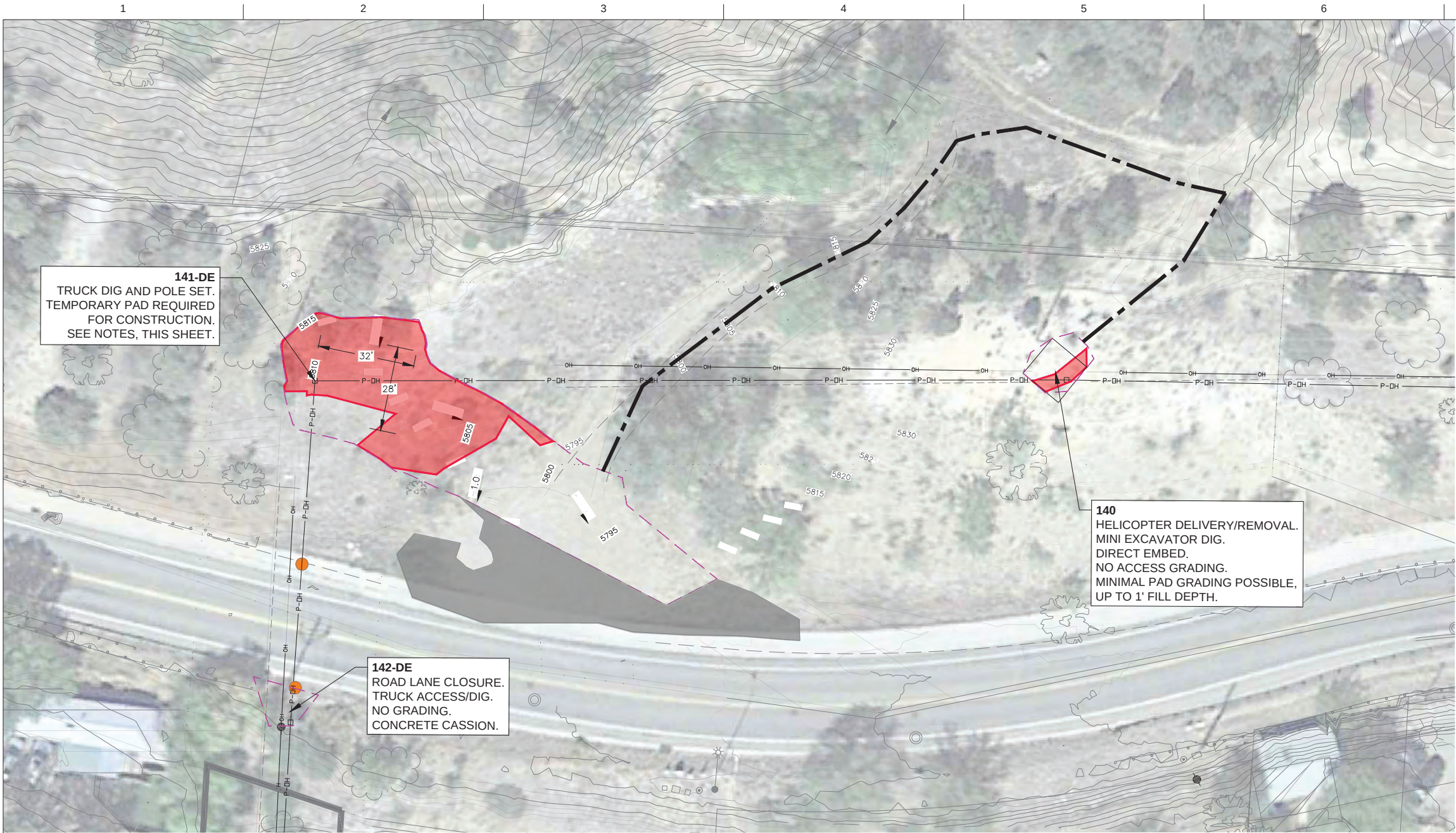
6584 GLENWOOD - MITCHELL CREEK
TRANSMISSION LINE REPLACEMENT
GLENWOOD SPRINGS, CO

GRADING ACCESS ENLARGEMENT



FILENAME	CGS08-CGS11.DWG
SCALE	1"=20'

SHEET
CGS10



- EXISTING ACCESS OR DRIVE OVER ACCESS, NO GRADING
- WORK / STAGING / PULL AREA, NO GRADING
- LIMIT OF GRADING (RED HATCH SHOWS SLOPES >30%)
- PROPOSED TRANSMISSION EASEMENT
- EXISTING OVERHEAD POWER
- P-OH --- PROPOSED OVERHEAD POWER
- PROPERTY LINE
- EASEMENT LINE
- LIMIT OF DISTURBANCE (GRADING CHANGES)
- COUNTY BOUNDARY LINE
- WALK-IN ACCESS. HELICOPTER SUPPORT FOR EQUIPMENT AND STRUCTURES.

- NOTES:
GRADING FOR CONSTRUCTION ACCESS TO POLE 141 IS TEMPORARY AND AS FOLLOWS:
- REMOVE TREES, BRUSH AND ROOT BALLS,
 - STRIP AND STOCKPILE TOPSOIL,
 - CUT AND FILL TO MEET GRADES SHOWN (IMPORT RECOMMENDED TO MINIMIZE CUT OF HILLSIDE),
 - PERFORM POLE CONSTRUCTION AND EXISTING POLE REMOVAL,
 - REMOVE IMPORTED MATERIAL AND RESTORE PRE-CONSTRUCTION GRADES,
 - COVER DISTURBED AREA WITH STOCKPILED TOPSOIL,
 - SEED AND MULCH AREA (SPECIFICS OF REVEGETATION TO BE PER EROSION CONTROL PLAN).



6/28/23	SITE PLAN	
ISSUE	DATE	DESCRIPTION

PROJECT MANAGER BRIAN BROWN

PROJECT NUMBER	10263652



6584 GLENWOOD - MITCHELL CREEK
TRANSMISSION LINE REPLACEMENT
GLENWOOD SPRINGS, CO

GRADING ACCESS ENLARGEMENT



FILENAME CGS08-CGS11.DWG
SCALE 1"=20'

SHEET
CGS11

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Appendix D: Vegetation Management Plans

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Appendix D-1: Revegetation Plan

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Memo

Date: Tuesday, July 25, 2023

Project: 6584 Glenwood Springs Substation to Mitchell Creek Substation Electric Transmission Line Rebuild

To: City of Glenwood Springs & Garfield County, Colorado

From: Braileigh Jay – Xcel Energy, Brian Brown – HDR Engineering

Subject: Revegetation Plan

Public Service Company of Colorado, a Colorado corporation conducting business as Xcel Energy, must replace the existing transmission line between the Glenwood Springs to Mitchell Creek Substations. This line crosses land within the City of Glenwood Springs (City) and in unincorporated Garfield County (County). The new structures will be within the existing transmission easement and accessed via existing private or public roads, existing and new access routes, by walk-in, or by helicopter. Temporary and permanent grading disturbance has been minimized due to a variety of reasons including the challenges of reestablishing revegetation in disturbed areas. Xcel Energy has chosen to call this a Revegetation Plan as opposed to a Landscaping Plan as the intent is to restore surface native type ground cover without the larger planting and irrigation effort often associated with a Landscaping Plan.

While there are multiple construction types for this project, i.e. temporary pad grading, temporary access grading, structure base excavation, etc., they are all fairly similar. Below is the general sequential approach to minimize disturbance and promote revegetation across the project. This will have to be slightly customized to each construction type and site conditions.

1. Prior to the start of construction, a surveyor will stake pole locations, off-sets, line easement limits, access routes, temporary construction areas, and other locations of importance where field delineation is beneficial.
2. Appropriate Xcel Energy staff, line construction contractor, foundation contractor, earthwork contractor, and erosion control contractor will meet on-site to review the delineated construction impact limits.
3. Flagging or paint used to delineate where perimeter erosion control measures should be placed based on disturbance limits defined by Xcel Energy construction team (item 2 above).
4. Xcel Energy's erosion control plan developer or erosion control install contractor will collect multiple representative topsoil soil samples for analysis along the transmission line. This analysis will focus on the potential for possible soil amendments (primarily nitrogen, phosphorus, and potassium) during seeding. 3 – 6 samples are expected based on the varying soil conditions along the line.
5. Erosion control contractor team to install perimeter erosion control measures, typically construction fence, boundary fence, sediment control logs, rock logs, and vehicle tracking control per the requirements identified in the State Stormwater Management Plan (SWMP) and City and County Grading permits.

6. Perform pre-construction meeting with City and County assuming that inspection and sign-off on erosion control measures is a condition of both jurisdiction's Grading Permits.
7. Only as necessary for project, trim and remove vegetation for off-site disposal that will directly impact site grading or access. Xcel Energy to utilize trimming as much as practicable to keep root structure in place.
8. In areas where grading (temporary or permanent) is required, strip topsoil (assume top 4 inches of soil) for reuse on site. Topsoil to be segregated from other material. Topsoil to be placed along access or in other areas adjacent grading. Topsoil may be transported from immediate work area due to space constraints. Topsoil that is stockpiled for more than 14 days will be seeded for temporary stabilization. Topsoil stockpiles that are to remain dormant for more than 14 days are to have side slopes no steeper than 1H:1V.
9. Topsoil stockpiles may be placed on undisturbed adjacent ground. In this case, Xcel Energy will place a separation fabric, i.e. Mirafi 140N or like, to provide a physical indicator as to where the stockpile ends and native ground begins. Xcel Energy has had success with this approach as it reduces unwanted disturbance of native ground and allows an undisturbed but lightly 'compressed' topsoil layer to bounce back once topsoil and separation fabric is removed.
10. Once permanent cut/fill slopes are graded (primarily compressor pads and structure pads in helicopter delivery locations), they will be covered with topsoil within 14 days and seeded and mulched within another 14 days. This will allow permanent cut/fill face revegetation to commence as soon as possible. Work areas where active construction is anticipated, i.e. flat pad work area is not to be topsoil covered until construction work has ceased. Once construction of permanent pads has ceased, topsoil cover is to be completed within 14 days and seeding and mulching to follow within another 14 days.
11. Once temporary cut/fill slopes are graded, they will be covered with a cover crop within 14 days. This cover crop is to be maintained until work has ceased and permanent grading is restored. Restoration from temporary construction impacts are to include replacement of topsoil, seeding, and mulching.
12. Subgrade excavation material, from grading or structure excavation, will be spread on the access road, exported from the site for off-site disposal, or stockpiled in immediate or near-by work area for future use, particularly in areas with temporary grading impacts that are to have grades restored. Like the topsoil above, subsoil that is stockpiled on undisturbed ground is to have a separation fabric below the stockpile to clearly distinguish between native grade and stockpile material. This will minimize disturbance of the native grade and allow this compressed native grade to bounce back once stockpile and separation fabric is removed. Note: subgrade material is not to be spread on-site in a manner that increases the area of disturbance, i.e. broadcast or pushed outside grading disturbance limit required for drive surface or equipment pad needs.
13. Once construction is completed at a site for permanent grading impacts, i.e. conductor pull/tensioning pads and access roads, the site soil is to be ripped to loosen the subgrade due to soil compaction during construction. Following decompaction, topsoil is to be placed at a depth of 4 inches in a loose manner ready to accept seed. Unlike most topsoil requirements, rock of various gravel sizes less than 6 inches diameter is expected in the topsoil layer which is indicative of native topsoil in this area.
14. Once construction is completed at a site for temporary grading impacts, i.e. mini-excavator pads, the site rough grades are to be reestablished and the subgrade soil is to be bucket compacted to a 'firm' condition. Following compaction, topsoil is to be placed at a depth of 4 inches in a smooth but loose manner ready to accept seed. Unlike most topsoil requirements, rock of various gravel sizes less than 6 inches diameter is expected in the topsoil layer and is indicative of native topsoil in this area.

15. Soil amendments are to be added per soil analytic recommendations via mechanical broadcast or hydraulic application. City and County approved seed mix is to be spread at appropriate rates given application type, hydraulic, drill, or hand broadcast. The amendment and seed application will vary substantially based on access type with helicopter structures having a different treatment process than areas readily accessible to larger truck traffic, i.e. access for a hydraulic sprayer. In cases of hydraulic application, the seed mix may be applied with the liquid amendment or hand broadcast but in no case is seed to be mixed and applied with mulch.
16. Final erosion control cover for seeded areas will vary based on access to disturbance areas. Helicopter access areas will not have mulch applied as the impact areas are a small footprint, hydraulic and crimp mulching is not available to these sites, and broadcast straw mulch is generally not effective as the product is blown away. Truck access areas will have either straw crimp mulch (on grades less than 10 percent and low rock content soil) or a high quality hydraulically applied mulch, i.e. Flexterra HP-FGM or like, on grades exceeding 10 percent. Xcel Energy generally does not support using erosion control blankets on this project due to concerns about reduced blanket to soil contact and synthetic mesh blankets having a high synthetic content which leads to a wildlife entrapment hazard.
17. Xcel Energy will change erosion control inspection schedule from weekly to monthly inspections once initial stabilization measures (seeding and mulching) have been completed. If there are areas of concern identified during the monthly inspection that need to be addressed (i.e. erosion or lack of revegetation growth), the revegetation contractor will return to the site to address identified issues.
18. Per the required State (SWMP) and local (Grading Permits), Xcel energy will continue to maintain structural erosion control measures across the project until no longer necessary. These will primarily include down-gradient sediment control logs but may include other control measures. The sediment control logs will be fully biodegradable to reduce wildlife entrapment hazards. These measures will be removed when no longer required and seed will be hand broadcast in areas where removal has exposed or disturbed less vegetated soil.
19. Once site has met plant density cover requirements, Xcel Energy will request a post-construction site visit with the City and/or County for jurisdiction closure concurrence.

NOTES:

- Xcel Energy's ability to stabilize disturbed areas with vegetation is dependent on many factors within Xcel Energy control. Unfortunately, favorable moisture conditions for germination and continued growth are beyond Xcel Energy control and a key determinate for revegetation. Xcel Energy anticipates adequate revegetation will take multiple years. Xcel Energy frequently returns to sites multiple times that are in the vegetation growth phase to address areas of erosion and reseed and/or mulch as necessary to promote vegetation stabilization.
- Xcel Energy hires a separate third-party company to perform the erosion control installation, maintenance, and revegetation as well as another third-party company to perform regular erosion control inspections. These companies have long standing relationships with Xcel Energy. With this approach, Xcel Energy has trained the installation company and inspection company to meet Xcel Energy's standards and to stay in compliance with state and local permit conditions which improve the restoration trajectory. Xcel Energy's practice is to continue inspection and maintenance, both performed by third party contractors, until site revegetation is established. Access for the post construction inspection and maintenance will be over prescriptive rights, land owner allowed access, temporary construction easements, and the transmission line easement.

- See Grading Plan submittal for location and discussion of temporary or permanent grading impact areas.
- Walk in only access paths are assumed to not create a disturbance that requires revegetation.
- The staging area north of Structure 125 may not be restored with revegetation depending on landowner agreements. This gravel pit area may be stabilized with native or imported aggregate surfacing.

Seed Mix:

The following seed mix was provided by Granite Seed Company specific to Glenwood Springs with the intention of including grasses, forbs, and pollinator seeds to revegetate project disturbed areas. The seed mix can be adjusted to meet local jurisdiction directives and soil conditions once determined.

Semi-Desert Loam Revegetation Seed Mixture*

Species	Pounds per Acre**	Number of Seeds***
Western wheatgrass (<i>Pascopyrum smithii</i>)	3.00	8
Indian ricegrass (<i>Achnatherum hymenoides</i>)	2.00	6
Prairie junegrass (<i>Koeleria macrantha</i>)	0.50	26
Sandberg bluegrass (<i>Poa secunda</i> ssp. <i>Sandbergii</i>)	1.00	24
Galleta grass (<i>Pleuraphis jamesii</i>)	2.00	7
Bluebunch wheatgrass (<i>Pseudoroegneria spicata</i> ssp. <i>Spicata</i>)	2.00	6
Bottlebrush squirreltail (<i>Elymus elymoides</i>)	2.00	9
Total	12.50	85

*The seed mix shown is based on existing native grasses that occur in this region. Seed mix may be obtained from other suppliers.

** Pure Live Seed

***Per Square Foot

Appendix D-2: Noxious Weed Management Plan

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Noxious Weed Management Plan

6584 GLENWOOD SPRINGS TO MITCHELL CREEK TRANSMISSION LINE REBUILD

City of Glenwood Springs and Garfield County, Colorado



July 25, 2023

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Prepared for:



Xcel Energy
PO BOX 840
Denver, Colorado 80201
(720) 963-3684

Prepared by:



HDR, Inc
1670 Broadway, Suite 3400
Denver, CO 80202

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Section 1. Introduction

The Public Service Company of Colorado (PSCo), a Colorado corporation conducting business as Xcel Energy (Xcel), is proposing to rebuild a 2-mile segment of a 69-kilovolt (kV) overhead transmission line from the Glenwood Springs Substation to the Mitchell Creek Substation within the City of Glenwood Springs and unincorporated Garfield County, Colorado.

On behalf of Xcel, HDR, Inc (HDR) conducted a noxious weed survey for the proposed 6584 Glenwood Springs to Mitchell Creek Transmission Line Rebuild project (Project) in October 2021. This Noxious Weed Management Plan (Plan) has been prepared to support the installation of prescribed seed mixes, management of noxious weeds and to comply with federal, state and local requirements regarding noxious weeds in the Project area.

1.1 Project Description

Xcel is proposing to rebuild a 2-mile segment of a 69-kilovolt (kV) overhead transmission line (**Appendix A – Overview Figure**). The line runs from the Glenwood Springs Substation to the Mitchell Creek Substation within the City of Glenwood Springs and a small portion of the line is in unincorporated Garfield County, Colorado. The project will utilize a staging area on the Beckley property (east of N Traver Trail) and is planning on a staging area west of Highlands Drive immediately north and adjacent the transmission line for material storage, assembly, and as a helicopter landing and material pickup zones.

The Project is located within Sections 04, 05, and 09 of Township (T) 6 South (S), Range (R) 69 West (W). Construction is anticipated to begin in Summer of 2022 and last the duration of 2022 for approximately one year.

Section 2. Noxious Weed Management Requirements

When present in large numbers, noxious plant species have had considerable impacts to the quality and integrity of natural ecosystems. Noxious weed species can alter fire ecology, successional ecosystem processes, and ecosystem function of the ecosystems they invade. Some species have had such serious economic and biological impacts that their control and management is mandated under Colorado State law (i.e., List A species).

Because of the adverse environmental effects of noxious weeds, federal and state governments have issued various orders and regulations regarding noxious weeds. The following are some of the regulations guiding noxious weed management.

2.1 Presidential Executive Order 13112—Invasive Species

Executive Order 13112, Invasive Species, was issued on February 3, 1999, to prevent the introduction of invasive species; provide for their control; and minimize the economic, ecological, and human health impacts that result from invasive species. This order directs federal agencies to prevent the introduction of invasive species, control and monitor invasive species, and restore native species and habitats that have been invaded (Federal Register 1999).

2.2 Colorado Noxious Weed Act

As defined by the Colorado Department of Agriculture (CDOA), noxious weeds are plants that reduce agricultural productivity, lower real estate values, endanger human health and well-being, and damage scenic values (CDOA 2021a). The Colorado Noxious Weed Act §§ 35-5.5-101 through 119, C.R.S. as amended, states that an organized and coordinated effort must be made to stop the spread of noxious weeds.

Rules pertaining to administration of the Act include a noxious weed list that designates and classifies noxious weed species into categories for immediate eradication (CDOA 2021a):

- **List A** contains 25 species of noxious weeds targeted for eradication. If individuals or populations of A List species are found, the local governing body must provide the State Weed Coordinator with mapping that includes information on location and density of the infestation.
- **List B** contains 38 species that are targeted for eradication, containment, or suppression based upon a given local governing body's management plan.
- **List C** contains 16 species for which the Commissioner of Agriculture, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, will develop and implement into state noxious weed management plans designed to support the efforts of local governing bodies to facilitate more effective integrated weed management on private and public lands.

In addition to the three lists, the state maintains a noxious weed species "Watch List". It contains 19 species that CDOA has determined pose a potential threat to the agricultural productivity and environmental values of the lands of Colorado. It is for advisory and education purposes only and is intended to encourage the collection of information needed to determine if the species should be listed as a noxious weed.

2.3 Garfield County Noxious Weed Management

Garfield County adopted a Noxious Weed Management Plan in 2016 to limit the impact of noxious weeds by providing guidelines for managing designated noxious weeds which represent a threat to the continued economic, environmental, and agricultural value of lands in Garfield County (Garfield County 2016). Of the 79 plant species considered noxious by the State of Colorado, Garfield County is home to 40 species on this list. The plan provides for the implementation of the Colorado Noxious Weed Act by detailing integrated management options for designated noxious weeds. Options include education, preventive measures, good stewardship, and control techniques.

The intent of the plan is to incorporate the above-mentioned options that are the least environmentally damaging and are practical, timely and economically feasible. It is the responsibility of all landowners to use integrated methods to manage noxious weeds, and the responsibility of local governing bodies to ensure that these plants are managed on public and private lands. Garfield County follows the dictates of the CDOAs rules as to which species on the

A and B lists must be eradicated, contained, or suppressed and manages those species and the species on its own locally designated list in accordance with the Weed Management Plan.

2.4 Substation Noxious Weed Management

Xcel Energy's vegetation management group maintains vegetation at substations and therefore this plan does not include treatment for noxious weeds at the substations (Glenwood Springs and Mitchell Creek substations) in the project area. Management of the noxious weeds at and immediately around the substation will be addressed separately. Xcel maintains a cleared area of 10-feet around the substation fence limiting vertical vegetation for site security purposes.

Section 3. Noxious Weed Survey Methods

On October 11 and 12, 2021, HDR conducted pre-construction noxious weed surveys of the study area to document baseline conditions along the transmission line right-of-way (ROW), staging yards, and access roads. Noxious weed surveys were conducted using pedestrian transects, with a 15-foot separation, covering an area of 30-feet in width along the transmission line ROW.

For the survey, the term “noxious weed” includes species listed as noxious by the Colorado Department of Agriculture (CDOA 2021a). Plant nomenclature for noxious weeds in this report follow the CDOA website.

Before field surveys were conducted, the following data sources were reviewed for information on vegetation patterns, topography, and hydrology in the project vicinity:

- Aerial Imagery—Recent and historic imagery from 1993 through 2019.
- Topographic map – U.S. Geological Survey.
- General ecological description of the project area (USDA 2006).
- National Land Cover Database (NLCD) Land Cover (USGS 2021).
- Colorado Department of Transportation (CDOT) Noxious Weed Map (CDOT 2021).
- Colorado Natural Heritage Program (CNHP) Noxious Weed Inventory, Mapping, and Monitoring (CNHP 2021).
- Colorado Department of Agriculture's (CDOA) noxious weed list (Effective October 2020) (CDOA 2021a).
- CDOA County Weed Programs (CDOA 2021b).

Using ArcMap Field Maps field collection software, noxious weed densities were recorded in four categories: 1-20 individuals, 21-100 individuals, 101-999 individuals, and 1000+ individuals. Following the field survey, the spatial data of noxious weed species and densities were illustrated in ArcGIS 10.7.1 for the study area.

Section 4. Study Area Description

4.1 Location

The approximate 28-acre study area is located within the town of Glenwood Springs with a small portion of the project crossing unincorporated Garfield County, Colorado (**Appendix A**).

The study area includes an approximate 30-foot-wide buffer around the 6584 transmission line, staging yards, and access roads.

The study area is found on the U.S. Geological Survey 7.5-minute quadrangles Glenwood Springs (2019), and has the following decimal degrees coordinates, western terminus: 39.559719, -107.352436; and eastern terminus: 39.550962, -107.321196 (datum is NAD 83). Please refer to **Appendix B** for a photolog of the project study area.

At the time of the field study, Xcel Energy was intending to reroute a small portion of the line to avoid conductor continuing over a residence. After further engineering review and discussion with the landowner, the proposed rebuild will stay in the current alignment. The potential line reroute (which has been abandoned) was between structures 114 – 116. Therefore, this segment of the line will have to be surveyed for the presence of noxious weeds. This survey is planned for the early summer of 2023. The findings of that survey will be added and an addendum to this report and submitted to the County.

4.2 Topography and Hydrology

The study area is located in northwestern Colorado and lies within the Rocky Mountain Range and Forest Region Land Resource Region (USDA 2006) at an elevation of approximately 5,800 feet.

The project study area is generally on steep hillside terrain within a mountain valley near the confluence of the Roaring Fork and Colorado Rivers. The Colorado River enters the county at the eastern end of Glenwood Canyon, about 12 miles east of Glenwood Springs, and flows southwest for about 62 miles before leaving the county between Parachute and DeBeque.

4.3 Land Use

Land uses within and around the study area includes recreation, transportation, residential and commercial uses. Land use in the areas surrounding the project area consists mostly of agricultural and rural residential developments. Interstate (I)-70 and the Town of Glenwood Springs occur immediately south of the project area as well as paved and unpaved county roads. The area north of the project area is primarily undeveloped Bureau of Land Management (BLM) land with some areas of private land immediately north of the transmission line.

4.4 Climate

Annual precipitation in the study area averages 16.4 inches and annual snowfall is 59.3 inches. Glenwood Springs records average annual high temperatures of 62.8 degrees Fahrenheit (F)

and an average low temperature of 31.5 degrees F (Western Regional Climate Center 2021).

4.5 Vegetation and Habitat

The project study area is located within pinyon-juniper habitat that is composed of Utah juniper (*Juniperus osteosperma*) with scattered pinyon pine (*Pinus edulis*) along the slopes and ridgelines. Other species that are present include Gambel oak (*Quercus gambelii*), big sagebrush (*Artemisia tridentata*), rubber rabbitbrush (*Ericameria nauseosa*), mountain mahogany (*Cercocarpus montanus*), saskatoon serviceberry (*Amelanchier alnifolia*) and an understory composed of a variety of grasses such as western wheatgrass (*Pascopyrum smithii*), and needleandthread grass (*Hesperostipa comata*). Please refer to **Appendix C** for a consolidated list of plant species observed during the field visit.

Section 5. Noxious Weed Survey Results

5.1 Noxious Weed Survey Results

Twelve listed noxious weed species and one watch list species were observed in the project study area during the October 2021 survey. One of the twelve noxious weed species documented in the project study area is from List A, six are included on List B, five species are included on List C, and one species is included on the watch list (**Table 1** and **Figures** in **Appendix A**).

The Colorado Department of Agriculture has prepared fact sheets for most State-listed noxious weeds. They feature detailed descriptions and photographs of the plants, as well as integrated management for each species. Noxious weed fact sheets for the 12 documented listed species are found in **Appendix D**.

Garfield County and the City of Glenwood Springs follow the dictates of the State's rules as to which species on the A and B lists must be eradicated, contained or suppressed and manages those species and the species on its own locally designated list in accordance with the Garfield County Noxious Weed Management Plan (Garfield County 2016).

CDOT's Noxious Weed Map details the locations of List A, B, and C noxious weeds as they occur along the ROW (CDOT 2021). At the location where Line 6584 crosses I-70, at Xcel Structure 143, salt cedar (*Tamarix* spp.) was documented by CDOT but was not documented within the project study area during surveys.

Cheatgrass and redstem fillaree were the most common species identified throughout the majority of the study area and in many areas were documented in densities of 100 to 1,000 individuals. Scotch thistle and bindweed were also noted in high densities in the study area. Cheatgrass, redstem fillaree and bindweed are designated by the State of Colorado as a List C species and Scotch thistle is a List B species.

Chinese clematis and common mullein were uncommon and only identified in the far western portion of the study area. Other species such as halogeton, musk thistle, and Russian olive had only one or two occurrences and do not show up as a datapoint on the figures.

Table 1. Colorado State Noxious Weed Species Observed in the Project Study Area

Scientific Name	Common Name	General Habitat	State of CO List	Garfield County List	Observed in the Study Area
<i>Acroptilon repens</i>	Russian knapweed	Open, upland areas	List B	Yes	Yes
<i>Bromus tectorum</i>	Cheatgrass	Open, upland areas	List C	No	Yes
<i>Carduus nutans</i>	Musk thistle	Open, upland areas	List B	Yes	Yes
<i>Clematis orientalis</i>	Chinese clematis	Roadsides, riparian corridors and rocky slopes	List B	Yes	Yes
<i>Convolvulus arvensis</i>	Field bindweed	Open, upland areas	List C	No	Yes
<i>Elaeagnus angustifolia</i>	Russian olive	Open, upland areas Riparian and moist areas	List B	Yes	No
<i>Erodium cicutarium</i>	Redstem filaree	Open, upland areas	List C	No	Yes
<i>Euphorbia myrsinites</i>	Myrtle spurge	Open, upland areas Riparian and moist areas	List A	Yes	Yes
<i>Halogeton glomeratus</i>	Halogeton	Roadsides, trails and overgrazed sites	List C	No	Yes
<i>Linaria dalmatica</i>	Dalmatian toadflax	Open, field, pastures, and roadsides	List B	Yes	Yes
<i>Onopordum acanthium</i>	Scotch thistle	Open, upland areas	List B	Yes	Yes
<i>Ulmus pumila</i>	Siberian elm	Open, upland areas, roadsides, riparian	Watchlist	No	Yes
<i>Verbascum thapsus</i>	Common mullein	Open, upland areas	List C	No	Yes

Sources: CDOA 2021a; Garfield County 2016

Section 6. Noxious Weed Management

Construction activities would expose soils in areas that have been previously disturbed and limited areas that have not been previously disturbed. This disturbance creates a potential for the introduction and spread of noxious weeds in the project area. Noxious weed species that occur in and adjacent to disturbed areas of the project have the potential to spread into areas impacted by placement of new structures, use and construction of access roads for construction equipment and use of staging areas. The goal of this plan is to minimize the spread of noxious weeds due to the proposed project's construction activities. By implementing measures intended to minimize

the spread of noxious weeds during construction and minimizing the establishment of new noxious weed populations post construction, the proposed project should minimize new and help reduce existing noxious weed infestations.

Xcel and its contractors work to minimize the use of chemicals that are harmful to beneficial insects in their vegetation management practices controlling shrubs, trees, and weed species within their rights-of-way and properties. This includes eliminating the use of neonicotinoids, a class of neuro-active insecticides, which have been found harmful to all invertebrate populations including bee populations and other native pollinators (Xcel Energy Undated).

The study area is adjacent rural residential developments with primarily undeveloped BLM land on the north. Due to adjacent roadways, recreational use and residential properties in the adjacent areas, noxious weed species are expected to continue spreading throughout the area.

Future construction and maintenance activities by Xcel and its contractors have the potential to expose soils creating a potential for the introduction and spread of noxious weeds in the project area. This rebuild has one segment of realignment involving 3 new structures to reduce spans over a residential structure. The remaining new structures will be within the existing transmission easement and accessed via existing private or public roads, existing and new access routes, or by helicopter. The grading work will be minimized by limiting the disturbance footprint and focusing on access grading impacts to the uphill side of the access routes. The Beckley Staging Yard will be used for construction activities and is located on an inactive staging area with surface mining activity on the parcel. A Stormwater Management Plan covers construction activities associated with the transmission line rebuild and Beckley Parcel Staging Yard. The potential staging yard near N Traver Trail will also be used for construction activities and is located in an open pasture. Equipment associated with the project activities varies based on the pole type and construction approach. Structures with the smallest impact involve helicopter fly-in of a compressor and crew walk-in. A minor step up in disturbance would involve mini-excavator track-in for structure excavation. The activity with the highest level of disturbance would include access and workspace grading for pick-up trucks, boom trucks, concrete trucks, and trailer puller reels. Truck traffic on the Line 6584 ROW will use the existing private or public roads and improve existing or create new access routes in limited areas. Soil disturbance is minimal to substantial based on the site conditions, pole type, and access needs.

Weed management priorities are based on the threat noxious weed species found in the project area pose to the overall goal of maintaining the health of the ecosystem. Generally, List A species are the highest priority because they are often the most aggressive species with limited distribution. Myrtle spurge is the only species documented that is designated as a "List A" species in the Colorado Noxious Weed Act. It is designated for statewide eradication. List B are next priority species and List C species are generally widespread and are not prioritized.

The best technique for controlling most noxious weeds is an integrated approach of chemical, mechanical, and biological controls. Chemical control involves the application of one or more herbicides at the appropriate time of the year (all herbicides should be applied by a certified applicator according to the manufacturer's directions). Mechanical control usually involves

mowing, hand-pulling, or cutting. Biological control is the use of organisms (usually insects, but also livestock) that are deliberately introduced to an area to control weeds.

Noxious Weed Treatment Measures

As part of the weed management program, the following measures will be implemented to minimize the spread of noxious weeds during the construction activities, as well as during restoration and reclamation efforts until the closure of the Storm Water Management Plan (SWMP).

Xcel's noxious weed management contractor will implement noxious weed control measures in accordance with existing regulations and local requirements.

Post-construction control measures can include one or more of the following methods (that may be implemented during restoration activities):

- Treatment methods will be based on species-specific and area-specific conditions (e.g., proximity to water or riparian areas, agricultural areas, and time of year) with the Garfield County coordinator being notified prior to noxious weed eradication activities. If areas are not seeded until the following spring, because of weather or scheduling constraints, undesirable vegetation will be eradicated before seeding.
- Mechanical methods rely on equipment that can be used to mow or disc weed populations. If such a method is used in areas to be restored, subsequent seeding will be conducted to re-establish a desirable vegetative cover that will stabilize the soils and slow the potential re-invasion of noxious weeds.
- Discing or other mechanical treatments, that would disturb the soil surface within native habitats, will be avoided in favor of an herbicide application, which is an effective means of reducing the size of noxious weed populations as well as preventing the establishment of new colonies.
- Seed selection will be based on site-specific conditions and the appropriate seed mix identified for those conditions, as presented in **Table 3**.
- Herbicide applications will be controlled to minimize the impacts on the surrounding vegetation. In areas of dense infestation, a broader application will be used and a follow-up seeding program will be implemented.

Pre-Construction

Prior to construction and soil disturbances, Xcel's noxious weed contractor shall apply pre-treatment, both chemical and mechanical to List A and List B noxious weeds in the areas of expected disturbance which includes 30 feet around each structure, within expected access road disturbance areas, and any other areas identified in the grading permit as to be disturbed. Chemical and mechanical treatment will be in accordance with the specifics listed in **Table 2** and

until the SWMP is closed.

Post-Construction - Phase 1

At the conclusion of construction (Year 1), disturbed areas will be inspected/surveyed for noxious weeds by a qualified weed specialist. The weed specialist will identify areas where the Control Techniques listed in **Table 2** following measures shall be implemented.

Post-Construction - Phase 2

Following the growing season after construction has been completed (Year 2) and until the project SWMP permit is closed, two noxious weed surveys shall occur yearly:

1. Early season (May-June) for cool-season noxious weeds (e.g., redstem fillaree, cheatgrass, bindweed),
2. Late season (July-August) for the warm-season noxious weeds (e.g., thistles and knapweeds). Areas of infestations identified in these surveys will determine appropriate treatment and suppression methods.

Table 2 presents species-specific recommended control measures which may be implemented. These recommended control measures are from the Colorado Department of Agriculture website (CDOA 2021a). Some of the noxious weed species are widespread and not found in defined populations, therefore treatment will be difficult and may not be prioritized. Treatment will only occur in areas where soil disturbance due to construction occurred and 30 feet around walk-in replacement structures.

Table 2. Noxious Weed Species Recommended Control Techniques

Common Name	Chemical	Mechanical	Biological
Russian knapweed	Aminopyralid (Milestone), Aminocyclopyrachlor + Chlorsulfuron (Perspective). Most effective if applied in the fall when above-ground stems die back.	Cutting or mowing can stress plant and force it to use reserves. Tilling and disking can create root fragments that can sprout. However, repeated deep tillage (1 foot) over 3 years can kill much of the root system.	The gall midge, <i>Jaapiella ivannikovi</i> , is a fly that lays eggs in the shoot tips of Russian knapweed. It forms galls that reduce flowering, seed production, and stunts the plants' growth. This biocontrol will stress the stand of Russian knapweed but will not likely eliminate it. Not available to public.
Downy brome (cheatgrass)	<i>Pseudomonas fluorescens</i> D7 inhibits cheatgrass and is currently approved by EPA and Colorado.	Mechanical methods are best for residential areas and small infestations. Collect, bag, and dispose of or destroy flowers; seeds can mature and germinate if left. Tilling must be deeper than	No approved biological control agents.

		6 inches to work. Prescribed fire applied before seed maturity, (late spring or early summer), may kill seeds; the trick is to get green cheatgrass and litter to carry fire and at a hot enough temperature to destroy seeds and seedlings.	
Musk thistle	Aminopyralid (Milestone), Chlorsulfuron (Telar), and Clopyralid (Transline). Apply in spring from rosette through very early flower growth stages.	Methods, such as tilling, hoeing and digging, are best for infestations smaller than 0.5 acres. Sever roots below the soil surface during the first year before the plant stores energy, and in the second year before flower production. Mowing, chopping and deadheading stimulates more flower production; these methods require consecutive years of season-long treatments. All flower buds and heads must be collected, bagged, and disposed of or destroyed. Prescribed fire that results in high soil burn severity damages roots and above ground biomass, but is not recommended due to impacts on desired plants.	<i>Trichosirocalus horridus</i> is the only biological control agent available for musk thistle in Colorado.
Chinese clematis	2, 4-D amine, Imazapic (Plateau, Panoramic), and Aminopyralid (Milestone). 2, 4-D amine applied anytime actively growing. Other herbicides applied in fall.	Digging or hand pulling is effective when soil is moist. Make certain to pull all the roots and bag specimens carefully so as to not scatter seeds if flowering.	No approved biological control agents.
Field bindweed	Clarity + 2,4-D Amine, Tordon 22K *this is a Restricted Use Pesticide, and Roundup Ultra *non-selective herbicide, will kill all vegetation* See Application timing on Noxious Weed Fact Sheets.	Cutting, mowing, or pulling has a negligible effect unless the plants are cut below the surface in the early seedling stage.	The bindweed gall mite, <i>Aceria mahlerbae</i> , has proven to be effective in reducing field bindweed infestations.
Russian olive	Triclopyr and imazapyr are the most effective herbicides. Both should be applied to the cambial layer of the tree immediately after cutting (cut-stump treatment).	Mowing or cutting can be effective, but often must be combined with either herbicides or excavation of the entire stump. Burning can be effective if conditions can support a long, hot fire.	<i>Tubercularia</i> canker can be effective.
Redstem filaree	Metsulfuron (Escort XP) or 2,4-D + dicamba (Rangestar). Apply at rosette stage of growth.	Hand pulling or digging when soil is moist, making sure to get the roots to prevent resprouting is effective. Removing flowers before the plant sets seed will also	No approved biological control agents.

		be effective.	
Myrtle spurge	2, 4-D ester, Dicamba + 2, 4-D, and Picloram + 2, 4-D. Spot treat isolated populations with a backpack application (Steve Anthony, Garfield County Vegetation Manager, personal communication, January 24, 2022).	Hand pull or dig when soil is moist. Make certain to pull all the roots and wear rubber gloves and eye protection to protect yourself from the toxic milky sap. Treatment follow up is important to check root fragment resprouts that will occur when the tap root is severed too shallow.	Biocontrol is not an approved method of control for State List A species.
Halogeton	Metsulfuron + Chlorsulfuron (Cimmaron X-tra) or Chlorsulfuron (Telar XP). Apply pre-emergence to post-emergence stages in spring.	Hand pull or dig when soil is moist, but make sure to wear gloves. Bag specimens carefully so as not to scatter seeds. The key to effective control is to prevent seed production and/or spread.	No approved biological control agents.
Dalmatian toadflax	Aminocyclophrachlor + Chlorsulfuron (Perspective), Picloram (restricted use), and Chlorsulfuron (Telar).	For small infestations, pulling toadflax by hand can be effective. Pull every year for 5 to 6 years to deplete the reserves of the root system. Monitor the site for 10 - 15 years to remove seedlings produced from dormant seeds.	<i>Calophasia lunula</i> , a predatory noctuid moth, feeds on leaves and flowers of Dalmatian toadflax. <i>Eteobalea intermediella</i> , a root boring moth, and <i>Mecinus janthinus</i> , a stem boring weevil, are also available.
Scotch thistle	Aminopyralid* (Milestone), Chlorsulfuron (Telar), Metsulfuron + Chlorsulfuron (Cimarron X-tra), Clopyralid (Transline) Aminocyclopyrachlor + chlorsulfuron (Perspective). Apply in spring rosette to early bolting growth stages. Two treatments in growing season required (Steve Anthony, Garfield County Vegetation Manager, personal communication, January 24, 2022).	Methods, such as tilling, hoeing and digging, are best for infestations smaller than 0.5 acres. Sever roots below the soil surface during the first year before the plant stores energy and in the second year before seed production. Mowing, chopping and deadheading stimulates more flower production; these methods require consecutive years of season-long treatments. Flower heads must be collected, bagged, and disposed of or destroyed; seeds will mature and germinate if left on the ground.	No approved biological control agents.
Siberian elm	No control methods available since this is a Watchlist species.	N/A	N/A

Source: Colorado Department of Agriculture (2021a).

Table 2 - Control Techniques based on recommendation from Garfield County Weed Control Manager, Steve Anthony following the CDOA-published control techniques for noxious weeds.

6.1 Seed mix

Restoration will consist of re-contouring the disturbed areas around structures and staging areas per grading plans and reseeding the area with the following seed mix. The timing of subsequent seeding efforts will be based on the life of the selected herbicide.

Table 3. Semi-Desert Loam Revegetation Seed Mixture*

Species	Pounds per Acre**	Number of Seeds***
Western wheatgrass (<i>Pascopyrum smithii</i>)	3.00	8
Indian ricegrass (<i>Achnatherum hymenoides</i>)	2.00	6
Prairie junegrass (<i>Koeleria macrantha</i>)	0.50	26
Sandberg bluegrass (<i>Poa secunda</i> ssp. <i>Sandbergii</i>)	1.00	24
Galleta grass (<i>Pleuraphis jamesii</i>)	2.00	7
Bluebunch wheatgrass (<i>Pseudoroegneria spicata</i> ssp. <i>Spicata</i>)	2.00	6
Bottlebrush squirreltail (<i>Elymus elymoides</i>)	2.00	9
Total	12.50	85

*The seed mix shown in Table 3 was developed by Granite Seed and Erosion Control based on existing native grasses that occur in this region. Seed mix may be obtained from other suppliers.

** Pure Live Seed

***Per Square Foot

Section 7. Recommended Management and Mitigation Actions

In addition to the specific management recommendations listed for each species in **Table 2**, the following mitigation measures are recommended (as appropriate) to minimize the spread of noxious weeds:

- All construction equipment will remain in designated work areas.
- The area of ground disturbance will be kept to the minimum necessary.
- Minimize imported topsoil during construction. If importing is necessary, use certified weed-free soil.
- All equipment will be thoroughly cleaned before entering and exiting the study area.
- All mulches and straw used at the site will be certified weed-free.
- All disturbed areas will be seeded after construction. Seeding will consist of species listed in **Table 3**. Semi-Desert Loam Seed Mixture will be spread on disturbed ground around structures and staging areas, as appropriate.
- All seed mixes, soil, and other plant material used for revegetation will be free of noxious weed seeds, roots, and other propagules.

- Only a Colorado-licensed Supervisor or Certified Operator will apply herbicides.
- All herbicides will be applied in accordance with the manufacturer's instructions.
- Broadcast herbicide spraying will be limited to areas of project ground disturbance, around each existing and new structure, and at staging areas. Weed treatment around each existing and new structure will be at a radius of 35-feet unless there is project disturbance beyond the 35-foot radius.
- The Garfield County Vegetation Manager or City of Glenwood Springs Parks Superintendent will be notified prior to noxious weed treatments, as appropriate to the disturbance jurisdiction. At time of the memorandum, this notification would be with either the Garfield County Vegetation Manager (Steve Anthony – 970-945-1377 ext. 4305, santhony@garfield-county.com) or City of Glenwood Springs Parks Superintendent (Daniel Roper – 970-384-6366, dan.roper@cogs.us).
- Applicable best management practices (BMPs) from the Stormwater Management Plan will be implemented.

Section 8. References

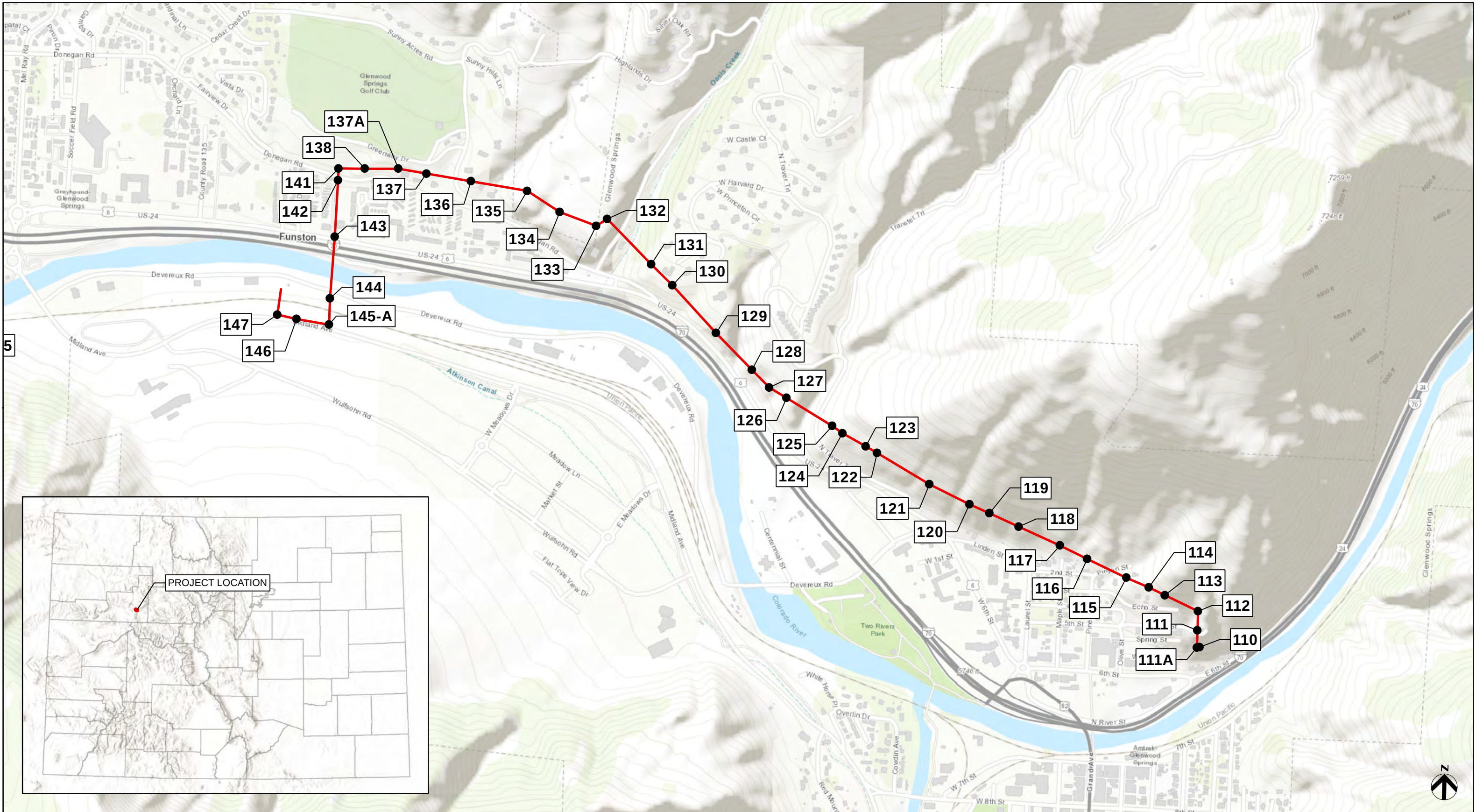
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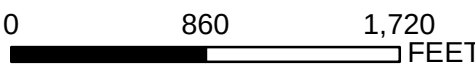
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Appendix A. Figures

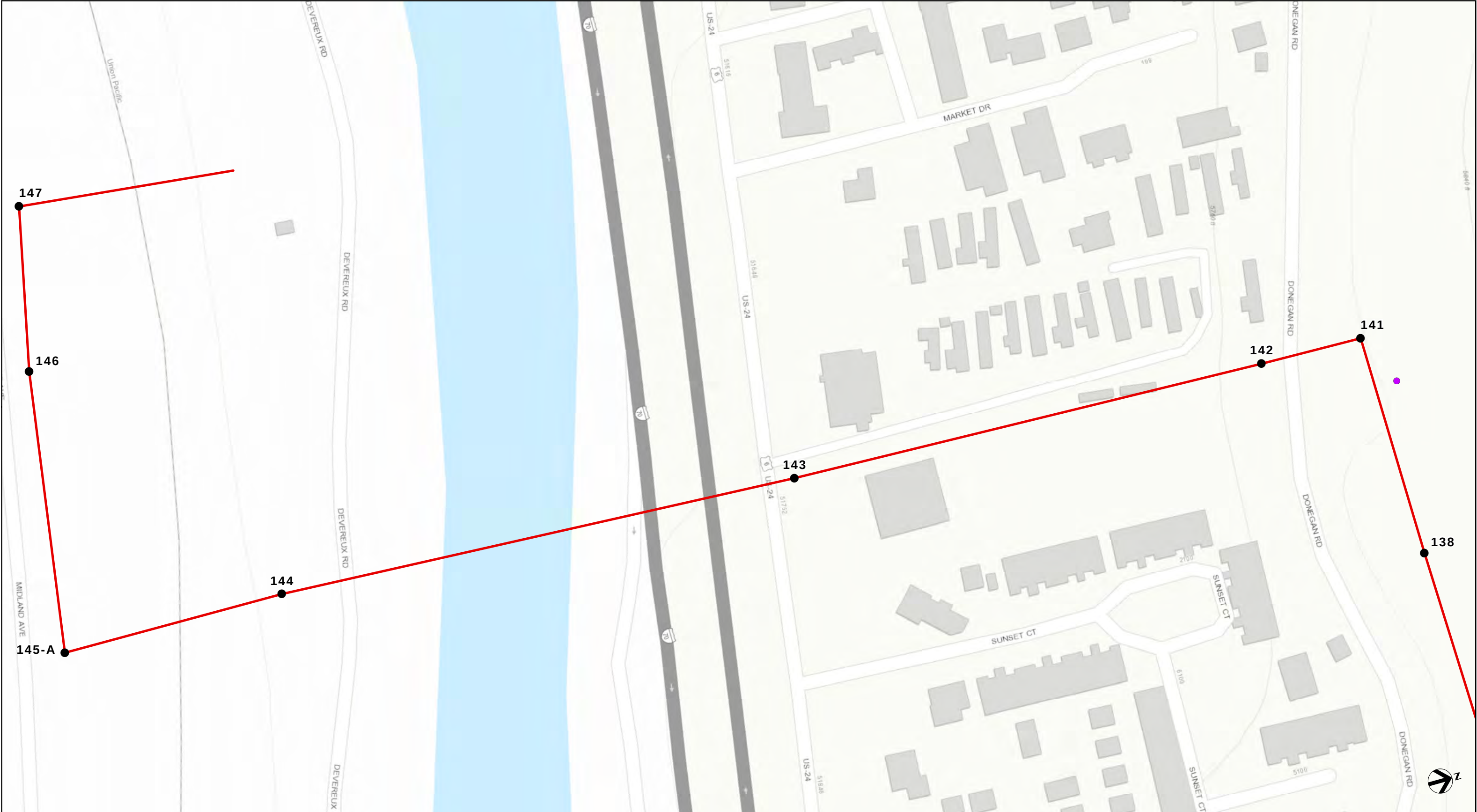
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 	XCEL 6584 NOXIOUS WEED SURVEY	● PROPOSED STRUCTURE LOCATION — ALIGNMENT
	OVERVIEW DATE: JANUARY 2023	



1 INCH EQUALS 850 FEET



**XCEL 6584 NOXIOUS
WEED SURVEY**

LIST A SPECIES

DATE: JANUARY 2023

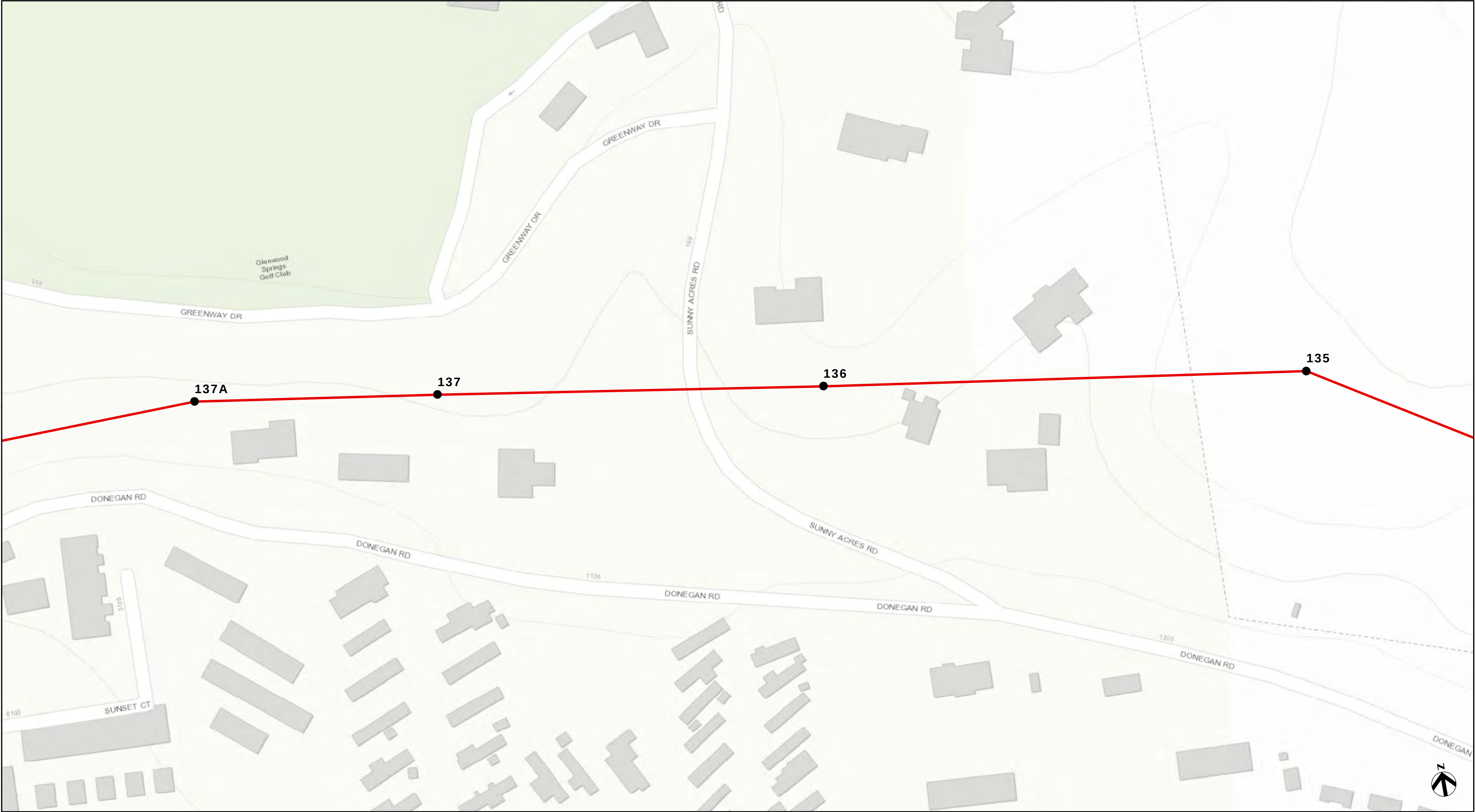
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MYRTLE SPURGE DENSITIES, # OF INDIVIDUALS

● 1-20 ● 101-999

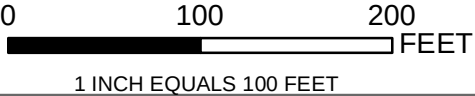
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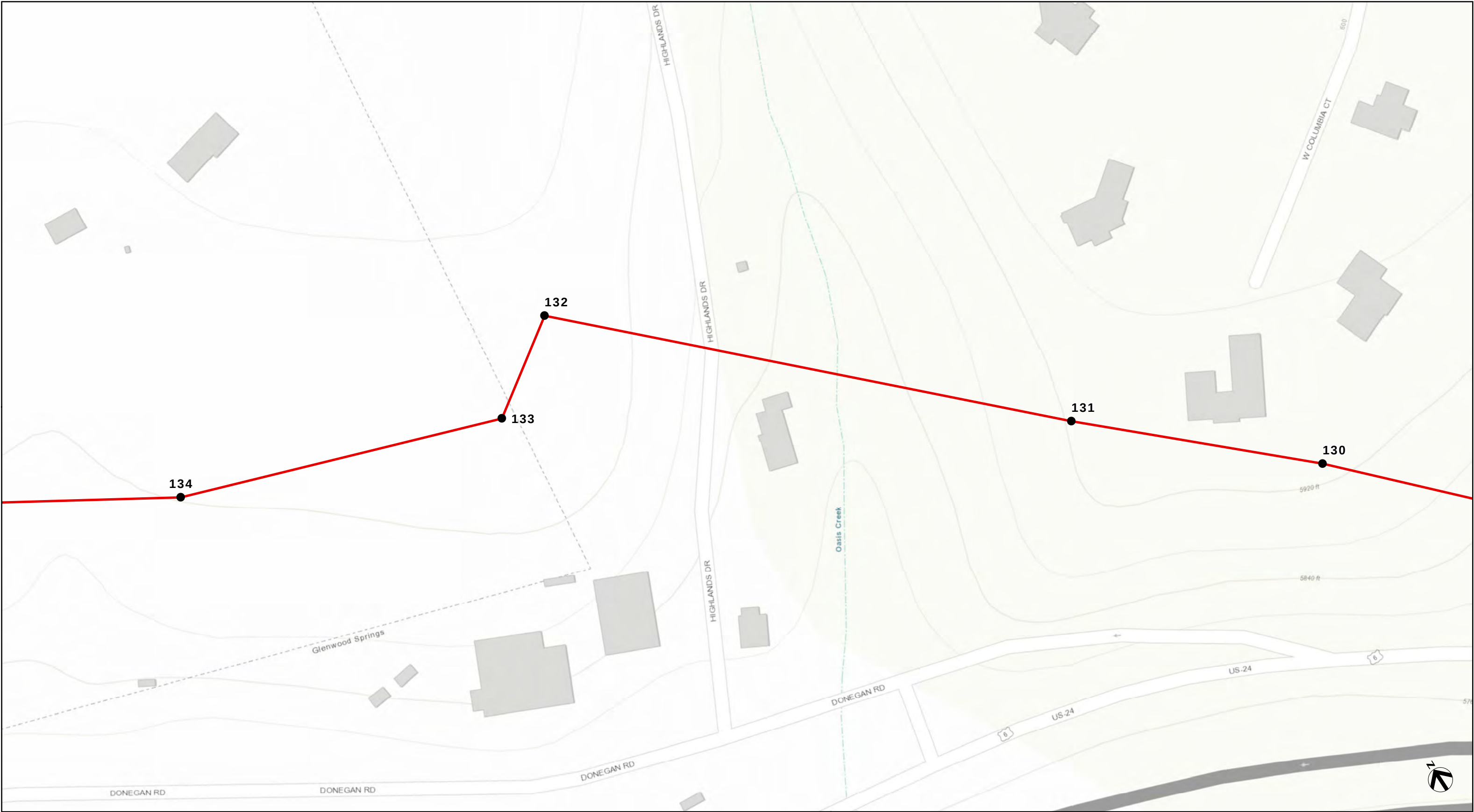
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**XCEL 6584 NOXIOUS
WEED SURVEY**
LIST A SPECIES
DATE: JANUARY 2023

- PROPOSED STRUCTURE LOCATION
- MYRTLE SPURGE DENSITIES, # OF INDIVIDUALS**
- 1-20 ● 101-999





**XCEL 6584 NOXIOUS
WEED SURVEY**

LIST A SPECIES

DATE: JANUARY 2023

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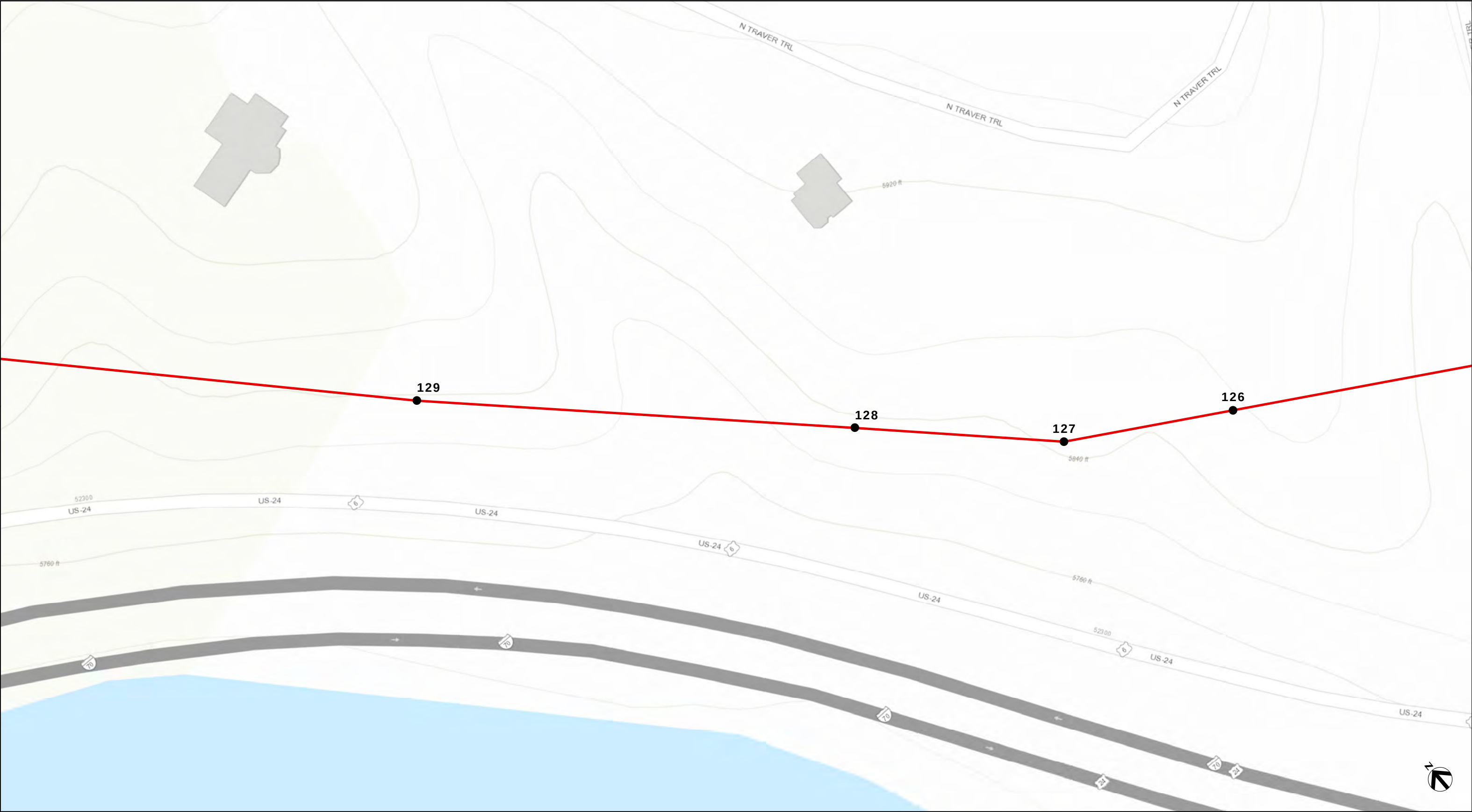
MYRTLE SPURGE DENSITIES, # OF INDIVIDUALS

● 1-20 ● 101-999

0 100 200

FEET

1 INCH EQUALS 100 FEET



**XCEL 6584 NOXIOUS
WEED SURVEY**

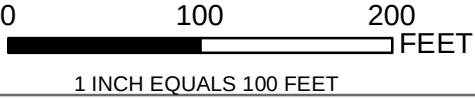
LIST A SPECIES

DATE: JANUARY 2023

● PROPOSED STRUCTURE LOCATION

MYRTLE SPURGE DENSITIES, # OF INDIVIDUALS

● 1-20 ● 101-999



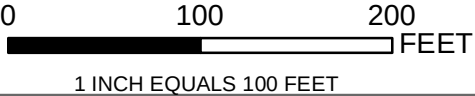


**XCEL 6584 NOXIOUS
WEED SURVEY**

LIST A SPECIES

DATE: JANUARY 2023

- PROPOSED STRUCTURE LOCATION
- MYRTLE SPURGE DENSITIES, # OF INDIVIDUALS**
- 1-20
 - 101-999





**XCEL 6584 NOXIOUS
WEED SURVEY**

LIST A SPECIES

DATE: JANUARY 2023

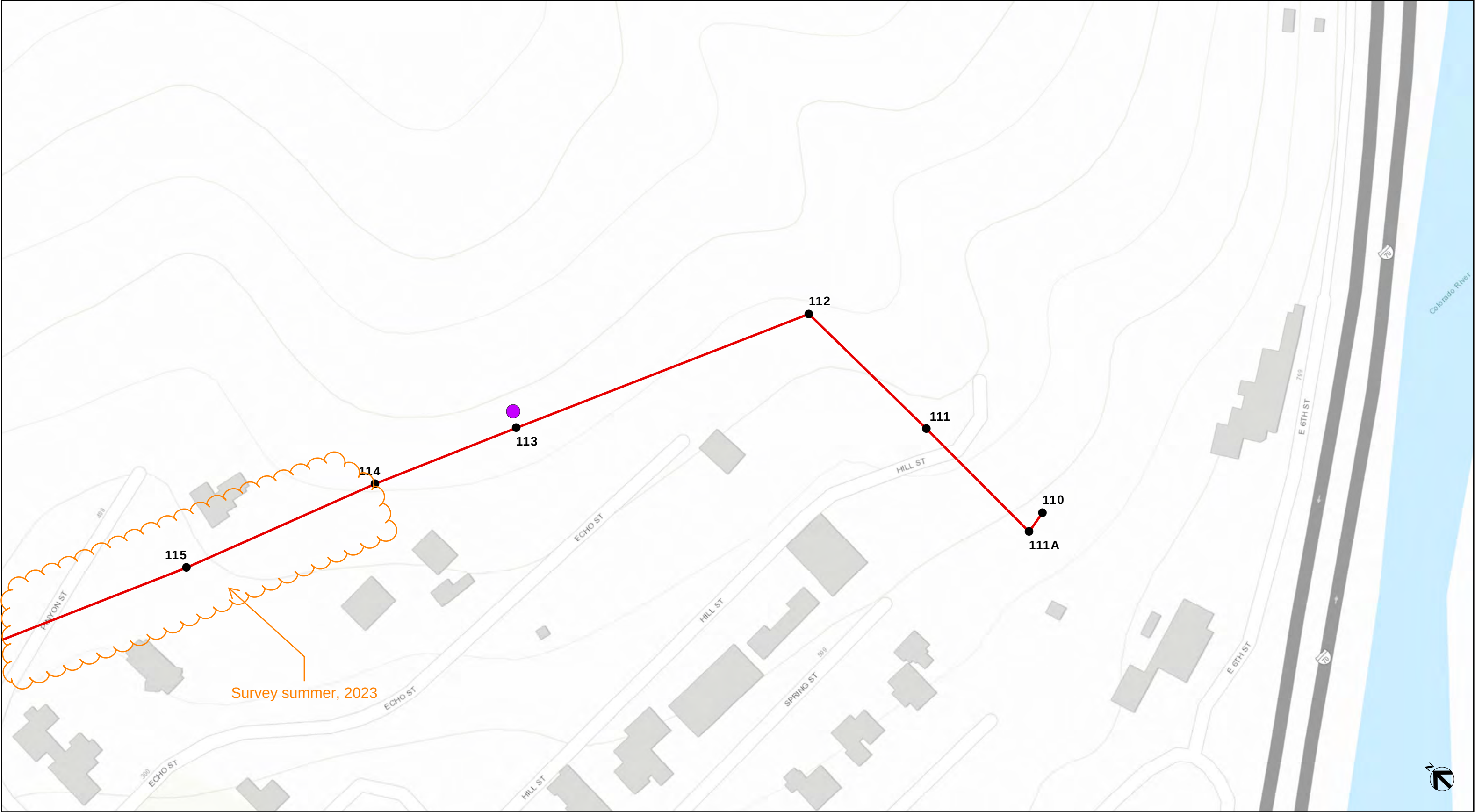
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MYRTLE SPURGE DENSITIES, # OF INDIVIDUALS

● 1-20 ● 101-999

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FEET

1 INCH EQUALS 100 FEET

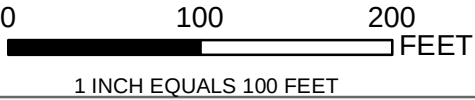


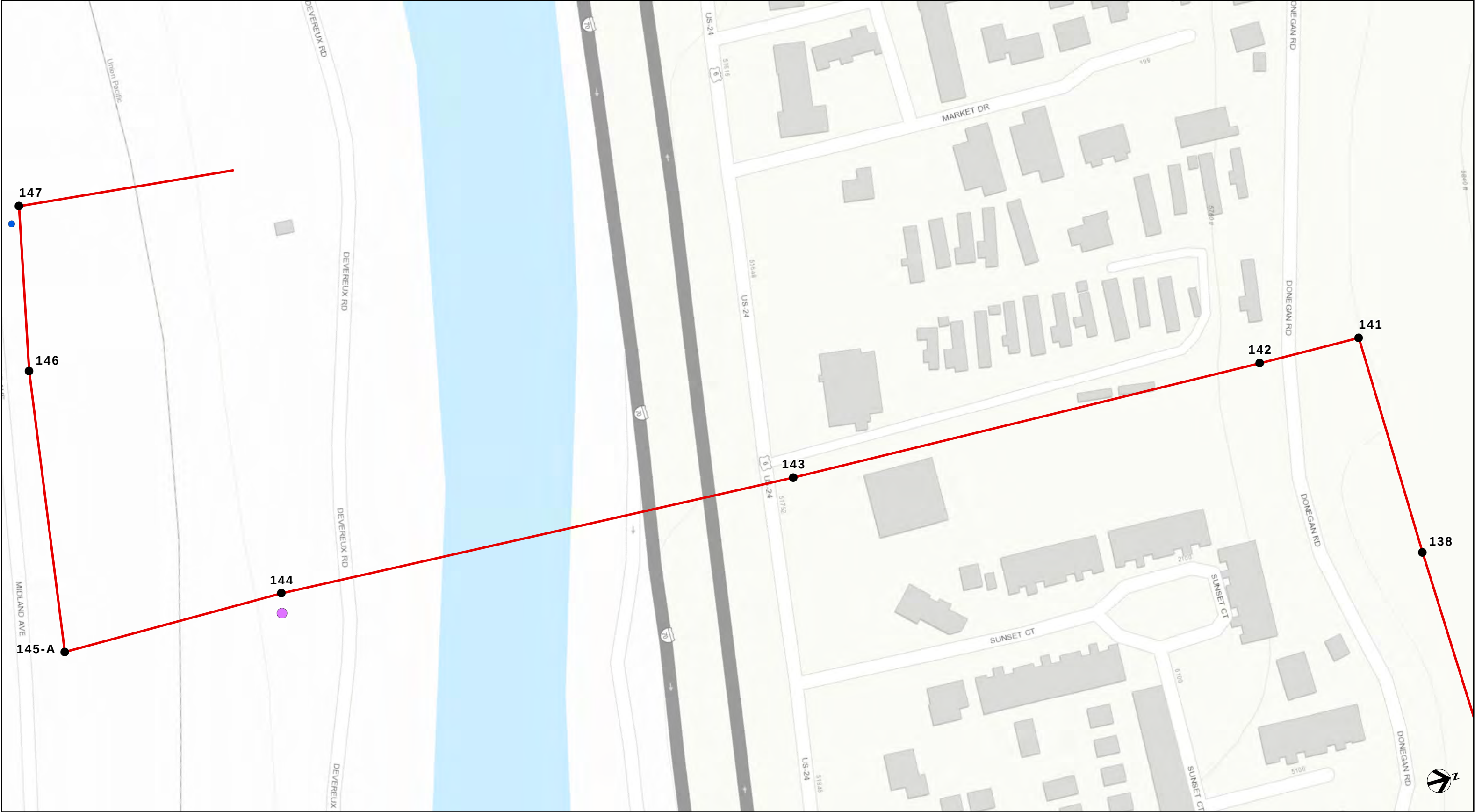
**XCEL 6584 NOXIOUS
WEED SURVEY**

LIST A SPECIES

DATE: JANUARY 2023

- PROPOSED STRUCTURE LOCATION
- MYRTLE SPURGE DENSITIES, # OF INDIVIDUALS**
- 1-20 ● 101-999

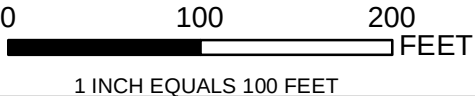


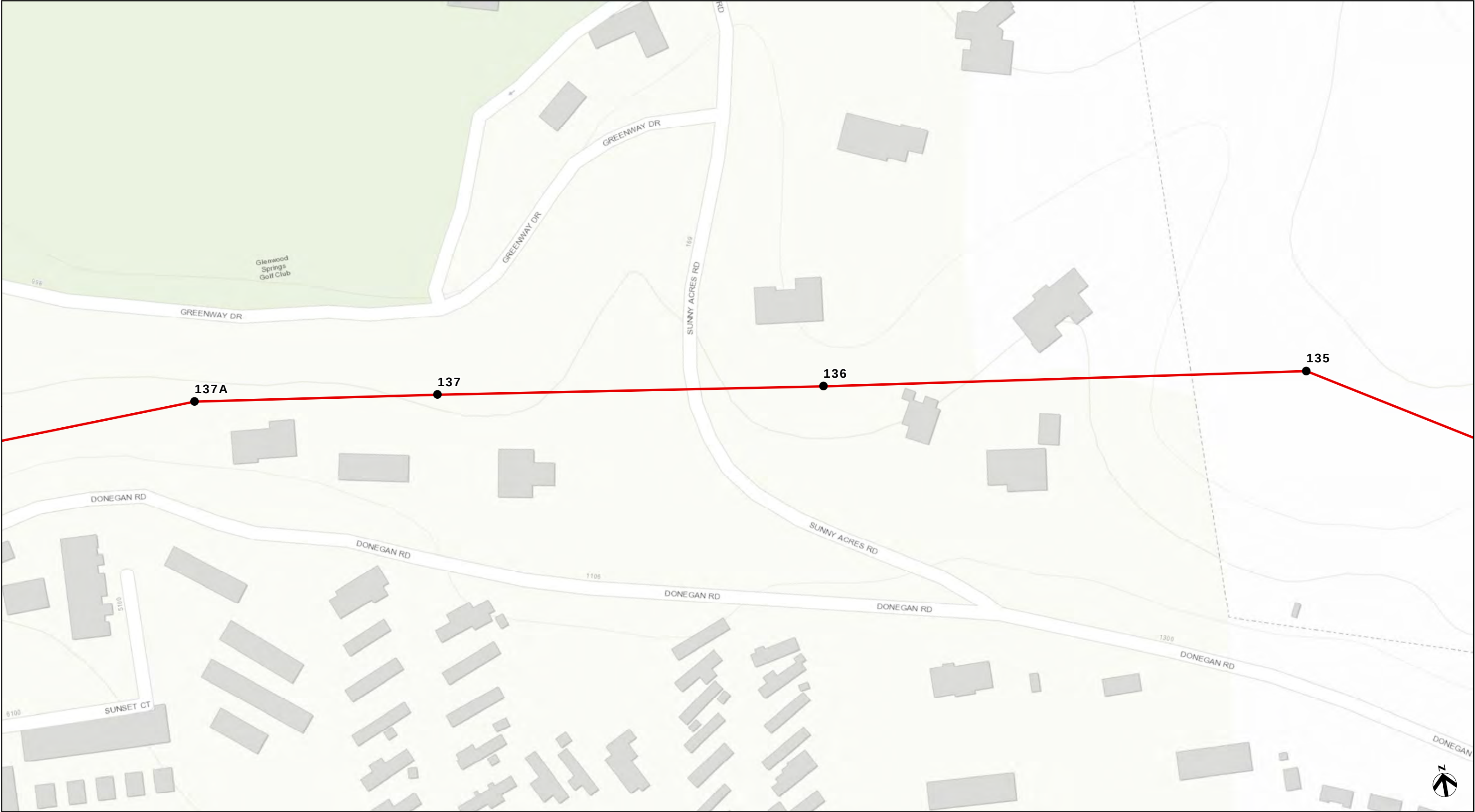


XCEL 6584 NOXIOUS WEED SURVEY
LIST B SPECIES
DATE: JANUARY 2023

- | | |
|-------------------------------|--------------------|
| ● PROPOSED STRUCTURE LOCATION | ● RUSSIAN KNAPWEED |
| ● CHINESE CLEMATIS | ● RUSSIAN OLIVE |
| ● DALMATIAN TOADFLAX | ● SCOTCH THISTLE |
| ● MUSK THISTLE | |

SPECIES DENSITIES, # OF INDIVIDUALS
○ 1-20 ○ 21-100 ○ 101-999





**XCEL 6584 NOXIOUS
WEED SURVEY**

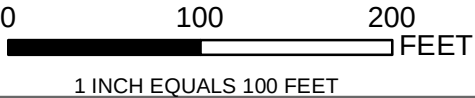
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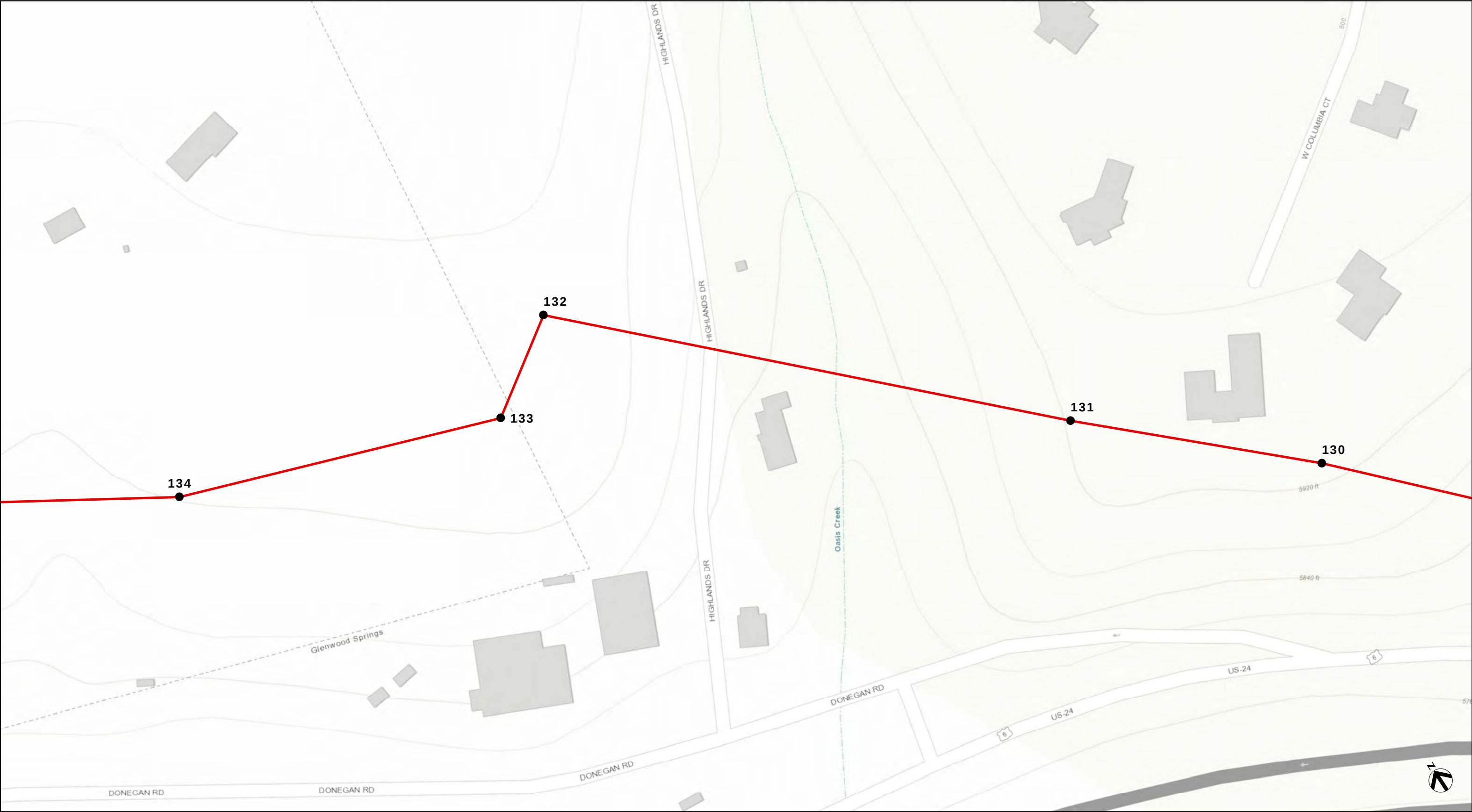
DATE: JANUARY 2023

- | | |
|-------------------------------|--------------------|
| ● PROPOSED STRUCTURE LOCATION | ● RUSSIAN KNAPWEED |
| ● CHINESE CLEMATIS | ● RUSSIAN OLIVE |
| ● DALMATIAN TOADFLAX | ● SCOTCH THISTLE |
| ● MUSK THISTLE | |

SPECIES DENSITIES, # OF INDIVIDUALS

○	○	○
1-20	21-100	101-999



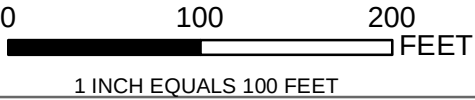


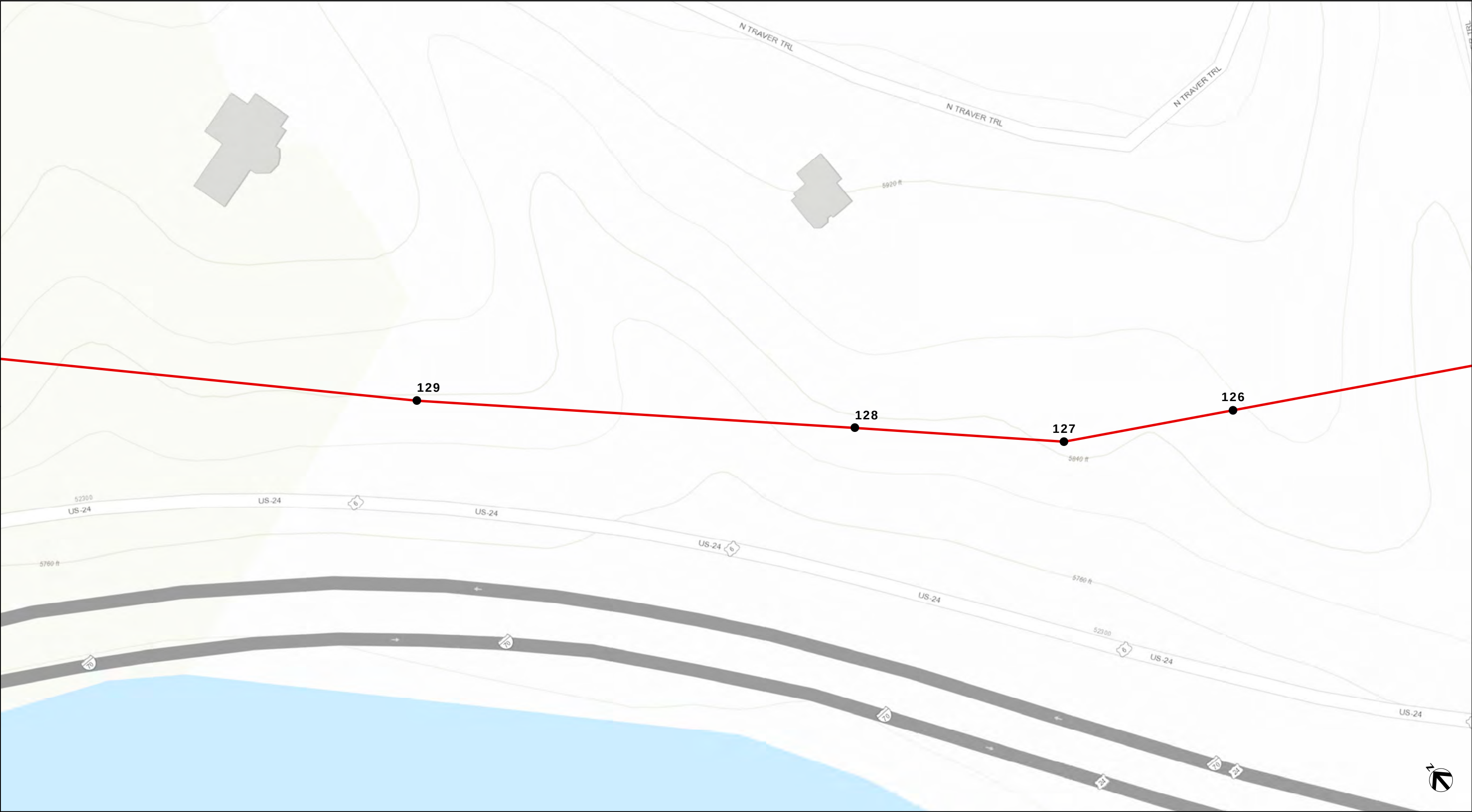
XCEL 6584 NOXIOUS WEED SURVEY
LIST B SPECIES
DATE: JANUARY 2023

- | | |
|-------------------------------|--------------------|
| ● PROPOSED STRUCTURE LOCATION | ● RUSSIAN KNAPWEED |
| ● CHINESE CLEMATIS | ● RUSSIAN OLIVE |
| ● DALMATIAN TOADFLAX | ● SCOTCH THISTLE |
| ● MUSK THISTLE | |

SPECIES DENSITIES, # OF INDIVIDUALS

○	○	○
1-20	21-100	101-999





**XCEL 6584 NOXIOUS
WEED SURVEY**

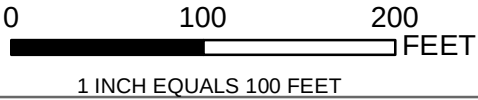
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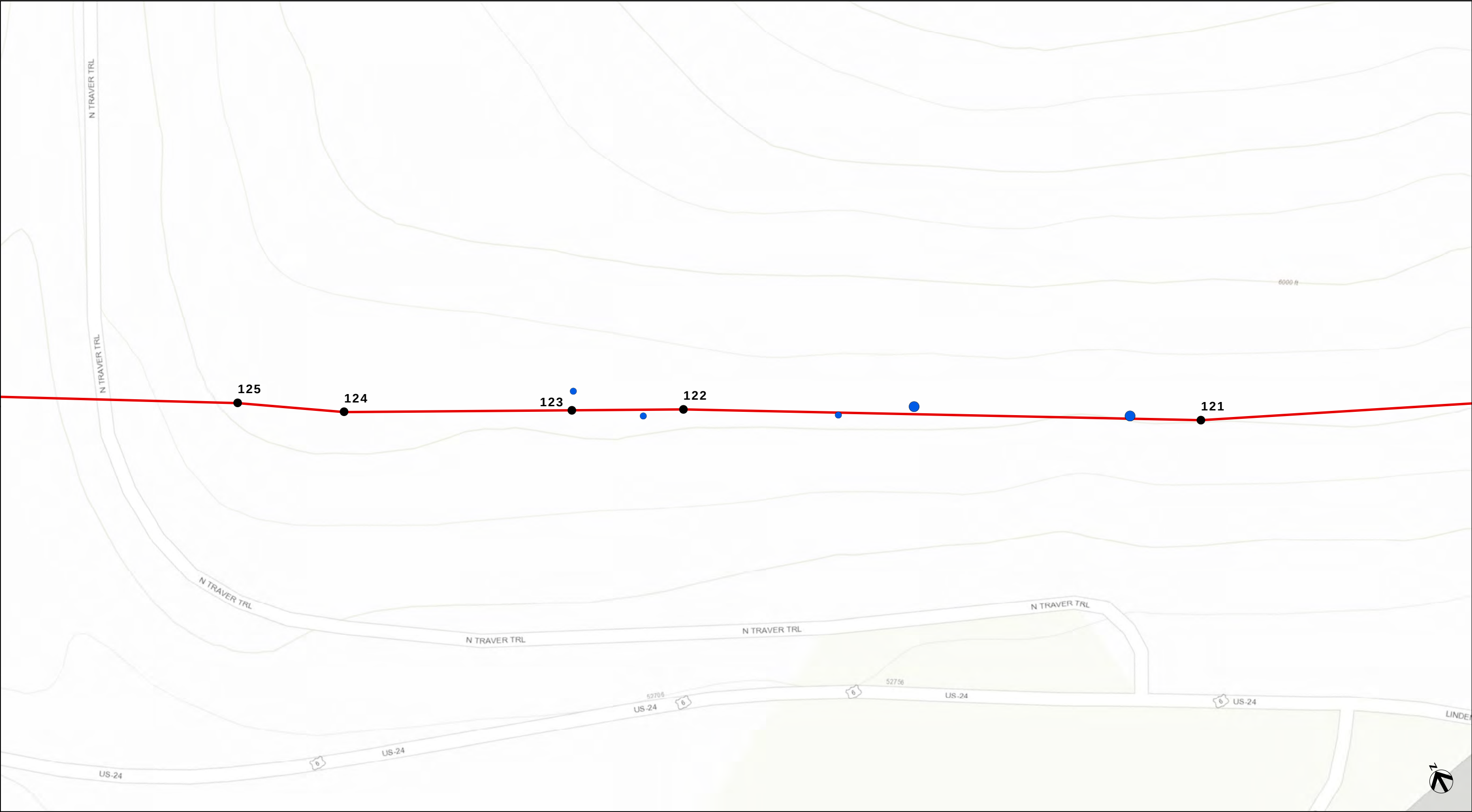
DATE: JANUARY 2023

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|-------------------------------|--------------------|
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| ● CHINESE CLEMATIS | ● RUSSIAN OLIVE |
| ● DALMATIAN TOADFLAX | ● SCOTCH THISTLE |
| ● MUSK THISTLE | |

SPECIES DENSITIES, # OF INDIVIDUALS

○	○	○
1-20	21-100	101-999



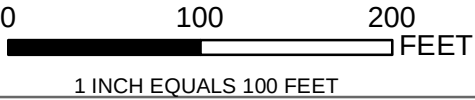


XCEL 6584 NOXIOUS WEED SURVEY
LIST B SPECIES
DATE: JANUARY 2023

- PROPOSED STRUCTURE LOCATION
- CHINESE CLEMATIS
- DALMATIAN TOADFLAX
- MUSK THISTLE
- RUSSIAN KNAPWEED
- RUSSIAN OLIVE
- SCOTCH THISTLE

SPECIES DENSITIES, # OF INDIVIDUALS

○	○	○
1-20	21-100	101-999





**XCEL 6584 NOXIOUS
WEED SURVEY**

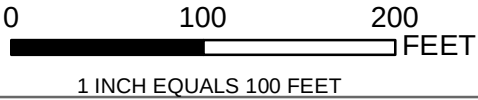
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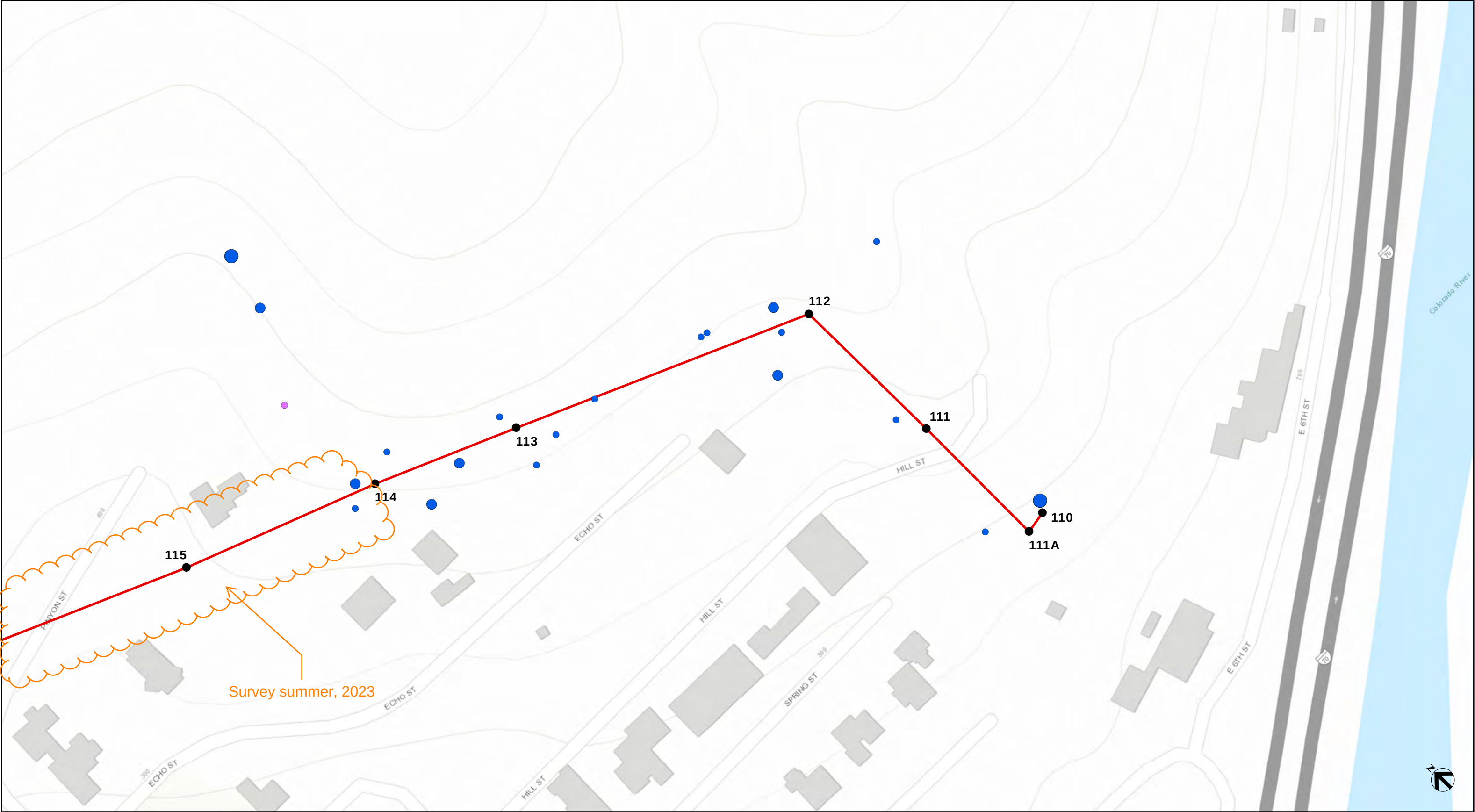
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SPECIES DENSITIES, # OF INDIVIDUALS

○	○	○
1-20	21-100	101-999





**XCEL 6584 NOXIOUS
WEED SURVEY**

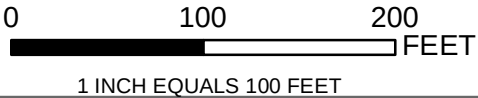
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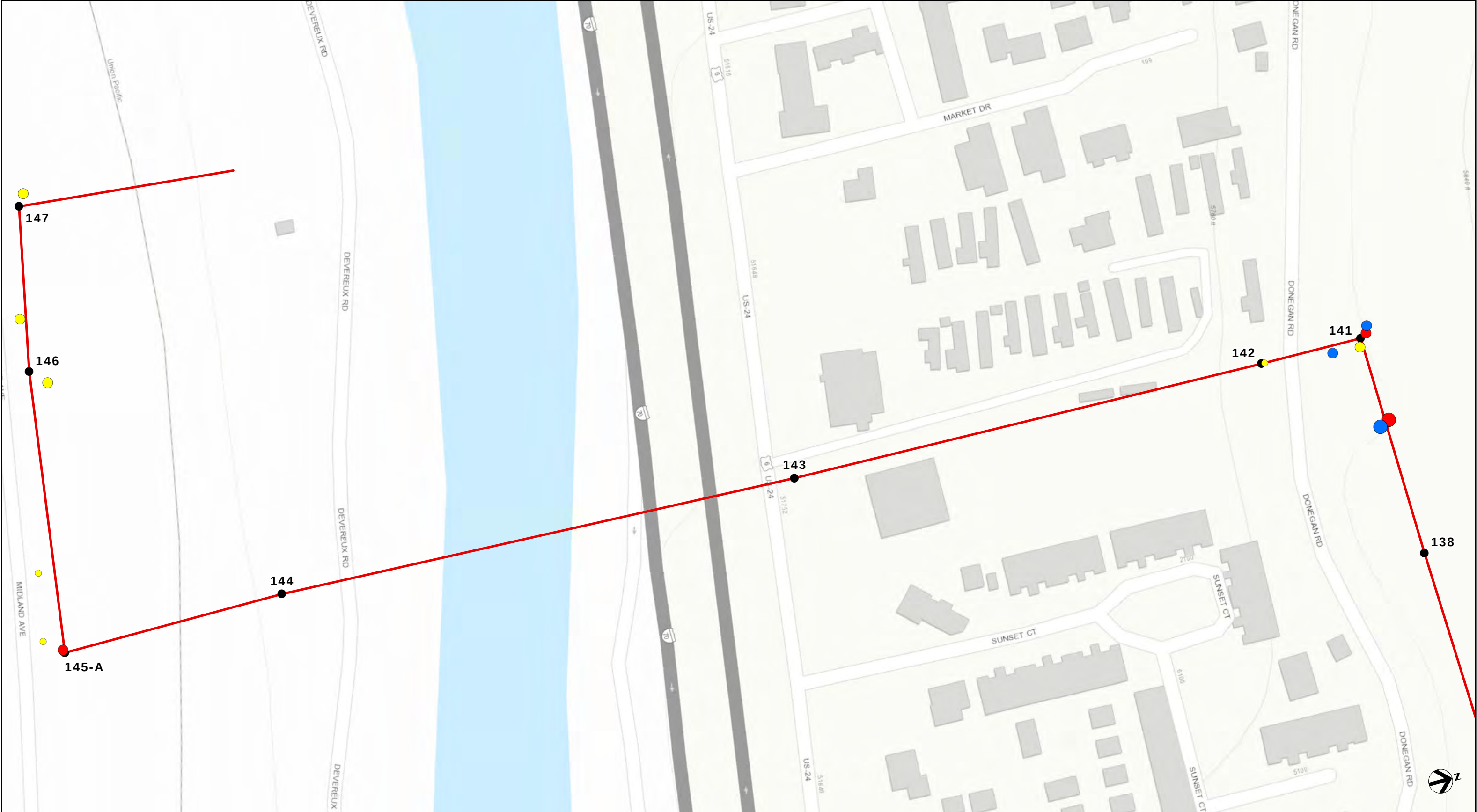
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| ● CHINESE CLEMATIS | ● RUSSIAN OLIVE |
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| ● MUSK THISTLE | |

SPECIES DENSITIES, # OF INDIVIDUALS

○	○	○
1-20	21-100	101-999







XCEL 6584 NOXIOUS WEED SURVEY

LIST C SPECIES

DATE: JANUARY 2023

●

PROPOSED STRUCTURE LOCATION

●

CHEATGRASS

●

COMMON MULLEIN

●

FIELD BINDWEED

●

HALOGETON

●

REDSTEM FILLAREE

SPECIES DENSITIES, # OF INDIVIDUALS

○

1-20

○

21-100

○

101-999

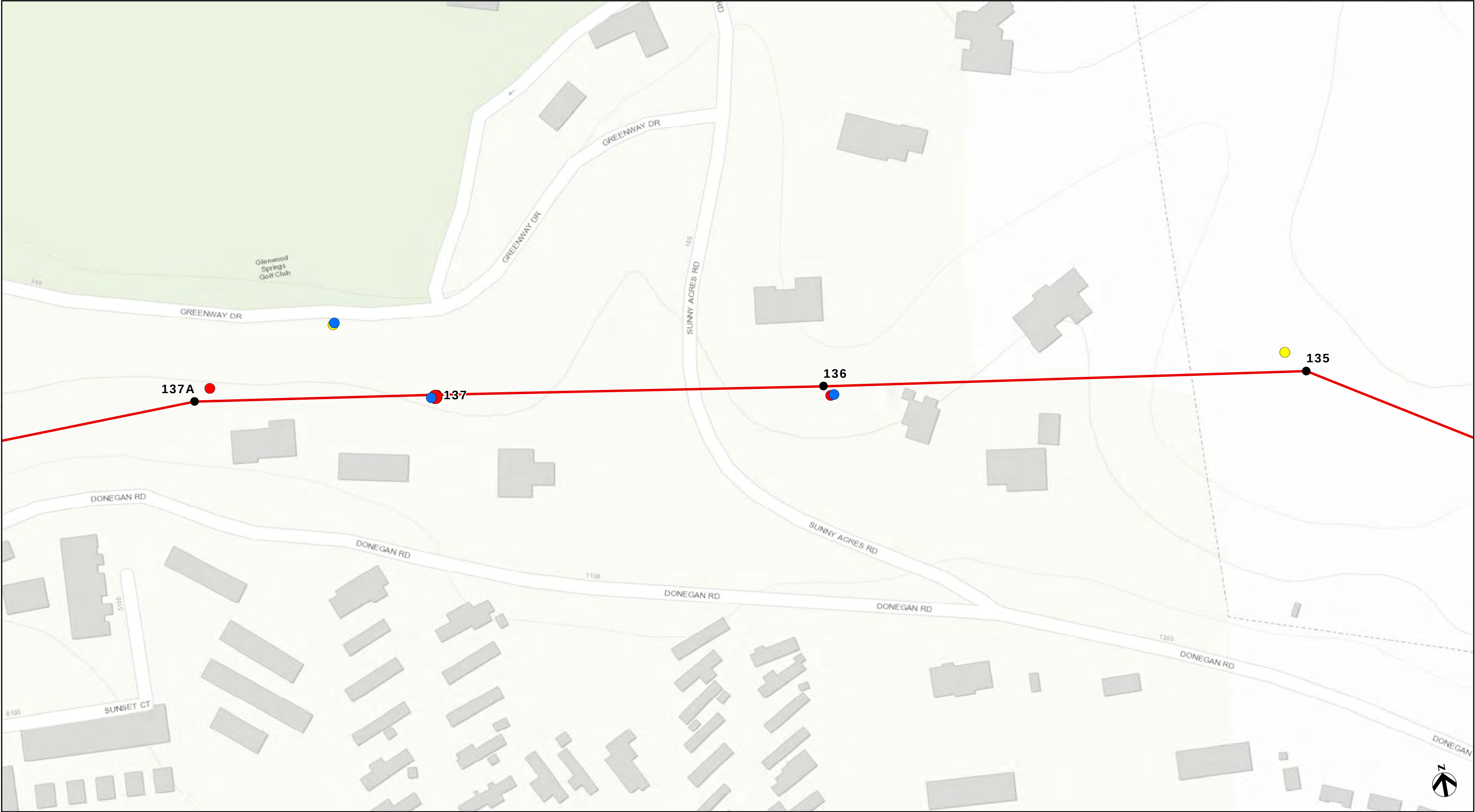
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100

200

FEET

1 INCH EQUALS 100 FEET



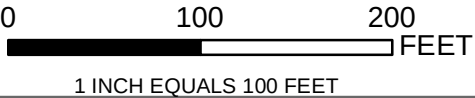
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LIST C SPECIES
DATE: JANUARY 2023

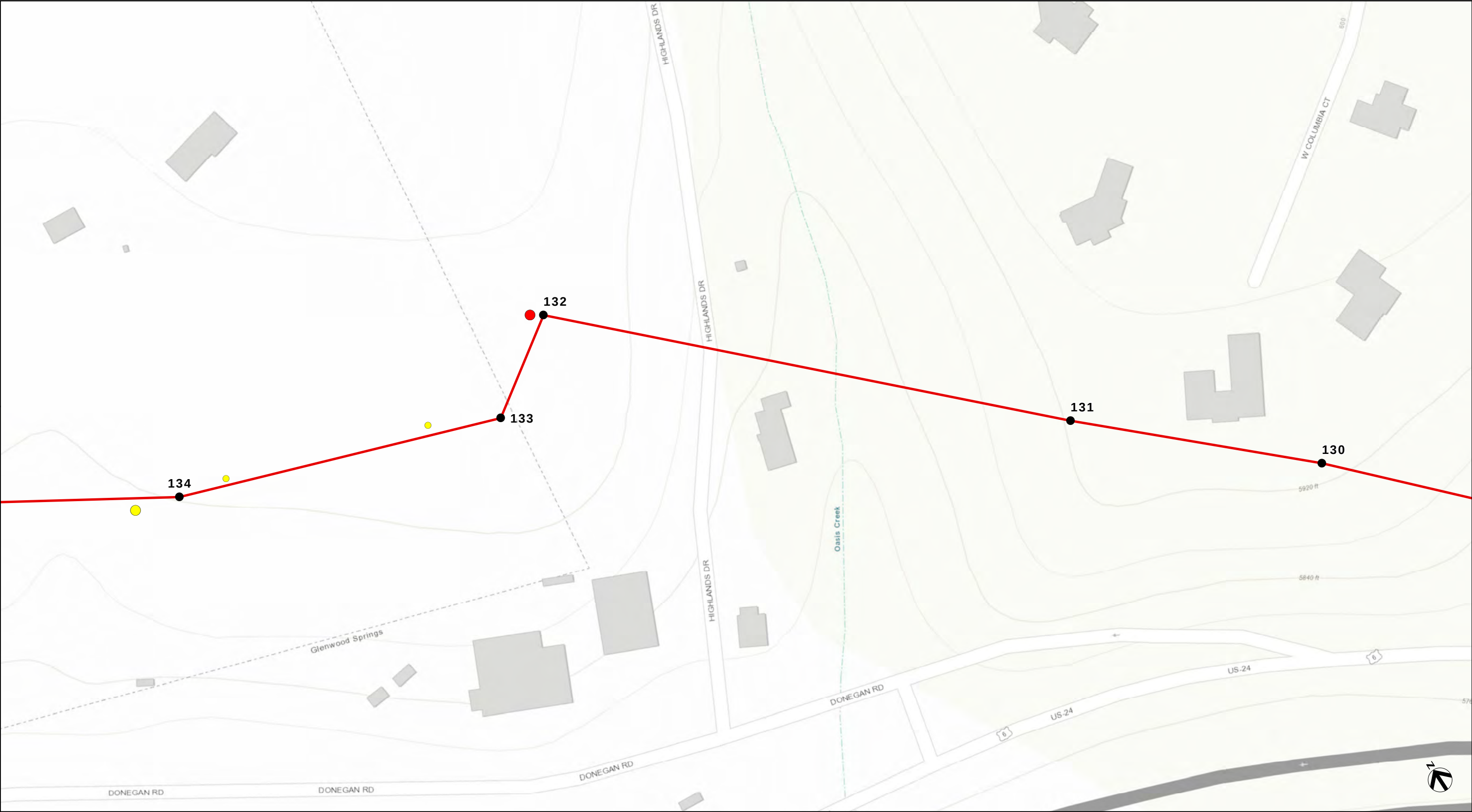
- PROPOSED STRUCTURE LOCATION
- CHEATGRASS
- COMMON MULLEIN

- FIELD BINDWEED
- HALOGETON
- REDSTEM FILLAREE

SPECIES DENSITIES, # OF INDIVIDUALS

○	○	○
1-20	21-100	101-999





**XCEL 6584 NOXIOUS
WEED SURVEY**

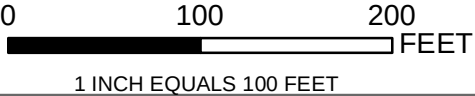
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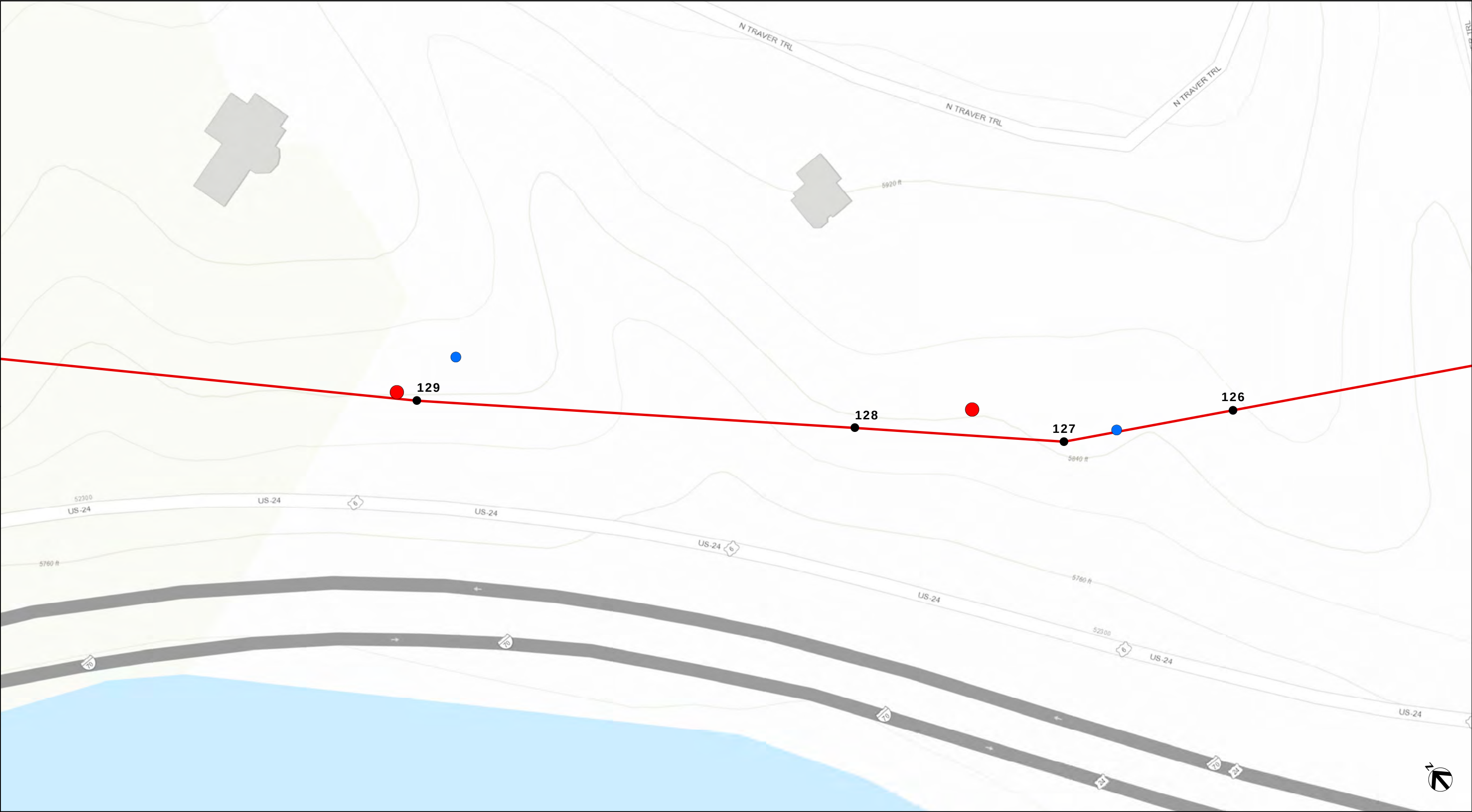
DATE: JANUARY 2023

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- CHEATGRASS
- COMMON MULLEIN
- FIELD BINDWEED
- HALOGETON
- REDSTEM FILLAREE

SPECIES DENSITIES, # OF INDIVIDUALS

○	○	○
1-20	21-100	101-999



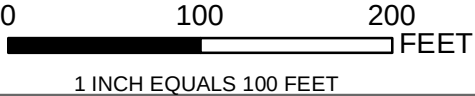


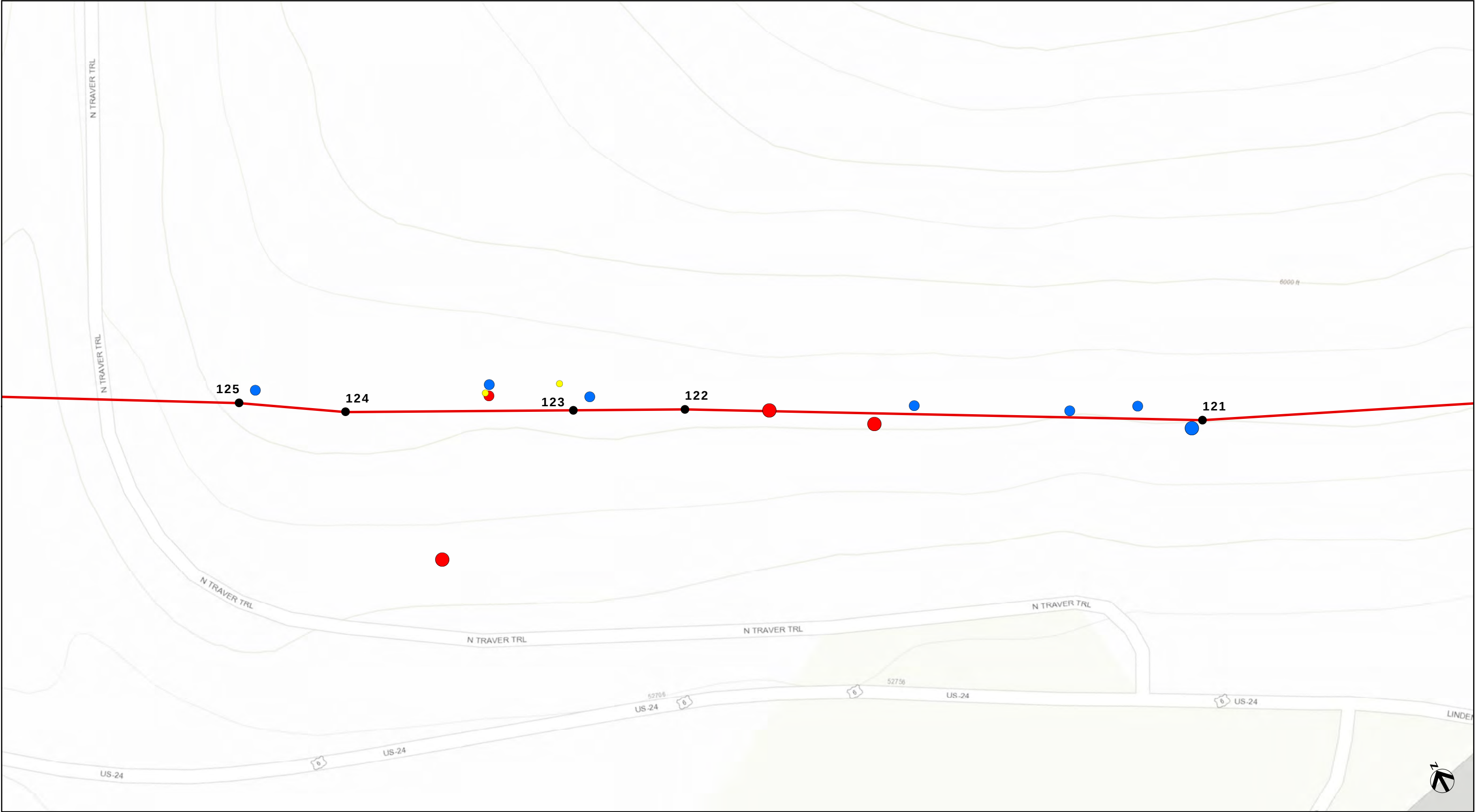
XCEL 6584 NOXIOUS WEED SURVEY
LIST C SPECIES
DATE: JANUARY 2023

- PROPOSED STRUCTURE LOCATION
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- COMMON MULLEIN
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- HALOGETON
- REDSTEM FILLAREE

SPECIES DENSITIES, # OF INDIVIDUALS

○	○	○
1-20	21-100	101-999





**XCEL 6584 NOXIOUS
WEED SURVEY**

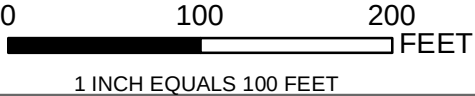
LIST C SPECIES

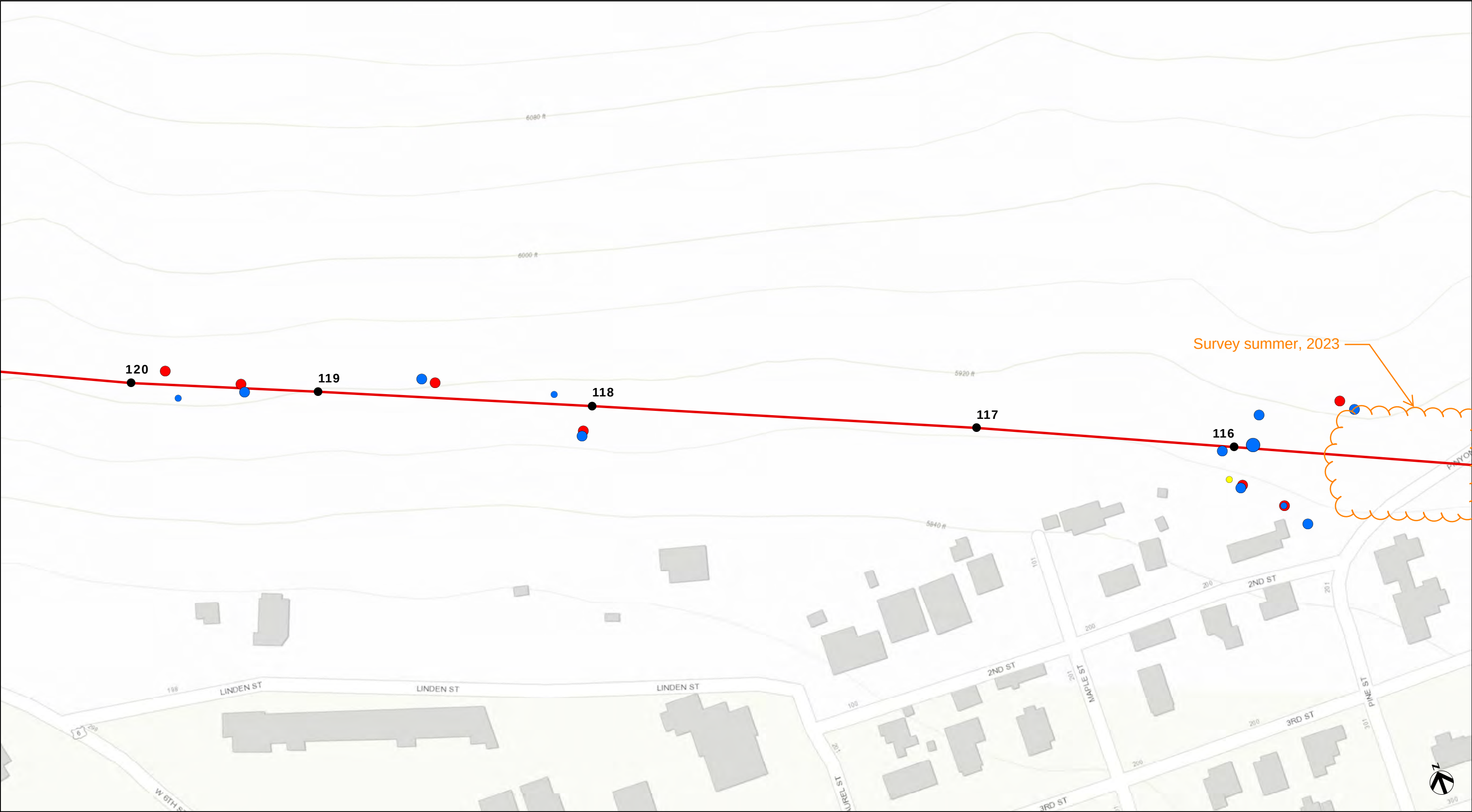
DATE: JANUARY 2023

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|-------------------------------|--------------------|
| ● PROPOSED STRUCTURE LOCATION | ● FIELD BINDWEED |
| ● CHEATGRASS | ● HALOGETON |
| ● COMMON MULLEIN | ● REDSTEM FILLAREE |

SPECIES DENSITIES, # OF INDIVIDUALS

○	○	○
1-20	21-100	101-999





**XCEL 6584 NOXIOUS
WEED SURVEY**

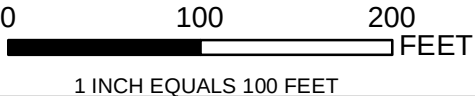
LIST C SPECIES

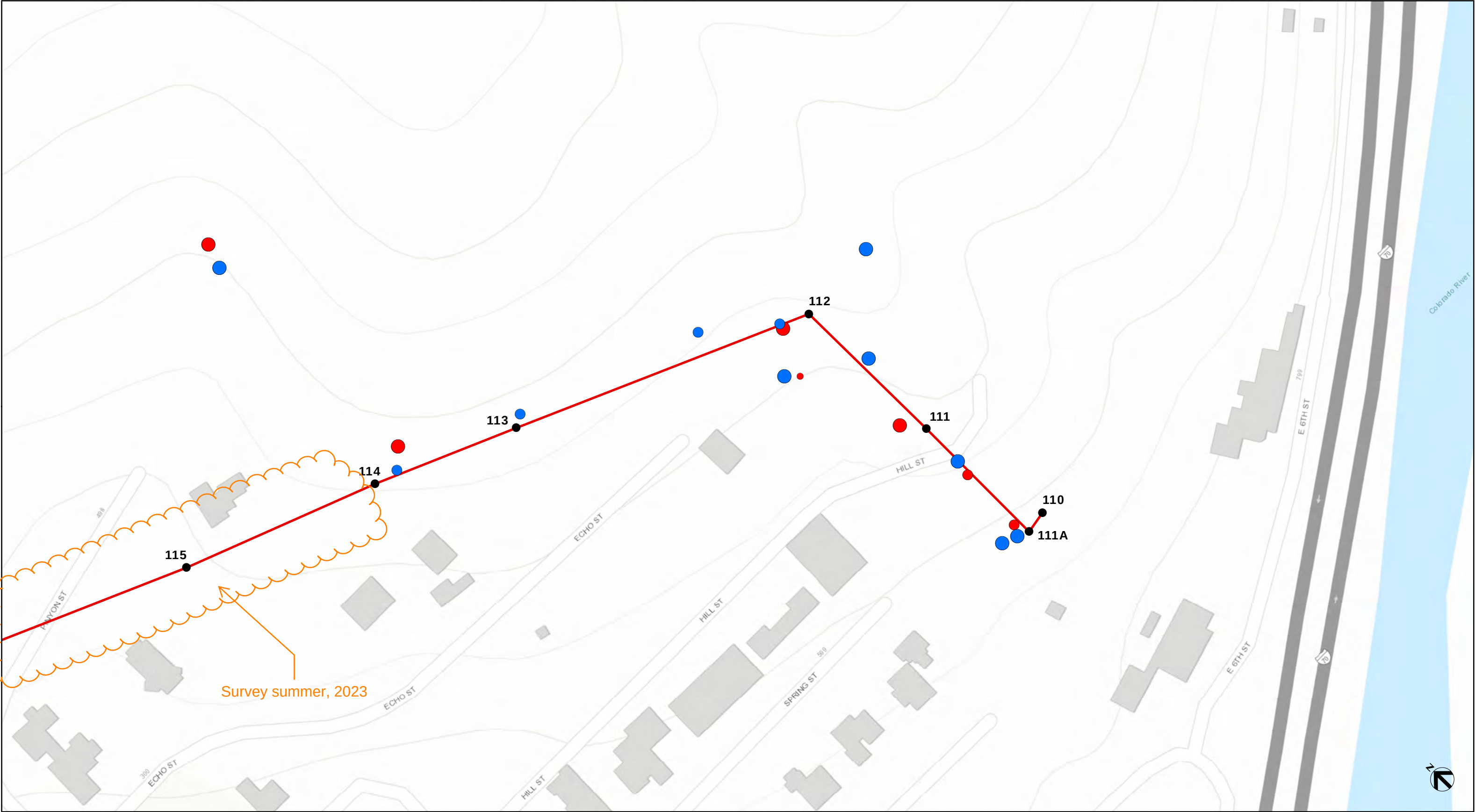
DATE: JANUARY 2023

- PROPOSED STRUCTURE LOCATION
- CHEATGRASS
- COMMON MULLEIN
- FIELD BINDWEED
- HALOGETON
- REDSTEM FILLAREE

SPECIES DENSITIES, # OF INDIVIDUALS

○	○	○
1-20	21-100	101-999





**XCEL 6584 NOXIOUS
WEED SURVEY**

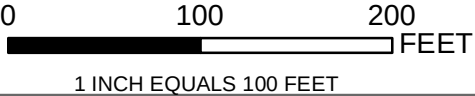
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DATE: JANUARY 2023

- PROPOSED STRUCTURE LOCATION
- CHEATGRASS
- COMMON MULLEIN
- FIELD BINDWEED
- HALOGETON
- REDSTEM FILLAREE

SPECIES DENSITIES, # OF INDIVIDUALS

○ 1-20 ○ 21-100 ○ 101-999



Appendix B. Representative Photographs

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Photo 1

Date Taken: October 2021

Native Gambel oak near STR 113



Photo 2

Date Taken: October 2021

Native pinyon-juniper habitat near STR 119



Photo 3

Date Taken: October 2021

Steep slope near STR 122



Photo 4

Date Taken: October 2021

Steep slope with native grasses near STR 123



Photo 5

Date Taken: October 2021

Steep slope near STR 126



Photo 6

Date Taken: October 2021

Myrtle spurge (List A) species near ROW

Appendix C Plant List

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Plant Species Observed in the Project Survey Area During the October 2021 Field Survey

Scientific Name	Common Name	Noxious weed Indicator*
<i>Achnatherum hymenoides</i>	Indian Ricegrass	-
<i>Agropyron cristatum</i>	Crested wheatgrass	-
<i>Ambrosia psilostachya</i>	Western ragweed	-
<i>Amelanchier alnifolia</i>	Saskatoon serviceberry	-
<i>Artemisia frigida</i>	Fringed sage	-
<i>Artemisia ludoviciana</i>	Western mugwort	-
<i>Artemisia tridentata</i>	Big sagebrush	-
<i>Asclepias subverticillata</i>	Horsetail milkweed	-
<i>Bassia scoparia</i>	Kochia	-
<i>Bromus inermis</i>	Smooth brome	-
<i>Bromus tectorum</i>	Cheatgrass	C
<i>Bouteloua gracilis</i>	Blue grama	-
<i>Carduus nutans</i>	Musk thistle	B
<i>Cercocarpus montanus</i>	Mountain mahogany	-
<i>Clematis orientalis</i>	Chinese clematis	B
<i>Convolvulus arvensis</i>	Field bindweed	C
<i>Elaeagnus angustifolia</i>	Russian olive	B
<i>Ericameria nauseosa</i>	Rubber rabbitbrush	-
<i>Erodium cicutarium</i>	Redstem fillaree	C
<i>Erioogonum</i> sp.	Buckwheat	-
<i>Euphorbia myrsinite</i>	Myrtle spurge	A
<i>Grindelia squarrosa</i>	Curly cup gumweed	-
<i>Helianthus annuus</i>	Common sunflower	-
<i>Heterotheca villosa</i>	Hairy golden aster	-
<i>Juniper</i> sp.	Juniper	-
<i>Linaria dalmatica</i>	Dalmatian toadflax	B
<i>Lycium barbarum</i>	Matrimony vine	-
<i>Malva neglecta</i>	Cheeseweed	-
<i>Marrubium vulgare</i>	Horehound	-
<i>Mentzelia</i> sp.	Blazingstar	-
<i>Onopordum acanthium</i>	Scotch thistle	B
<i>Opuntia</i> sp.	Prickly pear	-
<i>Pascopyrum smithii</i>	Western wheatgrass	-
<i>Penstemon</i> dp.	Penstemon	-
<i>Physalis virginiana</i>	Virginia ground cherry	-
<i>Pinus pinyon</i>	Pinyon juniper	-
<i>Quercus gambelii</i>	Gambel's oak	-
<i>Rhaponticum repens</i>	Russian knapweed	B
<i>Rhus aromatica</i>	Fragrant sumac	-
<i>Salsola tragus</i>	Russian thistle	-
<i>Taraxacum officinale</i>	Common dandelion	-
<i>Ulmus pumila</i>	Siberian elm	Watch list
<i>Verbena bracteata</i>	Prostrate vervain	-
<i>Verbascum thapsus</i>	Common mullein	C

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Appendix D. Noxious Weed Fact Sheets

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Myrtle spurge

List A Species

Rangeland, pasture, and riparian site recommendations

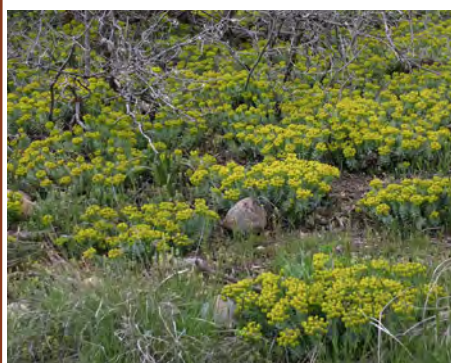
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Colorado Department of
Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us

Myrtle spurge Identification and Management



vegetation and reducing wildlife forage. Alternatives to planting myrtle spurge include native plants such as sulphur flower (*Erigeron umbellatus*), Kinnikinnick (*artocostaphylos uvursi*), or creeping mahonia (*Mahonia repens*). The soil seed reserve of myrtle spurge is estimated to be eight years. The site must be monitored for at least nine years after the last flowering adult plants have been eliminated and treatments repeated when necessary.

Identification and Impacts

Myrtle spurge (*Euphorbia myrsinites*) is a low growing perennial with trailing fleshy stems. The leaves are fleshy, blue-green and alternate. Flowers are inconspicuous with yellow-green, petal-like bracts that appear from March to May. Myrtle spurge spreads by seed and plants are capable of projecting seeds up to 15 feet. The plant grows from a taproot, with new stems emerging in early spring and dying back in the winter. Plants can grow up to 8-12 inches high and 12-18 inches in width.

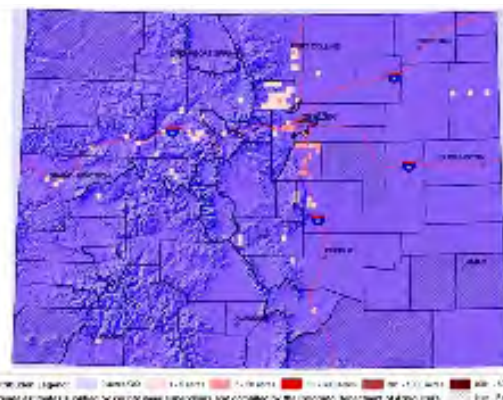
Myrtle spurge contains a toxic, milky sap which can cause severe skin irritations, including blistering. This plant is poisonous if ingested; causing nausea, vomiting and diarrhea. Wearing gloves, long sleeves, shoes, and eye protection is highly recommended when in contact with myrtle spurge, as all plant parts are considered poisonous.

Myrtle spurge is an invasive Ornamental that is native to Eurasia. It is popular with xeriscapes and rock gardens, preferring sunny to partly sunny areas and well drained soils. Myrtle spurge rapidly escapes gardens and invades sensitive ecosystems, out competing native

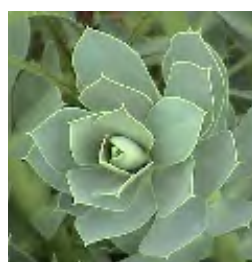
The key to effective control of myrtle spurge is to remove plants prior to seed set and to detect and remove new populations in natural areas early on. Small areas can be easily removed by mechanical means but should be done early to prevent triggering seed launching. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Myrtle spurge is designated as a "List A" species in the Colorado Noxious Weed Act. It is designated for statewide eradication. For more information visit www.colorado.gov/ag/weeds and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Map of myrtle spurge infestation.



Photos © Kelly Uhing, Colorado Department of Agriculture and (above) Crystal Andrews, Colorado Department of Agriculture.



Key ID Points

1. Low growing plant with blue-green, waxy leaves.
2. Flowers are yellow-green petal like bracts that appear from March to May.

Updated on:
7/2015

Euphorbia myrsinites



CULTURAL

Keeping desirable vegetation healthy and thick will help keep invaders out. Prevent the establishment of new infestations by minimizing disturbance and seed dispersal. Survey your land regularly to detect new invaders and eradicate any new populations quickly.



BIOLOGICAL

Biocontrol is not an approved method of control for State List A species. Eradication as the management objective for all List A species. For more information on insect biocontrol in Colorado, please contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916



MECHANICAL

Hand pull or dig when soil is moist. Make certain to pull all the roots and wear rubber gloves and eye protection to protect yourself from the toxic milky sap. Treatment follow up is important to check root fragment resprouts that will occur when the tap root is severed too shallow.

Integrated Weed Management:

Since Myrtle spurge spreads mainly by seed, it is very important to prevent seed production and deplete the seed bank. Remove mature plants prior to setting seed and seedlings whenever present.

Populations can be managed mechanically and by spot treatment of herbicides. It is important to be persistent with follow up treatments for many years.

Myrtle spurge

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. **Always read, understand, and follow the label directions. The herbicide label is the LAW!**

Herbicide	Rate	Application Timing
2,4-D ester	2 qt./acre + 1% v/v methylated seed oil	Use a 2,4-D ester formulation that has a 4.0 lbs. active ingredient/acre. Apply during spring or during fall regrowth.
Dicamba + 2,4-D	1 pint/acre dicamba + 2-3 pints/acre 2,4-D (amine or ester)	Use a 2,4-D formulation that has a 4 lbs. active ingredient/gallon. Apply during spring or during fall regrowth.
Picloram (Tordon/Picloram 22K - Restricted use pesticide) + 2,4-D	20 oz./acre + 2-3 pints/acre 2,4-D (amine or ester)	Apply at flowering growth stage during spring or to fall regrowth. DO NOT use near trees, desirable shrubs, water, or high water table.
Additional herbicide recommendations for other species can be found at: https://goo.gl/VFPCUV		



Russian knapweed *Acroptilon repens*



that can grow to become independent plants. Once rosettes emerge in the spring, remaining root buds slough-off until they develop again in late summer. Additionally, root fragments can develop into new plants.

Russian knapweed is allelopathic, which means it contains a toxic substance that inhibits the growth of competing plants. This weed may also be toxic to horses resulting in serious injury or possibly death of the animal. Russian knapweed displaces native vegetation and reduces forage values on range and pasturelands.

Habitat for Russian knapweed includes roadsides, ditch banks, riparian zones, pastures, rangeland, saline soils, clear cuts, and cropland. It typically invades degraded areas and sites with full sun.

The most effective method of control for Russian knapweed is to prevent its establishment through proper land management. Maintain healthy pastures and rangeland and continually monitor your property for new infestations. If Russian knapweed is already established, using an integrated weed management approach proves to be effective. Russian knapweed can be managed with herbicides or biocontrol insects, but long-term control must include planting competitive plant species to occupy bare ground once infested by the weed. Details on the back of this sheet can help to create a management plan compatible with your site ecology.



© Steve Dewey USU



Key ID Points

1. Distinguished from other knapweeds by the flower's smooth, papery bracts.
2. Roots are brown to black with scaly appearance.
3. Rosettes and lower leaves deeply lobed.
4. Upper leaves are smaller, smooth margined, and not lobed.

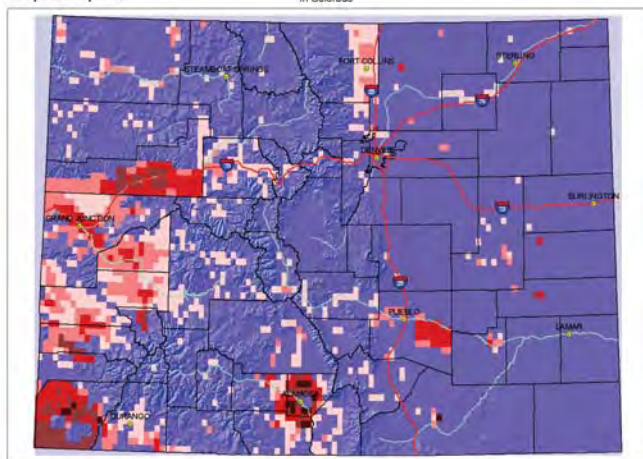
Russian knapweed (*Acroptilon repens*) is a non-native, deep-rooted perennial that spreads by aggressive, creeping, horizontal roots (rhizomes) and seeds. The roots are brown to black with a scaly appearance. Russian knapweed can grow up to 3 feet in height. The stems and leaves are covered with short gray hairs. The flowers are urn-shaped, pink to purple in color, and are solitary at the tips of the upper branches. Russian knapweed can be distinguished from other knapweeds by the smooth, papery, rounded bracts that surround the flowers. Russian knapweed emerges in early spring after soil temperatures remain above freezing. It produces flowers from June to August and sets seed in late summer to early fall. The seeds are viable for two to three years. Russian knapweed reproduces primarily from its root system. Buds on the horizontal roots can form adventitious shoots, August through the winter,

2008 Quarter Quad Survey

Russian knapweed
Acroptilon repens

2008 Quarterquad Survey
Distribution and Abundance
in Colorado

132,466+ Infested Acres



Distribution Legend: 0 ACRES/QUAD 1-5 6-50 51-300 301-1000 1001-5000
Acreage estimates supplied by county weed supervisors and compiled by the Colorado Department of Agriculture

Russian knapweed is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eliminated, contained, or suppressed depending on the local infestations. For more information, visit www.colorado.gov/ag/weeds and click on the Noxious Weed Program link or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-869-9030.

Integrated Weed Management Recommendations

The most effective control for Russian knapweed is to prevent its establishment through proper land management. An integrated weed management approach can be effective when dealing with Russian knapweed. It can be managed with herbicides or insects, but long-term control must include planting competitive plant species to occupy bare ground once infested by the weed.



CULTURAL

Maintain healthy pastures and prevent bare spots caused by overgrazing. Bare ground is prime habitat for weed invasions. Establishing sod-forming grasses or vegetation with dense shade can be an effective cultural control of Russian knapweed. Contact your local Natural Resources Conservation Service for seed mix recommendations.

BIOLOGICAL

The gall midge, *Jaapiella ivannikovi*, is a fly that lays eggs in the shoot tips of Russian knapweed. It forms galls that reduce flowering, seed production, and stunts the plants' growth. This biocontrol will stress the stand of Russian knapweed but will not likely eliminate it. The Colorado Department of Agriculture - Palisade Insectary, 970-464-7916, is currently establishing this biocontrol. It is not yet available to the public.

MECHANICAL

Mowing several times before the plants bolt stresses Russian knapweed and forces it to use nutrient reserves stored in the root system. However, mowing alone will not eliminate the infestation and it can stimulate shoot sprouting the following year. Mowing combined with a fall herbicide application will enhance control. Tilling and disking can create root fragments that can sprout. However, repeated deep tillage (1 foot) over 3 years can kill much of the root system.

CHEMICAL

The following are recommendations for herbicides that can be applied to range and pasturelands. Always read, understand, and follow the label directions. Please read label for exact rates. The herbicide label is the LAW!

Herbicide	Rate	Application Timing
Aminopyralid* (Milestone)	7 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply in the fall when above-ground stems die back and root buds are highly susceptible. Can also apply in the bud to senescence stages or in the spring during early bolt before flower buds form.
Aminocyclopyrachlor + Chlorisulfuron (Perspective)*	4-5 oz. product/acre + 1% v/v methylated seed oil	Apply in the fall when above-ground stems die back and root buds are highly susceptible. Can also apply in the bud to senescence stages or in the spring during early bolt before flower buds form. IMPORTANT: Applications greater than 5.5 oz. product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not for use on grazed or feed forage. Not for use on grazed or feed forage.

Note: *Product not permitted for use in the San Luis Valley. **This herbicide has residual soil activity that will affect all broadleaf seedlings germinating after application has occurred.

Additional herbicide recommendations for this and other species can be found at:

goo.gl/TvWnv9

Russian knapweed

Acroptilon repens



© Bruce Ackley, OH State University

Musk thistle *Carduus nutans* L. is a non-native biennial forb that reproduces solely by seed. During the first year of growth, a rosette forms in spring or fall. During the second year in mid to late spring, the stem bolts, flowers, sets seed, and the plant dies.

Musk thistle can grow up to 6 feet tall. The leaves have spines, are waxy, and dark green in color with a prominent light green to white midrib that can be seen from a distance. Leaves are dentately lobed; leaf bases sometimes extend down below the point of attachment. The terminal flower heads are purple, large in size (1.5 to 3 inches in diameter) and bend over as if nodding. These flower heads are made up of only disk flowers. They are surrounded by numerous, wide and stout lance-shaped, spine-tipped bracts that resemble an open pineapple. The pappus has

plumose bristles that appear barbed under magnification. Musk thistle produces many flower heads. The tallest shoots flower first; lateral shoots develop in leaf axils. A robust plant may produce 100 or more flowering heads. Reproduction is usually via out-crossing through insect pollination, but self-pollination also occurs. Flowers emerge in May through September. Seeds develop shortly after flowers emerge. Flower buds can contain viable seeds from self-pollination. Seeds can mature on severed bud and flower heads. Seeds remain viable in the soil for up to about 14 years. Seeds can germinate and emerge from spring through fall.

Musk thistle habitat is found in a variety of environments extending from shortgrass prairie to alpine. It is strongly associated with heavily disturbed sites, where over-use occurs or where site conditions are poor due to land management practices. This includes over-grazed areas, large fires, trails, ditches and roadsides. Infested livestock pastures suffer from significantly decreased carrying capacity.

Because musk thistle reproduces solely from seed, the key for successful management is to prevent seed production. Once flowers emerge and start to produce seed, effective management options will become limited. Once sites are infested, musk thistle can form dense stands. Prevention, adjusting land management practices, a robust integrated treatment plan and restoration are critical to eliminating this species.

Musk thistle is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be eradicated; some populations may be contained or suppressed depending on state regulations. For management directions for each county, refer to the most recent Rule, or visit www.colorado.gov/ag/weedcontacts for details.



© Chris Evans, University of IL



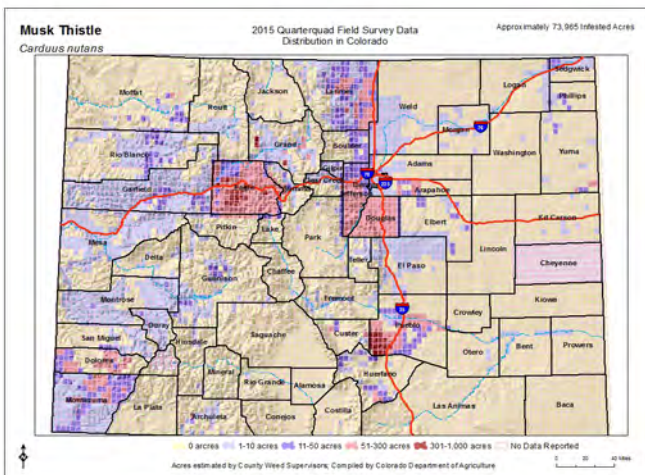
© Les Mehrhoff, DiscoverLife.org



Musk thistle

Carduus nutans L.

2015 Quarter Quad Survey



Key ID Points

1. Leaf with white midrib and leaf margins with spines.
2. Pappus with plumose barbed bristles.
3. Wide, stout lance-shaped bracts with spiny tips.

Integrated Weed Management Recommendations

Musk thistle

Carduus nutans L.

Effective integrated management means using a variety of eradication methods that also includes restoration, prevention of seed production and dispersal, and monitoring. Maintain robust healthy native landscapes and restore degraded sites. Avoid soil disturbance. As with most biennials, prevent seed production in the first and second year of musk thistle growth. Prevent seed from dispersing, such as on contaminated equipment. Rest sites until they are effectively restored. Change land use practices. Use methods appropriate for the site.



© Norman E. Rees, USDA Ag Research Service

CULTURAL CONTROL METHODS

Musk thistle is not tolerant of competition and needs light to germinate seeds. Cultural methods should aim to maintain or restore a competitive assemblage of forbs, cool and warm season grasses. Implement whole site restoration of soils, plants and water regimes where stands of musk thistle exist where needed. Use locally adapted species that are ecologically appropriate for the site to improve competitiveness. Include annual as well as perennial species. Incorporate soil amendments, soil microbes and mycorrhizal fungi in restoration and land management efforts. Minimize soil compaction and disturbance, especially in wetlands and moist soil. Irrigation can increase competitive species.



© Eric Coombs, OR Dept of Agriculture

BIOLOGICAL CONTROL METHODS

Although horses, cattle, goats and sheep may eat flower heads on a few plants, seeds pass through their digestive tracks unaltered and spread. The leaf and stalk spines can cause domestic livestock to avoid mature musk thistle. Thus, musk thistle can become an "increaser" in over-grazed systems. Properly managed grazing can improve vigor of desired species and indirectly reduce musk thistle. *Trichosirocalus horridus* is the only biological control agent available for musk thistle in Colorado. The other species, *Rhinocyllus conicus*, is not host specific and will damage native thistles, and therefore cannot be released as an agent in Colorado. For more information, visit the Colorado Department of Agriculture's Palisade Insectary website at www.colorado.gov/ag/biocontrol.



© Friends of NV Wilderness Stewardship Team

MECHANICAL CONTROL METHODS

Methods, such as tilling, hoeing and digging, are best for infestations smaller than 0.5 acres; weigh this against other plants present, ecology and site condition. Sever roots below the soil surface during the first year before the plant stores energy, and in the second year before flower production. Mowing, chopping and deadheading stimulates more flower production; these methods require consecutive years of season-long treatments. All flowerbuds and heads must be collected, bagged, and disposed of or destroyed; seeds will mature and germinate if left on the ground. Prescribed fire that results in high soil burn severity damage roots and above ground biomass, but is not recommended due to impacts on desired plants. Fire generally favors musk thistle germination.

CHEMICAL

NOTE: The following are recommendations for herbicides that can be applied to pastures and rangeland. Rates are approximate and based on equipment with an output of 30 gal/acre. Follow the label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

HERBICIDE	RATE	APPLICATION TIMING
Aminopyralid* (Milestone)	6 oz./acre + 0.25% v/v non-ionic surfactant	Apply in spring rosette to early bolting growth stages or in fall to rosettes. *Product not permitted for use in the San Luis Valley.
Chlorsulfuron** (Telar)	1-2.6 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply in spring from rosette through very early flower growth stages. (Can prevent viable seed formation if applied no later than the first viable flowers begin to open.) **This herbicide has residual soil activity that will affect all broadleaf seedlings germinating after application has occurred.
Clopyralid (Transline)	0.67-1.33 pints product/acre + 0.25% v/v non-ionic surfactant	Apply to rosettes through flower bud stage in spring, or to fall rosettes.



Colorado Department of Agriculture - Conservation Services

305 Interlocken Parkway

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www.colorado.gov/ag/weeds



Chinese clematis

Colorado Department of
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(303) 869-9030
weeds@state.co.us



Key ID Points

1. Solitary flowers with four yellow sepals.
2. A herbaceous to woody vine climbing perennial.

Chinese clematis Identification and Management



Identification and Impacts

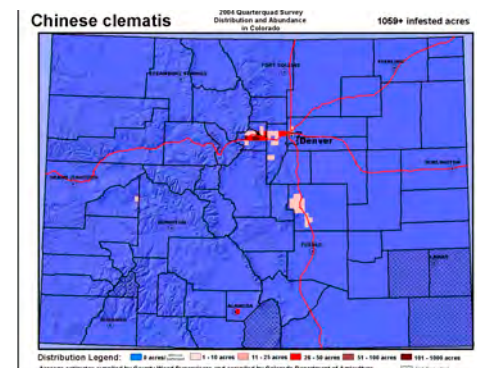
Chinese clematis (*Clematis orientalis*) is a herbaceous to woody vined perennial that is native to Eurasia. It is an escaped ornamental species that is a deciduous climber growing up to 12 feet. Solitary flowers have four yellow sepals (petal-like structures) that are often nodding. Each flower produces numerous feathery, long-tailed fruits which are conspicuous all winter. The plant flowers from August to September.

Habitats for Chinese clematis include roadsides, riparian corridors and rocky slopes. It is sometimes found in open woods. Plants prefer sunny areas but have shown to be somewhat shade tolerant. Chinese clematis prefers well-drained soils.

Chinese clematis can cause death to young trees and brush. It outcompetes native shrubs and herbaceous species. Plants will completely cover; rock walls, trees, bushes and fences. The juice of freshly crushed leaves and stems have blister causing agents.

The key to effective control of Chinese clematis is preventing the plants from going to seed. Pulling the woody stem prior to flowering can be an effective control. Chemical treatments are also effective when dealing with Chinese clematis. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Chinese clematis is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/weeds and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Updated on:
07/2015

Photos and Map © Colorado Department of
Agriculture.

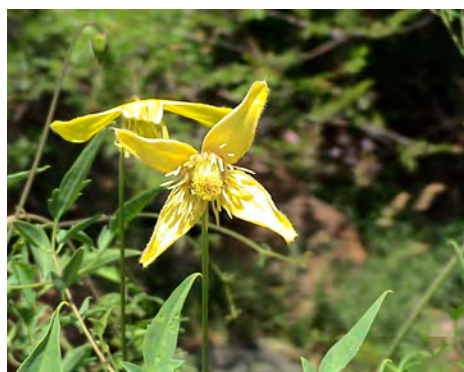
Clematis orientalis

**CULTURAL**

Cultural controls are possible in theory, but are very time consuming and expensive. Complete removal of any seedlings or newly established plants by continual hand pulling is also possible.

**BIOLOGICAL**

There is no biological control available for Chinese clematis. Since biological control agents take years to research, develop and release, no releases are expected in the foreseeable future. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

**MECHANICAL**

Hand pull or dig when soil is moist. Make certain to pull all the roots and bag specimens carefully so as to not scatter seeds if flowering.

Integrated Weed Management:

The most effective control method for dealing with Chinese clematis is preventing the plant from going to seed. Pulling the plant from the ground, by the woody stem, prior to the plant flowering is the most effective control. Chinese clematis also responds well to chemical treatments.

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

Herbicide	Rate	Application Timing
2,4-D amine	2 qts. product/acre at 4.0 lb active ingredient/gallon of product + 0.25% v/v non-ionic surfactant	Apply anytime when the plant is actively growing. Will damage neighboring brush species, if present.
Imazapic (Plateau, Panoramic)	12 oz. product/acre + 1 qt./acre methylated seed oil	Apply in the fall at flowering growth stage.
Aminopyralid (Milestone)	4 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply at flowering growth stage in the fall.
Additional herbicide recommendations for other species can be found at: goo.gl/TvWnv9		

Top to bottom photos, © (Top 2 photos) Stevens County (Washington State) Noxious Weed Control Board; and bottom photo David Hallinan, Bannock County Weed Superintendent, Idaho Weed Awareness Campaign.

Chinese clematis





reddish, and have surfaces coated with gray and scaly pubescence, becoming smooth.

Once thought to be a beneficial windbreak tree, it since has been deemed detrimental to the environment. Russian olive can grow in a variety of soil and moisture conditions, but prefers open, moist, riparian zones. It is shade tolerant and can be found along streams, floodplains, fields and open areas up to approximately 8,000 feet in elevation. Russian-olive can outcompete native plants, interfere with natural plant succession and nutrient cycling, and tax water reserves. Because Russian olive is capable of fixing nitrogen in its roots, it can grow on bare, mineral substrates and dominate riparian vegetation. Although Russian olive provides a plentiful source of edible fruits for birds, ecologists have found that bird species richness is actually higher in riparian areas dominated by native vegetation.

The key to effective control of Russian olive is preventing establishment of the trees or shrubs. If plants are already present, control options include cut-stump treatments and mechanical mowing. These treatments depend on size and location of the plant. Details on the back of this sheet can help you create a management plan compatible with your site ecology.

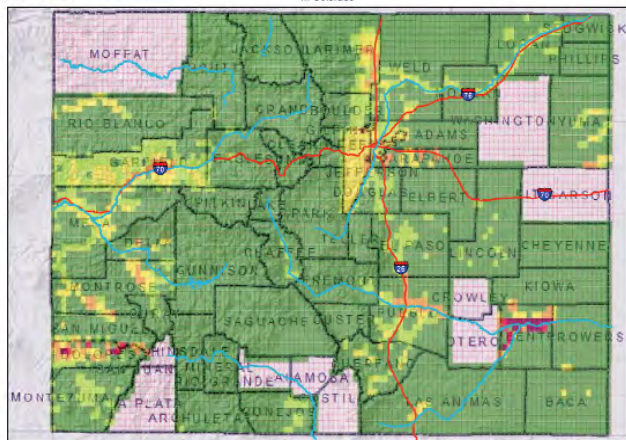


Russian olive *Elaeagnus angustifolia*

Russian Olive
Elaeagnus angustifolia

2013 Quarterquad Survey
Distribution and Abundance
In Colorado

64,150+ Infested Acres



Russian olive is redesignated as a “List B” species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/weeds and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Key ID Points

1. Leaves are silvery white.
2. Branches have 1 to 2 inch thorns.
3. Yellow-red fruits on mature plants.
4. Mature trees have shedding, reddish-brown bark.

Integrated Weed Management Recommendations

Integrated weed management offers the most effective combination of control efforts through the “cut stump” treatment. Trees are cut down with a hatchet or chainsaw, then immediately treated with an approved herbicide on the surface of the cut stump. The most effective timing is late summer/early fall for herbicide transfer into the roots.



© John Randall, TNC



© James Miller, USFS



© Chris Ness, Adams County



© Scott Peterson, USDA

CULTURAL

Replace Russian olives with native trees. Prevent establishment of new trees by removing seedlings and saplings before they mature. Contact your local Natural Resources Conservation Service for recommendations of other possible trees or shrubs.

BIOLOGICAL

Tubercularia canker is an unapproved biocontrol. However, it overwinters on infected stems and spreads via rain-splash, animals, or pruning implements to open wounds in the bark. Infected tissue becomes discolored or sunken. Entire stems may be girdled and killed, and the disease can deform or kill stressed plants over time.

MECHANICAL

Saplings can be pulled with a weed-wrench or cut with brush-cutters. Trees can be girdled or cut with chainsaws. However, stump sprouting commonly occurs after cutting down the tree; and stump excavation without removing all parts of the roots can result in root sprouting. Treating cut-stumps with an herbicide can eliminate sprouting. Stump burning is practical when conditions support a long, hot fire and most effective in summer or early fall. Saplings are most sensitive to mechanical treatment.

CHEMICAL

The table below includes recommendations for herbicides that can be applied to range and pasturelands. Always read, understand, and follow the label directions. The herbicide label is the LAW!

Herbicide	Rate	Application Timing
Triclopyr (Garlon 4, Remedy)	20-30% solution in basal bark oil. The herbicide Pathfinder comes pre-mixed in oil and does not require dilution.	Cut-Stump Treatment: Apply to the cambial layer of the tree immediately after the cut-stump treatment and to roots above soil surface. (Summer to fall; fall treatments showed fewer re-growth) Basal Bark Treatment: Spray till wet but not dripping; the roots above soil surface, root collar, and lower trunk to a height of 12-15 inches above ground (Late summer to fall)
Glyphosate* (Rodeo - approved aquatic label)	Undiluted (100% solution) or 50% solution in basal bark oil	Cut-Stump Treatment: Apply to the cambial layer of the tree immediately after the cut-stump treatment and to roots above soil surface. Diluted solutions requires regular agitation. Treat summer to fall; fall treatments showed fewer re-growth.

Note: *These products are non-selective and will kill any vegetation contacted.

Additional herbicide recommendations for this and other species can be found at:

goo.gl/TvWnv9



Colorado Department of Agriculture - Conservation Services

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Dalmatian toadflax

List B Species

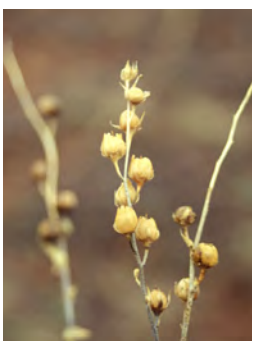
Rangeland, pasture, and riparian site recommendations

1

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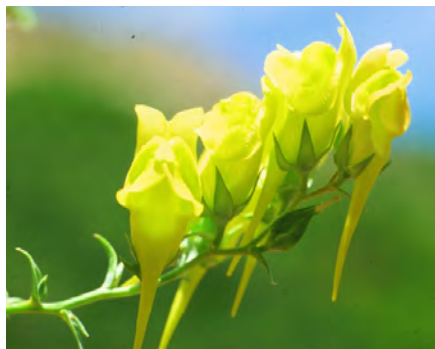
(303) 869-9030
weeds@state.co.us



Key ID Points

1. Showy yellow snapdragon-like flowers with an orange throat on elongated racemes.
2. Thick, waxy, bluish heart-shaped leaves that wrap the stem.

Dalmatian toadflax Identification and Management



Identification and Impacts

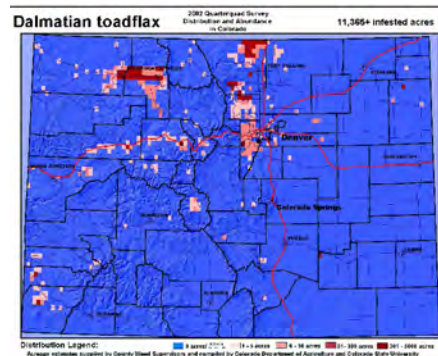
Dalmatian toadflax (*Linaria dalmatica*) is a non-native, perennial forb introduced from the Mediterranean region as a folk remedy, fabric dye and ornamental. It reproduces both by seed and by extensive, creeping rhizomes. A single plant produces 500,000 seeds, most of which fall within 18 inches of the parent plant. Seeds can remain viable for at least 10 years. Dalmatian toadflax grows to 3 feet, and has bright yellow snapdragon-like flowers with an orange throat on elongated racemes. The alternate leaves are broad, with a thick, waxy cuticle and a bluish cast. Each leaf is heart-shaped and wraps the stem.

Habitats for Dalmatian toadflax include disturbed open sites, fields, pastures, rangeland, roadsides, cropland and forest clearings. Infestations can begin in small disturbed sites, then spread even to rangeland and wildlife habitats in excellent condition. Dalmatian toadflax is a highly aggressive plant that can genetically adapt to varied environmental conditions and herbicide controls. Its extreme competitiveness is due to early spring regeneration from vegetative buds on roots that are not dependent on soil moisture or native plant competition. Once established, toadflax quickly overruns native plants and becomes

a monoculture that severely reduces forage, productivity, biodiversity and wildlife habitat.

The key to effective control of Dalmatian toadflax is prevention and integrating as many management strategies as possible. Prevention is always desirable when dealing with Dalmatian toadflax. Early detection and eradication can keep populations from exploding, making more management options available. With the plants varying genetically using many different approaches is important such as; chemical, mechanical, cultural and biological methods. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Dalmatian toadflax is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Clockwise, from lower left, photos © John M. Randall of The Nature Conservancy; and Linda Wilson and Susan Turner of Invasive.org. Infestation map by Crystal Andrews, Colorado Department of Agriculture.

Linaria dalmatica

Updated on:
07/2015



CULTURAL

It is imperative to seed managed areas with competitive grasses such as thickspike wheatgrass and streambank wheatgrass. The combination of herbicide spraying and seeding competitive grasses controls Dalmatian toadflax better than spraying alone. (K.G. Beck, CSU)



BIOLOGICAL

Calophasia lunula, a predatory noctuid moth, feeds on leaves and flowers of Dalmatian toadflax. Eteobalea intermediella, a root boring moth, and Mecinus janthinus, a stem boring weevil, are also available. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.



MECHANICAL

For small infestations, pulling toadflax by hand can be effective. Pull every year for 5 to 6 years to deplete the reserves of the root system. Monitor the site for 10 - 15 years to remove seedlings produced from dormant seeds.

Integrated Weed Management:

Because of the high genetic variability of the toadflax species, it is critical to integrate as many management strategies as possible into the control program. Two local populations may respond differently to the same herbicides.

Keys to management are to prevent seed formation and vegetative spread by roots.

Controlling toadflaxes is expensive and difficult, prevention is the best option.

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. **Always read, understand, and follow the label directions. The herbicide label is the LAW!**

Herbicide	Rate	Application Timing
Aminocyclopyrachlor + chlorsulfuron (Perspective)*	4 oz. product/acre + 1% v/v methylated seed oil	Apply <u>when flowering</u> in spring and/or in the fall regrowth. IMPORTANT: Applications greater than 5.5 oz. product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not for use on grazed or feed forage.
Picloram* (Tordon/Picloram 22K - Restricted use pesticide)	1-2 qts./acre + 1% v/v methylated seed oil	Apply <u>when flowering</u> in spring and/or in the fall regrowth. DO NOT use near trees, desirable shrubs, water, or high water table.
Chlorsulfuron** (Telar)	1.5-2 oz./acre + 1% v/v methylated seed oil	Apply <u>when flowering</u> in spring and/or in the fall regrowth.
Note: *Not permitted for use in the San Luis Valley. **This herbicide has residual soil activity that will affect all broadleaf seedlings germinating after application has occurred.		
Additional herbicide recommendations for this and other species can be found at: goo.gl/TvWnv9		

Top photo, © Kelly Uhing, Colorado Department of Agriculture. *Calophasia lunula* larva photo © Bob Richard, USDA APHIS, Invasive.org. Handpulling toadflax photo © Lake Tahoe Environmental Education Coalition.

Dalmatian toadflax





spine-tipped bracts curve away from the flowering head. The flower receptacle is fleshy and has pits to hold seeds. The plants flower from mid-June to September. Scotch thistle seeds have the ability to mature in flower buds and heads that have been removed from the stalk. Both species can produce up to 14,000 seeds per plant. Seeds remain viable for up to 30 years but germinate readily with moisture in spring and fall.

Scotch thistle invades rangeland, overgrazed pastures, roadsides, and irrigation ditches. Both species prefer moist soil, such as areas adjacent to creeks and rivers. Roadsides appear to be especially vulnerable to invasion likely due to the water runoff from the shoulders. Maintaining healthy pastures and native plants, minimizing soil disturbance, changing land use practices to prevent overuse, and using seed-free equipment are critical measures to preventing infestations. As with most biennials, once established, limiting seed production is critical to effective control. Due to the robust, spiny nature of Scotch thistle, this plant can act as a living barbed wire fence, making areas impassible for wildlife, livestock, and people and unpalatable to cattle.

To control seed production, plants with buds or flowers should be collected, bagged and immediately disposed of or destroyed. Chemical control is most effective when plants are in rosette stage, spring or early fall. Mechanical controls

can be used to eliminate small patches or plants in a later growth stage.

Scotch thistle is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be eradicated; some populations may be contained or suppressed depending on state regulations. For state regulations described for each county, refer to the most recent Rule, or visit www.colorado.gov/ag/weedcontacts for details.



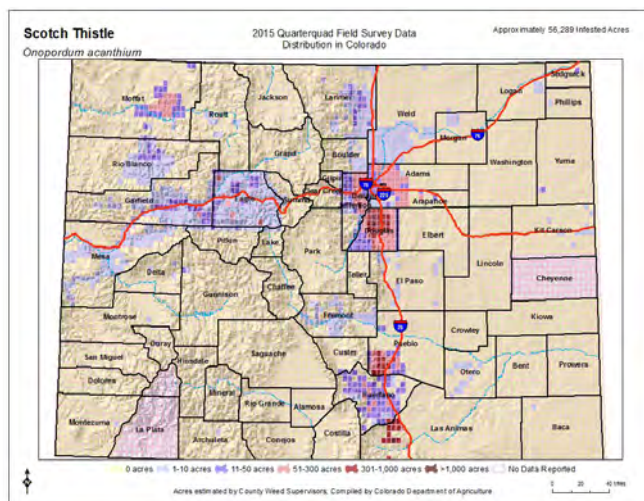
Onopordum acanthium L. and *O. tauricum* Willd.

Scotch thistle

Key ID Points

1. Pitted fleshy flower receptacle.
2. Prominent mid-rib.
3. Wide lobed leaves with distinct mid-rib.
4. Wide spiny wings extend the length of the stem.

2015 Quarter Quad Survey



Integrated Weed Management Recommendations

Scotch thistle

Onopordum acanthium L. and *O. tauricum* Willd.

Effective integrated management means using a variety of eradication methods along with restoration, prevention of seed production and dispersal, and monitoring. Maintain robust healthy native landscapes. Restore degraded sites. Avoid soil disturbance. As with most biennials, prevent seed production in the first and second year of growth. Prevent seed from dispersing, such as on contaminated equipment. Rest sites until they are effectively restored. Change land use practices. Use methods appropriate for the site.



CULTURAL CONTROL METHODS

Effectiveness begins with maintaining or restoring a competitive native forb and forb assemblage. Continue restoration efforts until native plants are robust and abundant. Use locally adapted native seeds whenever possible to improve competitiveness. Include cool season and warm season, as well as perennial and annual grasses in revegetation efforts. Soil may need to be restored by adding soil amendments, soil microbes, mycorrhizal fungi and nitrogen fixing plants such as legumes. Manage land uses so they do not create bare mineral soil or compact soil. Annual crop cultivation appears to be an effective control measure.



© Jacqui Turner, The Timaru Herald

BIOLOGICAL CONTROL METHODS

Domestic livestock are likely to avoid this plant due the large number of spines all over the plant. Goats and sheep may eat flower heads if plants are small. Since most livestock and herbivores avoid the leaves and stems, Scotch thistle can become an "increaser" in over-grazed systems. Properly managed grazing systems can increase desirable plant vigor and indirectly reduce Scotch thistle. There are no known biological control agents effective against scotch thistle or authorized in Colorado. For more information about biological control agents, visit the Colorado Department of Agriculture's Palisade Insectary website at www.colorado.gov/ag/biocontrol.



© Bugwood

MECHANICAL CONTROL METHODS

Methods, such as tilling, hoeing and digging, are best for infestations smaller than 0.5 acres; weigh this against other plants present, ecology and site condition. Sever roots below the soil surface during the first year before the plant stores energy and in the second year before seed production. Mowing, chopping and deadheading stimulates more flower production; these methods require consecutive years of season-long treatments. Flower heads must be collected, bagged, and disposed of or destroyed; seeds will mature and germinate if left on the ground. Fire gives Scotch thistle a competitive advantage. Large fleshy stems and leaves would not be consumed in a low severity fire and seeds would remain unaffected. High severity fires would likely damage native plants, which favors Scotch thistle if seeds are not killed and this is not recommended.

CHEMICAL

NOTE: The following are recommendations for herbicides that can be applied to pastures and rangeland. Rates are approximate and based on equipment with an output of 30 gal/acre. Follow the label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

HERBICIDE	RATE	APPLICATION TIMING
Aminopyralid* (Milestone)	7 oz. product/acre + 0.25-0.5% v/v non-ionic surfactant	Apply in spring rosette to early bolting growth stages or in fall to rosettes. *Product not permitted for use in the San Luis Valley.
Chlorsulfuron** (Telar)	1-2.6 oz. product/acre (0.75 oz. active ingredient/acre) + 0.25% v/v non-ionic surfactant	Spring from bolting to flower bud stages. **This herbicide has residual soil activity that will affect all broadleaf seedlings germinating after application has occurred.
Metsulfuron + Chlorsulfuron (Cimarron X-tra)	2 oz. product/acre + 0.25-0.5% v/v non-ionic surfactant	Apply during rosette to flower bud stages.
Clopyralid (Transline)	0.67-1.33 pints product/acre + 0.25% v/v non-ionic surfactant	Apply to rosettes in spring or fall.
Aminocyclopyrachlor + chlorsulfuron (Perspective)*	4.75-8 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply from the seedling to the bolting stage. IMPORTANT: Applications greater than 5.5 oz. product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not for use on grazed or feed forage.



Colorado Department of Agriculture - Conservation Services

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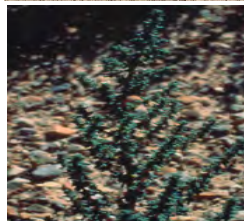


Halogeton

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weeds@state.co.us



Key ID Points

Identification and Management



Identification and Impacts

Halogeton (*Halogeton glomeratus*) is an annual forb native to Asia. The plant ranges in height of a few inches off the ground to 18 inches tall. Halogeton starts as a low growing multi-branched, spreading plant and then stems become erect with maturity. Plants begin as a blueish-green color in the spring turning redish-yellow later in the summer. Leaves are nearly tubular, small, and fleshy in nature. The ends of the leaf are tipped with a delicate needle-like spine. Flowers are inconspicuous, green and borne at the leaf axils. The root system is fibrous and spreading. Halogeton mainly reproduces by seeds. There are two different types of seeds produced. The seeds that are brown in color, generally will lie dormant and stay viable for many years. The seeds that are black in color will generally reproduce in the same growing season.

Habitats for Halogeton include roadsides, trails, areas where animals congregate, overgrazed sites, and is ideally adapted to the high desert/alkaline soils. The Plant can be toxic to grazing animals and at

times it is readily grazed by animals. Sheep seem to be most affected by the toxic oxalates, cows can also be affected. Halogeton is hard to eradicate in plant populations have been present for more than 2 years, since seeds can stay viable up to 10 years.

The key to effective control of Halogeton is preventing the plant to establish viable populations. Halogeton does not outcompete native vegetation, so maintaining and revegetating sites that are overgrazed are effective management tools. Herbicide treatments can also be effective in plant populations that are small. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Halogeton is designated as a "List C" species on the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local jurisdictions managing this species. For more information, visit www.colorado.gov/ag/weeds or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Photos © Bottom right, Bottom left, and top left; Kelly Uhing, Department of Agriculture; All others Clinton Shock, Oregon State University, Bugwood.org

Halogeton glomeratus

**CULTURAL**

Outcompeting Halogeton proves to be the most economical treatment method. Planting desirable grasses and forbs on disturbed sites, and where Halogeton populations are established will help control populations. For specific seed recommendations contact your local Natural Resources Conservation Services for seed mixes.

**BIOLOGICAL**

Currently there is not any biocontrol available for Halogeton. Biocontrol takes many years of research and development. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916 for more information.

**MECHANICAL**

Hand pull or dig when soil is moist, but make sure to wear gloves. Bag specimens carefully so as not to scatter seeds. The key to effective control is to prevent seed production and/or spread.

Integrated Weed Management:

Using cultural and herbicide treatments in combination can help control Halogeton populations. Halogeton does not outcompete native vegetation, so maintaining healthy plant populations and revegetating areas that have been disturbed, proves to be the most economical method of treatment.

Halogeton

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

HERBICIDE	RATE	APPLICATION TIMING
Metsulfuron + Chlorsulfuron (Cimmaron X-tra)	2.0 oz/acre	Apply pre-emergence to post-emergence stages in spring. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water.
Chlorsulfuron (Telar XP)	1/2 - 1 oz/acre	Apply pre-emergence to post-emergence stages in spring. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water.

Photos © Top to Bottom; (Unknown) Harney County Oregon; Whitney Cranshaw, Colorado State University, Bugwood.org; Kelly Uhing, Colorado Department of Agriculture





©James Bailey, iNaturalist

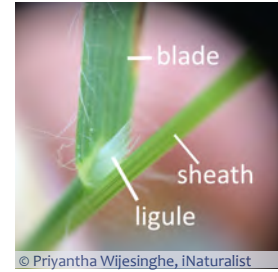
Cheatgrass (*Bromus tectorum* L.) is a winter annual grass in the Poaceae family, also known as downy brome.

Mature plants reach up to 24 inches tall. The stems are smooth but the leaf blades and sheath are hairy (downy). The ligules are fringed, short and membranous. The culms range from five to 90 cm long, can be prostrate or vertical, and have fine short hairs. Its fibrous roots can be up to 60 inches long, but the majority of root biomass is within first 12 inches of the soil surface. Roots are efficient at absorbing soil moisture, allowing cheatgrass to grow quickly early in season, while other plants are still dormant. Green up can occur twice per season. Cheatgrass has an unique spectral signature during seed set and senescence when it turns reddish purple. During these shoulder growing season events, it is easily detectable from other vegetation with satellite imagery.

The flower is a simple one-sided panicle that characteristically flops over and hangs, branches and is open. Spikelets are usually terminal. Usually there are five to many florets; it has perfect flowers. The upper and lower glumes are usually unequal in length and shorter than florets; the lower glume ranges from 4 to 14 mm in length and is one veined. The upper glume is three-veined. The plant disarticulates above the glumes. The lemmas are usually downy, narrowly lanceolate with sharp tips and about 9 to 12 mm long. Usually there are five to many lemmas. Awns are usually present and range from 10 to 18 mm long. It is a prolific seed producer, capable of two seed crops per season. Seeds need to be buried in soil or litter and have fall moisture to germinate. The fall seed crop has greater reproductive success than spring. Seeds lack dispersal anatomy so fall close to parent plants but transport readily with animals, people and equipment. Seed longevity is about three years. Both inbreeding and cross breeding occur.

Cheatgrass is one of the most competitive non-natives in the Western US. It thrives in arid, semi arid, and cold environments. Colorado's high elevation range is not an issue for cheatgrass; plants were recently detected as high as 9,500 feet. It exhibits phenotypic plasticity and genetic diversity, making it highly adaptable to a variety of conditions, likely due to multiple introductions. Its presence has significant negative impacts throughout the West. Most notably, it alters fire regimes and thus engineers a positive fire feedback loop that favors its growth over other plants. This feedback loop is why cheatgrass forms monocultures throughout the West.

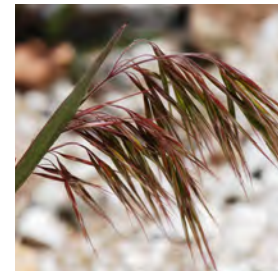
It is often confused with Japanese brome (*Bromus japonicus*), which has denser more compact spikelets, shorter awns, and changes from green to gold through the growing season.



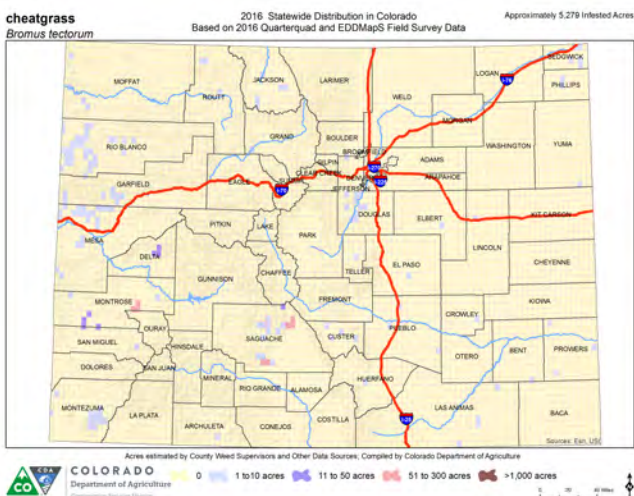
© Priyantha Wijesinghe, iNaturalist



© Veronika Johansson, iNaturalist



© Leslie J. Mehrhoff, University of CT



Key ID Points

1. Downy leaf blades, sheaths, ligules
2. Glumes are unequal size, lemmas are downy
3. One-sided panicle that droops, red-purple during seed set & senescence
4. Fibrous roots

Cheatgrass
Bromus tectorum L.

Integrated Weed Management Recommendations

Effective integrated management means using a variety of eradication methods in the same site along with restoration, prevention of seed production and dispersal, and monitoring. Maintain robust healthy native landscapes. Restore degraded sites. Avoid soil disturbance. Prevent seed production and seed dispersal, e.g. on contaminated equipment. Rest sites until restored. Modify land use practices. Use methods appropriate for the site, including land use practices.



© Martin Bernetti, Associated Press

CULTURAL

Biological soil crust is a soil health indicator of arid and semi arid sites; crusts inhibit cheatgrass seed germination. Aerial spread and cultivate soil crust where it is absent. Aerial and drill seeding bluebunch wheatgrass (*Pseudoroegneria spicata*) and Sandberg bluegrass (*Poa secunda*) with vesicular-arbuscular mycorrhizae; these are drought tolerant natives that are highly competitive against cheatgrass but require mycorrhizae. As these grasses establish and cheatgrass wanes slowly introduce additional species such as thickspike wheatgrass (*Elymus lanceolatus*), winterfat (*Krascheninnikovia lanata*), yarrow (*Achillea millefolium*) in the plant interspaces in subsequent years. Be cautious when purchasing seed as cheatgrass is often a contaminate, especially in mixes. Use seed pillows to disperse seeds.



© Stacy Litz, Associated Press

BIOLOGICAL

Sheep and cattle will select green cheatgrass which also affects desired cool-season grasses. Properly managed grazing can improve vigor of desired species and directly reduce cheatgrass. Post-fire grazing management varies depending on site potential and objectives. Currently there are no biological control agents for cheatgrass authorized in Colorado. For more biocontrol information, visit the Colorado Department of Agriculture's Palisade Insectary website at: www.colorado.gov/ag/biocontrol



© Bureau of Land Management

MECHANICAL

Mechanical methods are best for residential areas and small infestations. Mowing and chopping are not recommended; they leave roots behind, stimulate flower production, disperse seeds, and expand the size of the infested area. Collect, bag, and dispose of or destroy flowers; seeds can mature and germinate if left. Tilling must be deeper than 6 inches to work. Prescribed fire applied before seed maturity, (late spring or early summer), may kill seeds; the trick is to get green cheatgrass and litter to carry fire and at a hot enough temperature to destroy seeds and seedlings. Always combine prescribed fire with cultural methods, timed appropriately, and base it on site conditions and other plants present. Monitoring and adaptive management are critical if prescribed fire is used as a tool for control.



© Helena Weed Control, Rocky Mountain Elk Foundation

CHEMICAL

Pseudomonas fluorescens D7 inhibits cheatgrass and is currently approved by EPA and Colorado. NOTE: Herbicide recommendations to control cheatgrass in pastures and rangeland are found at: <https://goo.gl/TvWnv9>. Rates are approximate and based on equipment with an output of 30 gal/acre. Follow the label for exact rates. Consult local turf and ornamental experts for residential settings. Always read, understand, and follow the label directions. The herbicide label is the LAW!

Cheatgrass

Bromus tectorum L.



Colorado Department of Agriculture - Conservation Services

305 Interlocken Parkway

Broomfield, CO 80021

(303) 869-9030

www.colorado.gov/ag/weeds



Field bindweed

List C Species

Rangeland, pasture, and riparian site recommendations

1

Colorado Department of
Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us



Key ID Points

1. Leaves are shaped like arrowheads.
2. Flowers are funnel-shaped, white to pink, and have two small bracts one inch below the flower base.

Field bindweed Identification and Management



Identification and Impacts

Field bindweed (*Convolvulus arvensis*) is a non-native deep-rooted perennial that reproduces from seed and creeping, horizontal roots (rhizomes). Field bindweed stems are prostrate (grows low to the ground) and twining, and grow up to 6 feet long. Leaves are distinguishable by their arrowhead shape. The flowers are bell or trumpet-shaped, white to pink in color, and are about 1 inch long. Field bindweed seeds can remain viable in the soil for up to 40 years.

Field bindweed emerges from its root system in the spring. Flowering occurs from June to September and until the first fall frost. The number of seeds produced per plant ranges from 25 to 300 and seed production is variable depending on environmental conditions. Field bindweed is an extremely difficult noxious weed to control because, in part, of its taproot that may go 20 feet deep into the soil, and which repeatedly gives rise to numerous long rhizomes.

Field bindweed is a problem throughout Colorado. It is one of the most competitive perennial weeds. It is widespread in cultivated areas, pastures, lawns, gardens, roadsides, and waste areas from 4,000 to 8,000

feet in elevation.

To successfully manage field bindweed, containment and persistence in controlling existing stands are necessary in order to exhaust the root system and deplete the soil seed bank. This weed needs to be continually stressed, forcing it to exhaust root nutrient stores and eventually die. Of all control methods, prevention is most important. Maintain healthy pastures and rangeland and continually monitor your property for new infestations. A healthy cover of desirable perennial plants will assist in discouraging field bindweed establishment.

Field bindweed is designated as a "List C" species on the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local jurisdictions managing this species.

On the back of this sheet are field bindweed management recommendations. For more information, visit www.ag.state.co.us/csd/csdhome.html. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



White flower © Mary Ellen Harte, Invasive.org.
All other photos © Kelly Uhing.

Convolvulus arvensis



CULTURAL

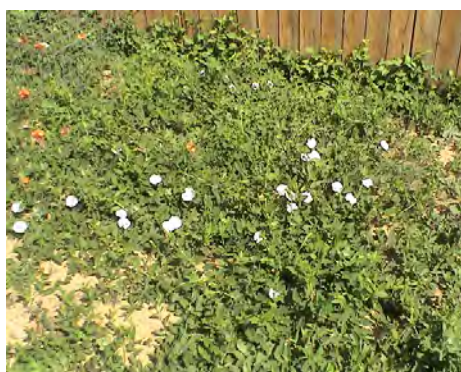
Establishment of selected grasses can be an effective cultural control of field bindweed. Contact your local Natural Resources Conservation Service for seed mix recommendations. Maintain healthy pastures and prevent bare spots caused by overgrazing. Bareground is prime habitat for **weed invasions**.



Bindweed mite damage

BIOLOGICAL

The bindweed gall mite, *Aceria mahlerbae*, has proven to be effective in reducing field bindweed infestations. This is an option for large infestations. To obtain a mite release, contact the Colorado Department of Agriculture, 970-464-7916.



MECHANICAL

Cutting, mowing, or pulling has a negligible effect unless the plants are cut below the surface in the early seedling stage. Well-established populations have a large seed bank in the soil that can remain viable for over 40 years.

Integrated Weed Management:

Field bindweed requires active management once it is established because of its potential to regenerate rapidly. Even small infestations should be viewed as a serious threat and managed aggressively.

Contain and persistently control infestations in order to exhaust the root system and deplete the soil seed bank.

Maintain a healthy cover of perennial plants to discourage field bindweed establishment.

HERBICIDES: The following are recommendations for herbicides that can be applied to range and pasturelands. *Rates are approximate and based on equipment with an output of 30 gallons per acre. Please read label for exact rates.* Always read, understand, and follow the label directions. **The herbicide label is the LAW!**

HERBICIDE	RATE	APPLICATION TIMING
Clarity + 2,4-D Amine	1 qt./acre or 1 oz/gal water	Just after full-bloom and/or fall. DO NOT apply near or under trees/shrubs or where soils have rapid permeability. DO NOT apply when outside temperatures will exceed 85 degrees. Add non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water.
Tordon 22K *this is a Restricted Use Pesticide*	1 qt./acre or 1 oz/gal water	Just after full-bloom and/or fall. DO NOT apply near or under trees/shrubs or where soils have rapid permeability. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/100 gal water.
Roundup Ultra *non-selective herbicide, will kill all vegetation*	4 - 5 qts./acre or 4 - 5 oz/gal water	Apply at full-bloom and/or fall. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/100 gal water. Use caution when applying near grasses or other desirable vegetation.

Field bindweed



Redstem filaree

List C Species

Rangeland, pasture, and riparian site recommendations

1

Colorado Department of
Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us

Redstem filaree Identification and Management



grazed by many different animals
especially sheep.

The key to effective control of Redstem filaree is preventing establishment of the plant and seed production. There are many options for control of Redstem filaree depending on site ecology. Both chemical and mechanical control options are effective. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Redstem filaree is designated as a "List C" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/weeds or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Identification and Impacts

Redstem filaree (*Erodium cicutarium*) is a winter annual or biennial forb that has a spreading or erect profile and is native to the Mediterranean or Asia. Part of the Geranium family, Redstem filaree grows generally from a rosette stage, and can grow from the 3 inches to 2 feet tall. The stems are hairy and red in color. The leaves are opposite and finely divided with toothed or lobed margins. They are pubescent, grow on short stems and have a reddish tint. The root system is a shallow taproot with fibrous secondary roots. The five petaled flowers are a purplish-pink in color and are in clusters of 2 or more. Each flower will produce five long lobed fruits. Each fruit will have an awn like tail which will dry and split with maturity. Redstem filaree primarily reproduces by seed and generally germinates in early spring.

Habitats for Redstem filaree include: dry pasturelands, landscapes, turfgrass and it prefers sandy soils. It can easily outcompete desirable vegetation once established. Redstem filaree is drought tolerant and can withstand a heavy stocking rate. The plant is



Key ID Points

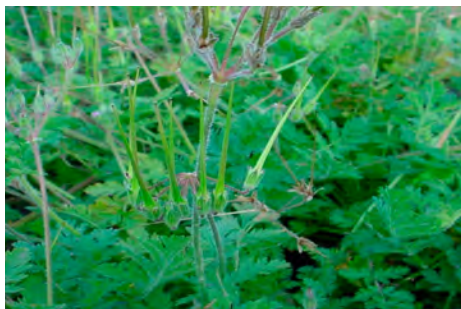
1. The hairy red colored stems.
2. The opposite leaf pattern in the rosette stage.
3. The long-beak like fruit and seed.



Photos © (Clockwise from lower left): Theodore Webster, USDA, Bugwood.org; (Unknown) Oregon State University; Howard F. Schwartz, Colorado State University, Bugwood.org; Richard Old, XID Services Inc., Bugwood.org; (Unknown) Oregon State University

Erodium cicutarium

Updated on:
08/09



CULTURAL

Prevent the establishment of Redstem filaree, in rangeland or pastureland by planting native grasses and forbs. Contact your local Natural Resources Conservation Service for seed mix recommendations that may help. Bareground is prime habitat for weed invasions.



BIOLOGICAL

Currently there is not any biocontrol available for Redstem filaree. Biocontrol takes many years of research and development. For more information, contact the Colorado Department of Agriculture's Insectary in Palisade, Colorado at 970-464-7916.



MECHANICAL

Hand pulling or digging when soil is moist, making sure to get the roots to prevent resprouting is effective. Removing flowers before the plant sets seed will also be effective. Be sure to bag specimens carefully so as not to spread seeds. Any kind of tillage to the area can also be effective.

Integrated Weed Management:

Locate and remove plants immediately before plants set seed to prevent the spread of Redstem filaree. Since the plant reproduces solely by seed, an integrated management effort must include the elimination of seed production and depletion of seed bank. Combing control methods of herbicide and mechanical can be effective.

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. *Rates are approximate and based on equipment with an output of 30 gallons per acre. Always read, understand, and follow the label directions. The herbicide label is the LAW!*

HERBICIDE	RATE	APPLICATION TIMING
Metsulfuron (Escort XP)	.33 oz of product /acre +.025% v/v non-ionic surfactant	Apply rosette stage through early flower stage.
2,4-D + dicamba (Rangestar)	2 pt. + 1 pt. product / acre	Apply rosette stage of growth.

Redstem filaree

Colorado State



Above photos © (Top): Richard Old, XID Services Inc., Bugwood.org; (Middle) Whitney Cranshaw, Colorado State University, Bugwood.org; (Bottom) Kelly Uhing, Colorado Department of Agriculture

Common mullein

Colorado Department of
Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us



Key ID Points

Identification and Management



Identification and Impacts

Common mullein (*Verbascum thapsus*) is a biennial forb native to Europe and Asia. The first year of the plant it produces a basal rosette. Basal rosettes can grow to 30 inches in diameter. The leaves are light-green in color and are covered in fine soft hairs. The woolly leaves are alternate and overlapping each other and can grow over a foot long. In spring of the second year the plant bolts an erect stem, that grows 2 to 6 feet tall. The flowers of the plant are borne in terminal spikes. These terminal spikes may reach up to 20 inches in length. The flowers are sulfur-yellow in color and have five petals. The flowers range from 3/4 of an inch to 1 1/2 inches in diameter. Numerous two chambered fruits produce 100,000 to 250,000 seeds per plant. Flowering and seed production typical occur from June to August. The plant has a deep taproot along with a fibrous root system.

Habitats for Common mullein are roadsides, waste places, right-of-ways, pastures, hay fields, and abandoned lands. It prefers gravelly soil types, but can grow in other soil types. Livestock will avoid eating

Common mullein, due to the hairy leaves of the plants. The plants were originally introduced as a medicinal plant. The Europeans used the flowers for tea, and the leaves for many remedies like burns and rashes. Both the Europeans and the Indians smoked the dried leaves to treat bronchitis.

The key to effective control of Common mullein is preventing the production of seeds. This plant is difficult to control due to the large amount of seed produced and seed bank left in the soil. Mechanical, cultural, biological and chemical treatments can be successful if utilized together in an integrated weed management plan. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Common mullein is designated as a "List C" species on the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local jurisdictions managing this species. For more information, visit www.colorado.gov/ag/weeds or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Photos © All Photos from Kelly Uhing, Department of Agriculture; Except Bottom left Mary Ellen (Mel) Harte, United States

Verbascum thapsus

**CULTURAL**

Cultural control can be effective in assistance with other treatment options. Once the parent plants have been removed, cultivating the area with desirable grasses and forbs may outcompete Common mullein seedlings. For specific seed recommendations contact your local Natural Resources Conservation Services for seed mixes.

**BIOLOGICAL**

Gymnetron tetrum, a seed eating weevil, biological control has been found in eastern Washington State and is currently working on populations there. The weevil has not yet been approved for use in Colorado. Contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916 for more information.

**MECHANICAL**

Hand pull or dig when soil is moist, prior to flowering and seed production can be effective. If flowers are present, bag specimens carefully so as not to scatter any potential seeds. The key to effective control is to prevent seed production and/or spread.

Integrated Weed Management:

Preventing the establishment and the seed production of Common mullein is key to controlling populations. If the population is established, using a combination of cultural, chemical, biological and mechanical treatments can aid in suppressing population size. Since plants produce thousands of seed treatments need to occur over an extended period of time.

Common mullein

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

HERBICIDE	RATE	APPLICATION TIMING
Chlorsulfuron (Telar XP)	1-3 oz/acre	Apply to rosette stages in spring or fall prior to bolting. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water.
2,4-D Picloram (Grazon P+D *this is a Restricted Use Pesticide*)	4 pts/acre	Apply to rosette stages in spring or fall prior to bolting. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water. DO NOT apply near trees/shrubs/high water table.
Picloram (Tordon 22K *this is a Restricted Use Pesticide*)	1-2 qts/acre	Apply to rosette stages to early growth stages in spring or fall. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water. DO NOT Apply near trees/shrubs/high water table.
Metsulfuron (Cimmaron)	1.0 oz/acre	Apply to rosette stages in spring or fall. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water.

Photos © Top to Bottom; Kelly Uhing, Colorado Department of Agriculture; Whitney Cranshaw, Colorado State University, Bugwood.org; Kelly Uhing, Colorado Department of Agriculture



Appendix E:

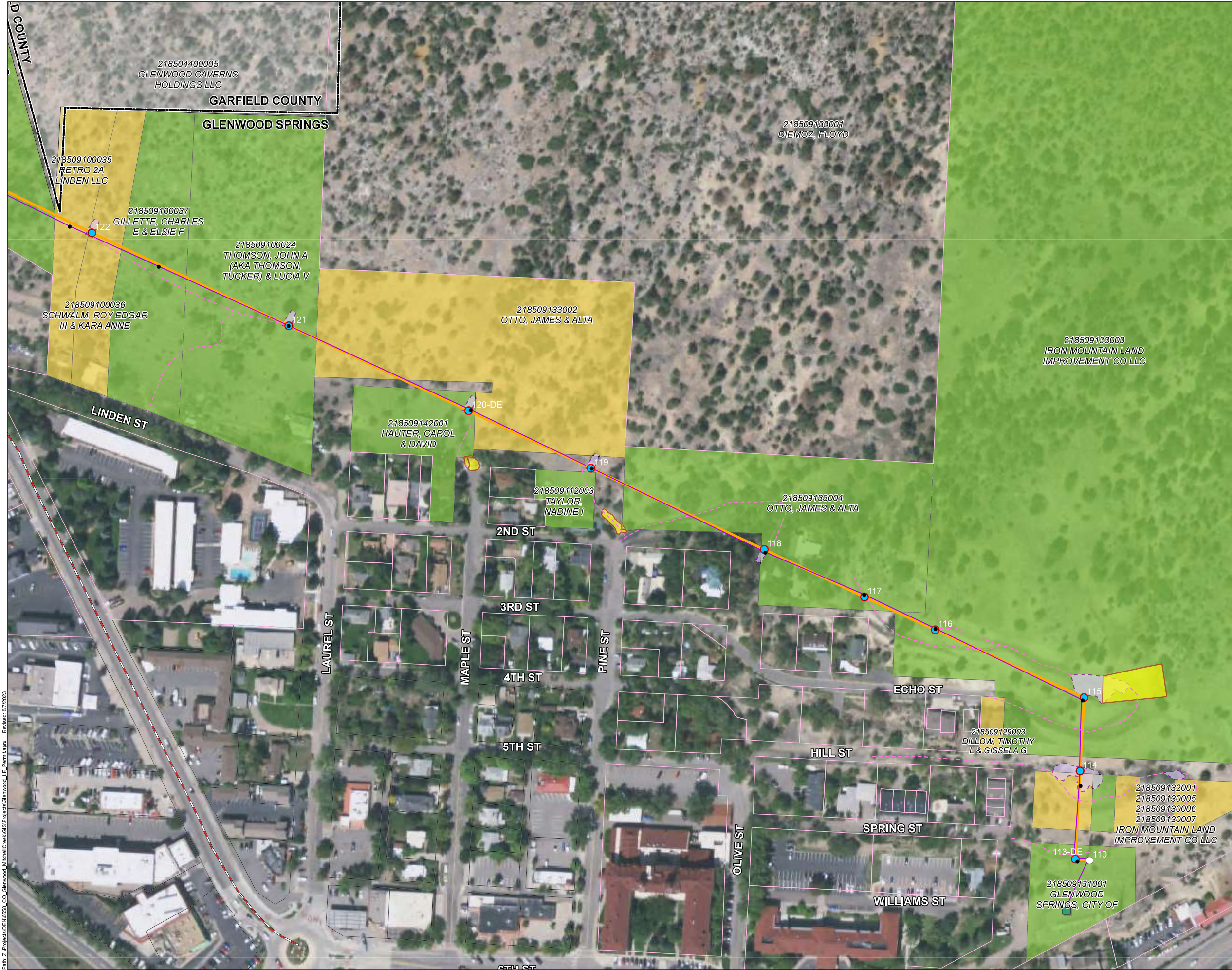
Landowner Notification List and Map

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Appendix E: Landowner Parcel List

PARCEL NUMBER	ACCOUNT NUMBER	OWNER	CARE OF NAME	OWNER ADDRESS	CITY	STATE	ZIP CODE
218505400081	R100023	72 SUNNY ACRES LLC		1405 DONEGAN ROAD GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218505412004	R530061	ANDERSON, ROBERT JOHN & MANETTE COLES		1405 DONEGAN ROAD GLENWOOD SPRINGS, CO 81601-2836	GLENWOOD SPRINGS	CO	81601-2836
218505300092	R100049	BOARD OF COUNTY COMMISSIONERS GARFIELD COUNTY		108 8TH STREET, SUITE 213 GLENWOOD SPRINGS, CO 81601-3363	GLENWOOD SPRINGS	CO	81601-3363
218504309001	R312424	BRITTEN, DOUGLAS E & JUDITH G		464 TRAVER TRAIL GLENWOOD SPGS, CO 81601	GLENWOOD SPGS	CO	81601
218505338014	R041501	CENTURA VENTURES LLC	CENTURA HEALTH	9100 E MINERAL CIRCLE ENGLEWOOD, CO 80112	ENGLEWOOD	CO	80112
218505300117	R530091	CLARK, KENNETH E		246 S REYNOSA DRIVE PUEBLO WEST, CO 81007	PUEBLO WEST	CO	81007
218504309002	R312425	DENNIE, J B & NOELENE G		460 N TRAVER TRAIL GLENWOOD SPRINGS, CO 81601-2847	GLENWOOD SPRINGS	CO	81601-2847
218509129003	R311139	DILLOW, TIMOTHY L & GISSELA G		514 ECHO STREET GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218505429028	R330325	EMERY, SUZANNE E & LARRY J		604 COLUMBIA COURT GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218505400065	R040069	FIT, JOZEF A		1653 COUNTY ROAD 130 GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218509100037	R040299	GILLETTE, CHARLES E & ELSIE F		PO BOX 449 INDIAN HILLS, CO 80454-0449	INDIAN HILLS	CO	80454-0449
218504400005	R330110	GLENWOOD CAVERNS HOLDINGS LLC		5100 TWO RIVERS PLAZA ROAD GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218505400110	R312265	GLENWOOD HIGHLANDS ESTATES HOMEOWNERS	MARTIN, MARVIN L & SANDRA R	1653 COUNTY ROAD 130 GLENWOOD SPRINGS, CO 81601-2864	GLENWOOD SPRINGS	CO	81601-2864
211935408025	R312209	GLENWOOD HIGHLANDS ESTATES HOMEOWNERS ASSOCIATION, INC		609 HIGHLANDS DRIVE GLENWOOD SPRINGS, CO 81601-2844	GLENWOOD SPRINGS	CO	81601-2844
218505200075	R040271	GLENWOOD SPRINGS GOLF CLUB		PO BOX 2298 GLENWOOD SPRINGS, CO 81602	GLENWOOD SPRINGS	CO	81602
218504307006	R330449	GLENWOOD SPRINGS, CITY OF		101 W 8TH STREET GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218509200050	R040279	GLENWOOD SPRINGS, CITY OF		101 W 8TH STREET GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218504300005	R330279	GLENWOOD SPRINGS, CITY OF		101 W 8TH STREET GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218509131001	R312084	GLENWOOD SPRINGS, CITY OF		101 W 8TH STREET GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218505300113	R540076	GLENWOOD SPRINGS, CITY OF		101 W 8TH STREET GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218504300007	R330451	GLENWOOD SPRINGS, CITY OF		101 W 8TH STREET GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218504300005	R330279	GLENWOOD SPRINGS, CITY OF		101 W 8TH STREET GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218504300005	R330279	GLENWOOD SPRINGS, CITY OF		101 W 8TH STREET GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218505100064	R040145	GOBBLERS KNOB LLC		PO BOX 1908 GLENWOOD SPRINGS, CO 81602	GLENWOOD SPRINGS	CO	81602
218505412003	R530060	GRAFF, SPENCER		1401 DONEGAN ROAD GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218504310001	R009121	GRASMERE, ROBERT HENRY JR	PRATT & ASSOC	201 CHURCH ROAD OJAI, CA 93023	OJAI	CA	93023
218504310002	R009122	GRASMERE, ROBERT HENRY JR	PRATT & ASSOC	201 CHURCH ROAD OJAI, CA 93023	OJAI	CA	93023
218505300084	R100043	GS AND PD LIVING TRUST, THE		4912 MOUNT UNION COURT COLORADO SPRINGS, CO 80918	COLORADO SPRINGS	CO	80918
218505300116	R530090	HARRIS, JAMES L & KAREN E		1265 DONEGAN ROAD GLENWOOD SPRINGS, CO 81601-2816	GLENWOOD SPRINGS	CO	81601-2816
218509142001	R084400	HAUTER, CAROL & DAVID		101 MAPLE STREET GLENWOOD SPRINGS, CO 81601-2927	GLENWOOD SPRINGS	CO	81601-2927
218509132001	R031960	IRON MOUNTAIN LAND IMPROVEMENT CO LLC		PO BOX 308 GLENWOOD SPRINGS, CO 81602	GLENWOOD SPRINGS	CO	81602
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218505429029	R330326	MCCALLUM TRUST		605 WEST COLUMBIA COURT GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218505113002	R312186	MCCARTY, KATHLEEN M & MERRILL, DALE A		603 HIGHLANDS DRIVE GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
218505429030	R330327	MCKINNEY, LEON RUSSELL & PATRICIA ANN RIES		603 COLUMBIA COURT GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
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218509100036	R040298	SCHWALM, ROY EDGAR III & KARA ANNE		555 FRONT RANGE ROAD LITTLETON, CO 80120	LITTLETON	CO	80120
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218505233014	R007512	WESTERN PINES HOMEOWNERS ASSOCIATION	INGRID WUSSOW	600 GREENWAY DRIVE GLENWOOD SPRINGS, CO 81601	GLENWOOD SPRINGS	CO	81601
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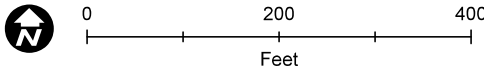
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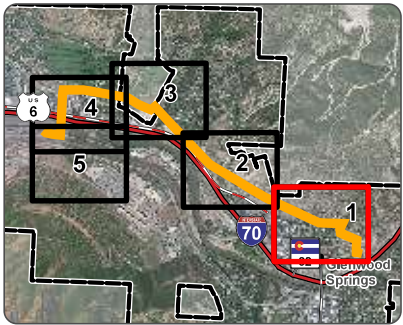
Glenwood Springs-Mitchell Creek Electric Transmission Line Rebuild Project

Easement Sheet Map: 1

- Glenwood Springs City Boundary
- Parcel within 300ft of Project
- Parcel
- Existing Electrical Infrastructure**
 - Substation
 - Existing Transmission Structure to be Removed
 - Existing Transmission Line Corridor
- Project Features**
 - Rebuild Route (60-foot ROW)
 - Access Road
 - Existing Transmission Structure to Remain Unchanged
 - Preliminary New Transmission Structure Location (Glenwood Springs)
 - Preliminary New Transmission Structure Location (Garfield County)
- Temporary Construction Easements**
 - Helicopter Fly Yard and Materials Staging Area
 - Temporary Construction Easement
 - Limit of Disturbance
- Construction Method**
 - Set by Crane
 - Set by Helicopter
- Landowner Easement**
 - Permanent and Temporary Easement
 - Permanent Easement
 - Temporary Easement



Scale is 1:1,200 when printed at 22" x 34"
NOT FOR CONSTRUCTION



Glenwood Springs-Mitchell Creek
Electric Transmission Line
Rebuild Project

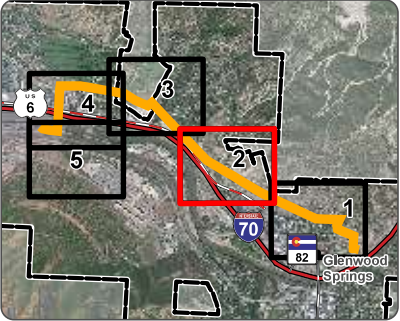
Easement Sheet Map: 2



- Glenwood Springs City Boundary
- Parcel within 300ft of Project
- Parcel
- Existing Electrical Infrastructure**
 - Substation
 - Existing Transmission Structure to be Removed
 - Existing Transmission Line Corridor
- Project Features**
 - Rebuild Route (60-foot ROW)
 - Access Road
 - Existing Transmission Structure to Remain Unchanged
 - Preliminary New Transmission Structure Location (Glenwood Springs)
 - Preliminary New Transmission Structure Location (Garfield County)
- Temporary Construction Easements**
 - Helicopter Fly Yard and Materials Staging Area
 - Temporary Construction Easement
 - Limit of Disturbance
- Construction Method**
 - Set by Crane
 - Set by Helicopter
- Landowner Easement**
 - Permanent and Temporary Easement
 - Permanent Easement
 - Temporary Easement



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NOT FOR CONSTRUCTION

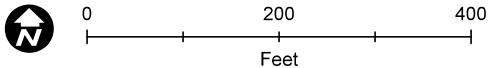




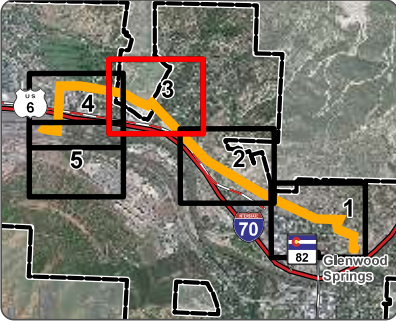
Glenwood Springs-Mitchell Creek Electric Transmission Line Rebuild Project

Easement Sheet Map: 3

- Glenwood Springs City Boundary
- Parcel within 300ft of Project
- Parcel
- Existing Electrical Infrastructure**
 - Substation
 - Existing Transmission Structure to be Removed
 - Existing Transmission Line Corridor
- Project Features**
 - Rebuild Route (60-foot ROW)
 - Access Road
 - Existing Transmission Structure to Remain Unchanged
 - Preliminary New Transmission Structure Location (Glenwood Springs)
 - Preliminary New Transmission Structure Location (Garfield County)
- Temporary Construction Easements**
 - Helicopter Fly Yard and Materials Staging Area
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- Construction Method**
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- Landowner Easement**
 - Permanent and Temporary Easement
 - Permanent Easement
 - Temporary Easement



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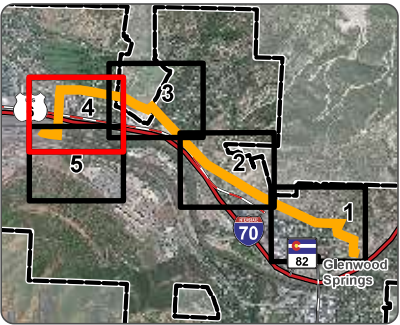
Glenwood Springs-Mitchell Creek Electric Transmission Line Rebuild Project

Easement Sheet Map: 4

- Glenwood Springs City Boundary
 - Parcel within 300ft of Project
 - Parcel
- Existing Electrical Infrastructure**
- Substation
 - Existing Transmission Structure to be Removed
 - Existing Transmission Line Corridor
- Project Features**
- Rebuild Route (60-foot ROW)
 - Access Road
 - Existing Transmission Structure to Remain Unchanged
 - Preliminary New Transmission Structure Location (Glenwood Springs)
 - Preliminary New Transmission Structure Location (Garfield County)
- Temporary Construction Easements**
- Helicopter Fly Yard and Materials Staging Area
 - Temporary Construction Easement
 - Limit of Disturbance
- Construction Method**
- Set by Crane
 - Set by Helicopter
- Landowner Easement**
- Permanent and Temporary Easement
 - Permanent Easement
 - Temporary Easement



Scale is 1:1,200 when printed at 22" x 34"
NOT FOR CONSTRUCTION

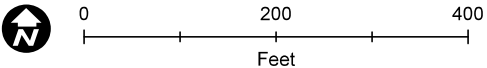




Glenwood Springs-Mitchell Creek Electric Transmission Line Rebuild Project

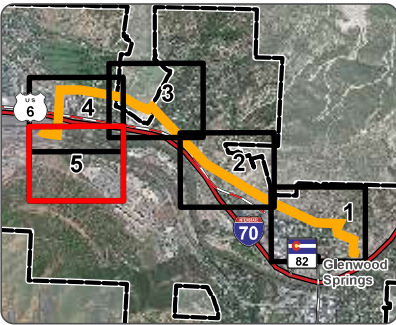
Easement Sheet Map: 5

- Glenwood Springs City Boundary
 - Parcel within 300ft of Project
 - Parcel
- Existing Electrical Infrastructure**
- Substation
 - Existing Transmission Structure to be Removed
 - Existing Transmission Line Corridor
- Project Features**
- Rebuild Route (60-foot ROW)
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 - Existing Transmission Structure to Remain Unchanged
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 - Permanent Easement
 - Temporary Easement



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Appendix F: EMF Study

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September 12, 2023

XCEL ENERGY

Glenwood – Mitchell Creek Transmission Line Electric & Magnetic Field Study

Revision A

PROJECT NUMBER:

0245968_0000

PROJECT CONTACT:

HUNTER TRAHAN

EMAIL:

HUNTER.TRAHAN@POWERENG.COM

PHONE:

(315) 295-7437



ELECTRIC & MAGNETIC FIELD STUDY

PREPARED FOR:

XCEL ENERGY

PREPARED BY:

JACOB WILLETTE – (207) 869-1479 – JACOB.WILLETTE@POWERENG.COM

WALTER AYALA – (858) 810-5393 – WALTER.AYALA@POWERENG.COM

REVISION HISTORY						
REV.	ISSUE DATE	ISSUED FOR	PREP BY	CHKD BY	APPD BY	NOTES
A	2023-09-12	Appvl	JRW	WAA	JAB	Issued for Review and Approval

“Issued For” Definitions:

- “Prelim” means this document is issued for preliminary review, not for implementation
- “Appvl” means this document is issued for review and approval, not for implementation
- “Impl” means this document is issued for implementation
- “Record” means this document is issued after project completion for project file

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3.0 DATA.....	2
4.0 RESULTS.....	3
4.1 ELECTRIC FIELD.....	3
4.2 MAGNETIC FIELD.....	4
5.0 CONCLUSIONS.....	5
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1.0 EXECUTIVE SUMMARY

Public Service Company of Colorado (Public Service or the Company) contracted POWER Engineers, Inc. (POWER) to perform an electromagnetic field (EMF) analysis for the 69 kV Glenwood - Mitchell transmission line located in the City of Glenwood Springs, CO. In addition, the 69 kV 6584 transmission line extending approximately 5 miles beyond the Mitchell Creek Substation and the results of this study can be applied to these sections assuming the controlling features listed in the data section are consistent. The 69 kV Glenwood - Mitchell transmission line is being rebuilt as a single circuit non-bundled 477 kcmil ACSS "Hawk" using 115 kV class structures. Three different structure configurations are analyzed in this study: vertical, delta, H-frame configuration. Structure configurations can be found in Appendix A. These structure types are expected to be the most dominant configurations throughout the transmission line. The present analysis does not include effects of objects outside the ROW.

The EMF and corona effects were modeled using the Corona and Field Effects Program (CAFEP) software, developed by Bonneville Power Administration (BPA).

Table 1 shows the electric and magnetic field results for each of the respective structure types analyzed in this study. The H-frame configuration had the highest field strengths at the edge of ROW.

Table 1: Electric & Magnetic Field Results				
Structure	Magnetic Field at Edge of ROW (mG)	Maximum Magnetic Field (mG)	Electric Field at Edge of ROW (kV/m)	Maximum Electric Field (kV/m)
Vertical	70.8	126.4	0.2	0.7
H-Frame	110.9	250.6	0.5	0.7
Delta	76.0	155.5	0.3	0.8

Minimum conductor height of 25.3 feet used on all structures.

2.0 ANALYSIS METHODOLOGY

The EMF field analysis was performed using the Bonneville Power Administration's (BPA) Corona and Field Effects Program (CAFEP) software version 3. CAFEP uses the electrical and physical characteristics of the transmission line to calculate resulting electric and magnetic fields from the transmission lines.

The electric fields are driven by the maximum operating voltage of conductors. Magnetic fields are primarily a function of the line current loading, which varies over time. Therefore, the magnetic fields calculations were performed using a maximum steady state loading of 1,250 amperes.

The values of these effects are typically of concern at various points across and just outside the right-of-way (ROW). Therefore, values reported include the maximum values within the ROW, along with the calculated values at the edge of the ROW for each structure type. Also, included for reference are plots of the results for all analyzed values across the entire width of the ROW and slightly beyond the ROW.

For the analysis, electric and magnetic fields were analyzed at a minimum conductor height (near mid-span, at maximum sag), as this location will produce the controlling case scenario.

3.0 DATA

Three structure configurations were analyzed in this study. The transmission line consists of a single circuit non-bundled 477 26/7 ACSS "Hawk" conductor. The following section details the data used for the analysis as gathered from various sources. Any changes to this data will have an impact on the results of the analysis.

- Maximum Operating Voltage: 72.45kV (105% of nominal)
- Right-of-Way (ROW) width: 60 feet
- Maximum Conductor Operating Ampacity: 1,250 Amperes
- Minimum Conductor Height: 25.3 feet
- Shield wire: 0.555-inch AFL DNO-10723 CentraCore OPGW

The geometry for each structure is shown in Appendix A. Dimensions shown in the figure references were used in calculations to obtain electric and magnetic field results with exception of structure height. All heights were based upon minimum conductor heights of 25.3 feet.

Any changes to the characteristics of the conductors or their arrangement could affect the results of the study and should be further investigated.

4.0 RESULTS

4.1 Electric Field

The electric field strength is a measure of the force per unit charge at a given point in space relative to a charged object. It is typically measured in volts or kilovolts per meter (kV/m). Table 2 shows a summary of the electric field values at the edge of the ROW. Values are calculated at the minimum conductor height (near mid-span) at a height of 1.0 m (3.28 ft) above the ground per IEEE Std 644-2019.

Table 2: Electric Field Results		
Structure	Electric Field at Edge of ROW (kV/m)	Maximum Electric Field (kV/m)
Vertical	0.2	0.7
H-Frame	0.5	0.7
Delta	0.3	0.8

Minimum conductor height of 25.3 feet used on all structures.

Figure 1 shows a plot of the electric fields across the ROW for the Glenwood-Mitchell Creek transmission line for the three structure configurations.

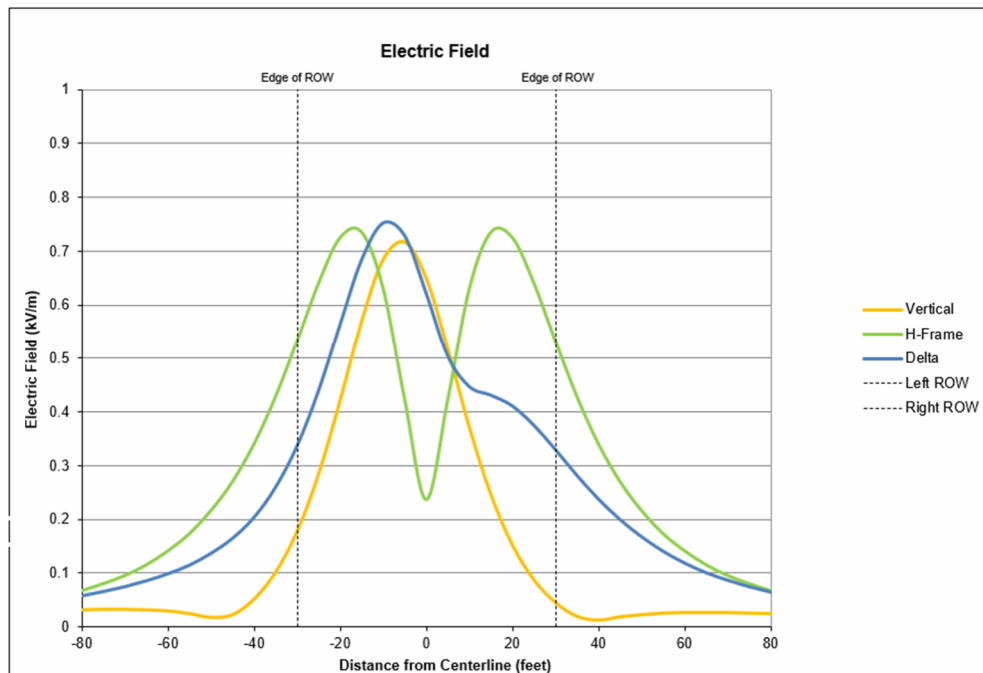


Figure 1: Electric Field Plot

4.2 Magnetic Field

The reported magnetic field values are the magnetic flux density at a given point in space. Magnetic flux density is measured in gauss or milligauss (mG).

Table 3 shows a summary of the magnetic field values at the ROW for each of the structure configurations analyzed. Values are calculated at the minimum conductor height (near mid-span) at a height of one meter above the ground per IEEE std 644-2019.

Table 3: Magnetic Field Results		
Structure	Magnetic Field at Edge of ROW (mG)	Maximum Magnetic Field (mG)
Vertical	70.8	126.4
H-Frame	110.9	250.6
Delta	76.0	155.5

Minimum conductor height of 25.3 feet used on all structures.

Figure 2 shows a plot of the magnetic field across the ROW for the three proposed single circuit structure configurations.

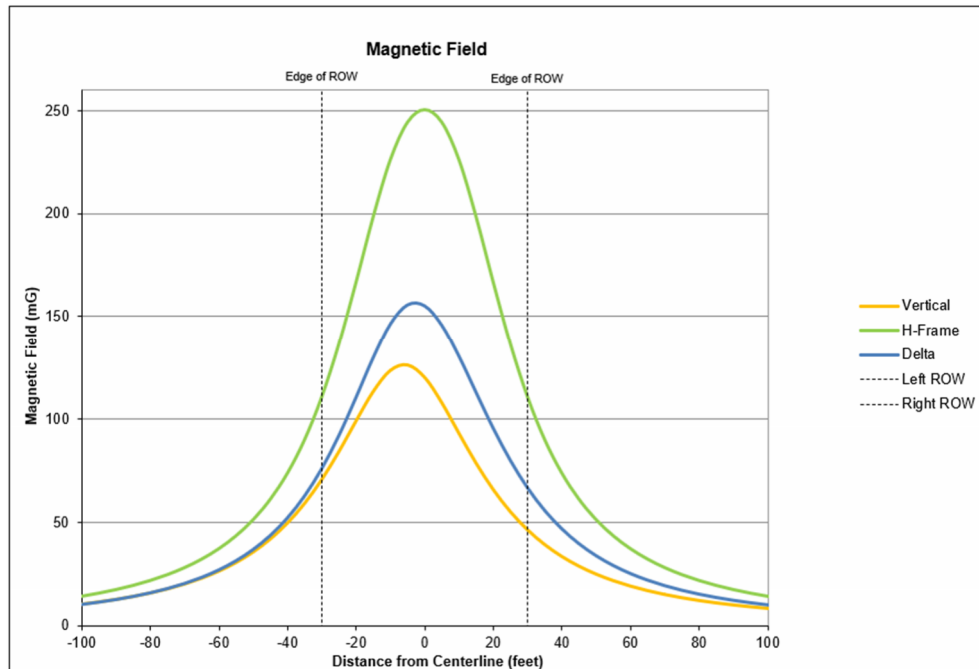


Figure 2: Magnetic Field Plot

5.0 CONCLUSIONS

Three structure configurations were reviewed for the 69 kV transmission line that will deliver power to Mitchell Creek Substation. The calculated electric and magnetic field results at the edge of the ROW were reviewed using maximum operating ampacity of the conductor at the designated elevation. The H-Frame structure has the highest magnetic field with 110.9 mG at the edge of ROW. The H-Frame structure also has the highest electric field results which are 0.5 kV/m at the edge of ROW.

APPENDIX A – STRUCTURE DRAWINGS

Figure 3: H Frame Structure

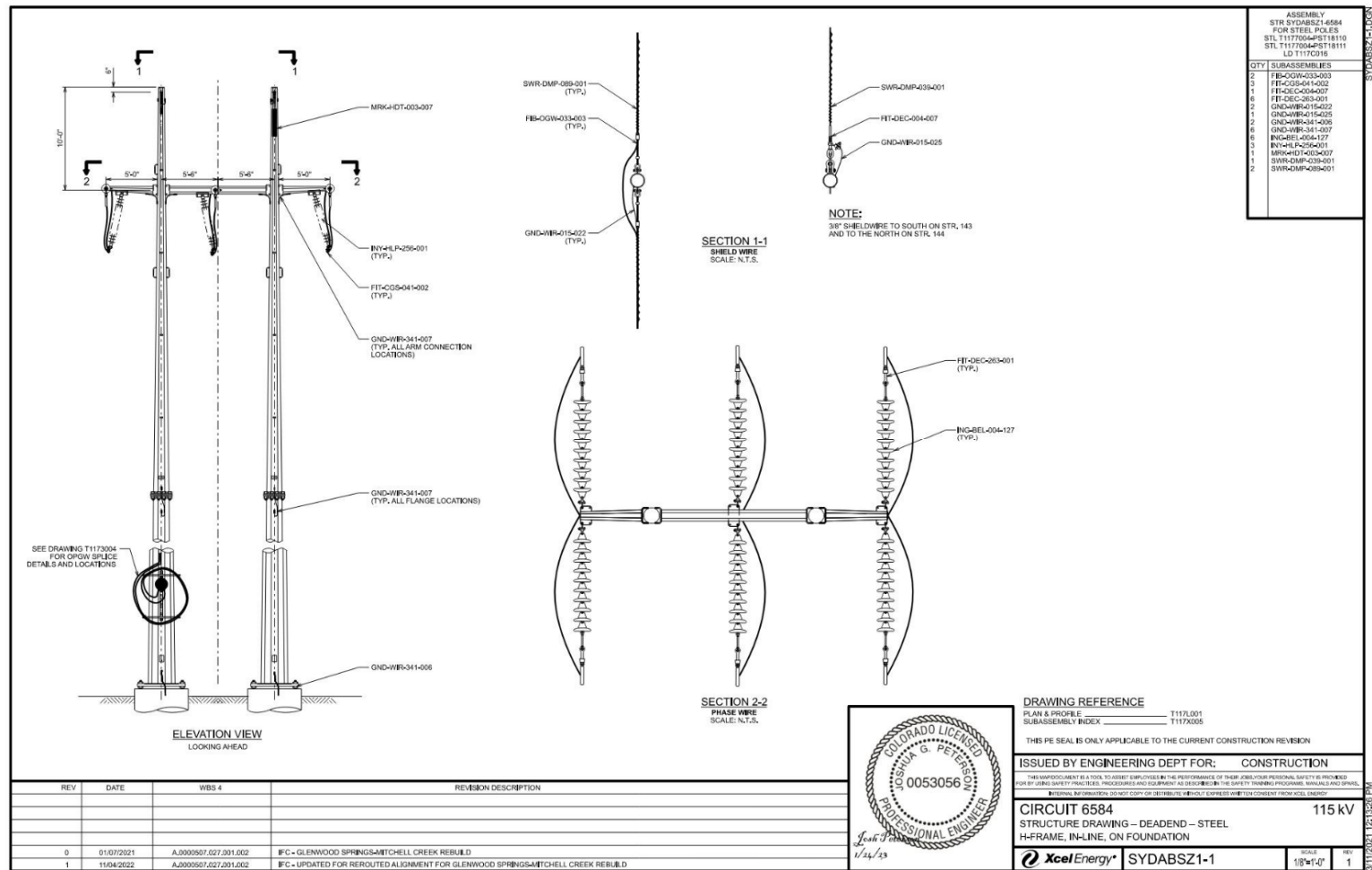


Figure 4: Vertical Structure

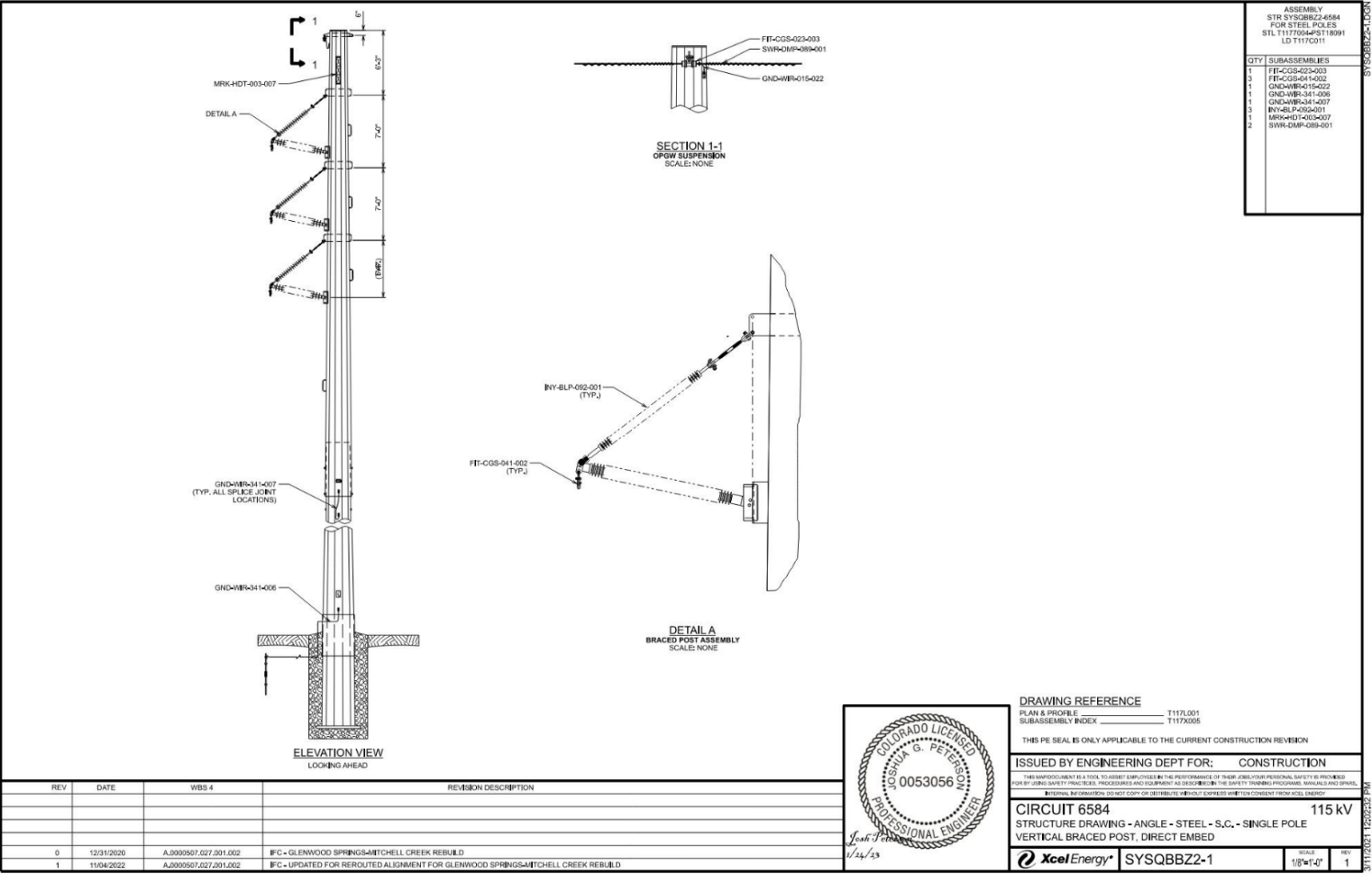
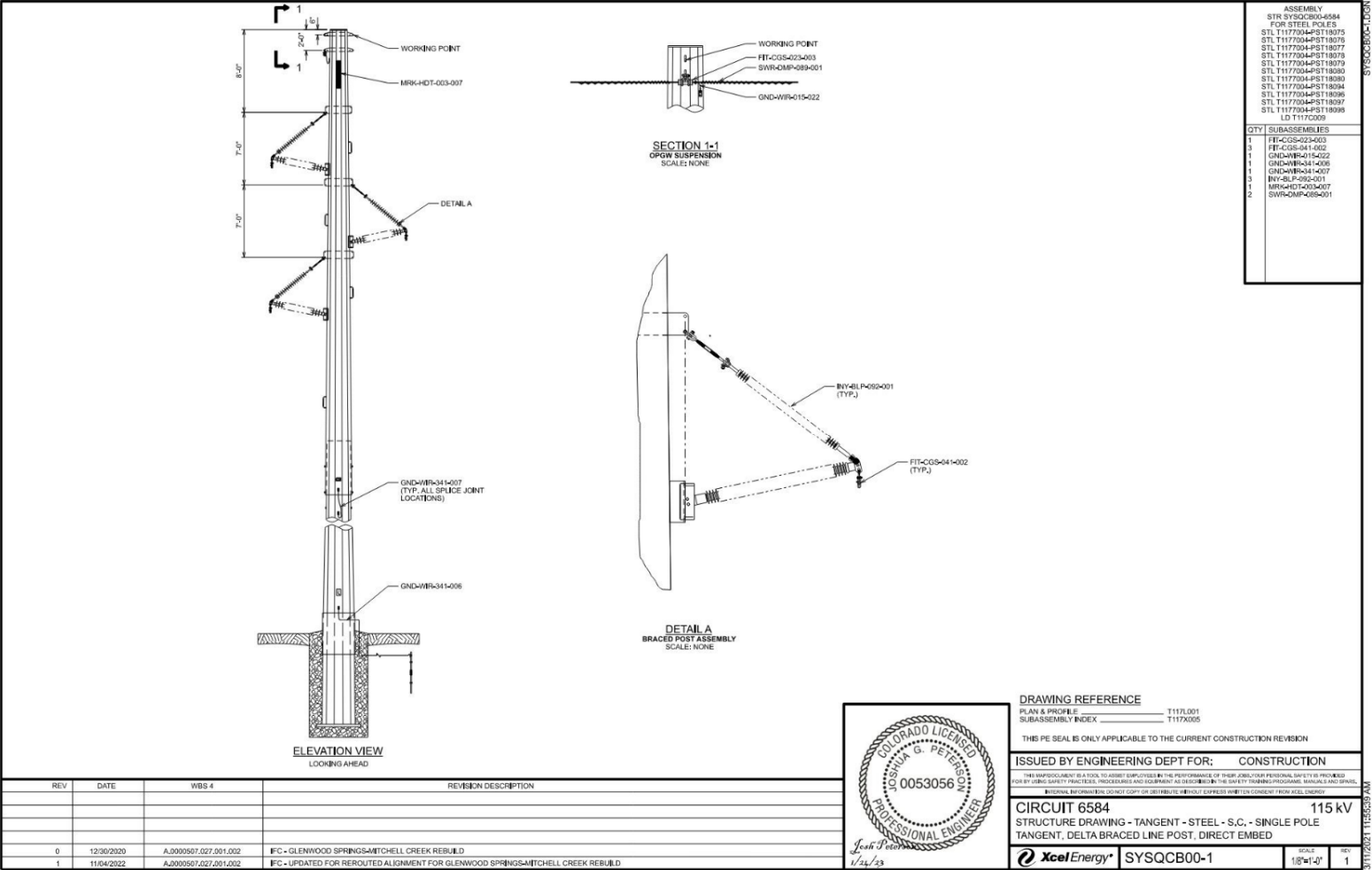


Figure 5: Delta Structure



Appendix G: Visual Simulations

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GLENWOOD SPRINGS – MITCHELL CREEK ELECTRIC TRANSMISSION LINE REBUILD PROJECT

Visual Simulations

January 23, 2023

Visual Simulation

View from pedestrian bridge over I-70 and the Colorado River



EXISTING VIEW

Visual Simulation

View from pedestrian bridge over I-70 and the Colorado River



VIEW WITH LINE REBUILT

Visual Simulation

View from pedestrian bridge over I-70 and the Colorado River



VIEW WITH LINE REBUILT: ARROW INDICATES POLE LOCATION

Visual Simulations

View from east of Traver Trail – proposed fly yard and material staging area



EXISTING VIEW

Visual Simulations

View from east of Traver Trail – proposed fly yard and material staging area



VIEW WITH LINE REBUILT

Visual Simulations

View from east of Traver Trail – proposed fly yard and material staging area



VIEW WITH LINE REBUILT: ARROW INDICATES POLE LOCATION

Visual Simulations

View from Traver Trail looking south across the Colorado River



EXISTING VIEW

Visual Simulations

View from Traver Trail looking south across the Colorado River



VIEW WITH LINE REBUILT

Visual Simulations

View from Traver Trail looking south across the Colorado River



VIEW WITH LINE REBUILT: ARROW INDICATES POLE LOCATION

Visual Simulations

View from Donegan Road looking south across the Colorado River



EXISTING VIEW

Visual Simulations

View from Donegan Road looking south across the Colorado River



VIEW WITH LINE REBUILT

Visual Simulations

View from Donegan Road looking south across the Colorado River



VIEW WITH LINE REBUILT: ARROW INDICATES POLE LOCATION

Visual Simulations

View from Midland Avenue trail looking northeast across the Colorado River



EXISTING VIEW

Visual Simulations

View from Midland Avenue trail looking northeast across the Colorado River



VIEW WITH LINE REBUILT

Visual Simulations

View from Midland Avenue trail looking northeast across the Colorado River



VIEW WITH LINE REBUILT: ARROW INDICATES POLE LOCATION

Appendix H: Engineering Reports

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Appendix H-1: Preliminary Soils and Geotechnical Engineering Report

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Geotechnical Engineering Report

**Xcel Line 6584 Glenwood Springs to Mitchell Creek
Various Locations**

Glenwood Springs, Colorado

February 16, 2021

Terracon Project No. 25205018

Prepared for:

Xcel Energy Services, Inc.
Denver, Colorado

Prepared by:

Terracon Consultants, Inc.
Wheat Ridge, Colorado



February 16, 2021

Xcel Energy Services, Inc.
1800 Larimer Street, Suite 500
Denver, Colorado 80202



Attn: Mr. Joshua Peterson
P: (608) 469-0216
E: Joshua.G.Peterson@xcelenergy.com

Re: Geotechnical Engineering Report
Xcel Line 6584 Glenwood Springs to Mitchell Creek
Various Locations
Glenwood Springs, Colorado
Terracon Project No. 25205018

Mr. Peterson:

We have completed the geotechnical engineering services for the project referenced above. This study was performed in general accordance with Purchase Order No. 4500532186 dated February 12, 2020 and subsequent amendments dated January 8, 2021 and February 4, 2021. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design of the proposed transmission line structures.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Scott W. Borecki, P.E.
Project Engineer

Scott B. Myers, P.E.
Regional Senior Consultant



Geotechnical Engineering Report

Xcel Line 6584 Glenwood Springs to Mitchell Creek ■ Glenwood Springs, Colorado

February 16, 2021 ■ Terracon Project No. 25205018



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Note: This report was originally delivered in a web-based format. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION RESULTS
GEOPHYSICAL RESULTS
SUPPORTING INFORMATION

Note: Refer to each individual Attachment cover page for a listing of contents.

Responsive ■ Resourceful ■ Reliable

REPORT SUMMARY

A geotechnical engineering exploration has been performed for the proposed rebuild of the existing 115 kV Glenwood to Mitchell Creek transmission line 6584 in Glenwood Springs, Colorado. Based on the information obtained from this subsurface exploration and the laboratory testing completed, the site appears suitable for the proposed construction; however, the following geotechnical conditions will need to be considered:

- Constructing the transmission line structures on drilled pier foundations is considered suitable from a geotechnical viewpoint. This report provides recommendations for the design and construction of drilled pier foundations and direct-embedded steel poles.
- Up to about 6½ feet of fill materials were encountered in the borings drilled for this exploration. We do not possess any information regarding whether the fill was placed under the observation of a geotechnical engineer.
- Boulders and cobbles were encountered in most of the borings drilled for this exploration. In order to advance the borings to the requested depths, a downhole hammer (ODEX) drilling technique was used in most of the borings. Difficult excavation and drilled pier installation should be anticipated during the construction of the proposed transmission line structures. Heavy-duty excavation equipment and drilling equipment will be required.
- Based on the 2015 International Building Code (IBC) Section 1613.3.2, the subsurface conditions encountered in the borings, and the results of the geophysical testing performed at selected locations, the seismic site classification for the sites range from C to D.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **General Comments** should be read for an understanding of the report limitations.

Geotechnical Engineering Report
Xcel Line 6584 Glenwood Springs to Mitchell Creek
Various Locations
Glenwood Springs, Colorado
Terracon Project No. 25205018
February 16, 2021

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed Line 6584 Glenwood Springs to Mitchell Creek rebuild project to be located in Glenwood Springs, Colorado.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil and bedrock conditions
- Groundwater levels
- Earthwork
- Geotechnical design criteria
- Seismic considerations

The geotechnical engineering Scope of Services for this project included advancing nine test borings (designated as Boring Nos. 1, 3, 5 through 8, and 10 through 12) to depths ranging from approximately 29 to 41 feet below existing site grades and performing geophysical explorations at six locations (designated as Geophysics Location Nos. 1 through 4, 9, and 14). Plans showing the site and exploration locations are shown in the **Site Location and Exploration Plans** and **Geophysical Results** sections. The results of the laboratory testing performed on soil and bedrock samples obtained from the site during the field exploration are included on the boring logs and/or as separate graphs in the **Exploration Results** section. The results of the geophysical explorations are included in the **Geophysical Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration.

Item	Description
Project Location	The project is to be located in Glenwood Springs, Colorado. The approximate endpoints of the proposed transmission line improvements are 39.5506°N, 107.3209°W and 39.5598°N, 107.3523°W. See Site Location .

Geotechnical Engineering Report

Xcel Line 6584 Glenwood Springs to Mitchell Creek ■ Glenwood Springs, Colorado
February 16, 2021 ■ Terracon Project No. 25205018



Item	Description
Existing Improvements	The transmission line alignment generally consists of vacant land, residential properties, and commercial properties.
Current Ground Cover	Ground cover along the proposed transmission line alignment are variable and general consists of grass, weeds, light vegetation, barren land, and asphalt and concrete pavements.
Existing Topography	The existing grade along the transmission line alignment is variable with elevation differences of up to about 200 feet.
Geology	Surficial geologic conditions near the site, as mapped by the U.S. Geological Survey (USGS) (¹Kirkham, et al, 2008), consist of the following units: ■ MI: Leadville Limestone ■ Pb: Belden Formation ■ Qdfo: Older debris-flow deposits ■ Qdfy: Younger debris-flow deposits ■ Qlo: Loess ■ Qlso: Older landslide deposits ■ Qto: Older terrace alluvium ■ Qtu: Tufa Glenwood Springs is known for its hot springs. Most of the hot springs are reportedly associated with the Leadville Limestone and other carbonate rocks. The geologic conditions presented in this section were obtained by locating the subject site on available large-scale geologic maps. Due to the scales involved, precise location of the site can be difficult to determine. In addition, the large-scale geologic maps describe only general trends. Local variations are possible and site-specific geology may differ from those described above. A site-specific detailed geologic description is beyond the scope of this project.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning. Our final understanding of the project conditions is as follows:

Item	Description
Project Description	We understand the Line 6584 Glenwood Springs to Mitchell Creek rebuild project consists of rebuilding approximately 1.5 miles of existing 115kV transmission line.

¹Kirkham, Robert M.; Streufert, Randall K.; Cappa, James A.; Shaw, Colin A.; Allen, Joseph L.; and Jones, James V., 2008, *Geologic Map of the Glenwood Springs Quadrangle, Garfield County, Colorado*, Map Series 38, United States Geological Survey.

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Item	Description
Anticipated Foundation Systems	We understand the deadend structures will be constructed on cylindrical concrete pier foundations, while the tangent structures will be direct-embedded steel poles.
Maximum Loads	■ Axial: 20 to 40 kips (assumed) ■ Lateral (shear): 20 to 60 kips (assumed) ■ Moment: 1,500 to 3,500 kip-ft (assumed)
Grading/Slopes	None anticipated
Underground Utilities	No below-grade infrastructure will be installed as part of this project.

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface soil, bedrock, and groundwater conditions based upon our review of the data and our understanding of the geologic setting and planned construction. The following sections provide our geotechnical characterization.

The geotechnical characterization forms the basis of our geotechnical calculations and evaluation of site preparation, foundation options, and pavement options. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Typical Profile

Based on the results of the borings for this exploration, subsurface conditions on the site can be generalized as follows:

Material Description	Approximate Depth to Bottom of Stratum below Existing Site Grade	Consistency/ Relative Density/ Hardness
Existing fill materials consisting of clay with varying amounts of gravel, sand, silt, and limestone fragments, and sand with varying amounts of boulders, gravel, silt, and clay	About 3½ to 6½ feet	Variable
Native soil consisting of lean clay with varying amounts of cobbles, boulders, gravel, sand, and silt, and sand with varying amounts of cobbles, boulders, gravel, silt, and clay.	About 12 to 41 feet, Maximum depth explored in all the borings except for Boring No. 1	Clay: stiff to hard Sand: loose to very dense

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Material Description	Approximate Depth to Bottom of Stratum below Existing Site Grade	Consistency/ Relative Density/ Hardness
Bedrock consisting of shale	About 31 feet, Maximum depth explored in Boring No. 1	Very hard

Stratification boundaries on the boring logs represent the approximate location of changes in soil and material types; in situ, the transition between materials may be gradual. Further details of the borings can be found on the boring logs in the **Exploration Results**. A summary of laboratory test results is included in the **Exploration Results**.

Groundwater Conditions

The borings were observed while drilling and upon completion of drilling for the presence and level of groundwater. The water levels encountered in the boreholes can be found on the boring logs in **Exploration Results** and are summarized below.

Boring No.	Shallowest depth to groundwater encountered while or upon completion of drilling ¹
1	None encountered
3	None encountered
5	None encountered
6	None encountered
7	None encountered
8	None encountered
10	None encountered
11	None encountered
12	About 40 feet

1. Due to safety concerns, borings were backfilled immediately after completion. Therefore, subsequent groundwater measurements were not obtained.

These observations represent groundwater conditions at the time of the field exploration and may not be indicative of other times or at other locations. Groundwater levels can be expected to fluctuate with varying seasonal and weather conditions.

Zones of perched and/or trapped groundwater may also occur at times in the subsurface soils overlying bedrock, on top of the bedrock surface or within permeable fractures in the bedrock materials. The location and amount of perched water is dependent upon several factors, including hydrologic conditions, type of site development, irrigation demands on or adjacent to the site, fluctuations in water features, seasonal and weather conditions.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the borings were performed. Groundwater levels during construction or at other times in the life of the structures may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

Geophysical (P-wave and MASW) Survey Interpretation

Terracon performed geophysical exploration services consisting of seismic refraction and MASW to better define the subsurface conditions at the subject site. Six locations (designated as Geophysics Location Nos. 1 through 4, 9, and 14) were tested in the area of the proposed transmission line structures. Terracon used a seismic refraction system (SRS) consisting of a SeismicSource DAQLink III seismograph and 24 geophones to derive subsurface seismic velocity information. Survey lines ranged from approximately 240 to 300 feet in length and had geophone spacings of 10 to 13 feet. The approximate location and layout of the survey lines are presented in the **Geophysical Results**.

After the geophysical survey line data was processed into velocity profiles, as described in **Exploration and Testing Procedures**, Boring Nos. 1 and 3 were superimposed on the velocity profiles for Geophysics Location Nos. 1 and 3, respectively. Based on comparison with the velocity profiles and the subsurface conditions encountered in the exploratory borings at the selected geophysics locations, the subsurface material types were generally associated with velocity profiles to estimate the geotechnical design parameters for the proposed structure foundations in areas where exploratory borings could not be drilled.

Although we typically recommend borings be performed to confirm the results of the seismic data, we understand that borings could not be performed near the seismic lines due to access conditions. It is important to note that seismic data used in lieu of borings can provide significant information about subsurface conditions, but it cannot provide the same level of geotechnical confidence as borings. The subsurface materials should be confirmed during construction and the design values should be adjusted, as needed. Full-time observation of the structure foundation construction should be performed by the Geotechnical Engineer.

GEOTECHNICAL OVERVIEW

Based on subsurface conditions encountered in the borings, the site appears suitable for the proposed construction from a geotechnical point of view provided certain precautions and design and construction recommendations outlined in this report are followed. We have identified

geotechnical conditions that could impact design and construction of the proposed transmission line structures and other site improvements.

Existing Fill Materials

Up to about 6½ feet of fill materials were encountered in portions of the site. Fill depths presented in the boring logs are approximate and the depth, lateral extents, and composition of fill should be expected to vary. We do not possess any information regarding whether the fill was placed under the observation of a geotechnical engineer.

There exists the potential for construction debris and/or domestic trash to be encountered within the fill on some portions of the site. However, the potential for encountering construction debris or domestic trash is considered to be low. The fill materials should be observed for the presence of trash and debris during site grading and construction.

The existing fill can be reused as engineered fill below drilling pads or temporary roads, provided the material meets the requirements of imported soils in the **Material Types** subsection in **Earthwork**, any deleterious materials are removed, and some movement can be tolerated. Some removal and replacement may be required if unsuitable or soft materials are exposed.

Boulders and Cobbles

Boulders and cobbles were encountered in Boring Nos. 3, 6, 7, 8, 10, 11, and 12. In order to advance the borings to the requested depths, a downhole hammer (ODEX) drilling technique was used in all the borings except for Boring No. 8. Boulders up to about 2 feet in diameter were encountered within the exploratory borings. Difficult excavation and drilled pier installation should be anticipated during the construction of the proposed transmission line structures. Heavy-duty excavation equipment and drilling equipment will be required.

Geothermal Aquifer Interaction

Based on the subsurface conditions encountered in the borings drilled for this exploration and the anticipated depths of the transmission line structure foundations, it is our opinion that the risk of encountering the geothermal aquifer is considered to be low.

In the event that artesian conditions are encountered during the construction of the transmission line structure foundations, the contractor should be prepared with a contingency plan to manage the artesian conditions and seal the pier hole. Prior to construction, the contingency plan should be reviewed by the owner and any other entities with jurisdiction.

EARTHWORK

The following presents recommendations for site preparation, excavation, subgrade preparation, and placement of engineered fills on the project. All earthwork on the project should be observed and evaluated by Terracon.

Site Preparation

Strip and remove existing vegetation, organics, and other deleterious materials from proposed improvement areas. All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction if new fill will be placed in these areas.

Stripped materials consisting of vegetation, unsuitable fills, and organic materials should be wasted from the site or used to revegetate landscaped areas or exposed slopes after completion of grading operations.

In areas where new fill will be placed, where possible, the site should be initially graded to create a relatively level surface to receive fill and to provide for a relatively uniform thickness of fill beneath the proposed improvement areas. All exposed areas that will receive fill, once properly cleared, should be scarified to a minimum depth of 12 inches, conditioned to near optimum moisture content, and compacted. It is imperative the moisture content of prepared materials be protected from moisture loss.

It is anticipated that the installation of the transmission line structures will require the use of heavy-duty construction equipment when installing the drilled piers through the cobbles and boulders and into the underlying bedrock.

The stability of subgrade soils may be affected by precipitation, repetitive construction traffic, or other factors. If unstable conditions are encountered or develop during construction, workability may be improved by overexcavation of wet zones and mixing these soils with crushed gravel. Use of geotextiles could also be considered as a stabilization technique. Lightweight excavation equipment may be required to reduce subgrade pumping.

Material Types

Fill for this project should consist of engineered fill. Engineered fill is fill that meets the criteria presented in this report and has been properly documented.

Engineered fill should meet the following material property requirements:

Fill Type ^{1,2}	USCS Classification	Acceptable Location for Placement
On-site clay soils	CL, CH, CL-ML	On-site clay soils are considered suitable for reuse as compacted fill for this project, provided the soils meet the gradation requirements presented in this section.

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Fill Type ^{1,2}	USCS Classification	Acceptable Location for Placement
On-site sand soils	SP, SC, SM	On-site sand soils are considered suitable for reuse as compacted fill for this project, provided the soils meet the gradation requirements presented in this section.
Imported soils	Varies	Imported soils meeting the gradation outlined herein can be considered acceptable for use as compacted fill for this project.

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the geotechnical engineer for evaluation.
2. Care should be taken during the fill placement process to avoid zones of dis-similar fill. Improvements constructed over varying fill types are at a higher risk of differential movement compared to improvements over a uniform fill zone.

Imported soils and on-site materials for engineered fill (if required) should meet the following material property requirements:

Gradation	Percent Finer by Weight (ASTM C136)
3"	100
No. 4 Sieve	50-100
No. 200 Sieve	15-75

- Liquid Limit 30 (max)
- Plasticity Index 15 (max)
- Maximum Expansive Potential (%) 1.0*

*Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at optimum water content. The sample is confined under a 200-psf surcharge and submerged.

Compaction Requirements

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift.

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Item	Description
Fill Lift Thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6 inches in loose thickness when hand-guided equipment (e.g. jumping jack, plate compactor) is used
Compaction Requirements ^{1,2}	Minimum of 95% of the material's standard Proctor maximum dry density (ASTM D698) for clay soils and a minimum of 98% of the material's standard Proctor maximum dry density for sand soils.
Moisture Content of Cohesive Soils (Clay Soils) ³	0 to +3% of the optimum moisture content
Moisture Content of Cohesionless Soils (Sand Soils)	-2 to +2% of the optimum moisture content

1. We recommend that engineered fill be tested for water content and compaction during placement. Should the results of the in-place density tests indicate the specified water or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified water and compaction requirements are achieved.
2. Water levels should be maintained low enough to allow for satisfactory compaction to be achieved without the compacted fill material pumping when proofrolled.
3. Moisture conditioned clay soils should not be allowed to dry out. A loss of moisture within these materials could result in an increase in the materials expansive potential. Subsequent wetting of these materials could result in undesirable movement.

Excavation

Excavations into the subsurface soils and bedrock will encounter a variety of conditions. The individual contractor(s) is responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety following local and federal regulations, including current Occupational Safety and Health Administration (OSHA) excavation and trench safety standards.

Soils and bedrock penetrated by the proposed excavations may vary significantly across the site. The soil and bedrock classifications are based solely on the materials encountered in the exploratory borings. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are encountered at the time of construction, the actual conditions should be evaluated to determine any excavation modifications necessary to maintain safe conditions.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

Grading and Drainage

All grades must provide effective drainage away from the proposed transmission line structures during and after construction and should be maintained throughout the life of the structures. Water retained next to structures can result in soil movements greater than those discussed in this report.

Earthwork Construction Considerations

The Geotechnical Engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during foundation excavation and construction.

The stability of subgrade soils may be affected by precipitation, repetitive construction traffic, or other factors. If unstable conditions develop along construction and maintenance access roads during general construction operations, recommended options for subgrade stabilization include removal and replacement of unstable soils or mixing unstable soils with crushed gravel. The use of geotextiles could also be considered as a stabilization technique.

STRUCTURE FOUNDATION RECOMMENDATIONS

We understand the deadend structures will be constructed on cylindrical concrete pier foundations, while the tangent structures will be direct-embedded steel poles. The following sections present criteria for each structure location and may be used for either direct-embed structures or structures constructed on drilled piers.

General Direct Embed Pole Design and Construction Recommendations

The maximum end bearing pressures given in the specific structure design tables are based on the cross-sectional area of the tip of the pole. Side resistance should be applied to the surface area of the pole for that given length interval below a depth of 3 feet to reduce the effect of frost. The combination of skin friction and end bearing pressure can be used to determine the vertical compression capacity. The skin friction value should be used to determine the uplift capacity of the pole.

For lateral load and overturning design, we have included LPILE® and MFAD parameters in the structure specific design tables. Lateral load design parameters are valid for maximum soil strain of 1 percent for the native soils acting over a distance of one shaft diameter. The passive pressure, coefficient of horizontal subgrade reaction, and LPILE® parameters presented in the specific structure design tables are ultimate values; therefore, appropriate factors of safety should be applied in the design.

Because cobbles and boulders were encountered in the borings, heavy-duty construction equipment will be required to install the transmission poles. Due to potential sloughing and raveling, foundation concrete quantities may exceed calculated geometric volumes.

General Drilled Pier Design and Construction Recommendations

The end bearing capacities given are based on the cross-sectional area of the tip of the pier. Side resistance should be applied to the surface area of the drilled pier for that given length interval below a depth of 3 feet to reduce the effect of frost. The combination of skin friction and end bearing pressure can be used to determine the vertical compression capacity. The skin friction value with a $\frac{2}{3}$ reduction should be used to determine the uplift capacity of the drilled piers. The contribution of soil resistance within the frost zone should be neglected in computations of vertical and lateral capacity.

For lateral load and overturning design, we have included LPILE and MFAD parameters in the structures-specific design tables. Lateral load design parameters are valid for maximum soil strain of 1 percent for the native soils acting over a distance of one shaft diameter. The passive pressure, coefficient of horizontal subgrade reaction, and LPILE parameters presented in the structure specific design tables are ultimate values; therefore, appropriate factors of safety should be applied in the pier design.

Piers should be considered to work in group action if the horizontal center-to-center spacing is less than three pier diameters. A minimum practical horizontal center to center spacing between piers of at least three diameters should be maintained, and adjacent piers should bottom at the same elevation. The capacity of individual piers must be reduced when considering the effects of group action. Capacity reduction is a function of pier spacing and the number of piers within a group. The following table presents capacity reductions for closely spaced piers.

Description	Value		
Drilled Pier Spacing (Center-to-Center)	>3 diameters	>2 to 3 diameters	1 to 2 diameters
Pier Capacity Reduction	None	30 percent	50 percent
1. End bearing values do not need to be reduced for closely spaced piers, if bottoms of piers are at the same elevation.			

Lateral analysis should account for the center-to-center spacing and p-y multiplier values per the following table:

Pier Center-to-Center Spacing (In Direction of Loading)	p-multiplier, p_M Row 1	p-multiplier, p_M Row 2	p-multiplier, p_M Row 3 and Higher
3 x diameter	0.8	0.4	0.3

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Pier Center-to-Center Spacing (In Direction of Loading)	p-multiplier, p_M Row 1	p-multiplier, p_M Row 2	p-multiplier, p_M Row 3 and Higher
5 x diameter	1.0	0.85	0.7

Boulders and cobbles were encountered within the borings drilled for this exploration. Specialized drilling equipment and/or techniques will be necessary to drill through boulders and cobbles to the anticipated pier depths. The individual contractor(s) should be provided a copy of this report to make their own determination about the means and methods required.

Groundwater (if encountered) should be removed from each pier hole prior to concrete placement. Pier concrete should be placed immediately after completion of drilling and cleaning. If pier concrete cannot be placed in dry conditions, a tremie should be used for concrete placement. Due to potential sloughing and raveling, foundation concrete quantities may exceed calculated geometric volumes. Pier-bearing surfaces must be cleaned prior to concrete placement. A Terracon representative should observe the bearing surface and shaft configuration.

Pier casing may be required if groundwater, loose soils, or caving soils are encountered. Casing should be withdrawn in a slow continuous manner maintaining a sufficient head of concrete to prevent infiltration of water or caving soils or the creation of voids in pier concrete. Pier concrete should have a relatively high fluidity when placed in cased pier holes or through a tremie. Pier concrete with slump in the range of 5 to 7 inches is recommended for uncased piers. For cased piers, a slump in the range of 7 to 9 inches is recommended.

Pier bearing surfaces must be cleaned prior to concrete placement. A representative of the geotechnical engineer should observe the bearing surface, shaft configuration and shear ring installation.

Free-fall concrete placement in piers will only be acceptable if provisions are taken to avoid striking the concrete on the sides of the hole or reinforcing steel. The use of a bottom-dump hopper, or an elephant's trunk discharging near the bottom of the hole where concrete segregation will be reduced, is recommended.

The top of the piers should be cylindrical in shape. Forms may be necessary at the top of the piers in order to minimize the disturbance of the soils and to maintain a cylindrical shape. Failure to provide this shape (i.e., allowing mushrooming of pier tops) may result in additional uplift forces and unanticipated movement.

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For drilled piers for the proposed dead-end structures for this project, we recommend the following:

Description	Value
Minimum length	15 feet
Pier concrete slump (uncased piers)	5 to 7 inches
Pier concrete slump (cased piers)	7 to 9 inches
Approximate total movement ¹	About 1 inch

1. Additional foundation movements could occur if water from any source infiltrates the foundation material; therefore, proper drainage and irrigation practices should be incorporated into the design and operation of the facility. Failure to maintain water content of the subsurface materials and positive drainage will nullify the movement estimates provided above.

Structure-Specific Design Tables

The structure-specific design tables are presented on the following pages.

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Boring No. 1			
Description	Material Type		
	Native Sand Soils	Native Clay Soils	Shale
Depth Below Existing Site Grade (feet)	3 to 4	4 to 12	12 to 31
LPILE Soil Type	Sand (Reese)	Stiff clay w/out free water	Stiff clay w/out free water
Effective Unit Weight (pcf) ¹	120	115	125
Angle of Internal Friction, ϕ (°)	34	0	0
Undrained Cohesion, c (psf)	0	1,000	4,000
Lateral Modulus, K (pci)	60	Static–1,000 Cyclic–400	Static–2,000 Cyclic–800
Strain at 50% of Maximum Stress, ϵ_{50}	N/A	0.005	0.004
Modulus of Deformation, E_p (ksi)	2.5	1.5	5.0
Allowable Vertical Parameters			
End Bearing (ksf) ^{2,3,4}	1.0	4.0	20.0
Skin Friction (ksf) ^{5,6}	0.05	0.4	2.0

1. Groundwater was not encountered in the boring while drilling.
2. A factor of safety of 3 was used to determine the allowable end bearing pressure.
3. Applicable for a minimum 5-foot embedment or one pier diameter into the bearing stratum, whichever is deeper.
4. Values applicable to piers bearing a minimum of 5 feet, or one pier diameter, above the bottom of the borehole.
5. A factor of safety of 2 was used to determine the allowable compressive skin friction.
6. Applicable for compressive loading only. Reduce to 2/3 of value shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.

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Boring No. 3		
Description	Material Type	
	Clay Fill Materials	Native Sand Soils
Depth Below Existing Site Grade (feet)	3 to 4	4 to 40
LPile Soil Type	Stiff clay w/out free water	Sand (Reese)
Effective Unit Weight (pcf) ¹	115	120
Angle of Internal Friction, ϕ (°)	0	34
Undrained Cohesion, c (psf)	2,000	0
Lateral Modulus, K (pci)	Static–2,000 Cyclic–800	125
Strain at 50% of Maximum Stress, ϵ_{50}	0.004	--
Modulus of Deformation, E_p (ksi)	1.0	3.5
Allowable Vertical Parameters		
End Bearing (ksf) ^{2,3,4}	2.0	8.0
Skin Friction (ksf) ^{5,6}	0.2	0.4

1. Groundwater was not encountered in the boring while drilling.
2. A factor of safety of 3 was used to determine the allowable end bearing pressure.
3. Applicable for a minimum 5-foot embedment or one pier diameter into the bearing stratum, whichever is deeper.
4. Values applicable to piers bearing a minimum of 5 feet, or one pier diameter, above the bottom of the borehole.
5. A factor of safety of 2 was used to determine the allowable compressive skin friction.
6. Applicable for compressive loading only. Reduce to 2/3 of value shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.

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Boring No. 5				
Description	Material Type			
	Clay Fill Materials	Native Sand Soils	Native Clay and Clayey Sand Soils	Native Sand Soils
Depth Below Existing Site Grade (feet)	3 to 3½	3½ to 18	18 to 38	38 to 41
LPile Soil Type	Stiff clay w/out free water	Sand (Reese)	Stiff clay w/out free water	Sand (Reese)
Effective Unit Weight (pcf) ¹	115	120	120	120
Angle of Internal Friction, ϕ (°)	0	34	0	34
Undrained Cohesion, c (psf)	2,000	0	2,500	0
Lateral Modulus, K (pci)	Static–2,000 Cyclic–800	60	Static–1,000 Cyclic–400	60
Strain at 50% of Maximum Stress, ϵ_{50}	0.004	N/A	0.005	N/A
Modulus of Deformation, E_p (ksi)	1.0	2.5	1.5	2.5
Allowable Vertical Parameters				
End Bearing (ksf) ^{2,3,4}	2.0	8.0	4.0	8.0
Skin Friction (ksf) ^{5,6}	0.2	0.4	0.4	0.4

1. Groundwater was not encountered in the boring while drilling.
2. A factor of safety of 3 was used to determine the allowable end bearing pressure.
3. Applicable for a minimum 5-foot embedment or one pier diameter into the bearing stratum, whichever is deeper.
4. Values applicable to piers bearing a minimum of 5 feet, or one pier diameter, above the bottom of the borehole.
5. A factor of safety of 2 was used to determine the allowable compressive skin friction.
6. Applicable for compressive loading only. Reduce to 2/3 of value shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.

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Boring No. 6		
Description	Material Type	
	Native Clay Soils	Native Sand Soils
Depth Below Existing Site Grade (feet)	3 to 7	7 to 41
LPile Soil Type	Stiff clay w/out free water	Sand (Reese)
Effective Unit Weight (pcf) ¹	115	125
Angle of Internal Friction, ϕ (°)	0	34
Undrained Cohesion, c (psf)	4,000	0
Lateral Modulus, K (pci)	Static–2,000 Cyclic–800	125
Strain at 50% of Maximum Stress, ϵ_{50}	0.004	N/A
Modulus of Deformation, E_p (ksi)	2.0	4.0
Allowable Vertical Parameters		
End Bearing (ksf) ^{2,3,4}	6.0	8.0
Skin Friction (ksf) ^{5,6}	0.6	0.6

1. Groundwater was not encountered in the boring while drilling.
2. A factor of safety of 3 was used to determine the allowable end bearing pressure.
3. Applicable for a minimum 5-foot embedment or one pier diameter into the bearing stratum, whichever is deeper.
4. Values applicable to piers bearing a minimum of 5 feet, or one pier diameter, above the bottom of the borehole.
5. A factor of safety of 2 was used to determine the allowable compressive skin friction.
6. Applicable for compressive loading only. Reduce to 2/3 of value shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.

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Boring No. 7		
Description	Material Type	
	Native Clay Soils	Native Sand Soils
Depth Below Existing Site Grade (feet)	3 to 12	12 to 41
LPile Soil Type	Stiff clay w/out free water	Sand (Reese)
Effective Unit Weight (pcf) ¹	115	125
Angle of Internal Friction, ϕ (°)	0	34
Undrained Cohesion, c (psf)	4,000	0
Lateral Modulus, K (pci)	Static–2,000 Cyclic–800	125
Strain at 50% of Maximum Stress, ϵ_{50}	0.004	N/A
Modulus of Deformation, E_p (ksi)	2.0	4.0
Allowable Vertical Parameters		
End Bearing (ksf) ^{2,3,4}	6.0	8.0
Skin Friction (ksf) ^{5,6}	0.6	0.6

1. Groundwater was not encountered in the boring while drilling.
2. A factor of safety of 3 was used to determine the allowable end bearing pressure.
3. Applicable for a minimum 5-foot embedment or one pier diameter into the bearing stratum, whichever is deeper.
4. Values applicable to piers bearing a minimum of 5 feet, or one pier diameter, above the bottom of the borehole.
5. A factor of safety of 2 was used to determine the allowable compressive skin friction.
6. Applicable for compressive loading only. Reduce to 2/3 of value shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.

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Boring No. 8			
Description	Material Type		
	Native Sand Soils	Native Clay Soils	Native Sand Soils
Depth Below Existing Site Grade (feet)	3 to 9	9 to 17	17 to 41
LPILE Soil Type	Sand (Reese)	Stiff clay w/out free water	Sand (Reese)
Effective Unit Weight (pcf) ¹	115	115	125
Angle of Internal Friction, ϕ (°)	34	0	34
Undrained Cohesion, c (psf)	0	4,000	0
Lateral Modulus, K (pci)	60	Static–1,000 Cyclic–400	125
Strain at 50% of Maximum Stress, ϵ_{50}	N/A	0.005	N/A
Modulus of Deformation, E_p (ksi)	1.5	1.5	4.0
Allowable Vertical Parameters			
End Bearing (ksf) ^{2,3,4}	4.0	4.0	8.0
Skin Friction (ksf) ^{5,6}	0.1	0.4	0.6

1. Groundwater was not encountered in the boring while drilling.
2. A factor of safety of 3 was used to determine the allowable end bearing pressure.
3. Applicable for a minimum 5-foot embedment or one pier diameter into the bearing stratum, whichever is deeper.
4. Values applicable to piers bearing a minimum of 5 feet, or one pier diameter, above the bottom of the borehole.
5. A factor of safety of 2 was used to determine the allowable compressive skin friction.
6. Applicable for compressive loading only. Reduce to 2/3 of value shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.

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Boring No. 10		
Description	Material Type	
	Sand Fill Materials	Native Sand Soils
Depth Below Existing Site Grade (feet)	3 to 4	4 to 41
LPile Soil Type	Sand (Reese)	Sand (Reese)
Effective Unit Weight (pcf) ¹	115	125
Angle of Internal Friction, ϕ (°)	32	34
Undrained Cohesion, c (psf)	0	0
Lateral Modulus, K (pci)	60	125
Strain at 50% of Maximum Stress, ϵ_{50}	N/A	N/A
Modulus of Deformation, E_p (ksi)	1.0	4.0
Allowable Vertical Parameters		
End Bearing (ksf) ^{2,3,4}	1.0	8.0
Skin Friction (ksf) ^{5,6}	0.05	0.6

1. Groundwater was not encountered in the boring while drilling.
2. A factor of safety of 3 was used to determine the allowable end bearing pressure.
3. Applicable for a minimum 5-foot embedment or one pier diameter into the bearing stratum, whichever is deeper.
4. Values applicable to piers bearing a minimum of 5 feet, or one pier diameter, above the bottom of the borehole.
5. A factor of safety of 2 was used to determine the allowable compressive skin friction.
6. Applicable for compressive loading only. Reduce to 2/3 of value shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.

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Boring No. 11			
Description	Material Type		
	Clay Fill Materials	Native Clay Soils	Native Sand Soils
Depth Below Existing Site Grade (feet)	3 to 4	4 to 17	17 to 29
LPile Soil Type	Stiff clay w/out free water	Stiff clay w/out free water	Sand (Reese)
Effective Unit Weight (pcf) ¹	110	115	115
Angle of Internal Friction, ϕ (°)	0	0	33
Undrained Cohesion, c (psf)	1,000	2,000	0
Lateral Modulus, K (pci)	Static–500 Cyclic–200	Static–1,000 Cyclic–400	60
Strain at 50% of Maximum Stress, ϵ_{50}	0.007	0.005	N/A
Modulus of Deformation, E_p (ksi)	0.5	0.8	1.5
Allowable Vertical Parameters			
End Bearing (ksf) ^{2,3,4}	1.0	3.0	8.0
Skin Friction (ksf) ^{5,6}	0.1	0.3	0.4

1. Groundwater was not encountered in the boring while drilling.
2. A factor of safety of 3 was used to determine the allowable end bearing pressure.
3. Applicable for a minimum 5-foot embedment or one pier diameter into the bearing stratum, whichever is deeper.
4. Values applicable to piers bearing a minimum of 5 feet, or one pier diameter, above the bottom of the borehole.
5. A factor of safety of 2 was used to determine the allowable compressive skin friction.
6. Applicable for compressive loading only. Reduce to 2/3 of value shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.

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Boring No. 12		
Description	Material Type	
	Sand Fill Materials	Native Sand Soils
Depth Below Existing Site Grade (feet)	3 to 6½	6½to 41
LPile Soil Type	Sand (Reese)	Sand (Reese)
Effective Unit Weight (pcf) ¹	115	120
Angle of Internal Friction, ϕ (°)	32	34
Undrained Cohesion, c (psf)	0	0
Lateral Modulus, K (pci)	60	60
Strain at 50% of Maximum Stress, ϵ_{50}	N/A	N/A
Modulus of Deformation, E_p (ksi)	1.0	2.5
Allowable Vertical Parameters		
End Bearing (ksf) ^{2,3,4}	1.0	8.0
Skin Friction (ksf) ^{5,6}	0.05	0.4

1. Groundwater was encountered at about 40 feet below grade in the boring while drilling.
2. A factor of safety of 3 was used to determine the allowable end bearing pressure.
3. Applicable for a minimum 5-foot embedment or one pier diameter into the bearing stratum, whichever is deeper.
4. Values applicable to piers bearing a minimum of 5 feet, or one pier diameter, above the bottom of the borehole.
5. A factor of safety of 2 was used to determine the allowable compressive skin friction.
6. Applicable for compressive loading only. Reduce to 2/3 of value shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.

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Geophysics Location No. 2			
Description	Material Type		
	Native Sand Soils		
Depth Below Existing Site Grade (feet)	3 to 10	10 to 30	30 to 40
LPile Soil Type	Sand (Reese)	Sand (Reese)	Sand (Reese)
Effective Unit Weight (pcf) ¹	115	120	125
Angle of Internal Friction, ϕ (°)	32	34	34
Undrained Cohesion, c (psf)	0	0	0
Lateral Modulus, K (pci)	60	60	125
Strain at 50% of Maximum Stress, ϵ_{50}	--	N/A	N/A
Modulus of Deformation, E_p (ksi)	1.5	2.5	4.0
Allowable Vertical Parameters			
End Bearing (ksf) ^{2,3,4}	4.0	8.0	8.0
Skin Friction (ksf) ^{5,6}	0.1	0.4	0.6

1. Groundwater was not encountered in the boring while drilling.
2. A factor of safety of 3 was used to determine the allowable end bearing pressure.
3. Applicable for a minimum 5-foot embedment or one pier diameter into the bearing stratum, whichever is deeper.
4. Values applicable to piers bearing a minimum of 5 feet, or one pier diameter, above the bottom of the borehole.
5. A factor of safety of 2 was used to determine the allowable compressive skin friction.
6. Applicable for compressive loading only. Reduce to 2/3 of value shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.
7. The recommended design parameters presented in this table are based on the geophysical explorations performed at the structure location and using correlations between the exploratory borings and geophysical explorations performed at other locations along the transmission line alignment. The subsurface materials should be confirmed during construction and the design values should be adjusted, as needed. Full-time observation of the structure foundation construction should be performed by the Geotechnical Engineer.

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Geophysics Location Nos. 4 and 9	
Description	Material Type
	Native Sand Soils
Depth Below Existing Site Grade (feet)	3 to 40
L-Pile Soil Type	Sand (Reese)
Effective Unit Weight (pcf) ¹	115
Angle of Internal Friction, ϕ (°)	32
Undrained Cohesion, c (psf)	0
Lateral Modulus, K (pci)	60
Strain at 50% of Maximum Stress, ϵ_{50}	--
Modulus of Deformation, E_p (ksi)	1.5
Allowable Vertical Parameters	
End Bearing (ksf) ^{2,3,4}	4.0
Skin Friction (ksf) ^{5,6}	0.1

1. Based on the nearby borings drilled for this exploration, we do not anticipate groundwater within the upper 40 feet.
2. A factor of safety of 3 was used to determine the allowable end bearing pressure.
3. Applicable for a minimum 5-foot embedment or one pier diameter into the bearing stratum, whichever is deeper.
4. Values applicable to piers bearing a minimum of 5 feet, or one pier diameter, above the bottom of the borehole.
5. A factor of safety of 2 was used to determine the allowable compressive skin friction.
6. Applicable for compressive loading only. Reduce to 2/3 of value shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.
7. The recommended design parameters presented in this table are based on the geophysical explorations performed at the structure locations and using correlations between the exploratory borings and geophysical explorations performed at other locations along the transmission line alignment. The subsurface materials should be confirmed during construction and the design values should be adjusted, as needed. Full-time observation of the structure foundation construction should be performed by the Geotechnical Engineer.

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Geophysics Location No. 12		
Description	Material Type	
	Native Sand Soils	
Depth Below Existing Site Grade (feet)	3 to 30	30 to 40
LPile Soil Type	Sand (Reese)	Sand (Reese)
Effective Unit Weight (pcf) ¹	115	125
Angle of Internal Friction, ϕ (°)	32	34
Undrained Cohesion, c (psf)	0	0
Lateral Modulus, K (pci)	60	125
Strain at 50% of Maximum Stress, ϵ_{50}	--	N/A
Modulus of Deformation, E_p (ksi)	1.5	4.0
Allowable Vertical Parameters		
End Bearing (ksf) ^{2,3,4}	4.0	8.0
Skin Friction (ksf) ^{5,6}	0.1	0.6

1. Groundwater was encountered at about 40 feet below grade in the boring while drilling.
2. A factor of safety of 3 was used to determine the allowable end bearing pressure.
3. Applicable for a minimum 5-foot embedment or one pier diameter into the bearing stratum, whichever is deeper.
4. Values applicable to piers bearing a minimum of 5 feet, or one pier diameter, above the bottom of the borehole.
5. A factor of safety of 2 was used to determine the allowable compressive skin friction.
6. Applicable for compressive loading only. Reduce to 2/3 of value shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.
7. The recommended design parameters presented in this table are based on the geophysical explorations performed at the structure location and using correlations between the exploratory borings and geophysical explorations performed at other locations along the transmission line alignment. The subsurface materials should be confirmed during construction and the design values should be adjusted, as needed. Full-time observation of the structure foundation construction should be performed by the Geotechnical Engineer.

SEISMIC CONSIDERATIONS

Based on our subsurface exploration and laboratory testing, it is our opinion that the soils have a low risk of liquefaction. The following table presents the seismic site classification based on the 2015 International Building Code (IBC), the subsurface conditions encountered within the borings, and the results of the geophysical testing performed at selected locations:

Boring/Geophysics Location No.	Site Classification ^{1,2}
1	C ³
2	C ³
3	C ³
4	C ³
5	C
6	C
7	C
8	C
9	C ³
10	C
11	D
12	C
14	C ³

1. In general accordance with the 2015 International Building Code, Section 1613.3.2.
2. The 2015 International Building Code (IBC) requires a site subsurface profile determination extending a depth of 100 feet for seismic site classification. The current scope requested does not include the required 100-foot subsurface profile determination. The deepest borings of this exploration extended to a maximum depth of about 41 feet and this seismic site class definition considers that similar subsurface conditions exist below the maximum depth of the subsurface exploration.
3. The seismic site classification determination was supplemented with the geophysical data collected at this location.

CORROSIVITY

The following table lists the results of laboratory water-soluble sulfate and pH testing performed on samples obtained during our field exploration. These values should be used to help determine potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials that will be used for project construction. Refer to the **Summary of Laboratory Test Results** presented in the **Exploration Results** section for the complete results

of the corrosivity testing performed on the on-site soils in conjunction with this geotechnical exploration.

The corrosion information presented is specific to the samples tested. If the actual soils that will be in contact with the structures at the site are different than those tested, then additional corrosion testing should be performed. Terracon is not a corrosion engineer, and our scope of work was limited to performing corrosion laboratory tests on selected samples, presenting these results, and providing a brief comparison of the results to selected criteria. A qualified corrosion engineer should be consulted if corrosion of underground utilities and structures is a concern.

Boring No.	Sample Depth (feet)	Water-Soluble Sulfate ¹ (%)	pH
1	0 – 5	<0.10	7.0
3	0 – 5	<0.10	7.2
5	0 – 5	<0.10	6.9
6	0 – 5	<0.10	6.9
7	0 – 5	<0.10	7.6
10	0 – 5	<0.10	6.9
11	0 – 5	<0.10	8.0
12	0 – 5	<0.10	6.9

1. Results of water-soluble sulfate testing indicate that samples of the on-site soils have an exposure class of S0 when classified in accordance with Table 19.3.1.1 of the American Concrete Institute (ACI) Design Manual. The results of the testing indicate ASTM Type I Portland Cement is suitable for project concrete in contact with on-site soils. However, if there is no (or minimal) cost differential, use of ASTM Type II Portland Cement is recommended for additional sulfate resistance of construction concrete. Concrete should be designed in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 19.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of

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pollutants, hazardous materials, or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

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EXPLORATION AND TESTING PROCEDURES

Field Exploration

Boring Layout: The locations of the borings are presented in the **Site Location and Exploration Plans**. The borings were located in the field by overlaying the site plan on Google Earth, recording the latitude and longitude coordinates, and staking the borings using a handheld, recreational-grade GPS unit. The accuracy of the latitude and longitude values is typically about +/- 25 feet when obtaining the values using this method. The accuracy of the boring locations should only be assumed to the level implied by the methods used.

Subsurface Exploration Procedures: The borings were drilled with CME-55 truck-mounted and Diedrich D-50 all-terrain rotary drill rigs with hollow-stem augers and downhole drilling (ODEX) drilling methods. During the drilling operations, lithologic logs of the borings were recorded by the field engineer. Relatively undisturbed samples were obtained at selected intervals using a 2½-inch outside diameter modified California barrel sampler and disturbed samples were obtained using a 2-inch outside diameter standard split spoon sampler. Bulk samples were obtained from auger cuttings. Penetration resistance values were recorded in a manner similar to the standard penetration test (SPT). This test consists of driving the sampler into the ground with a 140-pound hammer free falling through a distance of 30 inches. The number of blows required to advance the barrel sampler 12 inches (18 inches for standard split-spoon samplers, final 12 inches are recorded) or the interval indicated is recorded and can be correlated to the standard penetration resistance value (N-value). The blow count values are indicated on the boring logs at the respective sample depths, barrel sampler blow counts are not considered N-values.

An automatic hammer was used to advance the samplers in the borings performed on this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count value by increasing the penetration per hammer blow over what would be obtained using the cathead and rope method. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

The standard penetration test provides a reasonable indication of the in-place density of sandy type materials, but only provides an indication of the relative stiffness of cohesive materials since the blow count in these soils may be affected by the moisture content of the soils. In addition, considerable care should be exercised in interpreting the N-values in gravelly soils, particularly where the size of the gravel particle exceeds the inside diameter of the sampler.

Groundwater measurements were obtained in the borings at the time of drilling. Due to safety concerns, the borings were backfilled with auger cuttings and patched with cold patch asphalt

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(where applicable) after drilling. Some settlement of the backfill and patches may occur and should be repaired as soon as possible.

Geophysical Exploration Procedures: Terracon performed geophysical exploration services consisting of seismic refraction and MASW at six locations. Survey lines ranged from approximately 240 to 300 feet in length and had a geophone spacings of 10 to 13 feet. Terracon used a seismic refraction system (SRS) consisting of a SeismicSource DAQLink III seismograph and 24 geophones to derive subsurface seismic velocity information. The approximate location and layout of the survey lines are presented in the **Geophysical Results**.

First-arrival travel times of compressive waves (P-waves) produced by a P-wave source were recorded. Using only the first-arrival travel times and survey geometry, the data was forward modeled using a non-linear optimization technique called adaptive simulated annealing. This algorithm determines the compressive wave velocity model for a corresponding depth and resolution with the minimum travel-time error without searching through every possible model.

Multi-channel analysis of surface waves (MASW) was performed by collecting surface waves created by a seismic source consisting of a sledgehammer and a metal plate. The data was then processed using dispersion analysis software (SurfSeis, engineered by the Kansas Geological Survey) that extracts the fundamental-mode dispersion curve(s). The curves are inverted and modeled to yield a 1D shear-wave velocity profile at the center point of the array for a corresponding depth.

Laboratory Testing

Samples retrieved during the field exploration were returned to the laboratory for observation by the project geotechnical engineer and were classified in general accordance with the Unified Soil Classification System presented in the **Supporting Information**.

An applicable laboratory-testing program was formulated to determine engineering properties of the subsurface materials. Following the completion of the laboratory testing, the field descriptions were confirmed or modified as necessary, and the boring logs were prepared. The boring logs are included in the **Exploration Results**.

Laboratory test results are included in the **Exploration Results**. These results were used for the geotechnical engineering analyses and the development of foundation and earthwork recommendations. Laboratory tests were performed in general accordance with the applicable local or other accepted standards.

Selected soil samples were tested for the following engineering properties:

- Water content
- Dry density
- Grain size distribution
- Atterberg limits
- Water-soluble sulfate content
- pH

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SITE LOCATION AND EXPLORATION PLANS

Contents:

Site Location Plan

Exploration Plan with Aerial Image

Note: All attachments are one page unless noted above.

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SITE LOCATION

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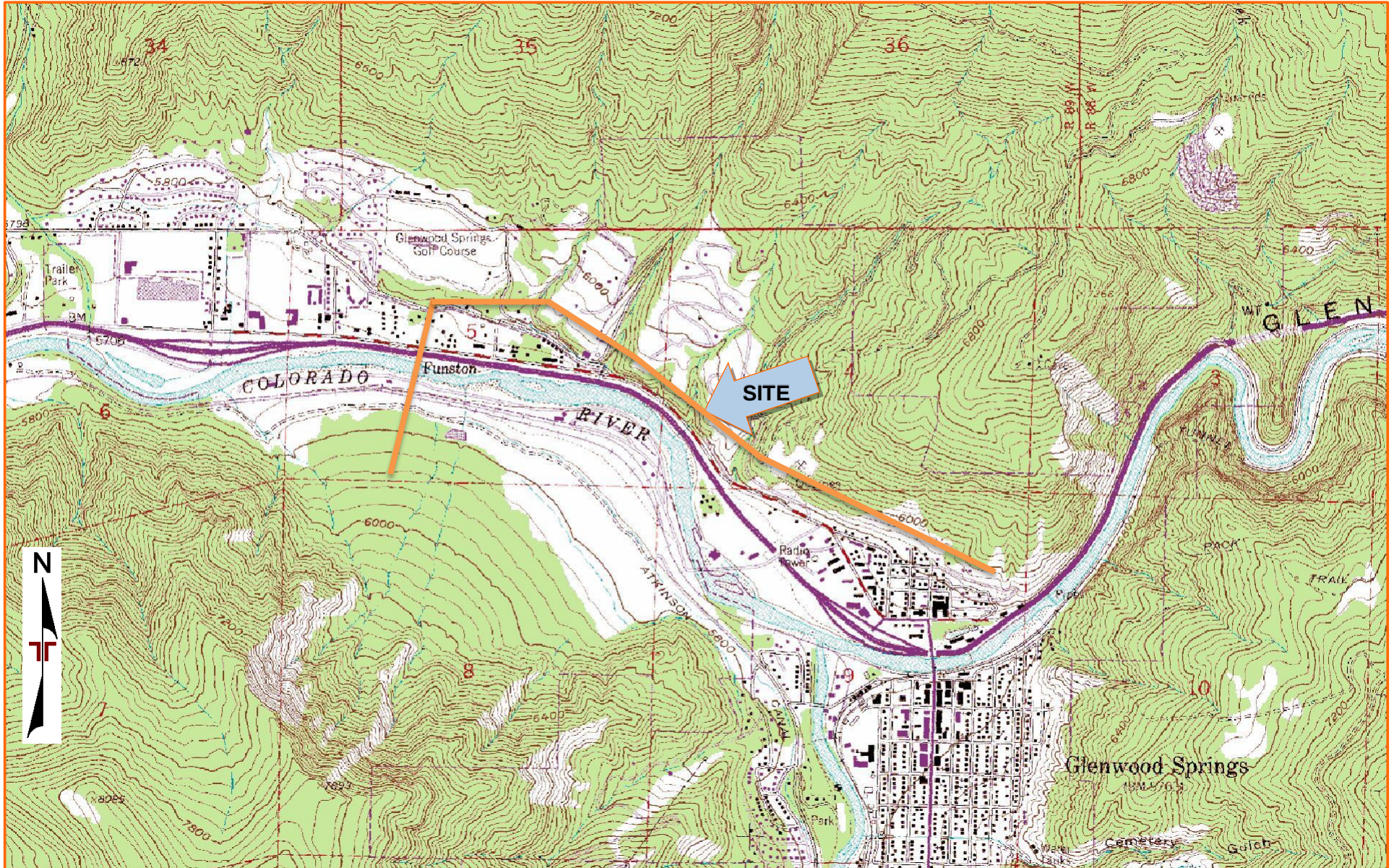


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT
INTENDED FOR CONSTRUCTION PURPOSES

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY
QUADRANGLES INCLUDE: GLENWOOD SPRINGS, CO (1/1/1987).

EXPLORATION PLAN WITH AERIAL IMAGE

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DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT
INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY
MICROSOFT BING MAPS

EXPLORATION RESULTS

Contents:

Boring Logs (Boring Nos. 1, 3, 5 through 8, and 10 through 12)

Grain Size Distribution (3 pages)

Summary of Laboratory Test Results

Note: All attachments are one page unless noted above.

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BORING LOG NO. 1

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PROJECT: Xcel Line 6584 Glenwood Springs to Mitchell Creek

CLIENT: Xcel Energy Services Inc

SITE: Various locations
Glenwood Springs, Colorado

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.5520° Longitude: -107.3214°	DEPTH (Ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	ATTERBERG LIMITS	PERCENT FINES
						LL-PL-PI	
	DEPTH						
	CLAYEY SAND (SC) , with gravel, fine to coarse grained, pale brown, medium dense						
	4.0				12-16	35-21-14	41
	SANDY LEAN CLAY (CL) , with gravel, calcareous, brown, stiff to very stiff	5			10-12		
					7-17		
		10			8-13		
					50/1"		
		15			50/0"		
	SHALE , gray, very hard	20			50/0"		
		25			50/0"		
		30			50/1"		
	Boring Terminated at 31 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4-1/2 inch diameter ODEX down-hole hammer

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

None encountered while drilling

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Started: 12-21-2020

Boring Completed: 12-21-2020

Drill Rig: CME-55

Driller: Terracon

Project No.: 25205018

BORING LOG NO. 3

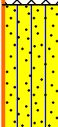
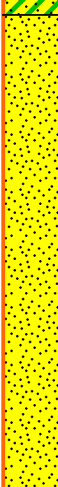
Page 1 of 1

PROJECT: Xcel Line 6584 Glenwood Springs to Mitchell Creek

CLIENT: Xcel Energy Services Inc

SITE: Various locations
Glenwood Springs, Colorado

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 25205018 XCEL LINE 6584 GL GPJ TERRACON.DATATEMPLATE.GDT 2/16/21

GRAPHIC LOG	LOCATION	See Exploration Plan	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	ATTERBERG LIMITS	PERCENT FINES
	Latitude: 39.5565° Longitude: -107.3334°						LL-PL-PI	
DEPTH								
	FILL - SANDY LEAN CLAY (CL) , with gravel, trace limestone fragments, calcareous, brown to grayish brown, hard, varies to silty sand with gravel (SM)						NP	20
	4.0					22-15		
	SILTY SAND (SM) , trace gravel and clay, fine to coarse grained, light yellowish brown, medium dense to dense		5			12-14		
	9.0					50/11"		
	POORLY GRADED SAND (SP) , with gravel, cobbles and boulders, fine to coarse grained, pale brown, medium dense		10			10-23		
	12.0					11-9		
	CLAYEY SAND (SC) , with cobbles and boulders, trace gravel, fine to coarse grained, light yellowish brown, medium dense		15			7-13		
	20					19-20		
	POORLY GRADED SAND (SP) , with gravel, cobbles and boulders, fine to coarse grained, brown, medium dense to very dense		25			50/4"		
	30					16-22		
			35			22-25		
	40.0					50/5"		
Boring Terminated at 40 Feet			40					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4-1/2 inch diameter ODEX down-hole hammer

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

None encountered while drilling

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Started: 06-09-2020

Boring Completed: 06-09-2020

Drill Rig: CME-55

Driller: Terracon

Project No.: 25205018

BORING LOG NO. 5

Page 1 of 1

PROJECT: Xcel Line 6584 Glenwood Springs to Mitchell Creek

CLIENT: Xcel Energy Services Inc

SITE: Various locations
Glenwood Springs, Colorado

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 25205018 XCEL LINE 6584 GL.GPJ TERRACON.DATATEMPLATE.GDT 2/16/21

GRAPHIC LOG	LOCATION See Exploration Plan	DEPTH (Ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	ATTERBERG LIMITS	PERCENT FINES
	Latitude: 39.5588° Longitude: -107.3373°					LL-PL-PI	
	DEPTH						
	FILL - SANDY LEAN CLAY (CL) , trace gravel and silt, calcareous, brown, very stiff, varies to silty gravel with sand (GM)					NP	16
3.5					13-16		
	SILTY SAND (SM) , with gravel, trace clay, fine to coarse grained, brown, medium dense	5			10-16		
7.0					23-39		
	POORLY GRADED SAND (SP) , with gravel, trace silt and clay, fine to coarse grained, brown, dense	10			25-39		
					18-21-20		
		15			14-23-20		
18.0							
	SANDY LEAN CLAY (CL) , trace gravel, calcareous, brown, hard	20			16-23-26		
23.0							
	CLAYEY SAND (SC) , with gravel, fine to coarse grained, brown, medium dense to dense	25			15-16-17		
31.0		30			11-9-10		
	SILTY CLAY (CL-ML) , trace sand, calcareous, brown, very stiff						
		35			10-13-11		
38.0							
	POORLY GRADED SAND (SP) , trace gravel, fine to coarse grained, light brown, dense	40			14-16-17		
41.0							
	Boring Terminated at 41 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4-1/2 inch diameter ODEX down-hole hammer

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

None encountered while drilling

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Started: 10-07-2020

Boring Completed: 10-07-2020

Drill Rig: Diedrich D-50

Driller: Terracon

Project No.: 25205018

BORING LOG NO. 6

Page 1 of 1

PROJECT: Xcel Line 6584 Glenwood Springs to Mitchell Creek

CLIENT: Xcel Energy Services Inc

SITE: Various locations
Glenwood Springs, Colorado

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.5606° Longitude: -107.3398°	DEPTH (Ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	ATTERBERG LIMITS	PERCENT FINES
						LL-PL-PI	
	DEPTH						
	LEAN CLAY (CL) , with sand, trace gravel, calcareous, brown, hard						
	7.0	5			20-25	34-16-18	74
					50/4"		
					50/2"		
		10			42-50/3"		
					8-21-50/5"		
		15			50/3"		
		20			50-50/1"		
		25			50/3"		
		30			50/5"		
		35			20-27-50		
		40			11-15-22		
	41.0						
	Boring Terminated at 41 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4-1/2 inch diameter ODEX down-hole hammer

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

None encountered while drilling

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Started: 10-09-2020

Boring Completed: 10-09-2020

Drill Rig: Diedrich D-50

Driller: Terracon

Project No.: 25205018

BORING LOG NO. 7

Page 1 of 1

PROJECT: Xcel Line 6584 Glenwood Springs to Mitchell Creek

CLIENT: Xcel Energy Services Inc

SITE: Various locations
Glenwood Springs, Colorado

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 25205018 XCEL LINE 6584 GL GPJ TERRACON.DATATEMPLATE.GDT 2/16/21

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.5616° Longitude: -107.3417°	DEPTH (Ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	ATTERBERG LIMITS	PERCENT FINES
						LL-PL-PI	
	DEPTH						
	LEAN CLAY (CL) , with sand, calcareous nodules, light brown to brown, hard						
					17-26	32-19-13	80
	6.0 with boulders around 5 feet	5			50-26		
	SANDY LEAN CLAY (CL) , with gravel, trace silt, calcareous, brown, hard				12-40		
		10			45-15		
	12.0				11-17		
	SILTY SAND (SM) , trace clay, fine to coarse grained, pale brown, medium dense to very dense	15			44-50/3"		
	with boulders around 15 feet						
		20			17-28-50/2"		
	23.0						
	POORLY GRADED SAND (SP) , with gravel, trace silt, fine to coarse grained, light brown, dense to very dense	25			11-15-20		
		30			36-36-24		
		35			26-50/3"		
		40			36-34-35		
	41.0						
	Boring Terminated at 41 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4-1/2 inch diameter ODEX down-hole hammer

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

None encountered while drilling

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Started: 10-08-2020

Boring Completed: 10-08-2020

Drill Rig: Diedrich D-50

Driller: Terracon

Project No.: 25205018

BORING LOG NO. 8

Page 1 of 1

PROJECT: Xcel Line 6584 Glenwood Springs to Mitchell Creek

CLIENT: Xcel Energy Services Inc

SITE: Various locations
Glenwood Springs, Colorado

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.5624° Longitude: -107.3442°	DEPTH (Ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	ATTERBERG LIMITS	PERCENT FINES
						LL-PL-PI	
	DEPTH						
	SILTY SAND (SM) , with cobbles and boulders, trace gravel and clay, fine to coarse grained, light brown, medium dense to very dense, varies to sandy lean clay with gravel (CL)						
					9-8	32-19-13	59
		5			8-16		
					27-50/5"		
9.0	SANDY LEAN CLAY (CL) , with cobbles and boulders, calcareous, brown, very stiff to hard	10			11-14-11		
					50/4"		
		15			27-50/5"		
17.0	POORLY GRADED SAND (SP) , with gravel, cobbles and boulders, fine to coarse grained, light brown, dense to very dense	20			50/5"		
		25			50/5"		
		30			16-24-22		
		35			24-29-45		
41.0	Boring Terminated at 41 Feet	40			50/3"		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
8-inch diameter hollow stem continuous flight power auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

None encountered while drilling

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Started: 10-13-2020

Boring Completed: 10-13-2020

Drill Rig: CME-55

Driller: Terracon

Project No.: 25205018

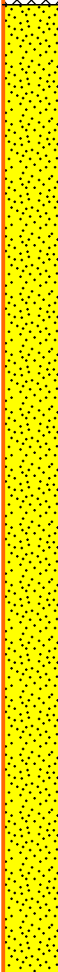
BORING LOG NO. 10

Page 1 of 1

PROJECT: Xcel Line 6584 Glenwood Springs to Mitchell Creek

CLIENT: Xcel Energy Services Inc

SITE: Various locations
Glenwood Springs, Colorado

GRAPHIC LOG	LOCATION	See Exploration Plan	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	ATTERBERG LIMITS	PERCENT FINES
	Latitude: 39.5627° Longitude: -107.3504°						LL-PL-PI	
DEPTH								
	FILL - SILTY SAND (SM) , with gravel, fine to coarse grained, brown, very dense						NP	30
	-boulder around 2.5 feet					50/3"		
	POORLY GRADED SAND (SP) , with gravel, trace cobbles and silt, fine to coarse grained, brown to light brown, dense to very dense		5			20-24-50/6"		
						16-15-15		
			10			13-18-26		
						12-28-35		
			15			22-16-16		
			20			12-23-20		
			25			14-40-50/6"		
			30			50/2"		
			35			43-43-50/3"		
			40			50/3"		
Boring Terminated at 41 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4-1/2 inch diameter ODEX down-hole hammer

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with grout upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

None encountered while drilling

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Started: 11-17-2020

Boring Completed: 11-17-2020

Drill Rig: CME-55

Driller: Terracon

Project No.: 25205018

BORING LOG NO. 11

Page 1 of 1

PROJECT: Xcel Line 6584 Glenwood Springs to Mitchell Creek

CLIENT: Xcel Energy Services Inc

SITE: Various locations
Glenwood Springs, Colorado

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_25205018 XCEL LINE 6584 GL.GPJ TERRACON.DATATEMPLATE.GDT 2/16/21

GRAPHIC LOG	LOCATION See Exploration Plan	DEPTH (Ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	ATTERBERG LIMITS	PERCENT FINES
	Latitude: 39.5611° Longitude: -107.3505°					LL-PL-PI	
	DEPTH						
0.4	ASPHALT						
4.0	FILL - SILTY CLAY (CL-ML) , trace gravel, calcareous, dark brown, medium stiff, varies to clayey sand (SC)				4-4	29-17-12	49
	LEAN CLAY (CL) , trace sand, calcareous, brown, medium stiff to very stiff	5			6-11		
					7-12		
		10			6-8		
					4-6		
14.0	FAT CLAY (CH) , calcareous, brown, stiff	15			6-7		
17.0	SILTY SAND (SM) , fine to coarse grained, pale brown, loose						
		20			4-9		
22.0	POORLY GRADED SAND (SP) , with gravel, cobbles and boulders, fine to coarse grained, gray to grayish brown, dense						
		25			50/9"		
29.0	ODEX Casing Broke at 29 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4-1/2 inch diameter ODEX down-hole hammer

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings and asphalt upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

None encountered while drilling

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Started: 06-09-2020

Boring Completed: 06-09-2020

Drill Rig: CME-55

Driller: Terracon

Project No.: 25205018

BORING LOG NO. 12

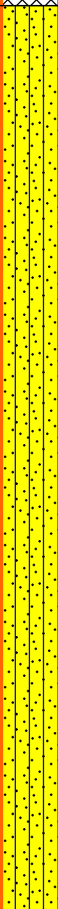
Page 1 of 1

PROJECT: Xcel Line 6584 Glenwood Springs to Mitchell Creek

CLIENT: Xcel Energy Services Inc

SITE: Various locations
Glenwood Springs, Colorado

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 25205018 XCEL LINE 6584 GL.GPJ TERRACON_DATATEMPLATE.GDT 2/16/21

GRAPHIC LOG	LOCATION See Exploration Plan	DEPTH (Ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	ATTERBERG LIMITS	PERCENT FINES
	Latitude: 39.5596° Longitude: -107.3519°					LL-PL-PI	
	DEPTH						
	FILL - SILTY SAND (SM) , with gravel, fine to coarse grained, red, medium dense					NP	29
	SILTY SAND (SM) , with gravel, trace cobbles and clay, fine to coarse grained, red to brown, medium dense to very dense						
		5			9-8		
					7-8-11		
		10			17-20-22		
					9-6-10		
					27-27-26		
		15			50/3"		
		20			8-6-8		
		25			10-7-12		
		30			50/6"		
		35			50/3"		
		40			50/5"		
	Boring Terminated at 41 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4-1/2 inch diameter ODEX down-hole hammer

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

WATER LEVEL OBSERVATIONS

-  About 40 feet while drilling
-  About 40 feet about 15 minutes after drilling

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Started: 11-16-2020

Boring Completed: 11-16-2020

Drill Rig: CME-55

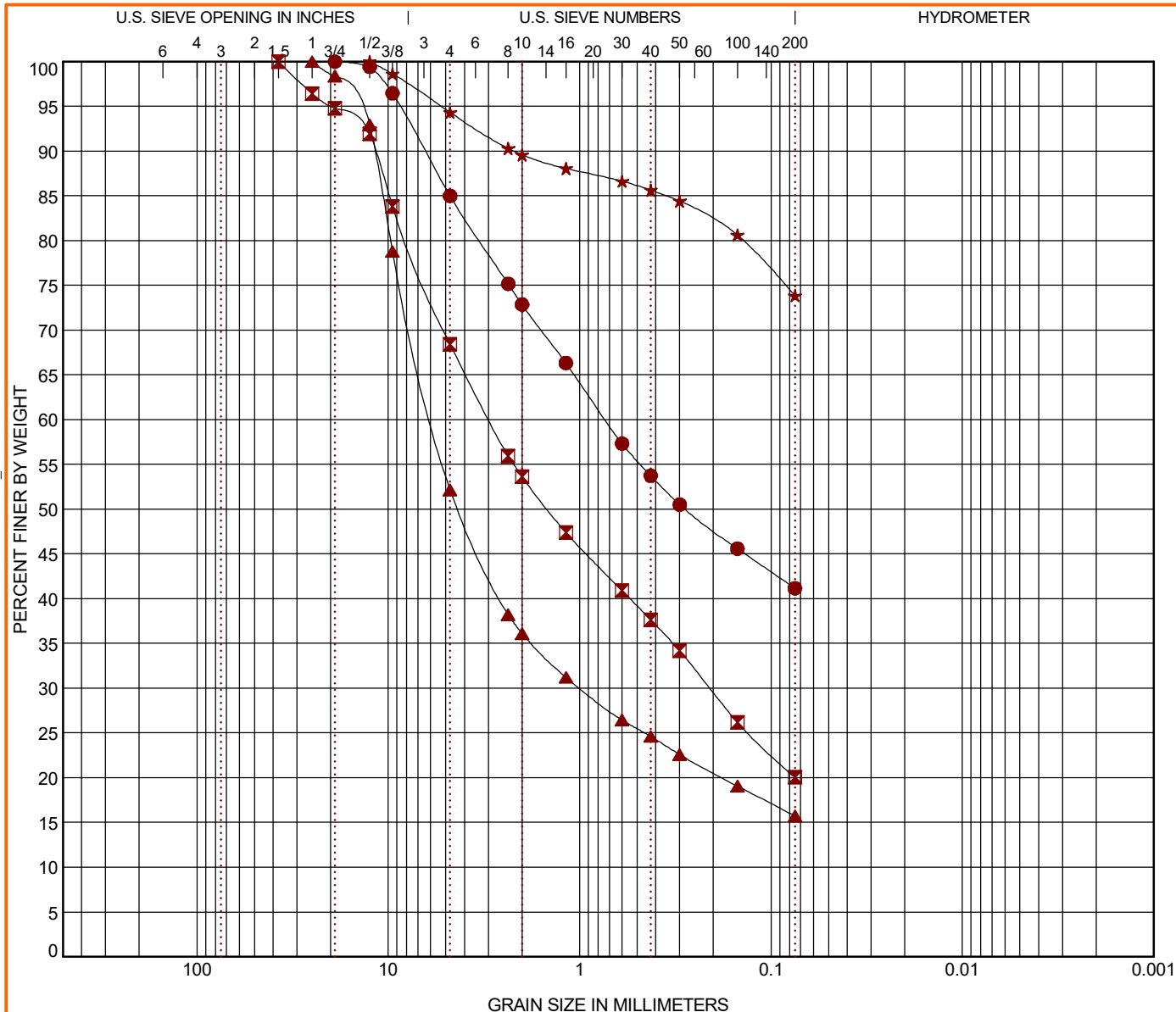
Driller: Terracon

Project No.: 25205018

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO DESC COMBINED 25205018 XCEL LINE 6584 GL.GPJ TERRACON_DATATEMPLATE.GDT 2/11/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification		AASHTO Classification		WC (%)	LL	PL	PI	Cc	Cu
●	1	0 - 5	CLAYEY SAND with GRAVEL (SC)		A-6 (2)			35	21	14		
☒	3	0 - 5	SILTY SAND with GRAVEL (SM)		A-1-b (0)			NP	NP	NP		
▲	5	0 - 5	SILTY GRAVEL with SAND (GM)		A-1-b (0)			NP	NP	NP		
★	6	0 - 5	LEAN CLAY with SAND (CL)		A-6 (11)			34	16	18		
Boring ID		Depth	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Gravel	%Sand	%Silt	%Fines	%Clay	
●	1	0 - 5	19	0.733			15.0	43.8		41.2		
☒	3	0 - 5	37.5	2.961	0.209		31.6	48.4		20.0		
▲	5	0 - 5	25	5.827	0.994		47.8	36.4		15.7		
★	6	0 - 5	12.5				5.7	20.5		73.9		

PROJECT: Xcel Line 6584 Glenwood Springs to Mitchell Creek

SITE: Various locations
Glenwood Springs, Colorado

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

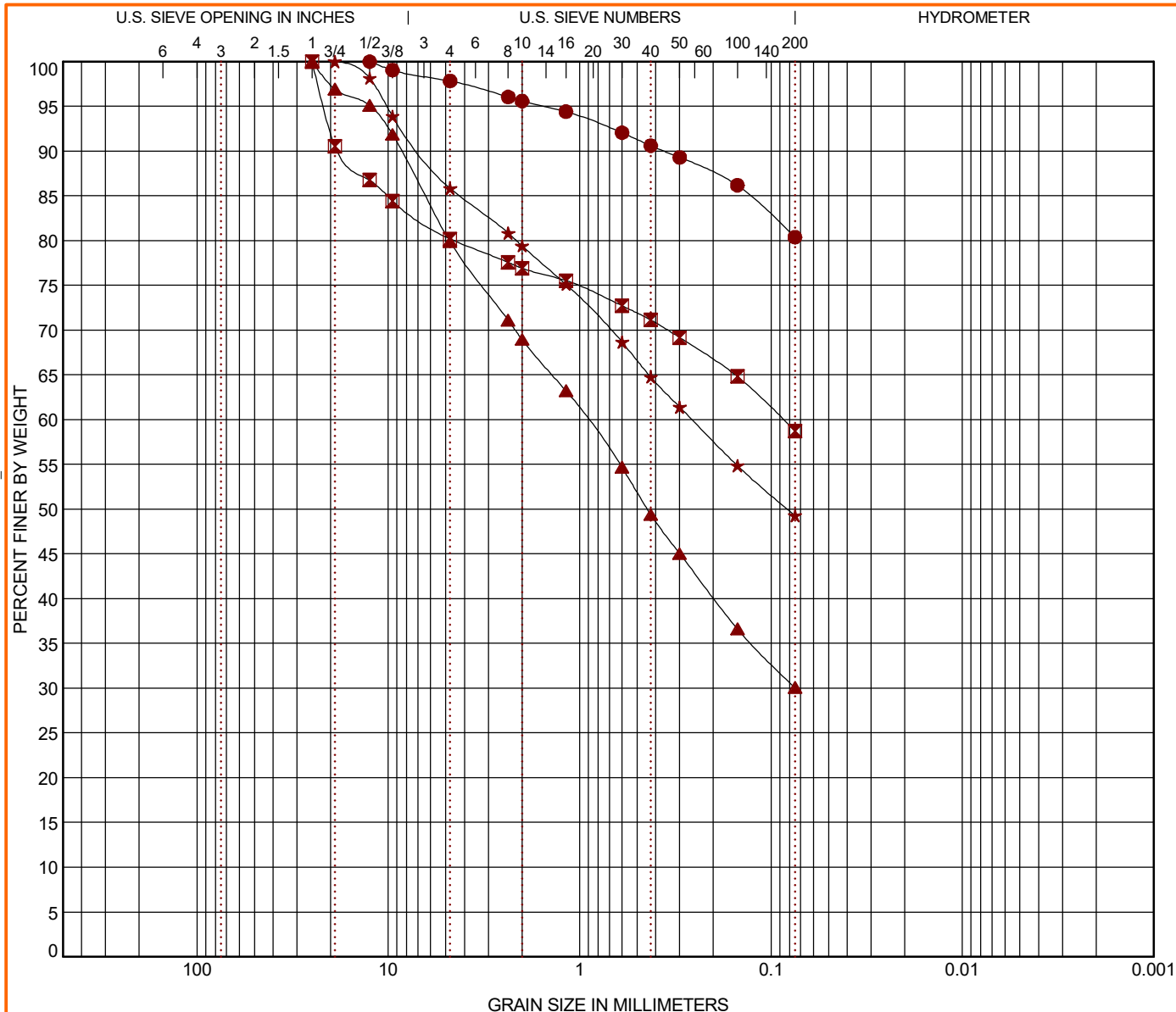
PROJECT NUMBER: 25205018

CLIENT: Xcel Energy Services Inc

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO DESC COMBINED 25205018 XCEL LINE 6584 GL.GPJ TERRACON_DATA TEMPLATE.GDT 2/11/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification		AASHTO Classification		WC (%)	LL	PL	PI	Cc	Cu
●	7	0 - 5	LEAN CLAY with SAND (CL)		A-6 (9)			32	19	13		
☒	8	2.5 - 3.5	SANDY LEAN CLAY with GRAVEL (CL)		A-6 (5)			32	19	13		
▲	10	0 - 5	SILTY SAND with GRAVEL (SM)		A-2-4 (0)			NP	NP	NP		
★	11	0 - 5	CLAYEY SAND (SC)		A-6 (3)			29	17	12		
Boring ID		Depth	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Gravel	%Sand	%Silt	%Fines	%Clay	
●	7	0 - 5	12.5				2.2	17.5		80.4		
☒	8	2.5 - 3.5	25	0.087			19.8	21.4		58.7		
▲	10	0 - 5	25	0.913			20.1	49.8		30.1		
★	11	0 - 5	19	0.259			14.2	36.5		49.3		

PROJECT: Xcel Line 6584 Glenwood Springs to Mitchell Creek

SITE: Various locations
Glenwood Springs, Colorado

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

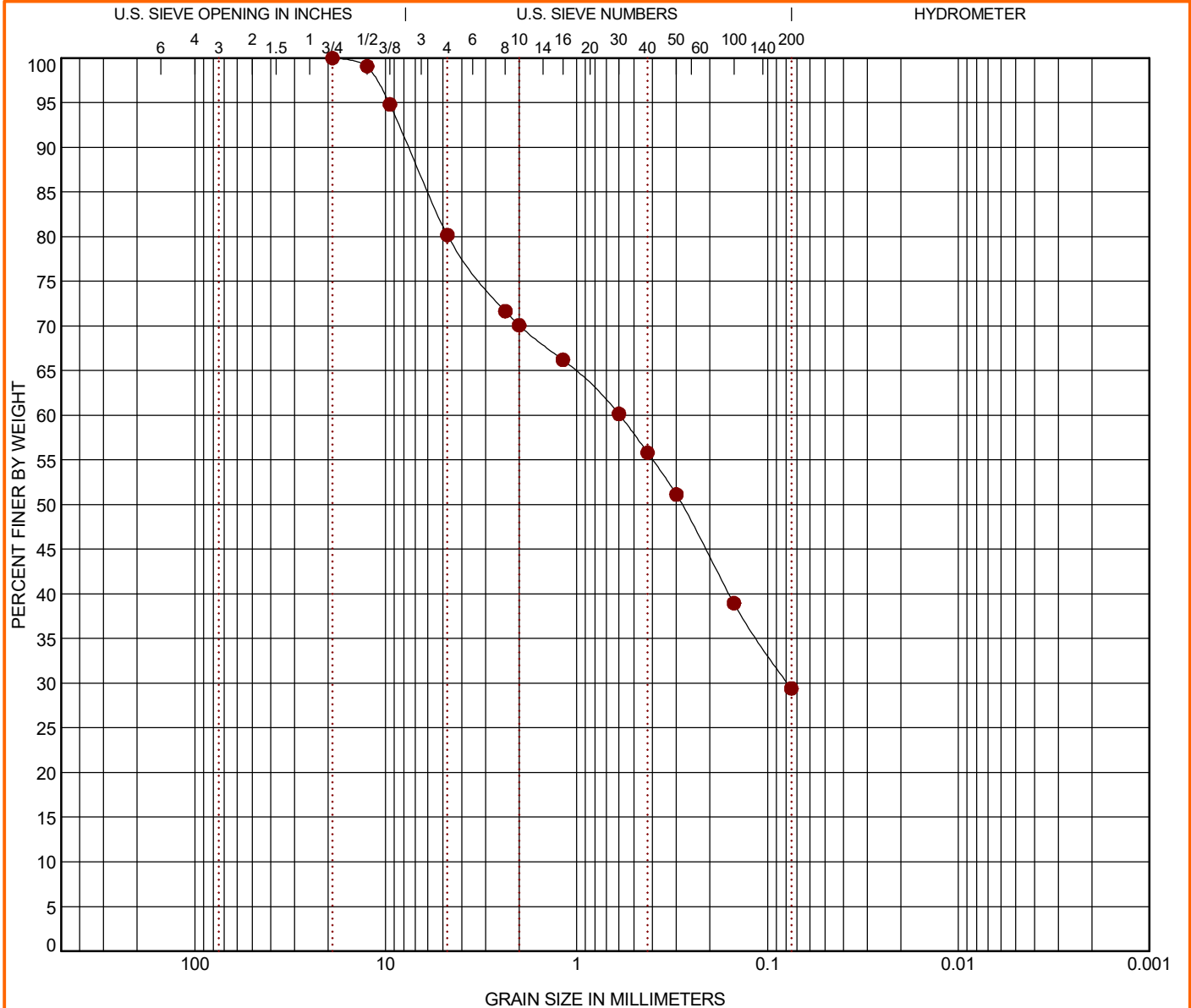
PROJECT NUMBER: 25205018

CLIENT: Xcel Energy Services Inc

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO DESC COMBINED 25205018 XCEL LINE 6584 GL.GPJ TERRACON_DATA\TEMPLATE.GDT 2/11/21



SUMMARY OF LABORATORY TEST RESULTS

Xcel Line 6584 Glenwood Springs to Mitchell Creek - Glenwood Springs, Colorado
Terracon Project No. 25205018



Boring No.	Depth (ft)	USCS Class.	Particle Size Distribution, Percent Passing by Weight					Atterberg Limits		Water-Soluble Sulfates (%)	pH	Remarks
			1½"	#4	#10	#40	#200	LL	PI			
1	0 - 5	SC	100	85	73	54	51	35	14	<0.10	7.0	
3	0 - 5	SM	100	68	54	38	20	NV	NP	<0.10	7.2	
5	0 - 5	GM	100	52	36	25	16	NV	NP	<0.10	6.9	
6	0 - 5	CL	100	94	90	86	74	34	18	<0.10	6.9	
7	0 - 5	CL	100	98	96	91	80	32	13	<0.10	7.6	
8	2½	CL	100	80	77	71	59	32	13			
10	0 - 5	SM	100	80	69	49	30	NV	NP	<0.10	6.9	
11	0 - 5	SC	100	86	79	65	49	29	12	<0.10	8.0	
12	0 - 5	SM	100	80	70	56	29	NV	NP	<0.10	6.9	

Notes:
Initial Dry Density and Initial Water Content are in-situ values unless otherwise noted.
* = Partially disturbed sample
- = Compression/settlement
NV = no value
NP = non-plastic

Remarks:
1 Remolded Compacted density (about 95% of ASTM D698 maximum density near optimum moisture content)
2 Remolded Compacted density (about 95% of ASTM D1557 maximum density near optimum moisture content)
3 Water added to sample
4 Dry density and/or moisture content determined from one ring of a multi-ring sample
5 Minus #200 Only
6 Moisture-Density Relationship Test Method ASTM D698/AASHTO T99
7 Moisture-Density Relationship Test Method ASTM D1557/AASHTO T180

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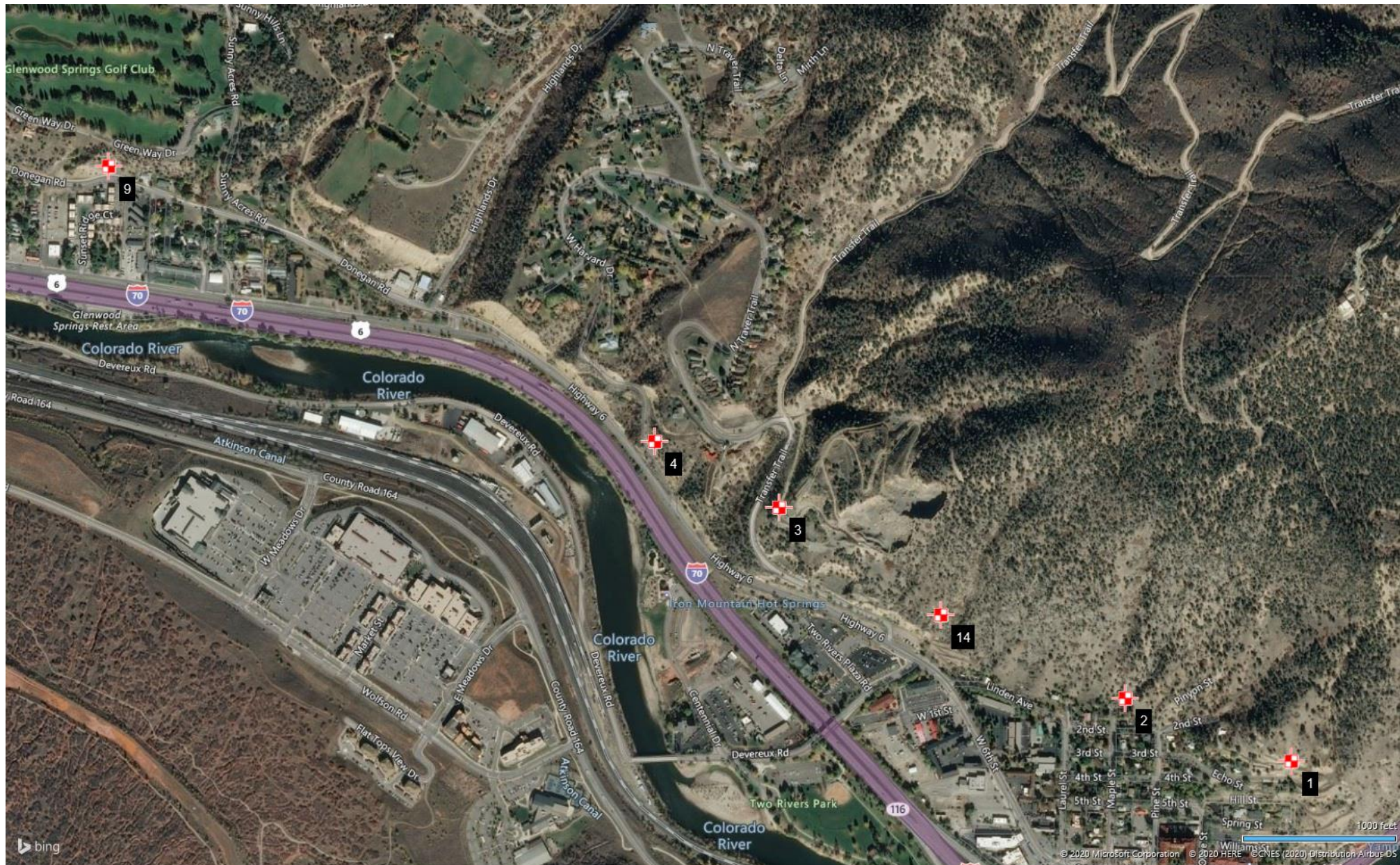
GEOPHYSICAL RESULTS

Contents:

Geophysical Exploration Plan
Shear Wave Velocity Profile (6 pages)
P-Wave Velocity Profile (6 pages)

Note: All attachments are one page unless noted above.

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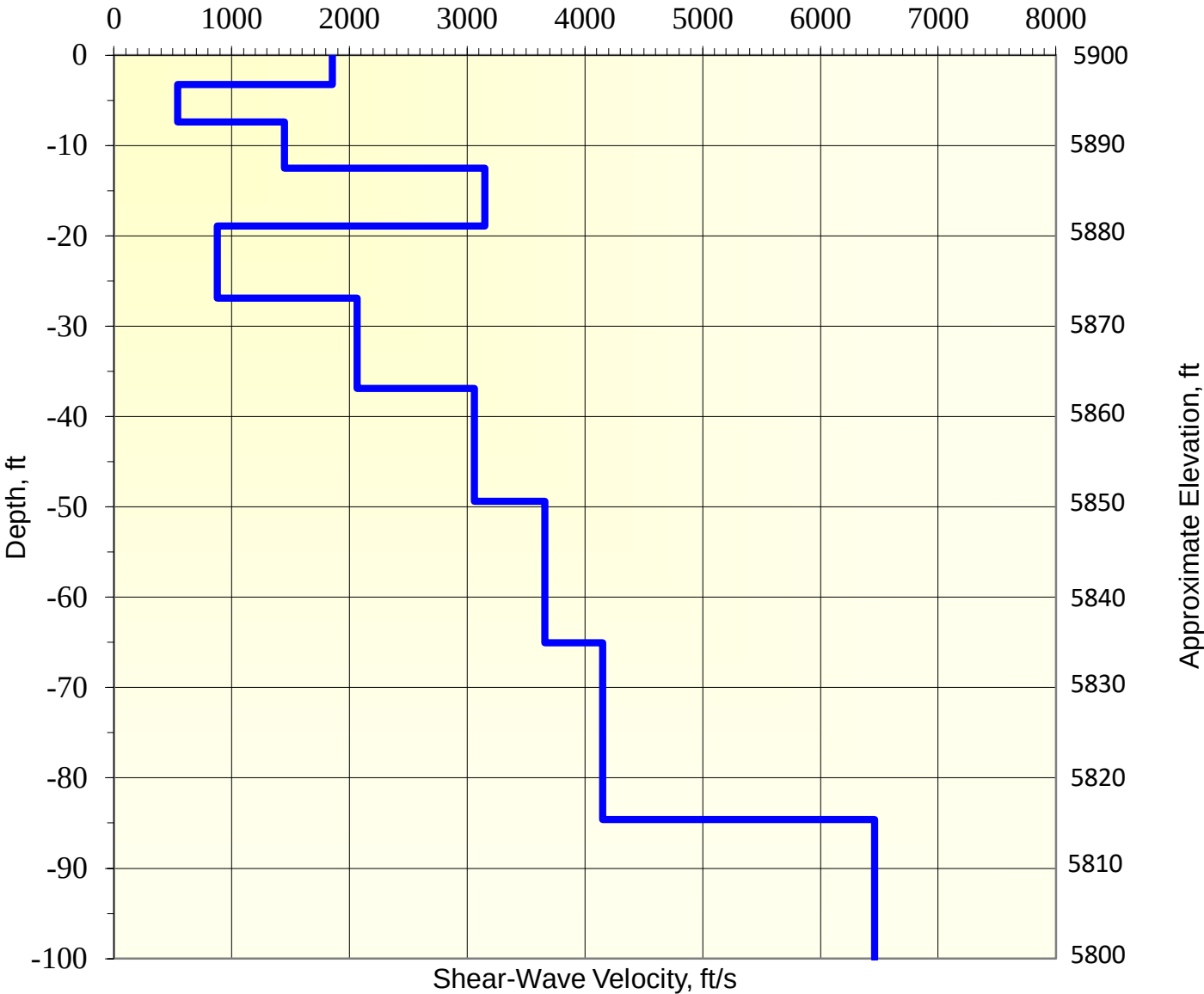
Legend

 Approximate Location of Seismic Lines

Project Manager: SWB	Project No. 25205018		Geophysical Exploration Plan
Drawn by: KTJ	Scale: As Shown		Geophysical Results
Checked by: JAS	File Name: LOC		Xcel Line 6584 Glenwood Springs to Mitchell Creek
Approved by: SBM	Date: October 2020		Glenwood Springs, Colorado

Geophysics Location No. 1

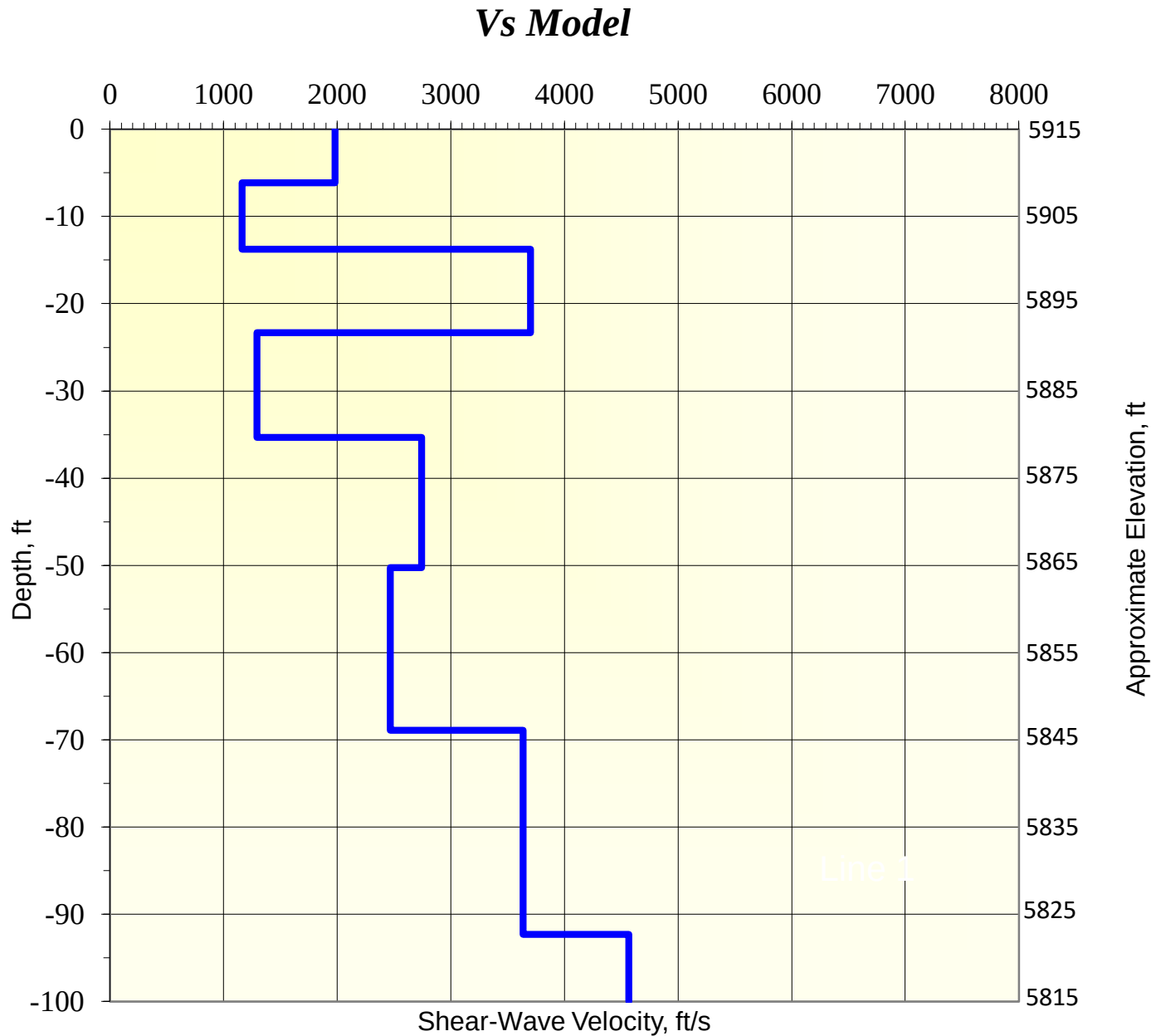
Vs Model



Average Shear-Wave Velocity to 100' = 2,257 ft/s

Project Manager: SWB	Project No. 25205018	Terracon Consulting Engineers & Scientists 10625 W. I-70 Frontage Rd. N., Ste. 3, Wheat Ridge, Colorado 80033 PH: (303) 423-3300 FAX: (303) 423-3353	Shear Wave Velocity Profile
Drawn by: KTJ	Scale: As Shown		Geophysical Results
Checked by: JAS	File Name: LOC		Xcel Line 6584 Glenwood Springs to Mitchell Creek
Approved by: SBM	Date: October 2020		Glenwood Springs, Colorado

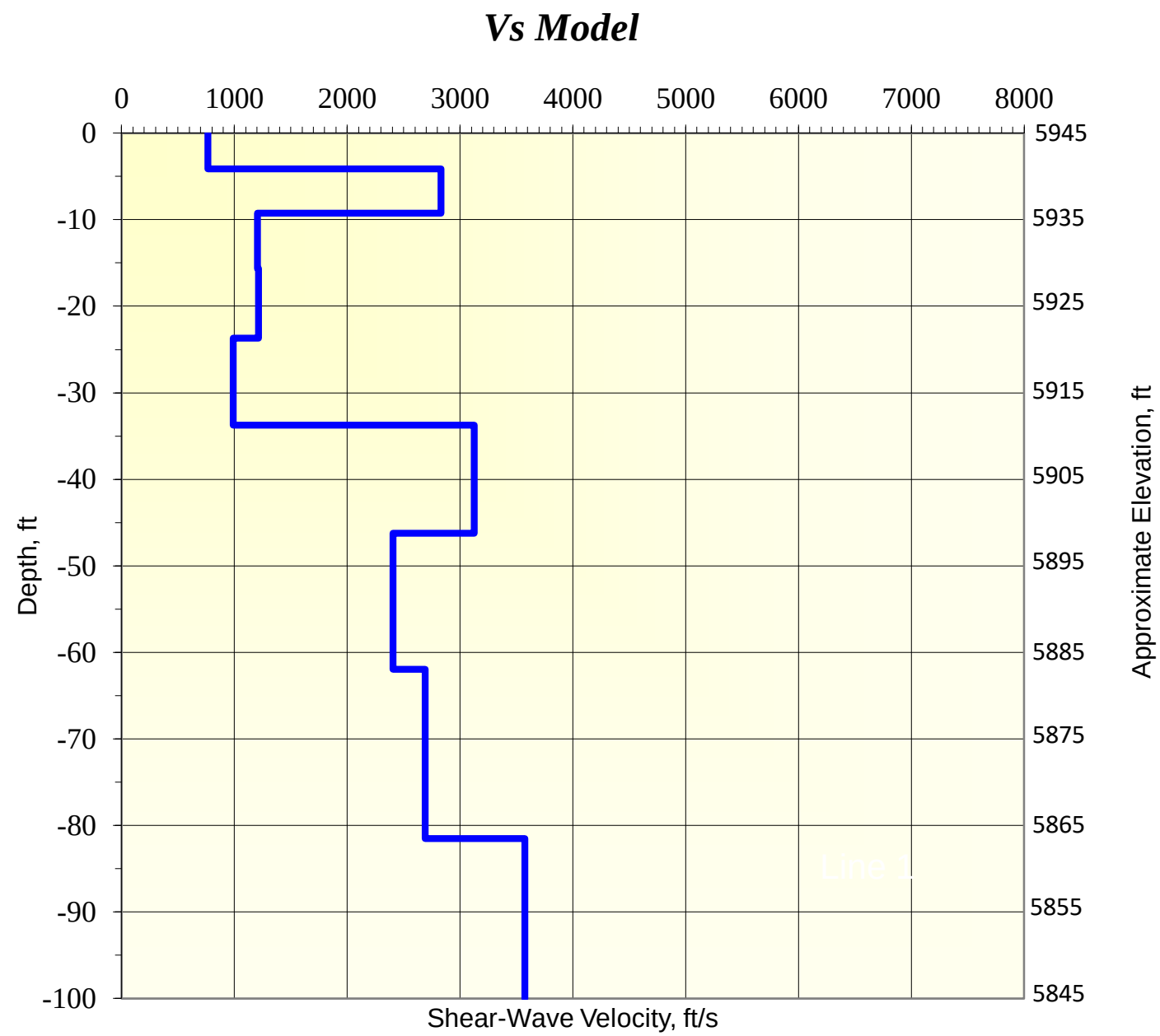
Geophysics Location No. 2



Average Shear-Wave Velocity to 100' = 2,345 ft/s

Project Manager: SWB	Project No. 25205018	Terracon Consulting Engineers & Scientists 10625 W. I-70 Frontage Rd. N., Ste. 3, Wheat Ridge, Colorado 80033 PH: (303) 423-3300 FAX: (303) 423-3353	Shear Wave Velocity Profile
Drawn by: KTJ	Scale: As Shown		Geophysical Results
Checked by: JAS	File Name: LOC		Xcel Line 6584 Glenwood Springs to Mitchell Creek
Approved by: SBM	Date: October 2020		Glenwood Springs, Colorado

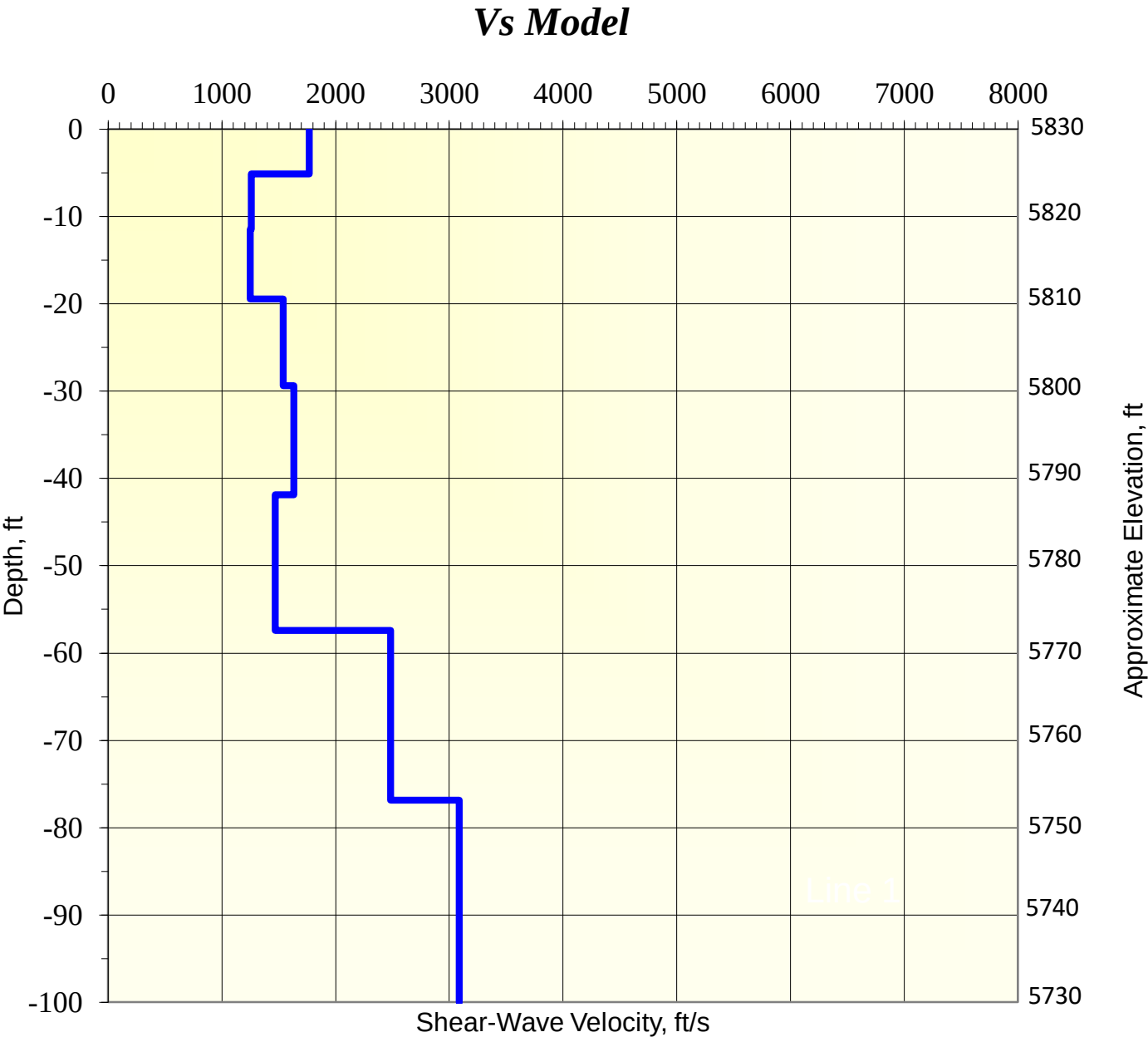
Geophysics Location No. 3



Average Shear-Wave Velocity to 100' = 1,914 ft/s

Project Manager: SWB	Project No. 25205018	Terracon Consulting Engineers & Scientists 10625 W. I-70 Frontage Rd. N., Ste. 3, Wheat Ridge, Colorado 80033 PH: (303) 423-3300 FAX: (303) 423-3353	Shear Wave Velocity Profile
Drawn by: KTJ	Scale: As Shown		Geophysical Results
Checked by: JAS	File Name: LOC		Xcel Line 6584 Glenwood Springs to Mitchell Creek
Approved by: SBM	Date: October 2020		Glenwood Springs, Colorado

Geophysics Location No. 4

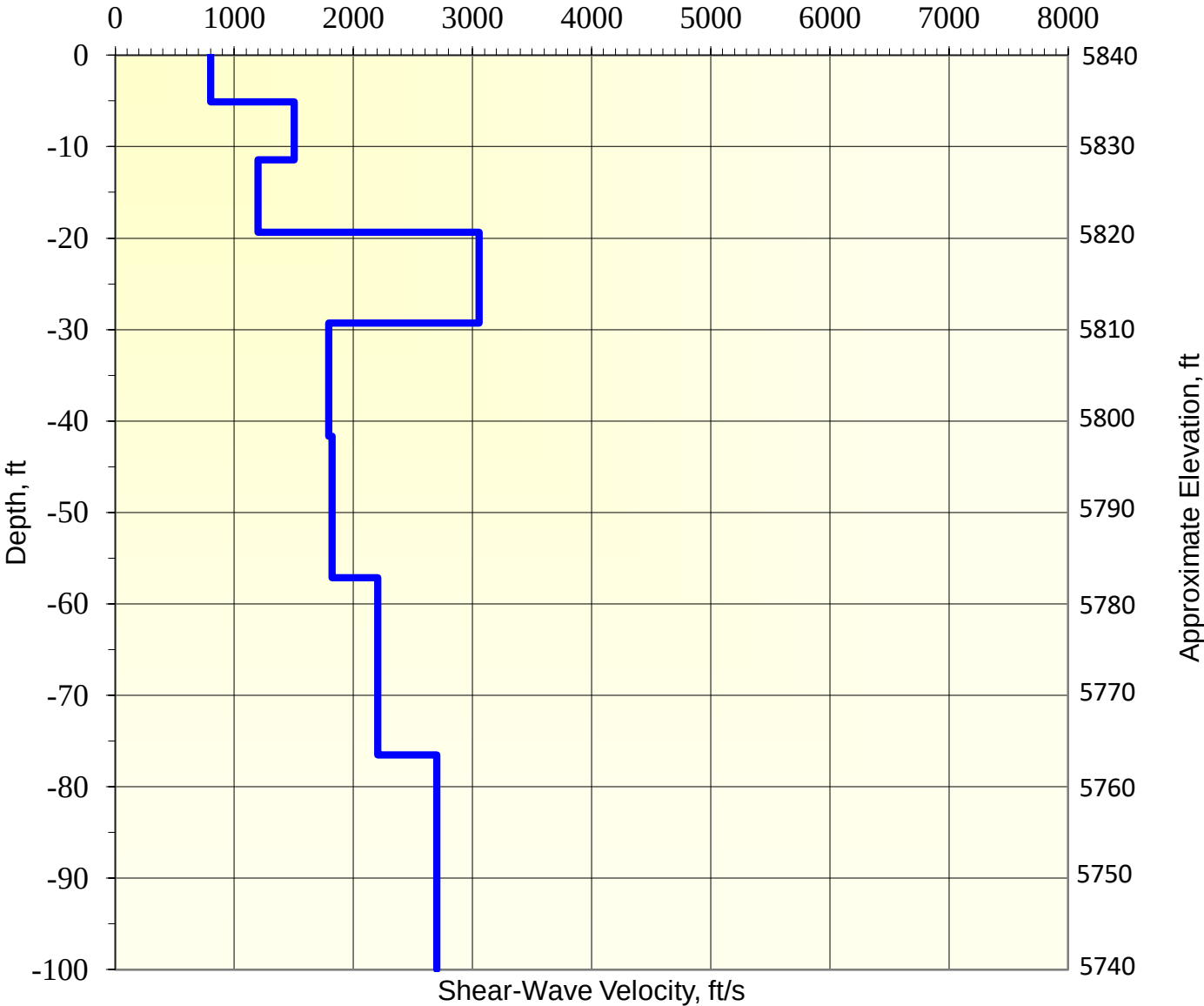


Average Shear-Wave Velocity to 100' = 1,840 ft/s

Project Manager: SWB	Project No. 25205018	Terracon Consulting Engineers & Scientists 10625 W. I-70 Frontage Rd. N., Ste. 3, Wheat Ridge, Colorado 80033 PH: (303) 423-3300 FAX: (303) 423-3353	Shear Wave Velocity Profile
Drawn by: KTJ	Scale: As Shown		Geophysical Results
Checked by: JAS	File Name: LOC		Xcel Line 6584 Glenwood Springs to Mitchell Creek
Approved by: SBM	Date: October 2020		Glenwood Springs, Colorado

Geophysics Location No. 9

Vs Model

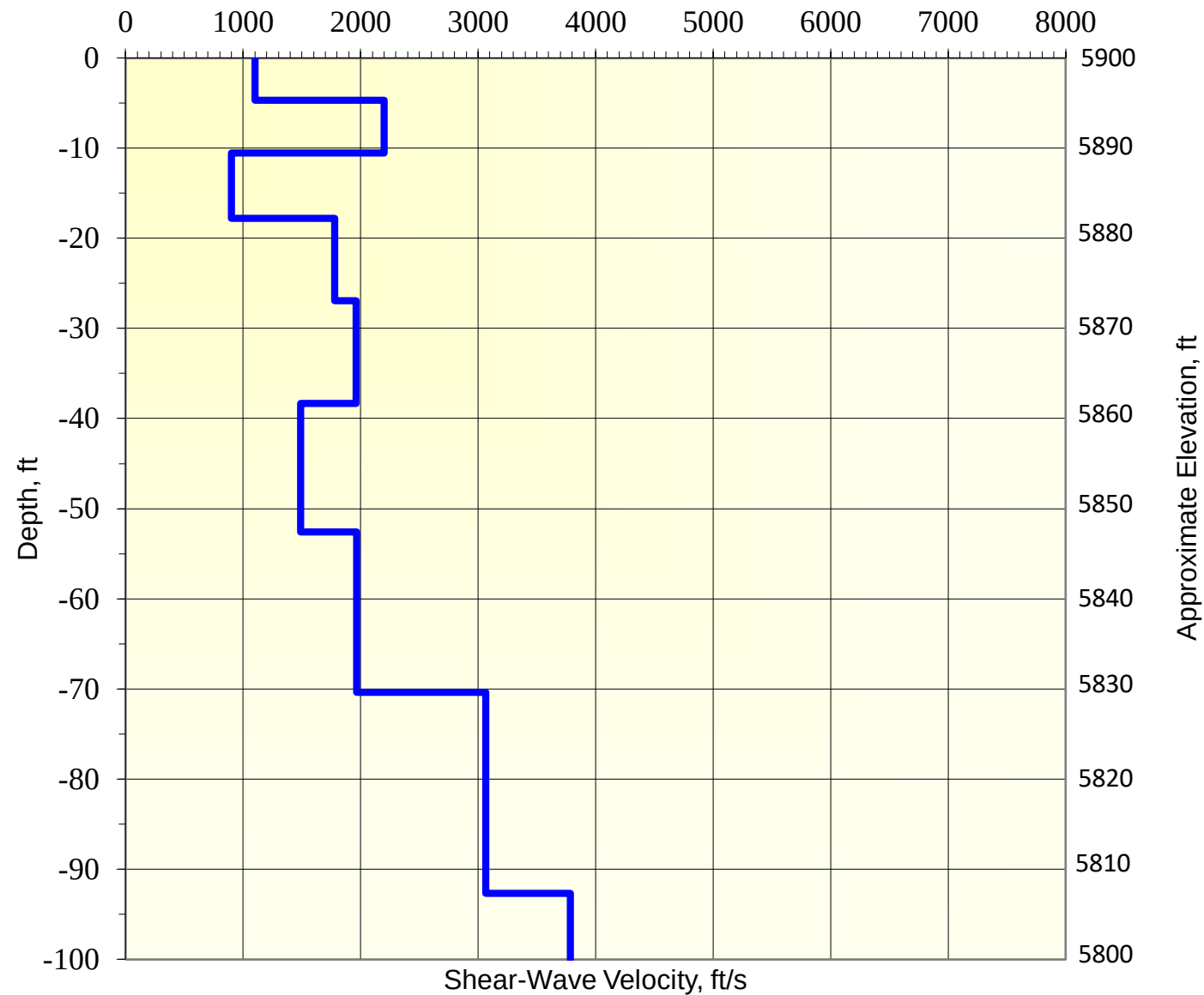


Average Shear-Wave Velocity to 100' = 1,876 ft/s

Project Manager: SWB	Project No. 25205018	Terracon Consulting Engineers & Scientists 10625 W. I-70 Frontage Rd. N., Ste. 3, Wheat Ridge, Colorado 80033 PH: (303) 423-3300 FAX: (303) 423-3353	Shear Wave Velocity Profile
Drawn by: KTJ	Scale: As Shown		Geophysical Results
Checked by: JAS	File Name: LOC		Xcel Line 6584 Glenwood Springs to Mitchell Creek
Approved by: SBM	Date: October 2020		Glenwood Springs, Colorado

Geophysics Location No. 14

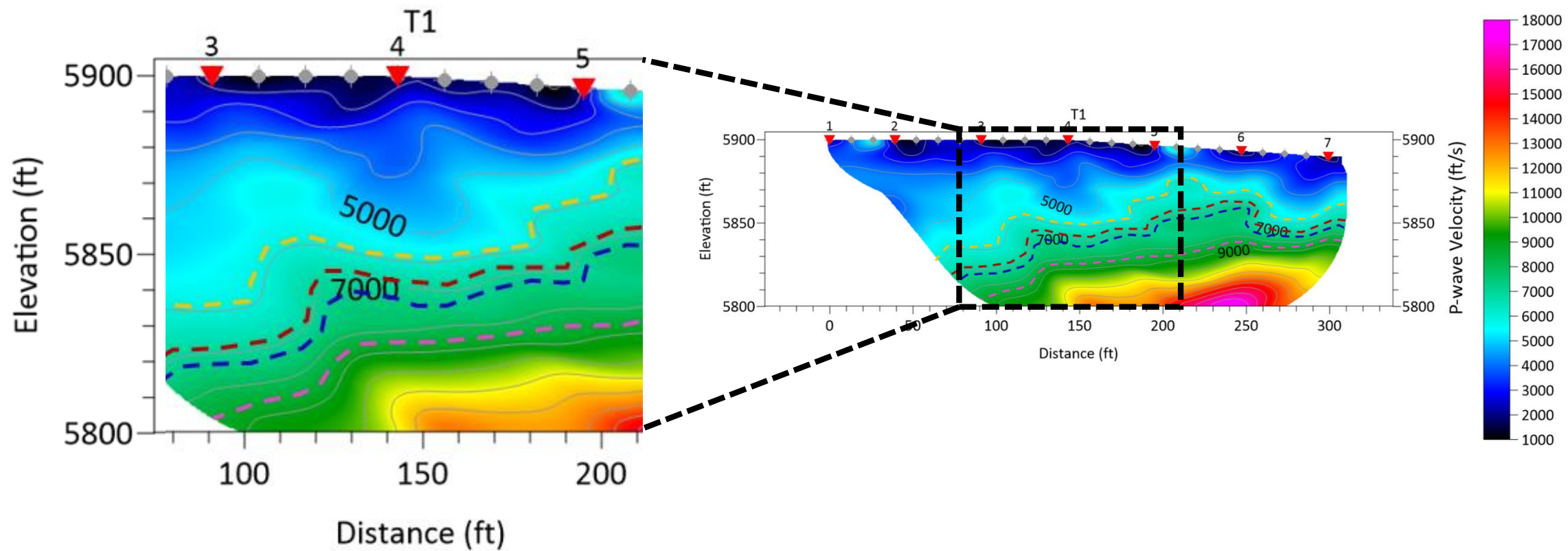
Vs Model



Average Shear-Wave Velocity to 100' = 1,859 ft/s

Project Manager: SWB	Project No. 25205018		Shear Wave Velocity Profile
Drawn by: KTJ	Scale: As Shown		Geophysical Results
Checked by: JAS	File Name: LOC		Xcel Line 6584 Glenwood Springs to Mitchell Creek
Approved by: SBM	Date: October 2020		Glenwood Springs, Colorado

Geophysics Location No. 1



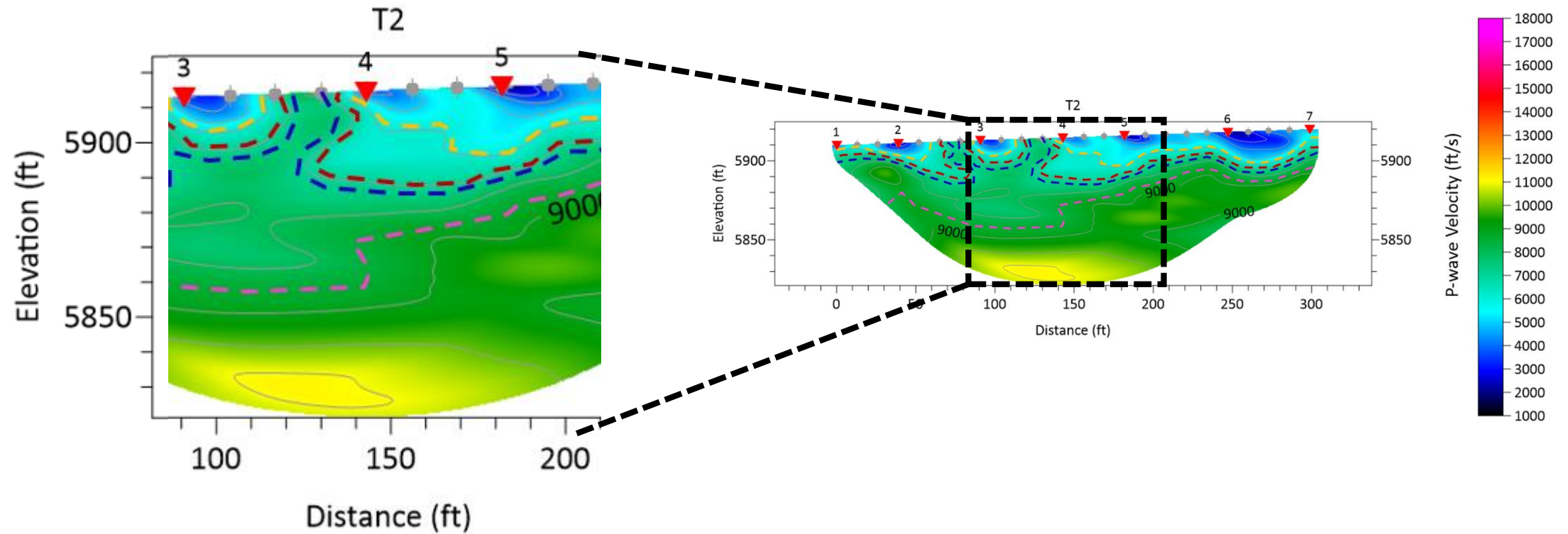
Legend

- Up to 5,900 ft/s rippable with D8R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 6,900 ft/s marginally rippable with D8R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 7,200 ft/s rippable with D10R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 8,500 ft/s marginally rippable with D10R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Shot Locations
- Geophone Locations



Project Manager: SWB	Project No. 25205018	 10625 W. I-70 Frontage Rd. N., Ste. 3, Wheat Ridge, Colorado 80033 PH: (303) 423-3300 FAX: (303) 423-3353	P-Wave Velocity Profile	
Drawn by: KTJ	Scale: As Shown		Geophysical Results	
Checked by: JAS	File Name: LOC		Xcel Line 6584 Glenwood Springs to Mitchell Creek	
Approved by: SBM	Date: October 2020		Glenwood Springs, Colorado	

Geophysics Location No. 2



Legend

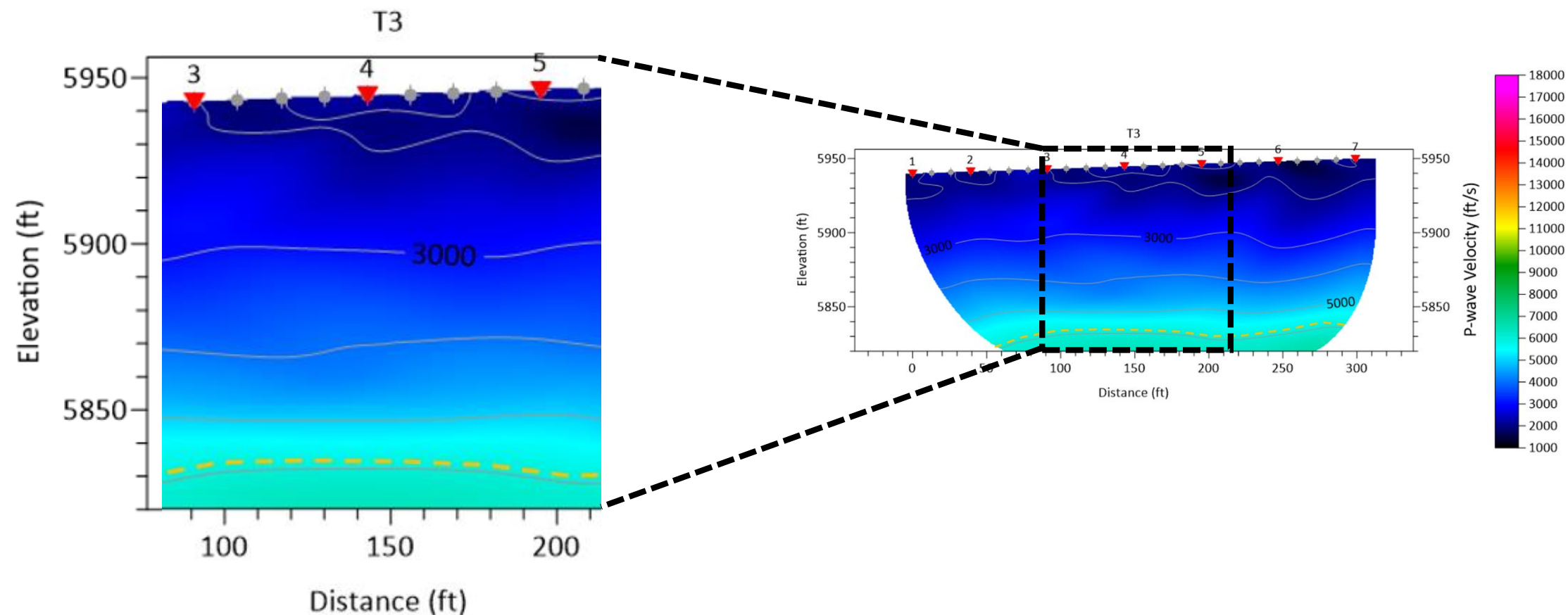
- Up to 5,900 ft/s rippable with D8R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 6,900 ft/s marginally rippable with D8R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 7,200 ft/s rippable with D10R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 8,500 ft/s marginally rippable with D10R (Catepillar "Handbook of Ripping" Twelfth Edition)
- ▼ Shot Locations
- ◆ Geophone Locations



Project Manager: SWB	Project No. 25205018		P-Wave Velocity Profile Geophysical Results Xcel Line 6584 Glenwood Springs to Mitchell Creek Glenwood Springs, Colorado
Drawn by: KTJ	Scale: As Shown		
Checked by: JAS	File Name: LOC		
Approved by: SBM	Date: October 2020		

10625 W. I-70 Frontage Rd. N., Ste. 3, Wheat Ridge, Colorado 80033
 PH: (303) 423-3300 FAX: (303) 423-3353

Geophysics Location No. 3



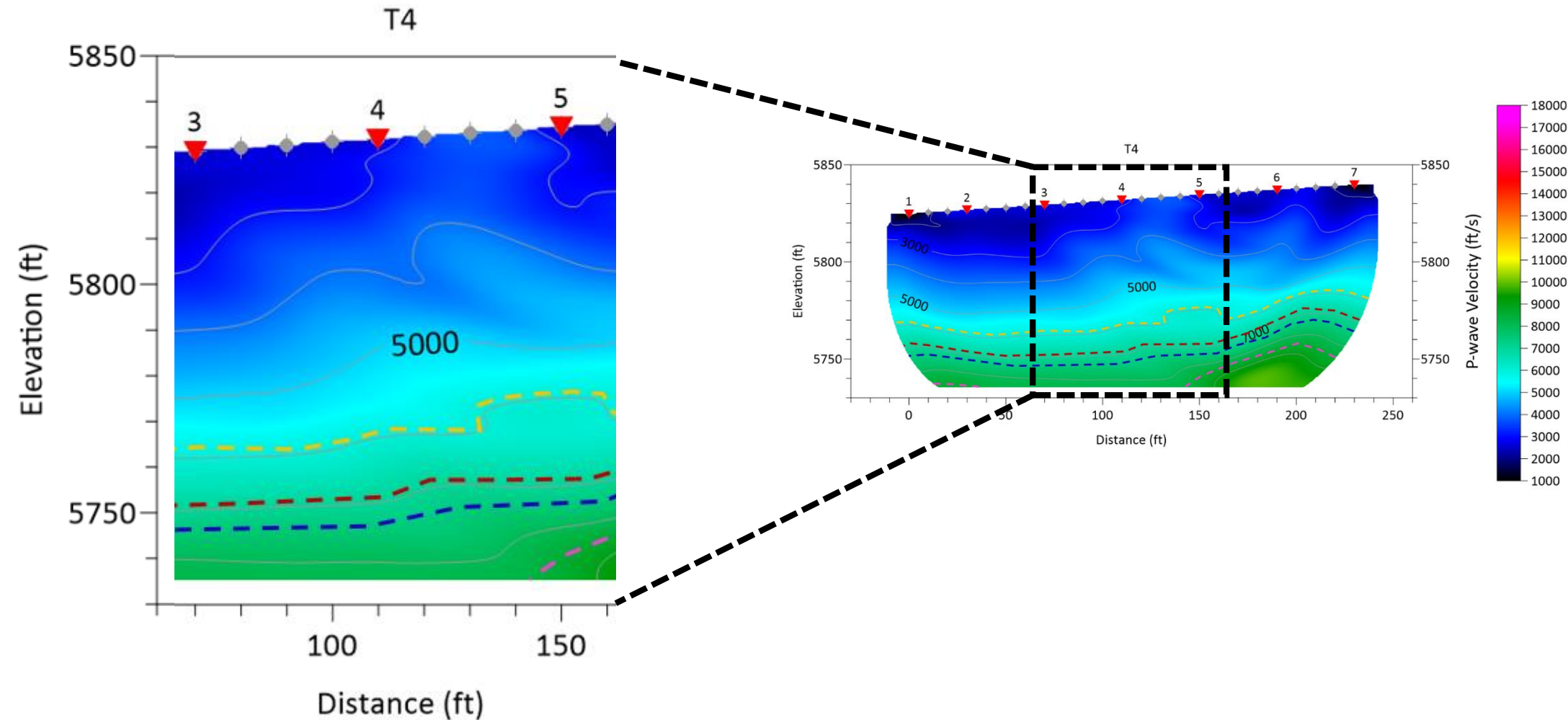
Legend

- Up to 5,900 ft/s rippable with D8R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 6,900 ft/s marginally rippable with D8R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 7,200 ft/s rippable with D10R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 8,500 ft/s marginally rippable with D10R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Shot Locations
- Geophone Locations



Project Manager: SWB	Project No. 25205018	 10625 W. I-70 Frontage Rd. N., Ste. 3, Wheat Ridge, Colorado 80033 PH: (303) 423-3300 FAX: (303) 423-3353	P-Wave Velocity Profile
Drawn by: KTJ	Scale: As Shown		Geophysical Results
Checked by: JAS	File Name: LOC		Xcel Line 6584 Glenwood Springs to Mitchell Creek
Approved by: SBM	Date: October 2020		Glenwood Springs, Colorado

Geophysics Location No. 4



Legend

- Up to 5,900 ft/s rippable with D8R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 6,900 ft/s marginally rippable with D8R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 7,200 ft/s rippable with D10R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 8,500 ft/s marginally rippable with D10R (Catepillar "Handbook of Ripping" Twelfth Edition)



Shot Locations

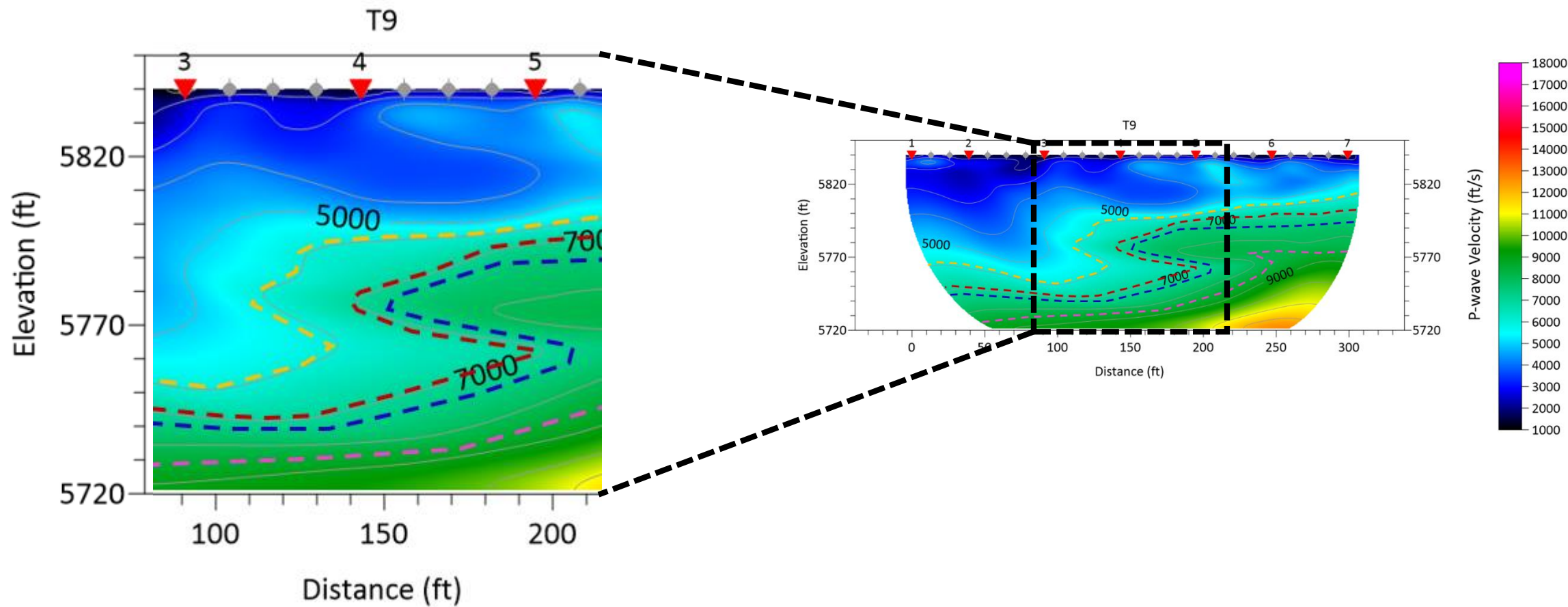


Geophone Locations



Project Manager: SWB	Project No. 25205018	 10625 W. I-70 Frontage Rd. N., Ste. 3, Wheat Ridge, Colorado 80033 PH: (303) 429-3300 FAX: (303) 429-3353	P-Wave Velocity Profile
Drawn by: KTJ	Scale: As Shown		Geophysical Results
Checked by: JAS	File Name: LOC		Xcel Line 6584 Glenwood Springs to Mitchell Creek
Approved by: SBM	Date: October 2020		Glenwood Springs, Colorado

Geophysics Location No. 9



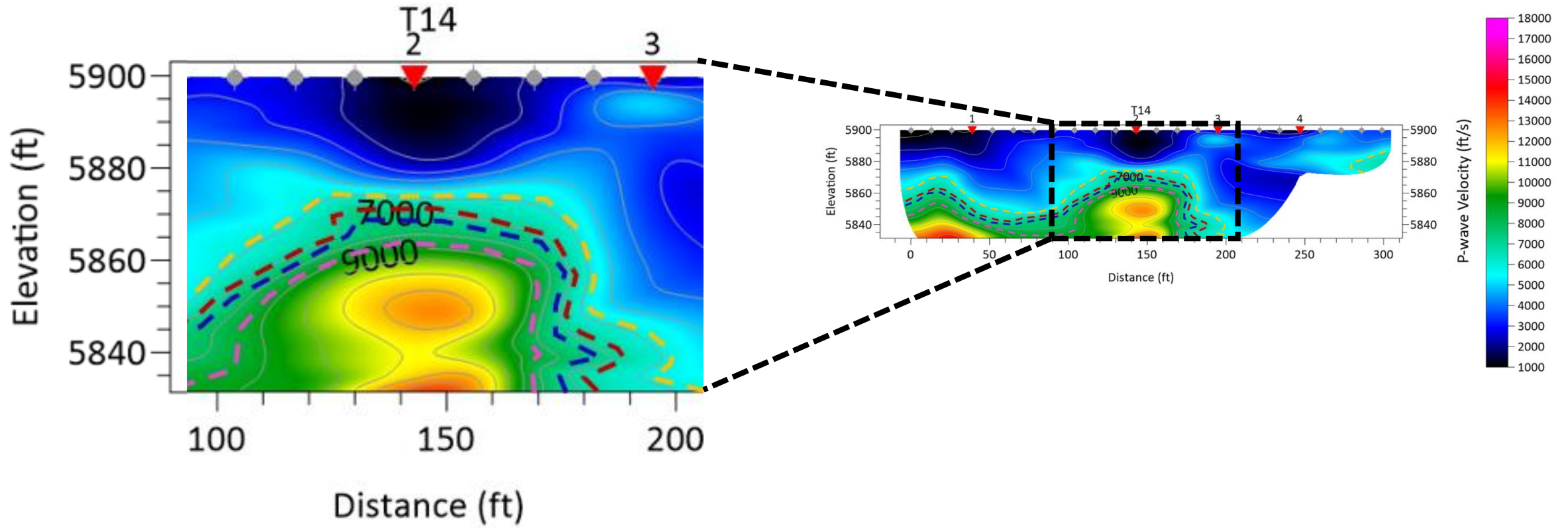
Legend

- Up to 5,900 ft/s rippable with D8R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 6,900 ft/s marginally rippable with D8R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 7,200 ft/s rippable with D10R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 8,500 ft/s marginally rippable with D10R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Shot Locations
- Geophone Locations



Project Manager: SWB	Project No. 25205018	 Consulting Engineers & Scientists 10625 W. I-70 Frontage Rd. N., Ste. 3, Wheat Ridge, Colorado 80033 PH: (303) 423-3300 FAX: (303) 423-3353	P-Wave Velocity Profile	
Drawn by: KTJ	Scale: As Shown		Geophysical Results	
Checked by: JAS	File Name: LOC		Xcel Line 6584 Glenwood Springs to Mitchell Creek	
Approved by: SBM	Date: October 2020		Glenwood Springs, Colorado	

Geophysics Location No. 14



Legend

- Up to 5,900 ft/s rippable with D8R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 6,900 ft/s marginally rippable with D8R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 7,200 ft/s rippable with D10R (Catepillar "Handbook of Ripping" Twelfth Edition)
- Up to 8,500 ft/s marginally rippable with D10R (Catepillar "Handbook of Ripping" Twelfth Edition)
- ▼ Shot Locations
- ◆ Geophone Locations



Project Manager: SWB	Project No. 25205018	 10625 W. I-70 Frontage Rd. N., Ste. 3, Wheat Ridge, Colorado 80033 PH: (303) 423-3300 FAX: (303) 423-3353	P-Wave Velocity Profile
Drawn by: KTJ	Scale: As Shown		Geophysical Results
Checked by: JAS	File Name: LOC		Xcel Line 6584 Glenwood Springs to Mitchell Creek
Approved by: SBM	Date: October 2020		Glenwood Springs, Colorado

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SUPPORTING INFORMATION

Contents:

General Notes

Unified Soil Classification System

Note: All attachments are one page unless noted above.

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GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING				WATER LEVEL	Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	FIELD TESTS	(HP)	Hand Penetrometer
	Auger	Shelby Tube	Split Spoon				(T)	Torvane
							(b/f)	Standard Penetration Test (blows per foot)
	Rock Core	Macro Core	Modified California Ring Sampler				N	N value
							(PID)	Photo-Ionization Detector
	Grab Sample	No Recovery	Modified Dames & Moore Ring Sampler				(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS	RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			BEDROCK		
	Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Ring Sampler Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-Value Blows/Ft.	Ring Sampler Blows/Ft.	Standard Penetration or N-Value Blows/Ft.	Descriptive Term (Consistency)
	Very Loose	0 - 3	0 - 5	Very Soft	less than 500	0 - 1	< 3	< 24	Soft
	Loose	4 - 9	6 - 14	Soft	500 to 1,000	2 - 4	3 - 5	24 - 35	Firm
	Medium Dense	10 - 29	15 - 46	Medium-Stiff	1,000 to 2,000	4 - 8	6 - 10	36 - 60	Medium Hard
	Dense	30 - 50	47 - 79	Stiff	2,000 to 4,000	8 - 15	11 - 18	61 - 96	Hard
	Very Dense	> 50	≥ 80	Very Stiff	4,000 to 8,000	15 - 30	19 - 36	> 96	Very Hard
				Hard	> 8,000	> 30	> 36		

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A					Soil Classification	
					Group Symbol	Group Name ^B
Coarse Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	Cu ≥ 4 and 1 ≤ Cc ≤ 3 ^E	GW	Well-graded gravel ^F	
			Cu < 4 and/or 1 > Cc > 3 ^E	GP	Poorly graded gravel ^F	
		Gravels with Fines: More than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F,G,H}	
			Fines classify as CL or CH	GC	Clayey gravel ^{F,G,H}	
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	Cu ≥ 6 and 1 ≤ Cc ≤ 3 ^E	SW	Well-graded sand ^I	
			Cu < 6 and/or 1 > Cc > 3 ^E	SP	Poorly graded sand ^I	
		Sands with Fines: More than 12% fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G,H,I}	
			Fines classify as CL or CH	SC	Clayey sand ^{G,H,I}	
Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	PI > 7 and plots on or above “A” line ^J		CL	Lean clay ^{K,L,M}
			PI < 4 or plots below “A” line ^J		ML	Silt ^{K,L,M}
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay ^{K,L,M,N}
			Liquid limit - not dried			Organic silt ^{K,L,M,O}
	Silts and Clays: Liquid limit 50 or more	Inorganic:	PI plots on or above “A” line		CH	Fat clay ^{K,L,M}
			PI plots below “A” line		MH	Elastic Silt ^{K,L,M}
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay ^{K,L,M,P}
			Liquid limit - not dried			Organic silt ^{K,L,M,Q}
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

^A Based on the material passing the 3-inch (75-mm) sieve

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^C Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

^D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

$$^E Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

^F If soil contains $\geq 15\%$ sand, add "with sand" to group name.

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^H If fines are organic, add "with organic fines" to group name.

^I If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

^J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^L If soil contains $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.

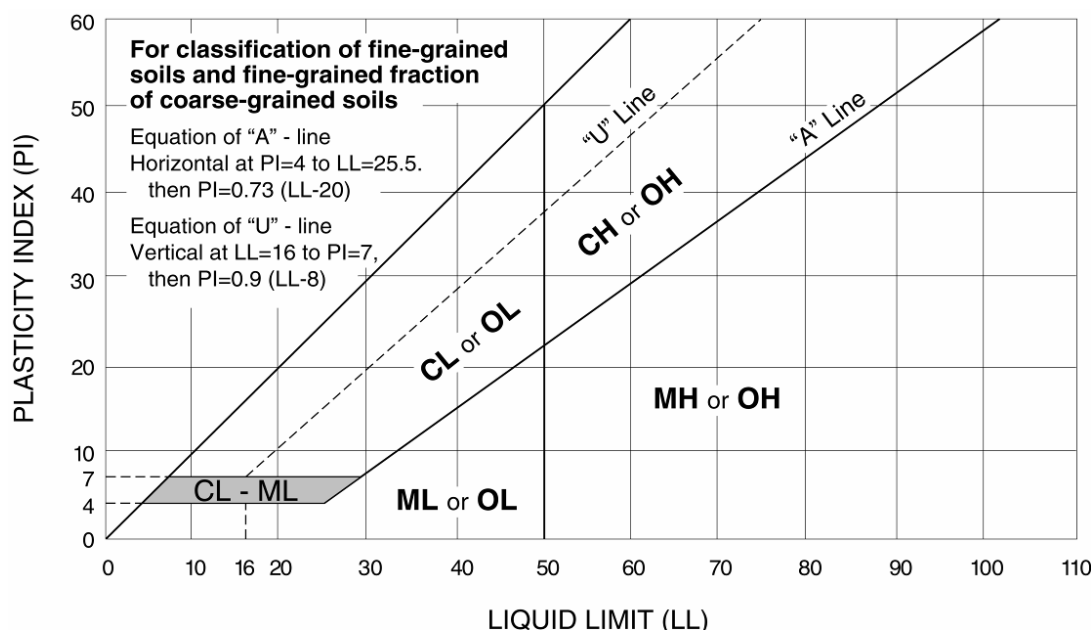
^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ and plots on or above "A" line.

^O $PI < 4$ or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.



Appendix H-2: Drainage Letter

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Memo

Date: Monday, January 23, 2023

Project: Xcel Energy 6584 Glenwood Springs – Mitchell Creek Electric Transmission Line Rebuild

To: City of Glenwood Springs and Garfield County

From: Braileigh Jay – Xcel Energy, Brian Brown – HDR Engineering

Subject: Drainage Letter for Above Ground Utility Construction

Xcel Energy is rebuilding the existing 2.25 mile 69 kV existing overhead electric line from the Glenwood Springs Substation, near E 6th St and N River St (NE of the Glenwood Hot Springs Pool), generally heading west to the Mitchell Creek Substation which is south of the Colorado River about half a mile east of the intersection of Devereux Road and Midland Avenue. See Figure 1 below for a general alignment of the proposed line.

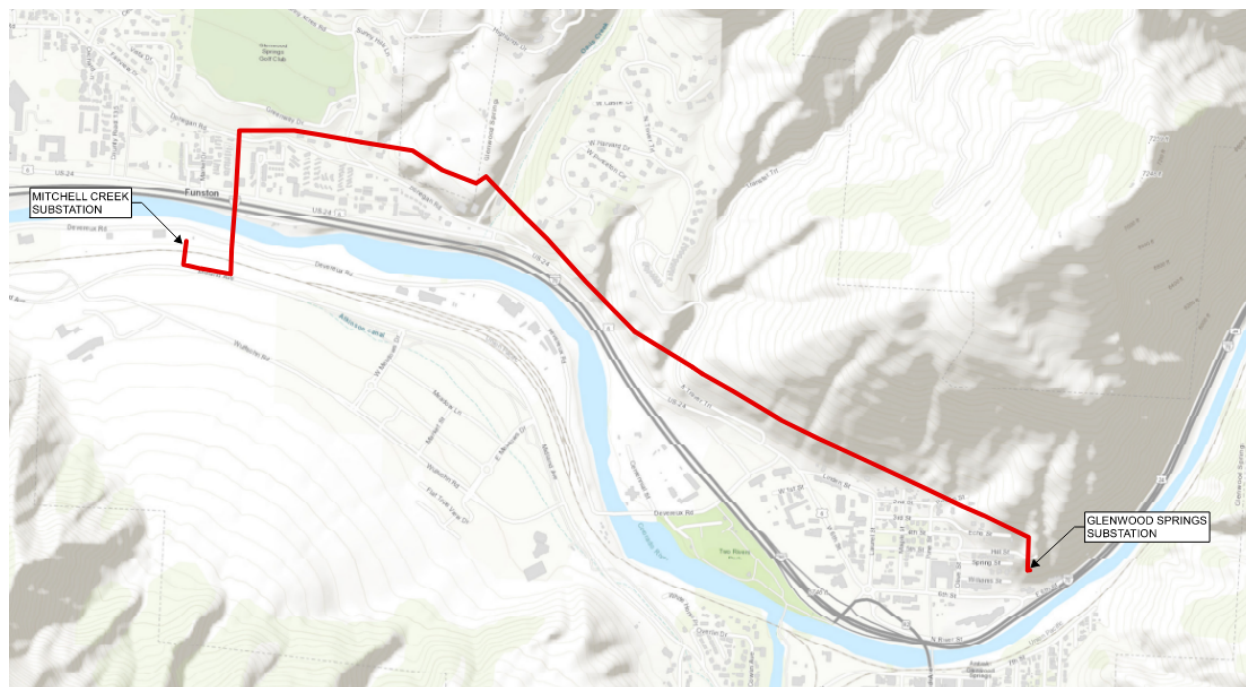


Figure 1 – Proposed Transmission Line alignment

Existing Conditions:

The current overhead transmission alignment is primarily constructed with direct embed wood structures that may have guy wires or multiple poles depending on site conditions and conductor tensioning. The existing pole diameter at the ground level is between 12 – 32 inches. The ground surfacing under and immediately around the structures is mounded immediately adjacent to pole and then tapers to match surrounding undisturbed grades. The project is generally built on steeper terrain with some flatter areas along the project's western third. There is existing access grading and limited leveling near structures in steeper hillsides. As grades become less steep, pre-existing graded access is less obvious or does not exist. Due to the nature of this project, there are currently no permanent water quality features nor existing drainage issues or concerns associated with the transmission line.

The Site project area is defined by existing Xcel Energy transmission right-of-way (ROW) or easements and additional area that will be utilized by temporary construction easements. In total, this project area is approximately 20 acres (line length x easement width). However, far less of this property will be impacted by construction since impacts are generally limited to the structure locations and associated access, not the entirety of the alignment. The disturbed area is estimated to be approximately 6 acres, excluding the staging area which was permitted separately. The area of existing surface treatments, i.e. aggregate, grass, and dirt, was not calculated as it will not change due to this project.

Proposed Conditions:

The line rebuild is in the same alignment as the existing line. The new line structures are generally located within 5 - 20 feet of the existing structure locations in the current line alignment. The proposed structures will be a steel monopole design with one H-frame steel pole structure and either direct bury (tangent structures) or have a concrete pier foundation (corner or dead-end) structures. These structures will be 16 – 32 inches in diameter for direct bury structures and roughly 5-foot diameter for concrete pier foundations. The proposed larger diameter single pole will replace multiple smaller wood poles in numerous locations. During the monopole construction, excavated material that will not be placed back into the excavation will be spread in a thin layer around the pole or removed from the site based on site conditions and landowner agreements.

Grading Impacts

Where feasible, access to many structures for the project will require utilizing existing access to permit truck or equipment access. Localized pad and access grading is temporary, excluding the small pad grading at the helicopter structures. Temporary and permanent grading impacts are listed below:

- New STR 114 – The current structure is on an isolated 'point' impacted by past grading (after the existing pole was installed) in the area. The new structure location will require grading changes to the 'point' to create access pad fill areas for the new pole construction. These changes impact a minor area and will promote increased site infiltration since grades will be reduced from very steep to 2.5H:1V or flatter. Hillside cuts are not required.
- New STR 115 – Prior access grading after the existing pole was installed, has created a narrow access path on the north side of the existing and proposed pole sites. This requires minor cut of the remanent point where the pole is located to create a wider drive path by fill. These changes

impact a small area and do not substantively change grades nor surfacing of the area. Hillside cuts are not required.

- New STR 141 – The proposed grading for structure access and pad is temporary and the most substantive grading change. During construction, run-on flow will be conveyed through the site. Water quality impacts will be mitigated with the use of up-gradient, intermediate, and down-gradient erosion control measures. Post-construction, topographic grades, topsoil cover, and vegetation is to be restored in impacted areas. Drainage paths and runoff are not expected to change, once area is restored.
- New STR 145 & 147 – The proposed grading for both structures is on the north side of Midland Avenue. Limited pad grading is required for foundation construction, setting the structure, and tensioning conductor. As these are temporary impacts, the grades, topsoil, and revegetation will be restored to pre-construction conditions after pad removal.
- Permanent helicopter pad grading sites, numerous locations – At the majority of helicopter structure locations, the compressor and structure pad sites require two 6-ft by 6-ft pads, one for safe compressor placement and one for safe structure excavation. Unless directed otherwise by landowners, these pad locations are expected to become permanent pads in the event of future pole work and associated pad reconstruction. These exceptionally small areas of grade modification with the same surface vegetation will have a de minimis impact on stormwater volume, time of concentration, direction, velocity, and water quality. Therefore, a hydraulic analysis of these small, isolated grading impacts will not be performed within local basin stormwater areas.

Steel Poles

The larger diameter of the proposed structures (i.e. a 2.5 foot diameter existing pole with guy wires compared to a 6 foot proposed diameter pole) will have a de minimus impact on the local stormwater drainage given the structure spacing and the proposed pole diameter increase for the larger basin area for either tangent or dead end structures.

Outcome:

This project will not permanently change the existing surface water flow paths, overall slopes, impervious surface area, nor time of concentration and therefore will not change the runoff volume, runoff peak, nor conveyance path for the alignment. Based on the project type and the absence of permanent stormwater drainage impacts, this type of replacement project does not require permanent water quality features be implemented.

HDR Engineering



Brian Brown, PE

CO PE 41644

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Appendix I: Updated Detail of City ROWs and Parcels to be Utilized for Project Easements

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Glenwood Springs – Mitchell Creek Electric Transmission Line Rebuild Project

City of Glenwood Springs Land Rights

Revision 2: June 2023

Permanent Electric Transmission Line Easements:

1. City ROW (Spring St.)
2. City fee Parcel No. 218509131001
3. City ROW (Hill St.)
4. City ROW (Chestnut St.)
5. City ROW (Olive St.)
6. City ROW (1st St.)
7. City ROW (North St.)
8. City Road (Traver Trail), part of Parcel No. 218504300007
9. City fee Parcel No. 218504300007
10. City fee Parcel No. 218504307006
11. City fee Parcel No. 218504300005
12. City Road (Sunny Acres Road) – aerial crossing, wires only
13. City Road (Donegan Road) – aerial crossing, wires only
14. City fee Parcel No. 218505300113

Temporary Construction Easements (TCEs):

TCEs are necessary for access & construction crew parking and materials setup

1. City ROW (Spring St. & Aspen St.) – coming off of Spring St.
2. City fee Parcel No. 218509131001
3. City ROW (Spring St. loops around to Hill St.)
4. City ROW (Cedar St.)
5. City ROW (Hill St. loops around to Spring St.)
6. City ROW (Hill St. loops around to Spring St)
7. City ROW (coming off of Hill St.)
8. City ROW (Chestnut St.)
9. City ROW (end of Pine St.)
10. City ROW (end of Maple St.)
11. City fee Parcel No. 218509200050 (pull off on Traver Trail)
12. City fee Parcel No. 218504300005
13. City fee Parcel No. 218504307006

**Engineering
Department
Ryan Gordon,
City Engineer**

Date: October 17, 2023

To: Community Development

Re: Xcel 1041 Permit Review

Please see the following engineering comments for the Xcel Location and Extent. These comments are not inclusive of comments from other departments, including Public Works, Building, etc. It is up to the applicant to verify that the appropriate reviews have been completed by these departments. City of Glenwood Springs Engineering reserves the right to make additional comments throughout the application process, especially if significant modifications are made. It is in the applicant's best interest to address all comments holistically to reduce the number of reviews necessary for approvals.

Engineering comments are based on the preliminary information provided and are subject to change and/or modification based on information provided.

1. All easements and/or ROW, temporary and permanent, must be recorded prior to approval of any permits.
2. Please provide a more detailed description of the evacuation plans for setting poles.
 - a. What is the radius of each evacuation?
 - b. When and how will the property owners be notified of the evacuation?
 - c. Will there be two notifications? One well in advanced and another 72 hours before?
3. All construction operations shall abide by the fire condition rules and restrictions when in place.
4. No environmental review has been completed by CPW and no coordination has been had to the date of this application. The City will need to see an environmental review from CPW prior to the issue of this 1041 permit along with any required permits.
5. You will need to get water for air quality control, where do you plan to source your water?
6. All public roads within the City ROW shall be maintained and if damaged will need to be replaced/ repaired per the City Standards.
7. A Grading Permit shall be submitted for each area of work, along with the following documents:
 - a. No work for this project will be allowed to commence until all work easements are recorded.
 - b. Final Stamped reports (Geotechnical, Drainage, Geologic Hazards, etc) for each work area.
 - i. A Drainage Report shall be completed by a qualified State of Colorado licensed Professional Engineer for all permanent impacts.

1. Any sites with drainage discharging directly to Colorado Department of Transportation (CDOT) Right of Way will be required to meet the requirements set forth by the most recent edition of the CDOT Drainage Design Manual. Approval of the report and any discharges to CDOT right of way will require a [CDOT Access Permit](#).
 2. All other sites shall meet the requirements for drainage are outlined within Chapter 4 of the City of Glenwood Springs Engineering Standards available here: Chapter 4 - Engineering Standards.
- ii. A geotechnical report has been provided with the 1041 Application. Provide a final report stamped by a licensed Professional Engineer.
 1. The report identified potential construction concerns around large boulders/cobbles and non-native fill materials. Heavy duty excavation equipment may need to be employed. Has the site access for heavy duty equipment been considered?
 2. Provide a recommendation and design for the structural section for access roads within the City's ROW.
 - iii. A number of these project sites are outside of the City of Glenwood Springs geologic hazards mapping per the City of Glenwood Springs Geologic Hazards Mapping completed by Lincoln Devore in 1978. Mapping is available on the City Website at the following link for your review: [Geologic Hazards Mapping](#)
 1. Potential Geologic Hazards should be evaluated by the geotechnical engineer. If geologic hazards are identified, a Geologic Hazards Report should be completed by a qualified State of Colorado licensed Professional Engineer for this site. Mitigation should be completed per the City of Glenwood Springs Municipal Code Section 070.040.020 – Sensitive Area Protection Subsection (C).
 - c. Final Stamped Construction Documents for each work area shall be submitted and approved by the City, including but not limited to:
 - i. Site Plan
 - ii. Grading Plan
 - iii. Drainage Plan
 - iv. Temporary and Final Erosion Control Plans
 - v. Construction Management Plan
 - vi. Restoration/ Revegetation Plan
 - vii. Traffic Control Plan
 - d. The Stormwater Management Plan and Construction Stormwater Discharges Permit or Dewatering Permit shall be submitted to the City.
8. Any retaining walls over four feet (4') in height from bottom of footer to top of wall or adjacent to any area subject to additional loading (tiered walls, traffic, parking, etc) shall be designed by a qualified State of Colorado licensed Professional Engineer.
 9. Any work taking place within the City of Glenwood Springs Right of Way requires a Right of Way Permit for each work site, including staging areas in the ROW.
 - a. Provide a plan indicating the impacts or staging within the ROW. If there is grading or changes in surface type, the following items should be included:

- i. Drainage, Geotechnical, and Geohazard Report, if applicable.
 - ii. Site Plan
 - iii. Grading Plan
 - iv. Drainage Plan, if applicable
 - v. Erosion Control Plan
 - vi. Restoration/Revegetation Plan
 - b. Traffic Control Plan for any impacts to the traveling public.
10. Any work taking place within the CDOT Right of Way will require a Special Use Permit (SUP).
11. Record drawings (As-Built)/Improvement Survey Plat (ISP) will be required to be submitted to the city along with electronic drawings (CAD) as described in the Engineering Standards.
- a. Critical improvements should be identified including, but not limited to:
 - i. Utility improvements, identify:
 - 1. Structures
 - 2. Easements
 - 3. Ownership demarcation points
 - 4. As-built plan for utilities (private or public)
 - ii. Stormwater improvements
 - 1. Verified detention capacity and/or verified infiltration rates.
 - iii. Retaining walls, identify:
 - 1. Locations
 - 2. Height, i.e. top of wall (TOW) and bottom of wall (BOW)
12. It appears that ROW and easement is used interchangeably in the document. Please provide clarification on these terms and how they relate to this project.
13. The “Glenwood Springs Substation” is called the “North Glenwood Substation”. Please update.
14. The Railroad ROW through town is in the County, not the City. Update the county L&E to note this change.
15. It is noted that the contractor is responsible to have a capping plan if they run into any artesian well conditions along the way. A preliminary plan should be created to have a level of confidence that the contractor can cap a well if water is encountered. Most likely it would be hot water which could complicate the planning.
16. Will vegetation removal and maintenance extend out to the 60’ easement area or still be at the 30’ easement area?
17. Is Xcel planning to add Fiber Optic lines to the transmission lines at any time? Will be a change to the existing lines and visual impacts.
18. Provide an exhibit or rendering that shows the visual impact of the specialized structures or stations that connect the underground lines to overhead lines to help the City assess the visual impacts.

19. Electric & Magnetic Field Study evaluates the project at a Maximum Operating Voltage of 72.45kV. The 1041 repeatedly states that the voltage may increase in the future to a maximum of 115kV. Will there be another study conducted given any increase in standard operating voltage? Should this line be evaluated for greater voltage given the current proposal?
20. Temporary Construction Easements will be restored to reasonably the same conditions as pre-construction. Also, all areas not needed for operations and maintenance will be reclaimed in a manner generally similar to their condition prior to construction What is the definition of “Reasonably” and “generally similar”? We assume that restoration of ROW is included in these definitions.
21. Underground installation has been stated to be more than 10 times the cost of overhead installation. Can Xcel provide the cost analysis of both options?
22. It is stated that “The section of the Colorado River crossed by the existing line is not anticipated to be impacted during construction or operation of the Project. Additionally, it is unlikely that the Project would require a Section 404 permit under the Clean Water Act based on the proposed transmission line pole locations and lack of anticipated impact to wetlands or other waters of the United States (WOTUS).” Has Xcel determined if wetlands will be impacted?
23. Garfield County L&E Permit and State of Colorado “Notification of Intention to Submit Permit Application for Major Electrical Facilities” both unresolved. Do these jurisdictions require the permits be pulled before start of work?
24. Has Xcel secured the necessary permits and clearances from ACOE, railroad, CDOT, CPW and other agencies?

If you have any questions about these comments, please contact the City of Glenwood Springs Engineering Department.



Planning and Zoning Commission Report

Date: December 12, 2023
To: Planning and Zoning Commission
From: Ryan Gordon, City Engineer
Subject: Planning File #68-23 Code Amendments to Title 070 related to Storm-water Development Standards and Fee In-Lieu.

Applicant: City of Glenwood Springs

ACTION ITEMS

Consideration of Code Text Amendments to Title 070 and the Engineering Standards to adopt a stormwater fee-in-lieu.

BACKGROUND

Under the current development process, a new development or redevelopment is required to comply with the stormwater standards per the City's Engineering Standards (Chapter 4). The current standards require the development to meet both the stormwater quality and stormwater detention requirements.

To comply with the detention requirements, the development typically needs to construct a pond, dry well or other stormwater facility. These facilities require an engineer to analyze, size and design and can be costly to construct. Additionally, they can be difficult to locate on a property depending on site constraints. A Maintenance Agreement is required between the City and the property owner to ensure that the stormwater facilities function properly.

The City will be required to comply with a state issued MS4 permit that regulates sources of stormwater pollution from pipes and drains that flow from the City to the river – the City does not currently have a MS4 permit but we anticipate that the state will issue one within the next couple of years. The MS4 permit requires that the City develops and runs a program to control stormwater discharges which will include a water quality element. The City would be responsible for inspecting stormwater facilities – both on public and private property - on a regular basis to confirm they are functioning as designed and in compliance with the MS4 permit.

From the Engineering Department's perspective, a regional approach to stormwater treatment where the City would construct and maintain regional stormwater treatment facilities would be preferred over having hundreds of dispersed treatment facilities that are constructed and maintained on private property.

To accomplish and facilitate this goal, the City would like to establish a stormwater fee in lieu process to allow developments to pay the City instead of installing stormwater facilities required under the code. The fee would be used to design and construct these regional stormwater facilities.

This fee in lieu is not a requirement of a development to pay and they can still go through the current process of hiring an engineer, designing a stormwater system, constructing the system and establishing an O&M agreement.

Engineering has reviewed multiple recent projects in the City and have developed the fee in lieu based on the constructed cost of the stormwater system. This fee in lieu does not include the cost of design or long term maintenance costs associated with the stormwater system.

The stormwater fee in lieu is \$50 per cubic foot of required detention or \$365 per 100 square feet of in impervious area.

PROJECT SUMMARY

This fee in lieu is not a requirement of a development to pay and they can still go through the current process of hiring an engineer, designing a stormwater system, constructing the system and establishing an O&M agreement.

Engineering has reviewed multiple recent projects in the City and have developed the fee in lieu based on the constructed cost of the stormwater system. This fee in lieu does not include the cost of design or long term maintenance costs associated with the stormwater system.

The stormwater fee in lieu is \$50 per cubic foot of required detention or \$365 per 100 square feet of in impervious area.

In order to add a fee in-lieu for Stormwater requirements the following code sections would be added to **070.040.030 - Site Development and Improvement Standards.**

(e) *Site Development and Improvement Standards.*

(1) *Drainage Plan.* Every development plan shall include a drainage plan that meets the requirements of the City's Engineering Standards.

(2) *Fee in Lieu of Stormwater Management*

a. Prior to the issuance of the building permit or a change in use of the property, the developer of a property may submit an application to the Director and City Engineer for payment of fee in lieu of onsite Stormwater management requirements in the City's Engineering Standards.

b. The fee in lieu shall be established by resolution of the City Council in an amount that is calculated to approximate the cost of obtaining, developing, and maintaining a public stormwater system.

c. All fees in lieu paid pursuant to this Subsection shall be deposited in a separate fund, which fund may be used to undertake future projects to accommodate stormwater management. These fees may not be used for the general expenses of the City.

REVIEW CRITERIA AND STAFF ANALYSIS A Code amendment is a legislative decision by the City Council. Prior to recommending approval or approving a proposed Code amendment, the Planning Commission and City Council shall consider whether and to what extent the proposed amendment. Staff analysis is provided in **BOLD.**

i. Is consistent with the Comprehensive Plan and other City policies;

The Comprehensive Plan identifies the following goals that are supported by this proposal:

- **Preserve natural resources and protect against hazards**
- **Advance climate and resiliency goals as a core community value**

ii. Does not conflict with other provisions of this Code or other provisions in the Glenwood Springs Municipal Code;

The proposed code language does not conflict with other provisions and is modeled after similar fee in-lieu systems the City already has codified.

iii. Is necessary to address a demonstrated community need;

With the impending MS4 designation from the State of Colorado, the City of Glenwood Springs needs the ability to design, monitor, and manage the stormwater system. This code change will assist with that task. Additionally, the requirement to accommodate stormwater management on site is challenging for most developments, and a City wide approach will be more efficient.

iv. Is necessary to respond to substantial changes in conditions and/or policy; and

The State's MS4 requirements are a substantial change for the City of Glenwood Springs.

v. Is consistent with the general purpose and intent of this Code.

Staff finds the proposal consistent with the purpose of the Development Code which is to protect the public health, safety, and welfare of the City and to implement the policies, goals, and strategies adopted by the City of Glenwood Springs, including those set forth in the Glenwood Springs Comprehensive Plan.

Staff finds that the proposal meets the five criteria.

REVIEWING AGENCY COMMENTS

Public Works and Engineering have incorporated comments into the text language.

ACTION ITEMS & STAFF RECOMMENDATIONS

Staff recommends approval of the Code Text Amendments to Title 070 establishing a stormwater fee in-lieu and associated Engineering Standards.

Suggested Findings:

The proposal:

- i. Is consistent with the Comprehensive Plan and other City policies;
- ii. Does not conflict with other provisions of this Code or other provisions in the Glenwood Springs Municipal Code;
- iii. Is necessary to address a demonstrated community need;
- iv. Is necessary to respond to substantial changes in conditions and/or policy; and
- v. Is consistent with the general purpose and intent of this Code.

Exhibit A. Proposed Code Amendments

070.040.030 Site Development and Improvement Standards.

- (a) *Purpose.* This Section is intended to ensure that, for all subdivision and for every development requiring a development permit, the developer shall:
- (1) Provide, pay for, and install or cause to be installed, where needed: water distribution systems, storm drain structures, wastewater lines, pumps and appurtenant devices, curbs and gutters, street base course material and wearing course material, bridges, electrical transformers, street lights, underground communications systems and wiring, gas distribution systems, fire hydrants, fire alarms and other fire-control devices, street signs and traffic-control devices;
 - (2) Preserve or replace trees, shrubs, ground cover and other vegetation, and structures;
 - (3) Stabilize soil and prevent erosion and culverts or other devices to enclose open ditches and inhibit access to them by children;
 - (4) Reserve and dedicate to the City lands or easements where needed by the nature of the development for public purposes, including, but not limited to: utility easements and easements for drainage purposes, pedestrian easements, parkland or fees in lieu of such dedications;
 - (5) Delay or phase development if necessary to ensure that the City can provide necessary municipal services and facilities; and
 - (6) Ensure the completion of installation of curbs, gutters, street paving, and other improvements and to ensure that dedications are made.
- (b) *Applicability.*
- (1) *General.* Unless exempted in Paragraph (2) below, this Section shall be applicable to:
 - a. All subdivision of land within the City that results in the partitioning, dividing, combining, or altering of any lot, parcel, or tract of land, including subdivisions created by an exercise of the power of eminent domain by an agency of the state or the City; and
 - b. All development requiring a development permit.
 - (2) *Exemptions.* The standards of this Section shall not apply to:
 - a. Creation or realignment of an easement; and
 - b. Adjustment of the boundary line or the transfer of land between two (2) adjacent property owners that does not result in the creation of any additional parcels.
- (c) *Engineering and Construction Plans.*
- (1) *Registered Engineer.* It shall be the responsibility of the developer to have an engineer registered in the State of Colorado prepare a complete set of engineering plans in accordance with all applicable City codes for the construction of all required improvements. Such plans shall be in conformance with the approved preliminary plat and/or development permit.
 - (2) *City Engineer Approval.* All plans and supporting engineering reports for improvements required by this Section shall be reviewed and approved by the City Engineer. All improvements shall be in accordance with the approved preliminary plat and/or development permit and all City standards, policies, and requirements.
- (d) *Nonconforming Design, Improvements, and Dedications.*

-
- (1) *General Rule: Conformity Required.* Except as otherwise provided in this Code, any development that is not in conformance with the requirements of this Section for design, improvements, or dedications shall be made to conform with such requirements before being issued a development permit or a building permit for construction of a new building.
- (2) *Exception Regarding Streets.*
- Where a development borders an existing nonconforming street, street layout and design requirements may be waived by the City Engineer for development proposals where no new streets will be designed or constructed, provided that such waiver is not detrimental to public safety or to the intent and purpose of this Code. Any such waiver shall be expressly stated in the conditions of the development permit.
 - Development on a lot bordering a street that does not meet minimum right-of-way width may be allowed where vehicular access to the lot is available from other than the nonconforming street.
 - Where the only vehicular access to a lot is a street that does not meet the minimum right-of-way width, a dedication shall be required that will increase the street right-of-way width by one-half (½) the deficient amount.
- (e) *Site Development and Improvement Standards.*
- (1) *Drainage Plan.* Every development plan shall include a drainage plan that meets the requirements of the City's Engineering Standards.
- (2) Fee in Lieu of Stormwater Management
- Prior to the issuance of the building permit or a change in use of the property, the developer of a property may submit an application to the Director and City Engineer for payment of fee in lieu of onsite Stormwater management requirements in the City's Engineering Standards.
 - The fee in lieu shall be established by resolution of the City Council in an amount that is calculated to approximate the cost of obtaining, developing, and maintaining a public stormwater system.
 - All fees in lieu paid pursuant to this Subsection shall be deposited in a separate fund, which fund may be used to undertake future projects to accommodate stormwater management. These fees may not be used for the general expenses of the City.
- (3) Erosion and Sediment Control, Slope Stabilization, and Revegetation Plan. Every development plan shall include an erosion and sediment control plan that meets the requirements of the City's Engineering Standards.
- ~~(3)~~ (4) Lot and Block Design.
- Lot Size and Access.*
 - Each lot in a development shall be designed to provide an adequate, accessible building site for a structure devoted to the intended use of the land.
 - Lot sizes shall be in conformance with applicable zone district regulations or Planned Unit Development regulations. Where individual water or sewage systems are proposed for each lot, lot sizes shall be in conformance with standards of the Colorado Department of Public Health and Environment.
 - Solar Access.* Lots and blocks shall be designed to afford the maximum solar access to each building site.
 - Lot Orientation.*

-
- i. All residential development is strongly encouraged to consider siting to maximize solar access for individual units as well as for parking areas and internal streets.
 - ii. To the maximum extent feasible, a minimum of fifty (50) percent of the single-family lots in a subdivision shall:
 - a. Have a north-south dimension of ninety (90) feet or more; and
 - b. Have a front lot line that is oriented within thirty (30) degrees of a true east-west axis.
 - 2. *Lots Adjacent to Railroad Right-of-Way.* If any part of a residential development borders an active railroad right-of-way, lots adjacent to such right-of-way shall either have a minimum depth of one hundred fifty (150) feet or be provided with a landscaped fifty-foot buffer strip adjacent to the railway or a parallel street adjacent to the railway. No dwelling unit shall be located within fifty (50) feet of the active railroad right-of-way.
- ~~(4)~~ (5) *Uniform Street Standards.* Design and improvement of streets shall comply with the City's Engineering Standards.
- ~~(5)~~ (6) *Water Distribution.* The water main distribution system of a development shall be designed to connect with the City water system, to be compatible with the existing system and to make water available to each lot in the proposed development. Fire hydrants shall be located to ensure protection to each lot based on utilization of existing City firefighting equipment and shall be approved by the Fire Chief.
- ~~(6)~~ (7) *Wastewater Collection.*
- a. Where the City wastewater collection system is within four hundred (400) feet of an existing wastewater main collection system, the wastewater collection system shall connect with the City system and provide service to each lot in the proposed development. Design of the system shall be the responsibility of the developer. The system shall be designed as required in the City's Engineering Standards and is subject to the approval of the City Engineer.
 - b. When the City wastewater collection system is not within four hundred (400) feet of an existing wastewater main collection system, the developer shall be responsible for installation of a wastewater collection system for the development. Such system shall meet all federal, state, and local laws and regulations concerning design and installation of the system.
- ~~(7)~~ (8) *Underground Utilities.*
- a. All wires, cables or other equipment for the distribution of electric energy and telecommunication signals, with the exception of transformers, meters, junction boxes, and like equipment, shall be placed underground where practicable.
 - b. Where subdivisions or developments are approved along or with crossing existing overhead power and communications facilities, energy and telecommunications may be obtained from these existing facilities. The connections to these facilities shall be placed underground unless otherwise approved by the Public Works Department due to economic, engineering, or aesthetic reasons.
 - c. Utility easements and rights-of-way shall be provided in the subdivision or development meeting the requirements of City systems for the installation and maintenance of energy distribution, telecommunication facilities, water, wastewater, and storm drainage facilities.



Chapter 4

Stormwater Standards

City of Glenwood Springs Engineering

Revised 2024

Chapter 4 Stormwater Standards

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Chapter 4 Stormwater Standards

I. Introduction

The standards in this chapter are intended to be applied by The City of Glenwood Springs Engineering Department while reviewing proposed drainage facilities and stormwater discharges associated with development and redevelopment projects. They are also intended to comply with the most recent version of the Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division's (WQCD) Colorado Discharge Permit System (CDPS) Stormwater Discharges Associated with Municipal Separate Storm Sewer Systems (MS4s) and the most recent version of the Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual.

A variety of stormwater management techniques shall be implemented to address the impacts of development. Proper management of stormwater runoff minimizes damage to public and private property, protects infrastructure, safeguards the public health, safety, and general welfare, and protects water resources and aquatic wildlife.

This chapter establishes design and review criteria for the construction, function, and use of stormwater best management practices (BMP's) that may be used to meet the minimum development standards. It also establishes the long-term responsibility and maintenance of BMPs to ensure that they continue to function as designed, are maintained appropriately, and protective of public safety.

The Urban Drainage and Flood Control District (UDFCD) has developed a lengthy and robust Urban Storm Drainage Criteria Manual (USDCM). Volume 3 of the USDCM (Volume 3) includes extensive language covering the importance of stormwater quality treatment and the functional mechanisms associated with various types of treatment facilities. It also includes detailed design guidance and criteria that are updated frequently based on ongoing field research on the functionality of various treatment facilities. While the climate and topography of Glenwood Springs are different from those in the Denver metro area, Volume 3 is a valuable reference and is cited throughout this Chapter.

The following is a summary of the minimum standards. This summary should only serve as a guideline for general understanding of stormwater management requirements in Glenwood Springs and for development of a conceptual design. Detailed and specific requirements are included throughout Chapter 4, that have the potential to significantly impact a site's design.



II. Minimum Standards

- A. Better Site Design – Site designs should preserve the natural drainage and treatment systems, reduce the generation of additional stormwater runoff and pollutants, and fully increase infiltration of stormwater into the ground rather than into hard infrastructure practicable.
- B. Water Quality Capture Volume (WQCV) – New development and redevelopment shall treat a volume of water equal to the 80th percentile runoff event for their site. This volume has been sized to remove 90% of particles greater than 60 microns in size by releasing the WQCV over a 12-hour period. The WQCV is determined based on the site's impervious area and can be reduced as impervious area is reduced.
- C. Detention – New development and redevelopment shall detain for the minor and major storm event up to the point that the stormwater system downstream can accommodate. In most cases, a site will be controlling the post-development peak discharge rate to the predevelopment rate for the 2-year event and 25-year event. Most redeveloped areas in the urban core will not be required to detain anything above the WQCV.
- D. Stormwater system – The downstream system from each site must be able to safely pass flows from the 2- or 25-year and 100-year event. A downstream hydrologic analysis must be performed to determine if there are any additional impacts in terms of peak flow increase or downstream flooding while meeting minimum standards #2 and #3. This analysis must be performed at the discharge points of the site and, at a minimum, at the next two downstream structures.
- E. Floodplains: Development and redevelopment is regulated in all floodplains and flood ways as delineated by FEMA and State regulations. Developments within these areas will be required to determine flood plain elevations for their site through a Floodplain Development Permit, see Chapter 1 for permit and guidance. Other requirements are detailed in City Municipal Code Section 070.040.020(d) Development in Waterways and Areas of Special Flood Hazards.
- F. Geologic Hazards: Development and redevelopment is restricted in those areas recognized in the Geologic Hazard Ordinance City Municipal Code Section 070.040.020(c) Development in Areas of Geologic Hazard.



III. Definitions and Abbreviations

- A. BMP-Best Management Practice: A device, practice, or method for removing, reducing, retarding, or preventing targeted stormwater runoff constituents, pollutants, and contaminants from reaching receiving waters.
- B. CDPHE-Colorado Department of Public Health and Environment: The principal department of the Colorado State government responsible for public Health and environmental agency. This is the permitting agency for water quality permits. Colorado Department of Public Health and Environment (CDPHE).
- C. CDPS-Colorado Discharge Permit System: Permitting system for all stormwater permits through CDPHE.
- D. Culvert: A transverse facility to convey water under a roadway or railway.
- E. EPA- Environmental Protection Agency: An independent executive agency of the United States federal government tasked with environmental protection matters.
- F. FILO- Fee in Lieu of: A fee designed to be paid instead of installing public infrastructure.
- G. Historic: Conditions prior to any land development (i.e., native/undisturbed).
- H. Major Storm: 100-year (0.01% chance) storm event.
- I. MHFD- Mile High Flood District: Denver Area stormwater management resource.
- J. MDCIA- Minimizing Directly Connected Impervious Area: A variety of runoff reduction strategies based on reducing impervious areas and routing runoff from impervious surfaces over grassy areas to slow runoff and promote infiltration. The concept of MDCIA has been recommended by MHFD as a key technique for reducing runoff peaks and volumes following urbanization.
- K. Minor Storm: 25-year (0.04% chance) storm event.
- L. LID- Low Impact Development: Refers to systems and practices that use or mimic natural processes that result in the infiltration, evapotranspiration, or use of stormwater in order to protect water quality and associated aquatic habitat.
- M. Professional Engineer: A qualified State of Colorado registered professional engineer that ensures that a site feature (stormwater, walls, grading, etc.) are installed correctly. as specified in the design.
- N. Stormwater System: Storm systems include streets, curbs, gutters, inlets, culverts, pipes, outfalls, roadside ditches (swales), detention areas, ponds,



wetlands, the Roaring Fork and Colorado Rivers and their tributaries within City boundaries to which stormwater is collected and conveyed.

- O. USDCM- Urban Storm Drainage Criteria Manual: Manual (Volumes 1, 2, and 3) developed by MHFD for guidance on stormwater management.
- P. WQCV- Water Quality Capture Volume: The runoff retention capacity of a BMP that is designed to capture and treat, at a minimum, the 80th percentile runoff event from an entire site, i.e., 80 percent of the most frequent occurring storms are fully captured and treated and larger events are partially treated.

DRAFT

IV. Stormwater Standards

1. Overview of Requirements

Unless specifically exempted, no development, disturbance of land, or construction shall be undertaken without first having been reviewed, approved, and issued a permit compliant with the requirements of the Engineering Standards. Unless specifically exempted, no building shall be erected, moved, or structurally altered without a building permit issued pursuant to the Glenwood Springs Municipal Code. This Chapter provides detailed guidelines on the development and building permits that require engineering review. For complete requirements, refer to the Glenwood Springs Municipal Code

All development and redevelopment projects in the City of Glenwood Springs that will:

- Increase the amount of impervious area on a site (this includes adding hard surface patios, increasing the footprint of the house, etc.)
- Disturb more than 200 square feet of land on the site (this includes grading, even if a structure or hard surface is not added, as well as “scrape and replace” of impervious area),
- Demolish more than 50% of the interior (based on the entire square footage of rooms where floors, ceilings, or walls are exposed over the square footage of the structure)

are required to an engineering review as part of the building permit, ROW permit, or grading permit application review process.

Refer to Table 1.0 for a guide on the requirements by the size of the project and subject property.



Table 1.0 General Requirements for Projects

Project Description	Area Added or Disturbed	General Requirements
Disturbing less than 200 SF	<200 SF	No Requirements
Landscaping or grading only, no impervious and or change to the drainage pattern.	200-1000 SF	• CMP
Landscaping or grading only that might include hardscape or change in grade or drainage pattern, small additions, small scrape and replace.	200-1000 SF	• WQCV or drain to green-space • CMP • Drainage Letter • FILO
Replacement of existing hardscape	Limited to footprint of existing hardscape	• CMP • WQCV or drain to green space for impervious area. • FILO
Interior Work Only	<50% Demolished	• CMP with 500 SF of Work
Interior Work Only Existing Lot Coverage 0-50%	>75% Demolished	• CMP • WQCV for Entire Area • Conveyance for Flows
Existing Lot Coverage 50%-100%	>200 SF	• CMP • WQCV for Entire Area • Conveyance for Flows • Detention to the Undeveloped rate Drainage Report or FILO • Requires a Professional Engineer
Landscaping, grading, installing or disturbing hardscapes, additions to structures	>1000 SF	• CMP • WQCV for Entire Area • Conveyance for Flows • Detention to the Changed rate Drainage Report or FILO • Requires a Professional Engineer

Notes:

- Special Circumstances: Any work, regardless of amount or size, performed on historic properties, in environmentally sensitive areas, geologic hazard areas, in jurisdictional or non-jurisdictional floodplains may be required to submit information for permit review and may be required to provide a more detailed drainage analysis and design than suggested in the table above.
- Pre-project lot coverage is determined by dividing the total hardscape footprint on the lot (house, driveway, patios, sidewalks, etc.) by the total lot area. Interior demolition is measured by the square footage of the room renovated/modified divided by the total square footage of the structure.



2. Review and Acceptance

The City shall review all drainage submittals for general compliance with the Engineering Standards. An acceptance by The City does not relieve the owner, engineer, or designer from the responsibility of ensuring that the design, calculations, plans, specifications, construction, and record drawings follow the criteria as stated in the owner's and engineer's certifications.

The City may, but is not required to, refer submittals to other agencies that have an interest or responsibility for drainage and/or water quality issues. Other review agencies may include local or State agencies, such as the Colorado Water Conservation Board or the Colorado Geologic Survey, responsible for floodplain and water quality, slope stability, mudflow analysis, geology, water rights and other stormwater related issues.

3. Stormwater Fee in Lieu

- A. The City recognizes that the stormwater infrastructure requirements may be difficult to achieve due to site constraints and costs. To help mitigate these constraints The City has provided the option of payment of a voluntary fee-in-lieu of detention (FILO). The amount of the fee is based on the estimate of the cost of providing detention in Glenwood Springs. However, if a developer can show that their cost of detention is less than The City cost estimate, The City has the option of accepting this lesser amount or asking the developer to build on-site detention.
- B. The average calculations showed that the volume of detention needed is approximately 7.3 cubic feet of rainwater runoff per 100 square feet of impervious area for the maximum design storm. The City reviewed engineer cost estimates and called local contractors to determine that it cost approximately \$50.00 per cubic foot of detention in Glenwood Springs. The FILO then works out to be \$365 per 100 square feet of impervious area added or redeveloped. The fee can be referenced in the Municipal Code _____.
- C. The fees collected through the FILO program will be used to improve conveyance and detention throughout the city and reduce impacts of urban runoff on the rivers.
- D. Exceptions can be made to the FILO or detention requirements and any development can apply for a variance by following the procedures outlined in Chapter 1 of the Engineering Standards.

4. Drainage Letter and Report

The purpose of the Drainage Plan and Report is to identify and refine conceptual solutions to the drainage changes that may occur onsite and offsite because of the development. These reports are required, unless determined by the City Engineer Department to be unnecessary.

Preparation of plan documents shall follow the standards and guidance found in Chapter 1 of the Engineering Design Standards. For projects, all reports shall:

- Be typed on 8½" by 11", electronic, pdf format.
- Contain enough information to describe the existing site, proposed work, explanation of steps taken to reduce impervious area and implement low impact development strategies, pre- and post-drainage patterns, sizing calculations for stormwater management facilities, how chosen facilities should operate and be maintained.
- The site plan, drawings, figures, plats, calculations, and tables shall be included in the plan set.
- Contain a certification sheet that includes the following statement and Professional Engineer's stamp and signature:

"I hereby affirm that this (Type of Report/Letter) and the accompanying plans for the (type or phase design) of (Name of Development) was prepared by me (or under my direct supervision) for the owners thereof in accordance with the provisions of the City of Glenwood Springs Stormwater, Drainage, Water Quality and Erosion Control Chapter and approved variances and exceptions listed thereto. I understand that it is the policy of the City of Glenwood Springs that the City of Glenwood Springs does not and will not assume liability for drainage facilities designed by others."

License No. _____

Licensed Professional Engineer, State of Colorado (Affix Seal)



A. Drainage Letter

A Drainage Letter is a short letter prepared for a site that has less than 1000 square feet of impervious added. The letter shall include:

- i. Description of the existing site, including common location, topography, land use, ground cover, soil type (if known), drainage pattern, riparian areas, wetlands, and receiving system.
- ii. Description of the proposed project, including changes to land use, topography, ground cover, soil type, drainage pattern and receiving system.
- iii. Discussion of any drainage issues.
- iv. Discussion of drainage basins and drainage alterations, including increases in flow, changes in direction, outfalls, etc.
- v. Description of proposed stormwater conveyance system
 1. Pervious infrastructure - Description of water quality improvements. Improvements must be made for at least the project area. Describe what efforts have been made to reduce runoff and increase infiltration (e.g. reduces impervious area, disconnect impervious area, route runoff via landscape rather than hard infrastructure). Demonstrate that 60% of the WQCV is either infiltrated or evaporated.
 2. Impervious infrastructure - Calculations to determine the WQCV and design a BMP that can treat that volume. WQCV and BMP design shall meet the requirements of USDCM Volume 3.

The Drainage Letter shall be stamped and signed by a qualified professional engineer licensed in Colorado.

B. Drainage Report

The Drainage Report shall provide details of the proposed drainage facilities including grading, erosion control, and stormwater treatment.

The purpose of the Drainage Report is to:

- i. Describe the existing site, including common location, topography, land use, ground cover, soil type, drainage pattern, location of riparian areas and wetlands, upstream runoff and receiving system (all downstream structures to outfall and riparian and wetland areas).



- ii. Describe the proposed project, including changes to land use, topography, ground cover, soil type, drainage pattern and receiving system.
- iii. Discuss any previous drainage studies (i.e., project master plans) for the site that influence or are influenced by the drainage design and the mitigation plan for any impacts.
- iv. Discuss the effects of adjacent drainage issues.
- v. Provide references to major drainage way planning studies such as flood hazard delineation reports, master plans, and flood insurance rate maps.
- vi. Discuss potential drainage impact of site constraints such as streets, utilities, existing structures, riparian areas, wetlands, and development or site plan.
- vii. Identify all irrigation facilities and waterways within the watershed that will influence or be influenced by the site drainage.
- viii. Describe proposed stormwater conveyance system.
 - 1. Pervious infrastructure - Description of water quality improvements. Improvements must be made for at least the project area. Describe what efforts have been made to reduce runoff and increase infiltration (e.g., reduces impervious area, disconnect impervious area, route runoff via landscape rather than hard infrastructure). Demonstrate that 60% of the WQCV is either infiltrated or evaporated.
 - 2. Impervious infrastructure - Calculations to determine the WQCV and design a BMP that can treat that volume. WQCV and BMP design shall meet the requirements of USDCM Volume 3.
- ix. Discuss easements and tracts for drainage purposes, including the conditions and limitations for use.
- x. The report must include printed copies of the input and output files for all computer models used for the analysis and design.
- xi. Reference plan drawings as needed.

The location, type, and design of the stormwater system shall be identified at a construction plan level or 95% design level. The Drainage Report shall provide details of the proposed drainage facilities, including grading and stormwater treatment. Not all designs may be completely finalized during the development process, and minor changes may occur during the development of the construction documents. If changes occur during final construction plan preparation or during construction, a

Drainage Report Addendum shall be submitted for review and approval along with the construction documents. The Drainage Report shall be stamped and signed by a qualified professional engineer licensed in Colorado.

5. Floodplain and Geologic Hazard Requirements

- A. Development within areas of special flood hazard must adhere to the standards in City Municipal Code Section 070.040.020(d) Development in Waterways and Areas of Special Flood Hazards.
 - i. Developments within these areas are required to determine the flood plain elevations for their site and complete a Floodplain Development Permit, see the City Municipal Code for permit and guidance.
- B. Development within areas of geologic hazards must adhere to the standards in the Geologic Hazard Ordinance City Municipal Code Section 070.040.020(c) Development in Areas of Geologic Hazard.

6. Rainfall

This section provides regionally specific rainfall depth, duration, frequency, and intensity data; runoff data; for use in addressing stormwater management for City projects.

- A. Overview
 - i. Climate: The climate in Glenwood Springs offers mild weather with low humidity and year-round sunshine. Summer weather in Glenwood Springs starts around June or July where temperatures reach 80°F during the day, although temperatures are much cooler during the night. The occasional summer shower can occur at any time, sometimes turning into thunderstorms. Autumn in Glenwood Springs is usually dry and warm and during September daytime temperatures can reach 70°F, but night temperatures can drop to below freezing. Winter daytime temperatures typically range from 20 to 40°F in the City and from 10 to 30°F on the mountain. Once the sun goes down, the temperature drops dramatically. The City of Glenwood Springs often sees isolated short, high intensity storms leading to significant concentrated flooding and debris events.
 - ii. Flooding: The current Flood Insurance Study was completed on October 15, 1985. The Mitchell Creek basin was re-mapped and a CLOMER for this floodplain was accepted in 2018. The Flood Insurance Rate Map for Glenwood Springs is, for insurance purposes, the principal product of the Flood Insurance Study. This map contains the official delineation of flood insurance zones and base flood elevations.



- iii. Peak Flow: The maximum rate of discharge during the period of runoff caused by a storm. The information about peak flows and associated volume of runoff during various floods that have been observed in the past can be compiled with the analysis of the observed discharge data and runoff hydrographs.

B. Methodology

The methodology used to generate the rainfall data for a project shall depend on the size of the drainage basin being studied. The Design Engineer needs to provide justification for the selected runoff generation method used. Methods available to calculate urban runoff generated in the Glenwood Springs area are:

i. Small basins (less than 90 Acres)

1. Rational Method: This method is the widely accepted method for determining runoff on small sites. This method uses rainfall data in the form of intensity-duration (time)-frequency curves, discussed in this section. The Rational Method becomes less valid over larger areas with larger basins.

ii. Large Basins (greater than 90 Acres)

1. TR-55: A simplified procedure for estimating runoff and peak discharges in small watersheds.
2. TR-20: A computer program that formulates hydrology on a physically based watershed scale runoff event model that computes direct runoff and develops hydrographs.
3. Colorado Urban Hydrograph Procedure (CUHP): Used for calculating runoff for basins that are larger than 90 acres. This method is not to be used for smaller basins, as it will generally overestimate or underestimate peak runoff rates.
4. Storm Water Management Model (SWMM) Version 5: A model developed by the EPA that is a dynamic rainfall-runoff-routing simulation model for single events or long term (continuous) simulation of runoff quantity and quality for primarily urban areas.

iii. Rainfall Depth, Duration, Frequency, and Intensity

The rainfall IDF curve is a statistical formula to describe the relationship between the local rainfall characteristics and return periods. The IDF curve is used in the Rational Method for peak runoff predictions of basins smaller than 90 acres. Rainfall intensity data, which form the basis of the IDF curves.



iv. Design Rainfall Distribution

For larger drainage areas (over 90 acres) or for sizing facilities where a hydrograph must be analyzed, such as a detention pond, a temporal distribution must be assigned to a precipitation event for calculation of runoff. Characteristics of a temporal distribution include duration and distribution (depth at a certain time) of rainfall.

C. The rainfall and snowfall design information needed for storm and snowmelt runoff analyses in the City of Glenwood Springs is defined below. Major subjects include:

- i. Precipitation statistics for the City of Glenwood Springs.
- ii. IDF (intensity-duration-frequency) relationships for flood predictions from small watersheds.
- iii. Temporal rainfall distributions for flood flow simulation through large watersheds
- iv. snowmelt calculation methods
- v. the derivation of WQVC

The 2-, 25-, and 100-year storms are needed for drainage designs. The IDF curves provided in the figures below are based upon data in the Precipitation-Frequency Atlas of the United States, Midwestern States, NOAA Atlas 14, Volume 8 (NOAA 2013).



Figure 7.1 Tabular Representation of Point Precipitation Frequencies

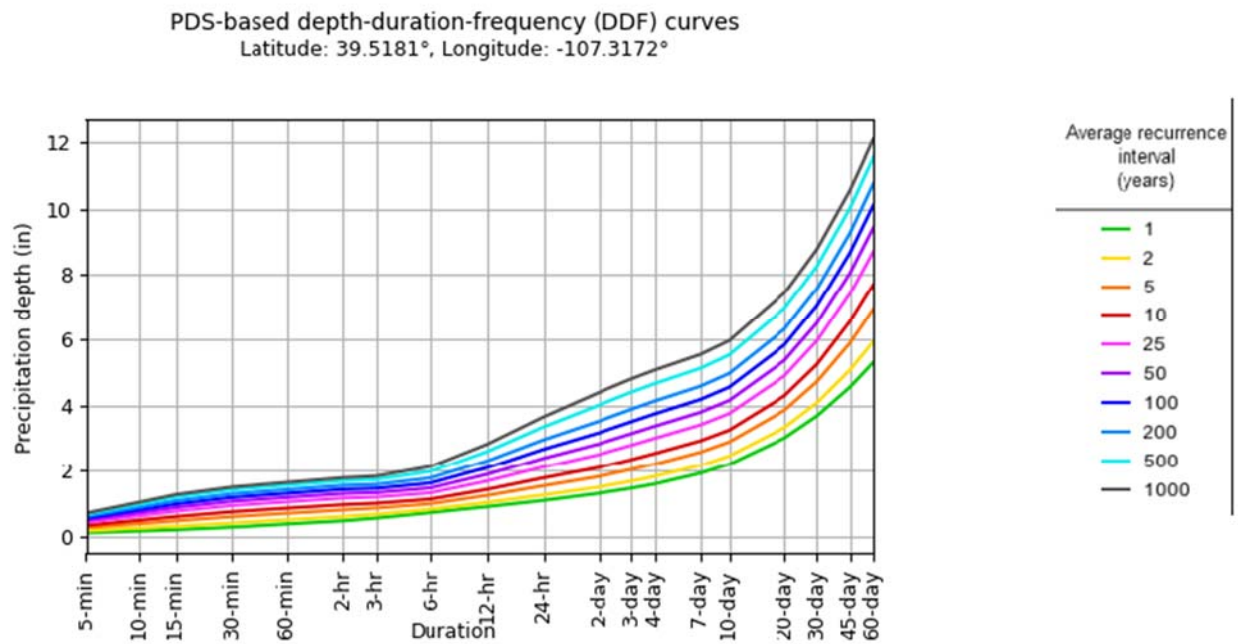
PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.116 (0.092-0.150)	0.176 (0.139-0.228)	0.268 (0.212-0.348)	0.339 (0.266-0.443)	0.430 (0.320-0.573)	0.494 (0.360-0.671)	0.553 (0.388-0.773)	0.607 (0.408-0.876)	0.670 (0.432-1.00)	0.712 (0.451-1.09)
10-min	0.170 (0.135-0.220)	0.258 (0.204-0.333)	0.392 (0.310-0.509)	0.497 (0.390-0.648)	0.630 (0.468-0.839)	0.723 (0.527-0.983)	0.809 (0.569-1.13)	0.889 (0.597-1.28)	0.982 (0.633-1.46)	1.04 (0.660-1.60)
15-min	0.208 (0.165-0.269)	0.314 (0.249-0.407)	0.479 (0.378-0.621)	0.606 (0.476-0.791)	0.768 (0.571-1.02)	0.882 (0.643-1.20)	0.987 (0.694-1.38)	1.08 (0.728-1.56)	1.20 (0.772-1.79)	1.27 (0.805-1.95)
30-min	0.285 (0.226-0.369)	0.411 (0.326-0.532)	0.604 (0.477-0.784)	0.753 (0.591-0.982)	0.940 (0.698-1.25)	1.07 (0.780-1.45)	1.19 (0.836-1.66)	1.30 (0.872-1.87)	1.42 (0.916-2.12)	1.50 (0.950-2.31)
60-min	0.381 (0.303-0.493)	0.510 (0.404-0.660)	0.707 (0.559-0.918)	0.860 (0.675-1.12)	1.05 (0.784-1.40)	1.19 (0.867-1.61)	1.31 (0.923-1.83)	1.42 (0.959-2.06)	1.56 (1.00-2.32)	1.64 (1.04-2.52)
2-hr	0.478 (0.384-0.608)	0.608 (0.488-0.776)	0.810 (0.648-1.04)	0.967 (0.769-1.24)	1.17 (0.881-1.53)	1.31 (0.966-1.75)	1.44 (1.02-1.98)	1.55 (1.06-2.21)	1.69 (1.10-2.49)	1.78 (1.14-2.70)
3-hr	0.560 (0.454-0.707)	0.679 (0.549-0.858)	0.865 (0.697-1.10)	1.01 (0.809-1.29)	1.20 (0.917-1.57)	1.34 (0.998-1.78)	1.46 (1.05-2.00)	1.59 (1.09-2.24)	1.73 (1.14-2.53)	1.84 (1.18-2.75)
6-hr	0.732 (0.600-0.909)	0.833 (0.682-1.04)	1.00 (0.816-1.25)	1.14 (0.923-1.43)	1.33 (1.04-1.73)	1.48 (1.13-1.95)	1.63 (1.19-2.22)	1.78 (1.25-2.50)	1.99 (1.33-2.88)	2.14 (1.39-3.16)
12-hr	0.908 (0.754-1.11)	1.04 (0.860-1.27)	1.25 (1.03-1.54)	1.43 (1.18-1.77)	1.69 (1.34-2.16)	1.89 (1.46-2.46)	2.10 (1.56-2.81)	2.31 (1.63-3.19)	2.60 (1.76-3.71)	2.82 (1.85-4.10)
24-hr	1.10 (0.924-1.32)	1.26 (1.06-1.52)	1.54 (1.29-1.86)	1.78 (1.48-2.16)	2.12 (1.70-2.68)	2.39 (1.87-3.07)	2.67 (2.00-3.52)	2.95 (2.11-4.02)	3.35 (2.29-4.70)	3.65 (2.42-5.21)
2-day	1.32 (1.12-1.56)	1.51 (1.28-1.78)	1.83 (1.55-2.17)	2.11 (1.78-2.52)	2.51 (2.04-3.12)	2.83 (2.24-3.58)	3.17 (2.41-4.12)	3.52 (2.55-4.73)	4.01 (2.78-5.55)	4.40 (2.95-6.18)
3-day	1.47 (1.26-1.72)	1.68 (1.45-1.98)	2.04 (1.75-2.40)	2.35 (2.00-2.78)	2.79 (2.29-3.44)	3.14 (2.50-3.93)	3.51 (2.68-4.51)	3.88 (2.83-5.15)	4.40 (3.07-6.03)	4.81 (3.25-6.69)
4-day	1.60 (1.38-1.86)	1.83 (1.58-2.13)	2.21 (1.90-2.58)	2.54 (2.17-2.98)	3.00 (2.47-3.66)	3.37 (2.70-4.18)	3.74 (2.88-4.77)	4.13 (3.03-5.44)	4.66 (3.26-6.33)	5.07 (3.44-7.01)
7-day	1.92 (1.68-2.21)	2.17 (1.89-2.49)	2.58 (2.24-2.97)	2.92 (2.52-3.38)	3.40 (2.83-4.09)	3.79 (3.06-4.62)	4.18 (3.24-5.25)	4.58 (3.38-5.94)	5.12 (3.62-6.85)	5.54 (3.79-7.55)
10-day	2.20 (1.94-2.51)	2.46 (2.16-2.80)	2.89 (2.53-3.30)	3.25 (2.82-3.73)	3.75 (3.14-4.46)	4.15 (3.38-5.02)	4.55 (3.56-5.66)	4.97 (3.69-6.38)	5.53 (3.93-7.33)	5.96 (4.10-8.05)
20-day	3.01 (2.69-3.36)	3.33 (2.97-3.73)	3.85 (3.42-4.33)	4.29 (3.79-4.84)	4.90 (4.15-5.71)	5.36 (4.42-6.36)	5.83 (4.62-7.12)	6.31 (4.75-7.95)	6.95 (4.99-9.04)	7.44 (5.18-9.87)
30-day	3.68 (3.32-4.08)	4.08 (3.67-4.52)	4.72 (4.23-5.25)	5.25 (4.67-5.86)	5.96 (5.09-6.87)	6.51 (5.40-7.62)	7.04 (5.61-8.49)	7.58 (5.74-9.43)	8.27 (5.98-10.6)	8.79 (6.16-11.5)
45-day	4.55 (4.13-4.98)	5.07 (4.60-5.56)	5.89 (5.32-6.48)	6.54 (5.87-7.23)	7.41 (6.36-8.42)	8.05 (6.73-9.31)	8.67 (6.95-10.3)	9.27 (7.06-11.4)	10.0 (7.28-12.7)	10.6 (7.45-13.7)
60-day	5.30 (4.84-5.76)	5.93 (5.41-6.45)	6.92 (6.29-7.55)	7.70 (6.94-8.44)	8.70 (7.50-9.79)	9.43 (7.92-10.8)	10.1 (8.14-11.9)	10.8 (8.22-13.1)	11.6 (8.42-14.5)	12.1 (8.57-15.6)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

(NOAA Atlas 14, Volume 8, Version 2; Glenwood Springs, Colorado; Latitude 39.5455°, Longitude -107.326°, Elevation 5788.02 feet)

Figure 7.2 DDF CURVE



(NOAA Atlas 14, Volume 8, Version 2; Glenwood Springs, Colorado; Latitude 39.5455°, Longitude -107.326°, Elevation 5788.02 feet)

Table 7.1 Rainfall Intensity-Duration-Frequency, Glenwood Springs, Co

Return Period	Rainfall Intensity in inch/hr for Various Periods of Duration								
	5-min	10-min	15-min	30-min	60-min (P_1)	2-hr	3-hr	6-hr	24-hr
2-yr	2.11	1.56	1.25	0.82	0.51	0.31	0.23	0.14	0.05
5-yr	3.17	2.35	1.88	1.20	0.72	0.41	0.29	0.16	0.05
10-yr	4.00	2.96	2.36	1.49	0.87	0.49	0.34	0.19	0.05
25-yr	5.04	3.75	2.98	1.86	1.06	0.58	0.40	0.21	0.05
50-yr	5.83	4.33	3.44	2.13	1.21	0.65	0.44	0.23	0.06
100-yr	6.50	4.83	3.84	2.36	1.33	0.70	0.48	0.24	0.06

Using the data in Table 7.1 (derived from NOAA Atlas 14 Volume 8), the following equation was used to determine intensities not shown in the IDF table or curve.

$$I = \frac{a \cdot P_1}{(b + t_c)^c} \quad \text{EQ. 7.1}$$

Where,

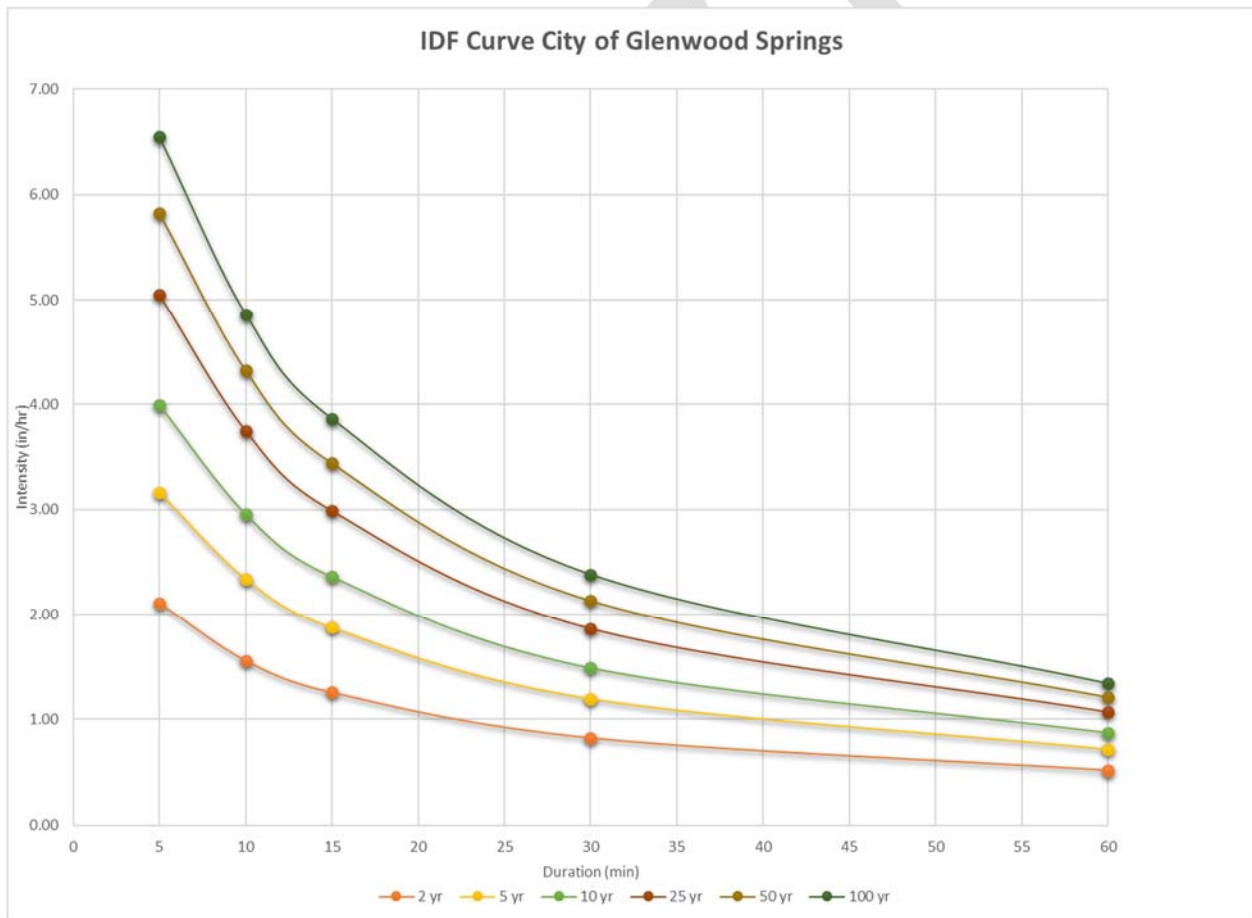
I= intensity

P1= 1-hr rainfall depth (inches

Tc= time of concentration

a,b,c= constants

Figure 7.3 IDF Curve, Glenwood Springs, Co



Note: Graphical representation of rainfall intensity, inches per hour, over a duration of time, in minutes, for several time periods, year.

7. Runoff

The surface in a watershed is composed of pervious or impervious areas. The pervious surface is the area where water can readily infiltrate into the ground. The impervious surface is the area that produces direct runoff as soon as it rains. As urbanization occurs, impervious areas increase. As a result, the total amount of runoff volume increases. In urban hydrology, the percentage of impervious area is the most sensitive parameter to runoff generation.

Estimates of runoff flow rates and volumes for selected levels of protection provide the basis for the design of drainage facilities for the management of flood discharges and water quality in a drainage system.

A. Hydrologic Loss

In a rain event, not all raindrops reach the ground. Raindrops can be lost to evaporation, infiltration, puddles, or land on vegetation. All major losses considered in the rainfall and runoff modeling techniques include soil infiltration and depression loss.

B. Soil Infiltration Loss

Infiltration is the penetration of water into the soil. Different soil types can affect this penetration rate. The Natural Resources Conservation Service (NRCS) has classified soils into four types (SCS 1983)

- Type A Soil – Soils having high infiltration rates such as sand and gravel.
- Type B Soil – Soils having moderate infiltration rates such as loamy soils.
- Type C & D Soil – Soils having very slow infiltration such as clay soils.

C. Depression Loss

Depression losses account for the amount that puddles in low areas, ponds, and potholes. These losses are only considered in CUHP/SWMM Modeling. Refer to the chart below for depression capacity for various land uses.

Soil Type	Initial Rate Inch/hr	Final Rate Inch/hr	Decay Coefficient 1/sec for CUHP	Decay Coefficient 1/hr for SWMM
A	5	1	0.0007	2.52
B	4.5	0.6	0.0018	6.48
C&D	3	0.5	0.0018	6.48

D. Hydraulic Criteria

Identify the hydraulic design point for closed systems tied to The City's existing collection system.

Identify flow capacity of drainage facilities, such as:

- i. Calculate culvert sizes with capacities and area of contribution.
- ii. Calculate storm sewer capacity including capacity of next two downstream drainage structures (max velocity 20 ft/sec, HGL 12 inches below ground, EGL below ground, minimum velocity of 5 ft/sec at half full conduit flow).
- iii. Calculate gutter capacity (max velocity 10 ft/sec, allowable spread = 4 feet minor storm, 12-inch depth at flow line for major storm, $n=.016$ for street, $n=.025$ for grass)
- iv. Calculate storm inlet capacity (clogging factor = 50%).
- v. Calculate storm inlet capacity (clogging factor = 50%).

8. Detention

A. Types of Detention Basins:

- i. Dry Detention Basins
- ii. Bio-retention or sand filter facilities
- iii. Wet Detention basins
- iv. Above/Below Ground

9. Water Quality

The City of Glenwood Springs water quality and erosion control design criteria relies on guidance provided in the MHFD USDCM Volume 3. The procedure is outlined below:

- A. Calculate the WQCV and Volume Reduction: This section presents the hydrologic basis and calculations for the WQCV and discusses the benefits of attenuating this volume. This section also describes various methods for quantifying volume reduction when using LID practices. The use of these methods should begin during the planning phase for preliminary sizing and development of the site layout. The calculations and procedures in this section allow the engineer to determine effective impervious area, calculate the WQCV, and more accurately quantify potential volume reduction benefits of BMPs.



- B. Select Stormwater Treatment Facility for new development or redevelopment: Treatment facility selection involves many factors such as physical site characteristics, treatment objectives, aesthetics, safety, maintenance requirements, and cost. Typically, there is not a single answer to the question of which facility should be selected for a site; there are usually multiple solutions ranging from standalone treatment facilities to treatment trains that combine multiple facilities to achieve the water quality objectives.
- i. Stormwater Treatment Facility Maintenance (MHFD USDCM Volume 3, Chapter 6): For stormwater treatment facilities to be effective, proper maintenance is essential. Maintenance includes both routinely scheduled activities, as well as non-routine repairs that may be required after large storms, or because of other unforeseen problems. Stormwater treatment facility maintenance is the responsibility of the entity owning the facility; however, local governments with MS4 permits are responsible for ensuring that maintenance of privately owned facilities occurs within their MS4. Facilities should be designed with maintenance as one of the key design considerations. Planning-level design guidance pertaining to maintenance is included in the individual Fact Sheets contained within this chapter. This chapter focuses on maintenance of in-service facilities and provides recommendations for private facility owners, as well as for MS4 permittees responsible for ensuring proper maintenance for both public and private facilities within their MS4.
- C. Colorado Department of Transportation's (CDOT) Erosion Control and Stormwater Quality Field Guide, provides an overview of erosion and sediment control principles and information on construction best management practices (BMPs). <https://www.codot.gov/programs/environmental/water-quality/assets/pocket-field-guide-english>.
- D. The Construction Management Plan Checklist, provided on the City of Glenwood Springs Engineering Department Website. (Add hyper Link to Checklist Location on COGS)

10. Calculating WQCV

- A. The WQCV is calculated as a function of imperviousness and BMP type using Equation 11.1 and Table 11.1, and as shown in Figure 12.1:

$$WQCV = 0.70 Aa(0.91I^3 - 1.19I^2 + 0.78I)/12 \quad \text{EQ. 11.1}$$

Where:

WQCV = Water Quality Capture Volume (ft³)

A = Area draining to the treatment facility (ft²)

a = Coefficient corresponding to BMP type and from Table 4.11

I = Imperviousness (percent expressed as a decimal)

Note: The provided equation is modified from MHFD USDCM Volume 3 Equation 3-1.

This equation was developed based on rainfall data from the Denver Metro area.

However, in reviewing MHFD USDCM Volume 3, Figure 3-1: Map of the average runoff Producing Storm's Precipitation Depth in the United States in Inches the precipitation depth of the average runoff producing storm in Glenwood Springs is 0.30 inches, while in Denver it is 0.43 inches. The WQCV equation above includes the coefficient of 0.70 to adjust for the equation for use in Glenwood Springs.

At a planning level, the watershed imperviousness can be estimated based on the zoned density. When finalizing design, calculate imperviousness based on the site plan.

Table 11.1 Drain Time Coefficients for WQCV

Drain Time (hours)	Coefficient, <i>a</i>
12 hours (filtration BMPs)	0.8
24 hours (constructed wetland ponds)	0.9
40 hours (extended detention)	1.0
No attenuation (e.g. grass buffer or swale)	1.0

Ref: Mile High Flood District Urban Drainage Criteria Manual Volume Three Table 3-2

B. Effective Imperviousness

The imperviousness value used in the WQCV calculation for sites that implement low impact development (LID) principles such as green infrastructure and MDCIA may be reduced to reflect the site's effective imperviousness. The effective imperviousness is dependent on the level of MDCIA implemented for high-level planning applications.

- Level 1 includes designing impervious surfaces to drain over a grass buffer or other pervious surface prior to reaching any stormwater conveyance system.

- Level 2 is an enhancement to Level 1 and includes eliminating curb and gutter or using slotted curbs; low-velocity pervious grass- or rock-lined swales instead of storm sewers, and pervious street shoulders.

Guidance on calculating effective imperviousness for Level 1 and Level 2 MDCIA can be found in Volume 3 of the USDCM.

Where a detailed site plan has been developed and the square footage of directly connected impervious area, unconnected impervious area, receiving pervious area, and separate pervious area have all been defined, a more detailed effective imperviousness can be determined using the methods in Volume 3 of the USDCM.

C. Detention

When a site requires a detention facility, a single facility may be designed to serve as both the detention and stormwater quality treatment facility. Detention facilities that are also water quality treatment facilities have outlets to provide for both the stormwater quality treatment and detention release rates. For these facilities, the guidance in the USDCM for Excess Urban Runoff Volume (EURV) facilities shall be followed.

Guidance on how to design extended detention basins, sand filter basins, bioretention, and permeable pavement to meet the WQCV standard are included in the fact sheets in Volume 3 of the USDCM.

When detention storage volume is sized for a site that also incorporates a water quality capture volume (WQCV), the 100-year volume required for quantity detention must be added to the entire WQCV. The WQCV must also be added in its entirety to the required 2- or 25-year volume.

11. Calculation WQCV Reduction

- Runoff volume reduction is an important part of the Four Step Process for stormwater management as discussed in MHFD USDCM Volume 3, Chapter 1 and is fundamental to effectively manage stormwater runoff.

The approach recommended in this section is based on the Four-Component Land Use Model that is used by the Colorado Urban Hydrograph Procedure (CUHP) and the EPA Stormwater Management Model (SWMM). This conceptual model, illustrated in Figure 4.12, represents a drainage area by four components:

- Directly Connected Impervious Area (DCIA) – DCIA is an impervious area that drains to the storm drain system or stream without flowing over surfaces that would allow for infiltration.



- ii. Unconnected Impervious Area (UIA) – UIA is an impervious area that drains to a receiving pervious area, where there is an opportunity for infiltration.
- iii. Receiving Pervious Area (RPA) – RPA is a pervious area that receives runoff from UIA and allows for infiltration.
- iv. Separate Pervious Area (SPA) – SPA is a pervious area that does not receive runoff from impervious surfaces.

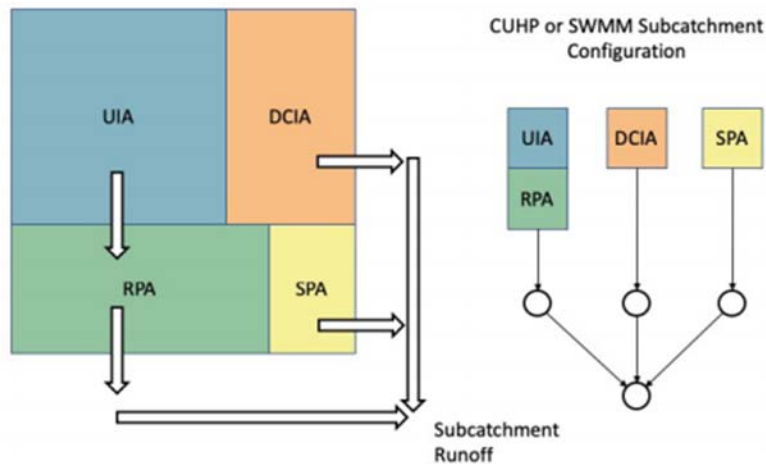


Figure 12.1: Water Quality Capture Volume (WQCV) Based on BMP Drain Time

Ref: Mile High Flood District Urban Drainage Criteria Manual Volume Three Figure 3-2.

B. Detention Criteria

- i. Detention needs to be provided for the increase in runoff from the pre- and post-developed conditions. The Design Engineer needs to provide justification for the selected detention requirement method used. Methods available to calculate detention in the Glenwood Springs area are:

1. Federal Aviation Administration (FAA): a Rational Formula-based procedure that is used in calculation and design of detention facilities with tributary areas of less than five (5) acres in size. This method provides sizing for one level of peak control only and not for multi-stage control facilities. The input required for this Rational Formula-based FAA volume calculation procedure includes:

The calculations are best set up in a tabular (spreadsheet) form with each 5-minute increment in duration being entered in rows and the following variables being entered, or calculated, in each column:

Determine the inflow volume by multiplying the peak flow rate (CiA) by the time of concentration (Tc) as calculated by the rational method:

$$V_i = (CiA)(T_c)60 \frac{sec}{min} \quad \text{EQ:12.1}$$

Where:

Vi = Inflow volume (ft³)

C = Rational Method runoff coefficient for the major or minor storm

i = Design Rainfall Intensity (in/hour)

A = area of the catchment tributary to the storage facility (acres)

Tc = Rational Method time of concentration for the tributary catchment (minutes) (see the Runoff chapter)

2. Determine the outflow volume by multiplying the allowable release (Qo) rate by the time of concentration (Tc):

$$V_o = (Q_o)(T_c)60 \frac{sec}{min} \quad \text{EQ. 12.2}$$

Where:

Vo = Outflow Volume

Qo = Allowable maximum release rate from the detention facility (cfs)

Tc = Rational Method time of concentration for the tributary catchment (minutes) (see the Runoff chapter)

3. If the entire site is not tributary to the detention pond, the allowable release rate from the detention pond must be decreased to compensate for site runoff that does not pass through the detention pond. The allowable release rate is calculated as the total site predevelopment runoff rate minus the post-development undetained flow rate. The result will be that the post-development peak flow from the entire site will meet the pre-development runoff rate criteria. A maximum of 5% of the total site is allowed to bypass the detention pond.

$$Q_o = Q_{pre-developed} - Q_{undetained} \quad \text{EQ. 12.3}$$

Where:

Q_o = Allowable maximum release rate from the detention facility (cfs)

$Q_{pre-developed}$ = Allowable maximum release rate from the site in the pre-developed condition (cfs)

$Q_{undetained}$ = The release rate that bypasses the detention facility (cfs)

4. Determine the storage volume by subtracting the outflow volume (V_o) from the inflow volume (V_i):

$$V_{storage} = V_i - V_o \quad \text{EQ. 12.4}$$

- ii. Storm Water Management Model (SWMM): May be used in calculation storage facilities with tributary areas of twenty (20) acres or more.
- iii. Both FAA and SWMM can be used for sizing of detention for storage facilities with tributary areas between five (5) and twenty (20) acres, but the FAA calculating should be increased by 20% to better align with the SWMM calculation.
- iv. Mile High Flood District (MHFD) Software/Spreadsheets.

12. WQCV in Sizing Detention Storage

When detention storage volume is sized for a site that also incorporates a water quality capture volume (WQCV), the 25-year volume required for quantity detention must be added to the entire WQCV. The WQCV must also be added in its entirety to the required 2-year or 25-year volume.

13. Permanent Stormwater Treat Facilities



Management of stormwater quality is important for river communities like Glenwood Springs. This section presents design requirements for permanent stormwater treatment facilities, the applicability of the requirements, runoff reduction, and site planning concepts. Information specific to industrial and commercial activities, design details, and design requirements associated with maintenance are also included. The goal of the requirements outlined in this section is to keep our streams and drainageways healthy.

The City is required to comply with the Colorado Discharge Permit System (CDPS). The content of this section will be revised as The City's requirements change. The naming convention for facilities that treat stormwater quality after construction has varied over time but are most generally called "Best Management Practices" (BMPs). The City's term for these facilities is "permanent stormwater treatment facilities". The term "treatment facilities" may also be used.

A. Site Planning

To minimize detrimental impacts to water quality in the city, site planning should consider how the site will be used as well as how stormwater runoff will be conveyed and treated to mitigate the impacts of development. These planning principles are guidelines, and no specific criteria is associated with them.

General site planning goals for every development are as follows:

- i. Reduce runoff and maximize stormwater infiltration by minimizing directly connected or continuous impervious areas, slowing runoff through previous and/or vegetated areas, and avoiding over compaction of pervious soil types.
- ii. Centralize treatment facilities and integrate them with site operations to minimize land use, achieve greater economy of scale, and reduce the number of treatment facilities requiring maintenance.
- iii. Minimize impacts to the natural environment including water quality, air quality, wildlife habitat, vegetation, wetlands, and natural landforms.
- iv. Promote riparian habitat by utilizing broad, shallow drainageways, open areas, and existing natural channels.
- v. Include tree planting to provide canopy stormwater capture and root intrusion to augment soil infiltration rates, especially in proximity to impervious surfaces and waterbodies to enhance shading.

- vi. Anticipate the risk for pollutant discharge from site operations such as washing, fueling, manufacturing, materials storage, and vehicle maintenance, among others. Develop operational procedures to minimize the risk of spills and design the site layout to prevent any spills from leaving the site.
- vii. Consider the freeze/thaw nature of the City's winter climate when selecting treatment facilities and how this may impact maintenance.
- viii. Limit the use of proprietary structures for water quality treatment as more frequent maintenance is typically required to maintain adequate performance. Proprietary structures often have high long-term costs.
- ix. Design treatment facilities for ease of maintenance.
- x. Any portion of a site not draining to a treatment facility should have a very low pollutant load and should drain across a vegetated area prior to discharge from the site. No impervious area should discharge directly into wetlands, the Roaring Fork River, the Colorado River, or one of their tributaries.

Best practices used to meet the city's site planning goals include low impact development (LID), green infrastructure, and nature-based solutions. One type of low impact development is minimizing directly connected impervious areas (MDCIA). MDCIA reduces runoff from the site by routing it from impervious surfaces to pervious areas to promote infiltration. Developing the layout of a site to reduce runoff will also reduce the required size of WQCV treatment facilities.

B. Methods of MDCIA:

include using pervious drainage conveyances where appropriate, routing downspouts across pervious areas, and incorporating vegetated areas into locations that generate and convey runoff like parking lots and driveways. Grass buffers, grass swales, and bioretention can all be used. Other LID principles include the following:

- i. Protect areas that add value such as those with mature trees, stream corridors, wetlands, and soils with high infiltration rates.
- ii. Minimize impacts by being creative with site layout to reduce the extent of paved and other impervious areas.
- iii. Concentrate new impervious areas over Type C and D soils and preserve areas over Type A and B soils for landscape areas and other permeable surfaces.



- iv. Maintain natural drainage patterns and implement sheet flow.
- v. Consider stormwater quality needs early in the development process to better integrate stormwater treatment facilities into the site.
- vi. Select permanent stormwater treatment facility based on expected pollutant type.

Volume 3 of the USDCM offers extensive text regarding planning principles and ideas to minimize site runoff. Volume 3 of the USDCM provides graphics that offer some general guidance as to the treatment facilities that are typically used for sites having specific characteristics.

C. Applicability

Permanent stormwater treatment facilities are required for all new development and redevelopment sites.

The city currently has no regional WQCV treatment facility. If the City constructs a regional WQCV treatment facility in the future, and a developer would like to use it to provide water quality treatment, Public Works must be contacted to determine the feasibility and associated requirements.

D. Design Standards

This section discusses design criteria for permanent stormwater treatment facilities that are allowed for use in the city. These treatment facilities include extended detention basins, grass swales, grass buffers, sand filter basins, bioretention (previously known as porous landscape detention or PLD), and proprietary structures. Permeable pavement is also allowed provided the maintenance agreement and the O&M Plan do not allow sanding. Retention ponds and wetland facilities are not typically allowed because water rights are a necessary component for legal standing of these facility types. Other types of treatment facilities may be proposed by the design engineer.

Proposals to use other treatment facility types are required to include detailed data and calculations showing that a proposed treatment facility meets one of the design standards listed in this section. The design of treatment facilities shall facilitate maintenance.



i. Tributary Offsite Area:

When an offsite area is tributary to a permanent stormwater treatment facility there are two options. The first option is to intercept the offsite flow and route it around or through the site in a separate conveyance system. The second option, if offsite flow cannot be separated, is to size the treatment facility for the entire tributary area. This could mean a much larger design volume for volume-based facilities or a larger peak runoff rate from the 80th percentile storm event for flow-based facilities.

ii. Right-of-Way Restrictions:

Privately owned and maintained treatment facilities must be located outside the public right-of-way and offline from public stormwater conveyance systems.

iii. Maintenance

Long-term maintenance requirements are a critical component of treatment facility selection and design because facilities that are not properly maintained do not function properly and/or do not treat stormwater runoff to the extent required by the MS4 permit. All new facilities shall be designed to facilitate maintenance operations.

Maintenance considerations that must be evaluated during the selection and design process include accessibility, required equipment, frequency of maintenance, special required training, and the need for replacement materials.

iv. Access

An easement shall be provided in accordance with Section 5.3 to allow City staff to access the facility if the responsible agency is negligent. Access roads shall be provided to all structures including forebays, outfalls, inlets, micropools, outlet structures, and proprietary facilities. Access roads must support an 80,000-pound vehicle load, be at least 10 feet wide, and have an inside turning radius of at least 25 feet. Access roads must pass close enough to each structure that the equipment to be used will reach the structure. A backhoe with a reach of 25 feet must be able to pass within 25 feet of the structure without leaving the access road. If the access road cannot pass close enough to the structure for the equipment to reach, a concrete access ramp or similar supportable material, such as a 6-inch layer of angular 4-

inch-minus riprap, shall be provided at a slope no steeper than 10:1. Concrete ramps shall be scored for wet weather traction.

v. Forebays

Accessible forebays shall be provided at all concentrated inflow points of extended detention basins and sand filter basins for removal of accumulated sediment and floatables. The forebay must be designed in accordance with Volume 3 of the USDCM.

vi. Stockpile Areas

Facilities should be designed with stockpile areas for temporary storage and drying of mucked out material. A stockpile area should be directly adjacent to each structure to be cleaned out. Stockpile areas shall be located outside the low flow area and should be as flat as possible. Total stockpile area shall be twice the square footage of all forebays and the micropool.

vii. Extended Detention Basins

Extended detention basins shall include a micropool with a hard bottom against which to excavate that is accessible to a vacuum truck or backhoe. Extended detention basins shall include a trickle channel at least 48 inches wide with no cross slope. Trickle channels shall have a concrete bottom and sides at least 6 inches high to allow access for lightweight maintenance equipment if the trickle channel longitudinal slope is less than 5%

viii. Infiltration Facilities

Sand filter basins have a short lifespan and shall include pretreatment to remove trash and larger sediment. If located next to a roadway, infiltration facilities shall include a barrier to prevent degradation of the roadway subgrade.

During construction and maintenance operations, special care shall be taken to avoid compaction of subsurface soils that will reduce infiltration rates.

If a full infiltration basin is not used, an underdrain system including a loading evaluation will be required and cleanouts must be provided every 300 feet. Infiltration testing shall be conducted after construction and prior to acceptance to ensure the facility functions as intended.

ix. Proprietary Structures

Proprietary structures that do not require confined space entry procedures are preferred. Careful design of access to vaults and use of a vacuum truck may eliminate confined space entry requirements.

Treatment facilities require regular inspection and maintenance, to be completed by the property owner. Section 4.14 outlines the inspections and maintenance requirements. Based on site conditions, the design engineer may require additional maintenance measures, a more frequent schedule, or unique protocols for a site. Volume 3 of the USDCM should be consulted when determining the maintenance schedule, activities, and protocols to be included on the O&M Plan.

14. Ownership and Maintenance Plan

An Ownership and Maintenance (O&M) Plan must be developed, submitted, and approved as part of the Stormwater Quality Plan and then also included as part of the Ownership and Maintenance (O&M) Agreement. An executed O&M Agreement is required prior to facility approval and project close out.

A. Inspection and Maintenance Requirements:

An executed O&M Agreement is required prior to facility approval and project close out. The requirements of an O&M Plan are outlined in a checklist in the appendix. City staff is available for consultation during the treatment facility selection and design process to ensure the design meets the requirements in this section. Minimum required components for maintenance are presented below.

Table 15.1: Minimum Required Inspection and Maintenance Schedule

Extended Detention Basin	
Activity	Required Frequency
Inspection for debris at outlet, sediment in the forebay, and damage to structures or embankments; maintain or repair as necessary	Twice annually
Remove sediment from forebay, trickle channel(s), and micropool; aeration of vegetated areas	Annually
Mowing	As needed to maintain 6" height and control weeds
Irrigation and application of fertilizer, herbicide, and pesticide	As needed to maintain vegetative health

Note: Maintenance frequency is highly dependent on construction activity within the tributary area, associated erosion control measures, and the design of the facility. More frequent removal of accumulated sediment may be required, but detention basins are generally low maintenance facilities.

Sand Filter Basin and Bioretention	
Activity	Required Frequency
Inspection to confirm infiltration rate after rainfall; maintain as necessary. Debris and litter removal.	Twice annually
Mowing, plant care, irrigation, and application of fertilizer, herbicide, and pesticide (for bioretention only)	As needed to maintain vegetative health
Mulch replacement (for bioretention only)	As needed to maintain 3" depth
Inspection of underdrain	When ponding lasts longer than 24 hours
Sediment removal and replacement of media	When ponding lasts longer than 24 hours and underdrain is not clogged

Proprietary Structure	
Activity	Required Frequency
Inspection for debris that may cause bypass of design treatment flow rate; maintain as necessary.	Quarterly for first 2 years; as indicated based on first 2 years after that
Filter cartridge inspection; replace as necessary	Twice annually
Debris removal, filter cartridge replacement, and vacuuming	As recommended by the manufacturer

Grass Swale, Grass Buffer	
Activity	Required Frequency
Inspection for uniform cover, sediment accumulation, rill and gully development, and impacts from foot or vehicle traffic; maintain as necessary. Debris and litter removal.	Twice annually
Aeration	Annually
Mowing	As needed to maintain 6" height
Irrigation and application of fertilizer, herbicide, and pesticide	As needed to maintain vegetative health

Note: Grass swales and buffers may need to be scraped or detached to restore original cross section and infiltration rate; Reseeding or resodding may be required to restore vegetative cover.

Permeable Pavement	
Activity	Required Frequency
Inspect during rainfall event or with applied water to ensure infiltration and integrity of system components; Maintain as necessary	Annually
Sweeping to remove sediment and debris	Monthly
Vacuuming to remove sediment that has filled void spaces	Annually

Note: Avoid sealing or repaving with non-porous materials; do not apply sand as part of winter operational procedures.

If the conditions of the O&M Agreement presented in the O&M Plan are not met, city staff may inspect facilities or respond to complaints relating to facilities that may not be performing properly. Facility owners should expect notification of inspections and subsequent findings to be communicated by inspection personnel. If maintenance efforts are not properly conducted over time, the city may complete the maintenance and back-charge the owner as included in the Maintenance Agreement.



15. References

- City of Aspen, *Urban Runoff Management Plan*
- Colorado Department of Transportation's (CDOT) Erosion Control and Stormwater Quality Filed Guide, provides an overview of erosion and sediment control principles and information on construction best management practices (BMPs).
<https://www.codot.gov/programs/environmental/water-quality/assets/pocket-field-guide-english>.
- Denver Urban Drainage and Flood Control District (UDFCD). *Urban Storm Drainage Criteria Manual*
- NOAA (2013), "*Precipitation Frequency Atlas of the United States, Midwestern States, NOAA Atlas 14 Volume 8*," National Oceanic and Atmospheric Administration, Washington, D.C.: US Department of Congress, National Weather Service, Silver Spring, Maryland.
- Station 05-3359 as Glenwood Springs #2, Daily Precipitation Record from January 1980 through December 2008, Western Regional Climate Center, Desert Research Institute 2215 Raggio Parkway, Reno, NV
- United States Department of Agriculture, Natural Resources Conservation Service, Web Soil Survey, 2019





Construction Management Plan Checklist

Prior to the approval of a building/ROW/Grading permit, any commercial, multi-family, or applicable single family/duplex project must complete an approved Construction Site Management Plan (CSMP). Below are the required items to be included in the CSMP. Please check "yes" if the item is included, "no" if it is not, and "N/A" if not-applicable. Please provide an explanation for any "No" answers at the bottom of the checklist.

Project Name: _____	Date: _____
Estimated Construction Start Date: _____	End Date: _____
Individual responsible for CSP monitoring and compliance	
Name: _____	Phone # (local): _____

	Yes	No	N/A
1. General			
a. CSP is shown on the proposed site plan	☐	☐	☐
b. Schedule Pre-Construction Meeting (<i>required only for commercial, industrial, & multifamily projects</i>)	☐	☐	☐
c. Right of Way permit (i.e. work or obstruction within ROW). <i>If required, describe below and include estimated start and stop dates.</i>	☐	☐	☐
2. Erosion and Sedimentation Control Plan showing			
a. Topographic Information – including sufficient detail to characterize the site	☐	☐	☐
b. Areas and extent of soil disturbance (show any phasing)	☐	☐	☐
c. Location of all on site and adjacent water bodies, wetlands, drainages, and storm water systems	☐	☐	☐
d. Vehicle tracking control measures (vehicle track pad, vehicle wash station, etc.)	☐	☐	☐
e. Inlet protection	☐	☐	☐
f. Perimeter Control Measures (BMPs)	☐	☐	☐
g. Standard details for all proposed control measures	☐	☐	☐
3. Site Construction Facilities (Identify the following):			
a. Staging areas	☐	☐	☐
b. Stockpile areas	☐	☐	☐
c. Dumpsters and trash receptacles	☐	☐	☐
d. Sanitary facilities	☐	☐	☐
e. Loading/Unloading areas	☐	☐	☐
f. Trailers and field offices (show access)	☐	☐	☐
4. Parking:			
a. Location and number of onsite and any offsite stabilized parking areas	☐	☐	☐
b. Is project located downtown? <i>If so, describe below where contractor parking will occur</i>	☐	☐	☐

5. External Traffic Control Plan showing:			
a. Show/label all traffic control devices (MUTCD compliant)	☐	☐	☐
b. Site access points; show existing adjacent streets and driveways; identify any changes and associated signage	☐	☐	☐
c. Sidewalks and trails; identify any changes and associated signage	☐	☐	☐
d. Use of the public Right of Way (ROW) - generally not permitted (for constrained sites show any proposed use of ROW, and obtain a ROW Permit from the City)	☐	☐	☐
e. Crane use details, including but not limited to, ROW encroachment, swing radius, loading locations (Crane will require ROW permit from the City)	☐	☐	☐
6. Internal Access Control showing			
a. Emergency access- <u>24' wide all weather surface for emergency access thru site</u> (to be maintained at all times)	☐	☐	☐
7. CSP Standard Notes:			
a. Standard CSP notes included on the site plan or Civil Plan Sheets	☐	☐	☐
8. Dust Control			
Provide narrative describing efforts to reduce fugitive dust from construction activities:			
Provide explanation for any "No" or "N/A" answers:			

**** Plans shall be phased and updated as the project evolves and site conditions change.**

**** Please notify adjacent property owners prior to mobilization.**

Standard Notes for Construction Management Plans:

1. This plan shall be kept on site at all times and updated to reflect any changes.
2. Clearing or grading shall not begin until all control measures have been installed.
3. Contractor is responsible for installing and maintaining temporary erosion and sediment control measures during construction and establishing any required permanent control measures to prevent release of pollutants from the project site.
4. Control measures shall be used, modified, and maintained whenever necessary to reflect current conditions. Control measures shall be inspected weekly and after every precipitation event. Accumulated sediment shall be removed from control measures when the sediment level reaches $\frac{1}{2}$ the height of the control measure.
5. The contractor shall promptly remove all sediment, mud, and construction debris that may accumulate in the right of way, private property, or water ways as a result of the construction activities.
6. All ingress and egress access points on to the disturbed site must be stabilized with a vehicle tracking control pad. Access shall only be via approved locations as shown on approved CSP.
7. Temporary soil stabilization measures shall be implemented where ground disturbances have temporarily or permanently ceased for 14 days or for areas of land disturbance within one growing season.
8. Concrete waste and washout water from mixing trucks shall be contained on site, removed from the site, and properly disposed. Materials shall not be allowed to enter state waters.
9. Contractor is responsible for complying with all local, state, and federal laws. In addition contractor must obtain required permits.
10. Emergency access must be kept obstacle free and passable at all times.
11. For any work to be done in the Right of Way, coordinate with the City ROW Manager regarding special permitting. No work shall be conducted in the ROW between November 1 and May 1 without prior approval from the director of Public Works.
12. Where required as part of the ROW permit or where site work affects the pedestrian or vehicle travel way, traffic control shall be installed. All traffic control shall be in accordance with the Manual on Uniform Traffic Control Devices, latest edition.
13. Sidewalks adjacent to construction sites shall be maintained, for public use, by the contractor. In areas where construction is taking place next to the sidewalk and overhead hazards are possible, site is responsible for installing and maintaining sidewalk protection.

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12/01/2023: Other Notice	15.30
12/08/2023: Other Notice	13.20
Affidavit Fee	10.00

Subtotal	\$38.50
Tax	\$0.00
Processing Fee	\$3.85
Total	\$42.35

Please take notice that the Glenwood Springs Planning and Zoning Commission will conduct public hearings to consider Code Text Amendments to Municipal Code Title 070 related to Stormwater Design Standards and Fee In-Lieu, and other changes to the land use code.

The public hearings will be held on December 12, 2023 after 6:00 p.m. via Zoom and at City Hall, 101 W. 8th Street, Glenwood Springs. Zoom attendance instructions can be found at www.cogs.us/agendas by clicking on the meeting date.

Additional information on the application is available for review at the Planning Department by calling (970) 384-6404.

The City of Glenwood Springs ensures meaningful access to City programs, services, and activities to comply with American Disabilities Act and reasonably provides: translation, interpretation, modifications, accommodations, alternative formats, auxiliary aids and services. To request these services, contact Bryana Starbuck, Public Information Officer, bryana.starbuck@cogs.us or 970-309-7521.

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