

**AMENDMENT NO. 1**  
**TO THE**  
**FINAL DRAINAGE REPORT**  
**FOR**  
**TIMBERLINE STORAGE YARD**  
**EL PASO COUNTY, COLORADO**

NOVEMBER 2019

Prepared for:  
**Timberline Landscaping, Inc.**  
20625 Andalusian View  
Pueblo, CO 81008  
(719)-638-1000

Prepared by:



20 Boulder Crescent, Suite 110  
Colorado Springs, CO 80903  
(719) 955-5485

Project #43-095

PCD Project No. PPR-17-018/PPR-19-042

**AMENDMENT NO. 1  
TO THE  
FINAL DRAINAGE REPORT  
FOR  
TIMBERLINE STORAGE YARD  
DRAINAGE PLAN STATEMENTS**

ENGINEERS STATEMENT

The attached drainage plan and report was prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omission on my part in preparing this report.

\_\_\_\_\_  
Virgil A. Sanchez, P.E. #37160  
For and on Behalf of M&S Civil Consultants, Inc

DEVELOPER'S STATEMENT

I, the developer have read and will comply with all the requirements specified in this drainage report and plan.

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATE: \_\_\_\_\_

ADDRESS: Timberline Landscaping, Inc.  
20625 Andalusian View  
Pueblo, CO 81008

EL PASO COUNTY'S STATEMENT

Filed in accordance with the requirements of El Paso County Land Development Code, Drainage Criteria Manual Volumes 1 and 2, and the Engineering Manual, as amended.

BY: \_\_\_\_\_

Jennifer Irvine, P.E.  
County Engineer

DATE: \_\_\_\_\_

CONDITIONS:

**AMENDMENT NO. 1  
TO THE  
FINAL DRAINAGE REPORT  
TIMBERLINE STORAGE YARD**

**TABLE OF CONTENTS**

PURPOSE	4
GENERAL LOCATION AND DESCRIPTION	4
SOILS	5
HYDROLOGIC CALCULATIONS	5
HYDRAULIC CALCULATIONS	5
FLOODPLAIN STATEMENT	5
DRAINAGE CRITERIA	5
FOUR STEP PROCESS	6
EXISTING DRAINAGE CONDITIONS	6
PROPOSED DRAINAGE CONDITIONS	7
WATER QUALITY PROVISIONS AND MAINTENANCE	10
OFFSITE DOWNSTREAM CHANNEL ANALYSIS	10
EROSION CONTROL	11
CONSTRUCTION COST OPINION	11
SUMMARY	12
REFERENCES	13

**APPENDIX**

Vicinity Map  
Soils Map  
FIRM Panel  
Hydrologic Calculations  
Hydraulic Calculations / EDB & WQCV Calculations  
HEC-RAS Calculations  
Grading Erosion Control Plan  
Existing/Proposed/Future Drainage Map

**AMENDMENT NO. 1  
TO THE  
FINAL DRAINAGE REPORT  
FOR  
TIMBERLINE STORAGE YARD**

**PURPOSE**

This document is intended to serve as the first amendment to the Final Drainage Report for the Timberline Storage Yard. The purpose of this document is to identify and analyze the on and offsite drainage patterns and to ensure that post development runoff is routed through the site safely and in a manner that satisfies the requirements set forth by the El Paso County Drainage Criteria Manual.

The development plan for the site will consist of a storage yard with an office/warehouse building and wash bay. The site will also have roadway drive isles constructed from asphalt and asphalt millings, concrete and asphalt parking areas, landscaping and lighting and a full spectrum extended detention basin as well as underground utilities. The parcel is zoned "M" and the proposed use is permissible within the Industrial zoning criteria. The amendment is required to as the site plan is being expanded to utilize the parcel in its entirety.

**GENERAL LOCATION AND DESCRIPTION**

Timberline Storage Yard is located in the north and southeast quarter of the southwest quarter of Section 28, Township 13 South, Range 65 West of the 6th P.M. in El Paso County, Colorado. The parcel is bound to the north, south, and east by other vacant parcels of land. Adjacent to the southwest corner of the site, is an existing development that consists of a light industrial/storage and a maintenance yard. As shown on the enclosed FIRM panel, a channel known as the East Fork of Sand Creek Sub-tributary flows from east to west along the northern boundary of the site. Due to the presence of an existing railroad embankment, the sub-tributary does not influence the subject site. The site is located with the greater Sand Creek Drainage Basin and is tributary to the Sand Creek Channel via the East Fork Sand Creek Sub-Tributary. A vicinity map showing the location of the proposed development has been provided in the appendix of this report.

In the existing condition, both the parcel and offsite contributing watershed lands are sparsely vegetated, with ground cover consisting primarily of native grasses ranging in density from fair to good. Slopes across the development typically range between 2% to 7% while offsite slopes located to the east of the nearly 38 acres, reach grades of 10:1. Offsite flows reaching development are mainly from small fringe areas located along the north and western boundaries. A ridgeline which bisects the parcel, north to south functions to direct runoff to the southern boundary where it has historically collected.

As discussed, the proposed development will construct an office/warehouse building, a car wash bay, and gravel and asphalt parking areas, lighting, and landscaping, as well as build an access road from existing Capitol Drive. Two temporary modular buildings will be moved onsite until the primarily office building can be completed. The majority of the site will be utilized for the storage of landscaping related

materials such as various types of rock, gravel, boulders and mulch along with other commercial related landscaping products, vehicles and trailers.

Runoff entering the subject site from offsite areas, as well as flows produced within the development will be collected by proposed storm sewer improvements and routed to a proposed full spectrum detention (FSD) pond located along the southern boundary and access roadway into the development. Addition detailed discussion regarding these improvements is discussed in subsequent sections of this report.

## **SOILS**

Soils for this project are delineated by the map in the appendix as Blakeland loamy sand (8) and Blendon Sandy Loam (10) is characterized as Hydrologic Soil Types "A" & "B". Soils in the study area are shown as mapped by Soil Conservation Service in the "Soils Survey of El Paso County Area".

## **HYDROLOGIC CALCULATIONS**

Hydrologic calculations were performed using the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual and where applicable the Urban Storm Drainage Criteria Manual. The Rational Method was used to estimate stormwater runoff anticipated from design storms with 5-year and 100-year recurrence intervals.

## **HYDRAULIC CALCULATIONS**

Hydraulic calculations were estimated using the Manning's Formula and the methods described in the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual. The relevant data sheets are included in the appendix of this report.

## **FLOODPLAIN STATEMENT**

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel No. 08041C0543 G, effective date December 7, 2018 no portion of this site is located within the 100- year floodplain.

## **DRAINAGE CRITERIA**

This drainage analysis has been prepared in accordance with the current El Paso County Drainage Criteria Manual and where applicable the City of Colorado Springs DCM Volume 1 dated May 2014 effective January 2015. Hydrologic calculations were performed to determine runoff quantities for the 5-year and 100-year frequency storms for developed conditions using the Rational Method as required for basins having areas less than 130 acres (in accordance with Chapter 6 of the City of Colorado Springs DCM Volume 1). Full spectrum detention facilities have been designed in accordance with Section 3.2.1. of Chapter 13 of the City of Colorado Springs DCM Volume 1, dated May 2014, effective January 31, 2015 and Urban Drainage and Flood Control District Manuals dated January 2016.

## FOUR STEP PROCESS

**Step 1 Employ Runoff Reduction Practices.** – Approx. 1.5 acres of the proposed developed 37.95 Acres of ground within the project is being set aside for a Full Spectrum Detention (FSD) Pond. Whenever possible runoff produced within developable area containing impervious surfaces will be routed through landscaped areas or earthen swales to minimize direct connection of impervious surfaces.

**Step 2 Stabilize drainage ways** –The Timberline Storage Yard site proposes a Full Spectrum Detention (FSD) pond to control developed runoff that is discharging to the historic drainage way that crosses the vacant parcel located to the south of the subject site. The FSD outlet structure has been designed to drain the water quality event storm in 40 hours, while reducing the 100 year peak discharge to approximately 90% of the predevelopment conditions. The development of this site is not anticipated to have negative effects on downstream drainage ways.

**Step 3 Provide water quality capture volume.** – A Full Spectrum Detention Basin is proposed to reduce peak discharge rates and provide water quality treatment. The WQCV will be released over a 40 hour period while larger event storms will be released in periods of times between 64-80 hours.

**Step 4 Consider Need for Industrial and Commercial BMP's** – This submittal provides a final grading and erosion control plans with BMPs in place. The proposed project will use silt fence, a vehicle tracking control pad, concrete washout area, mulching and reseeded to mitigate the potential for erosion across the site.

## EXISTING DRAINAGE CONDITIONS

The Timberline Storage Yard site consists of 37.95 acres and is situated west of the East Fork Reach of the Sand Creek Watershed. Prior to construction associated with this development there were no existing structures within the planned Timberline Storage Yard site. An existing (historic) conditions hydrologic analysis was performed to determine existing flow quantities entering and exiting the subject site so a comparison to post development discharge rates could be made. As shown on the Existing Drainage Map, located in the appendix of this report, the existing site terrain within the parcel generally slopes from north to south at grades that vary between 2% and 7%. An area east of the proposed site contributes to the overall drainage reaching the discharge point located to the south of the subject site.

**Basin EX-1** consists of native grass covered un-platted hillside located to the east of the parcel property boundary. Runoff produced by the 22.9 acre area of land has been calculated to be 7.6 cfs in the 5-year storm event and 51.0 cfs in the 100-year storm event. Runoff from this basin is conveyed as sheet flow to the west towards **Basin EX-2**.

**Basin EX-2** consists of grass covered un-platted lands to the east of a ridgeline that bisects the nearly 38 acre parcel. Runoff produced by the 23.6 acre area has been calculated to reach peak flow rates of 5.0 cfs in the 5-year storm event and 33.6 cfs in the 100-year storm event. Runoff from Basin EX-2 combines with runoff produced within **Basin EX-1** at **Design Point 1** located at the southeast corner of the proposed development boundary. The total calculated surface runoff at **DP1** is 11.5 cfs in the 5-year storm event and 77.3 cfs in the 100-year storm event.

**Basin EX-3** consists of native grass covered un-platted lands located within and adjacent to the western half of the parent parcel. Runoff produced by the 24.7 acre area of land has been calculated to be 5.1 cfs in the 5-year storm event and 34.3 cfs in the 100-year storm event. Runoff from **Basin EX-3** combines with runoff from **DP 1** at **Design Point 2**, at a small channelized drainage way located adjacent to the southern boundary of the planned development. The total calculated surface runoff at **DP2** is 15.1 cfs in the 5-year storm event and 101.4 cfs in the 100-year storm event. Runoff reaching this point continues south through the adjacent un-platted offsite parcel.

**Basin EX-4** consists of native grass covered un-platted lands located just to the west of the property at the southwest corner of the site. Runoff produced by the offsite 1.27 acre area of land has been calculated to reach 0.4 cfs in the 5-year storm event and 2.7 cfs in the 100-year storm event.

## **PROPOSED DRAINAGE CHARACTERISTICS**

### General Proposed Conditions Drainage Discussion

The parcel housing the proposed development is approximately 37.95 acres in size and is currently zoned “M” for industrial. The site is to consist of a large gravel storage yard, an office/warehouse building, a car wash bay, with asphalt and gravel parking areas, lighting, landscaping, and access entryways. Approximately two-thirds of the development will be utilized for the storage of materials and vehicles associated with commercial landscaping.

Runoff produced offsite along the majority of the north and west sides of the proposed site development areas will mimic the historic drainage patterns by sheet flowing to the development boundary lines (see attached proposed drainage map in the appendix) where it will combine with runoff generated onsite within the storage yard and from the east half of the warehouse building. Proposed earthen swales and proposed rip rap lined rundowns will convey the collected runoff to a proposed Full Spectrum Detention pond located along the southern boundary of the site. Runoff generated from the proposed landscaping area directly in front of the warehouse building will combine with runoff generated within the adjacent access road where it will be routed via curb and gutter to a concrete swale and routed then routed to the proposed pond. Runoff produced offsite to the east will combine with onsite flows with the eastern half of the development (which is to be utilized for material storage) and directed to a proposed riprap rundown which will convey the collected flows to the FSD pond. The runoff reaching the pond will be detained and discharged via a staged outlet box and proposed RCP storm system to the historic drainage way located south of the site below historic flow rates.

Runoff generated from the west half of the proposed warehouse building and west parking lot and a small portion of the proposed access/entrance roadway will be discharge into the proposed DWIRE pond. The proposed discharge from this portion of the site, post construction, is just slightly higher than historic. It should be noted that a shared access and drainage easement has been signed by the adjacent property owner permit access to the west side of the building and to allow for developed discharge onto the site. A maintenance agreement is included with this report and submittal.

## Proposed Conditions Detailed Drainage Discussion

**Basin OS-1**, 1.47 acres, (Q5=0.4cfs, Q100=2.8cfs), consists of undeveloped un-platted offsite lands located along the north boundary of the proposed development. Runoff from **Basin OS-1** is tributary to **Basin A**.

**Basin A**, 5.87 acres, (Q5=5.8cfs, Q100=17.3cfs), consists primarily of portions of the proposed gravel storage, greenbelt/agricultural land and access roads located near the north and west boundaries. Runoff produced within **Basin A** combines with runoff from **Basins OS-1** and enters Basin B.

**Basin OS-2**, 2.44 acres, (Q5=2.4cfs, Q100=7.5cfs), consists of undeveloped un-platted offsite lands located along the west boundary of the proposed development. Runoff from **Basin OS-2** is tributary to **Basin B**.

**Basin C**, 2.47 acres, (Q5=2.3cfs, Q100=6.9cfs), consists primarily of portions of the proposed gravel storage, greenbelt/agricultural land and access roads located adjacent to Basin A and B. Runoff from **Basin C** is tributary to **Basin B**.

**Basin B**, 7.91 acres, (Q5=10.4cfs, Q100=25.9cfs), consists primarily of a proposed gravel storage yard as well as a portion of the proposed office/warehouse building, wash bay, associated concrete aprons, and asphalt parking areas located along the northeast corner of the building. Runoff produced within **Basin B** combines with runoff from **Basins OS-1, OS-2, A and C** at **Design Point 1** (Q5=16.0cfs, Q100=45.3cfs). Runoff reaching DP-1 will be directed to a proposed Full Spectrum Detention Pond at **Design Point 4** via a 4'bw 3:1 SS trapezoidal 25% rundown lined with D50=18" riprap atop a gravel and fabric liner. A pair of 4:1SS, 1' min. deep v-shaped earthen swales graded at a min of 1% are recommended to be constructed along the northern exterior of the pond embankment to intercept runoff that might otherwise erode the pond side slopes. An 18" deep concrete lined forebay is to be constructed at the bottom of the rundown to collect any conveyed sediment.

**Basin D**, 0.65 acres, (Q5=2.3cfs, Q100=4.6cfs), consists of the southwestern quarter of the proposed office/warehouse building, a portion of the east paved parking lot, landscaping and a portion of the gravel drive isles. Runoff produced within **Basin D** flows east toward a low point located at **Design Point 2**.

**Basin E**, 0.37 acres, (Q5=0.9cfs, Q100=1.8cfs), consists of a landscaped area, portions of the east paved parking lot, as well as portions of the asphalt millings access roadway planned along the southern boundary line. Runoff generated by this basin are directed eastward via the proposed curb and gutter to a 6' wide concrete swale. The 6' wide concrete swale will direct flow to a lowpoint at **Design Point 2** (Q5=2.8cfs, Q100=5.6cfs). Runoff reaching DP-2 will be directed to a proposed Full Spectrum Detention via a 2.5'bw 2:1 SS trapezoidal 25% rundown lined with D50=18" riprap atop a gravel and fabric liner to **Design Point 4**. A 12" deep concrete lined forebay is to be constructed at the bottom of the rundown to collect any conveyed sediment.

**Basin OS-3**, 0.56 acres, (Q5=0.2cfs, Q100=1.2cfs), consists of small offsite area located between the permanent site improvements and the historic drainage channel along the southern boundary of the proposed development. Runoff produced within **OS-3** sheet flows to the south to the historic drainage channel at **Design Point 6**.

**Basin OS-4**, 3.08 acres, (Q5=1.0cfs, Q100=6.6cfs), consists of undeveloped offsite lands located along the northern boundary of the proposed development. Runoff from **Basin OS-4** is tributary to **Basin G**.

**Basin OS-5**, 21.36 acres, (Q5=6.6cfs, Q100=44.4cfs), consists of an undeveloped hillside located directly east of the subject site. Runoff from this site will continue to discharge into the subject site as in the historic condition. Runoff from **Basin OS-5** is tributary to **Basin G**.

**Basin G**, 16.67 acres, (Q5=13.6cfs, Q100=40.9cfs), consists of the eastern half of the development which is planned to be utilized for primarily for storing landscaping materials. Approximately 14.17 acres is to be utilized for storing landscape materials and 2.5 acres will be reseeded and mulched. The upper storage area will flow through the lower portion of **Basin G** which will be reseeded and mulched to minimize sediment transport. Runoff from this basin and the surrounding offsite areas are to be conveyed overland to a low point located at **Design Point 3** (Q5=20.4cfs, Q100=85.9cfs). Runoff reaching **DP-3** will be directed to a proposed Full Spectrum Detention via a 3.0'bw 2:1 SS trapezoidal 25% rundown lined with D50=18" riprap atop a gravel and fabric liner to **Design Point 4**. A 1.5' deep low tailwater riprap basin is to be constructed at the bottom of the rundown to collect any conveyed sediment.

**Basin F**, 1.55 acres, (Q5=0.9cfs, Q100=4.4cfs), consists of a portion of land dedicated to a proposed Full Spectrum Detention (FSD) pond. Runoff from **Design Points 1, 2 & 3** contribute to the proposed FSD pond at **Design Point 4** at a combined peak flow rate of Q5=35.7cfs, Q100=124.5cfs. The proposed full spectrum detention **FSD Pond 1** was sized utilizing the UDFCD UD-Detention Worksheet, Vol 3.07. Based upon the contributing watershed size, characteristics and planned imperviousness the pond required a minimum of 2.721 acre feet of storage in the 100-year event to limit the discharge to a maximum of 71.5cfs. A proposed 42" RCP with riprap lined outfall will convey runoff to offsite down-gradient property. A proposed riprap outfall will slow and disperse flows as to not impact the historic drainage way located to the south of the site. The crest of the spillway is set above the 100-year water surface at 6538.5 which allows for positive drainage to a future curb line. In the interim, the spillway will outfall into a gradual slope of 1.8% which will be lined with SC150 North American Green erosion control blanket. The proposed embankment has been set at 6540.2. Should the pond outlet box become clogged storm water shall overtop the emergency spillway and outfall to the historic channel.

**Basin OS-6**, 3.84 acres, (Q5=1.0cfs, Q100=6.4cfs), consists of an undeveloped hillside located directly east of the subject site. Runoff from this site will continue to discharge to the south eastern boundary of the site as in the historic condition. Runoff from **Basin OS-6** is tributary to **Basin H and Basin OS-7**.

**Basin H**, 0.97 acres, (Q5=0.4cfs, Q100=2.5cfs), is a small undeveloped basin located at the southeast corner of the site. In the proposed condition, a small earthen berm is to be constructed along the north edge of **Basin H** and **Basin G** to redirect the **Basin G** flow to the proposed **FSD Pond 1**. Flows entering from **Basin OS-6** shall be routed through **Basin H** via historic drainage patterns to **Basin OS-7**. The proposed berm will function to protect the proposed improvements to the north and furthermore function to control the offsite runoff that was previously discharge as un-detained sediment laden flows to the property to the south. In the event the roadway is extended with the development of the adjacent property the earthen berm could easily be removed and other storm sewer solutions implemented.

**Basin OS-7**, 0.46 acres, (Q5=0.2cfs, Q100=1.2cfs), consists of a small offsite area located between the permanent site improvements and the historic drainage channel. The combined runoff from this primarily

undeveloped area Basin H, Basin OS3, Basin OS6, OS7 and the proposed FSD detention pond outlet pipe combines at **Design Point 6** for a 5 and 100-year peak flow rates of 1.8cfs and 80.6cfs. This calculated developed discharge is below the existing runoff estimated to reaching this location of 15.1cfs and 101.4cfs in the 5 year and 100 year events respectively and therefore is not anticipated to negatively affect downstream facilities or properties.

**Basin I**, 1.50 acres, (Q5=4.9cfs, Q100=9.8cfs), consists of a portion of the concrete aprons, and gravel and asphalted surfaces for the purpose of parking and driving located along the western side of the planned development as well as the western half of the proposed warehouse building. Runoff from **Basin I** is directed offsite to the adjacent property as sheet flow.

**Basin OS-8** consists of native prairie grass covered un-platted lands located just to the west of the property at the southwest corner of the site. Runoff produced by the offsite 1.53 acre area of land has been calculated to reach 0.8 cfs in the 5-year storm event and 3.9cfs in the 100-year storm event. Runoff from **Basin OS-8** and **Basin I** combine at **Design Point 7** at 5 and 100-year peak flow rates of 4.4cfs and 11.1cfs. This calculated developed discharge is slightly higher than the existing runoff estimated to reaching this location of 0.4 and 2.7cfs in the 5-year and 100 year events respectively. The proposed developed flows will be detained and treated within a Full Spectrum Detention Facility that is planned to be constructed with the adjacent DWIRE storage yard, to meet MS4 permit requirements.

## **WATER QUALITY PROVISIONS AND MAINTENANCE**

The proposed full spectrum detention (FSD) pond 1 functions to provide detention and water quality for the proposed development as well as all runoff tributary to it. This includes runoff produced onsite, north of the development and parcel, as well as offsite flows adjacent to the east and west boundary of the parcel. This full spectrum detention pond will function to treat approximately 63.84 acres by providing 0.623 acre-feet of storage for the water quality event, 1.350 acre feet of storage at the EURV event storm and 2.721 acre-feet of storage in the 100-year event. The proposed full spectrum detention basin will be private and shall be maintained by the property owner. Access shall be granted to the owner and El Paso County for access and maintenance of the private WQCV facility. A private maintenance agreement document shall accompany this report submittal.

The sizing for the full spectrum detention facility has been determined using the guidelines set forth in the Urban Drainage and Flood Control District Criteria Manual. Refer to the UDFCD UD-Detention Excel Workbook located within the appendix of this report for calculations.

## **OFFSITE DOWNSTREAM CHANNEL ANALYSIS**

El Paso County Engineering has requested an analysis of the offsite downstream channel. The existing channel runs north to south on unplatted land owned by Weatherford Artificial (Sch. No. 5300000190). The analysis of the existing channel will be begin at the outfall of the proposed Timberline Storage to the north and will end at the two existing 48" culverts at the southwest end of the property. Runoff reaching the two culverts will ultimately be routed to the East Fork Sand Creek Subtributary. Runoff tributary to the existing channel has been accounted for, as proposed developed flow from the proposed Timberline Storage site (37.95 acres), offsite developed flow from the BLH NO.2 LLC property (22.9 acres), existing

undeveloped flow from the offsite BLH NO.2 LLC property (7.7 acres) and existing undeveloped flow from the offsite Weatherford Artificial property (30.2 acres).

Analysis of the existing channel and results provided by the Hydrologic Engineering Center River Analysis System (HEC-RAS) program. Per the results provided (see Appendix), scour (see shear values) and velocities are below the maximum values as stated in the City of Colorado Springs Drainage Criteria Manual Vol.1 (DCM1). Hence erosion of the existing channel is minimal. Let it be noted that with the development of Timberline Storage, the runoff values have been reduced in part to the release rate by the EDB pond. Proposed discharge from the site, post construction, is less than historic and therefore its construction is not anticipated to negatively affect downstream facilities or properties.

## EROSION CONTROL

It is the policy of the El Paso County that we submit a grading and erosion control plan with the drainage report. Proposed silt fence, vehicle traffic control, and concrete washout area are proposed as erosion control measures. The costs for these measures have been provided on the Grading and Erosion Control plan.

## CONSTRUCTION COST OPINION

Private Drainage Facilities (**NON-Reimbursable**):

Item	Description	Quantity	Unit Cost	Cost
1.	42" RCP	117 LF	\$181 /LF	\$21,177.00
2.	42" RCP FES	1 EA	\$2,389 /EA	\$2,389.00
3.	2.5'w,2:1SS Rundown	18 CY	\$80 /CY	\$1,440.00
4.	3.0'w,2:1SS Rundown	18 CY	\$80 /CY	\$1,440.00
5.	4.0'w, 3:1SS Rundown	29 CY	\$80 /CY	\$2,320.00
6.	D50=12" Riprap	40 CY	\$65 /CY	\$2,600.00
7.	Low Tailwater Basin	17 CY	\$65 /CY	\$1,105.00
8.	Concrete Forebays	1 LS	\$6,345 /LS	\$6,345.00
9.	Type 1 MH	1 EA	\$6,458 /EA	\$6,458.00
10.	Full Spectrum Det Pond	1 EA	\$10,000 /EA	\$10,000.00
11.	Modified Type D Outlet	1 EA	\$20,500 /EA	\$20,500.00
<b>Total \$</b>				<b>\$75,774.00</b>

M & S Civil Consultants, Inc. (M & S) cannot and does not guarantee the construction cost will not vary from these opinions of probable costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular. The above and below is only an estimate of the facility cost amounts in 2019. This parcel is not being platted, thus no drainage basin fees are required with this development.

## **SUMMARY**

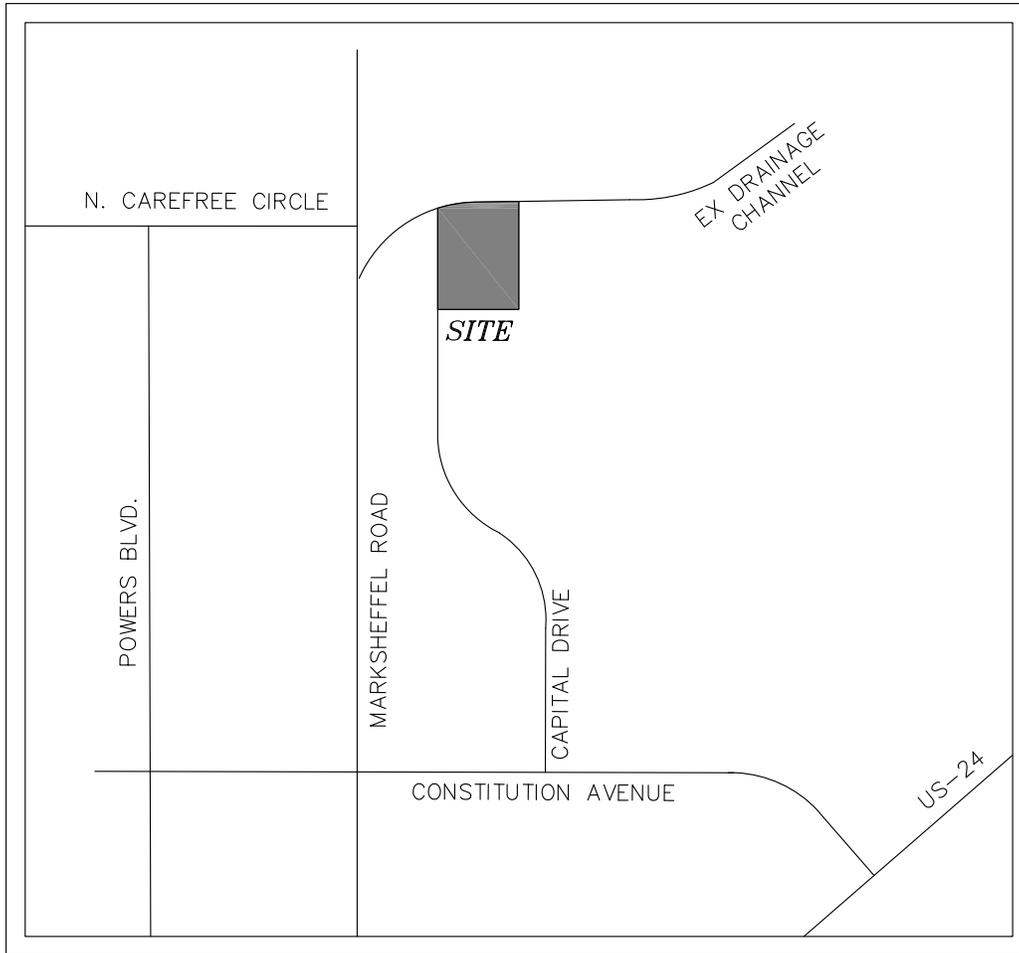
The proposed Amendment to the Final Drainage Report for the Timberland Storage Yard is located within the Sand Creek Drainage Basin. Developed runoff both offsite and onsite basins are collected and conveyed to full spectrum detention facilities located in the south edge of the site. All stormwater collected by pond 1 will be detained, treated, and released in accordance with the requirements of El Paso County and the City of Colorado Springs Drainage Criteria. The proposed drainage facilities recommended within this report will adequately convey, detain and route runoff from the planned development to the historic drainage ways at peak flow rates which are in line with historic rates, therefore developed runoff discharged from the Timberland Storage Yard is not anticipated to adversely affect the surrounding and downstream developments.

## **REFERENCES**

- 1.) "El Paso County and City of Colorado Springs Drainage Criteria Manuals".
- 2.) "Urban Storm Drainage Criteria Manual"
- 3.) SCS Soils Map for El Paso County.
- 4.) Flood Insurance Rate Map (FIRM), Federal Emergency Management Agency, Effective date December 7, 2018.

## **APPENDIX**

**VICINITY MAP**



# VICINITY MAP

N.T.S.



20 BOULDER CRESCENT, SUITE 110  
 COLORADO SPRINGS, CO 80903  
 PHONE: 719.955.5485

**SOILS MAP**



PARCEL  
BOUNDARY  
(37.95 AC)

EXTENDS OF STUDIED  
WATERSHED



NOT TO SCALE

**Summary by Map Unit – El Paso County Area, Colorado (CO625)**

Map unit symbol	Map unit name	Rating
8	Blakeland loamy sand, 1 to 9 percent slopes	A
10	Blendon sandy loam, 0 to 3 percent slopes	B

- HYDROLOGIC TYPE A SOILS 
- HYDROLOGIC TYPE B SOILS 
- SITE BOUNDARY 
- ANALYZED WATERSHED BOUNDARY 

TIMBERLINE  
STORAGE YARD  
SOILS MAP



**FIRM PANEL**



APPROXIMATE SCALE IN FEET



NATIONAL FLOOD INSURANCE PROGRAM

# FIRM FLOOD INSURANCE RATE MAP

EL PASO COUNTY,  
COLORADO  
AND INCORPORATED AREAS

PANEL 543 OF 1300  
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY NUMBER PANEL SUFFIX

EL PASO COUNTY UNINCORPORATED AREAS

REVISIONS APPROVED BY FEMA

REVISED TO  
REFLECT LOMR

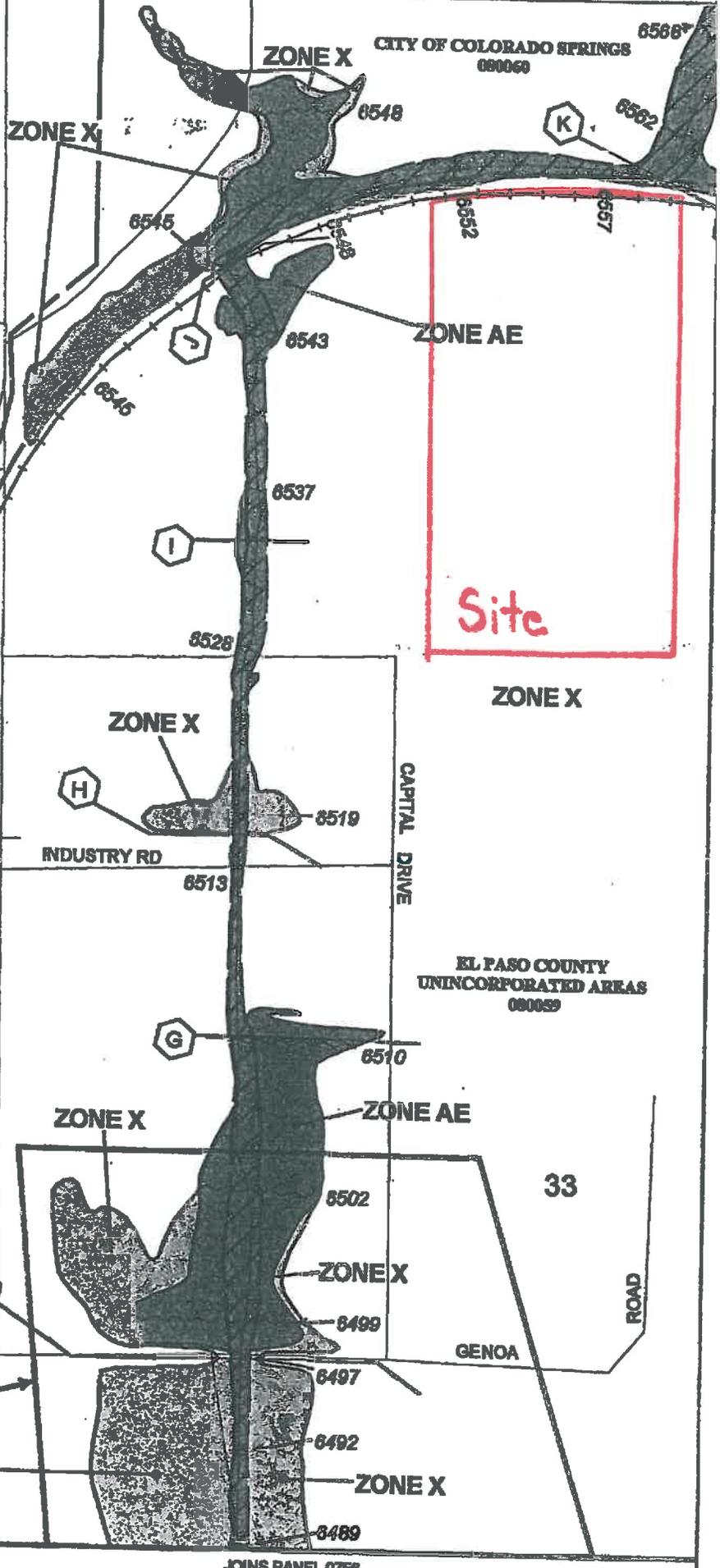
DATED NOV 18 2004

MAP NUMBER  
00041C0543 F

EFFECTIVE DATE:  
MARCH 17, 1997



Federal Emergency Management Agency



Site

REVISED  
AREA

JOINS PANEL 0639

32

COLORADO AND EASTERN

F

ZONE X

ZONE X

INDUSTRY RD

ZONE X

H

6513

G

ZONE X

ZONE AE

ZONE X

6499

6497

6492

6489

ZONE X

CAPITAL DRIVE

ZONE X

EL PASO COUNTY  
UNINCORPORATED AREAS  
080059

33

GENOA

ROAD

JOINS PANEL 0758

ZONE X

CITY OF COLORADO SPRINGS  
080060

6586

6548

K

6562

ZONE X

6545

J

6543

ZONE AE

6545

6537

I

6528

6537

Site

ZONE X

ZONE X

6519

H

6513

G

6510

ZONE X

ZONE AE

6502

6499

6497

6492

6489

ZONE X

CAPITAL DRIVE

ZONE X

EL PASO COUNTY  
UNINCORPORATED AREAS  
080059

33

GENOA

ROAD

JOINS PANEL 0758

FLOODING SOURCE		FLOODWAY				BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE	
REVISIED DATA									
Sand Creek East Fork Subtributary									
A	650	133	250	7.9	6,423.6	6,423.6	6,423.6	0.0	
B	2,090	52	185	10.7	6,446.9	6,446.9	6,446.9	0.0	
C	2,202	52	224	8.8	6,448.0	6,448.0	6,448.0	0.0	
D	3,567	58	191	10.3	6,467.8	6,467.8	6,467.8	0.0	
E	4,408	56	185	10.6	6,480.1	6,480.1	6,480.1	0.0	
F	5,507	65	198	9.9	6,497.3	6,497.3	6,497.4	0.1	
G	6,747	78	211	9.2	6,510.2	6,510.2	6,510.4	0.2	
H	7,397	44	257	7.5	6,516.3	6,516.3	6,517.3	1.0	
I	8,347	64	192	9.9	6,535.2	6,535.2	6,535.2	0.0	
J	9,257	100	403	4.3	6,545.1	6,545.1	6,446.1	1.0	
K	10,737	80	195	8.9	6,557.6	6,557.6	6,558.0	0.4	
L	11,540	231	202	5.5	6,577.2	6,577.2	6,577.2	0.0	
M	13,300	214	201	5.5	6,601.9	6,601.9	6,601.9	0.0	
N	16,170	219	209	5.3	6,639.1	6,639.1	6,639.1	0.0	
O	18,910	60	96	7.2	6,674.2	6,674.2	6,674.2	0.0	
P	20,650	90	110	6.3	6,697.8	6,697.8	6,697.8	0.0	
Q	22,900	100	112	6.1	6,729.2	6,729.2	6,729.3	0.1	

NOV 18 2004

<sup>1</sup>Feet above confluence with Sand Creek East Fork

FEDERAL EMERGENCY MANAGEMENT AGENCY

EL PASO COUNTY, CO  
AND INCORPORATED AREAS

FLOODWAY DATA

SAND CREEK EAST FORK SUBTRIBUTARY

## **HYDROLOGIC CALCULATIONS**

**TIMBERLINE STORAGE  
EXISTING DRAINAGE CALCULATIONS  
(Area Runoff Coefficient Summary)**

BASIN	TOTAL AREA (SF)	TOTAL AREA (Acres)	STREETS / DEVELOPED			OVERLAND / DEVELOPED			OVERLAND / UNDEVELOPED			WEIGHTED	
			AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	C <sub>5</sub>	C <sub>100</sub>
EX-1	998724.7	22.93	0.00	0.81	0.88	0.00	0.30	0.50	22.93	0.09	0.36	0.09	0.36
EX-2	1029448.0	23.63	0.00	0.81	0.88	0.00	0.30	0.50	23.63	0.09	0.36	0.09	0.36
EX-3	1074435.8	24.67	0.00	0.81	0.88	0.00	0.30	0.50	24.67	0.09	0.36	0.09	0.36
EX-4	55409.0	1.27	0.00	0.81	0.88	0.00	0.30	0.50	1.27	0.09	0.36	0.09	0.36

Calculated by: DLM  
Date: 9/12/2019  
Checked by: VAS

**TIMBERLINE STORAGE  
EXISTING DRAINAGE CALCULATIONS  
(Area Drainage Summary)**

<i>From Area Runoff Coefficient Summary</i>				<b>OVERLAND</b>				<b>STREET / CHANNEL FLOW</b>				<b>Time of Travel (T<sub>t</sub>)</b>	<b>INTENSITY *</b>		<b>TOTAL FLOWS</b>	
BASIN	AREA TOTAL (Acres)	C <sub>5</sub>	C <sub>100</sub>	C <sub>5</sub>	Length (ft)	Height (ft)	T <sub>c</sub> (min)	Length (ft)	Slope (%)	Velocity (fps)	T <sub>t</sub> (min)	TOTAL (min)	I <sub>5</sub> (in/hr)	I <sub>100</sub> (in/hr)	Q <sub>5</sub> (c.f.s.)	Q <sub>100</sub> (c.f.s.)
		<i>From DCM Table 5-1</i>														
<i>EX-1</i>	22.93	0.09	0.36	0.09	100	4.0	11.5	325	8.0%	2.8	1.9	13.5	3.7	6.2	7.6	51.0
<i>EX-2</i>	23.63	0.09	0.36	0.09	100	4.0	11.5	1600	1.6%	1.3	21.1	32.6	2.4	4.0	5.0	33.6
<i>EX-3</i>	24.67	0.09	0.36	0.09	90	3.8	10.8	1750	1.6%	1.3	23.1	33.8	2.3	3.9	5.1	34.3
<i>EX-4</i>	1.27	0.09	0.36	0.09	100	5.0	10.7	330	2.1%	1.4	3.8	14.5	3.6	6.0	0.4	2.7

\* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: DLM  
Date: 9/12/2019  
Checked by: VAS

**TIMBERLINE STORAGE  
EXISTING DRAINAGE CALCULATIONS  
(Basin Routing Summary)**

<i>From Area Runoff Coefficient Summary</i>				<b>OVERLAND</b>				<b>PIPE / CHANNEL FLOW</b>				<b>Time of Travel (T<sub>t</sub>)</b>	<b>INTENSITY *</b>		<b>TOTAL FLOWS</b>	
<b>DESIGN POINT</b>	<b>CONTRIBUTING BASINS</b>	<b>CA<sub>5</sub></b>	<b>CA<sub>100</sub></b>	<b>C<sub>s</sub></b>	<b>Length (ft)</b>	<b>Height (ft)</b>	<b>T<sub>c</sub> (min)</b>	<b>Length (ft)</b>	<b>Slope (%)</b>	<b>Velocity (fps)</b>	<b>T<sub>t</sub> (min)</b>	<b>TOTAL (min)</b>	<b>I<sub>5</sub> (in/hr)</b>	<b>I<sub>100</sub> (in/hr)</b>	<b>Q<sub>5</sub> (c.f.s.)</b>	<b>Q<sub>100</sub> (c.f.s.)</b>
<b>1</b>	<b>EX1, EX2</b>	4.19	16.76	TAKEN FROM BASIN EX1			13.5	1300	1.5%	1.9	11.6	25.1	2.7	4.6	<b>11.5</b>	<b>77.3</b>
<b>2</b>	<b>DP1, EX3</b>	6.41	25.64	TAKEN FROM BASIN EX2								32.6	2.4	4.0	<b>15.1</b>	<b>101.4</b>
<b>3</b>	<b>EX4</b>	0.11	0.46	TAKEN FROM BASIN EX4								14.5	3.6	6.0	<b>0.4</b>	<b>2.7</b>

Calculated by: DLM  
Date: 9/12/2019  
Checked by: VAS

**TIMBERLINE STORAGE**  
**PROPOSED DRAINAGE CALCULATIONS**  
**(Area Runoff Coefficient Summary)**

			<i>ROOFS 0.73-0.81 COMMERCIAL AREAS 0.81-0.88 ASPHALT DRIVES 0.90-0.96</i>			<i>LANDSCAPED AREAS 0.16-0.41 GRAVEL STORAGE YARD 0.30-0.50 LIGHT INDUST AREAS 0.59-0.70</i>			<i>GRAVEL STORAGE YARD 0.30-0.50 PARKS 0.12-0.39 GREENBELTS/AGRI. 0.09-0.36</i>			<i>WEIGHTED</i>	
<b>BASIN</b>	<b>TOTAL AREA (SF)</b>	<b>TOTAL AREA (Acres)</b>	<b>AREA (Acres)</b>	<b>C<sub>5</sub></b>	<b>C<sub>100</sub></b>	<b>AREA (Acres)</b>	<b>C<sub>5</sub></b>	<b>C<sub>100</sub></b>	<b>AREA (Acres)</b>	<b>C<sub>5</sub></b>	<b>C<sub>100</sub></b>	<b>C<sub>5</sub></b>	<b>C<sub>100</sub></b>
<i>A</i>	255817.4	5.87	0.00	0.73	0.81	4.99	0.30	0.50	0.88	0.09	0.36	0.27	0.48
<i>B</i>	344618.1	7.91	0.44	0.90	0.96	1.14	0.59	0.70	6.33	0.30	0.50	0.38	0.55
<i>C</i>	107689.3	2.47	0.00	0.73	0.81	2.10	0.30	0.50	0.37	0.09	0.36	0.27	0.48
<i>D</i>	28400.0	0.65	0.47	0.90	0.96	0.18	0.16	0.41	0.00	0.09	0.36	0.70	0.81
<i>E</i>	15936.0	0.37	0.20	0.90	0.96	0.17	0.16	0.41	0.00	0.30	0.50	0.56	0.70
<i>F</i>	67446.0	1.55	0.00	0.90	0.96	0.23	0.30	0.50	1.32	0.12	0.39	0.15	0.41
<i>G</i>	726210.0	16.67	0.00	0.90	0.96	14.17	0.30	0.50	2.50	0.09	0.36	0.27	0.48
<i>H</i>	42442.0	0.97	0.00	0.90	0.96	0.00	0.30	0.50	0.97	0.09	0.36	0.09	0.36
<i>I</i>	65383.5	1.50	0.85	0.90	0.96	0.54	0.30	0.50	0.11	0.16	0.41	0.63	0.75
<i>OS1</i>	64029.9	1.47	0.00	0.81	0.88	0.00	0.30	0.50	1.47	0.09	0.36	0.09	0.36
<i>OS2</i>	106418.5	2.44	0.00	0.81	0.88	1.90	0.30	0.50	0.54	0.09	0.36	0.25	0.47
<i>OS3</i>	24414.0	0.56	0.00	0.90	0.96	0.00	0.16	0.41	0.56	0.09	0.36	0.09	0.36
<i>OS4</i>	134326.7	3.08	0.00	0.90	0.96	0.00	0.30	0.50	3.08	0.09	0.36	0.09	0.36
<i>OS5</i>	930571.9	21.36	0.00	0.81	0.88	0.00	0.30	0.50	21.36	0.09	0.36	0.09	0.36
<i>OS6</i>	167403.3	3.84	0.00	0.81	0.88	0.00	0.30	0.50	3.84	0.09	0.36	0.09	0.36
<i>OS7</i>	20171.5	0.46	0.00	0.81	0.88	0.00	0.30	0.50	0.46	0.09	0.36	0.09	0.36
<i>OS8</i>	66445.0	1.53	0.08	0.90	0.96	0.00	0.30	0.50	1.44	0.09	0.36	0.13	0.39

Calculated by: DLM-GT  
Date: 11/16/2019  
Checked by: VAS

## TIMBERLINE STORAGE PROPOSED DRAINAGE CALCULATIONS (Area Drainage Summary)

From Area Runoff Coefficient Summary				OVERLAND				STREET / CHANNEL FLOW				Time of Travel (T <sub>t</sub> )		INTENSITY *		TOTAL FLOWS	
BASIN	AREA TOTAL (Acres)	C <sub>5</sub>	C <sub>100</sub>	C <sub>5</sub>	Length (ft)	Height (ft)	T <sub>c</sub> (min)	Length (ft)	Slope (%)	Velocity (fps)	T <sub>t</sub> (min)	TOTAL (min)	CHECK (min)	I <sub>5</sub> (in/hr)	I <sub>100</sub> (in/hr)	Q <sub>5</sub> (c.f.s.)	Q <sub>100</sub> (c.f.s.)
		From DCM Table 5-1															
<i>A</i>	5.87	0.27	0.48	0.27	90	2.0	10.9	575	1.9%	1.0	9.9	20.8	13.7	3.7	6.1	5.8	17.3
<i>B</i>	7.91	0.38	0.55	0.38	100	1.0	13.1	810	1.4%	1.2	11.6	24.7	15.1	3.5	5.9	10.4	25.9
<i>C</i>	2.47	0.27	0.48	0.27	100	2.0	11.9	850	2.5%	1.1	12.9	24.8	15.3	3.5	5.9	2.3	6.9
<i>D</i>	0.65	0.70	0.81	0.70	50	6.0	2.3	50	1.0%	2.0	0.4	2.7	10.6	5.2	8.7	2.3	4.6
<i>E</i>	0.37	0.56	0.70	0.56	100	2.0	7.8	172	0.9%	1.9	1.5	9.3	11.5	4.2	7.1	0.9	1.8
<i>F</i>	1.55	0.15	0.41	0.15	50	1.0	9.7	50	25.0%	5.0	0.2	9.8	10.6	4.2	7.0	0.9	4.4
<i>G</i>	16.67	0.27	0.48	0.27	100	2.5	11.1	1800	1.1%	0.7	41.7	52.8	20.6	3.0	5.1	13.6	40.9
<i>H</i>	0.97	0.09	0.36	0.09	50	4.0	6.5	518	2.8%	3.3	2.6	9.1	13.2	4.3	7.2	0.4	2.5
<i>I</i>	1.50	0.63	0.75	0.63	50	1.0	4.8	50	4.0%	4.0	0.2	5.0	10.6	5.2	8.7	4.9	9.8
<i>OS1</i>	1.47	0.09	0.36	0.09	100	4.0	11.5	315	1.1%	0.7	7.1	18.7	12.3	3.2	5.4	0.4	2.8
<i>OS2</i>	2.44	0.25	0.47	0.25	100	1.0	15.3	200	2.0%	1.0	3.4	18.7	11.7	3.9	6.5	2.4	7.5
<i>OS3</i>	0.56	0.09	0.36	0.09	50	4	6.5	800	2.5%	1.1	12.0	18.5	14.7	3.5	6.0	0.2	1.2
<i>OS4</i>	3.08	0.09	0.36	0.09	50	1	10.3	200	1.0%	0.7	4.8	15.0	11.4	3.5	5.9	1.0	6.6
<i>OS5</i>	21.36	0.09	0.36	0.09	100	4	11.5	600	5.5%	2.3	4.3	15.8	13.9	3.4	5.8	6.6	44.4
<i>OS6</i>	3.84	0.09	0.36	0.09	100	3	12.7	1000	3.8%	1.4	12.2	24.9	16.1	2.8	4.6	1.0	6.4
<i>OS7</i>	0.46	0.09	0.36	0.09	50	2	8.2	300	2.0%	2.8	1.8	9.9	11.9	4.1	7.0	0.2	1.2
<i>OS8</i>	1.53	0.13	0.39	0.13	100	5	10.3	330	2.1%	2.9	1.9	12.2	12.4	3.8	6.4	0.8	3.9

\* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: DLM-GT  
Date: 11/12/2019  
Checked by: VAS



## TIMBERLINE STORAGE PROPOSED DRAINAGE CALCULATIONS (Basin Routing Summary)

From Area Runoff Coefficient Summary				OVERLAND				PIPE / CHANNEL FLOW				Time of Travel (T <sub>t</sub> )	INTENSITY *		TOTAL FLOWS		COMMENTS	
DESIGN POINT	CONTRIBUTING BASINS DPS AND/OR PIPES	CA <sub>5</sub>	CA <sub>100</sub>	C <sub>s</sub>	Length (ft)	Height (ft)	T <sub>c</sub> (min)	Length (ft)	Slope (%)	Velocity (fps)	T <sub>t</sub> (min)	TOTAL (min)	I <sub>5</sub> (in/hr)	I <sub>100</sub> (in/hr)	Q <sub>5</sub> (c.f.s.)	Q <sub>100</sub> (c.f.s.)		
1	OS1, OS2, A, B, C	5.96	10.06	TAKEN FROM BASIN A				13.7	900	1.4%	1.2	12.5	26.2	2.7	4.5	16.0	45.3	DRAINAGE SWALE INTO FSD (N Forebay)
2	D, E	0.66	0.79	TAKEN FROM BASIN E									9.3	4.2	7.1	2.8	5.6	2.5'W RIPRAP RUNDOWN (SW Forebay)
3	G, OS4, OS5	6.68	16.79	TAKEN FROM BASIN G									20.6	3.0	5.1	20.4	85.9	3.0'W RIPRAP RUNDOWN (SE Rundown)
4	DP1, DP2, DP3	13.29	27.63	TAKEN FROM BASIN A									26.2	2.7	4.5	35.7	124.5	PROPOSED FSD POND 1
5	PR1			TAKEN FROM UD-DETENTION SHEET DET POND 1												0.4	71.5	PROPOSED FSD POND 1 RELEASE
6	H, OS3, OS6, OS7 PR1	0.53	2.10	TAKEN FROM BASIN OS6				24.90	618	2.8%	3.3	3.1	28.0	2.6	4.3	1.4	9.1	HISTORIC OUTFALL
																0.4	71.5	FLOWS SUMMED
7	BASIN I OS8	1.15	1.73	TAKEN FROM BASIN OS8									12.2	3.8	6.4	1.8	80.6	DWIRE DETENTION POND
																4.4	11.1	

Calculated by: DLM-GT  
Date: 11/16/2019  
Checked by: VAS

**TIMBERLINE STORAGE  
PROPOSED DRAINAGE CALCULATIONS  
(Storm Sewer Routing Summary)**

<i>PIPE RUN</i>	<i>Contributing Pipes/Design Points</i>	<i>Equivalent CA<sub>5</sub></i>	<i>Equivalent CA<sub>100</sub></i>	<i>Maximum T<sub>C</sub></i>	<i>Intensity*</i>		<i>Flow</i>		<i>Pipe Size</i>
					<i>I<sub>5</sub></i>	<i>I<sub>100</sub></i>	<i>Q<sub>5</sub></i>	<i>Q<sub>100</sub></i>	
<b>1</b>	<b>POND 1 OUTLET (DP6)</b>		TAKEN FROM UD-DETENTION WORKSHEET				<b>0.4</b>	<b>71.5</b>	<b>PROP 42" RCP</b>

\* Intensity equations assume a minimum travel time of 5 minutes.

DP - Design Point

PR - Pipe Run

FB- Flow By from Design Point

INT- Intercepted Flow from Design Point

Calculated by: DLM-GT

Date: 9/12/2019

Checked by: VAS

**HYDRAULIC CALCULATIONS / EDB WQCV CALCULATIONS**

***TIMBERLINE STORAGE  
DRAINAGE REPORT DRAINAGE CALCULATIONS  
(Pond Volume Calculation)***

***FSD POND 1***

Elevation	SF	CF	Storage	
			AF	Sum
6530.18	0.00	0.00	0.00	0.00
6530.51	147.00	24.25	0.00	0.00
6531.00	853.00	245.00	0.01	0.01
6532.00	7,247.00	4,050.00	0.09	0.10
6533.00	20,867.00	14,057.00	0.32	0.42
6534.00	29,321.00	25,094.00	0.58	1.00
6535.00	32,162.00	30,741.50	0.71	1.70
6536.00	35,142.00	33,652.00	0.77	2.48
6537.00	38,215.00	36,678.50	0.84	3.32
6538.00	41,392.00	39,803.50	0.91	4.23
6539.00	44,738.00	43,065.00	0.99	5.22
6540.00	48,283.00	46,510.50	1.07	6.29
	Total =	<u>273,921</u> CF		
		Total =	<u>6.3</u> Ac-ft	
100 Year Spillway Elevation = 6538.5				

Calculated by: DLM  
Date: 9/12/2017  
Checked by: \_\_\_\_\_

<i>Weighted Percent Imperviousness of WQ Pond 1</i>				
<i>Contributing Basins</i>	<i>Area (Acres)</i>	<i>C<sub>s</sub></i>	<i>Impervious % (I)</i>	<i>(Acres)*(I)</i>
<i>A</i>	5.87	0.27	34	199.67
<i>B</i>	7.91	0.38	53	419.30
<i>C</i>	2.47	0.27	34	84.06
<i>D</i>	0.65	0.70	84	54.77
<i>E</i>	0.37	0.56	78	28.54
<i>F</i>	1.55	0.15	11	17.03
<i>G</i>	16.67	0.27	34	566.83
<i>OS1</i>	1.47	0.09	0	0.00
<i>OS2</i>	2.44	0.25	30	73.29
<i>OS4</i>	3.08	0.09	0	0.00
<i>OS5</i>	21.36	0.09	0	0.00
<b><i>Totals</i></b>	<b>63.85</b>			<b>1443.48</b>
<b><i>Imperviousness of WQ Pond 2</i></b>	<b>22.5</b>			

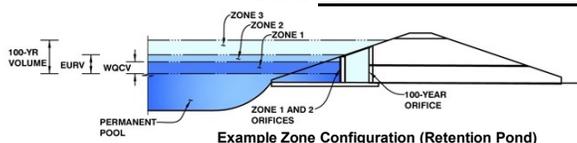


## Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Timberline Storage (Amended)

Basin ID: FSD Pond 1



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.29	0.668	Orifice Plate
Zone 2 (EURV)	4.41	0.737	Orifice Plate
Zone 3 (100-year)	6.84	1.928	Weir&Pipe (Restrict)
		3.333	Total

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft <sup>2</sup>
Underdrain Orifice Centroid =	N/A	feet

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	4.41	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	19.60	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft <sup>2</sup>
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft <sup>2</sup>

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.47	2.94					
Orifice Area (sq. inches)	2.51	2.30	1.50					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.41	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	17.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	% grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H <sub>1</sub> =	4.41	N/A	feet
Over Flow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	7.24	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	47.60	N/A	ft <sup>2</sup>
Overflow Grate Open Area w/ Debris =	23.80	N/A	ft <sup>2</sup>

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	42.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	27.15		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	6.58	N/A	ft <sup>2</sup>
Outlet Orifice Centroid =	1.28	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.87	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	6.85	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	72.50	feet
Spillway End Slopes =	10.00	H:V
Freeboard above Max Water Surface =	0.67	feet

Calculated Parameters for Spillway

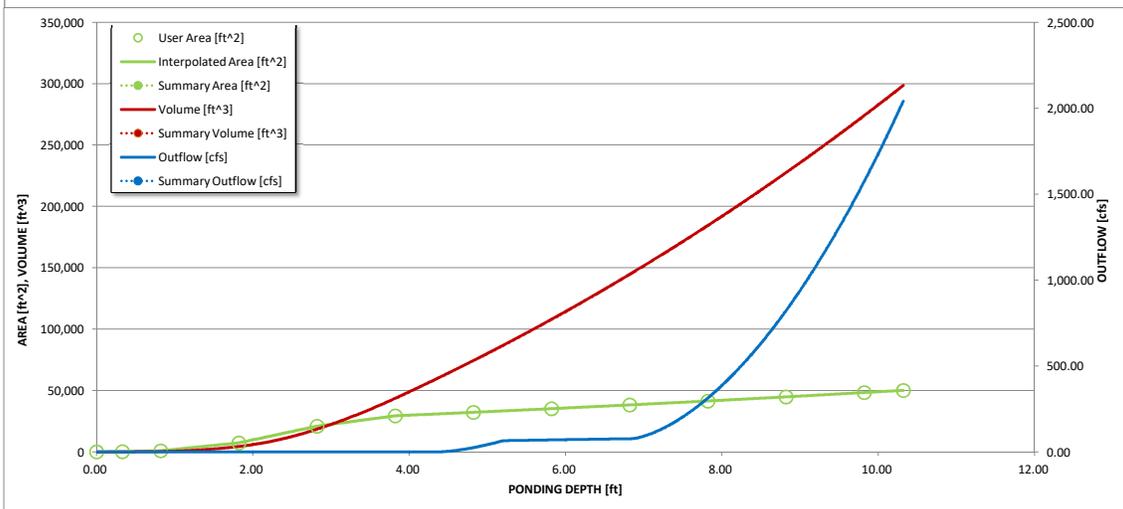
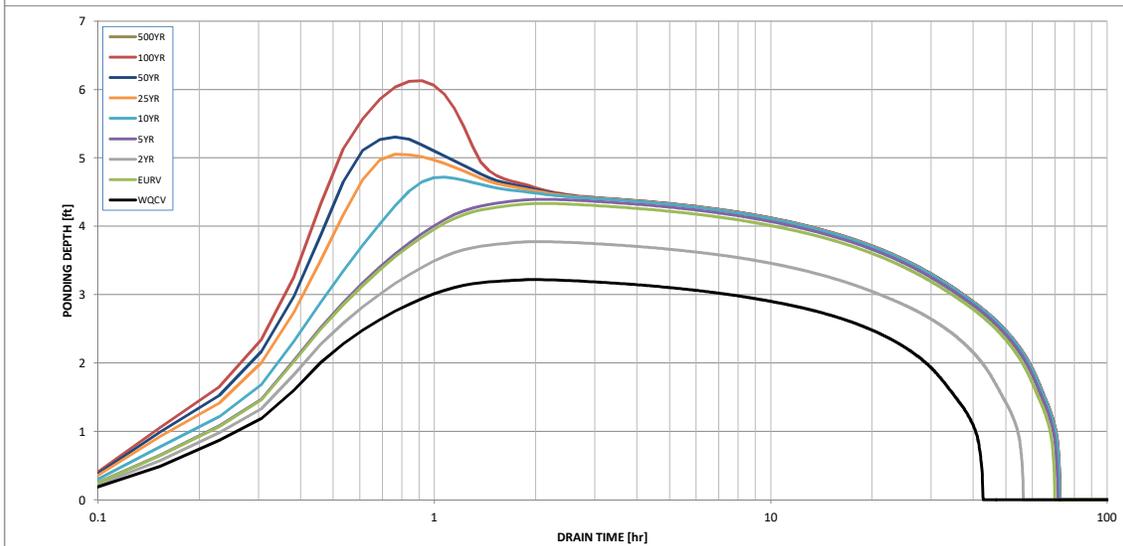
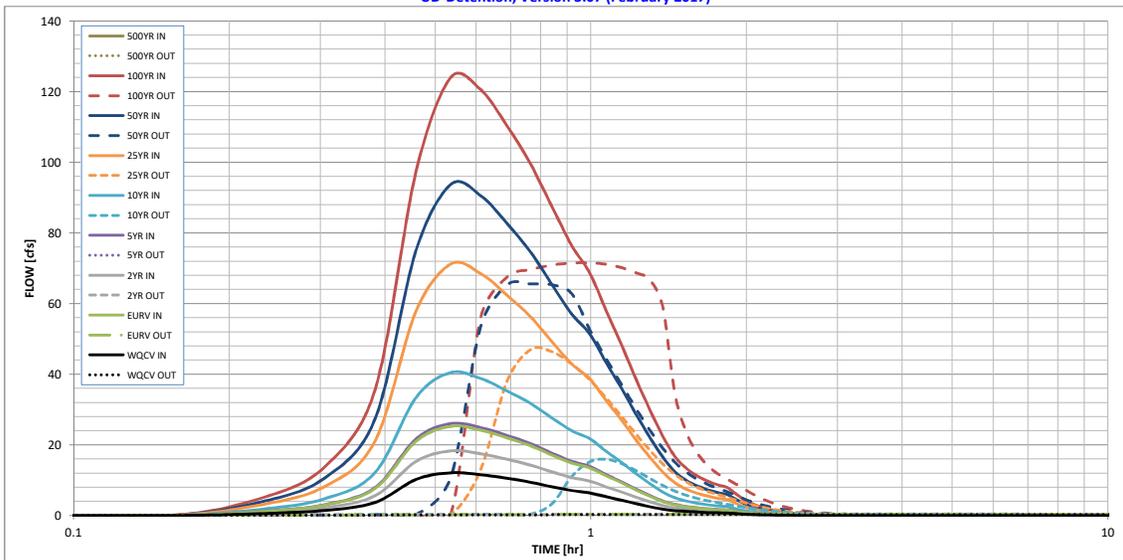
Spillway Design Flow Depth =	0.65	feet
Stage at Top of Freeboard =	8.17	feet
Basin Area at Top of Freeboard =	0.98	acres

### Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	0.00
Calculated Runoff Volume (acre-ft) =	0.668	1.406	1.016	1.450	2.269	4.027	5.340	7.102	0.000
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.668	1.406	1.016	1.451	2.270	4.030	5.336	7.108	#N/A
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.16	0.53	0.78	1.12	0.00
Predevelopment Peak Q (cfs) =	0.0	0.0	0.6	1.2	10.5	33.6	49.9	71.5	0.0
Peak Inflow Q (cfs) =	12.1	25.2	18.3	26.0	40.4	71.2	93.7	123.9	#N/A
Peak Outflow Q (cfs) =	0.3	0.4	0.3	0.4	15.9	47.0	65.5	71.5	#N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	1.5	1.4	1.3	1.0	#N/A
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	#N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.3	1.0	1.4	1.5	#N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	#N/A
Time to Drain 97% of Inflow Volume (hours) =	40	64	52	65	64	60	57	54	#N/A
Time to Drain 99% of Inflow Volume (hours) =	42	68	55	69	69	67	65	64	#N/A
Maximum Ponding Depth (ft) =	3.22	4.33	3.77	4.39	4.72	5.05	5.31	6.13	#N/A
Area at Maximum Ponding Depth (acres) =	0.55	0.71	0.66	0.71	0.73	0.75	0.77	0.83	#N/A
Maximum Volume Stored (acre-ft) =	0.623	1.350	0.965	1.392	1.623	1.875	2.066	2.721	#N/A

# Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)



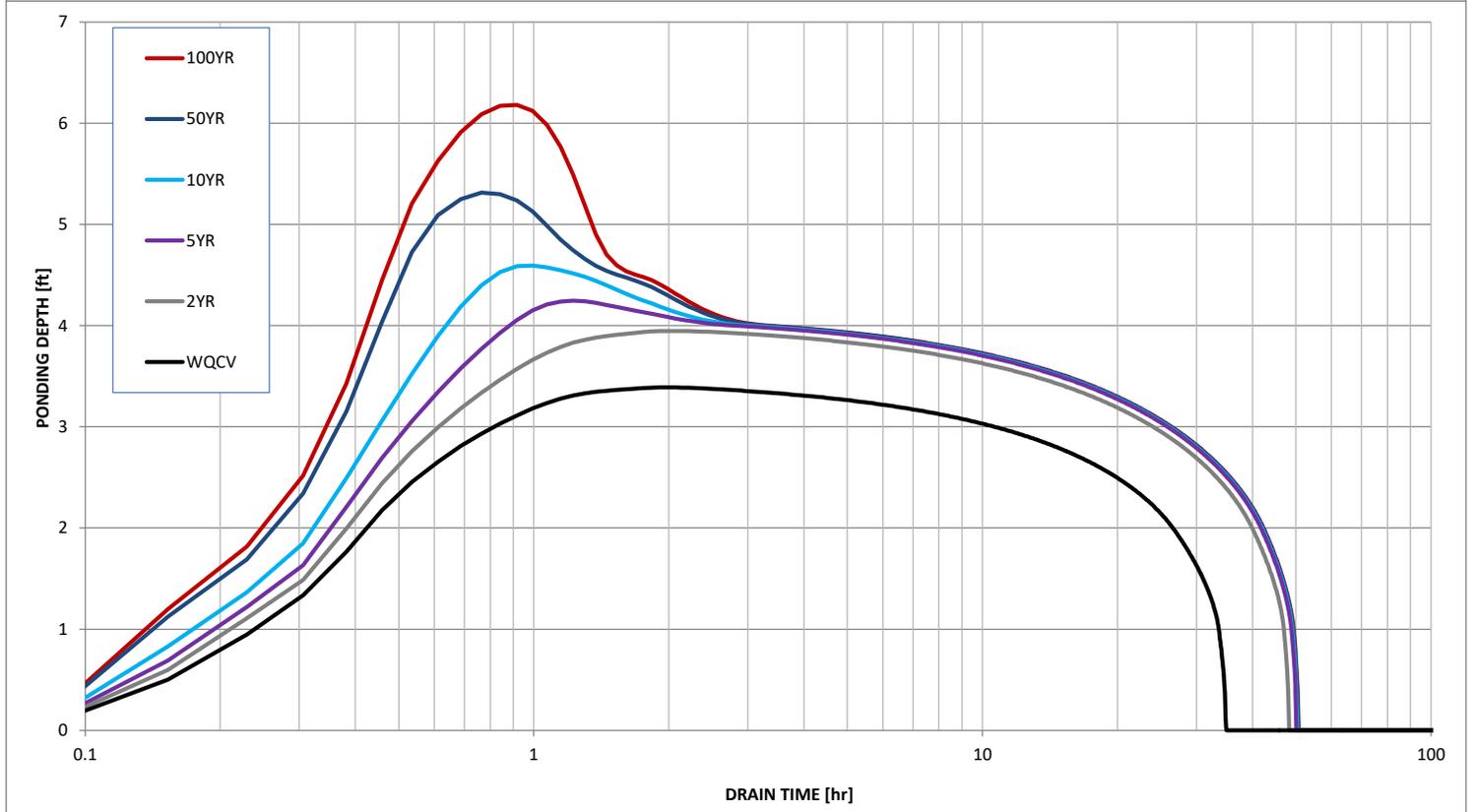
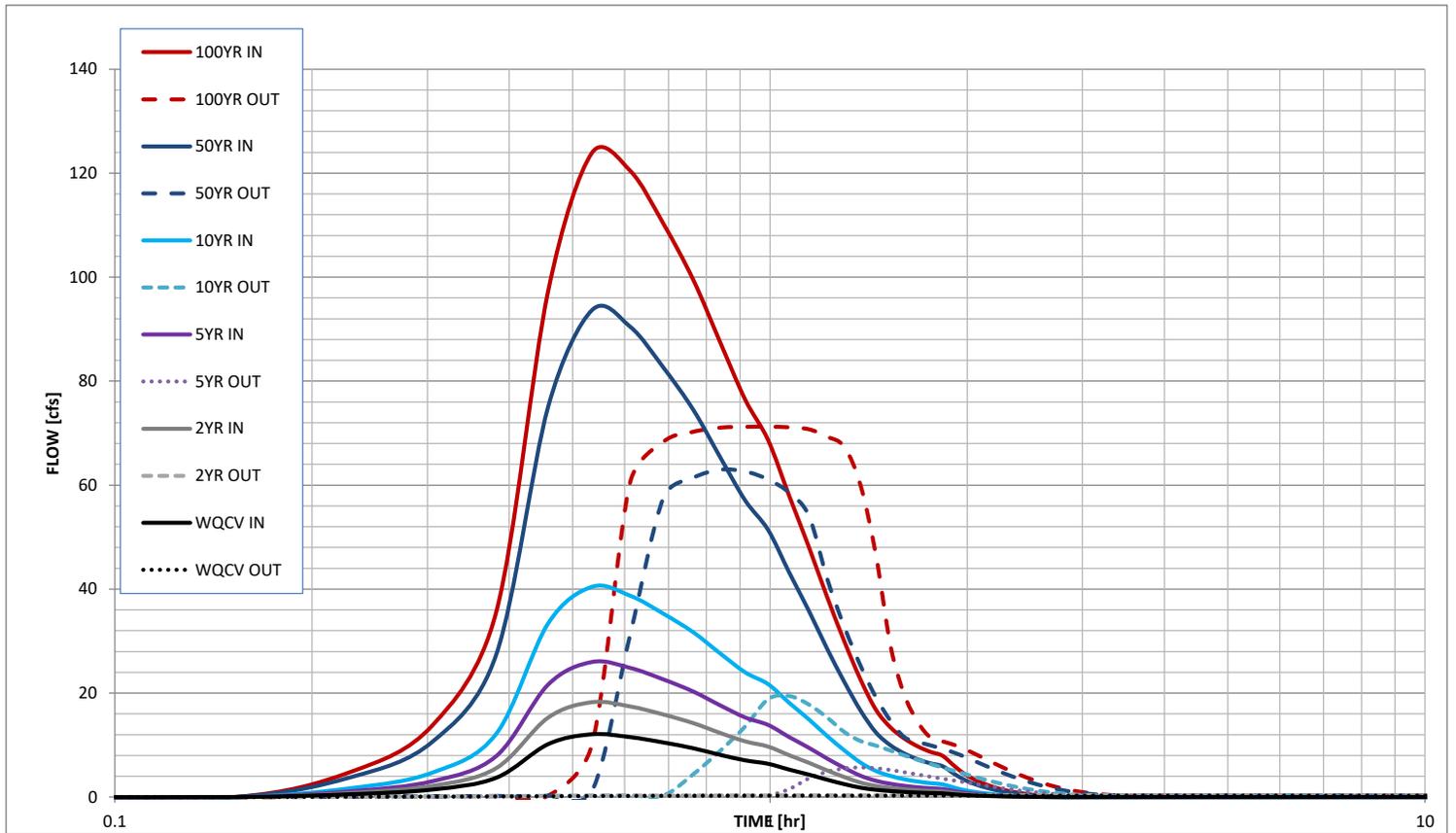
S-A-V-D Chart Axis Override

	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			





# Stormwater Detention and Infiltration Design Data Sheet





PROJECT: Timberline Storage Yard

DATE: \_\_\_\_\_

Forebay Volumes Req'd

Size of Contributing Area = 69.22 ac.

MIN. Forebays = 3% of WQCV (UDFCD T5-EDB-12)

WQCV Pond 1 = .740 (UD - Oct V. 3.07)

Total Volume Req'd =  $0.03 \times 0.740 = 0.0222 ac$

$\times \frac{43560 ac-ft}{1 ac} = 967.03 cf$

Total # of Forebays = 3

Divide Volume based upon Contributing area flows

$Q_{pond} @ Pond = 45.7 + 4.5 + 9.6 + 58.3 = 118.1 cfs$

$N = 45.7 / 118.1 = 0.387 = 38.7\%$

$SW = 4.5 / 118.1 = 0.038 = 3.8\%$

~~$SE = 100\% - 38.7 - 3.8 = 57.5\%$~~

Req'd Forebay Volumes

$N = 0.387 \times 967.0 = 374 cf / 11.5 ft = 249.3 sf (min)$

$SW = 0.038 \times 967.0 = 37 cf / 11.0 ft = 37.0 sq ft$

~~$SE = 0.575 \times 967.0 = 556 cf / 11.5 ft = 390.7 sf (min)$~~

PROJECT: Timberline Storage Yard

DATE: \_\_\_\_\_

Size notch for N Forebay

2% of undisturbed 100-yr Flow Remaining Forebay

$$Q_{100} = 45.3 \text{ cfs}$$

$$Q_{LF} = 45.3 \text{ cfs} \times 0.02 = 0.906 \text{ cfs}$$

Size notch using weir eqn (Rect Weir)

$$Q = \frac{3.247 L H^{1.48} - 0.566 L^{1.9} H^{1.9}}{1 + 2 L^{1.87}} \quad H = 1.5'$$

$$L = 1.9''$$

~~Size notch for SE Forebay~~

~~2% of undisturbed 100-yr Flow Remaining Forebay~~

~~$$Q_{100} = 65.2 \text{ cfs}$$~~

~~$$Q_{LF} = 65.2 \times 0.02 = 1.304 \text{ cfs}$$~~

~~Size notch using weir eqn (Rect Weir)~~

~~$$Q = \frac{3.247 L H^{1.48} - 0.566 L^{1.9} H^{1.9}}{1 + 2 L^{1.87}} \quad H = 1.5'$$~~

~~$$L = 2.8''$$~~



CIVIL CONSULTANTS, INC.

20 BOULDER CRESCENT, STE 110  
COLORADO SPRINGS, CO 80903  
(719) 955-5485

PROJECT: \_\_\_\_\_

DATE: \_\_\_\_\_

Size notch for SW forebay

2% of undisturbed 100-yr Flow Penning Forebay

$$Q_{FD} = 4.5 \text{ cfs}$$

$$Q_{UF} = 4.5 \times 0.02 = 0.09 \text{ cfs}$$

$$Q = \frac{3.247 L \cdot H^{1.4} - 0.506 L^{1.9} H^{1.9}}{1 + 2L^{1.87}} \quad H = 10$$

$$L = 0.33'' \quad \text{use a min of } 3/8'' \text{ wide}$$

**TIMBERLINE STORAGE**  
**EMERGENCY SPILLWAY CALCULATIONS FSD POND 1**

<b>Horizontal Broad-Crested Weir (Eqn 12-20 UDFCD)</b>					
Variable			Solve For		
<i>C</i>	3.00		L (ft)	H (ft)	Q (cfs)
<i>L</i>	72.50	ft	0.0	0.0	119.3
<i>H</i>	0.67	ft			
<i>Q</i>		cfs			

<b>Sloping Broad-Crested Weir (Eqn 12-21 UDFCD)</b>					
Variable			Solve For		
<i>C</i>	3.00		Z (ft)	H (ft)	Q (cfs)
<i>Z</i>	10.00	ft	0.0	0.0	4.4
<i>H</i>	0.67	ft			
<i>Q</i>		cfs			

<b>Total Q</b>	<b>128.10</b>
----------------	---------------

Equation 12-20

$$Q = C_{BCW} L H^{1.5}$$

Equation 12-21

$$Q = \left(\frac{2}{5}\right) C_{BCW} Z H^{2.5}$$

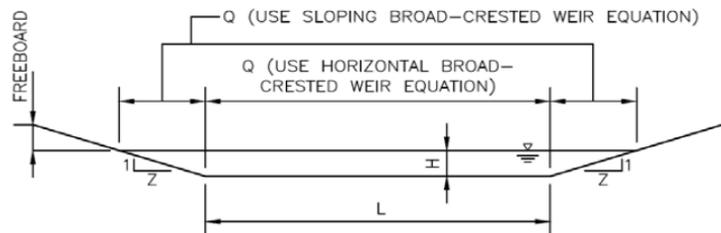
Where:

*Q* = discharge (cfs)

*C<sub>BCW</sub>* = broad-crested weir coefficient (This ranges from 2.6 to 3.0. A value of 3.0 is often used in practice.) See Hydraulic Engineering Circular No. 22 for additional information.

*L* = broad-crested weir length (ft)

*H* = head above weir crest (ft)



**Figure 12-20. Sloping broad-crest weir**

PROJECT: TIMBER LINE STORAGE YARD

DATE: 11-14-19

RIPRAP APRON

From 3.2.1 UDFCD  
EQ. 9-11  $L_p = \left[ \frac{1}{2 \tan \theta} \right] \left[ \frac{A_t}{\frac{1}{2}} - w \right]$

$A_t = \frac{Q}{V} = \frac{100}{5} = 20 \text{ ft}^2$  Assumed 0.4 For  $Y_t/D$   $Q/D^{2.5} = \frac{100}{3.5^{2.5}} = 4.36$

From FIGURE 9-35 EXPANSION FACTOR = 4.2

$L_p = (4.2) \left( \frac{20 \text{ ft}^2}{3.5^4} - 3.5^4 \right) = 9.3'$  check  $3 \times 3.5 = 10.5' > 9.3'$  USE 10.5'

EQ 9-13

$\theta = \tan^{-1} \left( \frac{1}{2 [\text{EXPANSION FACTOR}]} \right) = \tan^{-1} \left( \frac{1}{2 (4.2)} \right) = 6.79$

EQ 9-14

$T = 2 (L_p \tan \theta) + w = 2 (10.5 \tan 6.79) + 3.5 = \underline{6.0}$

ROCK SIZING

Assume  $Y_t/D = 0.4$   $Q/D^{1.5} = \frac{100}{3.5^{1.5}} = 15.27$

From FIG 9-38 USE TYPE A RIPRAP  $D_{50} = 18''$

DEPTH =  $2D_{50} = 3'$  DEPTH

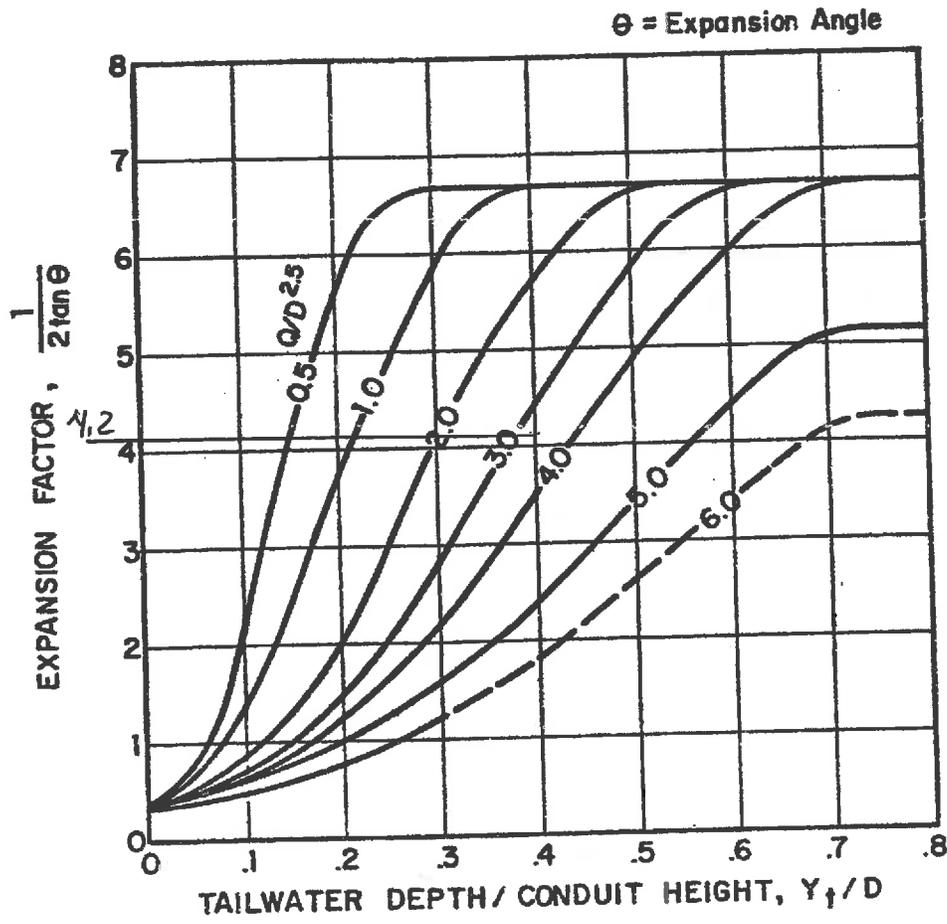


Figure 9-35. Expansion factor for circular conduits

$$H_a = \frac{(H + Y_n)}{2}$$

Equation 9-19

Where the maximum value of  $H_a$  shall not exceed  $H$ , and:

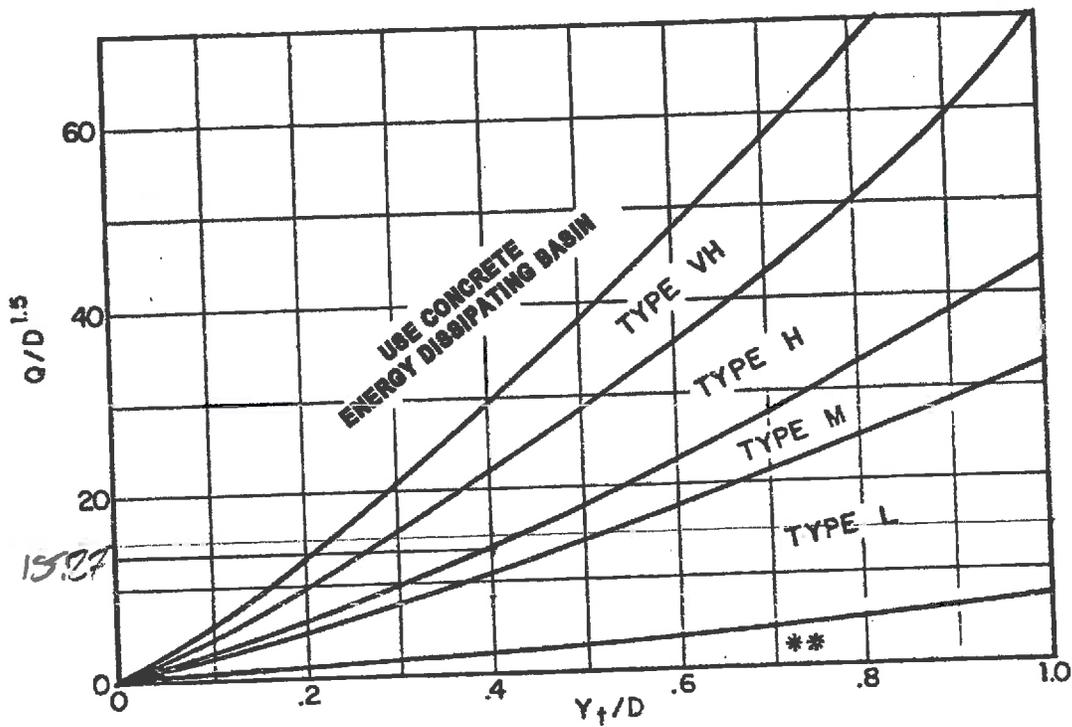
$D_a$  = parameter to use in place of  $D$  in Figure 9-38 when flow is supercritical (ft)

$D_c$  = diameter of circular culvert (ft)

$H_a$  = parameter to use in place of  $H$  in Figure 9-39 when flow is supercritical (ft)

$H$  = height of rectangular culvert (ft)

$Y_n$  = normal depth of supercritical flow in the culvert (ft)



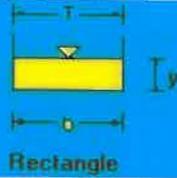
Use  $D_a$  instead of  $D$  whenever flow is supercritical in the barrel.  
 \*\* Use Type L for a distance of  $3D$  downstream.

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for  $Q/D2.5 \leq 6.0$ )

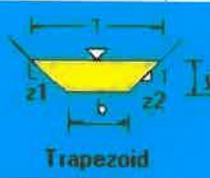
## The open channel flow calculator

Select Channel Type:

Trapezoid ▾



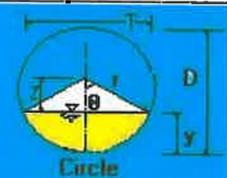
Rectangle



Trapezoid



Triangle



Circle

Velocity(V)&Discharge(Q) ▾

Select unit system: Feet(ft) ▾

Channel slope:   
ft/ft

Water depth(y):  ft

Bottom width(b)   
ft

Flow velocity   
ft/s

Left Slope (Z1):  to 1 (H:V)

Right Slope (Z2):   
to 1 (H:V)

Flow discharge   
ft<sup>3</sup>/s

Input n value  or select n

Calculate!

Status: Calculation finished

Reset

Wetted perimeter   
ft

Flow area  ft<sup>2</sup>

Top width(T)  ft

Specific energy   
ft

Froude number

Flow status

Critical depth  ft

Critical slope  ft/ft

Velocity head  ft

Copyright 2000 Dr. Xing Fang, Department of Civil Engineering, Lamar University.

RUNDOWN BELOW SPILLWAY  $V = 4.18$  ft/s

USE NORTH AMERICAN GREEN SC150 PERMISSIBLE SHEAR STRESS 8 ft/s



# Material and Performance Specification Sheet

North American Green  
 14649 Highway 41 North  
 Evansville, IN 47725  
 800-772-2040  
 FAX: 812-867-0247  
[www.nagreen.com](http://www.nagreen.com)

A **tensar** Company

## SC150 Erosion Control Blanket

The extended-term double net erosion control blanket shall be a machine-produced mat of 70% agricultural straw and 30% coconut fiber with a functional longevity of up to 24 months. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with a heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and an approximate 0.63 x 0.63 (1.59 x 1.59 cm) mesh, and on the bottom side with a lightweight photodegradable polypropylene netting with an approximate 0.50 x 0.50 in (1.27 x 1.27 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread.

The SC150 shall meet requirements established by the Erosion Control Technology Council (ECTC) Specification and the US Department of Transportation, Federal Highway Administration's (FHWA) *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-03 Section 713.17 as a type 3.B Extended-term Erosion Control Blanket*.

The SC150 is also available with the DOT System™, which consists of installation staple patterns clearly marked on the erosion control blanket with environmentally safe paint. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

Material Content		
Matrix	70% Straw Fiber	0.35 lbs/yd <sup>2</sup> (0.19 kg/m <sup>2</sup> )
	30% Coconut Fiber	0.15 lbs/yd <sup>2</sup> (0.08 kg/m <sup>2</sup> )
Nettings	Top - Heavyweight photodegradable with UV additives	3.0 lb/1000 ft <sup>2</sup> ( 1.47 kg/100 m <sup>2</sup> )
	Bottom - Lightweight Photodegradable	1.5 lb/1000 ft <sup>2</sup> ( 0.73 kg/100 m <sup>2</sup> )
Thread	Degradable	

SC150 is available in the following standard roll sizes:

Width	6.67 ft (2.03 m)	16 ft (4.87 m)
Length	108 ft (32.92 m)	108 ft (32.92 m)
Weight ± 10%	44 lbs (19.95 kg)	105.6 lbs (47.9 kg)
Area	80.0 yd <sup>2</sup> (66.9 m <sup>2</sup> )	192 yd <sup>2</sup> (165.5 m <sup>2</sup> )

### Index Value Properties:

Property	Test Method	Typical
Thickness	ASTM D6525	0.39 in (9.91 mm)
Resiliency	ECTC Guidelines	75%
Water Absorbency	ASTM D1117	285%
Mass/Unit Area	ASTM 6475	11.44 oz/yd <sup>2</sup> (388 g/m <sup>2</sup> )
Swell	ECTC Guidelines	30%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	1.11 oz-in
Light Penetration	ECTC Guidelines	8.7%
Tensile Strength - MD	ASTM D6818	146.6 lbs/ft (2.17 kN/m)
Elongation - MD	ASTM D6818	26.9%
Tensile Strength - TD	ASTM D6818	147.6 lbs/ft (2.19 kN/m)
Elongation - TD	ASTM D6818	25.2%

### Performance Design Values:

Maximum Permissible Shear Stress	
Unvegetated Shear Stress	2.00 lbs/ft <sup>2</sup> (96 Pa)
Unvegetated Velocity	8.00 ft/s (2.44 m/s)

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 - 2:1	≥ 2:1
≤ 20 ft (6 m)	0.001	0.048	0.100
20-50 ft	0.051	0.079	0.145
≥ 50 ft (15.2 m)	0.10	0.110	0.190

### Bench Scale Testing\* (NTPEP):

Test Method	Parameters	Results
ECTC Method 2 Rainfall	50 mm (2 in)/hr for 30 min	SLR** = 5.47
	100mm (4 in)/hr for 30 min	SLR** = 5.67
	150 mm (6 in)/hr for 30 min	SLR** = 5.88
ECTC Method 3 Shear Resistance	Shear at 0.50 inch soil loss	2.72 lbs/ft <sup>2</sup>
ECTC Method 4 Germination	Top Soil, Fescue, 21 day incubation	538% improvement of biomass

\* Bench Scale tests should not be used for design purposes

\*\* Soil Loss Ratio = Soil loss with Bare Soil/Soil Loss with RECP (soil loss is based on regression analysis)

Roughness Coefficients- Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.050
0.50 - 2.0 ft	0.050 - 0.018
≥ 2.0 ft (0.60 m)	0.018

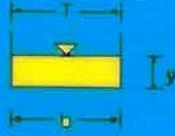
Product Participant of:



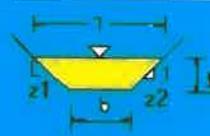
## The open channel flow calculator

Select Channel Type:

Trapezoid ▾



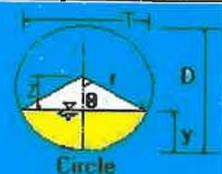
Rectangle



Trapezoid



Triangle



Circle

Velocity(V)&Discharge(Q) ▾

Select unit system: Feet(ft) ▾

Channel slope: 0.25  
ft/ft

Water depth(y): 0.25 ft

Bottom width(b) 2.5  
ft

Flow velocity 7.3353  
ft/s

LeftSlope (Z1): 2.5 to 1 (H:V)

RightSlope (Z2): 2.5  
to 1 (H:V)

Flow discharge 5.7307  
ft<sup>3</sup>/s

Input n value 0.035 or select n

Calculate!

Status: Calculation finished

Reset

Wetted perimeter 3.85  
ft

Flow area 0.78 ft<sup>2</sup>

Top width(T) 3.75 ft

Specific energy 1.09  
ft

Froude number 2.83

Flow status Supercritical flow

Critical depth 0.46 ft

Critical slope 0.0265 ft/ft

Velocity head 0.84 ft

Copyright 2000 Dr. Xing Fang, Department of Civil Engineering, Lamar University.

SW RIPRAP Run Down

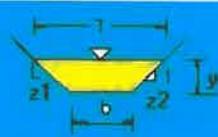
## The open channel flow calculator

Select Channel Type:

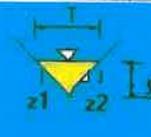
Trapezoid ▾



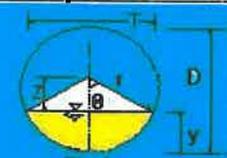
Rectangle



Trapezoid



Triangle



Circle

Velocity(V)&Discharge(Q) ▾

Select unit system: Feet(ft) ▾

Channel slope: 0.25  
ft/ft

Water depth(y): 0.99 ft

Bottom width(b) 3  
ft

Flow velocity 15.9389  
ft/s

LeftSlope (Z1): 2.5 to 1 (H:V)

RightSlope (Z2): 2.5  
to 1 (H:V)

Flow discharge 86.3928  
ft<sup>3</sup>/s

Input n value 0.035 or select n

Calculate!

Status: Calculation finished

Reset

Wetted perimeter 8.33  
ft

Flow area 5.42 ft<sup>2</sup>

Top width(T) 7.95 ft

Specific energy 4.93  
ft

Froude number 3.4

Flow status Supercritical flow

Critical depth 1.86 ft

Critical slope 0.0182 ft/ft

Velocity head 3.94 ft

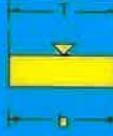
Copyright 2000 Dr. Xing Fang, Department of Civil Engineering, Lamar University.

SE RIPRAP RUNDOWN

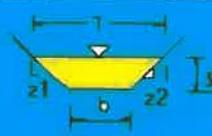
## The open channel flow calculator

Select Channel Type:

Triangle ▾



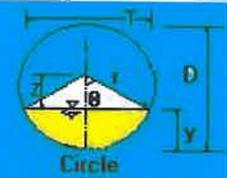
Rectangle



Trapezoid



Triangle



Circle

Velocity(V)&Discharge(Q) ▾

Select unit system: Feet(ft) ▾

Channel slope:   
ft/ft

Water depth(y):   
ft

Bottom W(b)   
ft

Flow velocity   
ft/s

LeftSlope (Z1):  to 1 (H:V)

RightSlope (Z2):  to 1 (H:V)

Flow discharge   
ft<sup>3</sup>/s

Input n value  or select n

Status: Calculation finished

Wetted perimeter   
ft

Flow area   
ft<sup>2</sup>

Top width(T)   
ft

Specific energy   
ft

Froude number

Flow status

Critical depth   
ft

Critical slope   
ft/ft

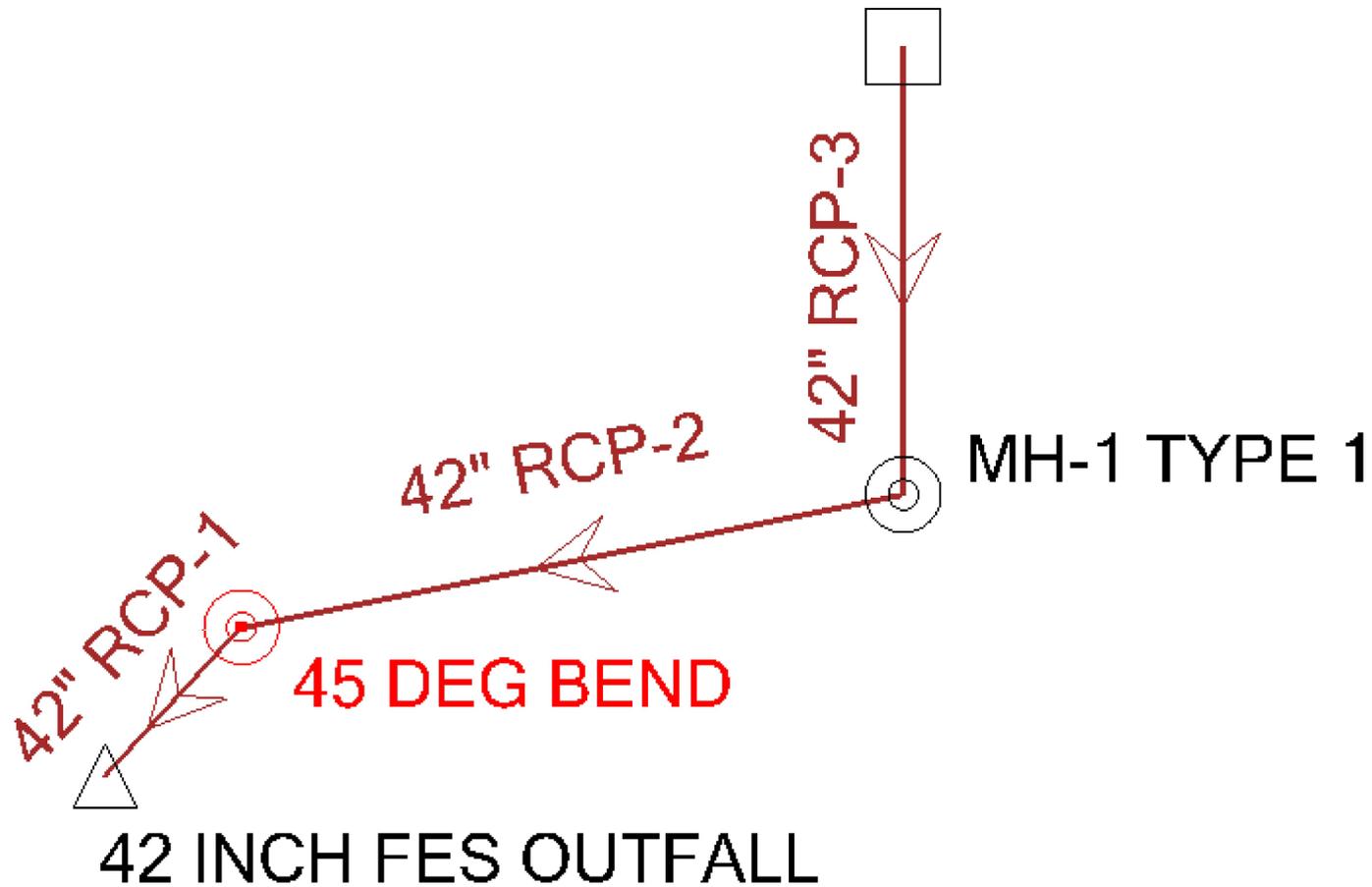
Velocity head   
ft

Copyright 2000 Dr. Xing Fang, Department of Civil Engineering, Lamar University.

6' CONCRETE SWALE

# STRM 1- POND 1 OUTFALL INDEX MAP

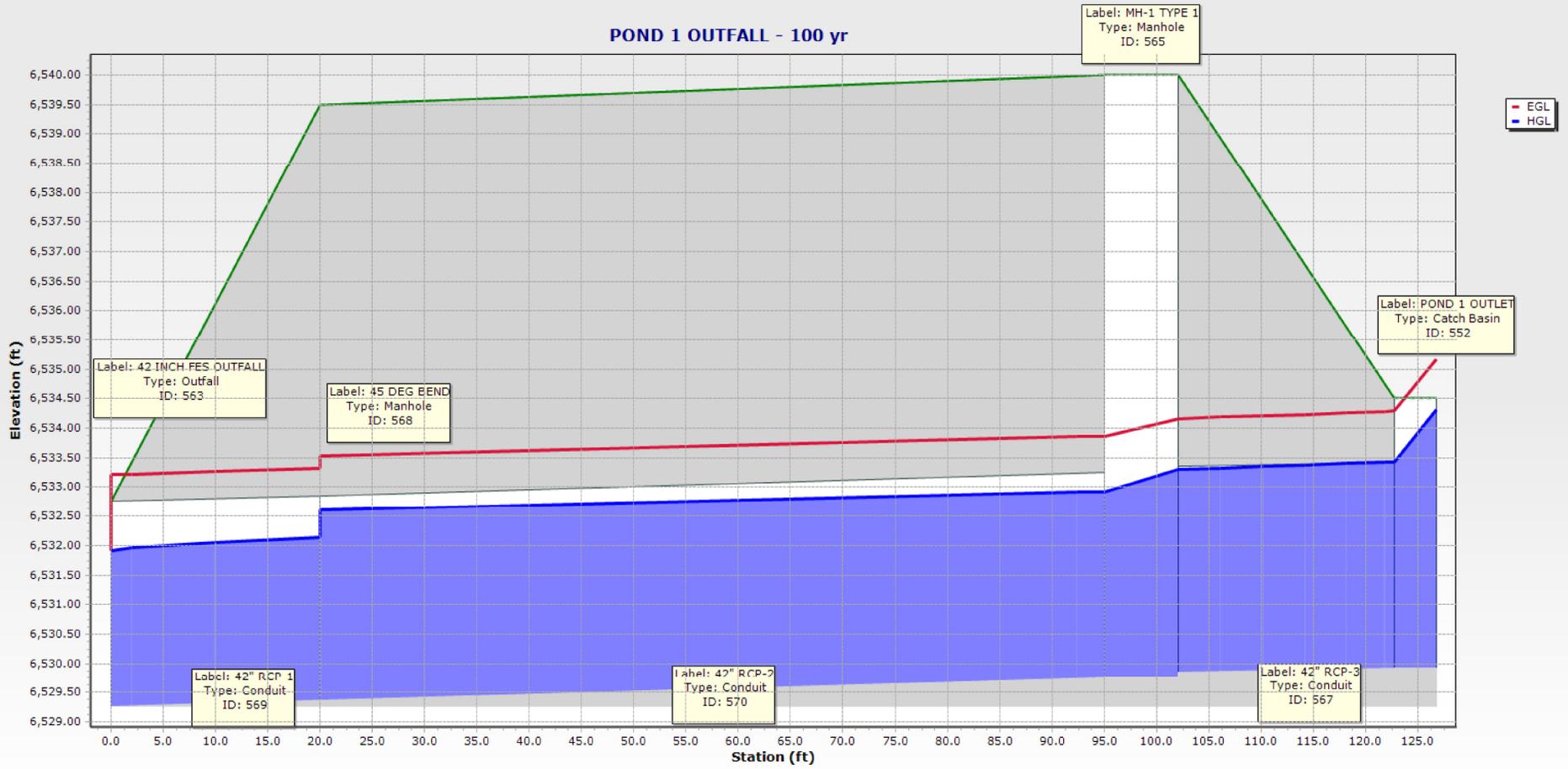
POND 1 OUTFLET



**Conduit FlexTable: POND 1 100 YR**

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Froude Number (Normal)	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)	Upstream Structure Hydraulic Grade Line (In) (ft)
42" RCP-3	567	POND 1 OUTLET	71.50	128.6	26.2	7.43	0.700	(N/A)	2.65	6,534.29	6,534.17	6,533.43	6,533.30	0.13	6,534.31
42" RCP-1	569	45 DEG BEND	71.50	100.5	20.0	8.43	0.833	2.88	2.65	6,533.32	6,533.21	6,532.13	6,531.91	0.22	6,532.61
42" RCP-2	570	MH-1 TYPE 1	71.50	100.9	78.6	8.40	0.824	2.90	2.65	6,533.87	6,533.52	6,532.93	6,532.61	0.32	6,533.30
Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description								
7.43	1.020	0.88	6,540.00	6,534.51	6,529.85	6,529.93	Circle - 42.0 in								
7.68	0.400	0.48	6,532.76	6,539.50	6,529.26	6,529.36	Circle - 42.0 in								
7.45	0.400	0.38	6,539.50	6,540.00	6,529.36	6,529.75	Circle - 42.0 in								

### POND 1 OUTFALL - 100 yr



HEC-RAS HEC-RAS 5.0.3 September 2016  
 U.S. Army Corps of Engineers  
 Hydrologic Engineering Center  
 609 Second Street  
 Davis, California

```

X   X   XXXXXX   XXXX   XXXX   XX   XXXX
X   X   X       X   X       X   X   X   X   X
X   X   X       X       X   X   X   X   X
XXXXXXXX XXXX   X       XXX XXXX   XXXXXX   XXXX
X   X   X       X       X   X   X   X   X
X   X   X       X   X       X   X   X   X   X
X   X   XXXXXX   XXXX   X   X   X   X   XXXXX
    
```

PROJECT DATA

Project Title: existingswale  
 Project File : existingswale.prj  
 Run Date and Time: 12/4/2017 3:05:07 PM

Project in English units

PLAN DATA

Plan Title: swale analysis  
 Plan File : o:\43095A\Tim Emick\Documents\Reports\Drainage\HEC-RAS\existingswale.p01

Geometry Title: existingswale  
 Geometry File : o:\43095A\Tim Emick\Documents\Reports\Drainage\HEC-RAS\existingswale.g01

Flow Title : ex flow w timberline  
 Flow File : o:\43095A\Tim Emick\Documents\Reports\Drainage\HEC-RAS\existingswale.f01

Plan Summary Information:

Number of: Cross Sections = 7 Multiple Openings = 0  
 Culverts = 0 Inline Structures = 0  
 Bridges = 0 Lateral Structures = 0

Computational Information

Water surface calculation tolerance = 0.01  
 Critical depth calculation tolerance = 0.01  
 Maximum number of iterations = 20  
 Maximum difference tolerance = 0.3  
 Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary  
 Conveyance Calculation Method: At breaks in n values only  
 Friction Slope Method: Average Conveyance  
 Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: ex flow w timberline  
 Flow File : o:\43095A\Tim Emick\Documents\Reports\Drainage\HEC-RAS\existingswale.f01

Flow Data (cfs)

River	Reach	RS	5YR	100YR
existing swale	existing swale	1074.48	5.2	84.2
existing swale	existing swale	620.87	11.6	126.9
existing swale	existing swale	400	12.1	130.6
existing swale	existing swale	175.88	13.5	139.7

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
existing swale	existing swale	5YR	Normal S = 0.022	Normal S = 0.02

GEOMETRY DATA

Geometry Title: existingswale  
 Geometry File : o:\43095A\Tim Emick\Documents\Reports\Drainage\HEC-RAS\existingswale.g01

CROSS SECTION

RIVER: existing swale  
 REACH: existing swale RS: 1074.48

INPUT

Description:

Station Elevation Data		Data		num=		16					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6530.367	099998	6530.27	15.57	6530.18	39.4	6530.13	43.03	6529.97		
51.38	6526.41	52.96	6526.23	60	6526.81	61.75	6526.94	62.19	6526.94		
65.05	6527.42	69.31	6528.1	92.52	6528.97	97.37	6529.07	108.59	6529.46		
120	6529.84										

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.03	120	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	120		171.67	171.67		.1	.3

CROSS SECTION

RIVER: existing swale  
 REACH: existing swale RS: 902.81

INPUT

Description:

Station Elevation Data		Data		num=		15					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6527.85	13.59	6527.47	16.76	6527.42	41.75	6526.87	46.77	6526.29		
60	6525.4	61.9	6525.27	68.4	6525.78	74.5	6525.91	81.3	6526.18		
88.72	6527.19	94.11	6528.08	112.71	6528.74	119.25	6529.01	120	6529.03		

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.03	120	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	120		113.78	113.78		.1	.3

CROSS SECTION

RIVER: existing swale  
 REACH: existing swale RS: 789.03

INPUT

Description:

Station Elevation Data		Data		num=		13					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6527.76	23.05	6526.62	32.69	6526.31	62.39999	6524.94	75.97	6524.47		
80.31	6524.36	80.54	6524.36	89.43	6524.3	98.67	6525.33	108.83	6526.49		
138.32	6527.86	155.36	6528.39	165.31	6529.02						

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.03	165.31	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	165.31		168.16	168.16		.1	.3

CROSS SECTION

RIVER: existing swale  
 REACH: existing swale RS: 620.87

INPUT

Description:

Station Elevation Data		Data		num=		17					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6527.58	9100037	6527.56	29.14	6526.63	37.42999	6526.27	61.32001	6523.27		
62.03999	6523.13	62.46001	6523.13	67.78999	6523.29	80	6523.59	92.41	6523.94		
94.9	6523.98	99.08	6524.02	135.86	6524.35	139.15	6524.37	146.21	6524.49		
196.17	6525.18	220	6525.61								

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.035	0	.03	220	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	220		220.87	220.87		.1	.3

CROSS SECTION

RIVER: existing swale  
 REACH: existing swale RS: 400

INPUT

Description:

Station Elevation Data		num= 13	
Sta	Elev	Sta	Elev
0	6522.564	610001	6522.47
60	6521.57	64.2	6521.54
142.01	6521.75	142.24	6521.82

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.035	0	.03
145	.035	145	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	145	224.12	224.12	224.12		.1	.3

CROSS SECTION

RIVER: existing swale  
 REACH: existing swale RS: 175.88

INPUT

Description:

Station Elevation Data		num= 22	
Sta	Elev	Sta	Elev
0	6521.1930	50999	6520.75
35.09	6520.67	102.35	6519.63
140.38	6519.68	167.91	6519.68
172.6	6519.69	199.67	6519.87
243.44	6522.22	245	6522.17

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.035	0	.03
245	.035	245	.035

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	245	147.52	147.52	147.52		.1	.3

CROSS SECTION

RIVER: existing swale  
 REACH: existing swale RS: 28.36

INPUT

Description:

Station Elevation Data		num= 15	
Sta	Elev	Sta	Elev
0	6521.5232	07001	6521.08
86.45	6519.71	95.58	6519.39
124.79	6518.04	125.48	6518.02

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.035	0	.03
149.97	.035	149.97	.035

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	0	149.97		.1	.3

SUMMARY OF MANNING'S N VALUES

River: existing swale

Reach	River Sta.	n1	n2	n3
existing swale	1074.48	.035	.03	.035
existing swale	902.81	.035	.03	.035
existing swale	789.03	.035	.03	.035
existing swale	620.87	.035	.03	.035
existing swale	400	.035	.03	.035
existing swale	175.88	.035	.03	.035
existing swale	28.36	.035	.03	.035

SUMMARY OF REACH LENGTHS

River: existing swale

Reach	River Sta.	Left	Channel	Right
-------	------------	------	---------	-------

				existingswale.rep
existing swale	1074.48	171.67	171.67	171.67
existing swale	902.81	113.78	113.78	113.78
existing swale	789.03	168.16	168.16	168.16
existing swale	620.87	220.87	220.87	220.87
existing swale	400	224.12	224.12	224.12
existing swale	175.88	147.52	147.52	147.52
existing swale	28.36			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: existing swale

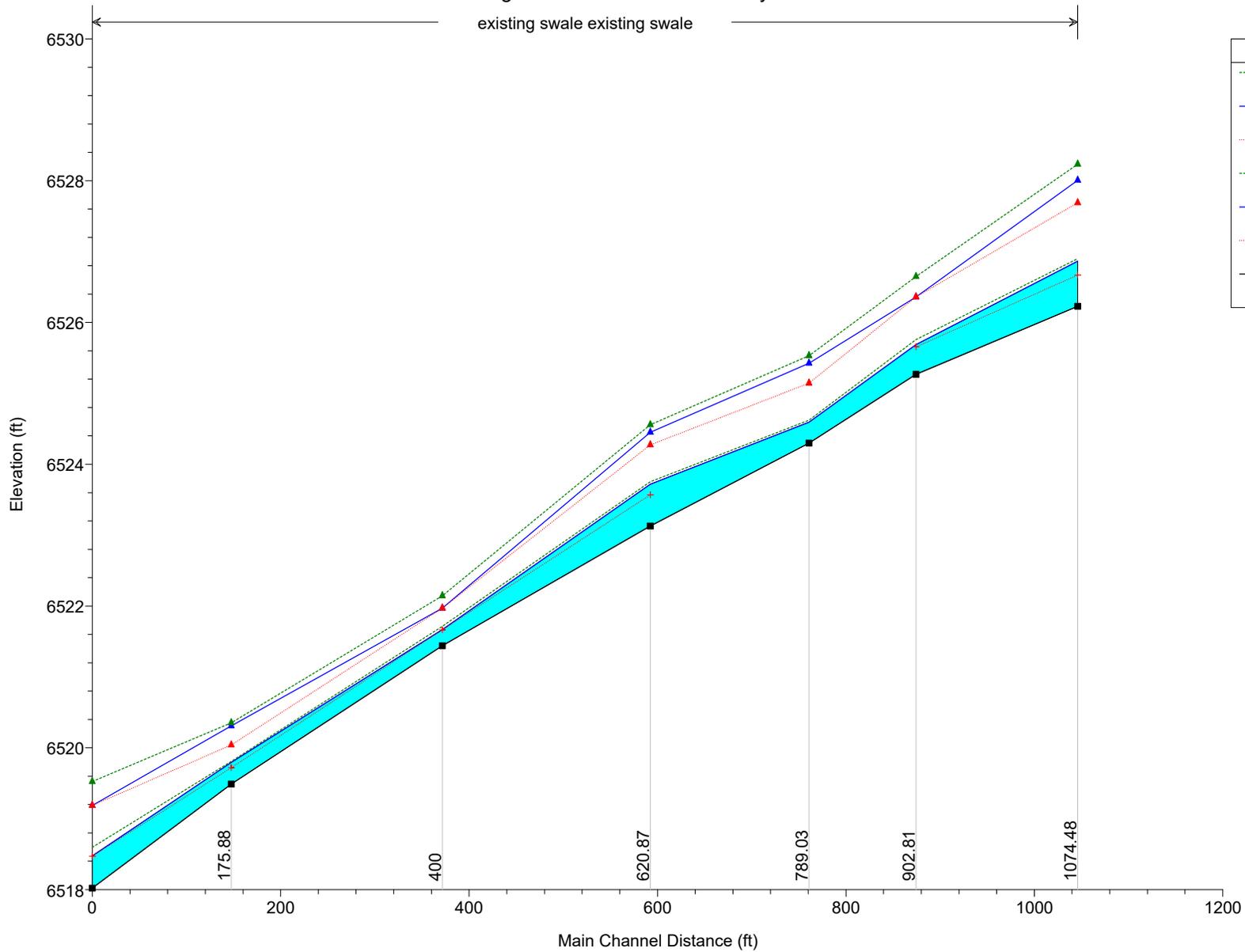
Reach	River Sta.	Contr.	Expan.
existing swale	1074.48	.1	.3
existing swale	902.81	.1	.3
existing swale	789.03	.1	.3
existing swale	620.87	.1	.3
existing swale	400	.1	.3
existing swale	175.88	.1	.3
existing swale	28.36	.1	.3

HEC-RAS Plan: exsw River: existing swale Reach: existing swale

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Max Chl Dpth (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Shear Chan (lb/sq ft)	Froude # Chl
existing swale	1074.48	5YR	5.20	6526.23	6526.87	0.64	6526.67	6526.90	0.003696	1.46	3.57	10.45	0.08	0.44
existing swale	1074.48	100YR	84.20	6526.23	6528.01	1.78	6527.69	6528.23	0.005784	3.82	22.03	21.10	0.37	0.66
existing swale	902.81	5YR	5.20	6525.27	6525.69	0.42	6525.66	6525.76	0.015218	2.15	2.42	11.55	0.20	0.83
existing swale	902.81	100YR	84.20	6525.27	6526.36	1.09	6526.36	6526.65	0.017093	4.28	19.66	36.48	0.57	1.03
existing swale	789.03	5YR	5.20	6524.30	6524.59	0.29		6524.62	0.006992	1.38	3.77	19.65	0.08	0.55
existing swale	789.03	100YR	84.20	6524.30	6525.43	1.13	6525.14	6525.53	0.004633	2.60	32.35	47.61	0.20	0.56
existing swale	620.87	5YR	11.60	6523.13	6523.72	0.59	6523.57	6523.75	0.004583	1.48	7.86	26.87	0.08	0.48
existing swale	620.87	100YR	126.90	6523.13	6524.45	1.32	6524.27	6524.56	0.006887	2.66	47.79	91.93	0.22	0.65
existing swale	400	5YR	12.10	6521.44	6521.67	0.23	6521.67	6521.71	0.025559	1.70	7.12	71.62	0.16	0.95
existing swale	400	100YR	130.60	6521.44	6521.97	0.53	6521.97	6522.15	0.019209	3.35	38.96	114.13	0.41	1.01
existing swale	175.88	5YR	13.50	6519.49	6519.80	0.31	6519.72	6519.81	0.004447	0.93	14.50	96.91	0.04	0.42
existing swale	175.88	100YR	139.70	6519.49	6520.31	0.82	6520.04	6520.35	0.002691	1.67	83.55	159.13	0.09	0.41
existing swale	28.36	5YR	13.50	6518.02	6518.48	0.46	6518.47	6518.60	0.019987	2.77	4.87	19.54	0.31	0.98
existing swale	28.36	100YR	139.70	6518.02	6519.19	1.17	6519.19	6519.53	0.015570	4.65	30.01	45.39	0.64	1.01

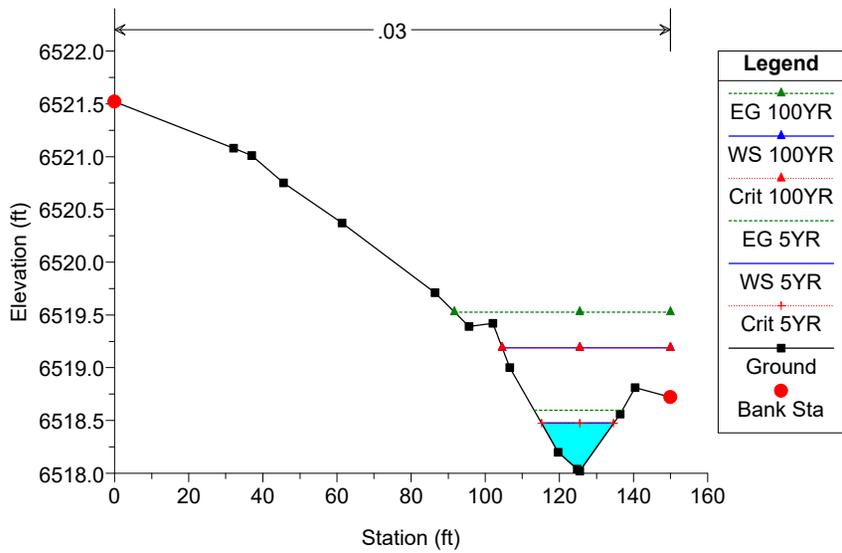
existingswale Plan: swale analysis 12/4/2017

existing swale existing swale

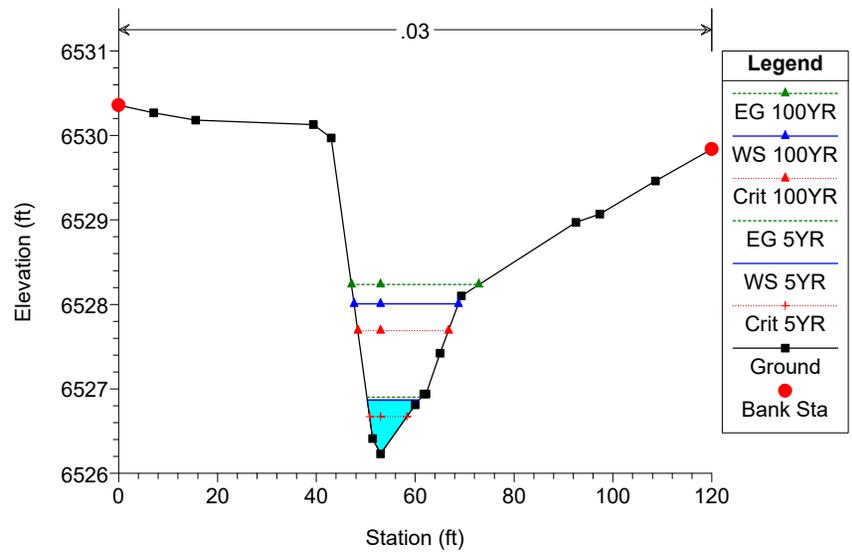


Legend	
EG 100YR	▲ (green dashed line)
WS 100YR	▲ (blue solid line)
Crit 100YR	▲ (red dotted line)
EG 5YR	▲ (green dashed line)
WS 5YR	▲ (blue solid line)
Crit 5YR	▲ (red dotted line)
Ground	■ (black solid line)

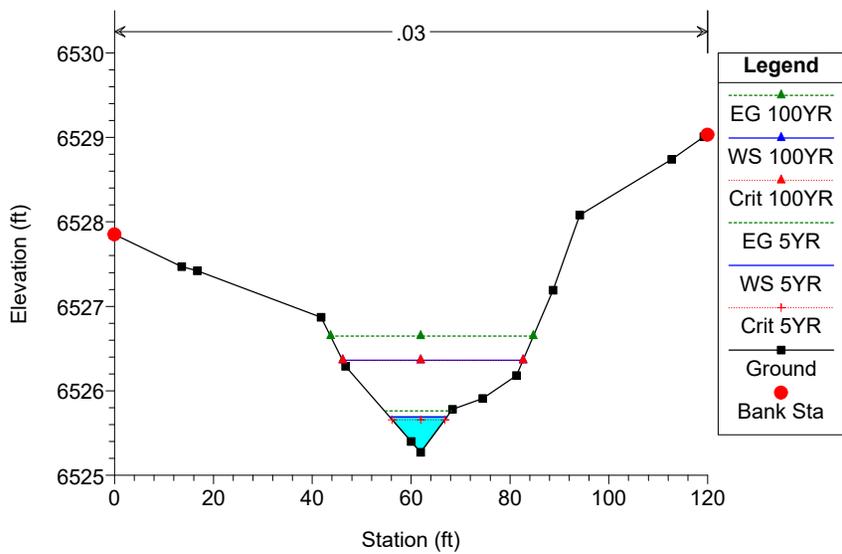
existingswale Plan: swale analysis 12/4/2017



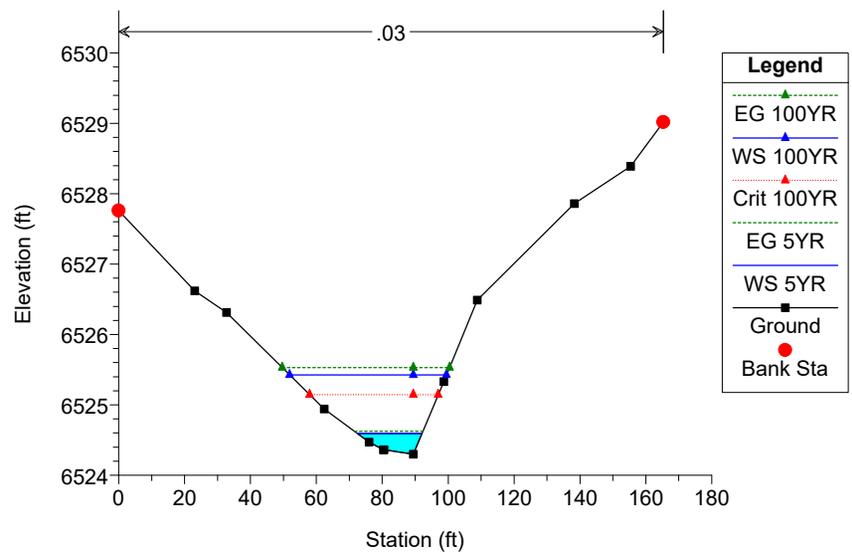
existingswale Plan: swale analysis 12/4/2017



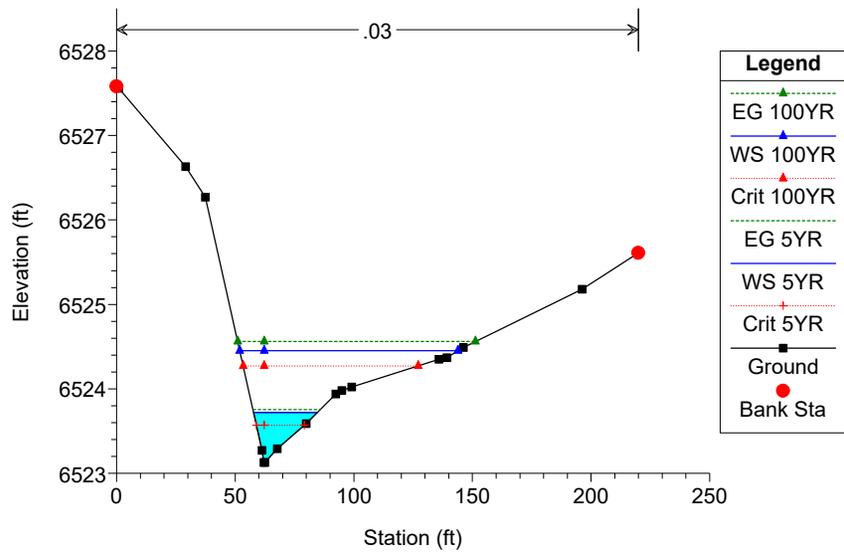
existingswale Plan: swale analysis 12/4/2017



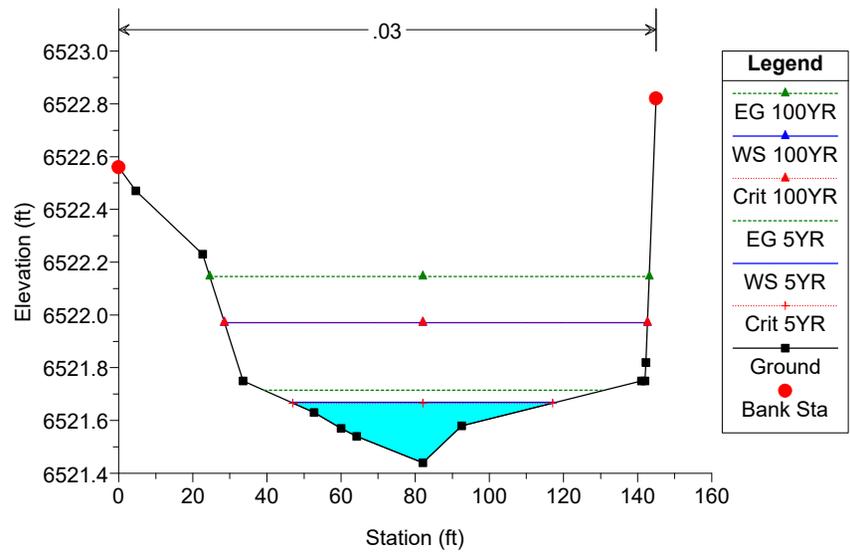
existingswale Plan: swale analysis 12/4/2017



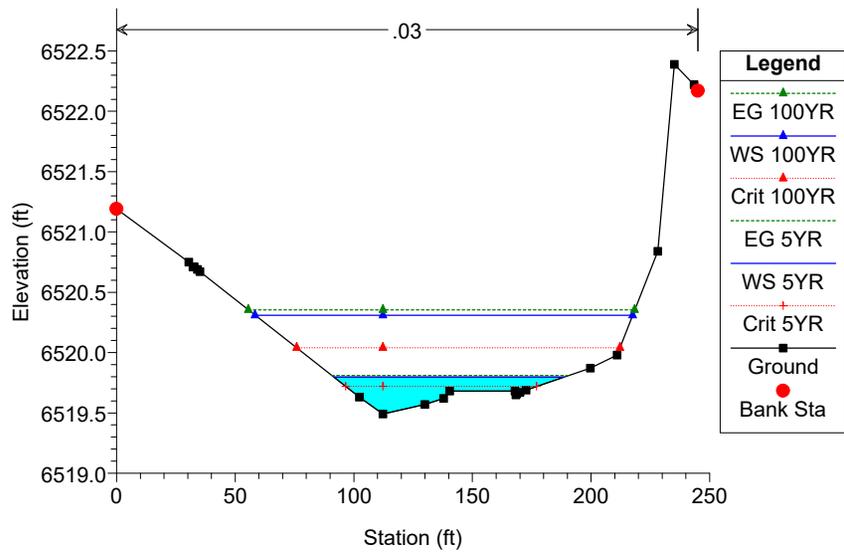
existingswale Plan: swale analysis 12/4/2017



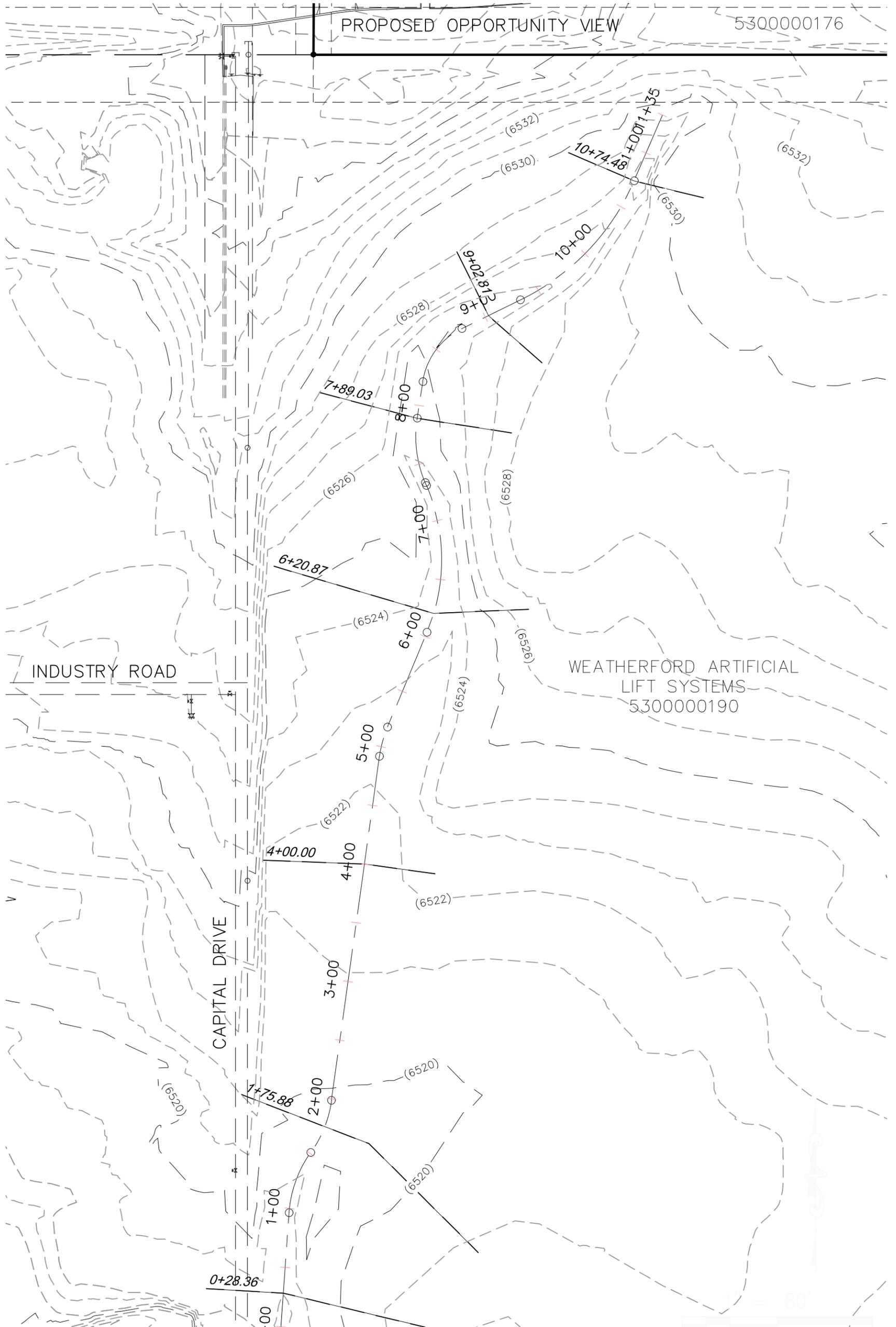
existingswale Plan: swale analysis 12/4/2017



existingswale Plan: swale analysis 12/4/2017



# OFF-SITE SWALE HEC-RAS WORK MAP



5YR EVENT

100YR EVENT

CROSS SECTION ID	FLOW CFS	DEPTH FT	VELOCITY FT/S	SHEAR LB/SF	FLOW CFS	DEPTH FT	VELOCITY FT/S	SHEAR LB/SF
10+74.48	5.2	0.6	1.5	0.1	84.2	1.8	3.8	0.4
9+02.81	5.2	0.4	2.2	0.2	84.2	1.1	4.3	0.6
7+89.03	5.2	0.3	1.4	<0.1	84.2	1.1	2.6	0.2
6+20.87	11.6	0.6	1.5	<0.1	126.9	1.3	2.7	0.2
4+00.00	12.1	0.2	1.7	0.2	130.6	0.5	3.4	0.4
1+75.88	13.5	0.3	0.9	<0.1	139.7	0.8	1.7	0.1
0+28.36	13.5	0.4	2.8	0.3	139.7	1.2	4.7	0.6



20 BOULDER CRESCENT, SUITE 110  
 COLORADO SPRINGS, CO 80903  
 PHONE: 719.955.5485

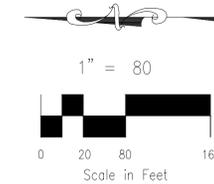
**GRADING AND EROSION CONTROL PLAN**



11-19-19  
FOR INFORMATION  
PURPOSES ONLY

# TIMBERLINE STORAGE YARD

## OVERALL GRADING AND EROSION CONTROL PLAN



### LEGEND

- EX MAJ CONT
- EX MIN CONT
- PROP MAJ CONT
- PROP MIN CONT
- LIMITS OF DISTURBANCE
- OUT FILL LINE
- PROPOSED STORM SEWER INLET WITH PIPE
- LOW POINT
- HIGH POINT
- EXISTING
- FLOWLINE
- TOP OF CURB
- FINISH FLOOR
- FINISH GRADE
- TOP OF FOOTING
- SILT FENCE - INITIAL
- VEHICLE TRACKING CONTROL - INITIAL
- CONCRETE WASH-OUT BASIN - INITIAL
- STRAW BALE - INITIAL
- INLET PROTECTION - INITIAL
- TEMPORARY SEDIMENT BASIN - INTERIM
- CULVERT INLET PROTECTION - INITIAL
- CULVERT INLET PROTECTION - INITIAL
- TEMPORARY STOCK PILE AREA - INITIAL
- NORTH AMERICAN GREEN SC250 PERMANENT EROSION CONTROL BLANKET (OR APPROVED EQUAL) - PERM

- LP
- HP
- EX
- FL
- TC
- FG
- FF
- TOF
- SF
- VTC
- CWA
- SB
- IP
- TSB
- CIP
- SSA
- SP
- TRM

<b>TIMBERLINE STORAGE YARD</b>	
<b>OVERALL GRADING AND EROSION CONTROL PLAN</b>	
PROJECT NO. 43-095	DATE: 11/19/2019
DESIGNED BY: GW	HORIZONTAL SCALE: 1"=80'
DRAWN BY: GW	VERTICAL SCALE: N/A
CHECKED BY: VAS	SHEET 2 OF 14
<b>GR02</b>	

102 E. PILES PEAK AVE., 5TH FLOOR  
 COLORADO SPRINGS, CO 80903  
 PHONE: 719.555.5485

**CIVIL CONSULTANTS, INC.**

<p>FOR AND ON BEHALF OF          M&amp;S CIVIL CONSULTANTS, INC.</p>	<p>ARCHIT. A. SANCHEZ, COLORADO P.E. NO. 371160</p>
--	---

NO.	REVISIONS:	DATE:

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE OR LIABLE FOR UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

CAUTION

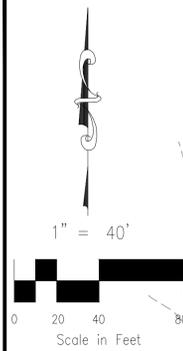
File: 0:\43095A\Tim\_Erick\Org\Dev\Plan\43095\_Grading\_Plan\_Surface\_Type.dwg Plotstamp: 11/20/2019 1:01 PM

11-19-19  
FOR INFORMATION  
PURPOSES ONLY

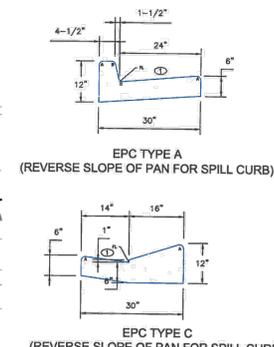
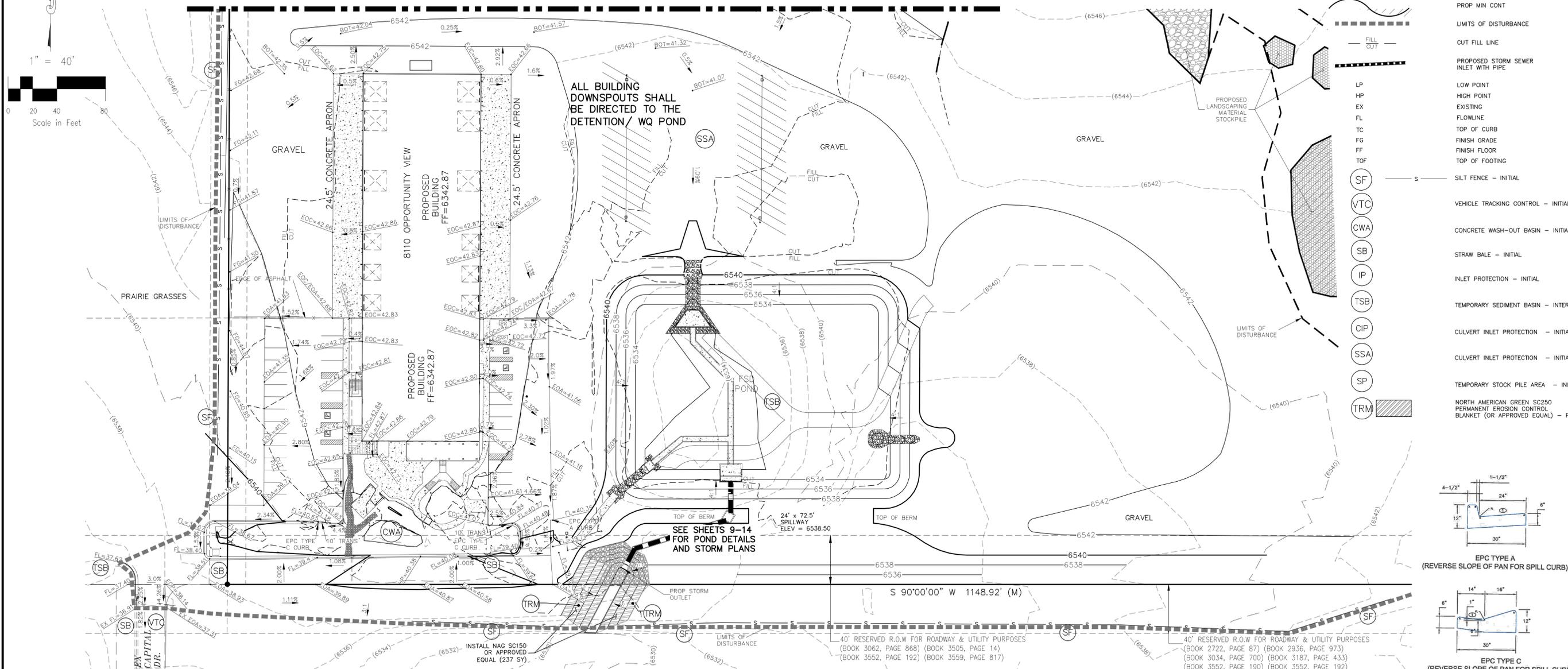
# TIMBERLINE STORAGE YARD

## GRADING AND EROSION CONTROL PLAN

SEE SHEET 4



LEGEND	
(Symbol)	EX MAJ CONT
(Symbol)	EX MIN CONT
(Symbol)	PROP MAJ CONT
(Symbol)	PROP MIN CONT
(Symbol)	LIMITS OF DISTURBANCE
(Symbol)	CUT FILL LINE
(Symbol)	PROPOSED STORM SEWER INLET WITH PIPE
(Symbol)	LOW POINT
(Symbol)	HIGH POINT
(Symbol)	EXISTING FLOWLINE
(Symbol)	TOP OF CURB
(Symbol)	FINISH GRADE
(Symbol)	FINISH FLOOR
(Symbol)	TOP OF FOOTING
(Symbol)	SILT FENCE - INITIAL
(Symbol)	VEHICLE TRACKING CONTROL - INITIAL
(Symbol)	CONCRETE WASH-OUT BASIN - INITIAL
(Symbol)	STRAW BALE - INITIAL
(Symbol)	INLET PROTECTION - INITIAL
(Symbol)	TEMPORARY SEDIMENT BASIN - INTERIM
(Symbol)	CULVERT INLET PROTECTION - INITIAL
(Symbol)	CULVERT INLET PROTECTION - INITIAL
(Symbol)	TEMPORARY STOCK PILE AREA - INITIAL
(Symbol)	NORTH AMERICAN GREEN SC250 PERMANENT EROSION CONTROL BLANKET (OR APPROVED EQUAL) - PERM



### STANDARD CONSTRUCTION NOTES:

- ALL DRAINAGE AND ROADWAY CONSTRUCTION SHALL MEET THE STANDARDS AND SPECIFICATIONS OF THE CITY OF COLORADO SPRINGS/EL PASO COUNTY DRAINAGE CRITERIA MANUAL VOLUMES 1 AND 2, AND THE EL PASO COUNTY ENGINEERING CRITERIA MANUAL.
- CONTRACTOR SHALL BE RESPONSIBLE FOR THE NOTIFICATION AND FIELD LOCATION OF ALL EXISTING UTILITIES, WHETHER SHOWN ON THE PLANS OR NOT, BEFORE BEGINNING CONSTRUCTION. LOCATION OF EXISTING UTILITIES SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. CALL 811 TO CONTACT THE UTILITY NOTIFICATION CENTER OF COLORADO SPRINGS.
- CONTRACTOR SHALL KEEP A COPY OF THESE APPROVED PLANS, THE GRADING AND EROSION CONTROL PLAN, THE STORMWATER MANAGEMENT PLAN (SWMP), THE SOILS AND GEOTECHNICAL REPORT AND THE APPROPRIATE DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS AT THE JOB SITE AT ALL TIMES INCLUDING THE FOLLOWING:
  - EL PASO COUNTY ENGINEERING CRITERIA MANUAL (ECM)
  - CITY OF COLORADO SPRINGS/EL PASO COUNTY ENGINEERING CRITERIA MANUAL VOLUMES 1 AND 2.
  - COLORADO DEPARTMENT OF TRANSPORTATION (CDOT) STANDARDS SPECIFICATION FOR ROAD AND BRIDGE CONSTRUCTION.
  - CDOT M&S STANDARDS.
- IT IS THE DESIGN ENGINEER'S RESPONSIBILITY TO ACCURACY SHOW EXISTING CONDITION BOTH ON-SITE AND OFF-SITE ON THE CONSTRUCTION PLANS. ANY MODIFICATION NECESSARY DUE TO CONFLICT OMISSIONS OR CHANGED CONDITIONS WILL BE ENTIRELY THE DEVELOPER'S RESPONSIBILITY TO RECTIFY.
- ONCE THE ESQCP HAS BEEN ISSUED, THE CONTRACTOR MAY INSTALL THE INITIAL STAGE EROSION AND SEDIMENT CONTROL BMPs AS INDICATED ON THE GEC. A PRECONSTRUCTION MEETING BETWEEN THE CONTRACTOR, ENGINEER, AND EL PASO COUNTY WILL BE HELD PRIOR TO ANY CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE APPLICANT TO COORDINATE THE MEETING TIME AND PLACE WITH COUNTY PCD INSPECTIONS STAFF.
- IT IS THE CONTRACTOR'S RESPONSIBILITY TO UNDERSTAND THE REQUIREMENTS OF ALL JURISDICTIONAL AGENCIES AND TO OBTAIN ALL REQUIRED PERMITS, INCLUDING BUT NOT LIMITED TO EL PASO COUNTY EROSION AND STORM WATER QUALITY CONTROL PERMIT (ESQCP), US ARMY CORPS OF ENGINEER ISSUED 401 AND/OR 404 PERMITS AND COUNTY AND STATE FUGITIVE DUST PERMITS.
- ALL CONSTRUCTION TRAFFIC MUST ENTER/EXIT THE CONSTRUCTION SITE AT APPROVED CONSTRUCTION ACCESS POINTS.
- ANY TEMPORARY SIGNAGE AND STRIPING SHALL COMPLY WITH EL PASO COUNTY DOW AND MUTCD CRITERIA.
- CONTRACTOR SHALL OBTAIN ANY PERMITS REQUIRE BY EL PASO COUNTY DOT INCLUDING WORK WITHIN THE RIGHT-OF-WAY AND SPECIAL TRANSPORT PERMITS.
- THE LIMITS OF CONSTRUCTION SHALL REMAIN WITHIN THE PROPERTY LINE UNLESS OTHERWISE NOTED. THE OWNER/DEVELOPER SHALL OBTAIN WRITTEN PERMISSION AND EASEMENTS, WHERE REQUIRED, FROM ADJOINING PROPERTY OWNER(S) PRIOR TO ANY OFFSITE DISTURBANCE GRADING, OR CONSTRUCTION.

### GRADING AND EROSION CONTROL NOTES:

- STORMWATER DISCHARGES FROM CONSTRUCTION SITES SHALL NOT CAUSE OR THREATEN TO CAUSE POLLUTION, CONTAMINATION, OR DEGRADATION OF STATE WATERS. ALL WORK AND EARTH DISTURBANCE SHALL BE DONE IN A MANNER THAT MINIMIZES POLLUTION OF ANY ON-SITE OR OFF-SITE WATERS, INCLUDING WETLANDS.
- NOTWITHSTANDING ANYTHING DEPICTED IN THESE PLANS IN WORDS OR GRAPHIC REPRESENTATION, ALL DESIGN AND CONSTRUCTION RELATED TO ROADS, STORM DRAINAGE AND EROSION CONTROL SHALL CONFORM TO THE STANDARDS AND REQUIREMENTS OF THE MOST RECENT VERSION OF THE RELEVANT ADOPTED EL PASO COUNTY STANDARDS, INCLUDING THE LAND DEVELOPMENT CODE, THE ENGINEERING CRITERIA MANUAL, THE DRAINAGE CRITERIA MANUAL, AND THE DRAINAGE CRITERIA MANUAL. ANY DEVIATIONS FROM REGULATIONS AND STANDARDS MUST BE REQUESTED, AND APPROVED, IN WRITING.
- A SEPARATE STORMWATER MANAGEMENT PLAN (SWMP) FOR THIS PROJECT SHALL BE COMPLETED AND AN EROSION AND STORMWATER QUALITY CONTROL PERMIT (ESQCP) ISSUED PRIOR TO COMMENCING CONSTRUCTION. MANAGEMENT OF THE SWMP DURING CONSTRUCTION IS THE RESPONSIBILITY OF THE DESIGNATED QUALIFIED STORMWATER MANAGER OR CERTIFIED EROSION CONTROL INSPECTOR. THE SWMP SHALL BE LOCATED ON SITE AT ALL TIMES DURING CONSTRUCTION AND SHALL BE KEPT UP TO DATE WITH WORK PROGRESS AND CHANGES IN THE FIELD.
- ONCE THE ESQCP IS APPROVED AND A 'NOTICE TO PROCEED' HAS BEEN ISSUED, THE CONTRACTOR MAY INSTALL THE INITIAL STAGE EROSION AND SEDIMENT CONTROL MEASURES AS INDICATED ON THE APPROVED GEC. A PRECONSTRUCTION MEETING BETWEEN THE CONTRACTOR, ENGINEER, AND EL PASO COUNTY WILL BE HELD PRIOR TO ANY CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE APPLICANT TO COORDINATE THE MEETING TIME AND PLACE WITH COUNTY STAFF.
- CONTROL MEASURES MUST BE INSTALLED PRIOR TO COMMENCEMENT OF ACTIVITIES THAT COULD CONTRIBUTE POLLUTANTS TO STORMWATER. CONTROL MEASURES FOR ALL SLOPES, CHANNELS, DITCHES, AND DISTURBED LAND AREAS SHALL BE INSTALLED IMMEDIATELY UPON COMPLETION OF THE DISTURBANCE.
- ALL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES SHALL BE MAINTAINED AND REMAIN IN EFFECTIVE OPERATING

CONDITION UNTIL PERMANENT SOIL EROSION CONTROL MEASURES ARE IMPLEMENTED AND FINAL STABILIZATION IS ESTABLISHED. ALL PERSONS ENGAGED IN LAND DISTURBANCE ACTIVITIES SHALL ASSESS THE ADEQUACY OF CONTROL MEASURES AT THE SITE AND IDENTIFY IF CHANGES TO THOSE CONTROL MEASURES ARE NEEDED TO ENSURE THE CONTINUED EFFECTIVE PERFORMANCE OF THE CONTROL MEASURES. ALL CHANGES TO TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES MUST BE INCORPORATED INTO THE STORMWATER MANAGEMENT PLAN.

- TEMPORARY STABILIZATION SHALL BE IMPLEMENTED ON DISTURBED AREAS AND STOCKPILES WHERE GROUND DISTURBING CONSTRUCTION ACTIVITY HAS PERMANENTLY CEASED OR TEMPORARILY CEASED FOR LONGER THAN 14 DAYS.
- FINAL STABILIZATION MUST BE IMPLEMENTED AT ALL APPLICABLE CONSTRUCTION SITES. FINAL STABILIZATION IS ACHIEVED WHEN THE GROUND DISTURBING ACTIVITIES ARE COMPLETE AND ALL DISTURBED AREAS EITHER HAVE A UNIFORM VEGETATIVE COVER WITH INDIVIDUAL PLANT DENSITY OF 70 PERCENT OF PRE-DISTURBANCE LEVELS ESTABLISHED OR EQUIVALENT PERMANENT ALTERNATIVE STABILIZATION METHOD IS IMPLEMENTED. ALL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES SHALL BE REMOVED UPON FINAL STABILIZATION AND BEFORE PERMIT CLOSURE.
- ALL PERMANENT STORMWATER MANAGEMENT FACILITIES SHALL BE INSTALLED AS DESIGNED IN THE APPROVED PLANS. ANY PROPOSED CHANGES THAT EFFECT THE DESIGN OR FUNCTION OF PERMANENT STORMWATER MANAGEMENT STRUCTURES MUST BE APPROVED BY THE ECM ADMINISTRATOR PRIOR TO IMPLEMENTATION.
- EARTH DISTURBANCES SHALL BE CONDUCTED IN SUCH A MANNER SO AS TO EFFECTIVELY MINIMIZE ACCELERATED SOIL EROSION AND RESULTING SEDIMENTATION. ALL DISTURBANCES SHALL BE DESIGNED, CONSTRUCTED, AND COMPLETED SO THAT THE EXPOSED AREA OF ANY DISTURBED LAND SHALL BE LIMITED TO THE SHORTEST PRACTICAL PERIOD OF TIME. PRE-EXISTING VEGETATION SHALL BE PROTECTED AND MAINTAINED WITHIN 50 HORIZONTAL FEET OF A WATERS OF THE STATE UNLESS SHOWN TO BE INFEASIBLE AND SPECIFICALLY REQUESTED AND APPROVED.
- COMPACTION OF SOIL MUST BE PREVENTED IN AREAS DESIGNATED FOR INFILTRATION CONTROL MEASURES OR WHERE FINAL STABILIZATION WILL BE ACHIEVED BY VEGETATIVE COVER. AREAS DESIGNATED FOR INFILTRATION CONTROL MEASURES SHALL ALSO BE PROTECTED FROM SEDIMENTATION DURING CONSTRUCTION UNTIL FINAL STABILIZATION IS ACHIEVED. IF COMPACTION

PREVENTION IS NOT FEASIBLE DUE TO SITE CONSTRAINTS, ALL AREAS DESIGNATED FOR INFILTRATION AND VEGETATION CONTROL MEASURES MUST BE LOOSENEED PRIOR TO INSTALLATION OF THE CONTROL MEASURE(S).

- ANY TEMPORARY OR PERMANENT FACILITY DESIGNED AND CONSTRUCTED FOR THE CONVEYANCE OF STORMWATER AROUND, THROUGH, OR FROM THE EARTH DISTURBANCE AREA SHALL BE A STABILIZED CONVEYANCE DESIGNED TO MINIMIZE EROSION AND THE DISCHARGE OF SEDIMENT OFF SITE.
- CONCRETE WASH WATER SHALL BE CONTAINED AND DISPOSED OF IN ACCORDANCE WITH THE SWMP. NO WASH WATER SHALL BE DISCHARGED TO OR ALLOWED TO ENTER STATE WATERS, INCLUDING ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OR FACILITIES. CONCRETE WASHOUTS SHALL NOT BE LOCATED IN AN AREA WHERE SHALLOW GROUNDWATER MAY BE PRESENT, OR WITHIN 50 FEET OF A SURFACE WATER BODY, CREEK OR STREAM.
- DURING DEWATERING OPERATIONS OF UNCONTAMINATED GROUND WATER MAY BE DISCHARGED ON SITE, BUT SHALL NOT LEAVE THE SITE IN THE FORM OF SURFACE RUNOFF UNLESS AN APPROVED STATE DEWATERING PERMIT IS IN PLACE.
- EROSION CONTROL BLANKETING OR OTHER PROTECTIVE COVERING SHALL BE USED ON SLOPES STEEPER THAN 3:1.
- CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL WASTES FROM THE CONSTRUCTION SITE FOR DISPOSAL IN ACCORDANCE WITH LOCAL AND STATE REGULATORY REQUIREMENTS. NO CONSTRUCTION DEBRIS, TREE SLASH, BUILDING MATERIAL WASTES OR UNUSED BUILDING MATERIALS SHALL BE BURIED, DUMPED, OR DISCHARGED AT THE SITE.
- WASTE MATERIALS SHALL NOT BE TEMPORARILY PLACED OR STORED IN THE STREET, ALLEY, OR OTHER PUBLIC WAY, UNLESS IN ACCORDANCE WITH AN APPROVED TRAFFIC CONTROL PLAN. CONTROL MEASURES MAY BE REQUIRED BY EL PASO COUNTY ENGINEERING IF DEEMED NECESSARY, BASED ON SPECIFIC CONDITIONS AND CIRCUMSTANCES.
- TRACKING OF SOILS AND CONSTRUCTION DEBRIS OFF-SITE SHALL BE MINIMIZED. MATERIALS TRACKED OFF-SITE SHALL BE CLEANED UP AND PROPERLY DISPOSED OF IMMEDIATELY.
- THE OWNER/DEVELOPER SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL CONSTRUCTION DEBRIS, DIRT, TRASH, ROCK,

SEDIMENT, SOIL, AND SAND THAT MAY ACCUMULATE IN ROADS, STORM DRAINS AND OTHER DRAINAGE CONVEYANCE SYSTEMS AND STORMWATER APPURTENANCES AS A RESULT OF SITE DEVELOPMENT.

- THE QUANTITY OF MATERIALS STORED ON THE PROJECT SITE SHALL BE LIMITED, AS MUCH AS PRACTICAL, TO THAT QUANTITY REQUIRED TO PERFORM THE WORK IN AN ORDERLY SEQUENCE. ALL MATERIALS STORED ON-SITE SHALL BE STORED IN A NEAT, ORDERLY MANNER, IN THEIR ORIGINAL CONTAINERS, WITH ORIGINAL MANUFACTURER'S LABELS.
- NO CHEMICAL(S) HAVING THE POTENTIAL TO BE RELEASED IN STORMWATER ARE TO BE STORED OR USED ON-SITE UNLESS PERMISSION FOR THE USE OF SUCH CHEMICAL(S) IS GRANTED IN WRITING BY THE ECM ADMINISTRATOR. IN GRANTING APPROVAL FOR THE USE OF SUCH CHEMICAL(S), SPECIAL CONDITIONS AND MONITORING MAY BE REQUIRED.
- BULK STORAGE OF ALLOWED PETROLEUM PRODUCTS OR OTHER ALLOWED LIQUID CHEMICALS IN EXCESS OF 55 GALLONS SHALL REQUIRE ADEQUATE SECONDARY CONTAINMENT PROTECTION TO CONTAIN ALL SPILLS ON-SITE AND TO PREVENT ANY SPILLED MATERIALS FROM ENTERING STATE WATERS, ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OR OTHER FACILITIES.
- NO PERSON SHALL CAUSE THE IMPEDIMENT OF STORMWATER FLOW IN THE CURB AND GUTTER OR DITCH EXCEPT WITH APPROVED SEDIMENT CONTROL MEASURES.
- OWNER/DEVELOPER AND THEIR AGENTS SHALL COMPLY WITH THE 'COLORADO WATER QUALITY CONTROL ACT' (TITLE 25, ARTICLE 8, CRS), AND THE 'CLEAN WATER ACT' (33 USC 1344), IN ADDITION TO THE REQUIREMENTS OF THE LAND DEVELOPMENT CODE, DCV VOLUME II AND THE ECM APPENDIX I. ALL APPROPRIATE PERMITS MUST BE OBTAINED BY THE CONTRACTOR PRIOR TO CONSTRUCTION (1041, NPDES, FLOODPLAIN, 404, FUGITIVE DUST, ETC.). IN THE EVENT OF CONFLICTS BETWEEN THESE REQUIREMENTS AND OTHER LAWS, RULES, OR REGULATIONS OF OTHER FEDERAL, STATE, LOCAL, OR COUNTY AGENCIES, THE MOST RESTRICTIVE LAWS, RULES, OR REGULATIONS SHALL APPLY.
- ALL CONSTRUCTION TRAFFIC MUST ENTER/EXIT THE SITE ONLY AT APPROVED CONSTRUCTION ACCESS POINTS.
- PRIOR TO CONSTRUCTION THE PERMITTEE SHALL VERIFY THE LOCATION OF EXISTING UTILITIES.

A WATER SOURCE SHALL BE AVAILABLE ON SITE DURING EARTHWORK OPERATIONS AND SHALL BE UTILIZED AS REQUIRED TO MINIMIZE DUST FROM EARTHWORK EQUIPMENT AND WIND.

- THE SOILS REPORT FOR THIS SITE HAS BEEN PREPARED BY ENTECH ENGINEERING, INC., ENTITLED GEOLOGIC HAZARD/LAND STUDY AND PRELIMINARY SUBSURFACE SOIL INVESTIGATION STERLING RANCH, DATED OCTOBER 31, 2006, AND SHALL BE CONSIDERED A PART OF THESE PLANS.
- AT LEAST TEN (10) DAYS PRIOR TO THE ANTICIPATED START OF CONSTRUCTION, FOR PROJECTS THAT WILL DISTURB ONE (1) ACRE OR MORE, THE OWNER OR OPERATOR OF CONSTRUCTION ACTIVITY SHALL SUBMIT A PERMIT APPLICATION FOR STORMWATER DISCHARGE TO THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, WATER QUALITY DIVISION. THE APPLICATION CONTAINS CERTIFICATION OF COMPLETION OF A STORMWATER MANAGEMENT PLAN (SWMP), OF WHICH THIS GRADING AND EROSION CONTROL PLAN MAY BE A PART. FOR INFORMATION OR APPLICATION MATERIALS CONTACT:
 

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
WATER QUALITY CONTROL DIVISION  
WOOD - PERMITS  
4300 CHERRY CREEK DRIVE SOUTH  
DENVER, CO 80246-1530  
ATTN: PERMITS UNIT

**ADDITIONAL NOTES:**  
STAGING AREA TO BE DETERMINED BY CONTRACTOR IN THE FIELD. THE LOCATIONS SHALL BE DELINEATED ON THIS PLAN BY THE CONTRACTOR.

THE EROSION CONTROL DELINEATED ON THIS PLAN SHALL BE REGULARLY UPDATED BY THE CONTRACTOR.

NO PORTION OF THIS PROPERTY IS LOCATED WITHIN A DESIGNATED FEMA FLOODPLAIN IN ACCORDANCE WITH FLOOD INSURANCE RATE MAPS (FIRM) 08041C0543G, EFFECTIVE DATE DECEMBER 7, 2018.

EL PASO COUNTY FILE NO. PPR 19-042

**TIMBERLINE STORAGE YARD**  
**GRADING AND EROSION CONTROL PLAN**  
 PROJECT NO. 43-095 DATE: 11/19/2019  
 SCALE: HORIZONTAL: 1"=40' VERTICAL: N/A  
 DESIGNED BY: GW CHECKED BY: VAS  
 DRAWN BY: VAS  
 SHEET 3 OF 14  
 GRO3

102 E. PILES PEAK AVE., 5TH FLOOR  
 COLORADO SPRINGS, CO 80903  
 PHONE: 719.555.5485

**CIVIL CONSULTANTS, INC.**

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

REVISIONS:

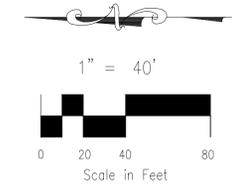
NO.	DATE	BY	DESCRIPTION

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

CAUTION

# TIMBERLINE STORAGE YARD

## GRADING AND EROSION CONTROL PLAN



LEGEND	
	LP LOW POINT
	HP HIGH POINT
	EX EXISTING
	FL FLOWLINE
	TC TOP OF CURB
	FG FINISH GRADE
	FF FINISH FLOOR
	TOF TOP OF FOOTING
	SF SILT FENCE - INITIAL
	VTC VEHICLE TRACKING CONTROL - INITIAL
	CWA CONCRETE WASH-OUT BASIN - INITIAL
	SB STRAW BALE - INITIAL
	IP INLET PROTECTION - INITIAL
	TSB TEMPORARY SEDIMENT BASIN - INTERIM
	CIP CULVERT INLET PROTECTION - INITIAL
	SSA CULVERT INLET PROTECTION - INITIAL
	SP TEMPORARY STOCK PILE AREA - INITIAL
	TRM NORTH AMERICAN GREEN SC250 PERMANENT EROSION CONTROL BLANKET (OR APPROVED EQUAL) - PERM

**11-19-19  
FOR INFORMATION  
PURPOSES ONLY**

SEE SHEET 3

<b>TIMBERLINE STORAGE YARD</b>	
<b>GRADING AND EROSION CONTROL PLAN</b>	
PROJECT NO. 43-095	DATE: 11/19/2019
DESIGNED BY: GW	SCALE: HORIZONTAL: 1"=40' VERTICAL: N/A
DRAWN BY: VAS	SHEET 4 OF 14
CHECKED BY:	GR04

**M&S CIVIL CONSULTANTS, INC.**

102 E. PILES PEAK AVE., 5TH FLOOR  
COLORADO SPRINGS, CO 80903  
PHONE: 719.555.5485

NO.	DATE	BY	DESCRIPTION	APPROV. BY	DATE

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

CAUTION

# **MAINTENANCE AGREEMENT**

**PRIVATE DETENTION BASIN /  
STORMWATER QUALITY BEST MANAGEMENT PRACTICE  
MAINTENANCE AGREEMENT AND EASEMENT**

This PRIVATE DETENTION BASIN / STORMWATER QUALITY BEST MANAGEMENT PRACTICE MAINTENANCE AGREEMENT AND EASEMENT (Agreement) is made by and between EL PASO COUNTY by and through THE BOARD OF COUNTY COMMISSIONERS OF EL PASO COUNTY, COLORADO (Board or County) and **DL Holdings, LLC, A Colorado Limited Liability Corporation**, (Owner or Developer). The above may occasionally be referred to herein singularly as “Party” and collectively as “Parties.”

Recitals

A. WHEREAS, Developer is the owner of certain real estate (the Property or Subdivision) in El Paso County, Colorado, which Property is legally described in **Exhibit A** attached hereto and incorporated herein by this reference; and

B. WHEREAS, Developer desires to develop on the Property a subdivision/land use to be known as **Dwire Storage Yard Fil. No. 1**; and

C. WHEREAS, the development of this Property will substantially increase the volume of water runoff and will decrease the quality of the stormwater runoff from the Property, and, therefore, it is in the best interest of public health, safety and welfare for the County to condition approval of this subdivision/land use on Developer’s promise to construct adequate drainage, water runoff control facilities, and stormwater quality structural Best Management Practices (“BMPs”) for the subdivision/land use; and

D. WHEREAS, Chapter 8, Section 8.4.5 of the El Paso County Land Development Code, as periodically amended, promulgated pursuant to Section 30-28-133(1), Colorado Revised Statutes (C.R.S.), requires the County to condition approval of all subdivisions on a developer’s promise to so construct adequate drainage, water runoff control facilities, and BMPs in subdivisions; and

E. WHEREAS, the Drainage Criteria Manual, Volume 2, as amended by Appendix I of the El Paso County Engineering Criteria Manual (ECM), as each may be periodically amended, promulgated pursuant to the County’s Colorado Discharge Permit System General Permit (MS4 Permit) as required by Phase II of the National Pollutant Discharge Elimination System (NPDES), which MS4 Permit requires that the County take measures to protect the quality of stormwater from sediment and other contaminants, requires subdividers, developers, landowners, and owners of facilities located in the County’s rights-of-way or easements to provide adequate permanent stormwater quality BMPs with new development or significant redevelopment; and

F. WHEREAS, Section 2.9 of the El Paso County Drainage Criteria Manual provides for a developer’s promise to maintain a subdivision’s drainage facilities in the event the County does not assume such responsibility; and

G. WHEREAS, developers in El Paso County have historically chosen water runoff detention basins as a means to provide adequate drainage and water runoff control in subdivisions,

which basins, while effective, are less expensive for developers to construct than other methods of providing drainage and water runoff control; and

H. WHEREAS, Developer desires to construct for the subdivision/land use **ONE** detention basin/stormwater quality BMP(s) (“detention basin/BMP(s)”) as the means for providing adequate drainage and stormwater runoff control and to meet requirements of the County’s MS4 Permit, and to operate, clean, maintain and repair such detention basin/BMP(s); and

I. WHEREAS, Developer desires to construct the detention basin/BMP(s) on property that will be platted as Lot 1, as indicated on **Exhibit B** attached hereto; and

J. WHEREAS, Developer shall be charged with the duties of constructing, operating, maintaining and repairing the detention basin/BMP(s) on the Property described in **Exhibit A**; and

K. WHEREAS, it is the County’s experience that subdivision developers and property owners historically have not properly cleaned and otherwise not properly maintained and repaired these detention basins/BMPs, and that these detention basins/BMPs, when not so properly cleaned, maintained, and repaired, threaten the public health, safety and welfare; and

L. WHEREAS, the County, in order to protect the public health, safety and welfare, has historically expended valuable and limited public resources to so properly clean, maintain, and repair these detention basins/BMPs when developers and property owners have failed in their responsibilities, and therefore, the County desires the means to recover its costs incurred in the event the burden falls on the County to so clean, maintain and repair the detention basin/BMP(s) serving this subdivision/land use due to the Developer/Owner’s failure to meet its obligations to do the same; and

M. WHEREAS, the County conditions approval of this subdivision/land use on the Developer’s promise to so construct the detention basin/BMP(s), and conditions approval on the Owner’s promise to reimburse the County in the event the burden falls upon the County to so clean, maintain and/or repair the detention basin/BMP(s) serving this Subdivision; and

N. WHEREAS, the County could condition subdivision/land use approval on the Developer’s promise to construct a different and more expensive drainage, water runoff control system and BMPs than those proposed herein, which more expensive system would not create the possibility of the burden of cleaning, maintenance and repair expenses falling on the County; however, the County is willing to forego such right upon the performance of Developer/Owner’s promises contained herein; and

O. WHEREAS, the County, in order to secure performance of the promises contained herein, conditions approval of this subdivision/land use upon the Developer’s grant herein of a perpetual Easement over a portion of the Property for the purpose of allowing the County to periodically access, inspect, and, when so necessary, to clean, maintain and/or repair the detention basin/BMP(s); and

#### Agreement

NOW, THEREFORE, in consideration of the mutual Promises contained herein, the sufficiency of which are hereby acknowledged, the Parties agree as follows:

1. Incorporation of Recitals: The Parties incorporate the Recitals above into this Agreement.

2. Covenants Running with the Land: Developer/Owner agrees that this entire Agreement and the performance thereof shall become a covenant running with the land, which land is legally described in Exhibit A attached hereto, and that this entire Agreement and the performance thereof shall be binding upon itself, its successors and assigns.

3. Construction: Developer shall construct on that portion of the Property described in Exhibit A attached hereto and incorporated herein by this reference, ONE detention basin/BMP(s). Developer shall not commence construction of the detention basin/BMP(s) until the El Paso County Planning and Community Development Department (PCD) has approved in writing the plans and specifications for the detention basin/BMP(s) and this Agreement has been signed by all Parties and returned to the PCD. Developer shall complete construction of the detention basin/BMP(s) in substantial compliance with the County-approved plans and specifications for the detention basin/BMP(s). Failure to meet these requirements shall be a material breach of this Agreement, and shall entitle the County to pursue any remedies available to it at law or in equity to enforce the same. Construction of the detention basin/BMP(s) shall be substantially completed within one (1) year (defined as 365 days), which one year period will commence to run on the date the approved plat of this Subdivision is recorded in the records of the El Paso County Clerk and Recorder. In cases where a subdivision is not required, the one year period will commence to run on the date the Erosion and Stormwater Quality Control Permit (ESQCP) is issued. Rough grading of the detention basin/BMP(s) must be completed and inspected by the El Paso County Planning and Community Development Department prior to commencing road construction.

In the event construction is not substantially completed within the one (1) year period, then the County may exercise its discretion to complete the project, and shall have the right to seek reimbursement from the Developer/Owner and its successors and assigns, for its actual costs and expenses incurred in the process of completing construction. The term actual costs and expenses shall be liberally construed in favor of the County, and shall include, but shall not be limited to, labor costs, tool and equipment costs, supply costs, and engineering and design costs, regardless of whether the County uses its own personnel, tools, equipment and supplies, etc. to correct the matter. In the event the County initiates any litigation or engages the services of legal counsel in order to enforce the Provisions arising herein, the County shall be entitled to its damages and costs, including reasonable attorney fees, regardless of whether the County contracts with outside legal counsel or utilizes in-house legal counsel for the same.

4. Maintenance: The Developer/Owner agrees for itself and its successors and assigns, that it will regularly and routinely inspect, clean and maintain the detention basin/BMP(s), and otherwise keep the same in good repair, all at its own cost and expense. No trees or shrubs that will impair the structural integrity of the detention basin/BMP(s) shall be planted or allowed to grow on the detention basin/BMP(s).

5. Creation of Easement: Developer/Owner hereby grants the County a non-exclusive perpetual easement upon and across the Property described in Exhibit A. The purpose of the easement is to allow the County to access, inspect, clean, repair and maintain the detention basin/BMP(s); however, the creation of the easement does not expressly or implicitly impose on the County a duty to so inspect, clean, repair or maintain the detention basin/BMP(s).

6. County's Rights and Obligations: Any time the County determines, in the sole exercise of its discretion, that the detention basin/BMP(s) is not properly cleaned, maintained and/or otherwise kept in good repair, the County shall give reasonable notice to the Developer/Owner and its successors and assigns, that the detention basin/BMP(s) needs to be cleaned, maintained and/or otherwise repaired. The notice shall provide a reasonable time to correct the problem(s). Should the responsible parties fail to correct the specified problem(s), the County may enter upon the Property to so correct the specified problem(s). Notice shall be effective to the above by the County's deposit of the same into the regular United States mail, postage pre-paid. Notwithstanding the foregoing, this Agreement does not expressly or implicitly impose on the County a duty to so inspect, clean, repair or maintain the detention basin/BMP(s).

7. Reimbursement of County's Costs / Covenant Running With the Land: The Developer/Owner agrees and covenants, for itself, its successors and assigns, that it will reimburse the County for its costs and expenses incurred in the process of completing construction of, cleaning, maintaining, and/or repairing the detention basin/BMP(s) pursuant to the provisions of this Agreement.

The term "actual costs and expenses" shall be liberally construed in favor of the County, and shall include, but shall not be limited to, labor costs, tools and equipment costs, supply costs, and engineering and design costs, regardless of whether the County uses its own personnel, tools, equipment and supplies, etc. to correct the matter. In the event the County initiates any litigation or engages the services of legal counsel in order to enforce the provisions arising herein, the County shall be entitled to its damages and costs, including reasonable attorney's fees, regardless of whether the County contracts with outside legal counsel or utilizes in-house legal counsel for the same.

8. Contingencies of Land Use/Land Disturbance Approval: Developer/Owner's execution of this Agreement is a condition of land use/land disturbance approval.

The County shall have the right, in the sole exercise of its discretion, to approve or disapprove any documentation submitted to it under the conditions of this Paragraph, including but not limited to, any separate agreement or amendment, if applicable, identifying any specific maintenance responsibilities not addressed herein. The County's rejection of any documentation submitted hereunder shall mean that the appropriate condition of this Agreement has not been fulfilled.

9. Agreement Monitored by El Paso County Planning and Community Development Department and/or El Paso County Department of Public Works: Any and all actions and decisions to be made hereunder by the County shall be made by the Director of the El Paso County Planning and Community Development Department and/or the Director of the El Paso County Department of Public Works. Accordingly, any and all documents, submissions, plan approvals, inspections, etc. shall be submitted to and shall be made by the Director of the Planning and Community Development Department and/or the Director of the El Paso County Department of Public Works.

10. Indemnification and Hold Harmless: To the extent authorized by law, Developer/Owner agrees, for itself, its successors and assigns, that it will indemnify, defend, and hold the County harmless from any and all loss, costs, damage, injury, liability, claim, lien, demand, action and causes of action whatsoever, whether at law or in equity, arising from or related to its intentional or negligent acts, errors or omissions or that of its agents, officers, servants, employees, invitees and licensees in the construction, operation, inspection, cleaning (including analyzing and disposing of any solid or hazardous wastes as defined by State and/or Federal environmental laws and regulations), maintenance, and repair of the detention basin/BMP(s), and such obligation arising under this Paragraph shall be joint

and several. Nothing in this Paragraph shall be deemed to waive or otherwise limit the defense available to the County pursuant to the Colorado Governmental Immunity Act, Sections 24-10-101, *et seq.* C.R.S., or as otherwise provided by law.

11. Severability: In the event any Court of competent jurisdiction declares any part of this Agreement to be unenforceable, such declaration shall not affect the enforceability of the remaining parts of this Agreement.

12. Third Parties: This Agreement does not and shall not be deemed to confer upon or grant to any third party any right to claim damages or to bring any lawsuit, action or other proceeding against either the County, the Developer/Owner, or their respective successors and assigns, because of any breach hereof or because of any terms, covenants, agreements or conditions contained herein.

13. Solid Waste or Hazardous Materials: Should any refuse from the detention basin/BMP(s) be suspected or identified as solid waste or petroleum products, hazardous substances or hazardous materials (collectively referred to herein as “hazardous materials”), the Developer/Owner shall take all necessary and proper steps to characterize the solid waste or hazardous materials and properly dispose of it in accordance with applicable State and/or Federal environmental laws and regulations, including, but not limited to, the following: Solid Wastes Disposal Sites and Facilities Acts, §§ 30-20-100.5 – 30-20-119, C.R.S., Colorado Regulations Pertaining to Solid Waste Disposal Sites and Facilities, 6 C.C.R. 1007-2, *et seq.*, Solid Waste Disposal Act, 42 U.S.C. §§ 6901-6992k, and Federal Solid Waste Regulations 40 CFR Ch. I. The County shall not be responsible or liable for identifying, characterizing, cleaning up, or disposing of such solid waste or hazardous materials. Notwithstanding the previous sentence, should any refuse cleaned up and disposed of by the County be determined to be solid waste or hazardous materials, the Developer/Owner, but not the County, shall be responsible and liable as the owner, generator, and/or transporter of said solid waste or hazardous materials.

14. Applicable Law and Venue: The laws, rules, and regulations of the State of Colorado and El Paso County shall be applicable in the enforcement, interpretation, and execution of this Agreement, except that Federal law may be applicable regarding solid waste or hazardous materials. Venue shall be in the El Paso County District Court.

IN WITNESS WHEREOF, the Parties affix their signatures below.

Executed this \_\_\_\_\_ day of \_\_\_\_\_, 2019, by:

**DL Holdings, LLC, a Colorado Limited Liability Corporation**

By: \_\_\_\_\_

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 2019, by **DL Holdings, LLC, a Colorado Limited Liability Corporation**

Witness my hand and official seal.

My commission expires: \_\_\_\_\_

\_\_\_\_\_  
Notary Public

Executed this \_\_\_\_\_ day of \_\_\_\_\_, 2019, by:

**BOARD OF COUNTY COMMISSIONERS  
OF EL PASO COUNTY, COLORADO**

By: \_\_\_\_\_

Craig Dossey, Executive Director  
Planning and Community Development Department  
Authorized signatory pursuant to LDC

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 2018, by \_\_\_\_\_, Executive Director of El Paso County Planning and Community Development Department.

Witness my hand and official seal.

My commission expires: \_\_\_\_\_

\_\_\_\_\_  
Notary Public

Approved as to Content and Form:

\_\_\_\_\_  
Assistant County Attorney

Exhibit A



102 E. Pikes Peak Ave, STE 500  
Colorado Springs, CO 80903  
Mail to: PO Box 1360  
Colorado Springs, CO 80901  
719.955.5485

**DWIRE STORAGE YARD  
FILING NO. 1  
LEGAL DESCRIPTION**

**EXHIBIT A**

BASIS OF BEARINGS: A PORTION OF THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW1/4) OF SECTION 28, TOWNSHIP 13 SOUTH, RANGE 65 WEST OF THE 6TH PRINCIPAL MERIDIAN, EL PASO COUNTY, COLORADO. THE SECTION CORNER COMMON TO SECTIONS 28,29, 32, AND 33 BEING MONUMENTED WITH A 3" ALUMINUM CAP STAMPED "PLS 38256", FROM WHICH A YELLOW PLASTIC CAP STAMPED "PLS 37909", BEARS S89°58'59"E, A DISTANCE OF 861.03 FEET.

LEGAL DESCRIPTION:

A PARCEL OF LAND IN THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 28, TOWNSHIP 13 SOUTH, RANGE 65 WEST OF THE SIXTH PRINCIPAL MERIDIAN, EL PASO COUNTY, COLORADO MORE PARTICULARLY DESCRIBED AS FOLLOWS;

COMMENCING AT THE AFORESAID YELLOW PLASTIC CAP;

THENCE N09°06'45"E A DISTANCE OF 145.85 FEET;

THENCE N00°59'19"E A DISTANCE OF 325.07 FEET;

THENCE N01°07'15"W A DISTANCE OF 804.53 FEET TO THE SOUTHERLY LINE OF THE FORMER CHICAGO, ROCK ISLAND, AND PACIFIC RAILROAD AS RECORDED UNDER RECEPTION NO. 215057836 IN THE RECORDS OF EL PASO COUNTY, COLORADO;

THENCE 649.44 FEET ON THE ARC OF A NON-TANGENT CURVE TO THE RIGHT ON SAID SOUTHERLY LINE, SAID CURVE HAVING A RADIUS OF 1795.32 FEET, AND A CENTRAL ANGLE OF 20°43'34" (THE CHORD OF WHICH BEARS N75°36'49"E, 645.91 FEET);

THENCE S00°13'52"W A DISTANCE OF 1455.11 FEET TO THE AFORESAID SOUTH LINE OF SECTION 28;

THENCE N89°57'07"W ALONG SAID SOUTH LINE A DISTANCE OF 626.77 FEET TO THE POINT OF BEGINNING;

SAID PARCEL CONTAINS A CALCULATED AREA OF 843,414 S.F. (19.362 ACRES MORE OR LESS).

Exhibit B



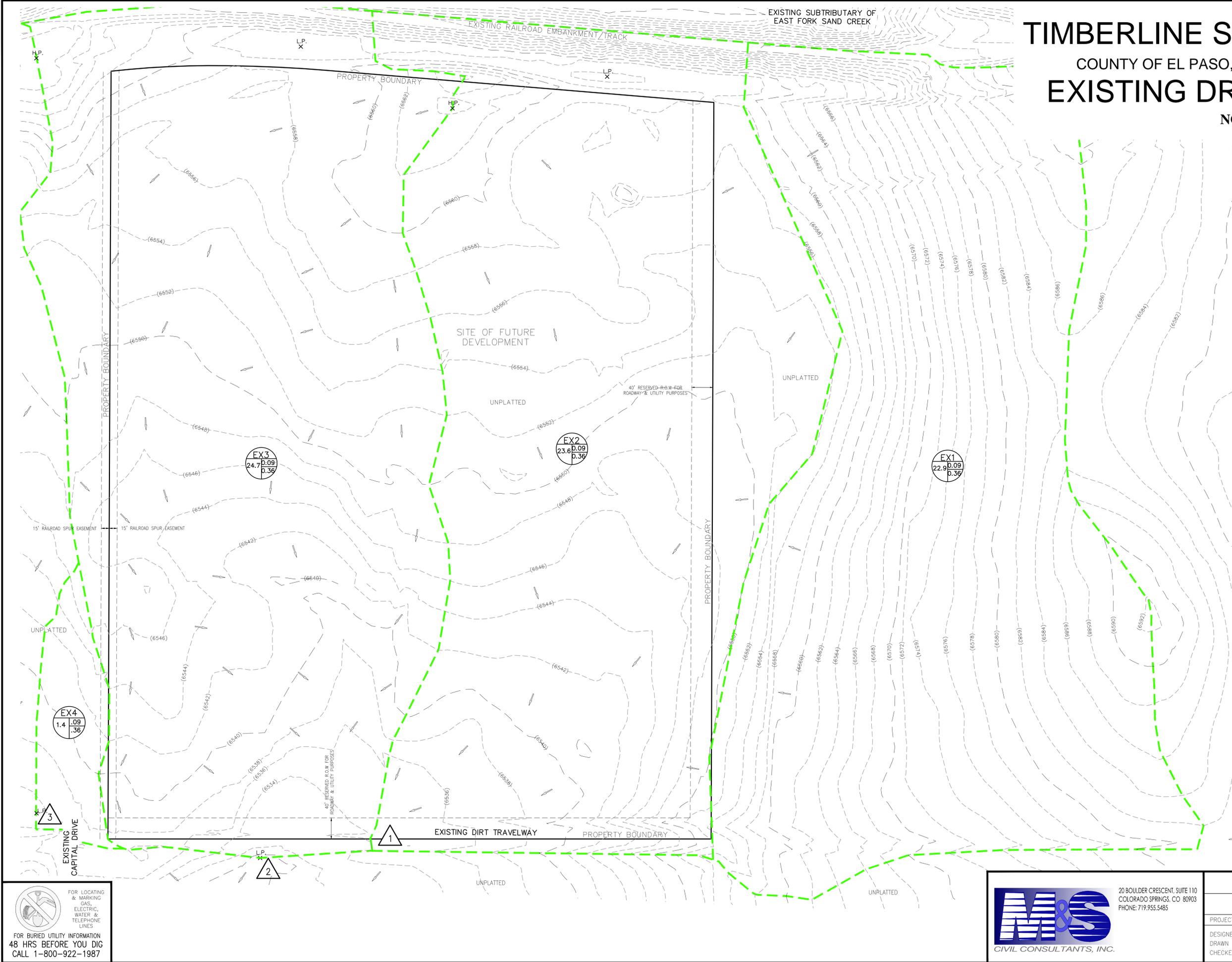
**PROPOSED/EXISTING DRAINAGE MAP**

# TIMBERLINE STORAGE YARD

COUNTY OF EL PASO, STATE OF COLORADO

## EXISTING DRAINAGE MAP

NOVEMBER 2019



**LEGEND**

BASIN DESIGNATION: Z, 25, .25, .35, C5, C100

ACRES

SURFACE DESIGN POINT (DP)

BASIN BOUNDARY

EXISTING CONTOUR

PARCEL BOUNDARY

EXISTING FLOW DIRECTION ARROW

H.P. X HIGH POINT

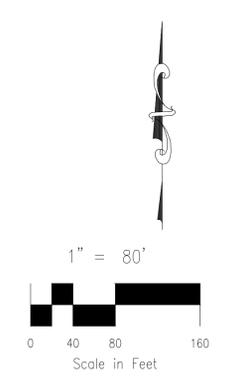
L.P. X LOW POINT

**BASIN SUMMARY**

BASIN	AREA (ACRES)	Q <sub>5</sub>	Q <sub>100</sub>
EX1	22.93	7.6	51.0
EX2	23.63	5.0	33.6
EX3	24.67	5.1	34.3
EX4	1.27	0.4	2.7

**DESIGN POINT SUMMARY**

DESIGN POINT	Q <sub>5</sub>	Q <sub>100</sub>	BASIN & DES. PTS
1	11.5	77.3	EX1, EX2
2	15.1	101.4	DP1, EX3
3	0.4	2.7	EX4



File: 0:\3095A\Timberline\Eng Exhibits\2019 Update\Existing Drainage Map 43-095.dwg Plotstamp: 9/12/2019 6:15 PM

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES

FOR BURIED UTILITY INFORMATION 48 HRS BEFORE YOU DIG CALL 1-800-922-1987

20 BOULDER CRESCENT, SUITE 110  
 COLORADO SPRINGS, CO 80903  
 PHONE: 719.955.5485

TIMBERLINE STORAGE YARD			
EXISTING DRAINAGE MAP			
PROJECT NO. 43-095	SCALE:	DATE: 11/19/2019	
DESIGNED BY: CMN	HORIZONTAL: 1"=80'	SHEET 1 OF 1	EDM
DRAWN BY: CMN	VERTICAL: N/A		
CHECKED BY: VAS			

# TIMBERLINE STORAGE YARD

## COUNTY OF EL PASO, STATE OF COLORADO

### PROPOSED DRAINAGE MAP

NOVEMBER 2019 **LEGEND**

- BASIN DESIGNATION**
- ACRES  $\frac{Z}{25} \frac{.25}{.35}$  C100
- PIPE RUN (PR) REFERENCE LABEL
- SURFACE DESIGN POINT (DP)
- BASIN BOUNDARY
- EXISTING CONTOUR
- PROP CONTOUR
- PARCEL BOUNDARY
- TIMBERLINE STORAGE YARD SITE BOUNDARY
- STORM SEWER PIPE
- FUTURE STORM SEWER PIPE
- INLET
- FUTURE INLET
- EXISTING FLOW DIRECTION ARROW
- EMERGENCY OVERFLOW DIRECTION
- FLOW DIRECTION
- FLARED END SECTION
- HIGH POINT
- LOW POINT
- CROSSSPAN

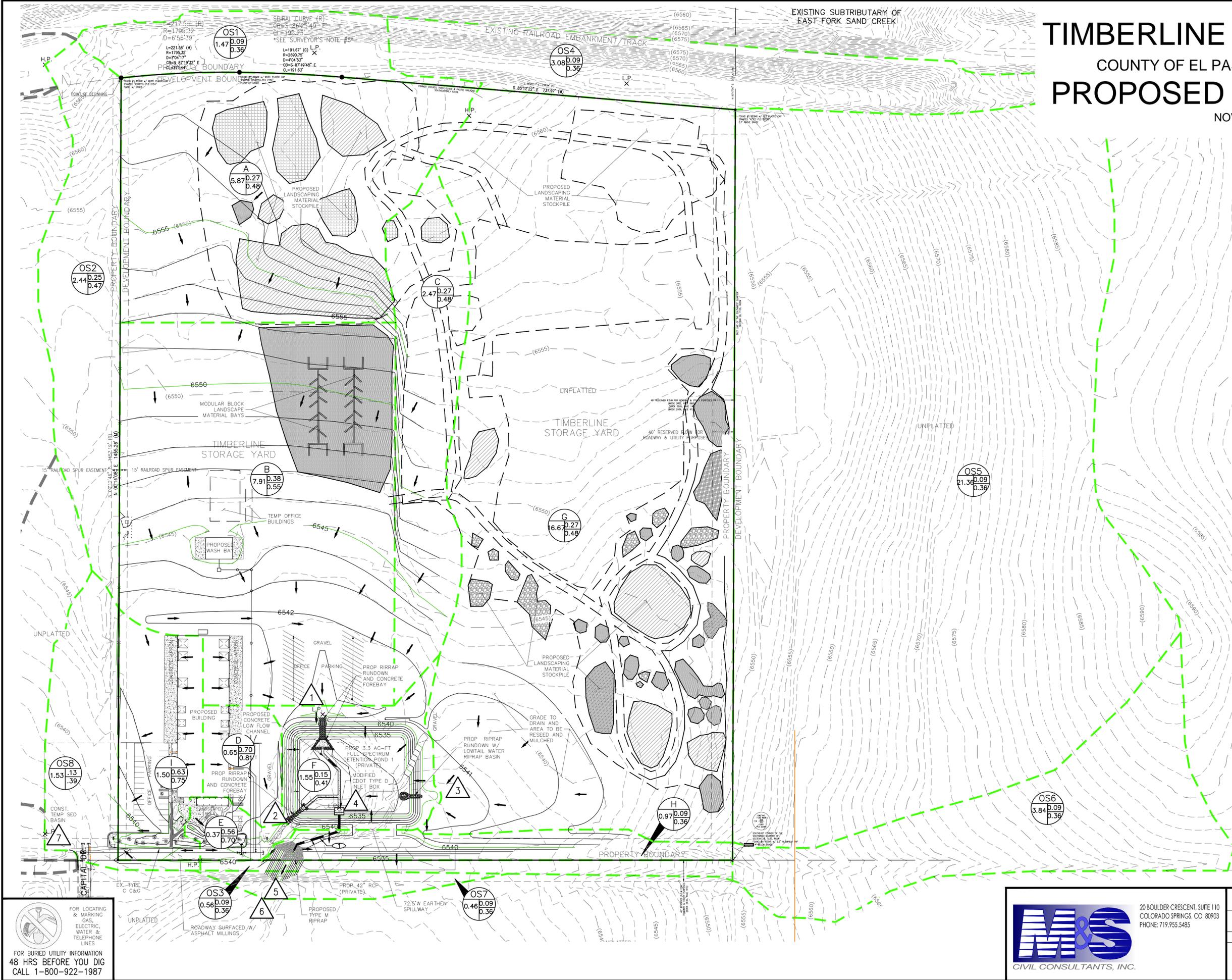
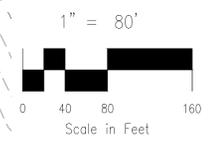
BASIN SUMMARY			
BASIN	AREA (ACRES)	Q <sub>s</sub>	Q <sub>100</sub>
A	5.87	5.8	17.3
B	7.91	10.4	25.9
C	2.47	2.3	6.9
D	0.65	2.3	4.6
E	0.37	0.9	1.8
F	1.55	0.9	4.4
G	16.67	13.6	40.9
H	0.97	0.4	2.5
I	1.50	4.9	9.8
OS1	1.47	0.4	2.8
OS2	2.44	2.4	7.5
OS3	0.56	0.2	1.2
OS4	3.08	1.0	6.6
OS5	21.36	6.6	44.4
OS6	3.84	1.0	6.4
OS7	0.46	0.2	1.2
OS8	1.53	0.8	3.9

DESIGN POINT SUMMARY			
DESIGN POINT	Q <sub>s</sub>	Q <sub>100</sub>	STRUCTURE
1	16.0	45.3	OS1, OS2, A, B, C, RIPPAP RUNDOWN INTO FULL-SPECTRUM DETENTION POND
2	2.8	5.6	D, E, RIPPAP RUNDOWN INTO FSD POND
3	20.4	85.9	G, OS4, OS5, RIPPAP RUNDOWN INTO FSD POND
4	35.7	124.5	DP1, DP2, DP3, TOTAL FLOW TO FSD
5	0.4	71.5	PR1, PROP FSD POND RELEASE
6	1.8	80.6	H, OS3, OS7, OS6, PR1, EXISTING SWALE
7	4.4	11.1	I, OS8, DWIRE POND

STORM SEWER SUMMARY			
PIPE RUN	Q <sub>s</sub>	Q <sub>100</sub>	CONTRIBUTING BASIN/DP/STR
1	0.4	71.5	42" RCP, POND OUTFALL

**POND 1 FULL SPECTRUM DETENTION BASIN DATA**

SPILLWAY CREST EL=6538.50  
 TOP OF EMBANKMENT EL=6540.20  
 100-YR VOLUME=2,721 AC-FT  
 100-YR INFLOW=123.9 CFS  
 100-YR RELEASE=71.5 CFS  
 WQ WATER SURFACE EL=6533.40  
 WQ VOLUME=0.623 AC-FT  
 EURV WATER SURFACE EL=6534.51  
 EURV VOLUME=350 AC-FT  
 100-YR WATER SURFACE EL=6536.31



**M&S CIVIL CONSULTANTS, INC.**

20 BOULDER CRESCENT, SUITE 110  
 COLORADO SPRINGS, CO 80903  
 PHONE: 719.955.5485

**TIMBERLINE STORAGE YARD**

**PROPOSED DRAINAGE MAP**

PROJECT NO. 43-095

DESIGNED BY: CMN  
 DRAWN BY: CMN  
 CHECKED BY: VAS

SCALE: HORIZONTAL: 1"=80'  
 VERTICAL: N/A

DATE: 9/12/2019

SHEET 1 OF 1

PDM

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES

FOR BURIED UTILITY INFORMATION 48 HRS BEFORE YOU DIG CALL 1-800-922-1987

File: 0:\43095A\Timberline\Eng\Exhibits\2019 Update\Updated Drainage Map\_43-095.dwg Plotstamp: 11/20/2019 4:15 PM