SUMMIT COUNTY
COLORADO

OPEN SPACE & TRAILS DEPARTMENT

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February 8, 2017

Chris Sturm
Colorado Water Conservation Board
1313 Sherman Street, Suite 718
Denver, CO 80203

RE: WSRA Grant – CTGG1 2016-445 Final Report – Swan River Stream Restoration – Phase 1 in the Colorado River Basin

Mr. Sturm:

This letter serves as a final report for activities completed on the Swan River Stream Restoration project (the Project) since the above referenced WSRA grant was approved on August 22, 2015. At this point, all tasks as identified in Exhibit A –Scope of Work of WSRA Grant CTGGI 2016-445 are complete. Below is a discussion of some of the most pertinent highlights of the project following contracting with the Colorado Water Conservation Board for Water Supply Reserve Account Grant CTGGI 2016-445.

Design-Build Team Contracting

Prior to the issuance of Notice-to-Proceed (NTP), Summit County (the County) advertised the design-build project through a Request for Proposals (RFP) on March 23, 2015. A pre-bid meeting was held on April 13, 2015 with 21 consultants/contractors represented. Six (6) design-build teams submitted proposal responses to the RFP, of which two were selected for interviews held on May 21, 2015. The County, in coordination with our project partners, selected the joint venture team of Ecological Resource Consultants, Inc. and Tezak Heavy Equipment, Inc. (the Contractor) and entered into a contract with the Contractor on July 9, 2015. Attached is the pre-bid meeting sign-in sheet and bid tabulation in Attachment A.

Field Investigation

On August 28, 2015 the Contractor installed seven (7) new piezometers within the Phase 1 project reach. The objective of the field work was to supplement existing monitoring wells and gain a better understanding of groundwater elevations within the project reach. During this field investigation, the Contractor also measured groundwater elevations in the previously installed piezometers throughout the Swan River valley. Based on the results of this investigation and collective groundwater dataset, the Contractor was able to the estimate the groundwater profile along the valley length and compare it to the proposed channel elevation and alignment. Additional discussion on this recent groundwater investigation is contained in the attached September 4, 2015 contractor memo contained in Exhibit B.

In late September, the Contractor completed a field inventory and wetlands delineation of project area using methods described in the USACE Wetland Delineation Manual (USACE, 1987), with additional direction from the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (USACE, 2010). The results of this wetlands delineation are attached in Exhibit B.

Design Review Meetings

A technical subcommittee of the project partners held two design meetings on July 30, 2015 and November 13, 2015 to review project goals and make design decisions. Project partners participating in these design meetings included the County, U.S. Forest Service (USFS), Colorado Water Conservation Board (CWCB), and Blue River Watershed Group (BRWG). Minutes from these meetings are attached in Exhibit C.

Design Development

With input from the project partners, notably the USFS, BRWG, and CWCB, in late 2015 the County finalized some of the most crucial design decisions influencing alignment and morphology for the restored Swan River channel. The biggest single design decision was to eliminate the fish barrier at the Tiger Road that was proposed in the original conceptual plans. The USFS requested this feature to be removed from this project reach since it was not included in the original NEPA analysis and more suitable locations for a fish barrier may exist downstream, or in future upstream restoration reaches. Despite the fish barrier being excluded in this project phase, restoring cutthroat trout habitat remains an overall project goal. The other most pertinent design details/decisions resulting from design review meetings are highlighted below:

- Construct approximately 5,100 LF of stream channel over approximately 3,100 LF of valley floor. This anticipated length of restored stream channel is approximately 1,600 LF greater than was proposed in the original conceptual design presented to CWCB. The proposed increase in channel length is due primarily to elimination of a fish barrier (vertical drop) at the Tiger Road crossing and need to compensate for channel drop through this location, as well as realigning a portion of Muggins Gulch Road to allow for desired channel alignment and dimensions. (See additional discussion in the attached August 17, 2015 contractor memo contained in Exhibit C.)
    - Channel sinuosity = 1.65 (>1.2 for Type C)
- Channel construction to occur from below Rock Island Road to below Muggins Gulch
- Reduce total number of river crossings to a single crossing of Tiger Road by realigning the channel south of Muggins Gulch
- Create 24 riffle-pool-glide / bend pool complexes
    - Spaced 6.6 x bankfull width (5-7 bankfull widths for Type C)
    - Width depth ratio = 16 (>12 for Type C)
- Construct channel with an average slope of 1.18% (<2% for Type C)
- Create a Type C Channel that will access its floodplain
    - Minimum entrenchment ratio = 2.9 (>2.2 for Type C Stream)

Based on the above design criteria, the Contractor optimized the original conceptual design and developed design documents and specifications suitable for advancing permitting and construction. Design plans suitable for permitting and construction were completed in March 2016 and early June 2016, respectively. Final plan development and review occurred in coordination with Summit County's project partners, as well as the County Engineering and Road & Bridge Departments. Final project construction plans are attached in Exhibit D.

Permitting

Following finalization of the design criteria, the project team is moved ahead rapidly to obtain the necessary permits.

U.S. Army Corps of Engineers (Corps)

A Section 404 Water Quality Certification was required from the Corps for this project. On August 17, 2015, the Contractor and County met with the Corps regulator to provide a project update. The Corps issued Nationwide Permit Number (NWP) 27 - Aquatic Habitat Restoration, Establishment, and Enhancement Activities coverage for the project on May 13, 2016. A copy of the Corp authorization letter is attached in Exhibit E.

Colorado Division of Reclamation, Mining, and Safety (DRMS)

The Project Area is subject to permit conditions associated with mining and reclamation permit M-1993-035 administered by DRMS. The County has a well-established, strong and collaborative working relationship with DRMS to maintain permit compliance while simultaneously achieving project restoration goals. Implementation of this project (i.e., stream restoration) required a Technical Revision to the existing mining permit. On April 7,

2016, DRMS authorized Summit County's request to revise the mining and reclamation permit to allow for a reclamation condition of a restored stream corridor on the project site.

Subsequent to DRMS authorization of a revised reclamation condition, and during project implementation (described in additional detail under *Construction*), the Contractor encountered mine waste within the alignment of the proposed restored stream channel. In coordination with DRMS, the Colorado Department of Public Health and Environment (CDPHE), USFS, and U.S. Environmental Protection Agency (EPA), on August 2, 2016, DRMS authorized Summit County's second request to revise the final reclamation condition necessary to address the mine waste encountered within the project site. Copies of both aforementioned Technical Revisions (TR02 and TR03) were included with WSRA Grant – CTGG1 2016-445 Progress Report #2 submitted to CWCB on August 8, 2016. Copies of the Technical Revision approvals are attached in Exhibit E.

The County will continue to work with DRMS to implement a Technical Revision and Acreage Reduction approval for Mining Permit M-1993-035.

Summit County Conditional Use Permit (CUP)
As a component to the restoration activities, the Design/Build team performed onsite crushing of dredge gravels in order to produce the required channel substrate and a marketable material (e.g., road base, structural fill, etc.). A Class 4 CUP was required from the Summit County Planning Department in order to perform onsite crushing and on March 24, 2016, the Summit County Upper Blue Planning Commission voted to approve Summit County's application for Class 4 CUP. The Planning Commission's decision was appealed by a member of the public to the Summit County Board of County Commissioners (BOCC), who held a denovo hearing on May 3, 2016. The BOCC voted to reject the appeal and issued a CUP for the project. A copy of the CUP is attached in Exhibit E.

Summit County Grading Permit
A grading permit from the Summit County Engineering Department was required for work occurring within roadway right-of-ways (Tiger Road). A grading permit was issued in August 2016, in advance of construction of the new crossing installed in September 2016.

Construction
Construction commenced on the project during spring 2016. Summit County held a pre-construction meeting with the Contractor on June 6, 2016 and major construction activities commenced shortly thereafter. The contractor generally kept a five (5) day a week (Monday – Friday) schedule. The Contractor and Summit County generally held bi-weekly onsite construction meetings to review construction progress and discuss/resolve any issues that arose. Summit County also posted construction signage in the vicinity of the project site for the public to learn about the project, understand who is involved with the project, and who to contact with questions/comments. Summit County also continues to maintain a project blog at the following URL: http://www.summitcountyco.gov/swanriverblog.

As of the submission of this final report, the Contractor has completed all grading and earthwork associated with the new stream channel, including several in-stream structures (riffles, pools, glides), all grading associated the 26 acres of riparian and upland areas. In addition, the Contractor completed installation of the new stream crossing, abandonment of the previous channelized section of the Swan River, installation of seed and temporary erosion control, as well as willow transplants. All earthwork and construction activities concluded in early November 2017 and gravel milling activities concluded in December 2017. Approximately 42,750 CY of crushed gravel material remains stockpiled upstream of the restoration site and will be fully removed in 2017 for use in other offsite projects (i.e., CDOT State Highway 9 Iron Springs realignment project between Frisco and Breckenridge). The site has been fully seeded, hydromulched and stabilized with erosion control blankets and degradable wattles in critical areas, fenced with buck and rail to control/prevent access, and signed as closed to the public during restoration. At this point, the Contractor is completely demobilized from the site.

Final landscape restoration work is scheduled for the 2017 field season to include additional riparian and upland plant installation funded through a Colorado Parks and Wildlife Wetlands and Riparian Restoration grant, as well a CWCB Watershed Restoration grant, awarded in late 2016 and early 2017 respectively.

Notable developments that occurred during construction include the following:

- *Mine Waste*: During excavation of the new channel, unexpected areas of mine wastes were encountered in a portion of the proposed new channel alignment. The Contractor immediately segregated this portion of the project area to avoid discharge of any water that potentially had contact with the mine waste. County staff reviewed the mine waste area with the Contractor on June 29, 2016 to ascertain conditions and identify solutions to avoid onsite and offsite impacts. Following the site visit with the Contractor, County staff notified Eric Scott of the DRMS Minerals Regulatory Program, who administers the Swan River Resource mine permit (M-1993-035) and conducted a site visit with Jeff Graves of the DRMS Inactive Mines Reclamation Program on July 8, 2016 to review site conditions and potential remediation approaches. County Staff also held a site visit with Mark Weinhold, White River National Forest (WRNF) Forest Hydrologist to discuss implications for the overall river restoration approach. Following these site visits, County staff discussed proposed remediation solutions with Mark Rudolph of the CDPHE Superfund, Voluntary Cleanup, and Remedial Program to seek feedback and confirmation of a proposed design solution to address onsite mine wastes. The appropriate agency representatives have concurred with the design approach that maintains the restoration goals for the project and addresses the existing onsite mine wastes. The design revisions also resulted in a 16% net increase to project costs, which are being fully funded by Summit County and the town of Breckenridge. Please refer to the attached TR03 for a detailed discussion of the revised project design approach. Refer to WSRA Grant – CTGG1 2016-445 Status Report #2 submitted August 8, 2016.

- *Onsite Hydrology*: Onsite hydrology is significantly better than was originally anticipated prior to construction based on historic groundwater monitoring results. Finish grades for the new stream channel are found to intersect groundwater, even during period of seasonally low groundwater. As a result of the groundwater conditions encountered during construction, at least 3,000 linear feet of the new channel will not require the originally specified natural stream liner. Savings realized from this design change were transferred into the new design approach required to address the stream segment intersecting onsite mine waste.

<u>Budget and Final Project Costs</u>

The budget spreadsheet attached in Exhibit F includes the budgeted and expended amounts for all funding sources as of the submission of this Final Status Report. The primary difference between the budget contained in WSRA Grant Contract No. CTGG1 2016-445 and presented here is an addition of $336,106 as a result of a change order required to address the mine wastes encountered onsite during construction, and an additional $34,061 to perform additional design related to wetlands creation/restoration in the vicinity of the restoration reach. These additional costs were borne entirely by Summit County and Town of Breckenridge. Additionally, the USFS/USFWS were able to contribute an additional $15,000 compared to what is presented in the original CWCB WSRA grant contract. No modifications to CWCB WSRA line item expenses occurred during the project.

Outstanding amounts to be collected include $130,000 from CPW and $56,864 from CWCB. Administrative delays have slowed CPWs payment processing and the remaining outstanding amount from CWCB is requested simultaneous with the submission of this Final Status Report.

We are very pleased with the outcome of this project and want to thank CWCB and its staff for their key role making this a successful project. Coordination among the project partners continues to be strong and has benefitted the project as a whole. We look forward to ongoing collaboration with CWCB on this and other projects in Summit County, and value the expertise CWCB staff brings to the Swan River Restoration project team.

Please feel free to contact Jason Lederer, Senior Resource Specialist, at 970.668.4213 with any questions.

Sincerely,

Brian Lorch
Director

Encl: Exhibit A. Pre-bid meeting sign in sheet and bid tabulation
Exhibit B. Field Investigation Reports
Exhibit C. Project Memos & Meeting Minutes
Exhibit D. Swan River Restoration Project Construction Plans
Exhibit E. Project Permits
Exhibit F. Final Project Budget Table
Exhibit G. Project Photographs
Exhibit H. Swan River Monitoring Photo Point Monitoring Map and Images

Exhibit A
Pre-bid meeting sign in sheet and bid tabulation

Swan River RFP meeting 04/13/2015

Name	Organization	Phone #	Email
Matt Grove	USFS	970 827 5166	magrove@fs.fed.us
Eric August	IMA	303-527-0191	eric@intermountainaquatics.com
Cory Lepperd	Lepperd Associates	303-216-2428	Cory Lepperd Associates.com
Shawn Lepperd	Lepperd Associates	(303) 216-2428	
Robert Krehbiel	Matrix Design Group	303-572-0200	robertk@matrixdesigngroup.
Lucas Babbitt	Michael Baker	303-549-8470	lucas.babbitt@MBakerIntl.com
Mike Lighthiser	Biohabitats, Inc.	303 471-0660	mlighthiser@biohabitats.com
Nathan Jean	NorthState/Stantec	970-227-2712	nathan.jean@stantec.com
Randy Walsh	NorthState/Stantec	970-658-6766	randy.walsh@stantec.com
Derek Williams	Bowman Consulting	3/674-7355	dwilliams@bowmancg.com
Michael Blazewicz	Round River Design/Crane Associates		Michael@roundriverdesign.com
Kelsey Arens	Colt and Steel	303 442-2888	karens@coltandsteel.com
Scott Gustin	InterTech E/E	970-420-2224	sgustin@cbmsinc.com
Mike Rachubinski	Lawrence Const.	303-791-5642	mRachubinski@lawrence-Construction.com
Peter Smith	Smith Environmental & Eng	720.887.4928	PeterSmith@Smithdelivers.com
Dave Blauch	Ecological Resource Consultants	303-679-4820	DAVE@ERCcolorado.net
Troy Thompson	Ecological Resource Consultants	303-679-4820	troy@ercolorado.net
Sarah Marshall	Smith Enviro. & Eng.	720-887-9928	sarahmarshall@Smithdelivers.com
Jason Ledbetter	Summit County OST	—	
Joe Kallis	Wagner Rents	970.531.2607	jkallis@wagnerequipment.com
Clint Packo	Freestone Aquatics	303.807.7805	Clint@FreestoneAquatics.com
Toby Stuart	Freestone Aquatics	970-227-0343	toby@freestoneAquatics.com
Don Nilsson	Stan Miller Inc.	970-390-4803	don@stanmillerinc.com
Mike Arbuckle	Stan Miller Inc	970 485 1679	mikeA@stanmillerinc.com
Brett Jordan	HydroGeo	9709619507	brett@hydrogeodesigns.com
Mike Coleman	ACA Products, Inc.	(719) 395-3790	mcoleman@acaproducts.com
Katie Jagt	Watershed Science & Design	720-308-5605	Katiejagt@watershedscienceanddesign.com

Swan River Stream Restoration RFP 5/1/2015

Bidders/Proposers *Bid Opening*

Proposer	Address	Phone	Base Bid
Michael Baker International & Inter-Fluv w/ SOC Excavating and Apline Eco	Baker: 165 S. Union Boulevard, #200, Lakewood, CO 80228	720-514-1100	Design Phase: $374,297
North State/Stantec Design Build Team w/ Edward Redente	North State Environmental: 289 Lowerty Street, Winston Salem, NC 27101 Stantec Consulting Services: 2950 E. Harmony Road, Suite 290, Fort Collins, CO 80528	336-845-1247 970-227-2792	Design Phase: $342,051 Construction Phase: $1,990,450
HydroGeo Designs & ACA w/ Otak, ECOS, Higher Ground Earthwork, and QFM	HydroGeo: P.O. Box 775, Buena Vista, CO 81211	970-901-9507	Design Phase: 300,684
Ecological Resource Consultants w/ Tezak Heavy Equipment, Western States Reclamation, and SM&RC Structural Engineers	ERC: 5672 Juhls Drive, Boulder, CO 80301	303-679-4820	Design & Permitting: $63,888
Leppert Associates & Colt & Steel w/ Range West, Hepworth-Pawlak and Geotechnical	Leppert: 1422 Washington Avenue, Golden, CO 80401	909-216-2428	Design: $166,473 Project Management: $102,462
Lawrence Construction Company & Smith Environmental and Engineering, Applegate Group, and Onefish Engineering	Lawrence: 9002 North Moore Road, Littleton, CO 80125	303-719-5642	Design, Permitting, Studies, Monitoring = $255,543.80 Construction: $1,746,270.90 Other: $177,698.25

Exhibit B
Field Investigation Reports

Ecological Resource Consultants, Inc.
35715 US Hwy. 40, Suite D204 ~ Evergreen, CO ~ 80439 ~ (303) 679-4820

Date: **September 4, 2015**

To: **Brian Lorch and Jason Lederer, Summit County**
Mark Weinhold, Justin Anderson and Matthew Grove, USFS
Peggy Bailey and Jim Shaw, BRWG
Chris Sturm, CWCB
Jon Ewert and Brandy Logan, CPW
Sarah Barclay

From: **Troy Thompson and Dave Blauch, ERC**

Re: **Swan River Restoration**
Summary of Field Data Collection and Groundwater Evaluation

On August 28, 2015 Ecological Resource Consultants, Inc. (ERC) and Tezak Heavy Equipment (Tezak) were on-site at the Swan River to complete additional field evaluations. The objective of the field work was to gain a better understanding of existing groundwater levels in the project vicinity and investigate a potential means of elevating groundwater to help ensure capture as part of the upcoming Swan River Phase 1 project. Specific tasks performed, data collected and studies that will be completed as part of the field program are described below.

Evaluation of LiDAR Mapping vs Established Vertical Datum

LiDAR mapping of the project site was obtained by others in 2014. Often times an adjustment is necessary when comparing elevation information obtained from LiDAR with localized vertical elevation datum that has been established. In order to relate the LiDAR generated topography with the established site datum, ERC completed a level loop to survey the elevation of multiple known points in the project area relative to Control Point #1 (CP-1), which was established by Baseline Surveyors in 2012. CP-1 is located at the downstream end of the Phase 1 project on the west side of Tiger Road at the base of an existing power pole. CP-1 has an elevation of 9,584.48 (NAVD 1988). Known points on Tiger Road, Muggins Gulch Road and ground points within the project area were shot and elevations calculated based on CP-1 were compared to elevations obtained from LiDAR mapping. Results of this analysis are summarized below on **Table 1**.

Table 1 – Survey Comparison

Point	Survey El (ft)	LiDAR El (ft)	Difference (ft)
Crest of Tiger Road	9595.1	9595.5	0.4
Muggins Gulch / Tiger Road	9583.7	9584.7	1.0
Point on Ground – Middle of Project Area (GW-1)	9597.4	9598.9	1.5
Point on Ground – Upper End of Project Area (GW-4)	9605.7	9607.0	1.3
Average Difference (LiDAR minus Survey) (ft)			1.05

Given the similarity in the survey elevations and the LiDAR elevations, no adjustment will be made to tie the LiDAR and NAVD 1988 datum control point together.

Installation of New Piezometers

As part of the field work, ERC installed seven (7) new piezometers in the Phase 1 project areas. The piezometers of 4 inch either perforated or slotted PVC pipes. Given the subsurface conditions, piezometers were not installed using standard well installation techniques but rather they were installed by excavating holes down below the groundwater level, installing the PVC and backfilling the hole with excavation materials. In most cases the base of the bottom segment of PVC was set approximately three (3) feet below the groundwater level encountered. The elevation of the top of casing at each piezometers was surveyed and the initial depth to groundwater was determined using an E-meter. Information on the nomenclature for each piezometer, its top of casing elevation, the initial depth to groundwater and the calculated elevation of groundwater are summarized in **Table 2**. The location of each new piezometer (shown in yellow) along with the piezometers installed in 2012 within the Phase 1 project reach (shown in orange) are illustrated in **Figure 1**. Notes on individual piezometers are given below. Bulk samples were collected from each excavation and gradations will be completed.

- Piezometer P15-1 was located upstream of Rock Island Road. The material encountered when excavating the hole was primarily cobbles and gravels with some amounts of fine material.
- Piezometer P15-2 was located downstream of Rock Island Road. The material encountered when excavating the hole was primarily cobbles and gravels with some amounts of fine material.
- Piezometer P15-3 was located near the proposed channel centerline roughly ½ way down the valley between P15-2 and the location where the stream historically becomes “live” indicating

groundwater is at the surface. The material encountered when excavating the hole was primarily cobbles and gravels with some amounts of fine material.

- Piezometer P15-4 was located towards the center of the valley near the location where the stream historically becomes live along Tiger Road. The material encountered when excavating the hole was primarily cobbles and gravels with some amounts of fine material.
- Piezometer P15-5 was located approximately half way between P15-4 and the Tiger Road crossing of the Swan River. The material encountered when excavating the hole ranged from cobbles and gravels with some amounts of fine material near the surface to lenses of tailings to clay layers. Overall the material in this hole was much smaller and less permeable than that observed in all of the other holes. Given the low permeability of the material, the initial water level for this piezometer was taken based on the water level encountered during initial excavation. The water level rose when installing the piezometer, but the elevated water levels were the result of well completion and not actual water levels.
- Piezometers P15-6a and P15-6b were co-located upstream and downstream from a section of woven geotextile that was buried to test whether material such as this geotextile could be used to elevate upstream water levels (see the discussion on localized flow barrier below). The material encountered when excavating these holes was primarily cobbles and gravels with some amounts of fine material.

Table 2 – Installed Piezometer Information

Piezometer	Top of Casing Elevation (ft)	Initial Depth to Groundwater (ft)	Initial Groundwater El (ft)
P15-1	9635.01	12.4	9622.61
P15-2	9624.31	7.2	9617.11
P15-3	9609.72	7.4	9602.32
P15-4	9599.73	1.6	9598.16
P15-5	9598.66	12	9586.66
P15-6a	9605.26	4.8	9600.46
P15-6b	9604.81	4.95	9599.86

Figure 1 – Location of Phase 1 Piezometers

As **Figure 1** indicates, no piezometers were installed within approximately 800 feet upstream of the Tiger Road Crossing. This was intentional so as to not obtain readings that were influenced by the backwater effect of Tiger Road.

Evaluation of Existing Groundwater Exposure

In additional to the new piezometers, groundwater levels through the Phase 1 project area were also determined by surveying select areas where groundwater was exposed at the surface. Areas of obvious groundwater exposure were identified by flowing water that appeared along the surface in localized depressions and then disappeared when ground elevations increased. In addition to areas where groundwater was exposed, ERC also excavated a test pit in the current channel downstream of Rock Island Road. While groundwater was not at the surface in this location, it was deemed to be an important point as it provides more information on the elevation required for the channel near the upstream end of Phase 1. **Table 3** provides information on selected groundwater exposure locations plus data downstream of Rock Island Road while **Figure 2** illustrates the surveyed locations of these points.

Table 3 – Groundwater Exposure

Groundwater ID Point	Elevation (ft)
GW-1	9597.4
GW-2	9597.6
GW-3	9603.8
GW-4	9605.7
Test Pit @ RIR (TP @ RIR)	9619.1

Figure 2 – Locations of Selected Groundwater Exposure

Test of Localized Flow Barrier

As part of the field program, ERC tested whether installing a local lower permeability barrier would have a notable impact on groundwater levels. Typical slurry walls or cutoff trenches extend through higher permeability layers both in depth and in lateral extent. Given the assumed depth of the dredge material

and the width of the valley, it is believed that constructing such a feature as part of the Swan restoration may be impractical. This field test therefore focused on evaluating whether a localized low permeability feature would have any impact on groundwater levels.

For this evaluation an approximately 10 foot deep x 75 foot long trench was excavated at a location where the current groundwater level was approximately five (5) feet below ground surface. Excavated material was found to be cobbles and gravels with some fines and was generally similar to most of the material excavated throughout the site. The excavation did not extend fully through the dredge material in either the vertical or horizontal direction. A similar sized section of woven geotextile was installed in the trench and the trench was then backfilled using the excavated material. Piezometer P15-6a was then installed approximately 15 feet upstream from the trench while P15-6b was installed roughly 15 feet downstream. **Photo 1** shows the excavated trench while **Photo 2** illustrates the completed trench with the upstream (P15-6a) piezometer installed.

Photo 1 – Excavated Trench Prior to Deploying Geotextile

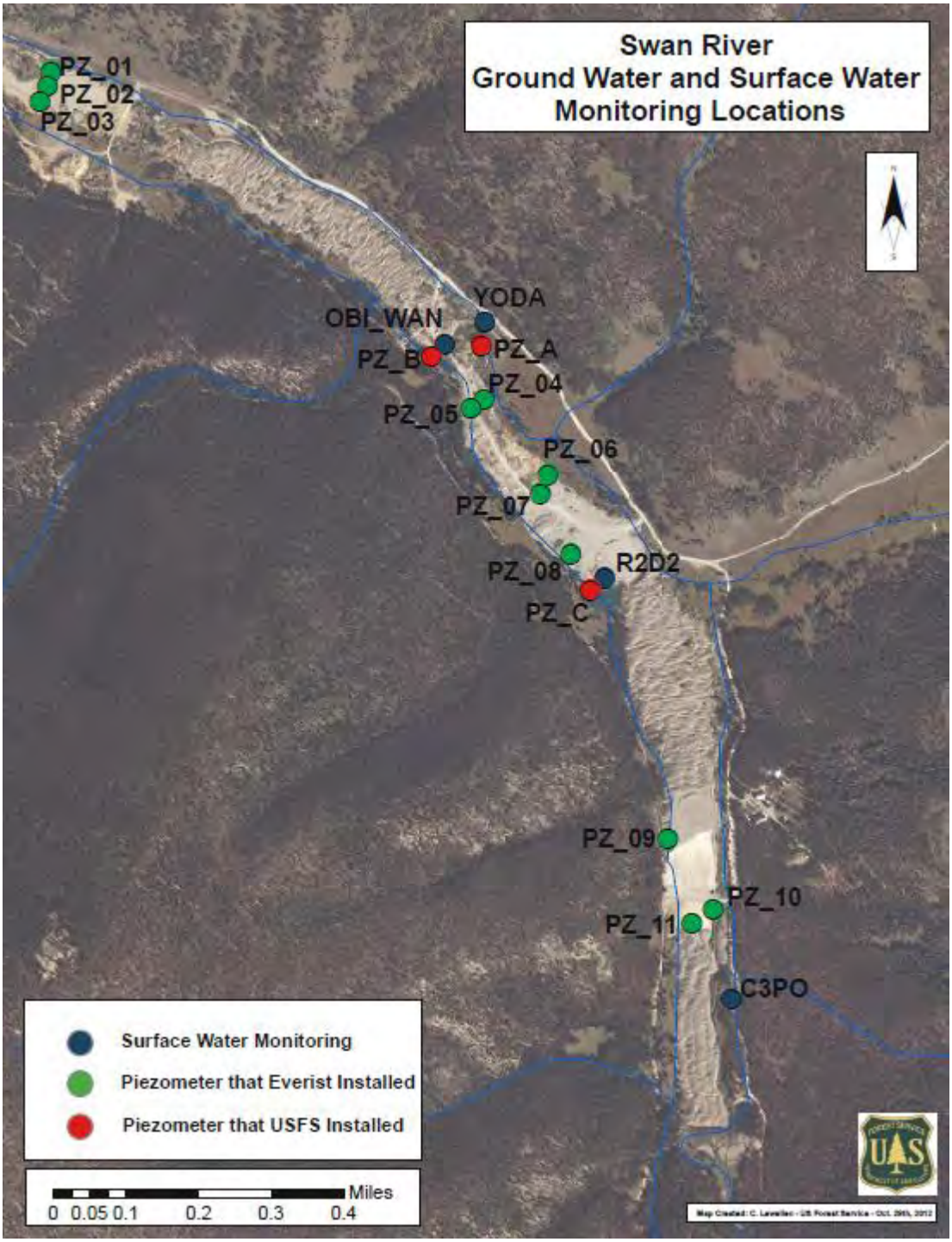
Photo 2 – Completed Trench with Piezometer P15-6a Visible Upstream (left)

Initial readings indicate that there is roughly a 0.6 foot drop in the groundwater table from point P15-6a to P15-6b. Ongoing monitoring of these points will provide insight as to whether the localized low permeability barrier has any impact on groundwater levels.

Read Previously Installed Piezometers

As part of ERC's field work, we also took water level readings at piezometers that were installed by the Forest Service/Everist during the summer of 2012. In June of 2012, 14 piezometers names PZ-1 to PZ-11 and PZ-A to PZ-C were installed. Readings occurred on these piezometers from June 11, 2012 to March 29, 2013 on irregular intervals. In late June or early July of 2012, the casings on these piezometers were modified (some cut and some added to) but the amount of pipe added or subtracted was not recorded. For this reason ERC only considered readings from July 9th 2012 and onward after the modifications were completed. The locations of these original piezometers is shown on **Figure 3**. Three of these previously installed piezometers (PZ-1, PZ-2 and PZ-3) are within the Phase 1 project area. When ERC completed its work on August 28, 2015 we reread these piezometers. Reading these piezometers on the same day when the new piezometers were installed provides a way of comparing local groundwater levels in August of 2015 with prior times.

Figure 3 – Locations of Previously Installed Piezometers



When ERC went to read these piezometers we found that only seven (7) of the original 14 piezometers remain intact. The remaining piezometers that were read, the depth to groundwater from the top of casing and the maximum, minimum and range of readings taken from July 2012 to March 2013 are summarized in **Table 4**.

Table 4 – Data from Previously Installed Piezometers

Piezometer ID	08-28-15 Depth from Top of Casing (ft)	Maximum Previous Depth from Top of Casing (ft)	Minimum Previous Depth from Top of Casing (ft)	Groundwater Variation over All Readings (ft)
PZ-1	10.5	11.6	10.5	1.1
PZ-2	9.2	10.0	9.2	0.8
PZ-3	14.8	15.8	14.1	1.7
PZ-5	12.6	13.0	12.3	0.7
PZ-7	10.6	11.2	10.6	0.6
PZ-8	11.2	11.8	10.1	1.7
PZ-9	18.6	22.1	17.5	4.6

In general, measured water levels in August of 2015 were within the range but towards the higher end (lower readings) of historic readings. With the exception of PZ-9, the overall range of all piezometers is relatively small, suggesting that the groundwater level doesn't vary considerably in the valley. PZ-9 is located near the far upstream portion of the valley and well away from the Phase 1 project reach therefore the range of readings at this point likely is not indicative of groundwater variation within Phase 1.

Estimates of Groundwater Levels along Valley Profile

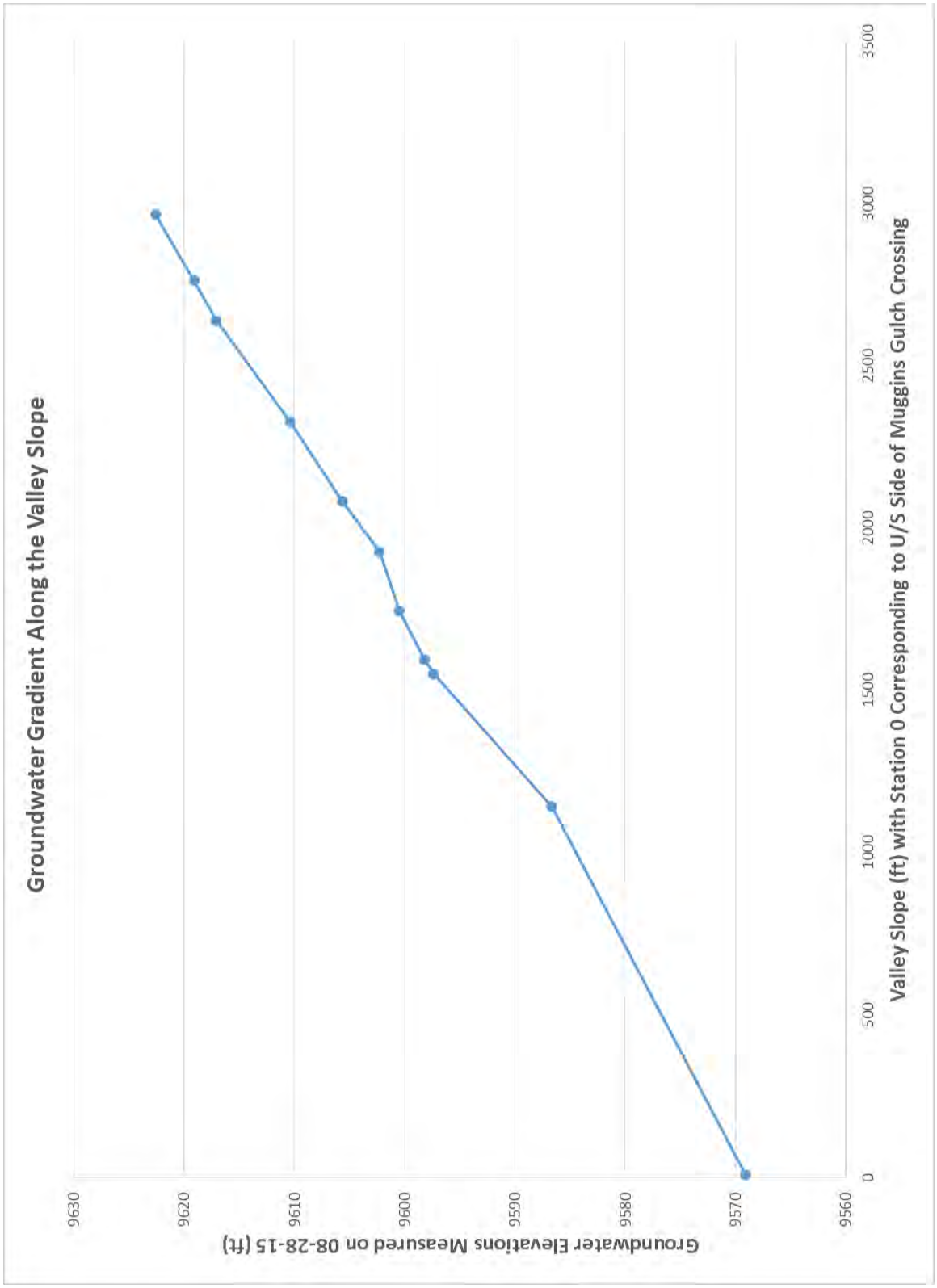
Groundwater data collected as part of the August 2015 work was used to develop a profile of the current groundwater levels over the length of the Phase 1 project. For this evaluation groundwater levels were plotted versus the valley slope. The intent of this evaluation is to determine how consistent the current groundwater slope is as a means to better understanding uncertainty in groundwater elevations at locations where no data is available.

Figure 4 shows the results of this assessment. Individual groundwater points used in this assessment and the straight line valley stationing used in the evaluation are presented in **Table 5**.

Table 5 – Information on Groundwater Gradients

ID	Valley Station	GW Level (ft)	Local Groundwater Gradient along Valley Slope from Upstream Point (%)
P15-1	29+67	9622.6	
TP @ RIR	27+63	9619.1	1.72%
P15-2	26+39	9617.1	0.61%
PZ-03	23+28	9610.4	2.15%
GW-4	20+85	9605.7	1.93%
P15-3	19+27	9602.3	2.15%
P15-6a	17+44	9600.5	0.98%
P15-4	15+94	9598.2	1.53%
GW-1	15+52	9597.4	1.90%
P15-5	11+42	9586.7	2.61%
Stream D/S @ Muggins Gulch	0+07	9569.1	1.55%
Overall Slope			1.81%

Figure 4 – Groundwater Profile across the Valley Slope



Current Estimates of Groundwater along Currently Proposed Channel Alignment

One of the primary reasons for the current field evaluation is to inform the current design as to how the proposed channel will interact with the groundwater table. The intent of the design is to develop a gaining stream, which will dictate that the channel invert is generally at or below the groundwater table. While the groundwater table is dynamic and changes over time, information gained from the August 2015 program allows us to evaluate the channel configuration developed by ERC in early August and compare invert elevations with observed groundwater levels.

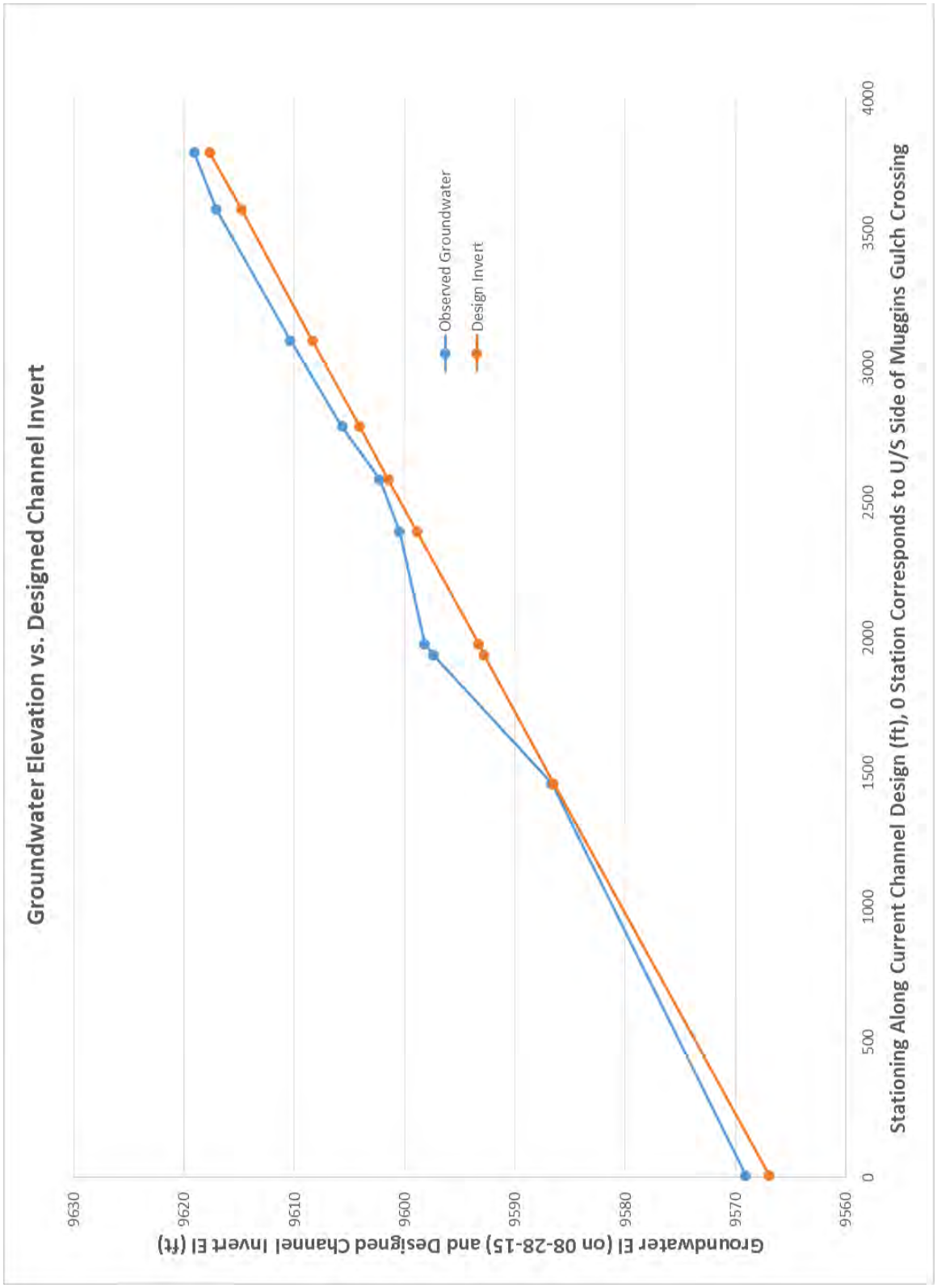
To accomplish this, point groundwater readings obtained in August of 2015 were projected onto the proposed channel centerline. The profile that ERC used for this evaluation assumed that a five foot cut would be required immediately downstream of Rock Island Road and the upstream channel invert elevation would be at elevation 9620. The downstream channel invert was assumed to tie into the existing channel invert at the intersection of Muggins Gulch road at an elevation of 9567 feet. A straight channel profile at a slope of 1.33% was assumed over the approximately 3,975 foot alignment.

Results of overlaying the initial channel profile with the observed groundwater levels are provided in **Figure 5**. **Table 6** summarizes the results and provides an indication of how far above or below observed groundwater is from the initial design at specific stream stationing. Station 0+00 is at the upstream end of the Muggins Gulch crossing while Station 39+75 equates to Rock Island Road.

Table 6 – Summary of Groundwater vs Preliminary Channel Invert Elevations

Station	Piezometer / GW Exposure	08-15 GW El (ft)	Initial Channel Invert El (ft)	Design Elevation Below Groundwater (ft)
27+63	TP @ RIR	9619.1	9617.7	1.4
26+39	P15-2	9617.1	9614.8	2.3
23+28	PZ-03	9610.4	9608.4	2
20+85	GW-4	9605.7	9604.1	1.6
19+27	P15-3	9602.3	9601.5	0.8
17+44	P15-6a	9591.2	9598.9	1.6
15+94	P15-4	9598.2	9593.3	4.9
15+52	GW-1	9597.4	9592.8	4.6
11+42	P15-5	9586.7	9586.5	0.2
0+07	Stream D/S @ Muggins Gulch	9569.1	9567.0	2.1
Average				2.2

Figure 5 – Groundwater Elevations vs Proposed Channel Centerline



Results indicate that the concept design that has the downstream invert at elevation 9567.0 feet and the upstream invert elevation at 9620.0 feet would be below the groundwater elevation as it was on August 28, 2015. Seasonal fluctuations in groundwater may result in lower water elevations at different times of the year, however the design elevations as currently contemplated appear to be at or near elevations that should encounter groundwater along its length throughout the year.

Next Steps

ERC recommends the following as next steps in the design process:

- Continue reading piezometers – Summit County and ERC will cooperate to complete this task
- Make minor revisions to the current design profile as necessary to maximize groundwater capture potential through observed seasonal variability.
- Generate a revised grading plan and excavation quantities based on the altered channel profile.
- Provide the revised grading plan and excavation quantities to the group for discussion. It is anticipated that the group will provide ERC with direction to proceed with this revised design as the basis for overall design plans.

Exhibit C
Project Memos & Meeting Minutes

Ecological Resource Consultants, Inc.
35715 US Hwy. 40, Suite D204 ~ Evergreen, CO ~ 80439 ~ (303) 679-4820

Project Update

Date: August 17, 2015

To: Brian Lorch and Jason Lederer, Summit County

Mark Weinhold, Justin Anderson and Matthew Grove, USFS

Peggy Bailey and Jim Shaw, BRWG

Chris Sturm, CWCB

Jon Ewert and Brandy Logan, CPW

Sarah Barclay

From: Troy Thompson and Dave Blauch, ERC

Re: Swan River Update

ERC is writing to provide the group with our summary of the decisions that were made at the project meeting on July 30th as well information on actions we have taken since the meeting and upcoming activities.

Summary of Main Points from Meeting

Fish Barrier

One of the main topics of discussion at the July 30th meeting was impacts of the fish barrier on ultimate excavation quantities. Removing the barrier will result in the need to cut substantially more material out when constructing the channel. This will result in spending a larger portion of the project budget on grading.

Despite the extra cost, the entire group agreed that the project should proceed with the barrier removed. Eliminating the barrier will provide connection to the downstream stretch of the Swan but also aid in the overall project objective of having the excavated channel lowered to the groundwater,

making it a gaining stream. Based on this direction, ERC will proceed with a design that eliminates the barrier.

Downstream Channel Slope

The group talked about whether the downstream portion of the restored channel should be steepened to reduce the amount of cut required. Steepening the downstream slope could take the form of drop structures or simply a steeper channel in the lowest reach. The downside to steepening the lower reach is that the Swan River valley and natural stream type is one that is less steep and more meandering. Steepening the channel also decreases the chance that the channel is below the ultimate natural groundwater table. After discussion on this topic it was decided that ERC would generally not steepen the downstream channel segment. As part of final design, minor steepening may occur, but the overall approach will be to have a generally consistent net channel slope.

Tie In Elevation at the Upstream End

The elevation of the project tie in at Rock Island Road was discussed. Two options that were talked about were matching the elevation culvert elevation and lowering the elevation as needed to intercept groundwater. The group agreed that lowering the upstream elevation so that it intercepted groundwater was preferable for this project. The benefits of this is that the constructed channel will be able to capture water at its upstream end. This potential disadvantages of this is that it may require more excavation and may leave a vertical barrier at Rock Island Road. The field work that ERC is doing this fall is aimed to define the desired elevation at the upstream end for this work.

Realistic Excavation Quantities

ERC presented some excavation quantities at the meeting. These quantities, however, were meant for a comparison of impacts removing or retaining the barrier had on volumes. These were not “true” cut quantities as they didn’t include any grading outside of the 75 foot area where the low permeability material is planned to be placed below the channel. For the next round of evaluations ERC will use a more realistic approach to get a better feel on how much excavation will be required.

Sediment Management

Management of sediment in the constructed channel was discussed. As the restored channel will be largely cut off from its upstream sediment supply, there is the potential that the restored stream will become sediment starved and prone to downcutting. Several options for dealing with this including trying to create an active flow channel to trying to seed the amount of sediment in the stream were discussed. No conclusion was reached on the right approach, although it was decided that through the permitting process it likely makes sense to introduce permitting agencies for the potential need to add sediment to the reach in the future.

Permitting

Permitting requirements were discussed. The most time critical permit will likely the US Army Corps 404 permit. ERC and the County were going to work together to engage the Corps in the process as soon as possible. Based on initial Corps feedback, ERC will be better able to determine the level of field work related to wetlands and waters of the US that will be required.

Planned Field Work

ERC indicated that it will be performing field work, likely in late August, to better understand groundwater levels. This information is particularly important to help identify the upstream elevation tie ins. From a permitting standpoint the group indicated that ERC is OK proceeding with this exploration work and that no additional permitting is required in advance of this work.

Existing Site Piezometers

The status of the existing piezometers on site were discussed. The piezometers have not been read recently. The County and/or Forest Service will start reading them again.

Activities Subsequent to July 30th Meeting

Subsequent to the meeting on July 30th, ERC completed additional evaluations on the likely groundwater levels at the project site and completed additional assessments of grading.

Groundwater Elevations

The first activity completed by ERC was to estimate the natural groundwater level at Rock Island Road. This estimate will be refined as this fall's field work is completed, but the intent was to provide an updated estimate of the expected groundwater level.

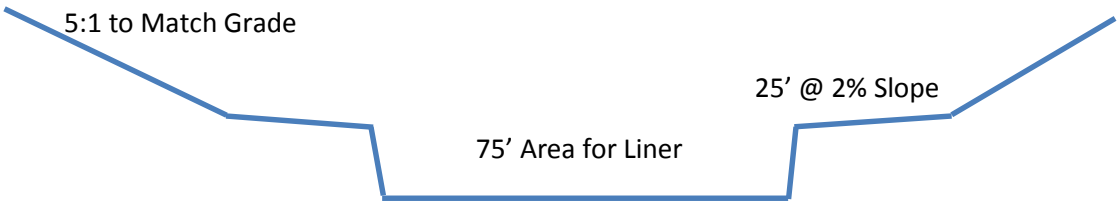
To complete this estimate, ERC used the "reference" area near the North Fork Tributary and the existing channel downstream of Muggins Gulch Road. It was assumed that the stream intercepts groundwater at each of these two locations. The straight line distance between these two locations is about 6,260 feet. The stream elevation based on LiDAR mapping is about 9,565 downstream and 9,700.5 upstream. As the LiDAR picks up the water surface and not the channel invert, the channel invert at each of these locations was assumed to be one foot below the LiDAR elevation.

Rock Island Road is about 3,010 feet upstream from the downstream segment (below Muggins Gulch). Using a straight line interpolation, this method suggests that groundwater in the vicinity of Rock Island Road would be approximately elevation 9,729 feet. This value is actually a bit higher than the 9,625 foot elevation of the existing downstream culvert at Rock Island Road that ERC used for its initial evaluation.

Grading

ERC then evaluated the amount of grading that is likely to be required. To do this, a surface was cut a Civil 3D model to approximate overall grading. The surface includes excavation needed to install the 75

foot low permeability liner. Outside of the 75 foot zone the grading assumed that the next 25 feet away from the channel on both sides would slope towards the channel at a 2% slope. This creates a 125 foot wide "riparian" zone. Outside of this 125 foot segment, the model assumed that the areas would be graded at a 5:1 slope to match existing grade. When completing the grading, the channel alignment was modified somewhat to minimize any grading to areas where there is significant existing vegetation. A schematic of the typical grading used in our model is given below.



As part of final design, this grading will be refined, however this assumption allowed ERC to more accurately estimate total excavation associated with the project.

Given the uncertainty in the groundwater elevation at the upstream end of the project (Rock Island Road), ERC completed the grading assuming two different upstream tie-in elevations. The first used and upstream elevation of 9,625 based on the invert of the existing culverts and the second assessment dropped this elevation by five feet assuming a tie-in at elevation 9,620. The calculated excavation quantity was approximately 138,000 cubic yards (CY) using an upstream elevation of 9,625 and 150,000 CY is the upstream tie-in was dropped by five feet. These results show that excavation will be significant, however overall quantities are not overly sensitive to the upstream tie-in elevation over the range evaluated. Copies of the plan and profile for both scenarios are attached. Note that given the uncertainty in the upstream elevation, these are subject to change, but should provide a reasonable representation of the amount of grading that will be required.

Upcoming Field Evaluation

ERC will be completing additional field work to help better understand existing groundwater levels, particularly in the vicinity of Rock Island Road. As part of this work ERC's plan is to excavate down to groundwater using a tracked excavator. The excavation will remain exposed so that fluctuations can be observed. ERC will also attempt to intercept groundwater at different locations through the project area. These areas will generally be located towards the upstream end of the project where groundwater elevations are likely not impacted significantly by the existing barrier.

ERC's current plan is to complete this field work early during the week of August 24th.

Ecological Resource Consultants, Inc.
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Technical Memorandum

Date: **December 3, 2015**

To: **Brian Lorch & Jason Lederer, Summit County Open Space Trails**

From: **Lisa Shea & Troy Thompson, ERC**

Re: **Swan River Restoration Project**

INTRODUCTION AND PROJECT OVERVIEW

Summit County and its project partners are planning to restore a portion of the Upper Swan River between Rock Island and Muggins Gulch Road in an area where the river has been disturbed from previous dredge mining activity. The project is located between Keystone and Breckenridge and is accessed from the Frisco exit (Highway 9) by travelling approximately 6.5 miles south to Tiger Road and then heading east for approximately 4.5 miles. This stretch of river is approximately 3,400 feet long as a relatively straight segment and has an average slope of approximately 1.7%. A map with the site location is shown on **Figure 1** below and **Figure 2** show the project area.

One of the challenges that has been identified is completing all of the desired work within the available budget. At a meeting on November 13th, ERC presented different concepts and budgetary construction cost estimates. It was concluded from that meeting that reducing the total volume of cut for the project and minimizing required road crossings were important factors in developing a design that met the budget. It was decided that ERC would consider different stream and road crossing alternatives as a way to determine a preferred alternative that would help guide the final arrangement and project design.

This memo was prepared to summarize the alternatives that were considered for both stream alignment and road crossings.

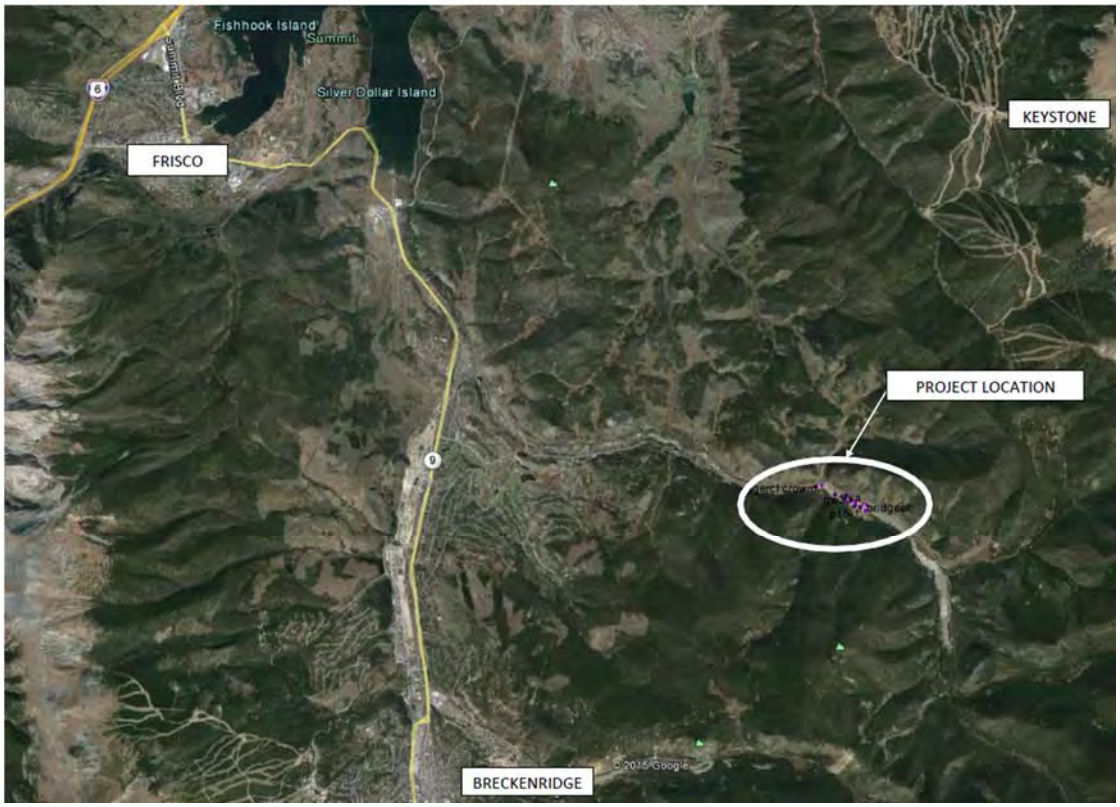
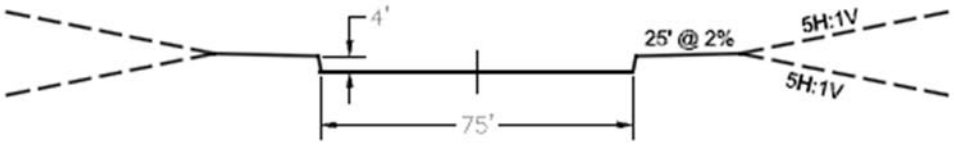


Figure 1 – Vicinity Map

Figure 2 – Project Area

The alternatives study was conducted to evaluated different options for channel realignment from a broad perspective without going into specific details. The alternative study was conducted as a decision making process so that a more informed decision could be made for the final configuration taking into account environmental issues, economic considerations, optimal river horizontal routing and geometric constraints. When considering all alternatives, the same template was used when quantifying cut that would be required. The general excavation template for all options includes a bottom width of 75 feet for the low permeability layer and an adjoining riparian area of 25 feet on either side of the stream as shown in **Figure 3.** This provides a roughly 125-foot wide river and riparian zone.



*Note: In some areas the 5H:1V slope was not achievable due to topographic constraints. In these cases ERC modified the slopes in a manner that allowed us to compare relative cut quantities required for the different alternatives.

Figure 3 – Typical River Cross Section

Options considered and a summary of each option is presented below.

- **Option 1 – Stream Alignment with Two Road Crossings** –This is the full project option presented at the November 13th meeting. The alignment would require box culvert crossings at Tiger and Muggings roads. As the Swan River would pass under both roads, each of these road crossings would require a large span and would cost on the order of $300,000 each. Grading between 6+50 and 7+50 was changed to 1.5H:1V to avoid a large excavation along the south hillside treed area. The channel cross section is primarily in cut and there are roughly 180,000 cubic yards (cy) of cut associated with this option. The option is shown in **Figure 4**.

- **Option 2 – Stream Alignment with one road Crossing Upstream and Reroute of Muggins Gulch Road** – This option in general follows a similar path as Option 1 roughly from station 14+00 to the end of the realigned stream. From Station 0+00 to 14+00, the alignment has been adjusted to the south up the hillside. Moving the alignment allows for one new major road crossing of the stream which occurs to the south of the Tiger

Road and Muggins Gulch Road junction. The existing Tiger Road crossing would be removed and the existing Muggins Gulch crossing would remain. There are constraints to this configuration between 6+50 and 12+00 as the daylight slope was reduced to 3H:1V to avoid cutting into the Tiger Road, as such the realigned stream abuts the Tiger Road on the north side. In this same area to the south, the daylight cut slope was reduced to 3H:1V to minimize the amount of excavation into the existing trees. Despite this steeper tie-in grading, putting the stream in this location would require removal of a significant portion of trees on the south side of the valley east of Tiger Road as depicted on the drawing. This is due to elevation and the need to preserve Tiger Road. The Muggins Gulch Road, at its tie-in to Tiger Road was moved to the north approximately 70 feet to accommodate the realignment and culvert crossing. Option 2 as shown on **Figure 5** has an excavation quantity of approximately 211,000 cy.

- **Option 3 – Stream Alignment with one road Crossing Upstream of Existing Road Intersection –** Option 3 is similar to Option 2 where this option includes a stream realignment with a single crossing of the Swan River. The difference between Options 2 and 3 is the crossing has been moved further to the south such that there is no realignment of Muggins Gulch Road required. Again similar issues exist as the channel turns to the south and the stream is constrained by Tiger Road on the west side and by the treed area on the southeast side. Even more tree removal would be required for this alternative. Option 3 has a cut volume of 250,000 cy and would require a single new Swan River crossing. The existing Muggins Gulch crossing would not be impacted. This option is shown in **Figure 6**.

- **Option 4 – Stream Alignment with one road Crossing and Shift of Muggins Gulch Road –** Option 4 involves following the alignment for Option 1 from as Station 15+00 to the end. From 15+00 downstream to 0+00 this alternative has the Swan River crossing under Tiger Road at a single location and then meandering down to a tie-in point with the existing stream. The existing Muggins Gulch spur and its road crossing would be removed and a new Muggins Gulch spur would be created. As only Muggins Gulch would pass under this new spur, this stream crossing would be smaller and significantly less costly than a crossing of the Swan River. For this option additional curvature was added to the alignment just east of Tiger Road to cover more of the previously disturbed area to the north. The daylight slopes were reduced from the 5H:1V from 7+00 to 13+00 to avoid topographic constraints due to Tiger Road and the treed area to the south. This option has an excavation quantity of 220,000 cy. This

quantity could be reduced and more closely match Option 1 by modifying the alignment between 7+00 and 19+00. This option is shown in **Figure 7**.

- **OPTION 5 – CHANNEL REALIGNMENT WITH NO ROAD CROSSINGS AND REROUTE OF MUGGINS GULCH ROAD -** This option is similar to Option 4 except Muggins Gulch Road was rerouted further to the north and ties into Tiger Road at its 145° bend. This option was looked at to compare excavation quantities with Option 4 and to compare the overall disturbance area with respect to the treed areas. The Muggins Gulch crossing in Option 5 would be simpler than Option 4, but would impact higher quality wetlands. Some areas along the alignment required decreasing the outer daylight slope to as great as 2H:1V to provide sufficient room for the stream and riparian area without taking out Tiger Road. **Figure 8** shows this option. As with all options, grading for this alternative was not optimized. Consequently there are some areas that need tweaking such as between 8+00 and 14+00 to eliminate the sharp curves in the area and to make an alignment that does not excavate into Tiger Road outside of the culvert crossing. The quantity of excavation for this option is on the order of 220,000 cy which could be reduced by reconfiguration in the areas mentioned above.

- **OPTION 6 – CHANNEL REALIGNMENT WITH NO ROAD CROSSINGS AND REROUTE OF MUGGINS GULCH ROAD -** Option 6 involves a quick look at an option that has no major Tiger Road crossings. This involves realigning both Tiger Road and Muggins Gulch Road. Tiger Road would be realigned to the south of the stream and involves a road realignment length of approximately 3,300 feet. Material excavated for the channel would be used to create the new road. The Tiger Road reroute alignment was based on following the tree/shrub line and keeping the disturbance of vegetation to a minimum. A smaller crossing of the Swan River would be required when the realigned Tiger Road crosses the existing channel. The Muggins Gulch Road would also be realigned following the same route as Option 5. The existing Tiger Road crossing would be removed but the northern extent of Tiger Road would remain open for access to Muggins Gulch. Daylight slopes along the stream were adjusted as needed to provide space for the road on either side. Since this study is conceptual and no optimization was completed, there are some areas that need adjusting such as between 18+00 and 20+00 to avoid excavating the existing Tiger Road and to increase sinuosity between Stations 15+00 and 24+00. The excavation quantity of this option is approximately 170,000 cy. Option 6 is shown on **Figure 9**.

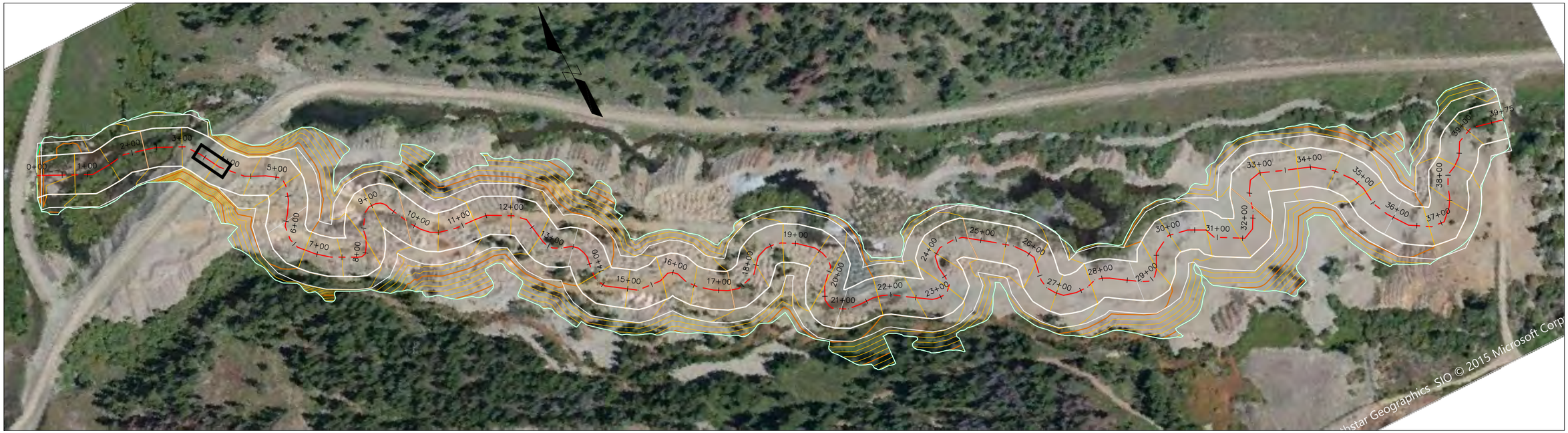
COMPARISON

A comparison of the different options is presented in **Table 1**.

Option	Cut Quantity (1,000 CY)	Swan River Crossings	Muggins Gulch Crossings	Environmental Issues	Road Work	Comments
1	180	2	0	Multiple Swan River crossings are not desirable	NA	Multiple Swan River crossings impact the cost and are less desirable from an ecological standpoint
2	210	1	0	Removal of trees	Mugging Gulch realignment	Excavation quantity, impacts to trees and proximity of stream to Tiger Road at crossing make this option undesirable
3	250	1	0	Removal of trees	NA	Excavation quantity, impacts to trees and proximity of stream to Tiger Road at crossing make this option undesirable
4	220	1	1	Removal of trees	Mugging Gulch realignment	Similar to Option 5 but will have more impacts on southern trees and creates a steep left channel bank
5	220	1	1	Crosses better wetlands	Mugging Gulch realignment	Similar to Option 4 but will impact better quality wetlands in Muggings Gulch
6	170	1 minor crossing	1	Crosses better wetlands; minimizes road crossings	New Tiger Road; Mugging Gulch realignment	Lowest excavation quantity and no major Swan River crossings make this the most desirable option. Access to Muggins Gulch Road would require additional travel.

CONCLUSIONS

We believe that Option 6 is most likely the best alternative. The low cut quantity and not having any major crossings of the Swan River drive this conclusion. The feasibility of this option, however, is dependent on the ability to move Tiger Road in a manner similar to what is shown in **Figure 9** plus costs that will be incurred for moving existing utilities. In the event that this option does not prove to be feasible, we believe that Option 5 is the next best alternative. In any case grading will need to be refined to minimize quantities and road crossings will need to be optimize to reduce overall project cost.



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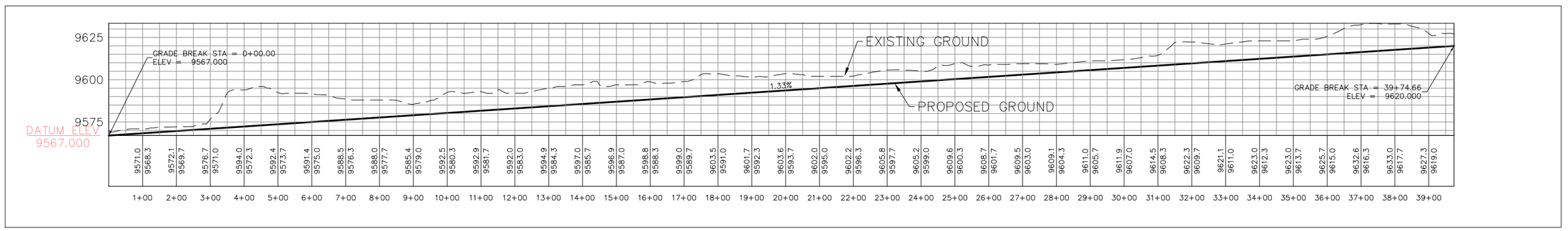

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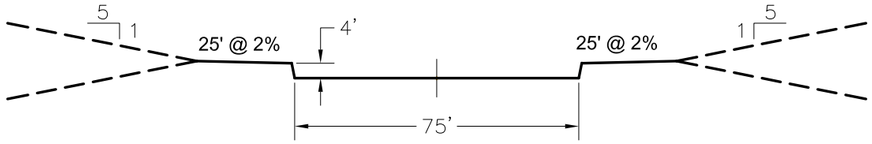
4X VERTICAL SCALE

CUT = 180,000 CY
FILL = 500 CY
QUANTITIES ARE NEAT LINE - NO CONTINGENCY ALLOWANCE



IN SOME AREAS THE 5H:1V DAYLIGHT SLOPE IS NOT ACHIEVABLE DUE TO TOPOGRAPHIC CONSTRAINTS.

REV	DATE	DESCRIPTION
A	012/02/15	ISSUED FOR ALTERNATIVES ANALYSIS

PREPARED BY
ECOLOGICAL RESOURCES CONSULTANTS, INC
35715 US HIGHWAY 40, SUITE D204
EVERGREEN, CO 80439

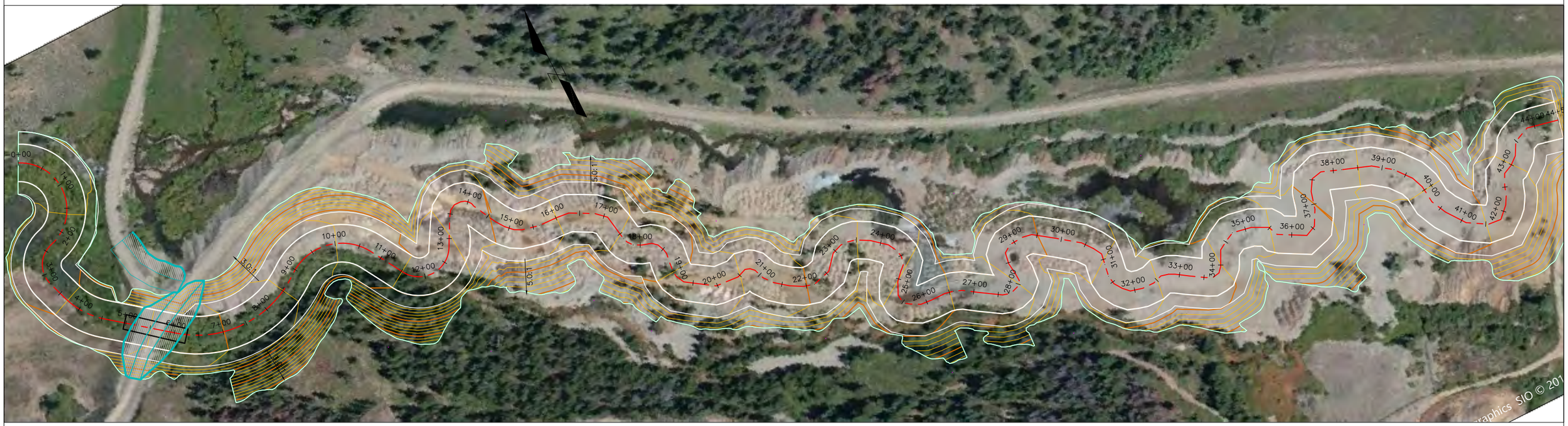
CLIENT
SUMMIT COUNTY OPEN SPACE AND TRAILS

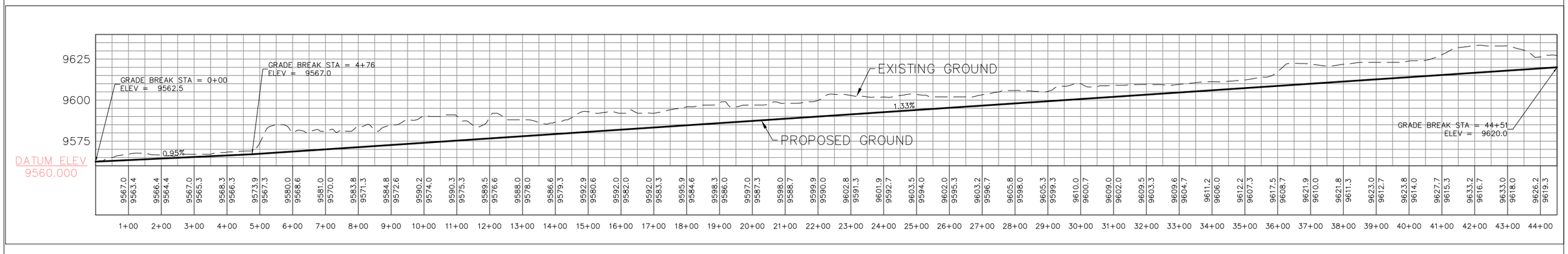
PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
OPTION 1
STREAM ALIGNMENT WITH TWO ROAD CROSSINGS

SHEET NO
4

C:\Users\Lisa\Dropbox (ERC Colorado)\ERC\01 PROJECTS\1035 Summit County\1501 Swan River\02 ACAD\Production DWGs\06-Swan-Dboule Rd Xing.dwg, 12/2/2015 4:28:37 PM





4X VERTICAL SCALE

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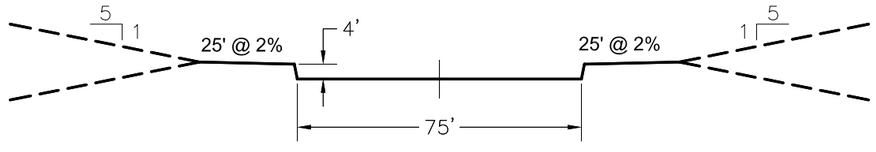
FILL = 2,000 CY
QUANTITIES ARE NEAT LINE - NO CONTINGENCY ALLOWANCE



IN SOME AREAS THE 5H:1V DAYLIGHT SLOPE IS NOT ACHIEVABLE DUE TO TOPOGRAPHIC CONSTRAINTS.

REV	DATE	DESCRIPTION
A	012/02/15	ISSUED FOR ALTERNATIVES ANALYSIS

PREPARED BY
ECOLOGICAL RESOURCES CONSULTANTS, INC
35715 US HIGHWAY 40, SUITE D204
EVERGREEN, CO 80439

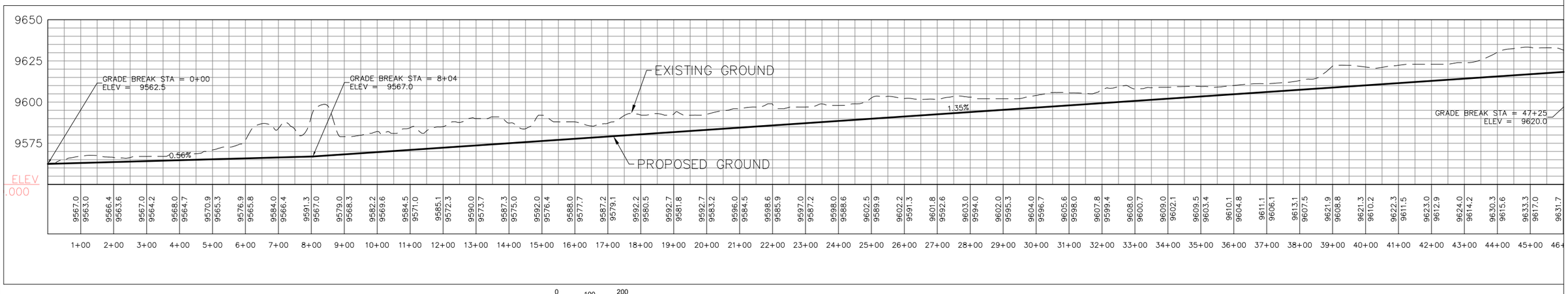
CLIENT
SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
OPTION 2
SINGLE ROAD CROSSING & REROUTE MUGGINS ROAD

SHEET NO
5

0 100 200 Feet



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4X VERTICAL SCALE

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FILL = 1,500 CY
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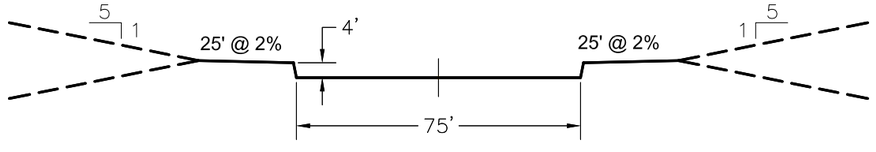


IN SOME AREAS THE 5H:1V DAYLIGHT SLOPE IS NOT ACHIEVABLE DUE TO TOPOGRAPHIC CONSTRAINTS.

REV	DATE	DESCRIPTION
A	012/02/15	ISSUED FOR ALTERNATIVES ANALYSIS

PREPARED BY
ECOLOGICAL RESOURCES CONSULTANTS, INC
35715 US HIGHWAY 40, SUITE D204
EVERGREEN, CO 80439

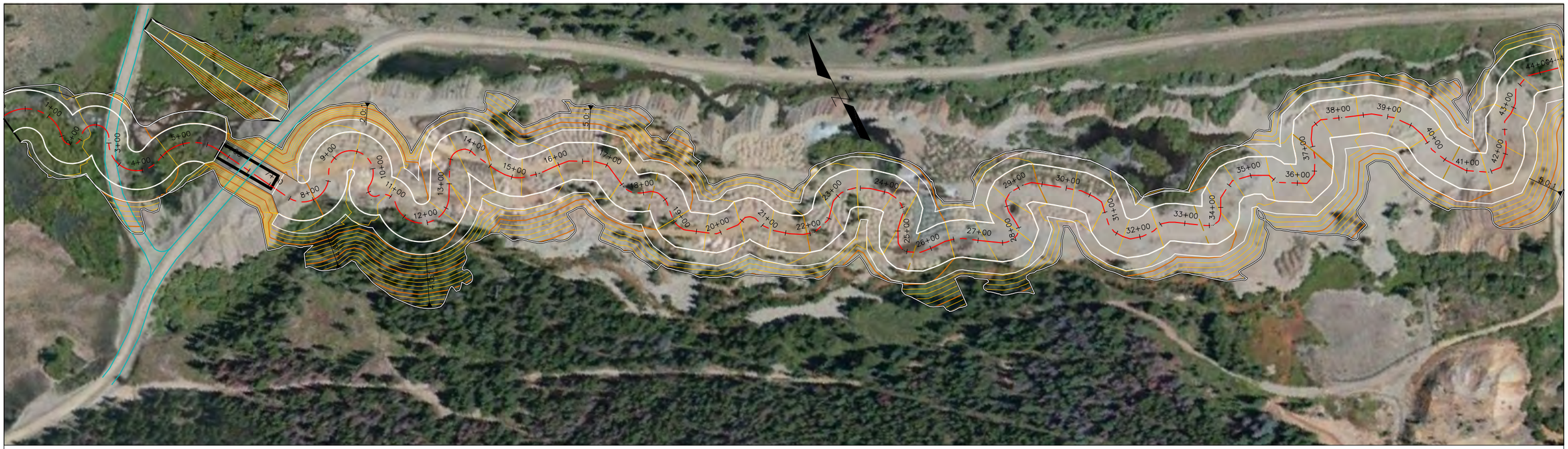
CLIENT
SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
OPTION 3
SINGLE ROAD CROSSING US OF ROAD INTERSECTION

SHEET NO
6

C:\Users\Lisa\Dropbox (ERC Colorado)\ERC\01 PROJECTS\1035 Summit County\1501 Swan River\02 ACAD\Production DWGs\08-Swan-Single Rd Xing-2.dwg, 12/2/2015 4:29:55 PM



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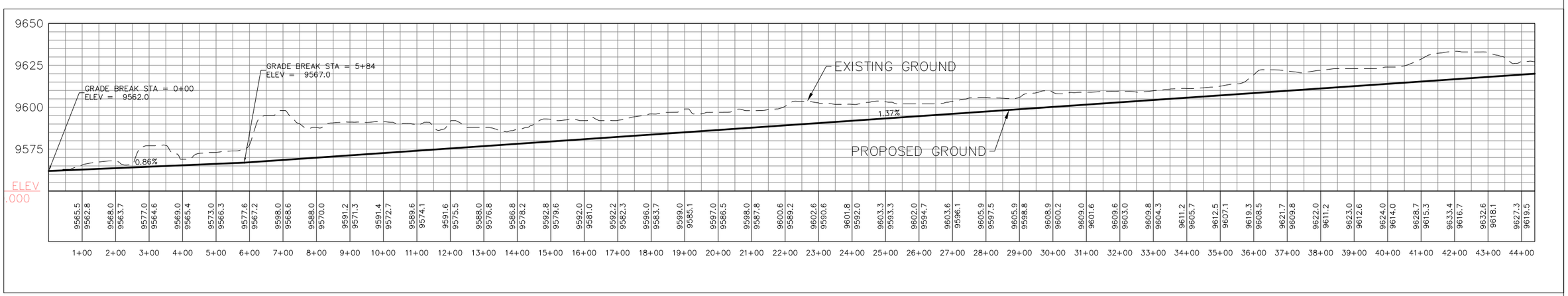
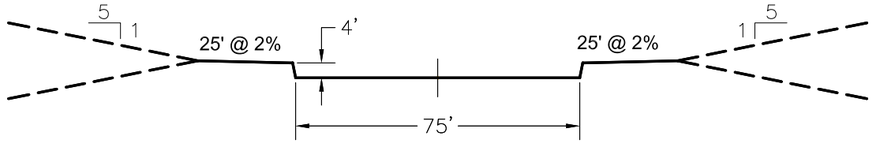


0 100 200 Feet

4X VERTICAL SCALE

CUT = 220,000 CY
FILL = 700 CY
QUANTITIES ARE NEAT LINE - NO CONTINGENCY ALLOWANCE



IN SOME AREAS THE 5H:1V DAYLIGHT SLOPE IS NOT ACHIEVABLE DUE TO TOPOGRAPHIC CONSTRAINTS.

REV	DATE	DESCRIPTION
A	012/02/15	ISSUED FOR ALTERNATIVES ANALYSIS

PREPARED BY
ECOLOGICAL RESOURCES CONSULTANTS, INC
35715 US HIGHWAY 40, SUITE D204
EVERGREEN, CO 80439

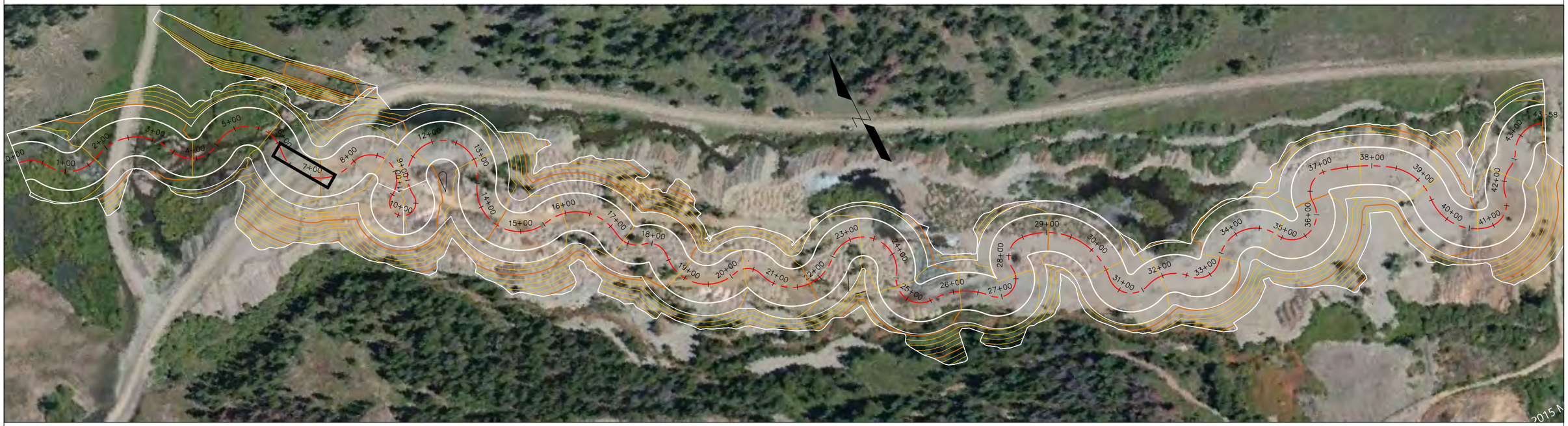
CLIENT
SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
OPTION 4
SINGLE ROAD CROSSING AND SHIFT OF MUGGINS ROAD

SHEET NO
7

C:\Users\Lisa\Dropbox (ERC Colorado)\ERC\01 PROJECTS\1035 Summit County\1501 Swan River\02 ACAD\Production DWGs\09-Swan-Single Rd Xing-Straight Stream.dwg, 12/2/2015 4:30:34 PM



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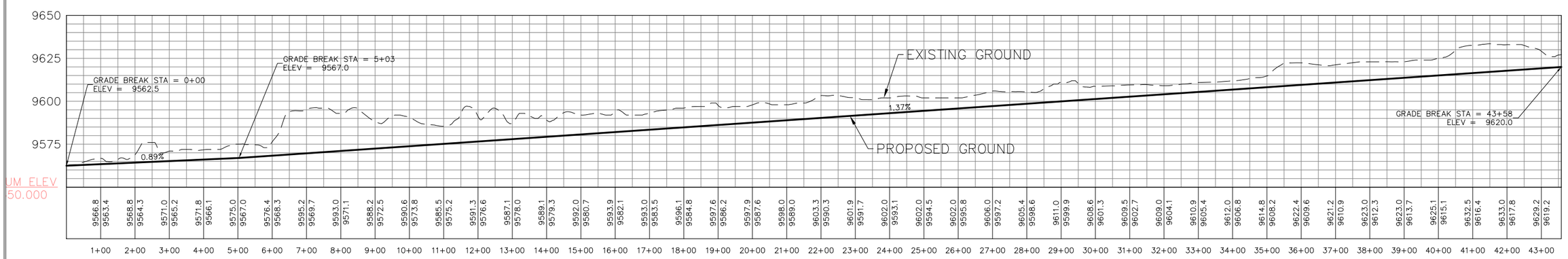

CUT = 222,000 CY
ROAD FILL = 5,500 CY
QUANTITIES ARE NEAT LINE - NO CONTINGENCY ALLOWANCE

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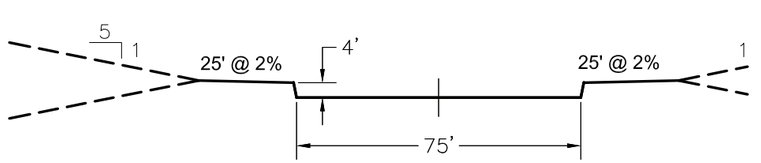
4X VERTICAL SCALE



IN SOME AREAS THE 5H:1V DAYLIGHT SLOPE IS NOT ACHIEVABLE DUE TO TOPOGRAPHIC CONSTRAINTS.

REV	DATE	DESCRIPTION
A	012/02/15	ISSUED FOR ALTERNATIVES ANALYSIS

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35715 US HIGHWAY 40, SUITE D204
EVERGREEN, CO 80439

CLIENT
SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
OPTION 5
NO ROAD CROSSINGS AND REROUTE OF MUGGINS ROAD

SHEET NO
8

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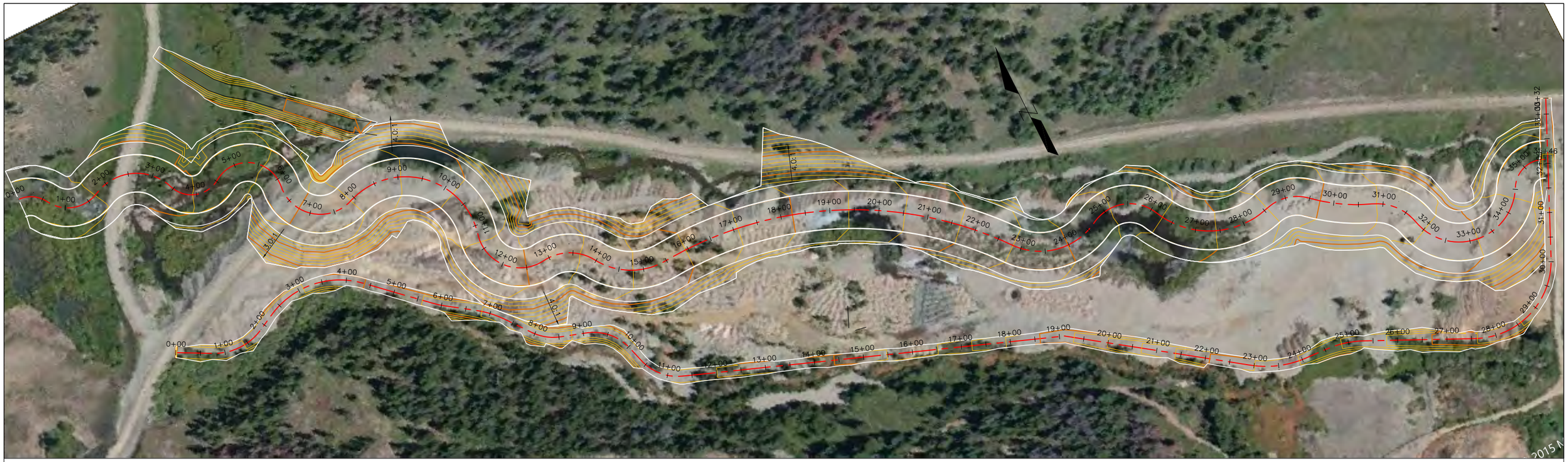

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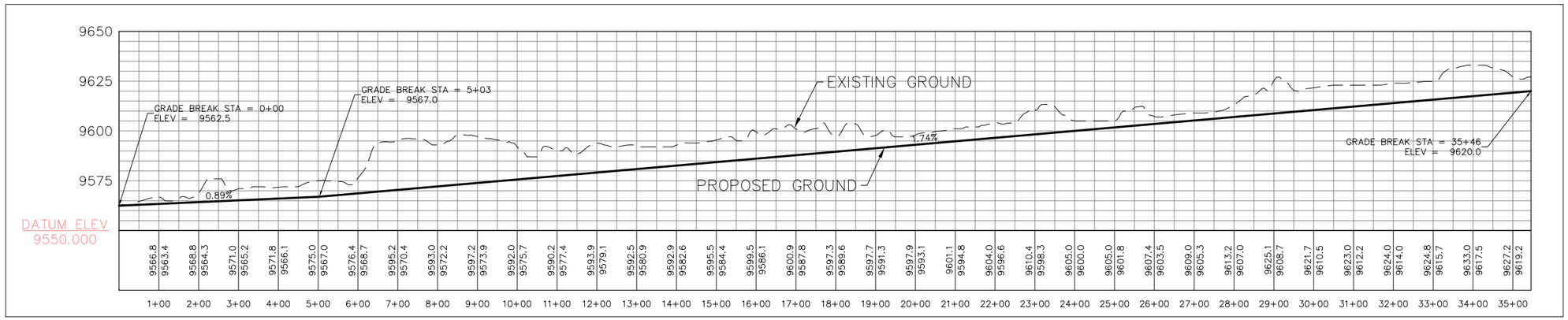
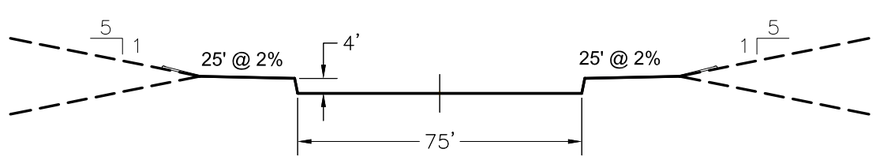


CUT = 170,000 CY
ROAD FILL = 10,000 CY
QUANTITIES ARE NEAT LINE - NO CONTINGENCY ALLOWANCE

0 100 200 Feet

4X VERTICAL SCALE



IN SOME AREAS THE 5H:1V DAYLIGHT SLOPE IS NOT ACHIEVABLE DUE TO TOPOGRAPHIC CONSTRAINTS.

REV	DATE	DESCRIPTION
A	012/02/15	ISSUED FOR ALTERNATIVES ANALYSIS

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EVERGREEN, CO 80439

CLIENT
SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
OPTION 6
REROUTE MAIN ROAD TO THE SOUTH AND CONNECT MUGGINS ROAD

SHEET NO
9

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SWAN RIVER RESTORATION PROJECT (REACH A)

PRE-CONSTRUCTION MEETING MINUTES
Date: Monday, June 6, 2016
Time: 8:30 a.m. – 10:30 a.m.
Location: County Commons, Frisco – Buffalo Mountain Room

Attendance:
Jason Lederer – Summit County Open Space and Trails
Jim Curnutte – Summit County Community Development
Robert Jacobs – Summit County Engineer
Tom Gosiorowski – Summit County Road and Bridge Director
Dave Blauch – ERC
Lisa Shea – ERC
Danny Tezak – Tezak Heavy Equipment
Troy Adair – Tezak Heavy Equipment (General Superintendant)
Keith Martinez – Tezak Heavy Equipment (Job Superintendent)
Mario Jimenez – Tezak Heavy Equipment (Project Manager)

INTRODUCTIONS: The meeting opened with introductions once all expected parties were present

AGENDA ITEMS: A discussion of items on the agenda

- Contacts and chain of command & list of subcontractors
    - A pre-construction meeting attendance list was distributed to include contact info. Jason Lederer will be creating a project distribution list to include these parties.
    - Mario Jimenez will also be distributing Tezak's project contact list. This list will be updated as necessary to include sub-contractors, etc. (see attached)
    - Jason Lederer and Brian Lorch are primary project points of contact for Summit County. Troy Thompson, Dave Blauch, and Keith Martinez will be primary points of contact for ERC/Tezak.
    - Tezak will provide a list of project subcontractors including, but not limited to the following: Crushing, Guardrail, Geotechnical, Concrete, Crane, Revegetation
- Hours of Operation
    - Jason reviewed the construction hours of operation as described in the Construction Phase Traffic Management Plan
    - Onsite construction is permissible from 7 a.m. – 7 p.m., M-S; Hauling from the site can occur 7 a.m. – 5:30 p.m., M-F.
- Project meetings
    - Onsite project meetings will occur every other Wednesday at 1:30 p.m. while construction is occurring onsite.
- Duties of the owner and contractor

    - Jason referenced the Scope of Work/Services, as well as all other relevant sections in the Contract.
- Submittals and Shop Drawings
    - Procedures for submittals and shop drawing review, tests, inspections, etc.
- List of subcontractors
    - Contractor shall supply a list of subcontractors
- Utilities
    - The utility owners are looking to remove the telephone pole and bury utilities located in the vicinity of the excavation for the new crossing.
    - Summit County will be coordinating with the utilities regarding easements, etc.
    - No major permanent utility relocations are required under the current project design. Temporary relocation will occur during installation of the crossing.
    - See Contract Sections VII-B, XVI
- Scheduling
    - ERC will provide project look aheads for the coming week on Friday's throughout the project duration.
    - Tezak will update project schedule with their monthly pay requisition submissions.
    - Progress reports and updating – schedule updates
    - Tentatively, late July SEMA to start hauling processed material.
    - Tentatively, late June to start the milling operation.
    - See Contract Section IV
- Site Security
    - Tezak is responsible for security of their equipment/facilities onsite.
    - Tezak indicated that it is not their intention to use security cameras.
    - Tezak indicated there will be no fenced staging area
    - Jason Lederer requested Tezak inform the County of any security issues they encounter so that they can be properly addressed.
- Site Utilization
    - Storage – only onsite storage planned. Storage locations will be rotated throughout the project site depending on the nature of site activities. No offsite storage required.
        - See Contract Section XVII, F
    - Trailer – a temporary field office will be located at the NW corner of the project site in the SE corner of Tiger Road and Summit Gulch Road.
    - Deliveries – TBD depending on the delivery. There are two primary access locations to the site – one at the NW corner, as well as Rock Island Road
        - See Contract Section XVII
    - Temporary Facilities – portable sanitary facilities will be located near the temporary field office – currently these facilities are located at the southeast end of the site adjacent to Rock Island Road.
- Site Safety – Accident Prevention and Security

  - Emergency Contacts – Emergency contacts will be listed in the site-specific Health and Safety Plan (HASP) to be provided by Tezak.
  - Jason Lederer reiterated that this is a heavily used recreation area. Recreational uses are primarily adjacent to the site on trails within the Golden Horseshoe and along Tiger Road.
  - In case of an Emergency call 911 – a landline will be available at the onsite temporary field office throughout construction. Cell phone signals are spotty onsite.
- Visitors to the Site
  - All visitors must check in with the contractor and notify Summit County Open Space and Trails for permission in advance of visiting the site.
  - Any unexpected visitors will be directed to Summit County Open Space and Trails to discuss access and/or the nature of their visit.
  - Visit by University of Nebraska on June 16th at 1:30 p.m. and the Breckenridge Open Space Advisory Commission (BOSAC) on June 20th at 4:00 p.m.
- Environmental Hazards
  - Jason Lederer reviewed some of the potential hazards at the project site including weather, wildlife, etc.
  - See Contract Section X
- Traffic Management
  - Jason provided a brief review of traffic management plan (TMP) including access, parking, temporary detours, etc.
  - The TMP will also be provided to and reviewed with any truckers hauling material from the site.
  - Any material used by the State Highway 9 (Iron Springs) project will be hauled by CDOT's contractor, SEMA or a SEMA subcontractor. SEMA is already familiar with the TMP and it will be included contractually with their purchase order.
  - Jason Lederer will be finalizing the TMP with the appropriate project contact information now that it is available.
  - See Contract Section XXII
- Permits
  - A discussion project permits and applicable conditions occurred. Site specific permits in clued a Summit County Grading Permit, Colorado Discharge Permit (CDP) for construction and associated Stormwater Management Plan (SWMP), Conditional Use Permit (Gravel milling), USACE NWP #27, Mining Permit (M-1993-035)
    - Tezak will have the project SWMP onsite in the temporary field office as well as in Keith Martinez's truck. Tezak will be using water trucks on the site to help control dust.
    - County owns rights to water within Swan River. Tezak's desire is to use water from Swan for dust control and soils compaction purposes. Tezak to provide a point of withdrawal and Jason Lederer to follow-up with County counsel.

        - ERC will be submitting an amendment request to the project NWP#27 404 permit. The amendment will include the revisions to the channel design at the downstream end of the project as well as associated impacts to jurisdictional areas (net reduction in wetland impacts associated with the revised design).
            - Downstream turbidity can be expected during construction. This turbidity is covered under the NWP#27.
            - Jason Lederer asked to be notified by ERC/Tezak of any expected downstream turbidity so he can discuss it in the project blog.
        - Robert Jacobs will be providing ERC comments on their grading permit application. The permit is primarily applicable to the new crossing and roadway realignments.
        - All proposed onsite earthwork is covered under Summit County's mining permit.
        - Jason Lederer reviewed the conditions of the Conditional Use Permit, which allows for gravel milling operations on the project site.
    - See Contract Section IX
- Rights-of-way
    - All project work is occurring within the limits of County/Town-owned property. No specific dedicated ROWs are known to occur within the project area.
    - Coordination with Open Space and Trails, the Summit County Road and Bridge Department, and Summit County Engineering Department will be ongoing throughout construction.
- Cooperation with other contractors working in the Swan River Valley
    - Jason Lederer reviewed the other constructors working within the Swan River Valley
        - Everist Materials
        - Ongoing land development occurring up Muggins Gulch Road
    - Jason Lederer emphasized working in harmony with other contractors working nearby
- Testing
    - Robert Jacobs will provide a schedule of testing and inspection requirements in the Grading Permit
    - See Contract Sections XVII, XVIII, XIX
- Cleanup
    - Tezak responsible for maintaining a clean and orderly site throughout construction
    - Project site must be cleaned each day. Contractor responsible for trash removal.
    - See Contract Section XXII
- Closeout
    - Jason Lederer reviewed project closeout procedures
    - See Contract Section XXIV
- Public relations
    - Jason Lederer asked that all public relation items, including inquiries, questions, comments, etc. be directed to him or Brian so that the County may determine an appropriate response.

- Jason Lederer will be maintaining a blog on the Summit County website.
- Summit County will be posting informational project signage will be posted at the NW corner of the site as well as near Rock Island Road.
- Tezak and ERC are also welcome to post signage at the site, after a review and authorization of such signage by the County.

ITEMS NOT INCLUDED ON THE AGENDA:

- Eligible Workers
  - Jason Lederer reiterated that all employees must be eligible workers per Contract Section XXXIX.
- HAZMAT
  - Jason Lederer reiterated that the County be notified of any and all potential HAZMAT situations encountered at the site.
- Project Bonding
  - Tezak will be providing bonding information to Summit County per Contract Section XXXIV

ADJOURNMENT: The meeting adjourned at 10:30 a.m.

ATTACHMENTS:

- Tezak Project Contact List
- Pre-construction Meeting Attendance List

205 Tunnel Drive Canon City, CO 81212
719-269-1173 719-269-1148 (Fax)

Equal Opportunity Employer

SWAN RIVER – RESTORATION PROJECT

PROJECT CONTACT LIST

Tezak Heavy Equipment Co., Inc.

Email: office@tezakheavyequipment.com

Temporary Field Office Phone Number: 970-453-9313

Daniel E. Tezak, President
Mobile: 719-671-1783
dtezak@tezakheavyequipment.com

Randy DiLuzio, General Manager
Mobile: 719-821-2298
rdiluzio@tezakheavyequipment.com

Mario Jimenez, Project Manager
Mobile: 719-671-1756
mjimenez@tezakheavyequipment.com

Troy Adair, General Superintendent
Mobile: 719-671-1777
tadair@tezakheavyequipment.com

Bryan Danner, P.E., Staff Engineer
Mobile: 719-334-6659
bdanner@tezakheavyequipment.com

Keith Martinez, On-Site Project Superintendent
Mobile: 719-821-9290
kmartinez@tezakheavyequipment.com

Dean Burns, Safety Manager
Mobile: 719-285-5558
dburns@tezakheavyequipment.com

PROJECT SUBCONTRACTORS:

Crushing Subcontractor:
A&S Paving & Redi-Mix
Canon City, CO 81212

Guardrail Subcontractor:
TBD

Geotechnical Firm
TBD

Concrete Subcontractor
TBD

Crane Subcontractor
TBD

ATTENDANCE LIST

Date of Meeting: June 6, 2016

Contract Title: Swan River Restoration Project Part 2 – Construction Services

LIST OF ATTENDEES

Name	Organization/Title	Business Telephone No.	Emergency (24-hr) Telephone Number
JASON LEDERER	SUMMIT COUNTY OST	970-668-4213	720-467-8559
Mario Jimenez	Tezak Heavy Equipment Project Manager	719-422-4214	719-671-1756 Cell
Troy Adair	Tezak Heavy Equip. General Superintendent	719-269-1173 719-671-1777	719-671-1777 Cell
Keith Martinez	Tezak Heavy Equip. JOB Superintendent	(719)-821-9290	(719)-821-9290
Danny Tezak	Tezak Heavy Equip	719-671-1783	719-671-1783
DAVE BLANCH	ERC	303-679-4820	720-273-7743
Jim Cornette	Summit County	970 668-4200	same
Tom Gosiorowski	Summit County R&B	9704712132	Same
Lisa Shea	ERC	303-679-4820 x110	303-250-2464

Exhibit D
Swan River Restoration Project Plans

WSRA Grant – CTGG1 2016-445 Final Report – Swan River Stream Restoration – Phase 1 in the Colorado River Basin

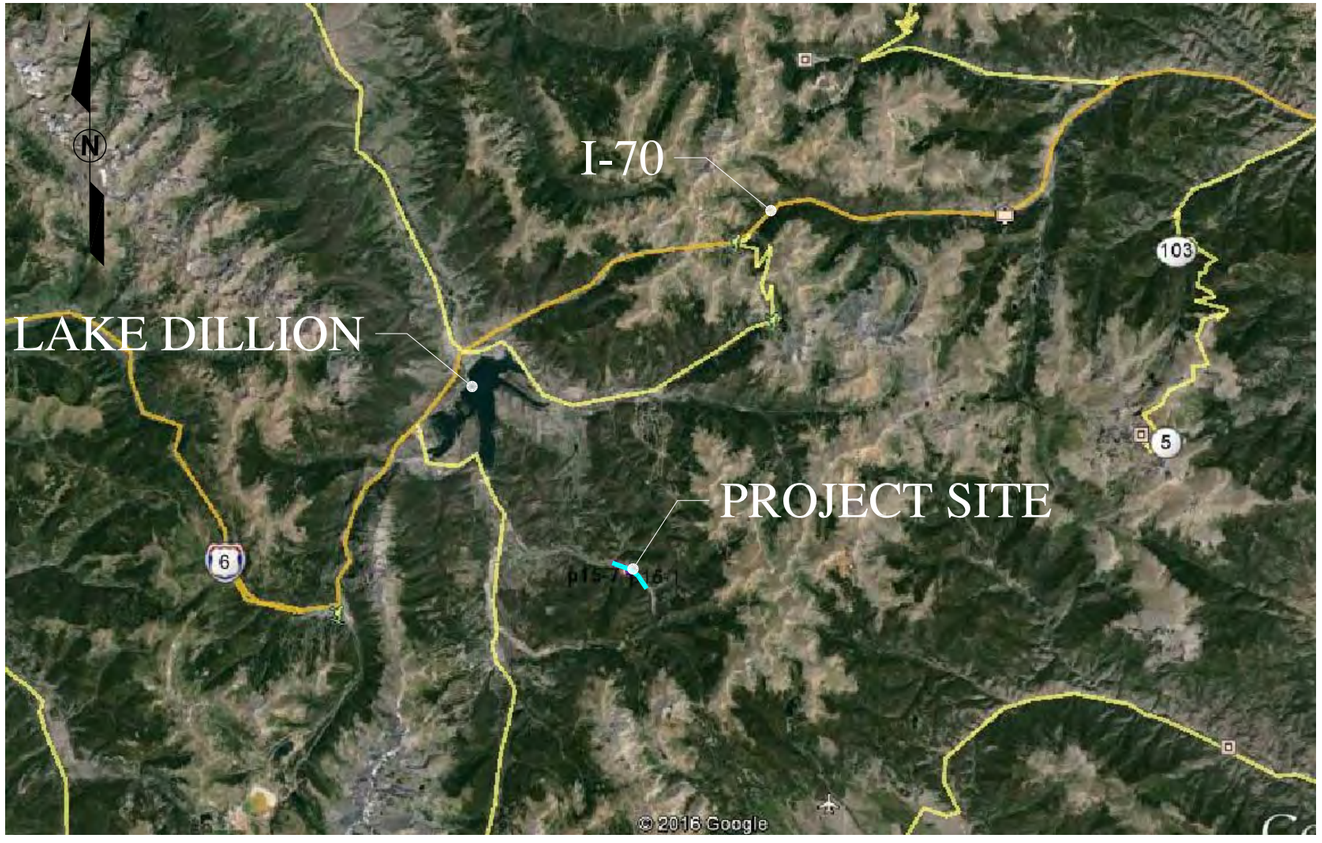
SUMMIT COUNTY OPEN SPACE AND TRAILS

SUMMIT COUNTY

SWAN RIVER RESTORATION PROJECT

JUNE 2016

LOCATION MAP:



INDEX

SHEET	TITLE OF SHEET
1	COVER SHEET - REV D
2	OVERALL RIVER RIVER RESTORATION PLANVIEW - REV B
3	OVERALL RIVER PLAN & PROFILE - REV B
4	CENTERLINE STREAM PROFILE AND TABLE - REV C
5	RIFFLE-POOL-GLIDE PROFILE - REV B
6	RIFFLE-POOL-GLIDE SECTIONS - REV B
7	BANK STABILIZATION - REV B
8A	EXISTING UTILITY ROUTING - REV A
8B	TEMPORARY UTILITY ROUTING - REV A
8C	PERMANENT UTILITY ROUTING - REVA
9	TIGER ROAD DETOUR PLAN AND PROFILE - REV A
10	CONSPAN PLAN - REV B
11	CONSPAN DETAILS - REV B
12	TIGER ROAD MODIFICATIONS PLAN AND PROFILE - REV C
13	TIGER ROAD SECTIONS - REV B
14	NOTES AND SPECIFICATIONS - REV B
E1	EROSION CONTROL PLAN - REV A
E2	PLANTING AND SEEDING DETAILS - REV A

REV	DATE	DESCRIPTION
D	06/22/16	RE-ISSUED FOR CONSTRUCTION
C	06/02/16	ISSUED FOR CONSTRUCTION
B	03/18/16	ISSUED FOR PERMITTING
A	02/09/16	ISSUED FOR PERMITTING

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EVERGREEN, CO 80439

CLIENT: SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT: SWAN RIVER RESTORATION PROJECT

TITLE: COVER SHEET

SHEET NO: 01

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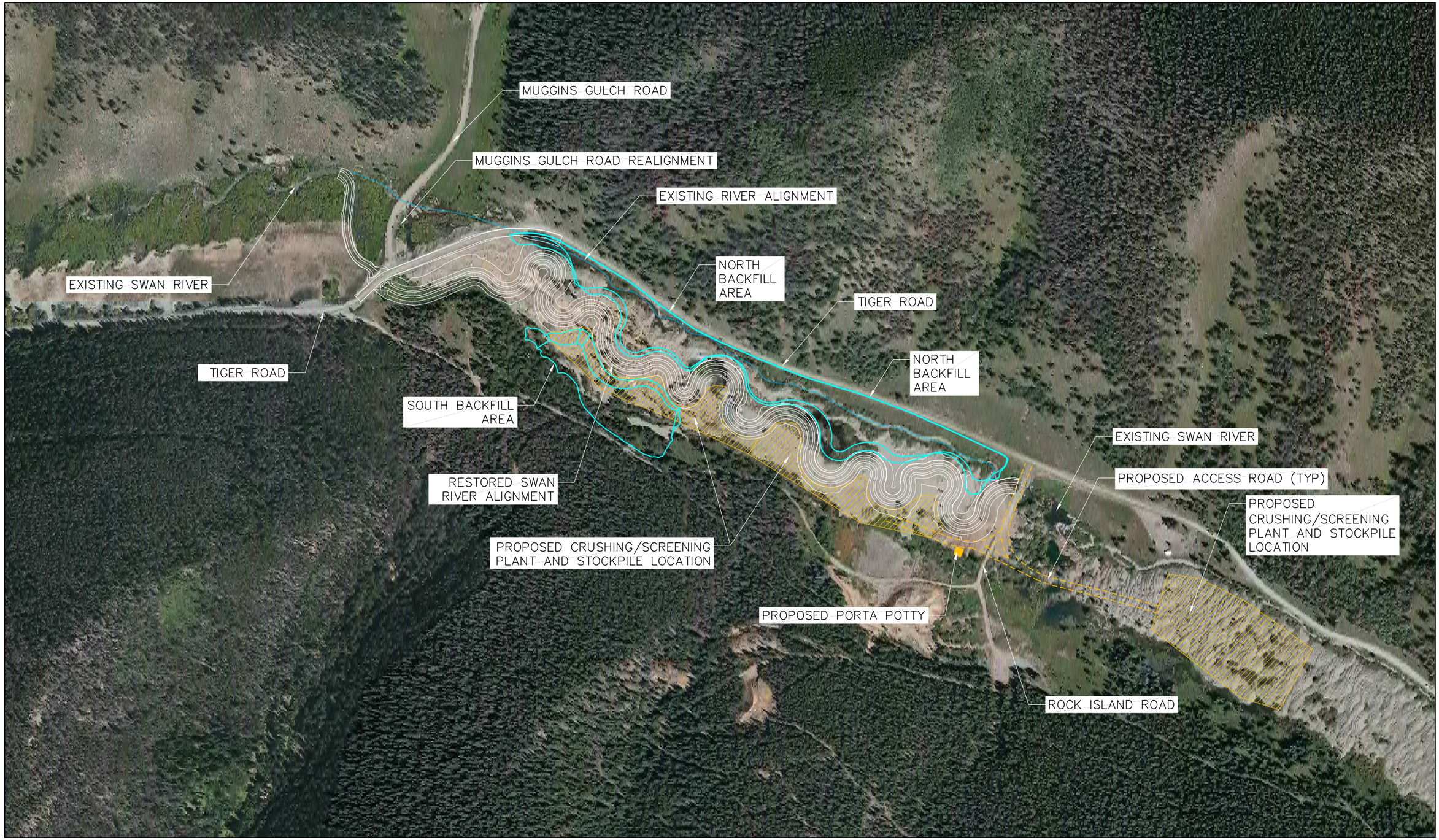

0 400 800 Feet

REV	DATE	DESCRIPTION
B	06/22/16	ISSUED FOR CONSTRUCTION
A	03/25/16	ISSUED FOR UTILITIES & BRIDGE DESIGN

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PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
OVERALL RIVER RESTORATION PLANVIEW

SHEET NO
02

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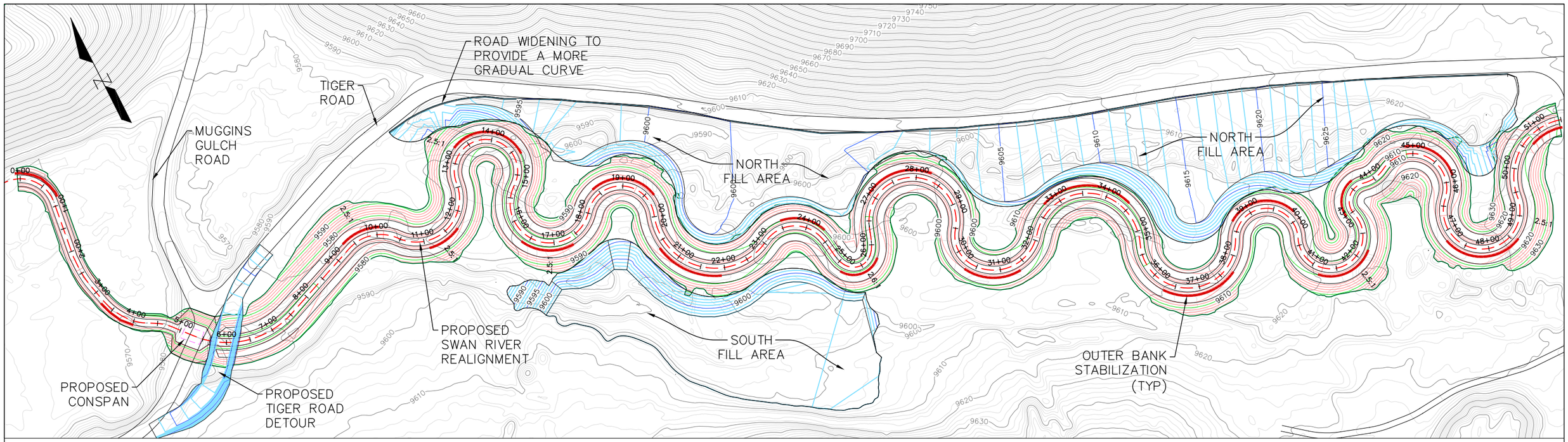
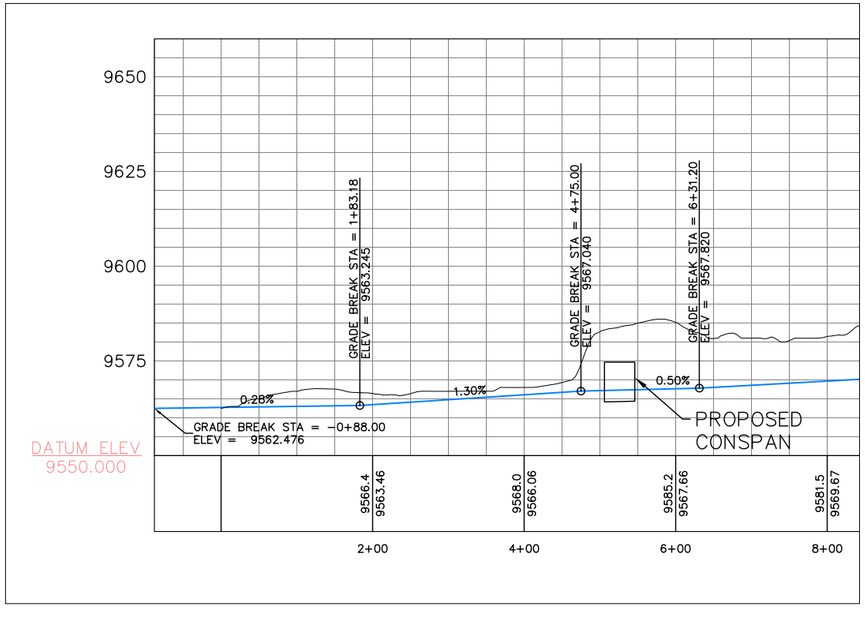
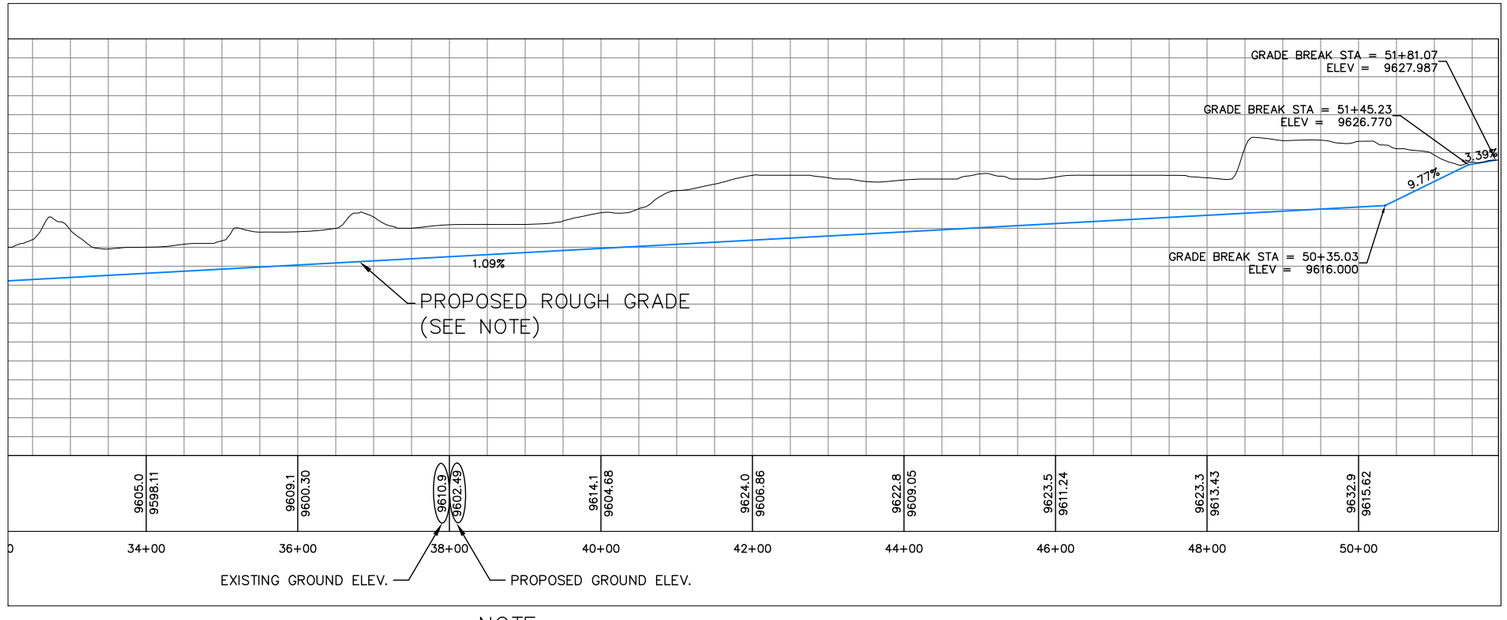


1 CHANNEL PLANVIEW

0 100 200 Feet





1 CHANNEL PROFILE
5X VERTICAL EXAGGERATION

NOTE:
PROFILE REPRESENTS AN OVERALL STRAIGHT GRADING ALONG THE CHANNEL CENTERLINE. THE CHANNEL WILL BE CONSTRUCTED WITH A SERIES OF RIFFLE–POOL–GLIDE SEQUENCES. SEE SHEET NO. 04 FOR DETAILS.

REV	DATE	DESCRIPTION
B	06/22/16	ISSUED FOR CONSTRUCTION
A	03/25/16	ISSUED FOR UTILITIES & BRIDGE DESIGN

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PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
RIVER REALIGNMENT PLAN & PROFILE

SHEET NO
03

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Station	ID	Riffle Length (ft)	Glide Length (ft)	Headin Length (ft)	Riffle Slope (%)	Glide Slope (%)	Headin Slope (%)	Pool Depth (ft)	Avg. Glide Depth (ft)
-6	Match Existing								
22	Glide 1		56			-2.79%			1.6
50	Pool 1			30			6.00%	1.8	
80	Riffle End 1	145							
225	Riffle Beginning 1				2.10%				
263	Glide 2		75			-2.80%			2.1
300	Pool 2			40			6.00%	2.4	
340	Riffle End 2	110							
450	Riffle Beginning 2				2.20%				
506	Culvert Exit								
546	Culvert Entrance								
623	End Glide 3		77			-1.27%			1.0
700	Pool 3			35			6.00%	2.1	
735	Riffle End 3	130							
865	Riffle Beginning 3				3.00%				
913	Glide 4		95			-1.89%			1.8
960	Pool 4			35			6.00%	2.1	
995	Riffle End 4	65							
1060	Riffle Beginning 4				3.00%				
1105	Glide 5		90			-2.00%			1.8
1150	Pool 5			35			6.00%	2.1	
1185	Riffle End 5	75							
1260	Riffle Beginning 5				3.00%				
1330	Glide 6		140			-2.36%			3.3
1400	Pool 6			60			6.00%	3.6	
1460	Riffle End 6	90							
1550	Riffle Beginning 6				3.00%				
1613	Glide 7		125			-2.40%			3.0
1675	Pool 7			55			6.00%	3.3	
1730	Riffle End 7	70							
1800	Riffle Beginning 7				3.00%				
1850	Glide 8		100			-2.70%			2.7
1900	Pool 8			50			6.00%	3.0	
1950	Riffle End 8	100							
2050	Riffle Beginning 8				3.00%				
2100	Glide 9		100			-2.70%			2.7
2150	Pool 9			50			6.00%	3.0	
2200	Riffle End 9	100							
2300	Riffle Beginning 9				2.50%				
2338	Glide 10		75			-2.80%			2.1
2375	Pool 10			40			6.00%	2.4	
2415	Riffle End 10	65							
2480	Riffle Beginning 10				2.80%				

Station	ID	Riffle Length (ft)	Glide Length (ft)	Headin Length (ft)	Riffle Slope (%)	Glide Slope (%)	Headin Slope (%)	Pool Depth (ft)	Avg. Glide Depth (ft)
2480	Riffle Beginning 10				2.80%				
2515	Glide 11		70			-3.00%			2.1
2550	Pool 11			40			6.00%	2.4	
2590	Riffle End 11	75							
2665	Riffle Beginning 11				2.80%				
2745	Glide 12		160			-1.69%			2.7
2825	Pool 12			50			6.00%	3.0	
2875	Riffle End 12	100							
2975	Riffle Beginning 12				2.00%				
3038	Glide 13		125			-2.16%			2.7
3100	Pool 13			50			6.00%	3.0	
3150	Riffle End 13	100							
3250	Riffle Beginning 13				2.60%				
3313	Glide 14		125			-2.16%			2.7
3375	Pool 14			50			6.00%	3.0	
3425	Riffle End 14	125							
3550	Riffle Beginning 14				2.80%				
3613	Glide 15		125			-2.16%			2.7
3675	Pool 15			85			3.53%	3.0	
3760	Riffle End 15	80							
3840	Riffle Beginning 15				2.40%				
3895	Glide 16		110			-1.64%			1.8
3950	Pool 16			35			6.00%	2.1	
3985	Riffle End 16	80							
4065	Riffle Beginning 16				2.40%				
4120	Glide 17		110			-2.18%			2.4
4175	Pool 17			45			6.00%	2.7	
4220	Riffle End 17	50							
4270	Riffle Beginning 17				2.50%				
4298	Glide 18		55			-1.64%			0.9
4325	Pool 18			20			6.00%	1.2	
4345	Riffle End 18	45							
4390	Riffle Beginning 18				2.40%				
4400	Glide 19		20			-7.50%			1.5
4410	Pool 19			30			6.00%	1.8	
4440	Riffle End 19	40							
4480	Riffle Beginning 19				2.50%				
4515	Glide 20		70			-3.86%			2.7
4550	Pool 20			50			6.00%	3.0	
4600	Riffle End 20	75							
4675	Riffle Beginning 20				2.40%				
4763	Glide 21		175			-1.03%			1.8
4850	Pool 21			35			6.00%	2.1	
4885	Riffle End 21	80							
4965	Riffle Beginning 21				1.80%				

REV	DATE	DESCRIPTION
C	06/16/16	ISSUED FOR CONSTRUCTION
B	03/18/16	ISSUED FOR PERMITTING
A	02/09/16	ISSUED FOR PERMITTING

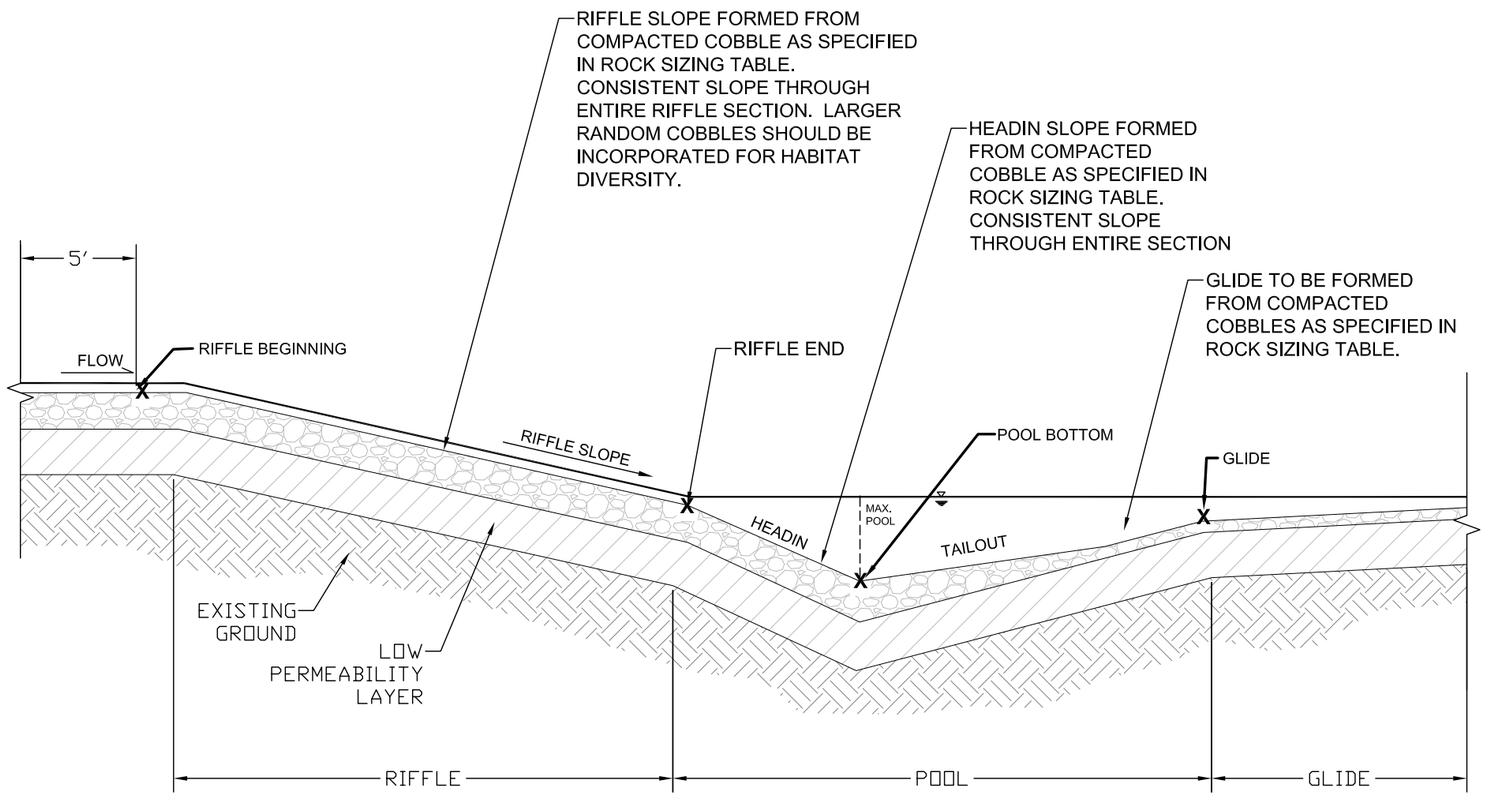
PREPARED BY
ECOLOGICAL RESOURCES CONSULTANTS, INC
35715 US HIGHWAY 40, SUITE D204
EVERGREEN, CO 80439

CLIENT
SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
CENTERLINE STREAM PROFILE AND TABLE

SHEET NO
04



RIFFLE–POOL–GLIDE PROFILE

NTS

ROCK SIZING TABLE	
	Minimum Diameter D_{50} (inches)
Riffle	4
Headin	6
Glide	1

NOTES:

1. FOR SPECIFIC DETAILS ON THE INDIVIDUAL RIFFLE-POOL-GLIDE SECTIONS THROUGHOUT THE CHANNEL SEE SHEETS 03 AND 05.
2. ADDITIONAL FILL MAY BE PLACED BETWEEN COBBLE AND LOW PERMEABILITY LAYERS.

REV	DATE	DESCRIPTION
B	03/18/16	ISSUED FOR PERMITTING
A	02/09/16	ISSUED FOR PERMITTING

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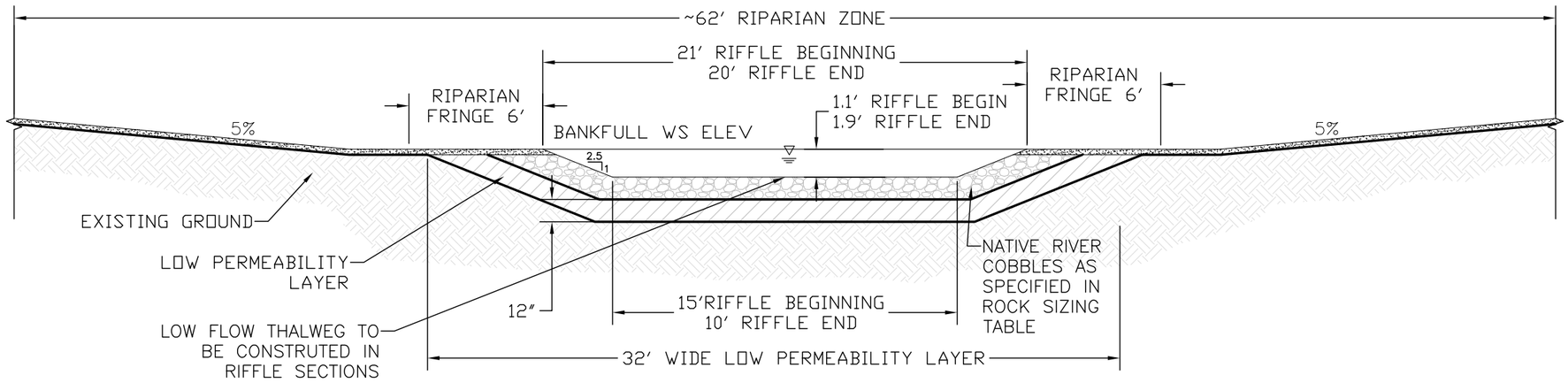
CLIENT: SUMMIT COUNTY OPEN SPACE AND TRAILS

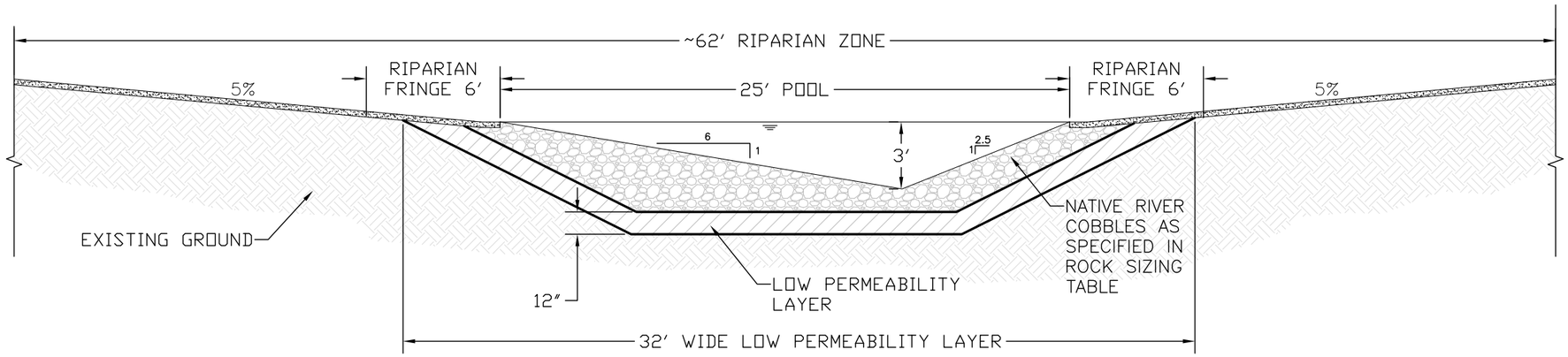
PROJECT: SWAN RIVER RESTORATION PROJECT

TITLE: RIFFLE-POOL-GLIDE PROFILE

SHEET NO: 05



3 TYPICAL RIFFLE SECTION
nts



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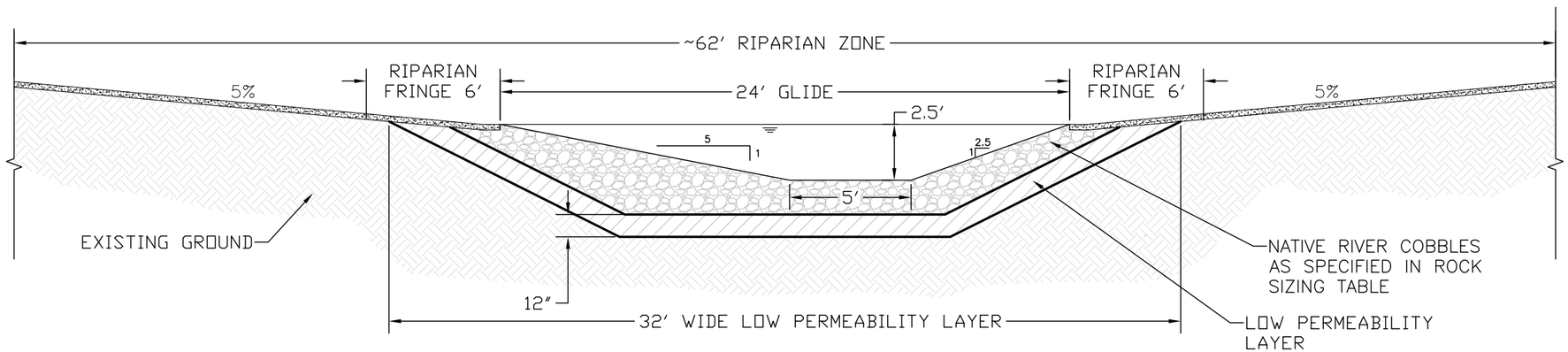

5 TYPICAL GLIDE SECTION
nts

NOTES:

1. FOR SPECIFIC DETAILS ON THE INDIVIDUAL RIFFLE-POOL-GLIDE SECTIONS THROUGHOUT THE CHANNEL SEE SHEET 04.
2. ADDITIONAL FILL MAY BE PLACED BETWEEN COBBLE AND LOW PERMEABILITY LAYERS.

REV	DATE	DESCRIPTION
B	03/18/16	ISSUED FOR PERMITTING
A	02/09/16	ISSUED FOR PERMITTING

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SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
RIFFLE-POOL-GLIDE SECTIONS

SHEET NO
06

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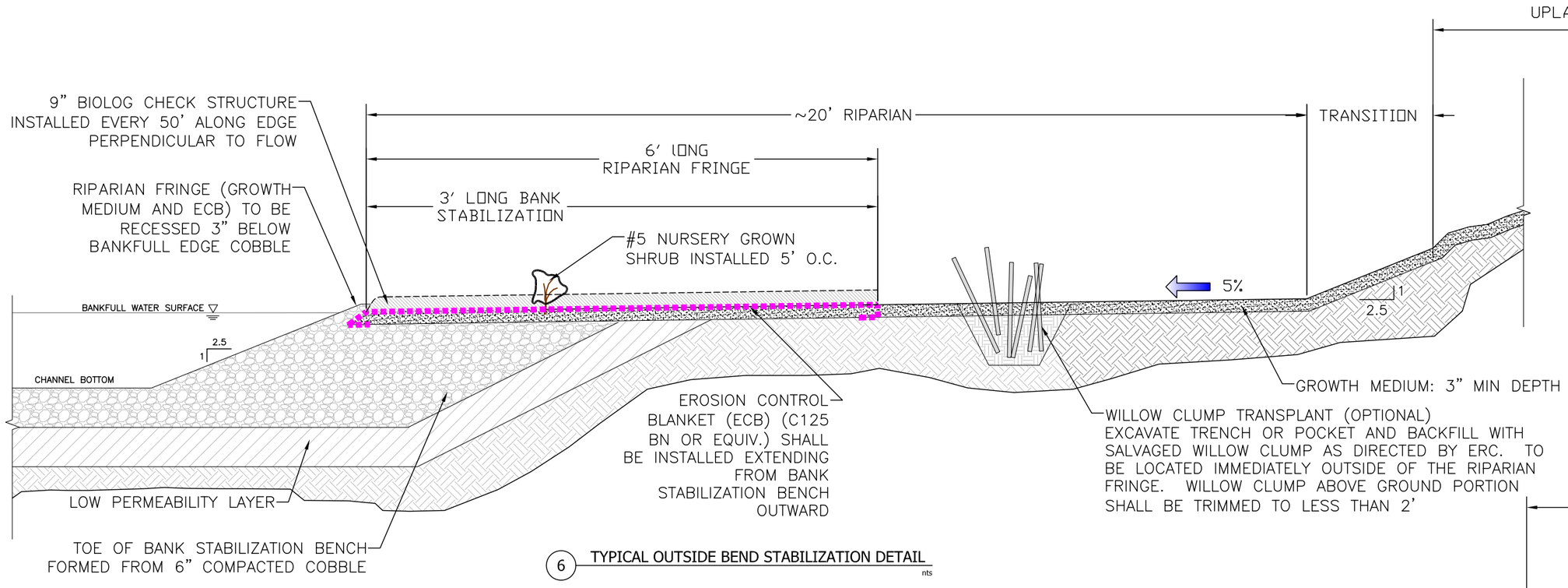
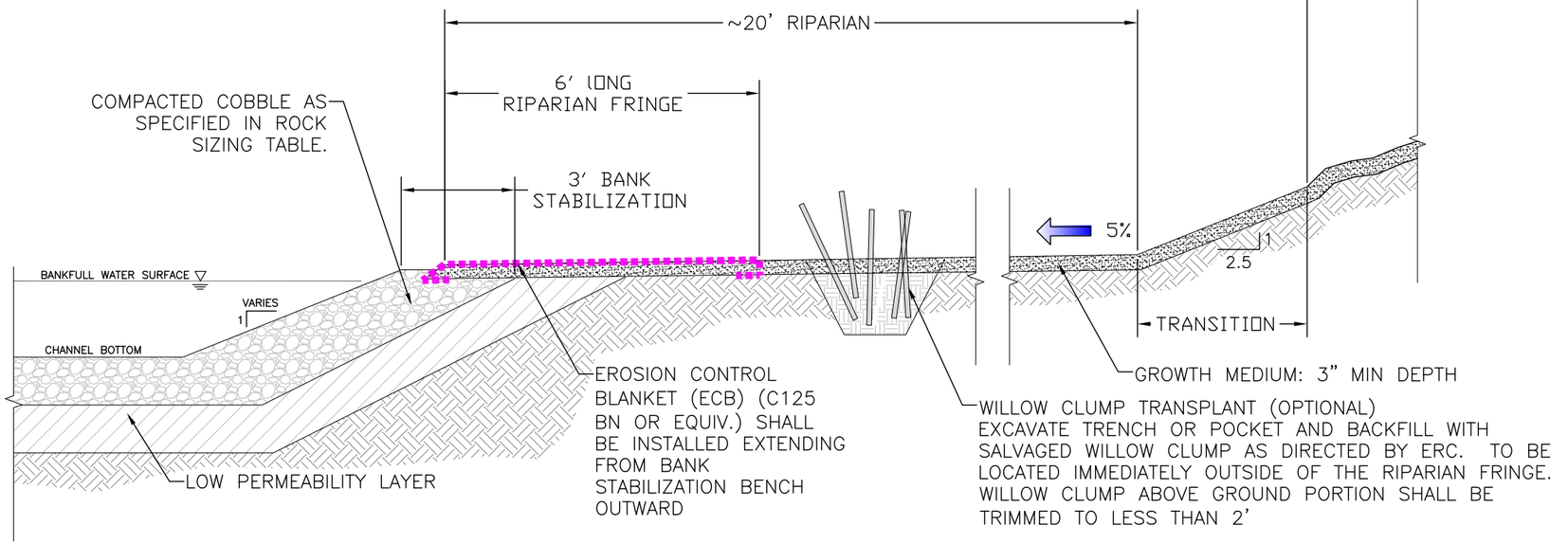


6 TYPICAL OUTSIDE BEND STABILIZATION DETAIL
nts



7 TYPICAL INSIDE BEND AND STRAIGHT SECTION BANK STABILIZATION DETAIL
nts

REV	DATE	DESCRIPTION
B	03/18/16	ISSUED FOR PERMITTING
A	02/09/16	ISSUED FOR PERMITTING

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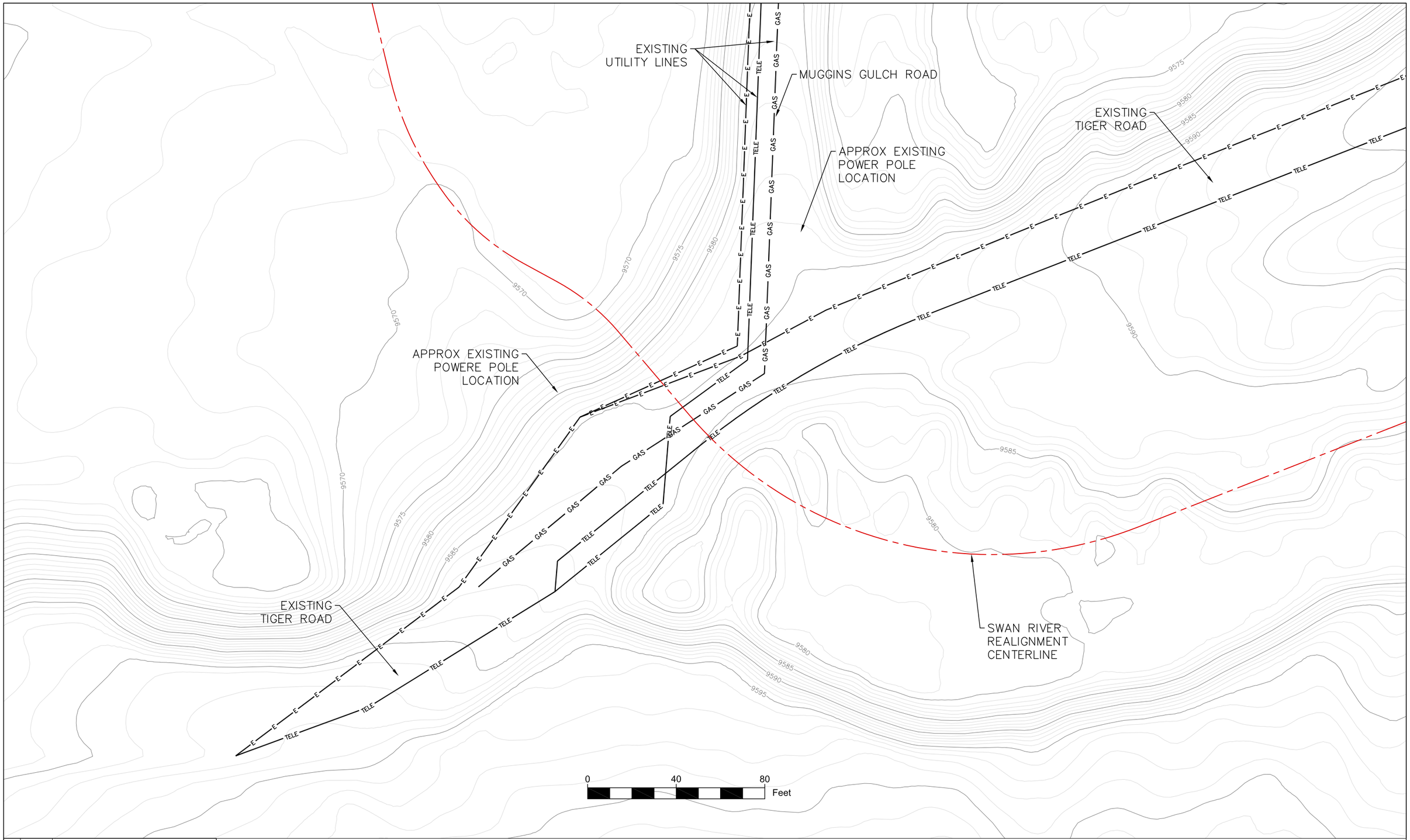
EVERGREEN, CO 80439

CLIENT: SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT: SWAN RIVER RESTORATION PROJECT

TITLE: BANK STABILIZATION

SHEET NO: 07



REV	DATE	DESCRIPTION
A	03/25/16	ISSUED FOR UTILITIES & BRIDGE DESIGN

PREPARED BY
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PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
EXISTING UTILITY ROUTING

SHEET NO
08A

C:\Users\Lisa\Dropbox (ERC Colorado)\ERC\01 PROJECTS\1035 Summit County\1501 Swan River\02 ACAD\Construction Dwgs\08-Utilities.dwg, 6/16/2016 9:31:32 AM

EXISTING UTILITY LINES

MUGGINS GULCH ROAD

EXISTING TIGER ROAD

APPROX EXISTING POWER POLE LOCATION

TEMPORARY BURIED ELECTRICAL AND GAS LINES

APPROX EXISTING POWERE POLE LOCATION

EXISTING TIGER ROAD

TIGER ROAD DETOUR

SWAN RIVER REALIGNMENT CENTERLINE

TEMPORARY BURIED TELEPHONE LINE

0 40 80 Feet

REV	DATE	DESCRIPTION
A	03/25/16	ISSUED FOR UTILITIES & BRIDGE DESIGN

PREPARED BY
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PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
TEMPORARY UTILITY ROUTING

SHEET NO
08B

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EXISTING UTILITY LINES

MUGGINS GULCH ROAD

EXISTING TIGER ROAD

APPROX EXISTING POWER POLE LOCATION

APPROX EXISTING POWERE POLE LOCATION

EXISTING TIGER ROAD

SWAN RIVER REALIGNMENT CENTERLINE

0 40 80 Feet

REV	DATE	DESCRIPTION
A	03/25/16	ISSUED FOR UTILITIES & BRIDGE DESIGN

PREPARED BY
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EVERGREEN, CO 80439

CLIENT
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PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
PERMANENT UTILITY ROUTING

SHEET NO
08C

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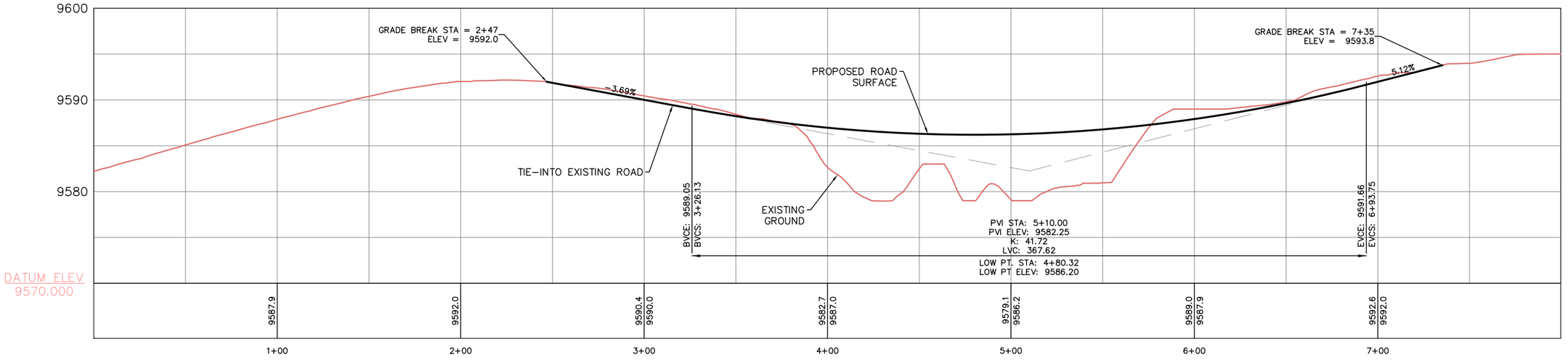

REV	DATE	DESCRIPTION
A	03/25/16	ISSUED FOR UTILITIES & BRIDGE DESIGN

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EVERGREEN, CO 80439

CLIENT
SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
TIGER ROAD DETOUR PLAN & PROFILE

SHEET NO
09

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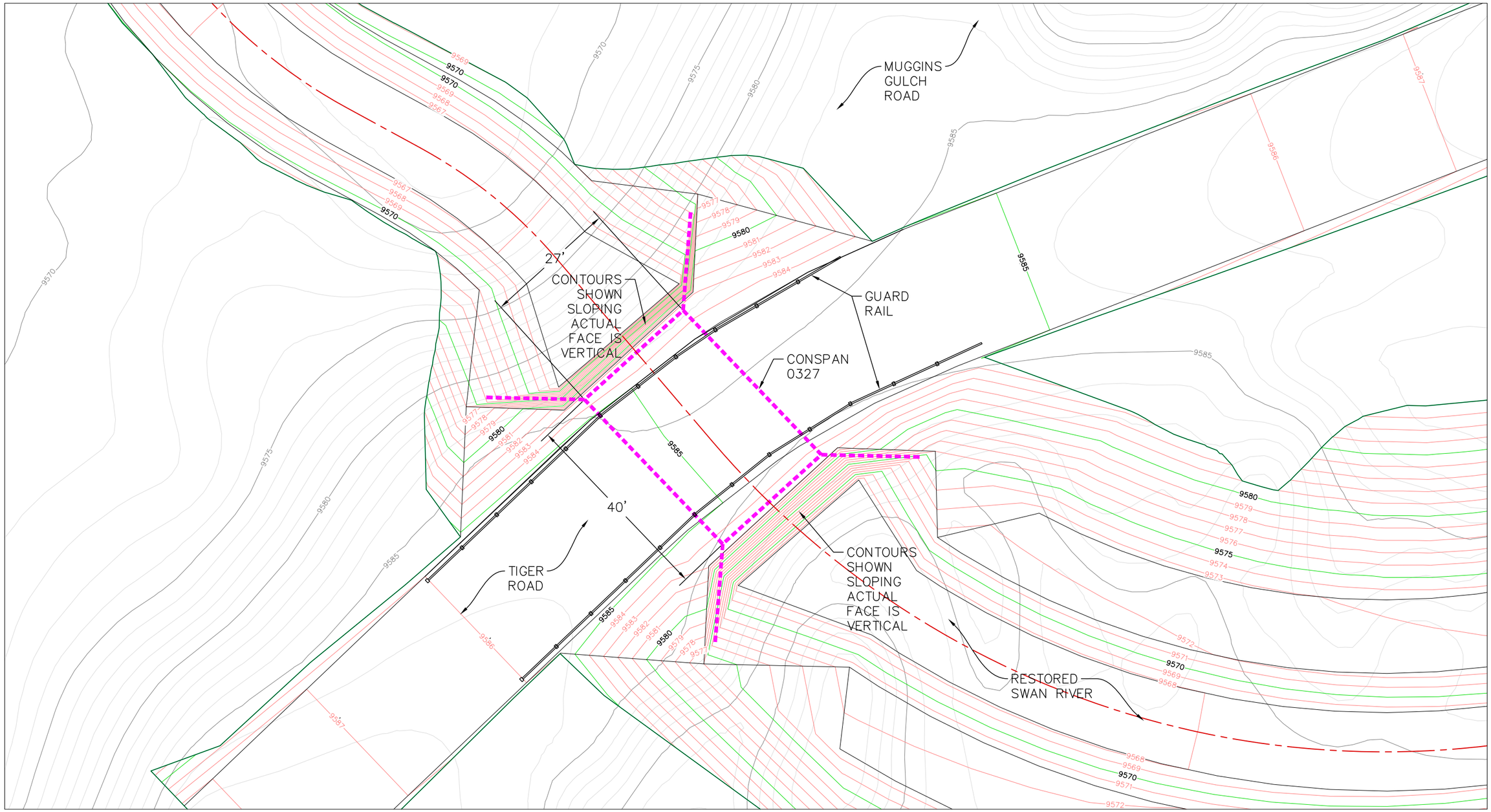

REV	DATE	DESCRIPTION
B	05/17/16	ISSUED FOR CONSPAN DESIGN
A	03/31/16	ISSUED FOR DISCUSSION

PREPARED BY
ECOLOGICAL RESOURCES CONSULTANTS, INC
35715 US HIGHWAY 40, SUITE D204
EVERGREEN, CO 80439

CLIENT
SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
CONSPAN PLAN

SHEET NO
10

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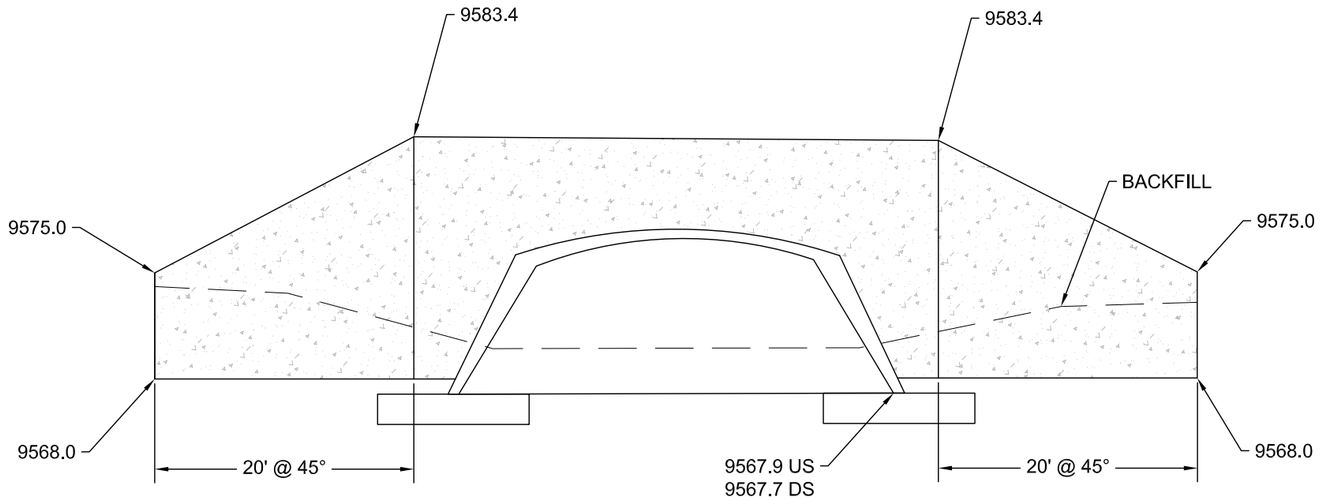
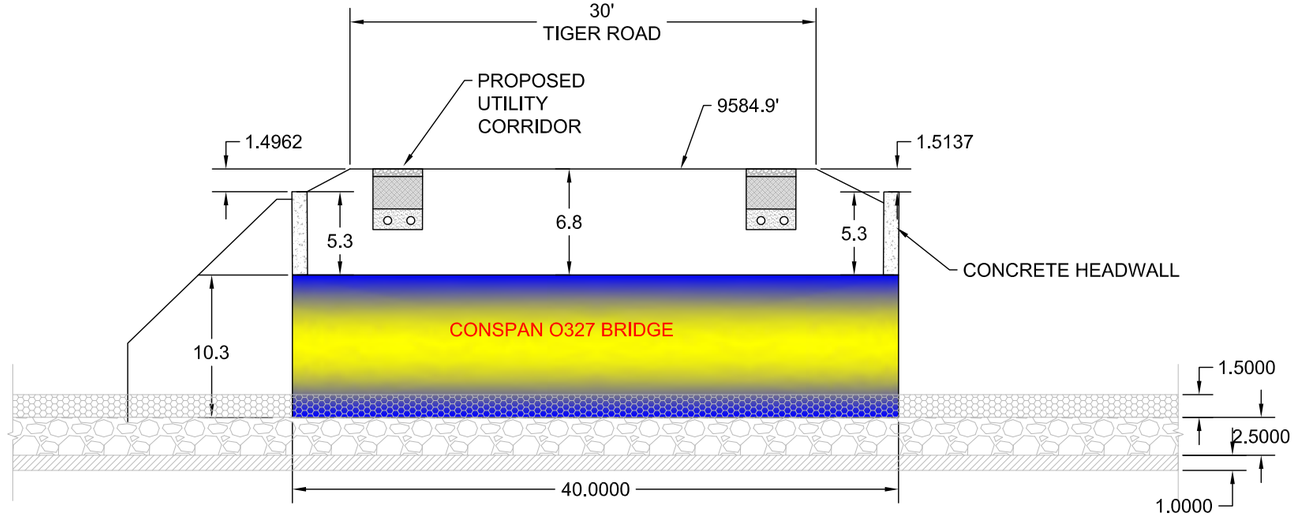


1 HEADWALL ELEVATION



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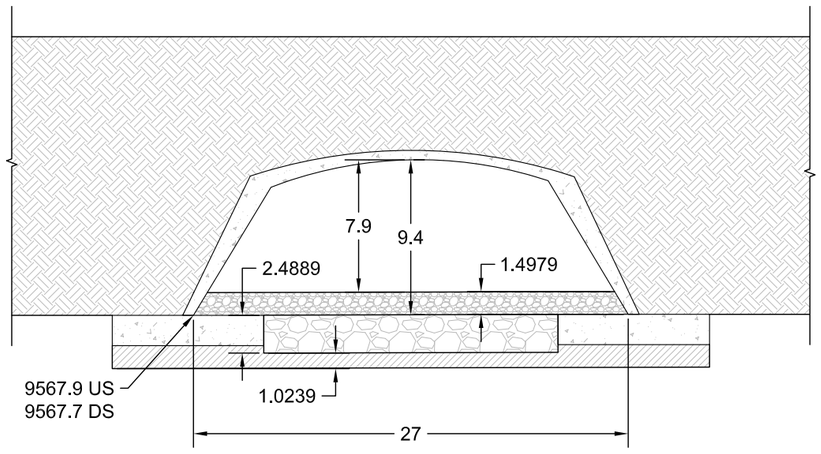

3 CONSPAN SECTION

REV	DATE	DESCRIPTION
B	05/17/16	ISSUED FOR CONSPAN DESIGN
A	03/25/16	ISSUED FOR UTILITIES & BRIDGE DESIGN

PREPARED BY
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EVERGREEN, CO 80439

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PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
CONSPAN DETAILS

SHEET NO
11

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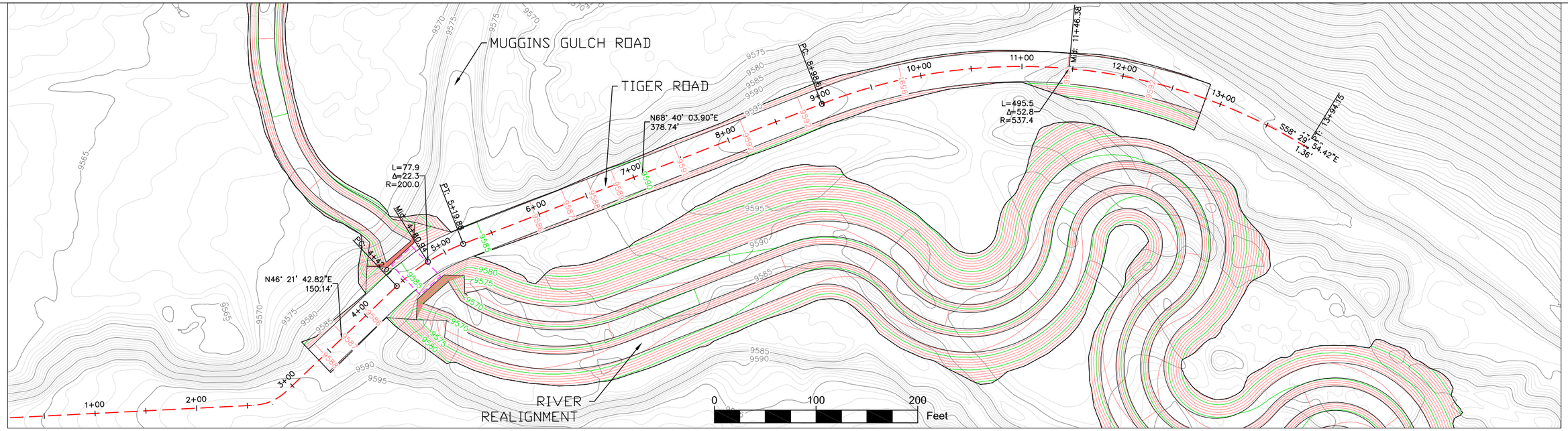

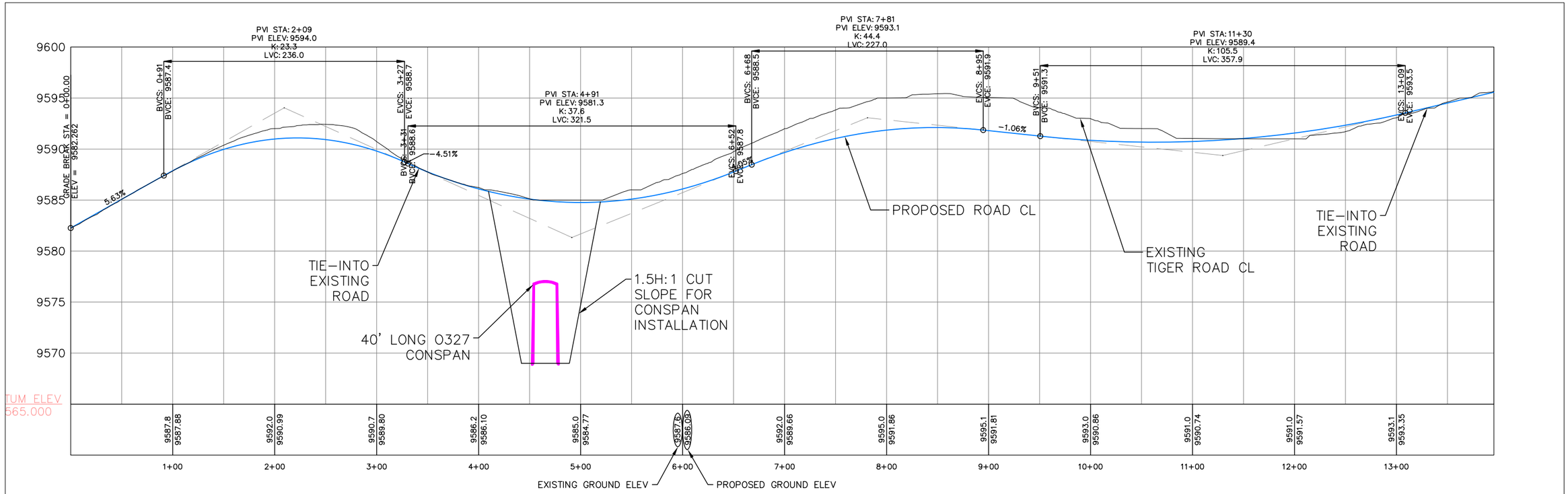

REV	DATE	DESCRIPTION
C	06/10/16	CORRECTED PROFILE BAND ELEVATIONS
B	06/08/16	HORIZONTAL ALIGNMENT LAYOUT INFO
A	03/31/16	ISSUED FOR DISCUSSION

PREPARED BY
ECOLOGICAL RESOURCES CONSULTANTS, INC
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EVERGREEN, CO 80439

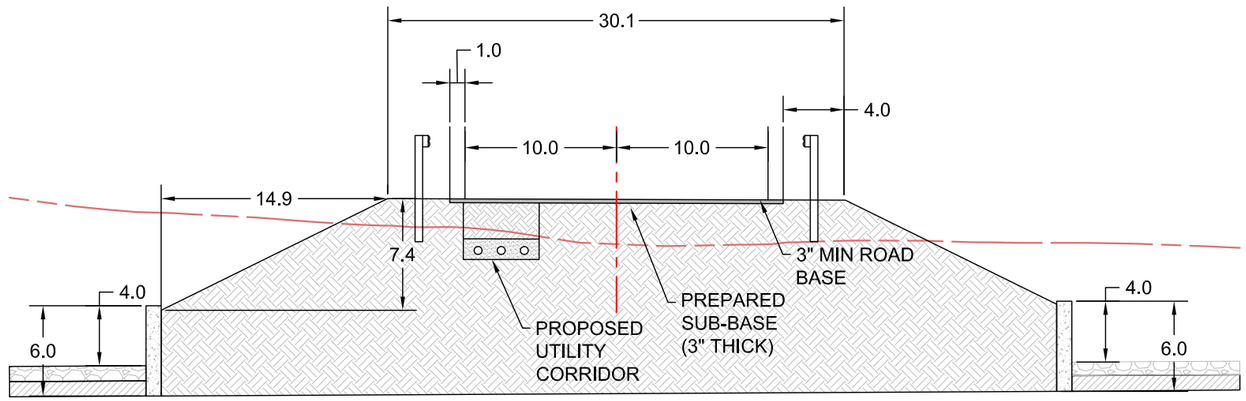
CLIENT
SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT
SWAN RIVER RESTORATION PROJECT

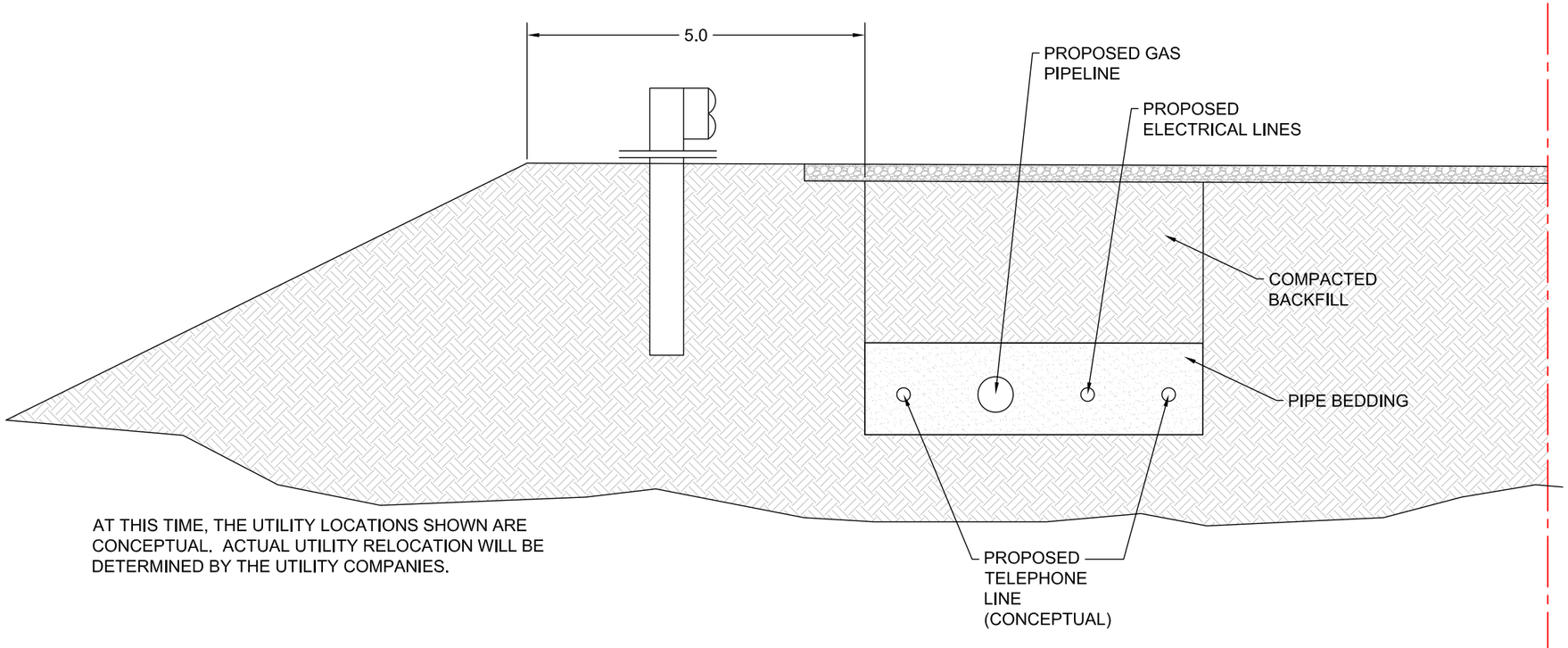
TITLE
TIGER ROAD MODIFICATION PLAN AND PROFILE

SHEET NO
12

C:\Users\Lisa\Dropbox (ERC Colorado)\ERC\01 PROJECTS\1035 Summit County\1501 Swan River\02 ACAD\Construction Dwgs\12-Tiger Rd Realignment.dwg, 6/10/2016 10:05:30 AM



1 SECTION THRU TIGER RD AT HEADWALL END



2 SECTION THRU UTILITY TRENCH

ROAD BASE GRADATION	
Standard Sieve Size	% Passing by Weight
3/4"	100%
No. 4	30-60%
No. 8	25-55%
No. 200	8-15%

SUB-BASE GRADATION	
Standard Sieve Size	% Passing by Weight
1-1/2"	100%
1"	95-100%
No. 4	30-70%
No. 200	5-12%

Compaction of Sub-base or Base Course: The sub-base or base course shall be placed and spread in a uniform layer and without segregation of size to a depth not exceeding 8" of uncompacted material. The material will be compacted to at least 95% of the maximum dry density at +/- 2% of optimum moisture content as determined by ASTM D698.

Pipe bedding shall be $\frac{3}{4}$" max screened rock.

Bedding material shall be spread and the surface graded to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints.

After each pipe has been aligned, placed in the final position on the bedding material, and shoved home, sufficient bedding material shall be deposited and compacted under and around each side of the pipe and back of the bell or end to hold the pipe in proper position and alignment during subsequent pipe jointing and embedding operations. Bedding material shall be deposited and compacted uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

Bedding shall be compacted to the top of the pipe in all areas where compacted backfill is specified.

Compacted backfill shall consist of suitable job excavated material, finely graded and free from debris, organic material, cinders, snow, ice, or other unsuitable materials, and stones larger than 3" in greatest dimension. Masses of moist, stiff clay shall not be used. Job excavated materials shall be placed in uniform layers not exceeding 8" in uncompacted thickness. The method of compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe.

Job excavated material shall be compacted to at least 90% of the maximum dry density at +/- 2% of optimum moisture content as determined by ASTM D698, except for the final 2' which will be compacted to at least 95% of the maximum dry density at +/- 2% of optimum moisture content as determined by ASTM D698.

Compacted backfill is required for the full depth of the trench above bedding beneath driveways, parking areas, roads, rec paths, or other construction or structures, or beneath fills or embankments.

REV	DATE	DESCRIPTION
B	06/22/16	RE-ISSUED TO ADD NOTE & REVISE DIMENSIONS
A	03/25/16	ISSUED FOR UTILITIES & BRIDGE DESIGN

PREPARED BY
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35715 US HIGHWAY 40, SUITE D204
EVERGREEN, CO 80439

CLIENT
SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
TIGER ROAD SECTIONS

SHEET NO
13

NOTES AND SPECIFICATIONS

A. GENERAL

A.1. This Plan has been prepared on behalf of Summit County Open Space and Trails.

A.2. This Plan has been prepared as a design-build project by Ecological Resource Consultants, Inc and Tezak Heavy Equipment (ERC/Tezak). Only key design elements and specifications are provided. These plans do not contain sufficient detail for construction from an unsupervised or independent construction group. All design layout, control datum and proposed elevations will require verification by ERC/Tezak.

A.3. Every effort shall be made during construction activity to minimize disturbance to the fishery and environment. This project requires authorization from the US Army Corps of Engineers. The Plan and construction activities are subject to the special conditions of the Permit. Project and construction activities shall comply with all other required permits. Per standard Colorado Division of Parks and Wildlife (CPW) best management practices, all heavy equipment working in the stream or around water shall be cleaned prior to site mobilization to prevent the spread of exotic or destructive aquatic nuisances and terrestrial weed species. All mud and debris shall be removed from equipment and parts (tracks, turrets, buckets, teeth, etc.) by hand scraping and power washing. All heavy equipment parts must be thoroughly sprayed and remain moist for at least 10 minutes with 1:15 solution of SPARQUAT industrial cleaner or water that is greater than 140 degrees F. All heavy equipment shall be inspected and approved by ERC prior to water entry.

A.4. All construction equipment working in or near the water shall be safe, clean and in exceptional operational condition. All equipment shall be inspected daily for any potential spills/leaks or mechanical problems prior to working in the water . All equipment shall be cleaned of any excess greases/oils and dirt daily prior to water entry. High pressure washing of construction equipment may be necessary daily and must be performed onsite in a pre-approved location.

A.5. Utility locates shall be established throughout the project area a minimum of five days prior to construction start date and updated during the project as needed. Utility Notification Center of Colorado 1-800-922-1987 or 811.

B. PROJECT INITIATION

B.1. ERC/Tezak shall field flag, stake and rope-off the limits of disturbance within the project area prior to commencement of construction as necessary. Markers shall be maintained until construction is completed. Any activity that impacts water of the US outside of the authorized impact areas per the Permit is prohibitive.

B.2. Plant material to be salvaged shall be clearly identified by ERC/Tezak prior to clearing and grubbing. Such plant material identified for salvage shall be removed and stored prior to clearing and grubbing. An excavator shall be used to collect plant material in a manner which preserves the rootball.

B.3. Salvaged plant material shall be temporarily stored on site.

B.4. All surface objects, trees, stumps, roots, and other protruding obstructions not designated to remain shall be cleared and grubbed as required. Smaller branches and trees shall be stripped, stockpiled and disposed of as required. Larger diameter logs and rootwads can be incorporated as non-structure habitat features within the stream, riparian fringe as determined by ERC/Tezak. Any such habitat features shall be appropriately located and adequately secured/anchored as directed by ERC/Tezak.

C. SEDIMENT CONTROL

C.1 Appropriate measures to prevent and minimize degradation to on-site and off-site waterways shall be implemented during construction activities. Specifically the following measures shall be implemented to minimize to the maximum extent feasible suspended sediments and turbidity:

- A downstream sediment dam constructed from clean cobble,rock or riprap shall be installed across the Swan River below all construction activities. The sediment dam shall be inspected and maintained as required.

- Emergency leak/spill containment and cleanup supplies must be stored onsite prior to the presence of any construction equipment working in flowing water. Leak/spill containment booms or similar must be installed downstream of all construction equipment working in flowing water. The emergency leak/spill containment supplies must be adequate to contain potential leak or spill from construction equipment onsite. All site employees must have knowledge of emergency leak/spill response measures.

C.2. All measures as outlined in the Colorado stormwater discharge permit shall be implemented, routinely inspected and maintained during the project as required. Final stabilization requirements for stormwater construction permit termination shall be transferred and become responsibility of the Summit County Open Space and Trails upon approved implementation of the site reclamation.

D. MATERIAL SPECIFICATIONS

D.1 Low Permeability Layer shall consist of a mixture of soil particle sizes. The maximum stone shall be 4" and there shall be at least 25% fines content (percent passing the US Number 200 sieve). The material shall be uniformly graded with various particle sizes incorporated into the mixture. The low permeability material mixture will most likely consist of a processed material using on-site soils and gravels as the source of raw materials. The Low Permeability soils will either be screened or generated by crushing on-site dredge materials.

D.2 Low Permeability material shall be placed in a single 1 foot compacted lift. The materials shall be compacted as directed by the field engineer.

D.3 Before placement of the Low Permeability layer, samples of prospective materials shall be collected and subjected to grain sizing analysis and Atterberg Limits testing. Testing of proposed material shall be completed as necessary to confirm the material conforms to the specifications prior to placing in the channel.

D.4 Once construction of the Low Permeability commences, placement of the material shall be visually monitored to ensure adequate compaction is being achieved and to visually observe for any changes in the material that may be outside of the required particle size limits as specified previously.

REV	DATE	DESCRIPTION
B	03/18/16	ISSUED FOR PERMITTING
A	02/09/16	ISSUED FOR PERMITTING

PREPARED BY
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35715 US HIGHWAY 40, SUITE D204
EVERGREEN, CO 80439

CLIENT
SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
NOTES AND SPECIFICATIONS

SHEET NO
14

ROCK SEDIMENT CONTROL DAM

MUGGINS GULCH ROAD

SF OR EROSION LOG

PROPOSED CONSPAN

PROPOSED SWAN RIVER REALIGNMENT

TIGER ROAD

TRANSITION

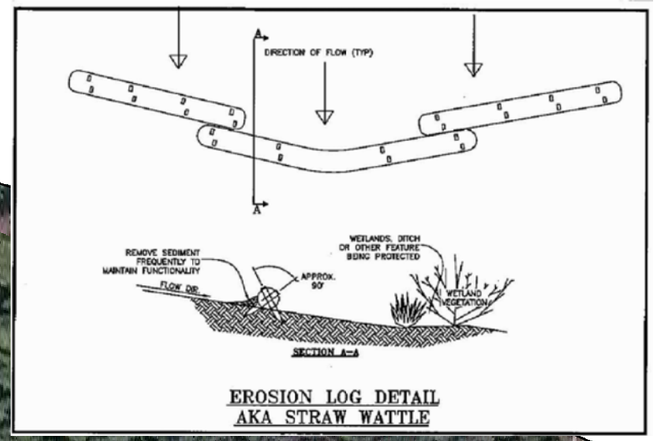
NORTH FILL AREA

RIPARIAN ZONE

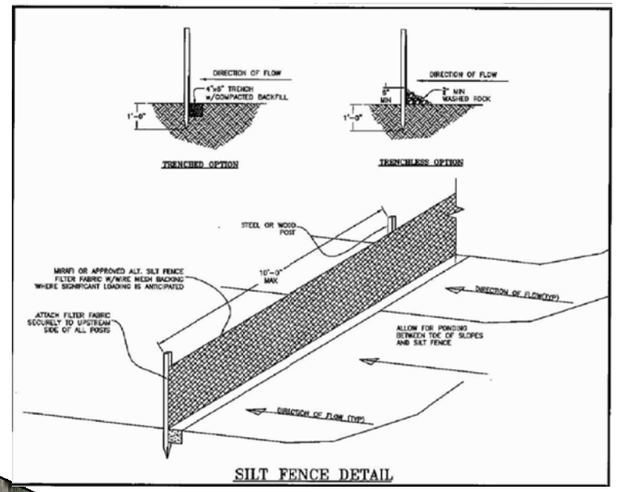
SOUTH FILL AREA

NEW CONSTRUCTED CHANNEL

NORTH FILL AREA



EROSION LOG DETAIL
AKA STRAW WATTLE



SILT FENCE DETAIL

1 EROSION CONTROL PLAN

0 200 400 Feet

REV	DATE	DESCRIPTION
A	5/24/16	ISSUED FOR EROSION CONTROL PLAN

PREPARED BY
ECOLOGICAL RESOURCES CONSULTANTS, INC
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EVERGREEN, CO 80439

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PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
EROSION CONTROL PLAN

SHEET NO
E1

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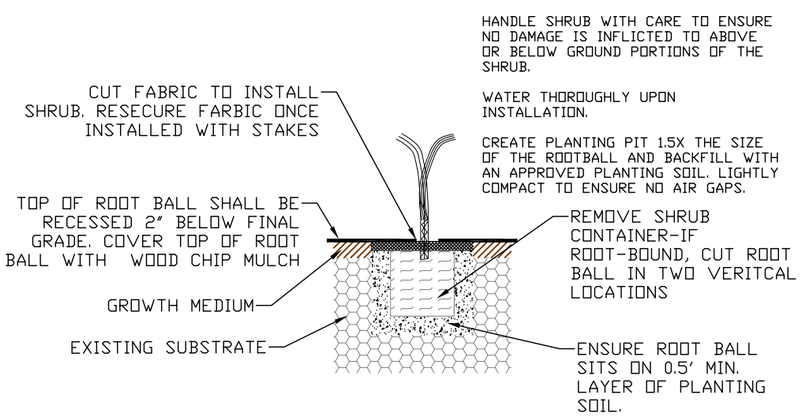


9 SHRUB PLANTING TYPICAL DETAIL

A. GROWTH MEDIUM

A.1. All designated Upland (including Transition) and Riparian Zone reclamation areas require the placement of a growth medium. Table 4 provides an estimate of growth medium quantity required. Two Growth Medium options have been developed for this Plan. Selected option will be determined based on project funding and availability of products as well as final approval by ERC and Summit County.

A.2. Growth Medium Option 1: Option 1 shall generally consist of on-site processed fine grained mineral soil screened to $\frac{3}{4}$" minus. As much as possible, mineral soils shall be free of any obvious weeds. It is assumed that local wood chips will be available and provided by the County. Wood chips shall be combined and thoroughly mixed into the mineral soil stockpile. Wood chips shall be added at a minimum rate of 5% to a maximum of rate 10% of the total volume of mineral soil. Approximately 400 cubic yards of wood chips shall be incorporated. After all Growth medium surface application, soil amendments shall be incorporated. Soil amendments shall include a mixture of organic fertilizer, mycorrhizae and humates. Richlawn 7-2-1 custom blend or similar is recommended and shall be determined based on soil nutrient laboratory analysis. Produced mineral soil shall be analyzed for organic and nutrient content to determine appropriate amendment ratios. Until laboratory analysis confirmation application rates are assumed at 1,500 pounds per acre. ERC to confirm final soil amendments prior to application.

A.3. Growth Medium Option 2. Option 2 shall generally consist of on-site processed fine grained mineral soil screened to 3/4" minus. As much as possible, mineral soils shall be free of any obvious weeds. Mineral soil shall be mixed with 20% blend by volume of unscreened High County Compost. High County Compost is available from Summit County Resource Allocation Park. Total volume of growth medium shall consist of 80% mineral soil and 20% compost. Mineral soil and Compost shall be thoroughly mixed prior to surface application.

A.4. Growth medium shall be evenly applied, loose, not compacted and free of clods to specified depths. Growth medium depths shall be confirmed by ERC upon surface application.

B. UPLAND RECLAMATION

B.1. Upland (including Transition) areas shall have a minimum depth of 3" of growth medium in place prior to seeding.

B.2. All areas designated as Uplands (including Transition) shall be seeded with the **Upland Seed Mix (Table 1)**. Upland Seed Mix shall be distributed by broadcast (or drill) methods in two opposite directions across the area. Seed shall be lightly incorporated into the growth medium by chain drag, drill , hydro-seeding or similar method to ensure adequate soil to seed contact.

B.3. All upland reclamation areas shall be stabilized with hydro-mulch. The use of wood fiber hydro-mulch shall be applied at a rate of 2000 pounds per acre. All hydro-mulch shall also include a mulch tackifer consisting of organic, non-toxic, free-flowing, non-corrosive material. Hydro-mulch shall cover all seeded areas with a uniform surface layer. Seeding shall not occur as part of hydro-mulch applications. An estimated 25,400 pounds of hydro-mulch is required to stabilize approximately 12.7 acres of Uplands (including Transition) within the project area. Water for hydro-mulch application is assumed available at the project site.

C. RIPARIAN ZONE RECLAMATION

C.1. Riparian Zone areas shall have a minimum depth of 3" of growth medium in place prior to seeding.

C.2. All areas designated as Riparian Zone shall be seeded with the **Riparian Seed Mix (Table 2)**. Riparian Seed Mix shall be distributed by broadcast (or drill) methods in two opposite directions across the area. Seed shall be lightly incorporated into the growth medium by chain drag, drill, hydro-seeding or similar method to ensure adequate soil to seed contact.

C.3. The Riparian Fringe within the Riparian Zone shall be stabilized by covering the surface with erosion control blanket extending a distance of 6 feet from the bankfull edge towards the Upland. The use of an extended-term (18-24-month) double net biodegradable natural fiber fabric such as North American Green Bionet C125BN or other equivalent product shall be installed. No polyproplylene netting structure shall be used. All fabric shall be installed per manufacture's specifications, trenched and secured with biodegradable stakes. All products shall be approved by ERC prior to site delivery.

- **Refer to Outside Bend Typical Detail.**

C.4. Outside Bend Riparian Fringe includes the installation nursery stock containerized native shrub plantings and/or transplanted material and willow staking. The **Riparian Shrub Planting Schedule (Table 3)** provides a list and quantities of species to be planted. Shrubs are proposed to be installed at approximately 5' on-center spacing along Outside Bend Riparian Fringe as field marked by ERC. Shrubs shall be installed per the **Shrub Planting Typical Detail**.

C.5. The Riparian Zone (outside of the Riparian Fringe) shall be stabilized with hydro-mulch. The use of wood fiber hydro-mulch shall be applied at a rate of 2000 pounds per acre. All hydro-mulch shall also include a mulch tackifer consisting of organic, non-toxic, free-flowing, non-corrosive material. Hydro-mulch shall cover all seeded areas with a uniform surface layer. Seeding shall not occur as part of hydro-mulch applications. An estimated 6,800 pounds of hydro-mulch is required to stabilize approximately 3.4 acres of Riparian Zone within the project area. Water for hydro-mulch application is assumed available at the project site.

D. Willow Transplants

D.1. Willow clumps shall be harvested on site and transplanted where feasible. Transplants shall be identified during initial construction efforts and transplant locations determined in the field by ERC. Willow clumps shall be harvested with an excavator salvaging the entire root ball (including any soil/cobble) and moved directly to transplant location. Prior to salvage, the above ground portion each shrub shall be trimmed to a height of 2'. Transplant locations may be at outside bends, along the riparian fringe (but not within the riparian fringe ECB) or at designated locations with appropriate hydrology. Salvaged willow clump root balls shall remain moist during transplant.

Table 1. Upland and Transition Seed Mix

Scientific Name	Common Name	% of Mix	PLS Req'd
Achnatherum hymenoides	Indian ricegrass	10	81
Bromus marginatus	mountain brome	20	354
Elymus trachycaulus	slender wheatgrass	20	143
Leymus cinereous	Great Basin Wildrye	5	44
Lupinus agenteus	silvery lupine	0.5	32
Pascopyrum smithii	western wheatgrass	25	258
Poa fendleriana	muttongrass	5	7
Festuca saximontana	Rocky Mountain fescue	15	33
Total UPLAND 1			**952**
Total UPLAND 2*			**514**

Notes:
Quantity assumes 200 seeds per square foot broadcast seeded.
*Quantity assumes UPLAND 1 **(13.0 acres)** of upland and transition reclamation.*
Completion of UPLAND 2 **(7.0 acres) full reclamation is pending.*
Final species composition and rates subject to availability.

Table 2. Riparian Seed Mix

Scientific Name	Common Name	% of Mix	PLS Req'd
Bromus marginatus	mountain brome	20	85
Calamagrostis canadensis	bluejoint	5	1
Deschampsia caespitosa	tufted hairgrass	10	2
Elymus trachycaulus	slender wheatgrass	25	43
Elymus canadensis	Canada wildrye	10	24
Pascopyrum smithii	western wheatgrass	25	62
Poa alpina	Alpine bluegrass	5	2
Total			**219**

Notes:
Quantity assumes 200 seeds per square foot broadcast seeded.
Quantity assumes 3.1 acres of riparian reclamation.
Final species composition and rates subject to availability.

Table 3. Shrub Planting Schedule

Scientific Name	Common Name	Outside Bends (5' O.C.)
Betula glandulosa	dwarf birch	75
Salix boothii	Booth's willow	110
Salix drummondiana	Drummond willow	110
Salix geyeriana	Geyer's willow	110
Salix monticola	park willow	75
Total		***480***

All shrubs #5-size nursery grown

Table 4 - Growth Medium Application Depths and Volumes

Type	Estimated Area (ac)	Depth (in)	Mineral Soil Volume (cy)
Upland 1	**13**	**3**	**5,250**
Riparian	**3.1**	**3**	**1,250**
TOTAL			**6,500**
Upland 2 *(Pending)*	**7.0**	**3**	**2850**

REV	DATE	DESCRIPTION
A	5/24/16	ISSUED FOR EROSION CONROL PLAN

PREPARED BY
ECOLOGICAL RESOURCES CONSULTANTS, INC
35715 US HIGHWAY 40, SUITE D204
EVERGREEN, CO 80439

CLIENT
SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
PLANTING AND SEEDING DETAILS

SHEET NO
E2

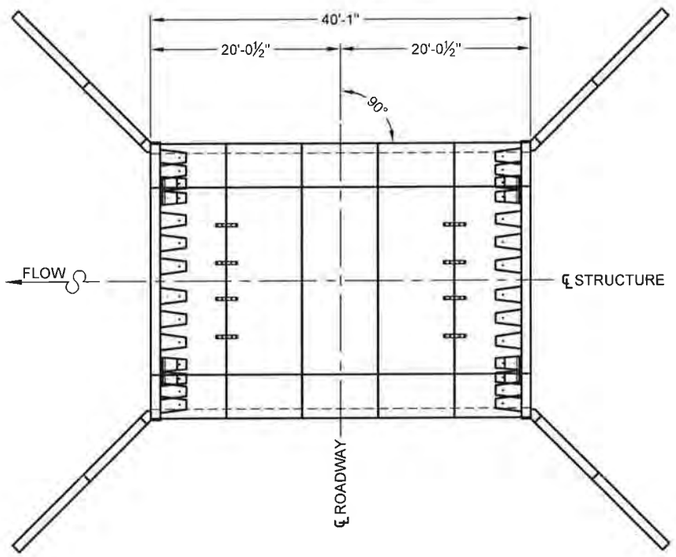
SWAN RIVER BRIDGE

SILVERTHORNE, COLORADO

NOTES

GENERAL NOTES:

1. THIS BRIDGE HAS BEEN DESIGNED FOR GENERAL SITE CONDITIONS. THE PROJECT ENGINEER SHALL BE RESPONSIBLE FOR THE STRUCTURE'S SUITABILITY TO THE EXISTING SITE CONDITIONS AND FOR THE HYDRAULIC EVALUATION -- INCLUDING SCOUR AND CONFIRMATION OF SOIL CONDITIONS
2. PRIOR TO CONSTRUCTION, CONTRACTOR MUST VERIFY ALL ELEVATIONS SHOWN THROUGH THE ENGINEER
3. ONLY CONTECH ENGINEERED SOLUTIONS LLC, THE CON/SPAN® APPROVED PRECASTER IN COLORADO MAY PROVIDE THE STRUCTURE DESIGNED IN ACCORDANCE WITH THESE PLANS
4. THE USE OF ANOTHER PRECAST STRUCTURE WITH THE DESIGN ASSUMPTIONS USED FOR THE CON/SPAN® STRUCTURE MAY LEAD TO SERIOUS DESIGN ERRORS USE OF ANY OTHER PRECAST STRUCTURE WITH THIS DESIGN AND DRAWINGS VOIDS ANY CERTIFICATION OF THIS DESIGN AND WARRANTY. CONTECH ENGINEERED SOLUTIONS LLC. ASSUMES NO LIABILITY FOR DESIGN OF ANY ALTERNATE OR SIMILAR TYPE STRUCTURES



LOCATION PLAN

NOT TO SCALE

DESIGN DATA

DESIGN LOADING:
- BRIDGE UNITS: HL-93
- HEADWALLS: DEAD LOAD + LIVE LOAD SURCHARGE
- WINGWALLS: DEAD LOAD + LIVE LOAD SURCHARGE

DESIGN FILL HEIGHT: 2'-0" MIN. TO 7'-0" MAX
FROM TOP OF CROWN TO TOP OF PAVEMENT
DESIGN METHOD (UNITS, HEADWALLS, WINGWALLS): LOAD RESISTANCE FACTOR DESIGN PER AASHTO LRFD SPECIFICATION
DESIGN METHOD (FOUNDATION): LOAD FACTOR DESIGN PER AASHTO STANDARD SPECIFICATION
ASSUMED NET ALLOWABLE BEARING CAPACITY: 4000 PSF *

*AT THE TIME OF DESIGN, A GEOTECHNICAL REPORT FOR THE PROJECT SITE WAS NOT AVAILABLE. IT IS THE PROJECT ENGINEER'S, OWNER'S AND/OR THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THAT THE ACTUAL SITE CONDITIONS AT THE TIME OF CONSTRUCTION ARE CONSISTENT WITH THE ASSUMED ALLOWABLE SOIL BEARING PRESSURE WITH A GEOTECHNICAL INVESTIGATION FROM A QUALIFIED GEOTECHNICAL ENGINEER

MATERIALS

PRECAST UNITS SHALL BE CONSTRUCTED AND INSTALLED IN ACCORDANCE WITH CON/SPAN® SPECIFICATIONS. CONCRETE FOR FOOTINGS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI. REINFORCING STEEL FOR FOOTINGS SHALL CONFORM TO ASTM A615 OR A996-GRADE 60.

COLORADO LICENSED
Michael G. Carfagno
42384
PROFESSIONAL ENGINEER

6-17-16

MARK	DATE	REVISION DESCRIPTION	BY

CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com
5670 Greenwood Plaza Blvd., Suite 530, Greenwood Village, CO 80111
800-526-3999 720-587-2700 720-587-2651 FAX

CON/SPAN® ⌀-SERIES

CONTRACT DRAWING

SWAN RIVER BRIDGE

SILVERTHORNE, COLORADO

PROJECT No	SEQ. No	DATE
528626	010	6/16/2016
DESIGNED: JAL	DRAWN: BTS	
CHECKED: DM	APPROVED: MGC	
SHEET NO: CT1 OF CT8		

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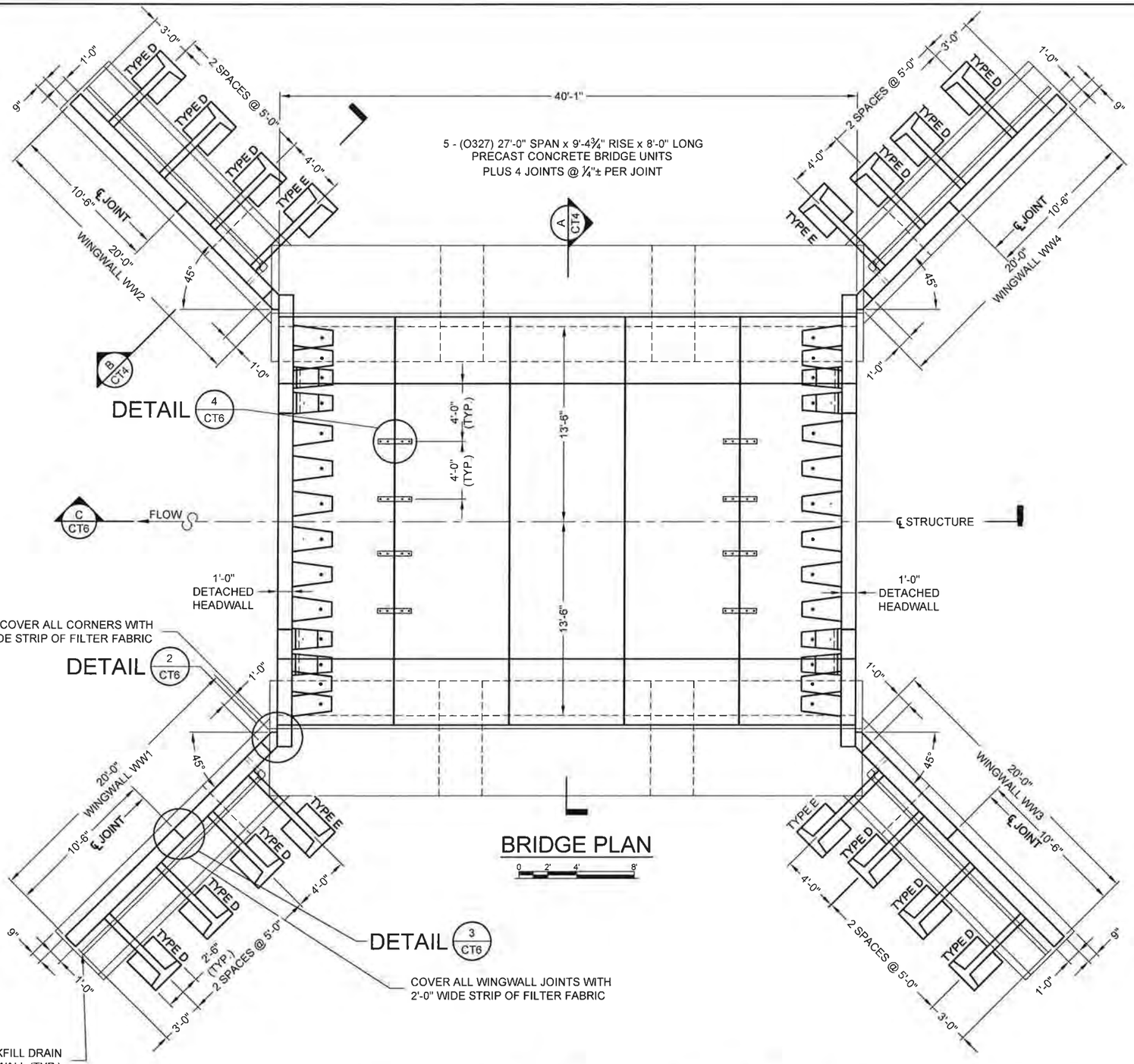

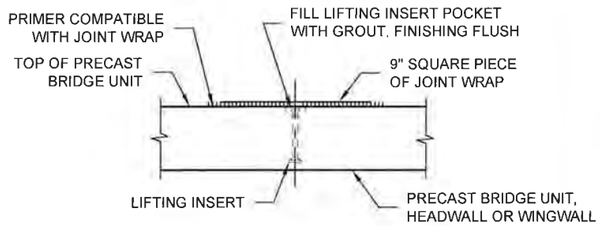

TYPICAL LIFT INSERT SEALING DETAIL

NOT TO SCALE

COLORADO LICENSED
Michael G. Carlappi
42384
PROFESSIONAL ENGINEER

6-17-16

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SILVERTHORNE, COLORADO

PROJECT No	SEQ No	DATE
528626	010	6/16/2016
DESIGNED		DRAWN
JAL		BTS
CHECKED		APPROVED
DM		MGC

SHEET NO CT2 OF CT8

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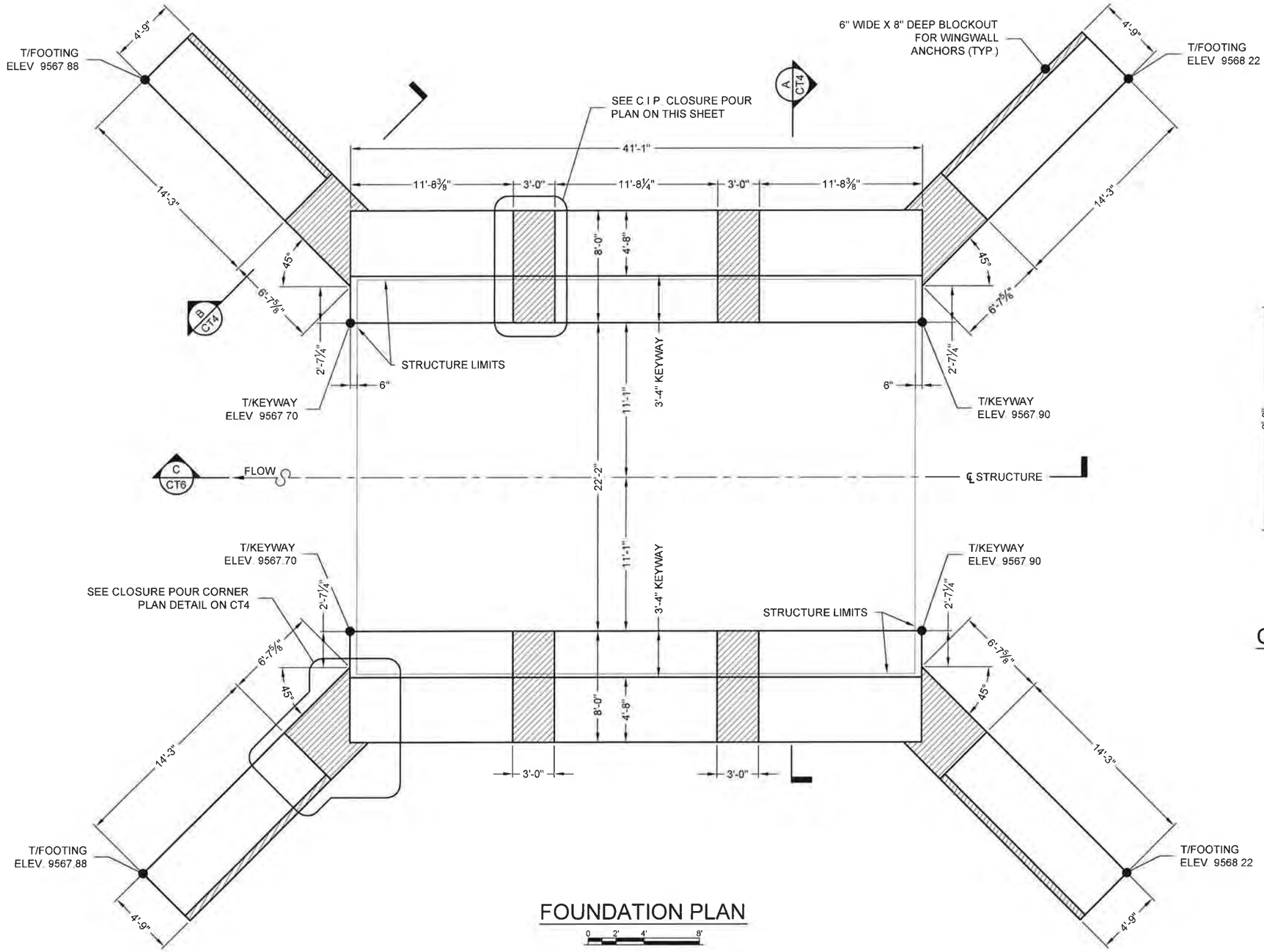
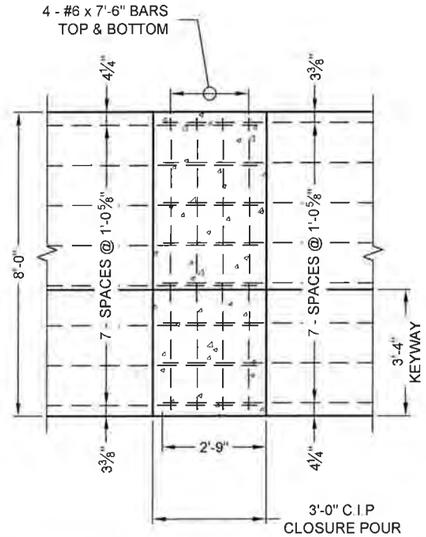


FOUNDATION PLAN

0 2' 4' 8'



C.I.P. CLOSURE POUR PLAN

0 1' 2' 4'

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42384
PROFESSIONAL ENGINEER

6-17-16

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CONTRACT DRAWING

SWAN RIVER BRIDGE

SILVERTHORNE, COLORADO

PROJECT No.	SEQ. No.	DATE
528626	010	6/16/2016
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SHEET NO: CT3 OF CT8		

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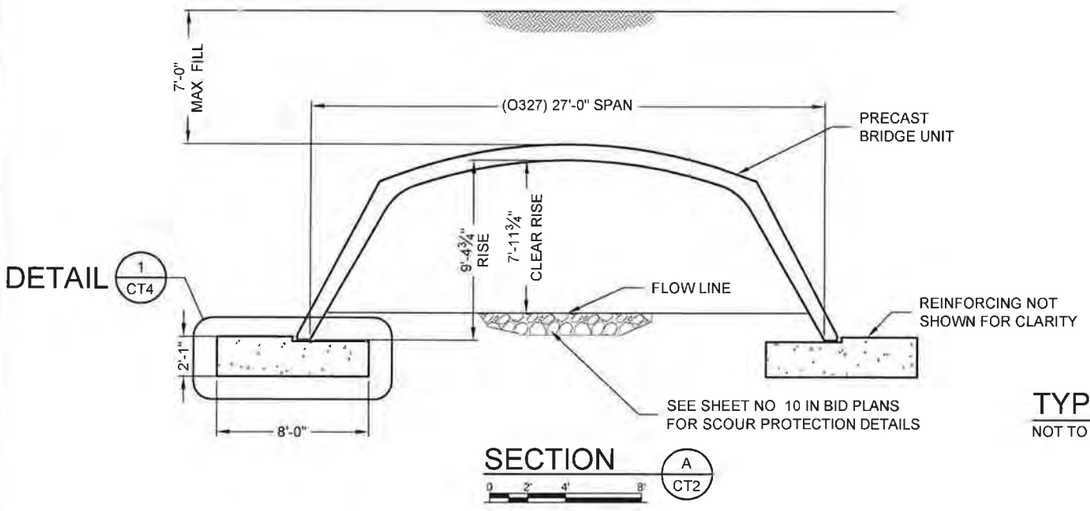
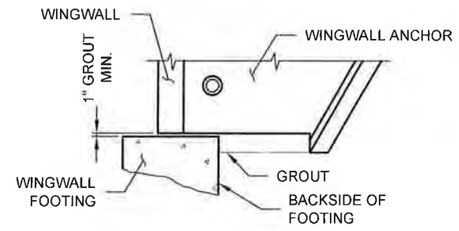
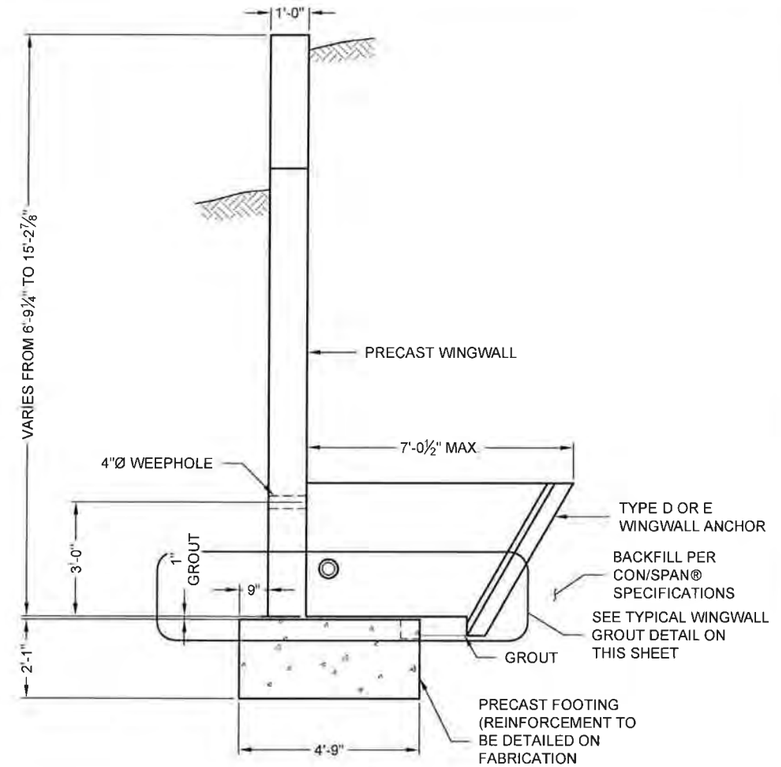




NOTES:
- MINIMUM 1" GROUT UNDER WINGWALL LEG & ANCHOR STEM
- AREA BETWEEN WINGWALL FOOTING AND WINGWALL ANCHOR SHALL BE GROUTED SOLID BEFORE BACKFILL
- FORM BACKSIDE OF FOOTING TO DIMENSIONS SHOWN ON FOUNDATION PLAN

TYPICAL WINGWALL GROUT DETAIL

NOT TO SCALE



SECTION B CT2
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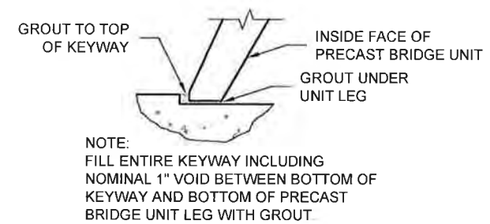
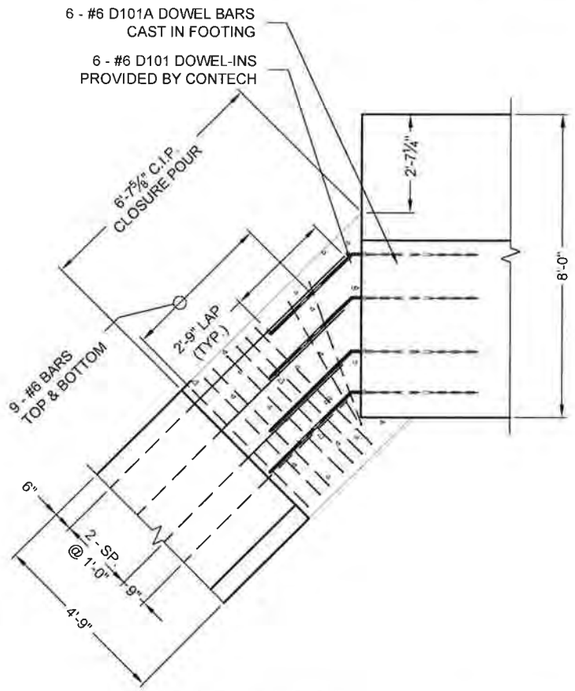


NOTE:
FILL ENTIRE KEYWAY INCLUDING NOMINAL 1" VOID BETWEEN BOTTOM OF KEYWAY AND BOTTOM OF PRECAST BRIDGE UNIT LEG WITH GROUT.

TYPICAL BRIDGE UNIT GROUT DETAIL

NOT TO SCALE



C.I.P. CLOSURE POUR CORNER PLAN

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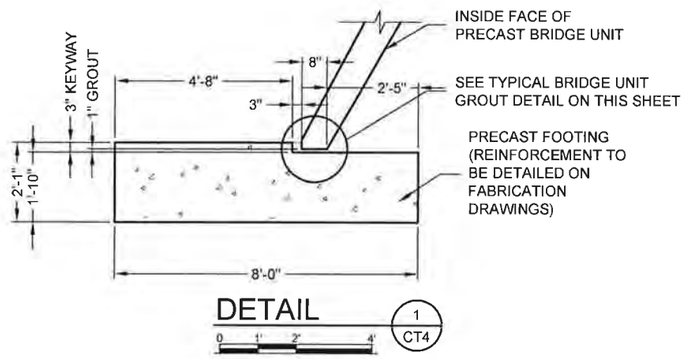

DETAIL 1 CT4
0 1' 2' 4'

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CONTRACT DRAWING

SWAN RIVER BRIDGE

SILVERTHORNE, COLORADO

PROJECT No	SEQ No	DATE
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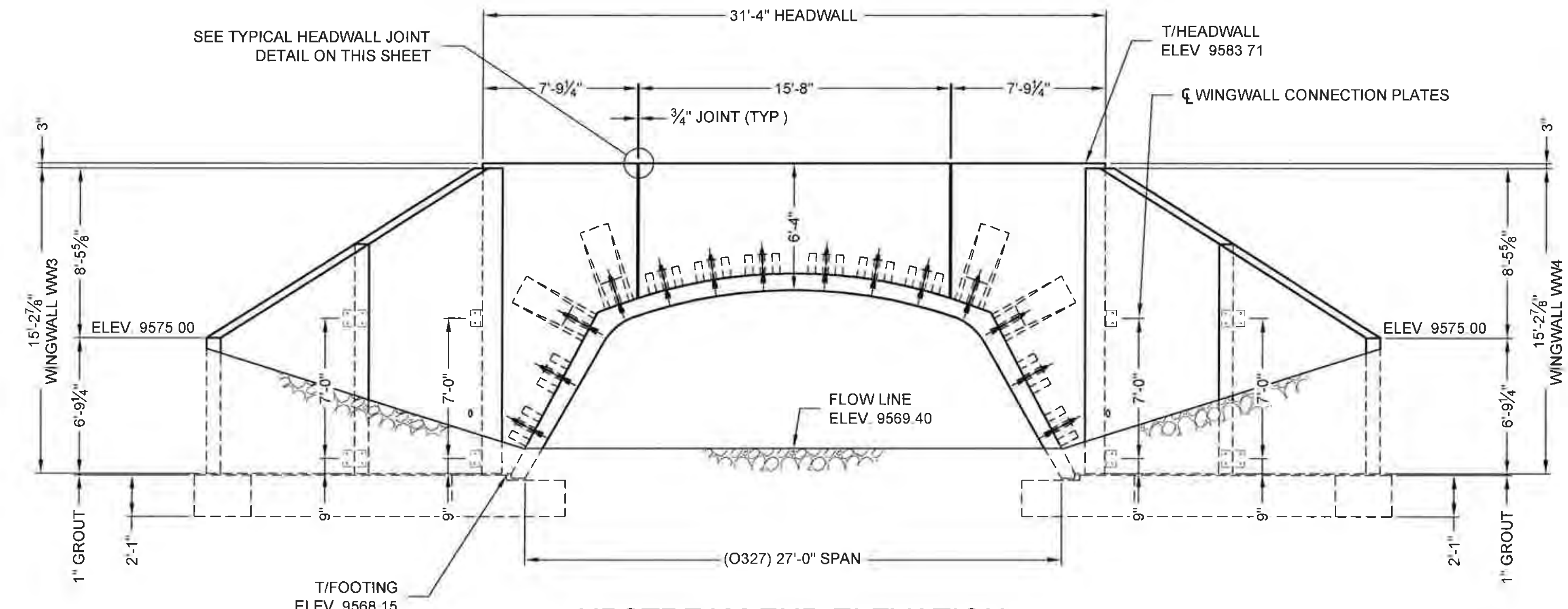
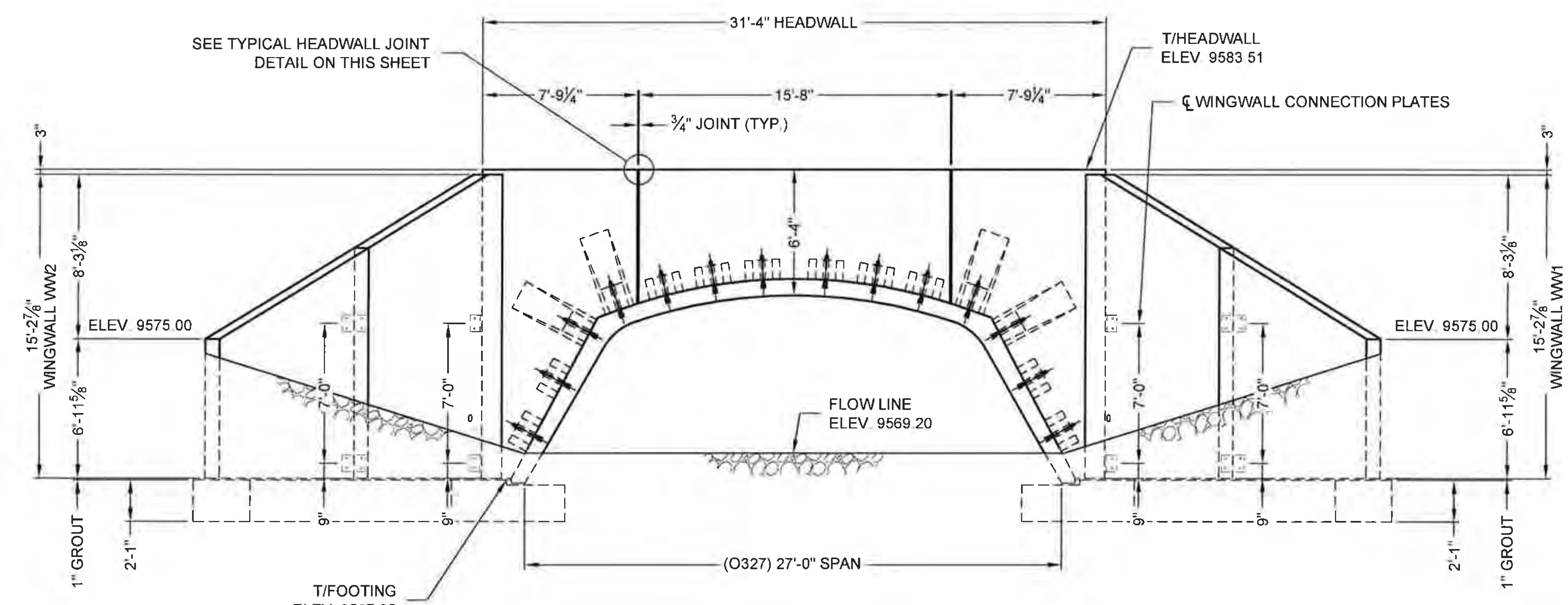
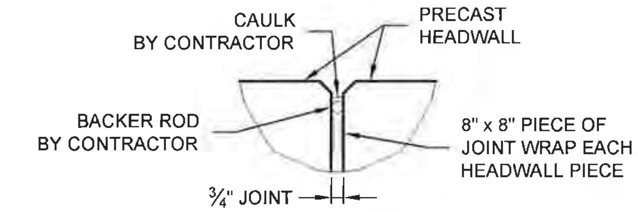


UPSTREAM END ELEVATION



DOWNSTREAM END ELEVATION



TYPICAL HEADWALL JOINT DETAIL

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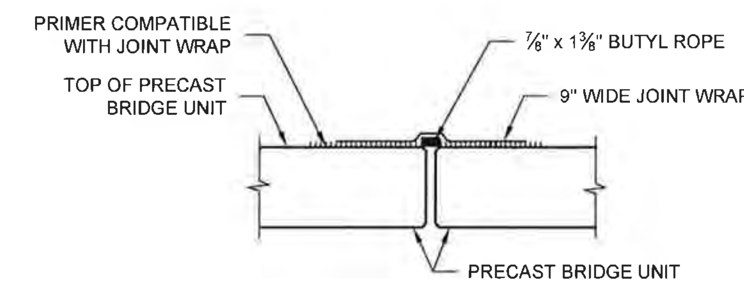

TYPICAL JOINT SEAL DETAIL

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CONTRACT DRAWING

SWAN RIVER BRIDGE

SILVERTHORNE, COLORADO

PROJECT No	SEQ. No	DATE
528626	010	6/16/2016

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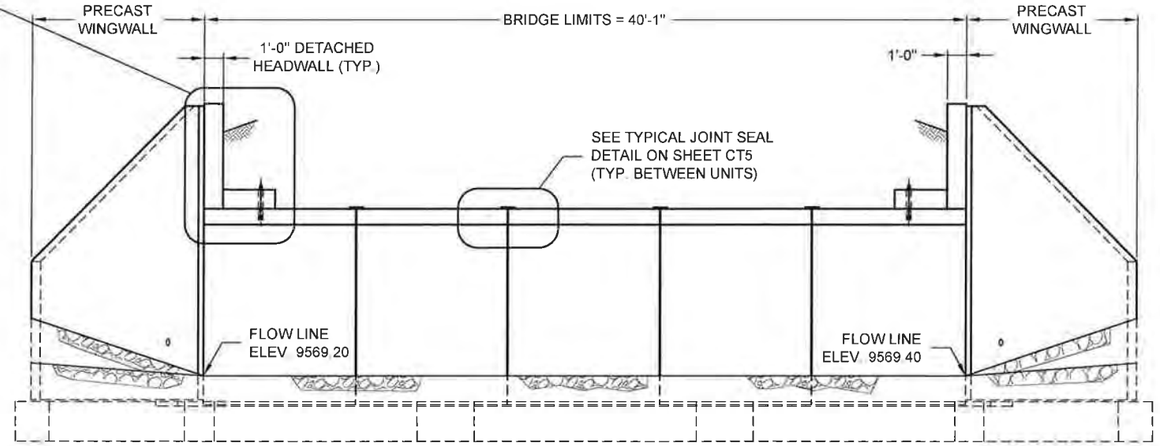
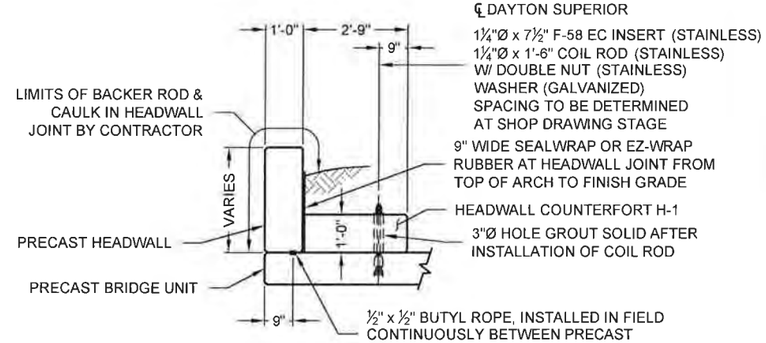
JAL	BTS
CHECKED	APPROVED
DM	MGC

SHEET NO CT5 OF CT8

DETAIL 5 / CT6



SECTION C / CT2



DETAIL 5 / CT6

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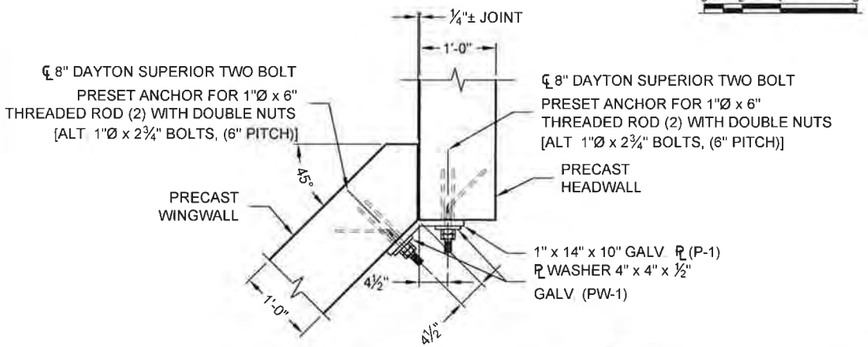


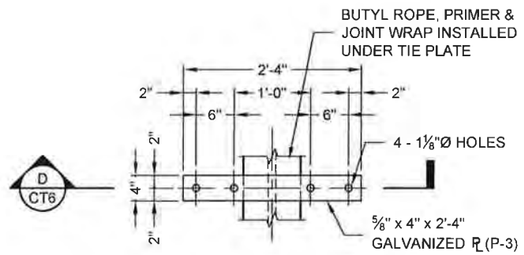
DETAIL @ HEADWALL 2 / CT2

0 1' 2'

NOTE:
CONNECTION ℄'S (P-1) MUST BE POSITIONED WITH SMALL Ø HOLES TOWARD PRECAST HEADWALL

DETAIL 3 / CT2

0 1' 2'



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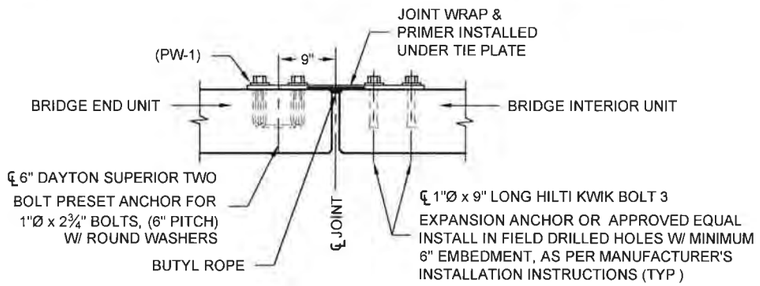

SECTION NOT TO SCALE D / CT6

COLORADO LICENSED
Michael G. Carfagno
42384
PROFESSIONAL ENGINEER

6-17-16

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CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
5670 Greenwood Plaza Blvd., Suite 530, Greenwood Village, CO 80111
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CONTRACT DRAWING

SWAN RIVER BRIDGE

SILVERTHORNE, COLORADO

PROJECT No:	SEQ. No	DATE:
528626	010	6/16/2016
DESIGNED: JAL	DRAWN: BTS	
CHECKED: DM	APPROVED: MGC	
SHEET NO: CT6 OF CT8		

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SPECIFICATIONS FOR MANUFACTURE AND INSTALLATION OF CON/SPAN® O-SERIES BRIDGE SYSTEMS

1. DESCRIPTION
   1.1. TYPE - THIS WORK SHALL CONSIST OF FURNISHING AND CONSTRUCTING A CON/SPAN® O-SERIES BRIDGE SYSTEM IN ACCORDANCE WITH THESE SPECIFICATIONS AND IN REASONABLY CLOSE CONFORMITY WITH THE LINES, GRADES, DESIGN AND DIMENSIONS SHOWN ON THE PLANS OR AS ESTABLISHED BY THE ENGINEER. IN SITUATIONS WHERE TWO OR MORE SPECIFICATIONS APPLY TO THIS WORK, THE MOST STRINGENT REQUIREMENTS SHALL GOVERN.
   1.2. DESIGNATION - PRECAST REINFORCED CONCRETE CON/SPAN® O-SERIES BRIDGE UNITS MANUFACTURED IN ACCORDANCE WITH THIS SPECIFICATION SHALL BE DESIGNATED BY SPAN AND RISE. PRECAST REINFORCED CONCRETE WINGWALLS AND HEADWALLS MANUFACTURED IN ACCORDANCE WITH THIS SPECIFICATION SHALL BE DESIGNATED BY LENGTH, HEIGHT, AND DEFLECTION ANGLE. PRECAST REINFORCED CONCRETE EXPRESS™ FOUNDATION UNITS MANUFACTURED IN ACCORDANCE WITH THIS SPECIFICATION SHALL BE DESIGNATED BY LENGTH, HEIGHT AND WIDTH.

2. DESIGN
   2.1. SPECIFICATIONS - THE PRECAST ELEMENTS ARE DESIGNED IN ACCORDANCE WITH THE "AASHTO LRFD BRIDGE SPECIFICATION" 7TH EDITION, ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 2015. A MINIMUM OF ONE FOOT OF COVER ABOVE THE CROWN OF THE BRIDGE UNITS IS REQUIRED IN THE INSTALLED CONDITION (UNLESS NOTED OTHERWISE ON THE SHOP DRAWINGS AND DESIGNED ACCORDINGLY.)

3. MATERIALS
   3.1. CONCRETE - THE CONCRETE FOR THE PRECAST ELEMENTS SHALL BE AIR-ENTRAINED WHEN INSTALLED IN AREAS SUBJECT TO FREEZE-THAW CONDITIONS, COMPOSED OF PORTLAND CEMENT, FINE AND COARSE AGGREGATES, ADMIXTURES AND WATER. AIR-ENTRAINED CONCRETE SHALL CONTAIN 6 ± 2 PERCENT AIR. THE AIR- ENTRAINING ADMIXTURE SHALL CONFORM TO AASHT0 M154. THE MINIMUM CONCRETE COMPRESSIVE STRENGTH SHALL BE AS SHOWN ON THE SHOP DRAWINGS.
      3.1.1. PORTLAND CEMENT - SHALL CONFORM TO THE REQUIREMENTS OF ASTM SPECIFICATIONS C150-TYPE I, TYPE II, OR TYPE III CEMENT.
      3.1.2. COARSE AGGREGATE - SHALL CONSIST OF STONE HAVING A MAXIMUM SIZE OF 1 INCH. AGGREGATE SHALL MEET REQUIREMENTS FOR ASTM C33.
      3.1.3. WATER REDUCING ADMIXTURE - THE MANUFACTURER MAY SUBMIT, FOR APPROVAL BY THE ENGINEER, A WATER-REDUCING ADMIXTURE FOR THE PURPOSE OF INCREASING WORKABILITY AND REDUCING THE WATER REQUIREMENT FOR THE CONCRETE.
      3.1.4. CALCIUM CHLORIDE - THE ADDITION TO THE MIX OF CALCIUM CHLORIDE OR ADMIXTURES CONTAINING CALCIUM CHLORIDE WILL NOT BE PERMITTED.
      3.1.5. MIXTURE - THE AGGREGATES, CEMENT AND WATER SHALL BE PROPORTIONED AND MIXED IN A BATCH MIXER TO PRODUCE A HOMOGENEOUS CONCRETE MEETING THE STRENGTH REQUIREMENTS OF THIS SPECIFICATION. THE PROPORTION OF PORTLAND CEMENT IN THE MIXTURE SHALL NOT BE LESS THAN 564 POUNDS (6 SACKS) PER CUBIC YARD OF CONCRETE.
   3.2. STEEL REINFORCEMENT
      3.2.1. THE MINIMUM STEEL YIELD STRENGTH SHALL BE 60,000 PSI, UNLESS OTHERWISE NOTED ON THE SHOP DRAWINGS.
      3.2.2. ALL REINFORCING STEEL FOR THE PRECAST ELEMENTS SHALL BE FABRICATED AND PLACED IN ACCORDANCE WITH THE DETAILED SHOP DRAWINGS SUBMITTED BY THE MANUFACTURER.
      3.2.3. REINFORCEMENT SHALL CONSIST OF WELDED WIRE REINFORCING CONFORMING TO ASTM SPECIFICATION A 1064, OR DEFORMED BILLET STEEL BARS CONFORMING TO ASTM SPECIFICATION A 615, GRADE 60. LONGITUDINAL DISTRIBUTION REINFORCEMENT MAY CONSIST OF WELDED WIRE FABRIC OR DEFORMED BILLET-STEEL BARS.
   3.3. STEEL HARDWARE
      3.3.1. BOLTS AND THREADED RODS FOR WINGWALL CONNECTIONS SHALL CONFORM TO ASTM A 307. NUTS SHALL CONFORM TO AASHTO M292 (ASTM A194) GRADE 2H. ALL BOLTS, THREADED RODS AND NUTS USED IN WINGWALL CONNECTIONS SHALL BE MECHANICALLY ZINC COATED IN ACCORDANCE WITH ASTM B695 CLASS 50.
      3.3.2. STRUCTURAL STEEL FOR WINGWALL CONNECTION PLATES AND PLATE WASHERS SHALL CONFORM TO AASHTO M 270 (ASTM A 709) GRADE 36 AND SHALL BE HOT DIP GALVANIZED AS PER AASHTO M 111 (ASTM A123).
      3.3.3. INSERTS FOR WINGWALLS SHALL BE 1" DIAMETER TWO-BOLT PRESET WINGWALL ANCHORS AS MANUFACTURED BY DAYTON SUPERIOR CONCRETE ACCESSORIES, MIAMISBURG, OHIO, (800) 745-3700 AND SHALL BE MECHANICALLY ZINC COATED IN ACCORDANCE WITH ASTM B695 CLASS 50.
      3.3.4. FERRULE LOOP INSERTS SHALL BE F-64 FERRULE LOOP INSERTS AS MANUFACTURED BY DAYTON SUPERIOR CONCRETE ACCESSORIES, MIAMISBURG, OHIO, (800) 745-3700.
      3.3.5. HOOK BOLTS USED IN ATTACHED HEADWALL CONNECTIONS SHALL BE ASTM A307.
      3.3.6. INSERTS FOR DETACHED HEADWALL CONNECTIONS SHALL BE AISI TYPE 304 STAINLESS STEEL, EXPANDED COIL INSERTS AS MANUFACTURED BY DAYTON SUPERIOR CONCRETE ACCESSORIES, MIAMISBURG, OHIO, (800) 745-3700. COIL RODS AND NUTS USED IN HEADWALL CONNECTIONS SHALL BE AISI TYPE 304 STAINLESS STEEL. WASHERS USED IN HEADWALL CONNECTIONS SHALL BE EITHER AISI TYPE 304 STAINLESS STEEL PLATE WASHERS OR AASHTO M270 (ASTM A709) GRADE 36 PLATE WASHERS HOT DIP GALVANIZED AS PER AASHTO M111 (ASTM A123).
      3.3.7. MECHANICAL SPLICES OF REINFORCING BARS SHALL BE MADE USING THE DOWEL BAR SPLICER SYSTEM AS MANUFACTURED BY DAYTON SUPERIOR CONCRETE ACCESSORIES, MIAMISBURG, OHIO, (800) 745-3700, AND SHALL CONSIST OF THE DOWEL BAR SPLICER (DB-SAE) AND DOWEL-IN (DI).

4. MANUFACTURE OF PRECAST ELEMENTS - SUBJECT TO THE PROVISIONS OF SECTION 5, BELOW, THE PRECAST ELEMENT DIMENSION AND REINFORCEMENT DETAILS SHALL BE AS PRESCRIBED IN THE PLAN AND SHOP DRAWINGS PROVIDED BY THE MANUFACTURER.
   4.1. FORMS - THE FORMS USED IN MANUFACTURE SHALL BE SUFFICIENTLY RIGID AND ACCURATE TO MAINTAIN THE REQUIRED PRECAST ELEMENT DIMENSIONS WITHIN THE PERMISSIBLE VARIATIONS GIVEN IN SECTION 5 OF THESE SPECIFICATIONS. ALL CASTING SURFACES SHALL BE OF A SMOOTH MATERIAL.
   4.2. PLACEMENT OF REINFORCEMENT
      4.2.1. PLACEMENT OF REINFORCEMENT IN PRECAST BRIDGE UNITS - THE COVER OF CONCRETE OVER THE OUTSIDE CIRCUMFERENTIAL REINFORCEMENT SHALL BE 2" MINIMUM. THE COVER OF CONCRETE OVER THE INSIDE CIRCUMFERENTIAL REINFORCEMENT SHALL BE 1½" MINIMUM, UNLESS OTHERWISE NOTED ON THE SHOP DRAWINGS. THE CLEAR DISTANCE OF THE END CIRCUMFERENTIAL WIRES SHALL NOT BE LESS THAN 1" NOR MORE THAN 2" FROM THE ENDS OF EACH SECTION. REINFORCEMENT SHALL BE ASSEMBLED UTILIZING SINGLE OR MULTIPLE LAYERS OF WELDED WIRE FABRIC (NOT TO EXCEED 3 LAYERS), SUPPLEMENTED WITH A SINGLE LAYER OF DEFORMED BILLET-STEEL BARS, WHEN NECESSARY. WELDED WIRE FABRIC SHALL BE COMPOSED OF CIRCUMFERENTIAL AND LONGITUDINAL WIRES MEETING THE SPACING REQUIREMENTS OF 4.3, BELOW, AND SHALL CONTAIN SUFFICIENT LONGITUDINAL WIRES EXTENDING THROUGH THE BRIDGE UNIT TO MAINTAIN THE SHAPE AND POSITION OF THE REINFORCEMENT. LONGITUDINAL DISTRIBUTION REINFORCEMENT MAY BE WELDED WIRE FABRIC OR DEFORMED BILLET-STEEL BARS AND SHALL MEET THE SPACING REQUIREMENTS OF 4.3, BELOW. THE ENDS OF THE LONGITUDINAL DISTRIBUTION REINFORCEMENT SHALL BE NOT MORE THAN 3" AND NOT LESS THAN 1½" FROM THE ENDS OF THE BRIDGE UNIT.
      4.2.2. BENDING OF REINFORCEMENT FOR PRECAST BRIDGE UNITS - THE OUTSIDE AND INSIDE CIRCUMFERENTIAL REINFORCING STEEL FOR THE CORNERS OF THE BRIDGE SHALL BE BENT TO SUCH AN ANGLE THAT IS APPROXIMATELY EQUAL TO THE CONFIGURATION OF THE BRIDGE'S OUTSIDE CORNER.
      4.2.3. PLACEMENT OF REINFORCEMENT FOR PRECAST WINGWALLS AND HEADWALLS - THE COVER OF CONCRETE OVER THE LONGITUDINAL AND TRANSVERSE REINFORCEMENT SHALL BE 2" MINIMUM. THE CLEAR DISTANCE FROM THE END OF EACH PRECAST ELEMENT TO THE END OF REINFORCING STEEL SHALL NOT BE LESS THAN 1½" NOR MORE THAN 3". REINFORCEMENT SHALL BE ASSEMBLED UTILIZING A SINGLE LAYER OF WELDED WIRE FABRIC, OR A SINGLE LAYER OF DEFORMED BILLET-STEEL BARS. WELDED WIRE FABRIC SHALL BE COMPOSED OF TRANSVERSE AND LONGITUDINAL WIRES MEETING THE SPACING REQUIREMENTS OF 4.3, BELOW, AND SHALL CONTAIN SUFFICIENT LONGITUDINAL WIRES EXTENDING THROUGH THE ELEMENT TO MAINTAIN THE SHAPE AND POSITION OF THE REINFORCEMENT. LONGITUDINAL REINFORCEMENT MAY BE WELDED WIRE FABRIC OR DEFORMED BILLET-STEEL BARS AND SHALL MEET THE SPACING REQUIREMENTS OF 4.3, BELOW.
      4.2.4. PLACEMENT OF REINFORCMENT FOR PRECAST FOUNDATION UNITS - THE COVER OF CONCRETE OVER THE BOTTOM REINFORCEMENT SHALL BE 3 INCHES MINIMUM. THE COVER OF CONCRETE FOR ALL OTHER REINFORCEMENT SHALL BE 2 INCHES MINIMUM. THE CLEAR DISTANCE FROM THE END OF EACH PRECAST ELEMENT TO THE END OF REINFORCING STEEL SHALL NOT BE LESS THAN 2 INCHES NOR MORE THAN 3 INCHES. REINFORCEMENT SHALL BE ASSEMBLED UTILIZING A SINGLE LAYER OF WELDED WIRE FABRIC OR A SINGLE LAYER OF DEFOREMED BILLET-STEEL BARS. WELDED WIRE FABRIC SHALL BE COMPOSED OF TRANSVERSE AND LONGITUDINAL WIRES MEETING THE SPACING REQUIREMENTS OF 4.3, BELOW, AND SHALL CONTAIN SUFFICIENT LONGITUDINAL WIRES EXTENDING THROUGH THE ELEMENT TO MAINTAIN THE SHAPE AND POSITION OF THE REINFORCEMENT. LONGITUDINAL REINFORCEMENT MAY BE WELDED WIRE FABRIC OR DEFORMED BILLET-STEEL BARS AND SHALL MEET THE SPACING REQUIREMENTS OF 4.3, BELOW.
   4.3. LAPS, WELDS, SPACING
      4.3.1. LAPS, WELDS, AND SPACING FOR PRECAST BRIDGE UNITS - TENSION SPLICES IN THE CIRCUMFERENTIAL REINFORCEMENT SHALL BE MADE BY LAPPING. LAPS MAY BE TACK WELDED TOGETHER FOR ASSEMBLY PURPOSES. FOR SMOOTH WELDED WIRE FABRIC, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 5.11.2.5.2 AND 5.11.6.2. FOR DEFORMED WELDED WIRE FABRIC, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 5.11.2.5.1 AND 5.11.6.1. THE OVERLAP OF WELDED WIRE FABRIC SHALL BE MEASURED BETWEEN THE OUTER-MOST LONGITUDINAL WIRES OF EACH FABRIC SHEET. FOR DEFORMED BILLET-STEEL BARS, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 5.11.2.1 FOR SPLICES OTHER THAN TENSION SPLICES. THE OVERLAP SHALL BE A MINIMUM OF 1'-0" FOR WELDED WIRE FABRIC OR DEFORMED BILLET-STEEL BARS. THE SPACING CENTER TO CENTER OF THE CIRCUMFERENTIAL WIRES IN A WIRE FABRIC SHEET SHALL BE NOT LESS THAN 2" NOR MORE THAN 4". THE SPACING CENTER TO CENTER OF THE LONGITUDINAL WIRES SHALL NOT BE MORE THAN 8". THE SPACING CENTER TO CENTER OF THE LONGITUDINAL DISTRIBUTION STEEL FOR EITHER LINE OF REINFORCING IN THE TOP SLAB SHALL BE NOT MORE THAN 1'-4".
      4.3.2. LAPS, WELDS, AND SPACING FOR PRECAST WINGWALLS, HEADWALLS AND FOUNDATIONS - SPLICES IN THE REINFORCEMENT SHALL BE MADE BY LAPPING. LAPS MAY BE TACK WELDED TOGETHER FOR ASSEMBLY PURPOSES FOR SMOOTH WELDED WIRE FABRIC, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 5.11.2.5.2 AND 5.11.6.2. FOR DEFORMED WELDED WIRE FABRIC, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 5.11.2.5.1 AND 5.11.6.1. FOR DEFORMED BILLET-STEEL BARS, THE OVERLAP SHALL MEET THE REQUIREMENTS OF AASHTO 5.11.2.1. THE SPACING CENTER-TO-CENTER OF THE WIRES IN A WIRE FABRIC SHEET SHALL BE NOT LESS THAN 2" NOR MORE THAN 8".
   4.4. CURING - THE PRECAST CONCRETE ELEMENTS SHALL BE CURED FOR A SUFFICIENT LENGTH OF TIME SO THAT THE CONCRETE WILL DEVELOP THE SPECIFIED COMPRESSIVE STRENGTH IN 28 DAYS OR LESS. ANY ONE OF THE FOLLOWING METHODS OF CURING OR COMBINATIONS THERE OF SHALL BE USED:
      4.4.1. STEAM CURING - THE PRECAST ELEMENTS MAY BE LOW-PRESSURE STEAM CURED BY A SYSTEM THAT WILL MAINTAIN A MOIST ATMOSPHERE.
      4.4.2. WATER CURING - THE PRECAST ELEMENTS MAY BE WATER CURED BY ANY METHOD THAT WILL KEEP THE SECTIONS MOIST.
      4.4.3. MEMBRANE CURING - A SEALING MEMBRANE CONFORMING TO THE REQUIREMENTS OF ASTM SPECIFICATION C309 MAY BE APPLIED AND SHALL BE LEFT INTACT UNTIL THE REQUIRED CONCRETE COMPRESSIVE STRENGTH IS ATTAINED. THE CONCRETE TEMPERATURE AT THE TIME OF APPLICATION SHALL BE WITHIN +/- 10 DEGREES F OF THE ATMOSPHERIC TEMPERATURE. ALL SURFACES SHALL BE KEPT MOIST PRIOR TO THE APPLICATION OF THE COMPOUNDS AND SHALL BE DAMP WHEN THE COMPOUND IS APPLIED.
   4.5. STORAGE, HANDLING & DELIVERY
      4.5.1. STORAGE - PRECAST CONCRETE BRIDGE ELEMENTS SHALL BE LIFTED AND STORED IN "AS-CAST" POSITION. PRECAST CONCRETE HEADWALL AND WINGWALL UNITS ARE CAST, STORED AND SHIPPED IN A FLAT POSITION. THE PRECAST ELEMENTS SHALL BE STORED IN SUCH A MANNER TO PREVENT CRACKING OR DAMAGE. STORE ELEMENTS USING TIMBER SUPPORTS AS APPROPRIATE. THE UNITS SHALL NOT BE MOVED UNTIL THE CONCRETE COMPRESSIVE STRENGTH HAS REACHED A MINIMUM OF 2500 PSI, AND THEY SHALL NOT BE STORED IN AN UPRIGHT POSITION.
      4.5.2. HANDLING - HANDLING DEVICES SHALL BE PERMITTED IN EACH PRECAST ELEMENT FOR THE PURPOSE OF HANDLING AND SETTING. SPREADER BEAMS MAY BE REQUIRED FOR THE LIFTING OF PRECAST CONCRETE BRIDGE ELEMENTS TO PRECLUDE DAMAGE FROM BENDING OR TORSION FORCES.
      4.5.3. DELIVERY - PRECAST CONCRETE ELEMENTS MUST NOT BE SHIPPED UNTIL THE CONCRETE HAS ATTAINED THE SPECIFIED DESIGN COMPRESSIVE STRENGTH, OR AS DIRECTED BY THE DESIGN ENGINEER. PRECAST CONCRETE ELEMENTS MAY BE UNLOADED AND PLACED ON THE GROUND AT THE SITE UNTIL INSTALLED. STORE ELEMENTS USING TIMBER SUPPORTS AS APPROPRIATE.
   4.6. QUALITY ASSURANCE - THE PRECASTER SHALL DEMONSTRATE ADHERENCE TO THE STANDARDS SET FORTH IN THE NPCA QUALITY CONTROL MANUAL. THE PRECASTER SHALL MEET EITHER SECTION 4.6.1 OR 4.6.2.
      4.6.1. CERTIFICATION - THE PRECASTER SHALL BE CERTIFIED BY THE PRECAST/PRESTRESSED CONCRETE INSTITUTE PLANT CERTIFICATION PROGRAM OR THE NATIONAL PRECAST CONCRETE ASSOCIATION'S PLANT CERTIFICATION PROGRAM PRIOR TO AND DURING PRODUCTION OF THE PRODUCTS COVERED BY THIS SPECIFICATION.
      4.6.2. QUALIFICATIONS, TESTING AND INSPECTION
         4.6.2.1. THE PRECASTER SHALL HAVE BEEN IN THE BUSINESS OF PRODUCING PRECAST CONCRETE PRODUCTS SIMILAR TO THOSE SPECIFIED FOR A MINIMUM OF THREE YEARS. HE SHALL MAINTAIN A PERMANENT QUALITY CONTROL DEPARTMENT OR RETAIN AN INDEPENDENT TESTING AGENCY ON A CONTINUING BASIS. THE AGENCY SHALL ISSUE A REPORT, CERTIFIED BY A LICENSED ENGINEER, DETAILING THE ABILITY OF THE PRECASTER TO PRODUCE QUALITY PRODUCTS CONSISTENT WITH INDUSTRY STANDARDS.
         4.6.2.2. THE PRECASTER SHALL SHOW THAT THE FOLLOWING TESTS ARE PERFORMED IN ACCORDANCE WITH THE ASTM STANDARDS INDICATED. TESTS SHALL BE PERFORMED AS INDICATED IN SECTION 6 OF THESE SPECIFICATIONS.
            4.6.2.2.1. AIR CONTENT: C231 OR C173
            4.6.2.2.2. COMPRESSIVE STRENGTH: C31,C39,C497
         4.6.2.3. THE PRECASTER SHALL PROVIDE DOCUMENTATION DEMONSTRATING COMPLIANCE WITH THIS SECTION TO CONTECH® ENGINEERED SOLUTIONS AT REGULAR INTERVALS OR UPON REQUEST.
         4.6.2.4. THE OWNER MAY PLACE AN INSPECTOR IN THE PLANT WHEN THE PRODUCTS COVERED BY THIS SPECIFICATION ARE BEING MANUFACTURED.
      4.6.3. DOCUMENTATION - THE PRECASTER SHALL SUBMIT PRECAST PRODUCTION REPORTS TO CONTECH® ENGINEERED SOLUTIONS AS REQUIRED.

5. PERMISSIBLE VARIATIONS
   5.1. BRIDGE UNITS
      5.1.1. INTERNAL DIMENSIONS - THE INTERNAL DIMENSION SHALL VARY NOT MORE THAN 1% FROM THE DESIGN DIMENSIONS NOR MORE THAN 1½" WHICHEVER IS LESS.
      5.1.2. SLAB AND WALL THICKNESS - THE SLAB AND WALL THICKNESS SHALL NOT BE LESS THAN THAT SHOWN IN THE DESIGN BY MORE THAN ¼". A THICKNESS MORE THAN THAT REQUIRED IN THE DESIGN SHALL NOT BE CAUSE FOR REJECTION.
      5.1.3. LENGTH OF OPPOSITE SURFACES - VARIATIONS IN LAYING LENGTHS OF TWO OPPOSITE SURFACES OF THE BRIDGE UNIT SHALL NOT BE MORE THAN ½" IN ANY SECTION, EXCEPT WHERE BEVELED ENDS FOR LAYING OF CURVES ARE SPECIFIED BY THE PURCHASER.
      5.1.4. LENGTH OF SECTION - THE UNDERRUN IN LENGTH OF A SECTION SHALL NOT BE MORE THAN ½" IN ANY BRIDGE UNIT.
      5.1.5. POSITION OF REINFORCEMENT - THE MAXIMUM VARIATION IN POSITION OF THE REINFORCEMENT SHALL BE ± ½". IN NO CASE SHALL THE COVER OVER THE REINFORCEMENT BE LESS THAN 1½" FOR THE OUTSIDE CIRCUMFERENTIAL STEEL OR BE LESS THAN 1" FOR THE INSIDE CIRCUMFERENTIAL STEEL AS MEASURED TO THE EXTERNAL OR INTERNAL SURFACE OF THE BRIDGE. THESE TOLERANCES OR COVER REQUIREMENTS DO NOT APPLY TO MATING SURFACES OF THE JOINTS.
      5.1.6. AREA OF REINFORCEMENT - THE AREAS OF STEEL REINFORCEMENT SHALL BE THE DESIGN STEEL AREAS AS SHOWN IN THE MANUFACTURER'S SHOP DRAWINGS. STEEL AREAS GREATER THAN THOSE REQUIRED SHALL NOT BE CAUSE FOR REJECTION. THE PERMISSIBLE VARIATION IN DIAMETER OF ANY REINFORCEMENT SHALL CONFORM TO THE TOLERANCES PRESCRIBED IN THE ASTM SPECIFICATION FOR THAT TYPE OF REINFORCEMENT.
   5.2. WINGWALLS & HEADWALLS
      5.2.1. WALL THICKNESS - THE WALL THICKNESS SHALL NOT VARY FROM THAT SHOWN IN THE DESIGN BY MORE THAN ½".
      5.2.2. LENGTH/HEIGHT OF WALL SECTIONS - THE LENGTH AND HEIGHT OF THE WALL SHALL NOT VARY FROM THAT SHOWN IN THE DESIGN BY MORE THAN ½".
      5.2.3. POSITION OF REINFORCEMENT - THE MAXIMUM VARIATION IN THE POSITION OF THE REINFORCEMENT SHALL BE ± ½" IN NO CASE SHALL THE COVER OVER THE REINFORCEMENT BE LESS THAN 1½".
      5.2.4. SIZE OF REINFORCEMENT - THE PERMISSIBLE VARIATION IN DIAMETER OF ANY REINFORCING SHALL CONFORM TO THE TOLERANCES PRESCRIBED IN THE ASTM SPECIFICATION FOR THAT TYPE OF REINFORCING. STEEL AREA GREATER THAN THAT REQUIRED SHALL NOT BE CAUSE FOR REJECTION.
   5.3. FOUNDATION UNITS
      5.3.1. WALL THICKNESS - THE WALL THICKNESS SHALL NOT VARY FROM THAT SHOWN IN THE DESIGN BY MORE THAN ½".
      5.3.2. LENGTH/ HEIGHT/WIDTH OF FOUNDATION SECTIONS - THE LENGTH, HEIGHT AND WIDTH OF THE FOUNDATION UNITS SHALL NOT VARY FROM THAT SHOWN IN THE DESIGN BY MORE THAN ½".
      5.3.3. POSITION OF REINFORCEMENT - THE MAXIMUM VARIATION IN THE POSITION OF THE REINFORCEMENT SHALL BE ± ½" IN NO CASE SHALL THE COVER OVER THE REINFORCEMENT BE LESS THAN 1½".
      5.3.4. SIZE OF REINFORCEMENT - THE PERMISSIBLE VARIATION IN DIAMETER OF ANY REINFORCING SHALL CONFORM TO THE TOLERANCES PRESCRIBED IN THE ASTM SPECIFICATION FOR THAT TYPE OF REINFORCING. STEEL AREA GREATER THAN THAT REQUIRED SHALL NOT BE CAUSE FOR REJECTION.

6. TESTING/ INSPECTION
   6.1. TESTING
      6.1.1. TYPE OF TEST SPECIMEN - CONCRETE COMPRESSIVE STRENGTH SHALL BE DETERMINED FROM COMPRESSION TESTS MADE ON CYLINDERS OR CORES. FOR CYLINDER TESTING, A MINIMUM OF 4 CYLINDERS SHALL BE TAKEN FOR EACH BRIDGE ELEMENT. EACH ELEMENT SHALL BE CONSIDERED SEPARATELY FOR THE PURPOSE OF TESTING AND ACCEPTANCE.
      6.1.2. COMPRESSION TESTING - CYLINDERS SHALL BE MADE AND TESTED AS PRESCRIBED BY THE ASTM C39 SPECIFICATION. CYLINDERS SHALL BE CURED IN THE SAME ENVIRONMENT AS THE BRIDGE ELEMENTS. CORES SHALL BE OBTAINED AND TESTED FOR COMPRESSIVE STRENGTH IN ACCORDANCE WITH THE PROVISIONS OF THE ASTM C42 SPECIFICATION.
      6.1.3. ACCEPTABILITY OF CYLINDER TESTS - WHEN THE AVERAGE COMPRESSIVE STRENGTH OF ALL CYLINDERS TESTED IS EQUAL TO OR GREATER THAN THE DESIGN COMPRESSIVE STRENGTH, AND NOT MORE THAN 10% OF THE CYLINDERS TESTED HAVE A COMPRESSIVE STRENGTH LESS THAN THE DESIGN CONCRETE STRENGTH, AND NO CYLINDER TESTED HAS A COMPRESSIVE STRENGTH LESS THAN 80% OF THE DESIGN COMPRESSIVE STRENGTH, THEN THE ELEMENT SHALL BE ACCEPTED. WHEN THE COMPRESSIVE STRENGTH OF THE CYLINDERS TESTED DOES NOT CONFORM TO THESE ACCEPTANCE CRITERIA, THE ACCEPTABILITY OF THE ELEMENT MAY BE DETERMINED AS DESCRIBED IN SECTION 6.1.4, BELOW.
      6.1.4. ACCEPTABILITY OF CORE TESTS - THE COMPRESSIVE STRENGTH OF THE CONCRETE IN A BRIDGE ELEMENT IS ACCEPTABLE WHEN THE AVERAGE CORE TEST STRENGTH IS EQUAL TO OR GREATER THAN THE DESIGN CONCRETE STRENGTH. WHEN THE COMPRESSIVE STRENGTH OF A CORE TESTED IS LESS THAN THE DESIGN CONCRETE STRENGTH, THE PRECAST ELEMENT FROM WHICH THAT CORE WAS TAKEN MAY BE RE-CORED. WHEN THE COMPRESSIVE STRENGTH OF THE RE-CORE IS EQUAL TO OR GREATER THAN THE DESIGN CONCRETE STRENGTH, THE COMPRESSIVE STRENGTH OF THE CONCRETE IN THAT BRIDGE ELEMENT IS ACCEPTABLE
         6.1.4.1. WHEN THE COMPRESSIVE STRENGTH OF ANY RECORE IS LESS THAN THE DESIGN CONCRETE STRENGTH, THE PRECAST ELEMENT FROM WHICH THAT CORE WAS TAKEN SHALL BE REJECTED
         6.1.4.2. PLUGGING CORE HOLES - THE CORE HOLES SHALL BE PLUGGED AND SEALED BY THE MANUFACTURER IN A MANNER SUCH THAT THE ELEMENTS WILL MEET ALL OF THE TEST REQUIREMENTS OF THIS SPECIFICATION. PRECAST ELEMENTS SO SEALED SHALL BE CONSIDERED SATISFACTORY FOR USE.
         6.1.4.3. TEST EQUIPMENT - EVERY MANUFACTURER FURNISHING PRECAST ELEMENTS UNDER THIS SPECIFICATION SHALL FURNISH ALL FACILITIES AND PERSONNEL NECESSARY TO CARRY OUT THE TEST REQUIRED.
   6.2. INSPECTION - THE QUALITY OF MATERIALS, THE PROCESS OF MANUFACTURE, AND THE FINISHED PRECAST ELEMENTS SHALL BE SUBJECT TO INSPECTION BY THE PURCHASER.

7. JOINTS
   THE BRIDGE UNITS SHALL BE PRODUCED WITH FLAT BUTT ENDS. THE ENDS OF THE BRIDGE UNITS SHALL BE SUCH THAT WHEN THE SECTIONS ARE LAID TOGETHER THEY WILL MAKE A CONTINUOUS LINE WITH A SMOOTH INTERIOR FREE OF APPRECIABLE IRREGULARITIES, ALL COMPATIBLE WITH THE PERMISSIBLE VARIATIONS IN SECTION 5, ABOVE. THE JOINT WIDTH BETWEEN ADJACENT PRECAST UNITS SHALL NOT EXCEED ¾".

8. WORKMANSHIP/ FINISH
   THE BRIDGE UNITS, WINGWALLS, HEADWALLS AND FOUNDATION UNITS SHALL BE SUBSTANTIALLY FREE OF FRACTURES. THE ENDS OF THE BRIDGE UNITS SHALL BE NORMAL TO THE WALLS AND CENTERLINE OF THE BRIDGE SECTION, WITHIN THE LIMITS OF THE VARIATIONS GIVEN IN SECTION 5, ABOVE, EXCEPT WHERE BEVELED ENDS ARE SPECIFIED. THE FACES OF THE WINGWALLS AND HEADWALLS SHALL BE PARALLEL TO EACH OTHER, WITHIN THE LIMITS OF VARIATIONS GIVEN IN SECTION 5, ABOVE. THE SURFACE OF THE PRECAST ELEMENTS SHALL BE A SMOOTH STEEL FORM OR TROWELED SURFACE. TRAPPED AIR POCKETS CAUSING SURFACE DEFECTS SHALL BE CONSIDERED AS PART OF A SMOOTH, STEEL FORM FINISH.

9. REPAIRS
   PRECAST ELEMENTS MAY BE REPAIRED, IF NECESSARY, BECAUSE OF IMPERFECTIONS IN MANUFACTURE OR HANDLING DAMAGE AND WILL BE ACCEPTABLE IF, IN THE OPINION OF THE PURCHASER, THE REPAIRS ARE SOUND, PROPERLY FINISHED AND CURED, AND THE REPAIRED SECTION CONFORMS TO THE REQUIREMENTS OF THIS SPECIFICATION.

10. REJECTION
    THE PRECAST ELEMENTS SHALL BE SUBJECT TO REJECTION ON ACCOUNT OF ANY OF THE SPECIFICATION REQUIREMENTS. INDIVIDUAL PRECAST ELEMENTS MAY BE REJECTED BECAUSE OF ANY OF THE FOLLOWING:
    10.1. FRACTURES OR CRACKS PASSING THROUGH THE WALL, EXCEPT FOR A SINGLE END CRACK THAT DOES NOT EXCEED ONE HALF THE THICKNESS OF THE WALL.
    10.2. DEFECTS THAT INDICATE PROPORTIONING, MIXING, AND MOLDING NOT IN COMPLIANCE WITH SECTION 4 OF THESE SPECIFICATIONS.
    10.3. HONEYCOMBED OR OPEN TEXTURE.
    10.4. DAMAGED ENDS, WHERE SUCH DAMAGE WOULD PREVENT MAKING A SATISFACTORY JOINT.

COLORADO LICENSED — Michael G. Carfagno — 42384 — PROFESSIONAL ENGINEER

6-17-16

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CON/SPAN® O-SERIES

CONTRACT DRAWING

SWAN RIVER BRIDGE

SILVERTHORNE, COLORADO

PROJECT No.	SEQ. No.	DATE
528626	010	6/16/2016
DESIGNED: JAL	DRAWN: BTS	
CHECKED: DM	APPROVED: MGC	
SHEET NO.: CT7 OF CT8		

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SPECIFICATIONS FOR MANUFACTURE AND INSTALLATION OF CON/SPAN® O-SERIES BRIDGE SYSTEMS (CONT'D)

11 MARKING
EACH BRIDGE UNIT SHALL BE CLEARLY MARKED BY WATERPROOF PAINT THE FOLLOWING SHALL BE SHOWN ON THE INSIDE OF THE VERTICAL LEG OF THE BRIDGE SECTION:
BRIDGE SPAN x BRIDGE RISE
DATE OF MANUFACTURE
NAME OR TRADEMARK OF THE MANUFACTURER

12 INSTALLATION PREPARATION
TO ENSURE CORRECT INSTALLATION OF THE PRECAST CONCRETE BRIDGE SYSTEM, CARE AND CAUTION MUST BE EXERCISED IN FORMING THE SUPPORT AREAS FOR BRIDGE UNITS, HEADWALL, AND WINGWALL ELEMENTS EXERCISING SPECIAL CARE WILL FACILITATE THE RAPID INSTALLATION OF THE PRECAST COMPONENTS

12 1 FOOTINGS
DO NOT OVER EXCAVATE FOUNDATIONS UNLESS DIRECTED BY SITE SOIL ENGINEER TO REMOVE UNSUITABLE SOIL

THE SITE SOILS ENGINEER SHALL CERTIFY THAT THE BEARING CAPACITY MEETS OR EXCEEDS THE FOOTING DESIGN REQUIREMENTS, PRIOR TO THE CONTRACTOR POURING OF THE FOOTINGS

THE BRIDGE UNITS AND WINGWALLS SHALL BE INSTALLED ON EITHER PRECAST OR CAST-IN-PLACE CONCRETE FOOTINGS THE SIZE AND ELEVATION OF THE FOOTINGS SHALL BE AS DESIGNED BY THE ENGINEER A KEYWAY SHALL BE FORMED IN THE TOP SURFACE OF THE BRIDGE FOOTING AS SPECIFIED ON THE PLANS NO KEYWAY IS REQUIRED IN THE WINGWALL FOOTINGS, UNLESS OTHERWISE SPECIFIED ON THE PLANS

THE FOOTINGS SHALL BE GIVEN A SMOOTH FLOAT FINISH AND SHALL REACH A COMPRESSIVE STRENGTH OF 2,000 PSI BEFORE PLACEMENT OF THE BRIDGE AND WINGWALL ELEMENTS BACKFILLING SHALL NOT BEGIN UNTIL THE FOOTING HAS REACHED THE FULL DESIGN COMPRESSIVE STRENGTH

THE FOOTING SURFACE SHALL BE CONSTRUCTED IN ACCORDANCE WITH GRADES SHOWN ON THE PLANS WHEN TESTED WITH A 10'-0" STRAIGHT EDGE, THE SURFACE SHALL NOT VARY MORE THAN ¼" IN 10'-0".

IF A PRECAST CONCRETE FOOTING IS USED, THE CONTRACTOR SHALL PREPARE A 4" THICK BASE LAYER OF COMPACTED GRANULAR MATERIAL THE FULL WIDTH OF THE FOOTING PRIOR TO PLACING THE PRECAST FOOTING

THE FOUNDATIONS FOR PRECAST CONCRETE BRIDGE ELEMENTS AND WINGWALLS MUST BE CONNECTED BY REINFORCEMENT TO FORM ONE MONOLITHIC BODY EXPANSION JOINTS SHALL NOT BE USED

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONSTRUCTION OF THE FOUNDATIONS PER THE PLANS AND SPECIFICATIONS

13 INSTALLATION
13 1 GENERAL - THE INSTALLATION OF THE PRECAST CONCRETE ELEMENTS SHALL BE AS EXPLAINED IN THE PUBLICATION CON/SPAN BRIDGE SYSTEMS INSTALLATION HANDBOOK
13 1 1 LIFTING - IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT A CRANE OF THE CORRECT LIFTING CAPACITY IS AVAILABLE TO HANDLE THE PRECAST CONCRETE UNITS THIS CAN BE ACCOMPLISHED BY USING THE WEIGHTS GIVEN FOR THE PRECAST CONCRETE COMPONENTS AND BY DETERMINING THE LIFTING REACH FOR EACH CRANE UNIT SITE CONDITIONS MUST BE CHECKED WELL IN ADVANCE OF SHIPPING TO ENSURE PROPER CRANE LOCATION AND TO AVOID ANY LIFTING RESTRICTIONS THE LIFT ANCHORS OR HOLES PROVIDED IN EACH UNIT ARE THE ONLY MEANS TO BE USED TO LIFT THE ELEMENTS THE PRECAST CONCRETE ELEMENTS MUST NOT BE SUPPORTED OR RAISED BY OTHER MEANS THAN THOSE GIVEN IN THE MANUALS AND DRAWINGS WITHOUT WRITTEN APPROVAL FROM CONTECH® ENGINEERED SOLUTIONS
13 1 2 CONSTRUCTION EQUIPMENT WEIGHT RESTRICTIONS - IN NO CASE SHALL EQUIPMENT OPERATING IN EXCESS OF THE DESIGN LOAD (HL-93) BE PERMITTED OVER THE BRIDGE UNITS UNLESS APPROVED BY CONTECH® ENGINEERED SOLUTIONS
13 1 2 1 IN THE IMMEDIATE AREA OF THE BRIDGE UNITS, THE FOLLOWING RESTRICTIONS FOR THE USE OF HEAVY CONSTRUCTION MACHINERY DURING BACKFILLING OPERATIONS APPLY:
- NO CONSTRUCTION EQUIPMENT SHALL CROSS THE BARE PRECAST CONCRETE BRIDGE UNIT
- AFTER THE COMPACTED FILL LEVEL HAS REACHED A MINIMUM OF 4" OVER THE CROWN OF THE BRIDGE, CONSTRUCTION EQUIPMENT WITH A WEIGHT OF LESS THAN 10 TONS MAY CROSS THE BRIDGE
- AFTER THE COMPACTED FILL LEVEL HAS REACHED A MINIMUM OF 1'-0" OVER THE CROWN OF THE BRIDGE, CONSTRUCTION EQUIPMENT WITH A WEIGHT OF LESS THAN 30 TONS MAY CROSS THE BRIDGE
- AFTER THE COMPACTED FILL LEVEL HAS REACHED THE DESIGN COVER, OR 2'-0" MINIMUM, OVER THE CROWN OF THE PRECAST CONCRETE BRIDGE, CONSTRUCTION EQUIPMENT WITHIN THE DESIGN LOAD LIMITS FOR THE ROAD MAY CROSS THE PRECAST CONCRETE BRIDGE

13 2 LEVELING PAD/SHIMS - THE BRIDGE UNITS AND WINGWALLS SHALL BE SET ON HARDBOARD SHIMS CONFORMING TO ASTM D1037 OR PLASTIC SHIMS (DAYTON SUPERIOR P-80, P-81 OR APPROVED EQUAL) MEASURING 5" x 5", MINIMUM, UNLESS SHOWN OTHERWISE ON THE PLANS A MINIMUM GAP OF ½" SHALL BE PROVIDED BETWEEN THE FOOTING AND THE BOTTOM OF THE BRIDGE'S VERTICAL LEGS OR THE BOTTOM OF THE WINGWALL ALSO, A SUPPLY OF ½", ½" AND ⅛" THICK HARDBOARD OR PLASTIC SHIMS FOR VARIOUS SHIMMING PURPOSES SHALL BE ON SITE

13 3 PLACEMENT OF BRIDGE UNITS - THE BRIDGE UNITS SHALL BE PLACED AS SHOWN ON THE ENGINEER'S PLAN DRAWINGS SPECIAL CARE SHALL BE TAKEN IN SETTING THE ELEMENTS TO THE TRUE LINE AND GRADE THE JOINT WIDTH BETWEEN ADJACENT PRECAST UNITS SHALL NOT EXCEED ¾"

13 4 IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN THE STRUCTURE SPAN DURING ALL PHASES OF INSTALLATION DUE TO THE ARCH SHAPE, BRIDGE ELEMENTS WILL TEND TO SPREAD UNDER SELF-WEIGHT IT IS IMPERATIVE THAT ANY LATERAL SPREADING OF THE BRIDGE ELEMENTS BE AVOIDED DURING AND AFTER THEIR PLACEMENT GENERALLY, HORIZONTAL CABLE TIES OR TIE RODS ARE SHIPPED IN THE LARGER BRIDGE ELEMENTS TO ASSIST IN PREVENTING THIS SPREADING CABLE TIES/TIE RODS SHALL NOT BE REMOVED UNTILL BRIDGE UNITS ARE GROUTED AND GROUT HAS CURED IT IS RECOMMENDED THAT TEMPORARY HARDWOOD BLOCKS BE USED IN CONJUNCTION WITH THE CABLE TIES/TIE RODS TO MAINTAIN SPAN IF, HOWEVER, DUE TO SITE RESTRICTIONS, THESE CABLE TIES/TIE RODS MUST BE REMOVED PRIOR TO PLACEMENT OF THE BRIDGE ELEMANTS, THE CONTRACTOR MUST NOTIFY CONTECH (MANUFACTURER) AND REQUEST A SUGGESTED INSTALLATION PROCEDURE

IN ADDITION, IF THE CABLE TIES/TIE RODS MUST BE REMOVED PRIOR TO SETTING ARCH UNITS, THE FOLLOWING QUALITY CONTROL PROCEDURE MUST BE FOLLOWED:
1) FIND "MEASURED SPAN" UPON ARCH UNIT'S DELIVERY TO SITE, PRIOR TO LIFTING FROM TRUCK AND REMOVING CABLE TIES/TIE RODS "MEASURED SPAN" SHALL BE THE AVERAGE OF (3) SPAN MEASUREMENTS ALONG THE LAY LENGTH OF THE ARCH UNIT
2) AFTER SETTING OF BRIDGE UNIT ON THE FOUNDATION, VERIFY THE SPAN THIS "INSTALLED SPAN MEASUREMENT" SHALL NOT EXCEED THE MAXIMUM OF:
A) THE NOMINAL SPAN +½" OR
B) THE "MEASURED SPAN"
IF THE "INSTALLED SPAN MEASUREMENT" EXCEEDS THIS AMOUNT, THE ARCH UNIT SHALL BE LIFTED AND RE-SET UNTIL THE "INSTALLED SPAN MEASUREMENT" MEETS THE LIMITS

13 5 PLACEMENT OF WINGWALLS, HEADWALLS AND FOUNDATION UNITS - THE WINGWALLS, HEADWALLS AND FOUNDATIONS SHALL BE PLACED AS SHOWN ON THE PLAN DRAWINGS SPECIAL CARE SHALL BE TAKEN IN SETTING THE ELEMENTS TO THE TRUE LINE AND GRADE

13 6 WATERPROOFING/JOINT PROTECTION AND SUBSURFACE DRAINAGE
13 6 1 EXTERNAL PROTECTION OF JOINTS - THE BUTT JOINT MADE BY TWO ADJOINING BRIDGE UNITS SHALL BE COVERED WITH A ⅛" x 1⅜" PREFORMED BITUMINOUS JOINT SEALANT AND A MINIMUM OF A 9" WIDE JOINT WRAP THE SURFACE SHALL BE FREE OF DIRT BEFORE APPLYING THE JOINT MATERIAL A PRIMER COMPATIBLE WITH THE JOINT WRAP TO BE USED SHALL BE APPLIED FOR A MINIMUM WIDTH OF 9" ON EACH SIDE OF THE JOINT THE EXTERNAL WRAP SHALL BE CS212 BY CONCRETE SEALANTS INC , EZ-WRAP RUBBER BY PRESS-SEAL GASKET CORPORATION, SEAL WRAP BY MAR MAC MANUFACTURING CO INC OR APPROVED EQUAL THE JOINT SHALL BE COVERED CONTINUOUSLY FROM THE BOTTOM OF ONE BRIDGE SECTION LEG, ACROSS THE TOP OF THE BRIDGE AND TO THE OPPOSITE BRIDGE SECTION LEG ANY LAPS THAT RESULT IN THE JOINT WRAP SHALL BE A MINIMUM OF 6" LONG WITH THE OVERLAP RUNNING DOWNHILL
13 6 2 IN ADDITION TO THE JOINTS BETWEEN BRIDGE UNITS, THE JOINT BETWEEN THE END BRIDGE UNIT AND THE HEADWALL SHALL ALSO BE SEALED AS DESCRIBED ABOVE IF PRECAST WINGWALLS ARE USED, THE JOINT BETWEEN THE END BRIDGE UNIT AND THE WINGWALL SHALL BE SEALED WITH A 2'-0" STRIP OF FILTER FABRIC ALSO, IF LIFT HOLES ARE FORMED IN THE BRIDGE UNITS, THEY SHALL BE PRIMED AND COVERED WITH A 9" x 9" SQUARE OF JOINT WRAP
13 6 3 DURING THE BACKFILLING OPERATION, CARE SHALL BE TAKEN TO KEEP THE JOINT WRAP IN ITS PROPER LOCATION OVER THE JOINT
13 6 4 SUBSOIL DRAINAGE SHALL BE AS DIRECTED BY THE ENGINEER

13 7 GROUTING
13 7 1 GROUTING SHALL NOT BE PERFORMED WHEN TEMPERATURES ARE EXPECTED TO GO BELOW 35° FOR A PERIOD OF 72 HOURS FILL THE BRIDGE-FOUNDATION KEYWAY WITH CEMENT GROUT (PORTLAND CEMENT AND WATER OR CEMENT MORTAR COMPOSED OF PORTLAND CEMENT, SAND AND WATER) WITH A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3000 PSI VIBRATE AS REQUIRED TO ENSURE THAT THE ENTIRE KEY AROUND THE BRIDGE ELEMENT IS COMPLETELY FILLED IF BRIDGE ELEMENTS HAVE BEEN SET WITH TEMPORARY TIES (CABLES, BARS, ETC) GROUT MUST ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 1500 PSI BEFORE TIES MAY BE REMOVED
13 7 2 ALL GROUT SHALL HAVE A MAXIMUM AGGREGATE SIZE OF ¼"
13 7 3 LIFTING AND ERECTION ANCHOR RECESSES SHALL BE FILLED WITH GROUT
13 7 4 AFTER GROUT HAS REACHED ITS DESIGN STRENGTH THE TEMPORARY HARDWOOD WEDGES SHALL BE REMOVED AND THEIR HOLES FILLED WITH GROUT

13 8 BACKFILL
13 8 1 DO NOT PERFORM BACKFILLING DURING WET OR FREEZING WEATHER
13 8 2 NO BACKFILL SHALL BE PLACED AGAINST ANY STRUCTURAL ELEMENTS UNTIL THEY HAVE BEEN APPROVED BY THE ENGINEER
13 8 3 BACKFILL SHALL BE CONSIDERED AS ALL REPLACED EXCAVATION AND NEW EMBANKMENT ADJACENT TO THE PRECAST CONCRETE ELEMENTS THE PROJECT CONSTRUCTION AND MATERIAL SPECIFICATIONS, WHICH INCLUDE THE SPECIFICATIONS FOR EXCAVATION FOR STRUCTURES AND ROADWAY EXCAVATION AND EMBANKMENT CONSTRUCTION, SHALL APPLY EXCEPT AS MODIFIED IN THIS SECTION
13 8 4 BACKFILL ZONES:
- IN-SITU SOIL
- ZONE A: CONSTRUCTED EMBANKMENT OR OVERFILL
- ZONE B: FILL THAT IS DIRECTLY ASSOCIATED WITH PRECAST CONCRETE BRIDGE INSTALLATION
- ZONE C: ROAD STRUCTURE

13 8 5 REQUIRED BACKFILL PROPERTIES
13 8 5 1 IN-SITU SOIL - NATURAL GROUND IS TO BE SUFFICIENTLY STABLE TO ALLOW EFFECTIVE SUPPORT TO THE PRECAST CONCRETE BRIDGE UNITS AS A GUIDE, THE EXISTING NATURAL GROUND SHOULD BE OF SIMILAR QUALITY AND DENSITY TO ZONE B MATERIAL FOR MINIMUM LATERAL DIMENSION OF ONE BRIDGE SPAN OUTSIDE OF THE BRIDGE FOOTING
13 8 5 2 ZONE A - ZONE A REQUIRES FILL MATERIAL WITH SPECIFICATIONS AND COMPACTING PROCEDURES EQUAL TO THAT FOR NORMAL ROAD EMBANKMENTS
13 8 5 3 ZONE B - GENERALLY, SOILS SHALL BE REASONABLY FREE OF ORGANIC MATTER, AND, NEAR CONCRETE SURFACES, FREE OF STONES LARGER THAN 3" IN DIAMETER SEE CHARTS FOR DETAILED DESCRIPTIONS OF ACCEPTABLE SOILS
13 8 5 4 ZONE C - ZONE C IS THE ROAD SECTION OF GRAVEL, ASPHALT OR CONCRETE BUILT IN COMPLIANCE WITH LOCAL ENGINEERING PRACTICES
13 8 5 5 GEOTECHNICAL ENGINEER SHALL REVIEW GRADATIONS OF ALL INTERFACING MATERIALS AND, IF NECESSARY, RECOMMEND GEOTEXTILE FILTER FABRIC (PROVIDED BY CONTRACTOR)

13 8 6 PLACING AND COMPACTING BACKFILL
DUMPING FOR BACKFILLING IS NOT ALLOWED ANY NEARER THAN 3'-0" FROM THE BRIDGE LEG

THE FILL MUST BE PLACED AND COMPACTED IN LAYERS NOT EXCEEDING 8" THE MAXIMUM DIFFERENCE IN THE SURFACE LEVELS OF THE FILL ON OPPOSITE SIDES OF THE BRIDGE MUST NOT EXCEED 2'-0"

THE FILL BEHIND WINGWALLS MUST BE PLACED AT THE SAME TIME AS THAT OF THE BRIDGE FILL IT MUST BE PLACED IN PROGRESSIVELY PLACED HORIZONTAL LAYERS NOT EXCEEDING 8" PER LAYER

THE BACKFILL OF ZONE B SHALL BE COMPACTED TO A MINIMUM DENSITY OF 95% OF THE STANDARD PROCTOR, AS REQUIRED BY AASHTO T-99

SOIL WITHIN 1'-0" OF CONCRETE SURFACES SHALL BE HAND-COMPACTED ELSEWHERE, USE OF ROLLERS IS ACCEPTABLE IF VIBRATING ROLLER-COMPACTORS ARE USED, THEY SHALL NOT BE STARTED OR STOPPED WITHIN ZONE B AND THE VIBRATION FREQUENCY SHOULD BE AT LEAST 30 REVOLUTIONS PER SECOND

THE BACKFILL MATERIAL AND COMPACTING BEHIND WINGWALLS SHALL SATISFY THE CRITERIA FOR THE BRIDGE BACKFILL, ZONE B

BACKFILL AGAINST A WATERPROOFED SURFACE SHALL BE PLACED CAREFULLY TO AVOID DAMAGE TO THE WATERPROOFING MATERIAL

13 8 7 BRIDGE UNITS
FOR FILL HEIGHTS OVER 12 FEET (AS MEASURED FROM TOP CROWN OF BRIDGE TO FINISHED GRADE), NO BACKFILLING MAY BEGIN UNTIL A BACKFILL COMPACTION TESTING PLAN HAS BEEN COORDINATED WITH AND APPROVED BY CONTECH® ENGINEERED SOLUTIONS

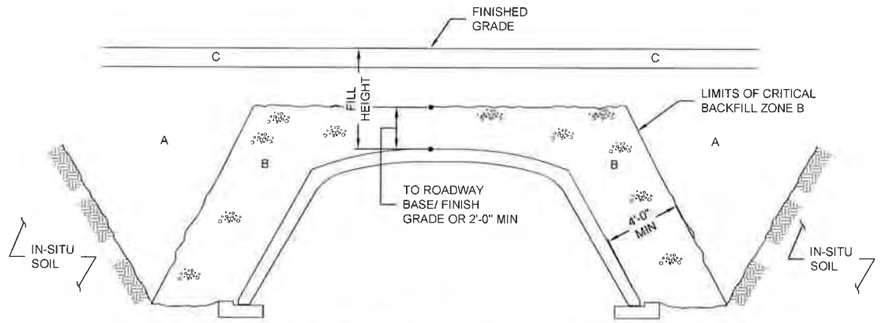
13 8 8 WINGWALLS
BACKFILL IN FRONT OF WINGWALLS SHALL BE CARRIED TO GROUND LINES SHOWN IN THE PLANS

13 8 9 MONITORING
THE CONTRACTOR SHALL CHECK SETTLEMENTS AND HORIZONTAL DISPLACEMENT OF FOUNDATION TO ENSURE THAT THEY ARE WITHIN THE ALLOWABLE LIMIT PROVIDED BY THE ENGINEER THESE MEASUREMENTS SHOULD GIVE AN INDICATION OF THE SETTLEMENTS AND DEFORMATIONS ALONG THE LENGTH OF THE FOUNDATIONS

THE FIRST MEASUREMENT SHOULD TAKE PLACE AFTER THE ERECTION OF ALL PRECAST BRIDGE SYSTEM ELEMENTS, A SECOND AFTER COMPLETION OF BACKFILLING, AND A THIRD BEFORE OPENING OF THE BRIDGE TO TRAFFIC FURTHER MEASUREMENTS MAY BE MADE ACCORDING TO LOCAL CONDITIONS

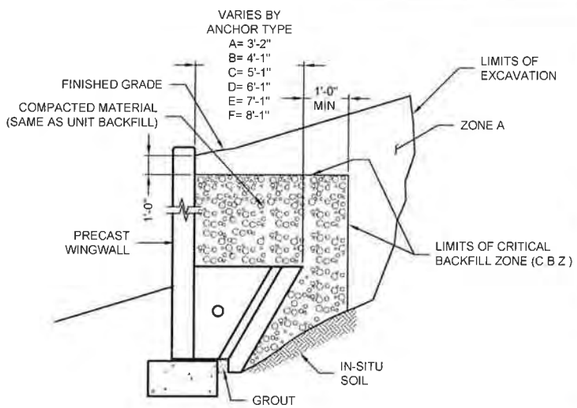
ACCEPTABLE SOILS FOR USE IN ZONE B BACKFILL

TYPICAL USCS MATERIALS	AASHTO GROUP	AASHTO SUBGROUP	PERCENT PASSING US SIEVE NO			CHARACTER OF FRACTION PASSING NO 40 SIEVE		SOIL DESRIPTION
			#10	#40	#200	LIQUID LIMIT	PLASTICITY INDEX	
GW, GP, SP	A1	A-1a	50 MAX	30 MAX	15 MAX		6 MAX	LARGELY GRAVEL BUT CAN INCLUDE SAND AND FINES
GM, SW, SP, SM		A-1b		50 MAX	25 MAX		6 MAX	GRAVELLY SAND OR GRADED SAND, MAY INCLUDE FINES
GM, SM, ML, SP, GP	A2	A-2-4			35 MAX	40 MAX	10 MAX	SANDS, GRAVELS WITH LOW-PLASTICITY SILT FINES
SC, GC, GM		A-2-5			35 MAX	41 MIN	10 MAX	SANDS, GRAVELS WITH PLASTIC SILT FINES
SP, SM, SW	A3			51 MIN	10 MAX		NON-PLASTIC	FINE SANDS
ML, SM, SC	A4				36 MIN	40 MAX	10 MAX	LOW-COMPRESSIBILTY SILTS

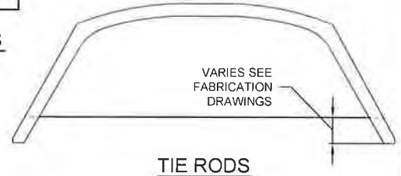


SPAN	FILL HEIGHT	ACCEPTABLE MATERIAL INSIDE ZONE B
≤ 24'-0"	≥ 12'-0"	A1, A3
≤ 24'-0"	< 12'-0"	A1, A2, A3, A4
> 24'-0"	ALL	A1, A3

BACKFILL REQUIREMENTS



WALL BACKFILL REQUIREMENTS



TIE RODS

COLORADO LICENSED
Michael G. Carfagno
42384
PROFESSIONAL ENGINEER
6-17-16

MARK	DATE	REVISION DESCRIPTION	BY

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CONTRACT DRAWING

SWAN RIVER BRIDGE

SILVERTHORNE, COLORADO

PROJECT No	SEQ No	DATE
528626	010	6/16/2016
DESIGNED: JAL	DRAWN: BTS	
CHECKED: DM	APPROVED: MGC	
SHEET NO: CT8 OF CT8		

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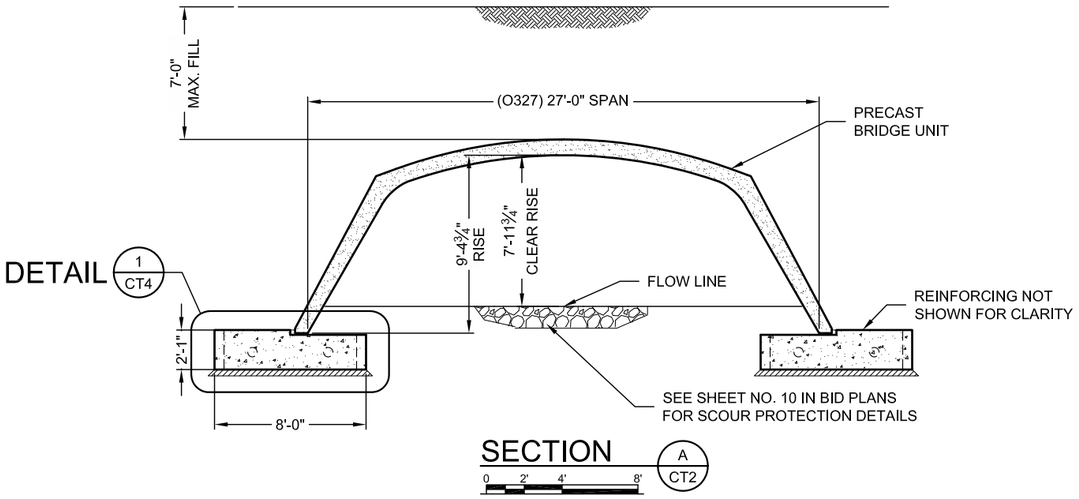
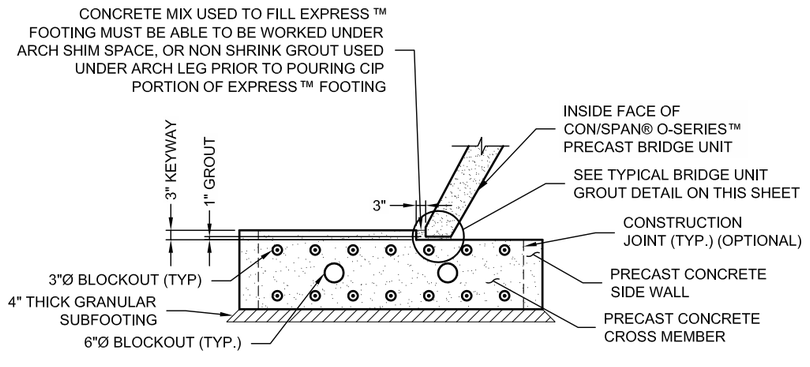


DETAIL 1 / CT4

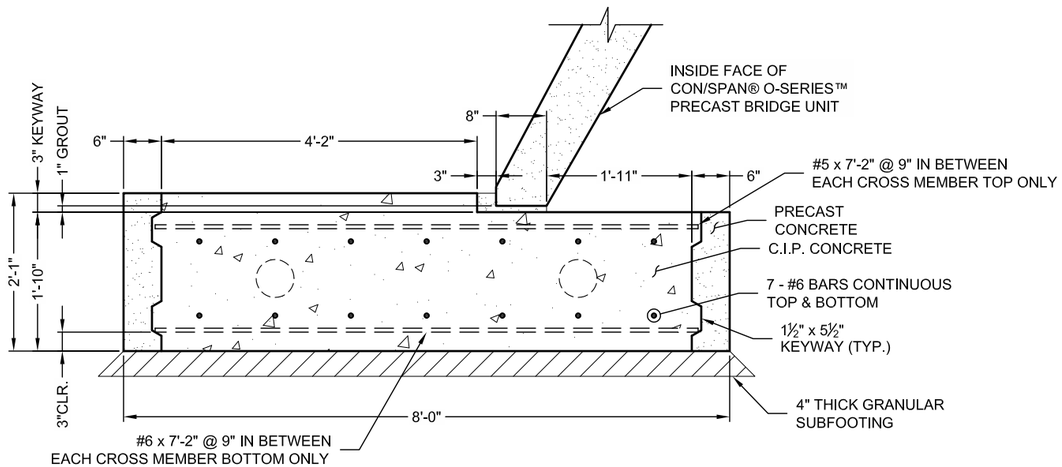
SECTION A / CT2

0 2' 4' 8'



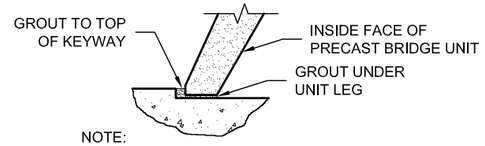
SECTION B / CT3

0 1' 2' 4'



DETAIL 1 / CT4

0 1' 2'



NOTE:
FILL ENTIRE KEYWAY INCLUDING NOMINAL 1" VOID BETWEEN BOTTOM OF KEYWAY AND BOTTOM OF PRECAST BRIDGE UNIT LEG WITH GROUT.

TYPICAL BRIDGE UNIT GROUT DETAIL

NOT TO SCALE

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SWAN RIVER BRIDGE

SILVERTHORNE, COLORADO

PROJECT No.:	SEQ. No.:	DATE:
528626	010	8/5/2016
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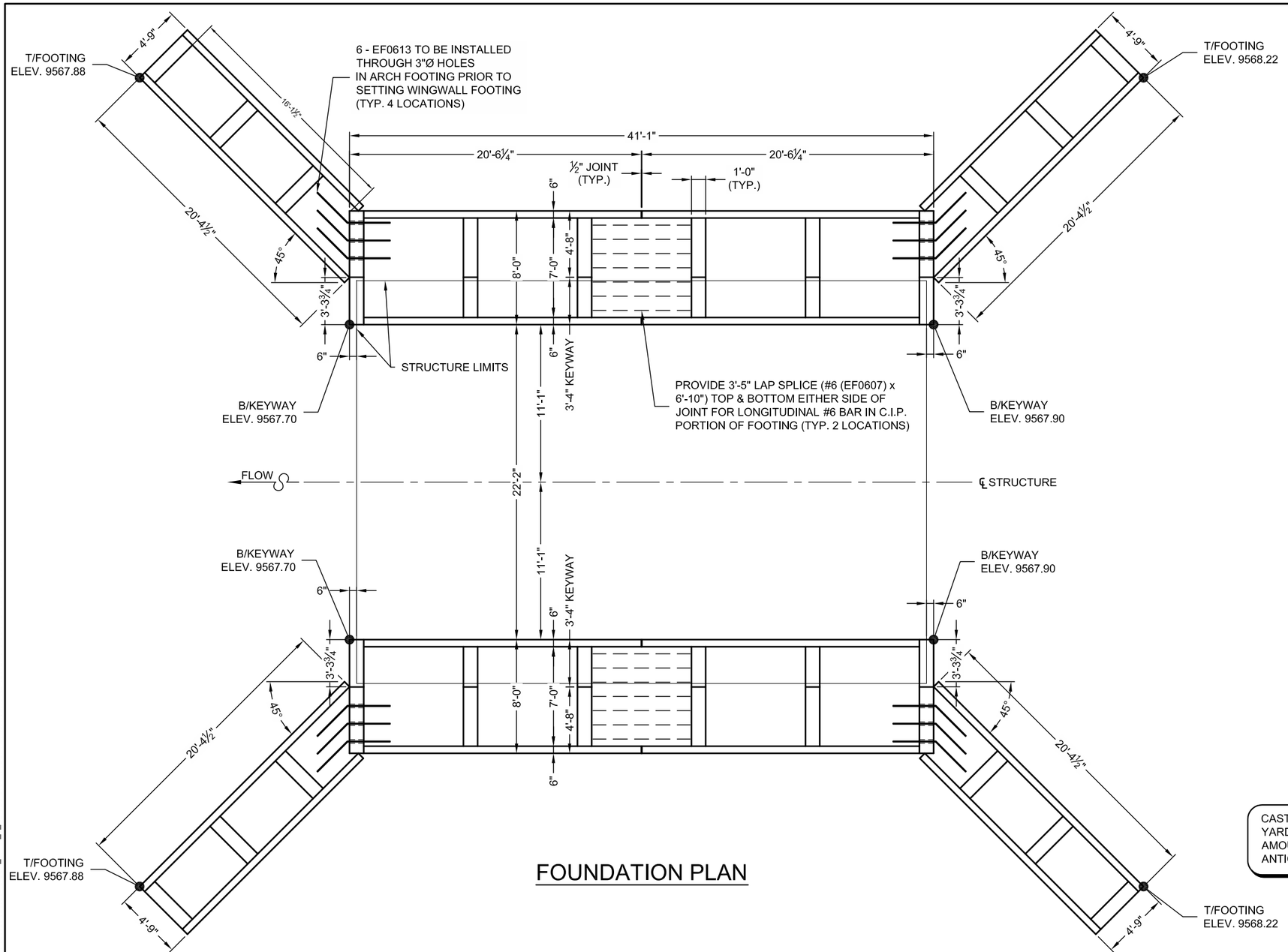

FOUNDATION PLAN

PRECAST REINFORCED CONCRETE EXPRESS ™ FOUNDATION NOTES:

1. PRECAST FOUNDATION UNITS SHALL BE CONSTRUCTED AND INSTALLED IN ACCORDANCE WITH SPECIFICATIONS FOR MANUFACTURE AND INSTALLATION OF CON/SPAN BRIDGE SYSTEMS.
2. PRECAST AND CAST-IN-PLACE CONCRETE FOR EXPRESS FOUNDATIONS SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4000 PSI. REINFORCING STEEL FOR FOUNDATIONS SHALL CONFORM TO ASTM A615 OR A996, GRADE 60.
3. PRECAST FOUNDATION UNITS SHALL BE SET ON A MINIMUM 4-INCH THICK BASE LAYER OF COMPACTED GRANULAR MATERIAL THE FULL WIDTH OF THE FOUNDATION.
4. COMPACTED BACKFILL MATERIAL MUST BE PLACED UP TO THE TOP OF THE PRECAST FOUNDATION UNITS ON BOTH SIDES PRIOR TO PLACING CAST-IN-PLACE CONCRETE PORTION OF FOUNDATIONS.
5. CONCRETE SURFACES WHICH CAST-IN-PLACE CONCRETE WILL BE PLACED AGAINST SHALL BE CLEAN, FREE OF LAITANCE, DIRT, STANDING WATER AND ANY OTHER MATERIAL THAT MAY IMPAIR THE BOND BETWEEN THE PRECAST CONCRETE AND CAST-IN-PLACE CONCRETE.
6. CAST-IN-PLACE CONCRETE MIX USED TO FILL FOUNDATION SHALL BE ABLE TO FLOW INTO ARCH SHIM SPACE OR NON-SHRINK GROUT SHALL BE PLACED UNDER ARCH UNIT LEG AT FOUNDATION CROSS MEMBERS PRIOR TO PLACEMENT OF CAST-IN-PLACE PORTION OF FOUNDATION.
7. IF THE AMBIENT TEMPERATURE AT THE TIME OF PLACEMENT OF CAST-IN-PLACE CONCRETE IS ABOVE 90°F OR EXPECTED TO GO BELOW 35°F DURING THE CURE PERIOD, THE CONTRACTOR SHALL FOLLOW THE REQUIREMENTS OF THE LATEST EDITION OF THE AASHTO LRFD BRIDGE CONSTRUCTION SPECIFICATIONS, SECTION 8.6.2 HOT WEATHER PROTECTION OR SECTION 8.6.4 COLD WEATHER PROTECTION.
8. IF PRECAST ARCH UNITS ARE TO BE ERECTED ON PRECAST FOUNDATION UNITS PRIOR TO PLACEMENT OF CAST-IN-PLACE CONCRETE, THE CABLE TIES/RODS (SHIPPED WITH LONG-SPAN STRUCTURES) MUST REMAIN IN PLACE AND MAY NOT BE REMOVED UNTIL CAST-IN-PLACE CONCRETE HAS REACHED A MINIMUM COMPRESSIVE STRENGTH OF 2000 PSI.
9. IF CABLE TIES/RODS (SHIPPED WITH LONG-SPAN STRUCTURES) MUST BE REMOVED PRIOR TO SETTING OF ARCH UNITS, CAST-IN-PLACE CONCRETE PORTION OF FOUNDATIONS MUST BE PLACED AND ALLOWED TO REACH A MINIMUM COMPRESSIVE STRENGTH OF 2000 PSI BEFORE PLACEMENT OF PRECAST ARCH UNITS, HEADWALLS AND WINGWALLS. CONTRACTOR MUST FOLLOW SPECIFICATION SECTION 13.4 AND NOTIFY CONTECH ENGINEER PRIOR TO REMOVING CABLES TIES/RODS.
10. IF CAST-IN-PLACE CONCRETE PORTION OF FOUNDATION IS TO BE PLACED PRIOR TO SETTING OF ARCH UNITS, HEADWALLS OR WINGWALLS, CAST-IN-PLACE CONCRETE SHALL REACH A MINIMUM COMPRESSIVE STRENGTH OF 2000 PSI BEFORE PRECAST ARCH UNITS, HEADWALLS AND WINGWALLS ARE SET.
11. FOUNDATION CONCRETE SHALL REACH ITS FULL DESIGN STRENGTH BEFORE BACKFILLING OF ARCH UNITS MAY COMMENCE.

CAST IN PLACE CONCRETE VOLUME: 56.2 CUBIC YARDS CONCRETE VOLUME IS ACTUAL REQUIRED AMOUNT AND SHOULD BE INCREASED FOR ANTICIPATED LEAKAGE, WASTE, ETC.

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FABRICATION DRAWING

SWAN RIVER BRIDGE

SILVERTHORNE, COLORADO

PROJECT No.:	SEQ. No.:	DATE:
528626	010	8/5/2016
DESIGNED: JAL		DRAWN: JA
CHECKED: DM		APPROVED: MGC
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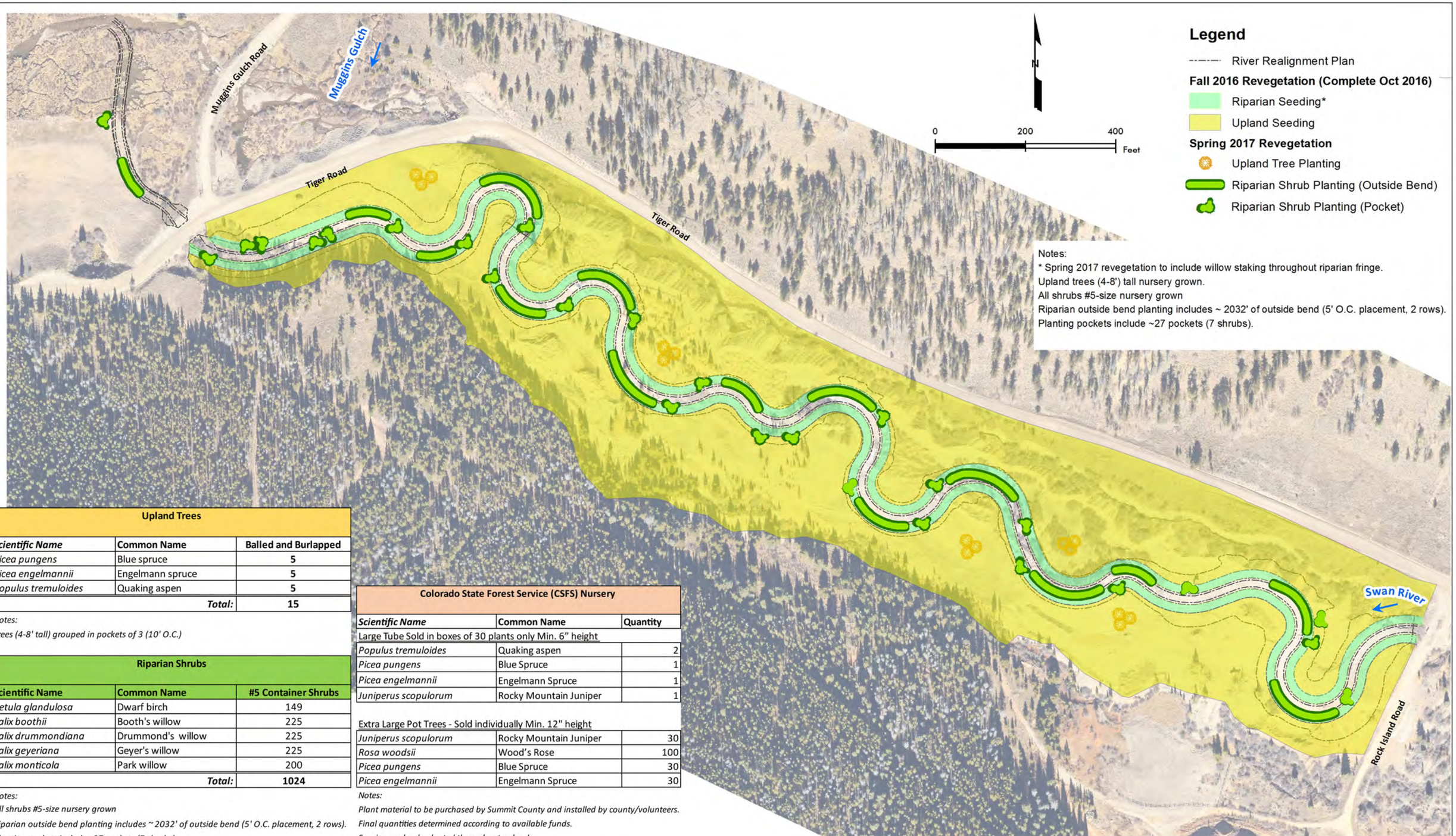


Upland Trees		
Scientific Name	Common Name	Balled and Burlapped
Picea pungens	Blue spruce	5
Picea engelmannii	Engelmann spruce	5
Populus tremuloides	Quaking aspen	5
	Total:	15

Notes:
Trees (4-8' tall) grouped in pockets of 3 (10' O.C.)

Riparian Shrubs		
Scientific Name	Common Name	#5 Container Shrubs
Betula glandulosa	Dwarf birch	149
Salix boothii	Booth's willow	225
Salix drummondiana	Drummond's willow	225
Salix geyeriana	Geyer's willow	225
Salix monticola	Park willow	200
	Total:	1024

Notes:
All shrubs #5-size nursery grown
Riparian outside bend planting includes ~ 2032' of outside bend (5' O.C. placement, 2 rows).
Planting pockets include ~27 pockets (7 shrubs).

Colorado State Forest Service (CSFS) Nursery		
Scientific Name	Common Name	Quantity
Large Tube Sold in boxes of 30 plants only Min. 6" height		
Populus tremuloides	Quaking aspen	2
Picea pungens	Blue Spruce	1
Picea engelmannii	Engelmann Spruce	1
Juniperus scopulorum	Rocky Mountain Juniper	1
Extra Large Pot Trees - Sold individually Min. 12" height		
Juniperus scopulorum	Rocky Mountain Juniper	30
Rosa woodsii	Wood's Rose	100
Picea pungens	Blue Spruce	30
Picea engelmannii	Engelmann Spruce	30

Notes:
Plant material to be purchased by Summit County and installed by county/volunteers.
Final quantities determined according to available funds.
Species randomly planted throughout uplands.

REV	DATE	DESCRIPTION

PREPARED BY
ECOLOGICAL RESOURCES CONSULTANTS, INC
35715 US HIGHWAY 40, SUITE D204
EVERGREEN, CO 80439

CLIENT
SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
2016 PLANTING PLAN
October 13, 2016

SHEET NO
1

Exhibit E
Project Permits

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

May 13, 2016

Regulatory Division (SPK-2015-00780)

Summit County Open Space and Trails
Attn: Mr. Jason Lederer
0037 Peak One Drive
Frisco, Colorado 80443
Jason.Lederer@SummitCountyCO.gov

Dear Mr. Lederer:

We are responding to your March 30, 2016, request for a Department of the Army permit for the Swan River Restoration Project. The approximately 29-acre project site is located along the Swan River adjacent to Tiger Road (CR6), approximately between Muggins Gulch Road and Rock Island Road, Latitude 39.523537°, Longitude -105.966068°, S ½ of Section 14, Township 6 South, Range 77 West, Summit County, Colorado.

Based on the information you provided to this office, the Swan River Restoration Project involves work in accordance with the Swan River Restoration Project Pre-Construction Notification plans dated March 18, 2016. These activities will result in the relocation of approximately 2,504 linear feet of the channelized Swan River, resulting in the re-establishment of approximately 5,131 linear feet of stream channel. The project will also result in the temporary loss of approximately 2.23 acres of wetland. This segment of river has been highly modified and degraded from dredged boat mining and remaining spoils left on-site. Restoration of the natural channel form, and re-connection of the stream to its floodplain and groundwater interaction, as well as large scale revegetation efforts, is expected to result in abundant riparian and wetland vegetation restoration across the largely denuded site.

The specific activities that require work/structures or the discharge of dredged or fill material in waters of the United States include restoration of the entire valley bottom and new channel alignment within the Project Area, which will require extensive earthwork and contouring. Heavy equipment will contour the existing landscape to re-establish appropriate valley shape, landforms and achieve appropriate elevations for groundwater interactions. Onsite material will be stockpiled and processed (sorted/screened/crushed) to produce specific materials (fine mineral soils, gravel and cobbles) used for restoration features. A majority of the surface grading and new channel excavation work will be completed with groundwater and stream flows directed around active earthwork areas. However localized drainage and minor flows are anticipated within the new channel work and will be discharged through Best Management Practices (BMPs). Once the new

channel is completed, flows will be introduced and the existing channel abandoned and backfilled.

The new channel alignment and the goal to eliminate fish barriers will require installation of an open bottom culvert bridge for Tiger Road and re-alignment of a section of Tiger Road and Muggins Gulch Road. Tiger Road will be shifted slightly east and Muggins Gulch Road will be shifted north providing adequate room for the new channel alignment. An arched open bottom culvert will be installed in Tiger Road to accommodate the new channel, replacing the current failing pipe culverts conveying stream flows through Tiger Road.

Large scale revegetation efforts will focus on developing a suitable growth medium to cap dredge spoils and the contoured land surface in order to establish native riparian and upland vegetation communities.

We have determined activities in waters of the U.S. associated with the project are authorized by **Nationwide Permit Number (NWP) 27 - Aquatic Habitat Restoration, Establishment, and Enhancement Activities**. You must comply with all terms and conditions of the NWP, applicable regional conditions, and project-specific special conditions. Information about the NWP and regional conditions are available on our website at *www.spk.usace.army.mil/Missions/Regulatory/Permitting/NationwidePermits.aspx*. In addition, your work must comply with the following special conditions:

1. Within 30 days following construction activities, you shall submit post-construction site and aerial photographs of the project site, showing the work conducted, to the Corps. The camera positions and view angles of post-construction photographs shall be identified on a map, aerial photo, or project drawing. Construction locations shall include all major project features and waters of the U.S.

2. You shall submit a brief annual monitoring report for a period of five years, beginning one year from the completion of project construction. These reports shall be submitted by December 31 of each year, and shall include a narrative describing the status of the both the channel restoration work and the success of the target objectives of the project. Representative ground photography of the sites shall be included in all reports.

Within 30 days after completion of the authorized work, you must sign the enclosed Compliance Certification and return it to this office.

This verification is valid until March 18, 2017, when the existing NWPs are scheduled to be modified, reissued, or revoked. Furthermore, if you commence or are under contract to commence this activity before the date the NWP is modified, reissued, or revoked, you will have 12 months from the date of the modification, reissuance or revocation to complete the activity under the present terms and conditions. Failure to comply with the

general and regional conditions of this NWP, or the project-specific special conditions of this authorization, may result in the suspension or revocation of your authorization.

We would appreciate your feedback on this permit action including your interaction with our staff. At your earliest convenience, please tell us how we are doing by completing the Corps' Regulatory Program national customer service survey found on our website at *www.spk.usace.army.mil/Missions/Regulatory.aspx.*

Please refer to identification number SPK-2015-00780 in any correspondence concerning this project. If you have any questions, please contact me at our Grand Junction Regulatory Office, 400 Rood Avenue, Room 224, Grand Junction, Colorado 81501, by email at *Matthew.R.Montgomery@usace.army.mil*, or telephone at 970-243-1199 Ext. 17.

Sincerely,

MONTGOMERY.MATTHEW.RAY.1258492168

Digitally signed by MONTGOMERY.MATTHEW.RAY.1258492168
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=MONTGOMERY.MATTHEW.RAY.1258492168
Date: 2016.05.13 11:38:22 -06'00'

Matthew Montgomery
Senior Project Manager, CO West Branch
Regulatory Division

Enclosure
1. Compliance Certification
2. Aerial Photo of Swan River Restoration Project, Corps File No. SPK-2015-00780

cc: (w/ encls)
Mr. Dave Blauch, Ecological Resource Consultants, via email: Dave@erccolorado.net
Ms. Lindsay Hirsh, Summit County Engineering, via email: LindsayH@co.summit.co.us
Mr. Jon Ewert, Colorado Parks and Wildlife, via email: jon.ewert@state.co.us
Ms. Ann Timberman, US FWS, via email: ann_timberman@fws.gov
Ms. Sarah Fowler, US EPA, via email; Fowler.Sarah@epamail.epa.gov

COMPLIANCE CERTIFICATION

Permit File Name: Swan River Restoration Project

Action ID: SPK-2015-00780

Nationwide Permit Number:

Permittee: Summit County Open Space and Trails
Attn: Mr. Jason Lederer
0037 Peak One Drive
Frisco, Colorado 80443

County: Summit

Date of Verification: May 13, 2016

Within 30 days after completion of the activity authorized by this permit, sign this certification and return it to the following address:

U.S. Army Corps of Engineers
Sacramento District
400 Rood Avenue, Room 224
Grand Junction, Colorado 81501
DLL-CESPK-RD-Compliance@usace.army.mil

Please note that your permitted activity is subject to a compliance inspection by a U.S. Army Corps of Engineers representative. If you fail to comply with the terms and conditions of the permit your authorization may be suspended, modified, or revoked. If you have any questions about this certification, please contact the U.S. Army Corps of Engineers.

* * * * * * * * *

I hereby certify that the work authorized by the above-referenced permit, including all the required mitigation, was completed in accordance with the terms and conditions of the permit verification.

Permittee Signature _____ Date _____


Swan River Restoration Project
SPK-2015-00780
Legend
Project Area
Muggins Gulch Rd
Summit Gulch Rd
Rock Island Rd
N
1000 ft
Google earth
© 2016 Google

1110928
Kathleen Neel – Summit County Recorder
3 Pages
5/12/2016 2:05 PM
DF: $0.00

RESOLUTION NO. 2016-22

BOARD OF COUNTY COMMISSIONERS
OF THE
COUNTY OF SUMMIT
STATE OF COLORADO

A RESOLUTION APPROVING PLANNING CASE #PLN16-017, a Conditional Use Permit to allow temporary milling (gravel crushing) of dredge tailings in support of the Swan River Restoration Project on the 136 acre A-1 zoned Williams Placer (MS#1118), Sections 14 and 24 of T6S, R77W 6th PM; (APPLICANT: Summit County Open Space & Trails Department)

WHEREAS, the Upper Blue Basin Planning Commission reviewed the application for a Conditional Use Permit to allow temporary milling (gravel crushing) of dredge tailings in support of the Swan River Restoration Project on the 136 acre A-1 zoned Williams Placer (MS#1118), Sections 14 and 24 of T6S, R77W 6th PM at their March 24, 2016 meeting that was publically noticed as required by law, and after consideration of all evidence and testimony presented to the Commission approved the request Conditional Use Permit on a vote of 6-1; and

WHEREAS, Peter Podore and Joe Harris appealed March 24, 2016 Upper Blue Planning Commission's approval of the requested Conditional Use Permit (Planning Case PLN16-017) to allow temporary milling (gravel crushing) of dredge tailings in support of the Swan River Restoration Project on the 136 acre A-1 zoned Williams Placer (MS#1118), Sections 14 and 24 of T6S, R77W 6th PM to the Board Of County Commissioners on March 31, 2016; and

WHEREAS, the Board of County Commissioners has reviewed the application and the appeal at a public hearing held on May 3, 2016 with public notice as required by law and considered the evidence and testimony presented at the hearing; and

WHEREAS, the Board of County Commissioners finds as follows:

A. The proposal is in general conformance with the Goals, Policies/Actions and provisions of the Summit County Countywide Comprehensive Plan, the Upper Blue Master Plan, and the Joint Upper Blue Master Plan as this conditional use permit will facilitate restoration, protection, and enhancement of the Swan River Valley and its open space lands. The temporary adverse impacts associated with any associated truck traffic, dust, and/or noise along the Tiger Road corridor through the adjoining residential neighborhoods would be negligible and are fully offset and acceptable given the significant long term public and environmental benefits resulting from the Swan River Restoration, of which gravel crushing under this conditional use permit is a critical, supporting component.

B. With compliance with the conditions noted below, the proposed milling/gravel crushing operation is in compliance with the County's Zoning Regulations for the A-1 zone district, the industrial./commercial performance standards under §3512 et seq., and provisions of §3812 et seq., Mining/Milling, of the Summit County Land Use & Development Code.

C. With compliance with the conditions noted below, the use is in harmony and compatible with surrounding land uses and the neighborhood and will not create a substantial adverse impact on adjacent properties or on services and infrastructure because any resulting dust or noise would be negligible as experienced by neighboring residential areas and resulting truck traffic on Tiger Road would be significantly less than if the Swan River Restoration Project were to be completed without benefit of onsite milling/gravel crushing.

D. No services or infrastructure other than Tiger Road are required for project implementation. Tiger Road is constructed to County Road & Bridge standards, has handled heavy truck traffic in the past without noticeable deterioration, and in the assessment of the County Road & Bridge Director is fully adequate to handle any truck traffic generated by this conditional use permit.

NOW, THEREFORE BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF THE COUNTY OF SUMMIT, STATE OF COLORADO, THAT the appeal filed by Peter Podore and Joe Harris of the Upper Blue Planning Commission's March 24, 2016 approval of a Conditional Use Permit (Planning Case PLN16-017) to allow temporary milling (gravel crushing) of dredge tailings in support of the Swan River Restoration Project on the 136 acre A-1 zoned Williams Placer (MS#1118), Sections 14 and 24 of T6S, R77W 6th PM is denied and the Conditional Use Permit is approved subject to the following conditions:

1. The applicant shall monitor progress toward the habitat goals set forth in the conditional use permit application, and provide annual progress reports to the Summit County Planning Department.
2. Milling operations of existing onsite dredge spoils may occur six (6) days a week and only between the hours of 7 a.m. and 7 p.m., Monday through Saturday. The Summit County Planning Department shall be notified at least seven (7) calendar days in advance of commencing milling operations, as well as periodic breaks and/or termination of milling operations.
3. The applicant shall revise their State mining permit to incorporate the design details set forth in this conditional use permit application.
4. Signage shall be posted at the site providing information about the Swan River Restoration project, as well as contact information for questions and comments. Signage meeting the requirements for Construction Project Identification in Chapter 9 of the Code will require a permit.
5. Construction phase dust control and monitoring shall conform to all State, Federal, and local stormwater management, erosion, and sediment control requirements including, but not limited to, controlling onsite fugitive dust with water, or similar comparable measures, and tarping loaded trucks leaving the project site.
6. Periodic project updates shall be posted to the blog on the Swan River Restoration project website at: www.restoretheswanriver.com.

7. Open Space & Trails, in conjunction with the County Manager's Office, shall finalize the travel management plan previously developed and submitted by staff with such plan to be updated to reflect any feedback from preliminary operations at the project site and on Tiger Road. The plan shall be presented to the BOCC and interested parties at a work session to be scheduled in the near future. Notice of the work session shall be sent out via email to interested parties who have provided their email address to the County at the hearing. The final plan shall also be published on the website.
8. The CUP will have a five (5) year term and may only be renewed by the Planning Commission after a public hearing for which substantial public notice is provided. Public notice for this hearing shall endeavor to encompass as many HOAs and properties accessed off of Tiger Road as reasonably practicable.
9. The CUP related activities shall be presented to the BOCC annually, in its proprietary role, for review and comment at a work session, to be scheduled prior to the commencement of the coming construction season. Notice for this work session shall endeavor to encompass as many HOAs and properties accessed off of Tiger Road as reasonably practicable.

ADOPTED THIS 3RD DAY OF MAY, 2016.

COUNTY OF SUMMIT
STATE OF COLORADO
BY AND THROUGH ITS
BOARD OF COUNTY COMMISSIONERS

Thomas C. Davidson, Chair

ATTEST:

Kathleen Neel

Kathleen Neel, Clerk & Recorder

COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

1313 Sherman Street, Room 215
Denver, CO 80203

April 7, 2016

Mr. Brian Lorch
Summit County Government and Town of Breckenridge
P.O. Box 5660
Frisco, CO 80443

Re: Swan River Resource, Permit M-1993-035, Technical Revision Approval, Revision TR02

Mr. Lorch:

On April 7, 2016 the Division of Reclamation, Mining and Safety approved the Technical Revision application submitted to the Division on April 4, 2016, addressing the following:

Revise reclamation plan as specified in submittal as part of a multi-agency stream restoration project.

The terms of the Technical Revision TR02 approved by the Division are hereby incorporated into Permit M-1993-035. All other conditions and requirements of Permit M-1993-035 remain in full force and effect.

The Division looks forward to the successful completion of the proposed stream restoration.

If you have any questions, please contact me.

Sincerely,

Eric C. Scott
Environmental Protection Specialist

COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

1313 Sherman Street, Room 215
Denver, CO 80203

August 2, 2016

Mr. Brian Lorch
Summit County Government and Town of Breckenridge
P.O. Box 5660
Frisco, CO 80443

Re: Swan River Resource, Permit M1993-035, Technical Revision Approval, Revision TR03

Dear Mr. Lorch:

After DRMS review of the TR03 submittal, as well as receiving comments of concurrence from CDPHE and EPA, on August 2, 2016 the Division of Reclamation, Mining and Safety approved the Technical Revision application submitted to the Division on August 1, 2016, addressing the following:

Modify TR02 due to historic mine waste encountered during channel restoration work.

The terms of the Technical Revision TR03 approved by the Division are hereby incorporated into Permit M1993-035. All other conditions and requirements of Permit M1993-035 remain in full force and effect.

If you have any questions, please contact me.

Sincerely,

Eric C. Scott
Environmental Protection Specialist

Enclosure

M-RV-01

Exhibit F
Final Project Budget Table

WSRA Grant – CTGG1 2016-445 Final Report – Swan River Stream Restoration – Phase 1 in the Colorado River Basin

Swan River Restoration (Reach A - Phase 1) Last Updated 2/2/2017
Summit County Open Space and Trails Department
Water Supply Reserve Account - Grant and Loan Program *Once CPW Contract finalized, $130k will be invoiced in full. Currently SCG fronting this source of funding
Drainage Basin: Colorado *SCG will invoice CWCB for the funding balance upon submission of the required Final Status Report
Water Source: Swan River

Budget & Timeline Table

Task	Description	Target Start Date	Target Completion Date	CWCB Funds (Budgeted)	CWCB Funds (Expended)	SCG Funds (Budgeted)	SCG Funds (Expended)	TOB Funds (Budgeted)	TOB Funds (Expended)	USFS & USFWS Funds (Budgeted)	USFS & USFWS Funds (Expended)	CPW FIF Funds (Budgeted)	CPW Funds (Expended)	Total Cost (Budgeted Cash)	Total Cost (Expended)	Other Funding In-Kind* (Projected)	In-Kind Sources	Other Funding In-Kind (Actual)	Total (Budgeted Cash & In-Kind)	Total Actual Expended
1	Project Management and Coordination**	7/15/2015	6/30/2018	$ 51,000	$ 45,540.00	$ 5,500	$ 5,500.00	$ 14,500	$ 14,500.00	$ -	$ -	$ 6,500	$ -	$ 77,500	$ 65,540.00	$ 11,000	SCG	$ -	$ 88,500	$ 65,540.00
2	Field Investigation and Data Collection	7/15/2015	11/1/2015	$ -	$ -	$ 14,500	$ 14,500.00	$ 14,000	$ 14,000.00	$ -	$ -	$ -	$ -	$ 28,500	$ 28,500.00	$ -	-	$ -	$ 28,500	$ 28,500.00
3	Design Development	7/15/2015	10/30/2015	$ -	$ -	$ 17,125	$ 17,125.00	$ 16,625	$ 16,625.00	$ -	$ -	$ -	$ -	$ 33,750	$ 33,750.00	$ -	-	$ -	$ 33,750	$ 33,750.00
4	Permitting***	7/15/2015	6/15/2018	$ -	$ -	$ 6,625	$ 6,625.00	$ 3,875	$ 3,875.00	$ -	$ -	$ -	$ -	$ 10,500	$ 10,500.00	$ 11,750	BRWG & FDRD	$ -	$ 22,250	$ 10,500.00
5	Stream Channel Improvements ****	6/1/2016	11/1/2016	$ 497,000	$ 486,298.00	$ 70,000	$ 83,578.70	$ 175,000	$ 175,000.00		$ -	$ 123,500	$ -	$ 865,500	$ 744,876.70	$ -	-	$ -	$ 865,500	$ 744,876.70
6	Riparian and Upland Improvements****	6/1/2016	11/1/2017	$ 427,000	$ 386,298.00	$ 354,359	$ 466,133.00	$ 209,000	$ 209,000.00	$ -	$ -	$ -	$ -	$ 990,359	$ 1,061,431.00	$ 9,000	BRWG & FDRD	$ -	$ 999,359	$ 1,061,431.00
7	Road and Culvert Improvements****	8/1/2016	11/1/2016	$ -	$ -	$ 240,000	$ 240,000.00	$ 10,000	$ 10,000.00	$ 225,000.00	$ 225,000.00	$ -	$ -	$ 475,000	$ 475,000.00	$ -	-	$ -	$ 475,000	$ 475,000.00
	TOTALS			**$ 975,000**	**$ 918,136.00**	**$ 708,109**	**$ 833,461.70**	**$ 443,000.00**	**$ 443,000.00**	**$ 225,000.00**	**$ 225,000.00**	**$ 130,000.00**	**$ -**	**$ 2,481,109.00**	**$ 2,419,597.70**	**$ 31,750**		**$ -**	**$ 2,512,859**	$ 2,419,597.70

Acronyms: CWCB = Colorado Conservation Board; SCG = Summit County Government; USFWS = United States Fish and Wildlife Service; TOB = Town of Breckenridge; USFS = United States Forest Service; CPW = Colorado Parks and Wildlife; BRWG = Blue River Watershed Group; FDRD = Friends of Dillon Ranger District

* In-kind funding: SCG will provide project management services from Open Space and Trails staff; BRWG and FDRD will assist with site revegetation and monitoring.

** Project management and coordination costs include 5% Summit County Administrative Overhead for all funding sources (CWCB Grant = $48,750) = $216 for TR Request to DRMS

***Permitting includes a July, 21, 2016 permitting fee for TR03 request to DRMS

****SCG and TOB budgets increased in this category following BOCC and Town Concil decisions to agree to a price increase & change order to address onsite mine wastes and associated project cost implications

Exhibit G
Project Photographs

Site Investigation

Test pit installation

August 28, 2015

Construction

Construction mobilization

(end May, 2016)

Mobile Rock Crushing Plant

Mobile rock milling plant mobilization

Construction

Initial site grading with scrapers, dozers, and other heavy equipment (June 23, 2016)

Construction

Rock milling underway and ongoing earthwork

(June 11, 2016)

Construction

(July 20, 2016)

Construction

Channel and in-stream structure construction; willow transplants installed on new stream banks (August 2, 2016)

Construction

Construction of deep pools with in-stream rock and wood features (August 17, 2016)

Construction

Aerial image of site while under construction

August 2016

Construction

Detour installed in order to construct new stream crossing (August 31, 2016)

Construction

Final grading of riparian and upland areas. Installation of fencing to prevent/control public entry to site while restoration activities ongoing

(September 16, 2016)

Construction

Footing installation for new stream crossing (September 23, 2016)

Construction

Installation of new crossing span segments (September 27, 2016)

Construction

Completed installation of all prefabricated crossing components; Hydraulic application of seed, mulch, and tackifier

(September 28, 2016)

Construction

(October 3, 2016)

Construction

Completion of crossing installation (October, 2016)

Construction

Completion of fencing installation; Bridge installation complete with new channel flowing freely

(November 9, 2016)

Construction

Seed and erosion control installation complete

(November 21, 2016)

Exhibit H
Swan River Monitoring Photo Point Monitoring Map and Images

Swan River Stream Restoration project (Phase 1)
Photo Point Monitoring – spring and summer 2016

Figures

Figure 1: Swan River Restoration; Photo Point Monitoring map providing an overview of the restoration area and six photo monitoring point locations. *(Note that four additional photo monitoring points have been added since the previous status report was submitted in February 2016.)*

Photo Points

Photo Point 1: Swan River; View east across the Phase 1 restoration reach from an adjacent hillside. Muggins Gulch is visible in the foreground.
Photo Point 2: Swan River; View south across the Phase 1 restoration reach from an adjacent hillside. Where visible, recently installed piezometers are circled in red.
Photo Point 3: Swan River; View north and west across the Phase 1 restoration reach from the top of a tailings pile adjacent to the Tiger Townsite.
Photo Point 4: Swan River; View north, east, and west across the Phase 1 restoration reach.
Photo Point 5: Swan River; View north, east, and west across the Phase 1 restoration reach.
Photo Point 6: Swan River; View north, east, and west across the Phase 1 restoration reach.
Photo Point 7: Swan River; View south and west across Phase 1 restoration reach.
Photo Point 8: Swan River; View north, west, and south across Phase 1 restoration reach from within the restoration site.
Photo Point 9: Swan River; View north, east, and south across Phase 1 restoration reach from within the restoration site.
Photo Point 10: Swan River; View south and west across portion of restoration reach to the west of Tiger Road.

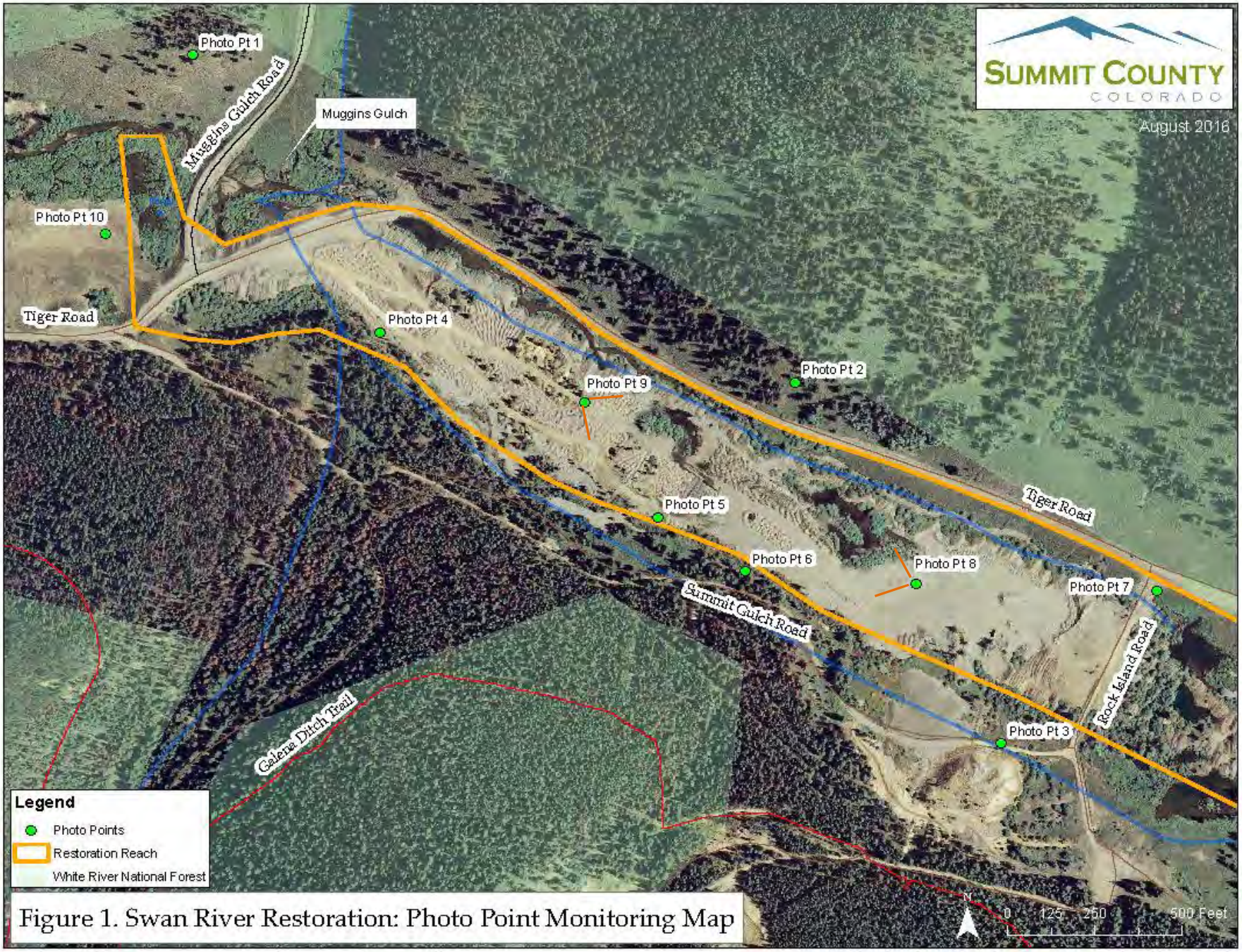


Figure 1. Swan River Restoration: Photo Point Monitoring Map

Photo Point 1

May 31, 2016

October 17, 2016

Photo Point 2

May 31, 2016

October 17, 2016

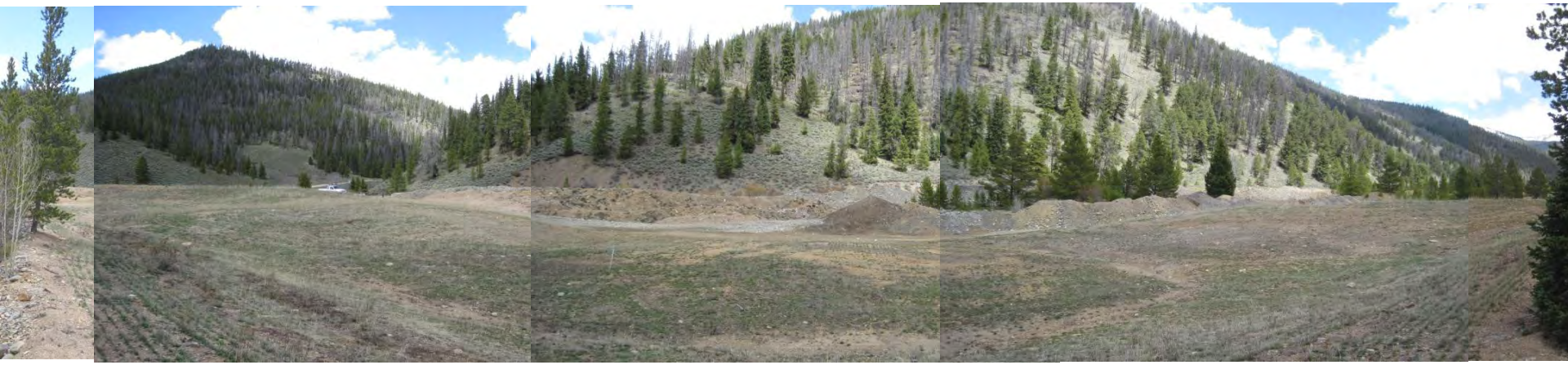
Photo Point 3

May 31, 2016

October 17, 2016

Photo Point 4

May 31, 2016



October 17, 2016

Photo Point 5

May 31, 2016

October 17, 2016

Swan River Restoration project reporting – Phase 1 (submitted to CWCB as supporting material for 2015 WSRA grant)

*Note: August 1, 2016 photo moved north into project site due to a construction-related berm obstructing view of project area.

Photo Point 6

May 31, 2016

October 17, 2016

Photo Point 7

August 8, 2016

October 17, 2016

Photo Point 8

May 31, 2016

October 17, 2016

Photo Point 9

May 31, 2016

October 17, 2016

Photo Point 10

May 31, 2016

October 17, 2016