



**Stormwater Management Facility
Operation and Maintenance (O&M) Plan
Template**

for:

***Asphalt Concrete Recycling
(Tract 6 and 10 Valley Gardens Subdivision)***

Located at:

***400 Feet Southwest of the intersection of
Janitell Road and E Las Vegas Street***

Prepared for:

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**Stormwater Management Facility
Inspection and Maintenance (I&M) Plan**

Table of Contents

- I. Compliance with Stormwater Facility Maintenance Requirements**
- II. Inspection & Maintenance- Annual Reporting**
- III. Preventative Measures to Reduce Maintenance Costs**
- IV. Access and Easements**
- V. Safety**
- VI. Field Inspection Equipment**
- VII. Inspecting Stormwater Management Facilities**
 - A. Inspection Procedures
 - B. Inspection Report
 - C. Verification of Inspection and Form Submittal
- VIII. Maintaining Stormwater Management Facilities**
 - A. Maintenance Categories
 - B. Maintenance Personnel
 - C. Maintenance Forms

Appendices

- Appendix A** - Maintenance Agreement(s)
- Appendix B** - Description of Stormwater Management Facilities
- Appendix C** - Standard Operation Procedures (SOP) for Extended Detention Basins; Grass Buffers and Grass Swales; Bioretention Cells aka Porous Landscape Detention; and Sand Filter Basin BMPs
- Appendix D** - Inspection Form(s)
- Appendix E** - Maintenance Form(s)
- Appendix F** - Annual Inspection and Maintenance Submittal form
- Appendix G** - Stormwater Facilities Map; Facility plan and detail sheets

Stormwater Management Facility Inspection and Maintenance (I&M) Plan

I. Compliance with Stormwater Facility Maintenance Requirements

All property owners are responsible for ensuring stormwater facilities installed on their property are properly maintained and function as designed. **Asphalt Concrete Recycling, LLC (ACR)** may elect to assign many of the management and maintenance functions described in this plan to a third party. **ACR** is aware of their responsibilities regarding stormwater facility maintenance. Maintenance agreement(s) associated with this property are provided in Appendix A.

II. Inspection & Maintenance – Annual Reporting

Requirements for the inspection and maintenance of stormwater facilities, as well as reporting requirements are included in this Stormwater Management Facility Inspection and Maintenance (I&M) Plan.

Verification that the Stormwater facilities have been properly inspected and maintained; submittal of the required Inspection and Maintenance Forms and Inspector qualifications shall be provided to the County of El Paso on an annual basis.

Copies of the Inspection and Maintenance forms for each of the stormwater facilities are located in Appendix D and E. A standard annual reporting form is provided in Appendix F. Each form shall be reviewed and submitted by the property owner or property manager to:

El Paso County
Department of Public Works - Stormwater
3275 Akers Drive
Colorado Springs, CO 80922

III. Preventative Measures to Reduce Maintenance Costs

The most effective way to maintain your water quality facility is to prevent the pollutants from entering the facility in the first place. Common pollutants include sediment, trash & debris, chemicals, dog wastes, runoff from stored materials, illicit discharges into the storm drainage system and many others. **ACR's** maintenance program includes measures to address these potential contaminants. Depending on the storm water quality facilities installed on the site the maintenance program includes:

- Educate property owners/residents to be aware of how their actions affect water quality, and how they can help reduce maintenance costs.
- Keep properties, streets and gutters, and parking lots free of trash, debris, and lawn clippings.
- Ensure the proper disposal of hazardous wastes and chemicals.
- Plan lawn care to minimize the use of chemicals and pesticides.

- Plan lawn care to minimize the use of chemicals and pesticides.
- Sweep paved surfaces regularly and dispose the sweepings properly.
- Be aware of automobiles leaking fluids. Use absorbents such as cat litter to soak up drippings – dispose of properly.
- Re-vegetate disturbed and bare areas to maintain vegetative stabilization.
- Clean out the upstream components of the storm drainage system, including inlets, storm sewers and outfalls.
- Do not store materials outdoors (including landscaping materials) unless properly protected from runoff.

IV. **Access and Easements**

ACR shall prepare a drawing showing all stormwater management facilities located on the site including designated access locations as well as a required easements. Refer to the Stormwater Facilities Map located in Appendix G for access and easement locations.

V. **Safety**

Keep safety considerations at the forefront of inspection procedures at all times. Likely hazards should be anticipated and avoided. ACR personnel should never enter a confined space (outlet structure, manhole, etc) without proper training or equipment. A confined space should never be entered without at least one additional person present and without using appropriate personal protection equipment.

If a toxic or flammable substance is discovered, leave the immediate area and call 911.

Vertical drops and fall hazards may be encountered in areas located within and around the facility. ACR shall avoid walking on top of retaining walls or other structures that have a significant vertical drop. If a vertical drop is identified that is greater than 48" in height, make the appropriate note/comment on the maintenance inspection form.

If any hazard is found within the facility area that poses an immediate threat to public safety, call 911.

VI. **Field Inspection Equipment**

ACR's inspectors shall have the appropriate equipment to take to the field. This is to ensure the safety of the inspector and allow the inspections to be performed as efficiently as possible. Below is a list of the equipment that may be necessary to perform the inspections of all Stormwater Management Facilities:

- Protective clothing and boots.
- Safety equipment (vest, hard hat, confined space entry equipment).

- Communication equipment.
- Inspection and Maintenance Plan for the site including stormwater management facility location maps.
- Clipboard.
- Stormwater Facility Maintenance Inspection Forms (See Appendix D).
- Manhole Lid Remover
- Shovel.

Some of the items identified above need not be carried by the inspector (manhole lid remover, shovel, and confined space entry equipment). However, this equipment should be available in the vehicle driven to the site.

VII. Inspecting Stormwater Management Facilities

The quality of stormwater entering the waters of the state relies heavily on the proper operation and maintenance of permanent best management practices. Stormwater management facilities shall be periodically inspected to ensure they function as designed. The inspection will determine the appropriate maintenance required for the facility.

A. Inspection Procedures

All stormwater management facilities shall be inspected by a qualified individual at a minimum of once per year. See the El Paso County *Storm Drainage Design & Technical Criteria Manual* for general guidelines for an inspector. Inspections will follow the inspection guidance found in the SOP for the specific type of facility. (Appendix C of this plan).

B. Inspection Report

ACR's personnel or inspector conducting the inspection activities shall complete the appropriate inspection report for the specific facility. Inspection reports are located in Appendix D.

The following information explains how to fill out the Inspection Forms:

General Information

This section identifies the facility location, person conducting the inspection, the date and time the facility was inspected, and approximate days since the last rainfall. Property classification is identified as single-family residential, multi-family residential, commercial, or other.

The reason for the inspection is also identified on the form depending on the nature of the inspection. All facilities shall be inspected on an annual basis at a minimum. In addition, all facilities shall be inspected after a significant precipitation event to ensure the facility is draining appropriately and to identify any damage that occurred as a result of the

increased runoff.

Inspection Scoring

For each inspection item, a score must be given to identify the urgency of required maintenance. The scoring is as follows:

- 0 = No deficiencies identified.
- 1 = Monitor – Although maintenance may not be required at this time, a potential problem exists that will most likely need to be addressed in the future. This can include items like minor erosion, concrete cracks/spalling, or minor sediment accumulation. This item should be revisited at the next inspection.
- 2 = Routine Maintenance Required – Some inspection items can be addressed through the routine maintenance program (See SOP in appendix C). This can include items like vegetation management or debris/trash removal.
- 3 = Immediate Repair Necessary – This item needs immediate attention because failure is imminent or has already occurred. This could include items such as structural failure of a feature (outlet works, forebay, etc), significant erosion, or significant sediment accumulation. This score should be given to an item that can significantly affect the function of the facility.
- N/A This is checked by an item that may not exist in a facility. Not all facilities have all of the features identified on the form (forebay, micro-pool, etc.).

Inspection Summary/Additional Comments

Additional explanations to inspection items, and observations about the facility not covered by the form, are recorded in this section.

Overall Facility Rating

An overall rating must be given for each facility inspected. The overall facility rating should correspond with the highest score (0, 1, 2, 3) given to any feature on the inspection form.

C. Verification of Inspection and Form Submittal

The Stormwater Management Facility Inspection Form provides a record of inspection of the facility. Inspection Forms for each facility type are provided in Appendix D. Verification of the inspection of the stormwater facilities, the facility inspection form(s), and Inspector Qualifications shall be provided to El Paso County on an annual basis. The verification and the inspection form(s) shall be reviewed and submitted by ACR or his property manager.

Refer to Section II of this Plan regarding the annual reporting of inspections.

VIII. Maintaining Stormwater Management Facilities

Stormwater management facilities shall be properly maintained to ensure they operate correctly and provide the water quality treatment for which they were designed. Routine maintenance performed on a frequently scheduled basis, can help avoid more costly rehabilitative maintenance that results when facilities are not adequately maintained.

A. Maintenance Categories

Stormwater management facility maintenance programs are separated into three broad categories of work. These categories are based largely on the Urban Drainage and Flood Control District's Maintenance Program for regional drainage facilities. The categories are separated based upon the magnitude and type of the maintenance activities performed. A description of each category follows:

Routine Work

The majority of this work consists of scheduled mowings and trash and debris pickups for stormwater management facilities during the growing season. This includes items such as the removal of debris/material that may be clogging the outlet structure well screens and trash racks. It also includes activities such as weed control, mosquito treatment, and algae treatment. These activities normally will be performed numerous times during the year. These items can be completed without any prior correspondence with El Paso County; however, completed inspection and maintenance forms shall be submitted to El Paso County for each inspection and maintenance activity with the annual report.

Restoration Work

This work consists of a variety of isolated or small-scale maintenance and work needed to address operational problems. Most of this work can be completed by a small crew, with minor tools, and small equipment. The ACR shall correspond with El Paso County and submit completed maintenance forms to El Paso County for each maintenance activity.

Rehabilitation Work

This work consists of large-scale maintenance and major improvements needed to address failures within the stormwater management facilities. This work requires consultation with El Paso County and may require an engineering design with construction plans to be prepared for review and approval. This work may also require more specialized maintenance equipment, surveying, construction permits or assistance through private

contractors and consultants. If these items are needed the ACR shall correspond with El Paso County and submit completed maintenance forms to El Paso County for each maintenance activity.

B. Maintenance Personnel

ACR's maintenance personnel shall be qualified to properly maintain stormwater management facilities. Inadequately trained personnel can cause additional problems resulting in additional maintenance costs.

C. Maintenance Forms

The Stormwater Management Facility Maintenance Form provides a record of maintenance activities. Maintenance Forms for each facility type are provided in Appendix E. Maintenance Forms shall be completed by the ACR's contractor completing the required maintenance items. The form shall then be reviewed by the ACR or an authorized agent of the property owner and submitted on an annual basis to El Paso County.

Refer to Section II of this Plan regarding the annual reporting of inspections and maintenance activities performed.

A P P E N D I X A

Stormwater Maintenance Agreement Template

A P P E N D I X B

General Location and Description of Stormwater Management Facilities Example

Appendix B

General Location and Description of Stormwater Management Facilities Example

A. General Site Description

The site is comprised of rural 2.5 acre minimum lots. The site is located at the southeast corner of Judge Orr Road and Curtis Road. The 172 acre site consists of 55 2.5 acre rural lots.

B. General Stormwater Management Description

All stormwater is conveyed via roadside swales and conventional corrugated metal pipe (CMP) to one of three detention basins that provide detention and water quality treatment. Developed runoff is released at or below historic rates.

C. Stormwater Facilities Site Plan

Inspection or maintenance personnel may utilize the Stormwater Facilities Map located in Appendix G for locating the stormwater facilities within this development.

D. On-Site Stormwater Management Facilities

List all facilities for each of the types (see examples provided below)

Volume Reduction Facilities

All impervious surfaces are routed through grass lined swales.

Storage Facilities (Detention)

Detention for the site is provided in one full spectrum water quality and detention pond. See the Facilities Map located in Appendix G for location of ponds.

Water Quality Facilities

Water quality is provided in the full spectrum pond.

Source Control Best Management Practices

Site does not include any nonstructural BMPs.

A P P E N D I X C

Standard Operating Procedures

For:

Extended Detention Basins (EDBs)

Grass Buffers and Grass Swales (GB-GS)

A P P E N D I X C – 1

Extended Detention Basins

Standard Operation Procedures for Inspection and Maintenance

Extended Detention Basins (EDBs)

September 2010

TABLE OF CONTENTS

EDB-1	Background.....	3
EDB-2	INSPECTING EXTENDED DETENTION BASINS (EDBs).....	3
EDB-2.1	Access and Easements	3
EDB-2.2	Stormwater Management Facilities Locations	3
EDB-2.3	Extended Detention Basin (EDB) Features.....	3
EDB-2.3.1	Inflow Points.....	4
EDB-2.3.2	Forebay.....	5
EDB-2.3.3	Trickle Channel (Low-Flow)	6
EDB-2.3.4	Bottom Stage	7
EDB-2.3.5	Micropool	8
EDB-2.3.6	Outlet Works	9
EDB-2.3.7	Emergency Spillway.....	10
EDB-2.3.8	Upper Stage (Dry Storage)	10
EDB-2.3.9	Miscellaneous	12
EDB-2.4	Inspection Forms	13
EDB-3	MAINTAINING EXTENDED DETENTION BASINS (EDBS)	13
EDB-3.1	Maintenance Personnel	13
EDB-3.2	Equipment.....	13
EDB-3.3	Safety.....	14
EDB-3.4	Maintenance Forms	14
EDB-3.5	Maintenance Categories and Activities	14
EDB-3.6	Routine Maintenance Activities	15
EDB-3.6.1	Mowing.....	15
EDB-3.6.2	Trash/Debris Removal	16
EDB-3.6.3	Outlet Works Cleaning	16
EDB-3.6.4	Weed Control	16
EDB-3.6.5	Mosquito/Algae Treatment.....	16
EDB-3.7	Minor Maintenance Activities	16
EDB-3.7.1	Sediment Removal.....	17
EDB-3.7.2	Erosion Repair	17
EDB-3.7.3	Vegetation Removal/Tree Thinning.....	18
EDB-3.7.4	Clearing Drains/Jet-Vac	18
EDB-3.8	Major Maintenance Activities	18
EDB-3.8.1	Major Sediment Removal.....	19
EDB-3.8.2	Major Erosion Repair	19
EDB-3.8.3	Structural Repair	20

EDB-1 BACKGROUND

Extended Detention Basins (EDBs) are one of the most common types of Stormwater Management Facilities utilized within the Front Range of Colorado. An EDB is a sedimentation basin designed to “extend” the runoff detention time, but to drain completely dry sometime after stormwater runoff ends. The EDB’s drain time for the water quality portion of the facility is typically 40 hours. The basins are considered to be “dry” because the majority of the basin is designed not to have a significant permanent pool of water remaining between runoff events.

EDBs are an adaptation of a detention basin used for flood control, with the primary difference is the addition of forebays, micro-pools and a slow release outlet design. Forebays are shallow concrete “pans” located at the inflow point to the basin and are provided to facilitate sediment removal within a contained area prior to releasing into the pond. These forebays collect and briefly hold stormwater runoff resulting in a process called sedimentation, dropping sediment out of the stormwater. The stormwater is then routed from the forebay into the concrete trickle channel and upper basin, the large grassy portion of the basin. The EDB uses a much smaller outlet that extends the emptying time of the more frequently occurring runoff events to facilitate pollutant removal. An EDB should have a small micro-pool just upstream of the outlet. This micro-pool is designed to hold a small amount of water to keep sediment and floatables from blocking the outlet orifices.

EDB-2 INSPECTING EXTENDED DETENTION BASINS (EDBs)

EDB-2.1 Access and Easements

Inspection or maintenance personnel may utilize the stormwater facility map located in Appendix G containing the location(s) of the access points and maintenance easements of the EDB(s) within this development.

EDB-2.2 Stormwater Management Facilities Locations

Inspection or maintenance personnel may utilize the stormwater facility map located in Appendix G containing the location(s) of the EDB(s) within this development.

EDB-2.3 Extended Detention Basin (EDB) Features

EDBs have a number of features that are designed to serve a particular function. Many times the proper function of one feature depends on another. For example, if a forebay is not properly maintained, it could negatively affect the performance of a feature downstream (trickle channel, micro-pool, etc.). Therefore, it is critical that each feature of the EDB is properly inspected and maintained to ensure the overall facility functions as it was intended. Below is a list and description of the most common features within an EDB and the corresponding maintenance inspection items that can be anticipated:

Table EDB-1
Typical Inspection & Maintenance Requirements Matrix

EDB Features	Sediment Removal	Mowing/ Weed control	Trash & Debris Removal	Erosion	Overgrown Vegetation Removal	Standing Water (mosquito/ algae control)	Structure Repair
Inflow Points (outfalls)	X		X				X
Forebay	X		X				X
Low-flow channel	X		X	X	X		X
Bottom Stage	X	X	X	X	X	X	
Micro-pool	X		X		X	X	X
Outlet Works	X		X				X
Emergency Spillway			X	X	X		X
Upper Stage			X	X			
Embankment		X		X	X		

EDB-2.3.1 Inflow Points

Inflow Points or Outfalls into EDBs are the point source of the stormwater discharge into the facility. An inflow point is commonly a storm sewer pipe with a flared end section that discharges into the EDB. In some instances, an inflow point could be a drainage channel or ditch that flows into the facility.

An energy dissipater (riprap or hard armor protection) is typically immediately downstream of the discharge point into the EDB to protect from erosion. In some cases, the storm sewer outfall can have a toe-wall or cut-off wall immediately below the structure to prevent undercutting of the outfall from erosion.

The typical maintenance items found with inflow points are as follows:

a. Riprap Displaced – Many times, because the repeated impact/force of water, the riprap can shift and settle. If any portion of the riprap apron appears to have settled, soil is present between the riprap, or the riprap has shifted, maintenance may be required to ensure future erosion is prevented. Depending on the nature of the maintenance the use of heavy equipment and proper bedding material may be required to repair the riprap. See Section EDB-3.5 – EDB-3.8.

b. Erosion Present/Outfall Undercut – In some situations, the energy dissipater may not have been sized, constructed, or maintained appropriately and erosion has occurred. Any erosion within the vicinity of the inflow point will require maintenance to prevent damage to the structure(s) and sediment transport within the facility. If there is any

question to whether the original design is inadequate, a qualified engineer should review the situation to avoid chronic maintenance repairs if it is a design issue.

c. Sediment Accumulation – Because of the turbulence in the water created by the energy dissipater, sediment often deposits immediately downstream of the inflow point. To prevent a loss in hydraulic performance of the upstream infrastructure, sediment that accumulates in this area must be removed in a timely manner.

d. Structural Damage – Structural damage can occur at anytime during the life of the facility. Typically, for an inflow, the structural damage occurs to the pipe flared end section (concrete or steel). Structural damage can lead to additional operating problems with the facility, including loss of hydraulic performance.

e. Woody Growth/Weeds Present – Undesirable vegetation can grow in and around the inflow area to an EDB that can significantly affect the performance of the drainage facilities discharging into the facility. This type of vegetation includes trees (typically cottonwoods) and dense areas of shrubs (willows). If woody vegetation is not routinely mowed/removed, the growth can cause debris/sediment to accumulate, resulting in blockage of the discharge. Also, tree roots can cause damage to the structural components of the inflow. Routine maintenance is essential for trees (removing a small tree/sapling is much cheaper and “quieter” than a mature tree). In addition, noxious weeds growing in the facility can result in the loss of desirable native vegetation and impact adjacent open spaces/land.

EDB-2.3.2 Forebay

A forebay is a solid surface (pad), typically constructed of concrete, immediately downstream of the inflow point. The forebay is designed to capture larger particles and trash to prevent them from entering the main portion of the EDB. The solid surface is designed to facilitate mechanical sediment removal (skid steer). The forebay typically includes a small diameter discharge pipe or v-notch weir on the downstream end and designed to drain the forebay in a specified period of time to promote sedimentation. The forebays vary in size and depth depending on the design and site constraints.

The typical maintenance items found with forebays are as follows:

a. Sediment/Debris Accumulation – Because this feature of the EDB is designed to provide the initial sedimentation, debris and sediment frequently accumulate in this area. If the sediment and debris is not removed from the forebay on a regular basis, it can significantly affect the

function of other features within the EDB. Routine sediment removal from the forebay can **significantly** reduce the need for dredging of the main portion of the EDB using specialized equipment (long reach excavators). Routine removal of sediment from the forebay can **substantially** decrease the long-term sediment removal costs of an EDB.

b. Concrete Cracking/Failing – The forebay is primarily constructed of concrete, which cracks, spalls, and settles. Damage to the forebay can result in decreased performance and impact maintenance efforts.

c. Drain Pipe/Weir Clogged – Many times the drainpipe or weir can be clogged with debris, and prevent the forebay from draining properly. If standing water is present in the forebay (and there is not a base flow), the forebay is most likely not draining properly. This can result in a decrease in performance and create potential nuisances with stagnant water (mosquitoes).

d. Weir/Drain Pipe Damaged – Routine maintenance activities, vandalism, or age may cause the weir or drain pipe in the forebay to become damaged. Weirs are typically constructed of concrete, which cracks and spalls. The drainpipe is typically smaller in diameter and constructed with plastic, which can fracture.

EDB-2.3.3 Trickle Channel (Low-Flow)

The trickle channel conveys stormwater from the forebay to the micro-pool of the EDB. The trickle channel is typically made of concrete. However, grass lined (riprap sides protected) is also common and can provide for an additional means of water quality within the EDB. The trickle channel is typically 6-9 inches in depth and can vary in width.

The typical maintenance items found with trickle channels are as follows:

a. Sediment/Debris Accumulation – Trickle channels are typically designed with a relatively flat slope that can promote sedimentation and the collection of debris. Also, if a trickle channel is grass lined it can accumulate sediment and debris at a much quicker rate. Routine removal of accumulated sediment and debris is essential in preventing flows from circumventing the trickle channel and affecting the dry storage portion of the pond.

b. Concrete/Riprap Damage – Concrete can crack, spall, and settle and must be repaired to ensure proper function of the trickle channel. Riprap can also shift over time and must be replaced/repared as necessary.

c. Woody Growth/Weeds Present – Because of the constant moisture in the area surrounding the trickle channel, woody growth (cottonwoods/willows) can become a problem. Trees and dense shrub type vegetation can affect the capacity of the trickle channel and can allow flows to circumvent the feature.

d. Erosion Outside of Channel – In larger precipitation events, the trickle channel capacity will likely be exceeded. This can result in erosion immediately adjacent to the trickle channel and must be repaired to prevent further damage to the structural components of the EDB.

EDB-2.3.4 Bottom Stage

The bottom stage is at least 1.0 to 2.0 feet deeper than the upper stage and is located in front of the outlet works structure. The bottom stage is designed to store the smaller runoff events, assists in keeping the majority of the basin bottom dry resulting in easier maintenance operations, and enhances the facilities pollutant removal capabilities. This area of the EDB may develop wetland vegetation.

The typical maintenance items found with the bottom stage are as follows:

a. Sediment/Debris Accumulation – The bottom stage can frequently accumulate sediment and debris. This material must be removed to maintain pond volume and proper function of the outlet structure.

b. Woody Growth/Weeds Present - Because of the constant moisture in the soil surrounding the micro-pool, woody growth (cottonwoods/willows) can create operational problems for the EDB. If woody vegetation is not routinely mowed/removed, the growth can cause debris/sediment to accumulate outside of the micro-pool (see EDB 2.3.5), which can cause problems with other EDB features. Also, tree roots can cause damage to the structural components of the outlet works. Routine management is essential for trees (removing a small tree/sapling is much cheaper and “quieter” than a mature tree).

c. Bank Erosion – The bottom stage is usually a couple feet deeper than the other areas of the ponds. Erosion can be caused by water dropping into the bottom stage if adequate protection/armor is not present. Erosion in this area must be mitigated to prevent sediment transport and other EDB feature damage.

d. Mosquitoes/Algae Treatment – Nuisance created by stagnant water can result from improper maintenance/treatment of the bottom stage. Mosquito larvae can be laid by adult mosquitoes within the permanent pool. Also, aquatic vegetation that grows in shallow pools of water can decompose causing foul odors. Chemical/mechanical treatment of the

bottom stage may be necessary to reduce these impacts to adjacent homeowners.

e. Petroleum/Chemical Sheen – Many indicators of illicit discharges into the storm sewer systems will be present in the bottom stage area of the EDB. These indicators can include sheens, odors, discolored soil, and dead vegetation. If it is suspected that an illicit discharge has occurred, contact the supervisor immediately. Proper removal/mitigation of contaminated soils and water in the EDB is necessary to minimize any environmental impacts downstream.

EDB-2.3.5 Micro-pool

The micro-pool is a concrete or grouted boulder walled structure directly in front of the outlet works. At a minimum, the micro-pool is 2.5 feet deep and is designed to hold water. The micro-pool is critical in the proper function of the EDB; it allows suspended sediment to be deposited at the bottom of the micro-pool and prevents these sediments from being deposited in front of the outlet works causing clogging of the outlet structure, which results in marshy areas within the top and bottom stages.

The typical maintenance items found with micro-pools are as follows:

a. Sediment/Debris Accumulation – The micro-pool can frequently accumulate sediment and debris. This material must be removed to maintain the micro pool volume, depth, and proper function of the outlet structure.

b. Woody Growth/Weeds Present - Because of the constant moisture in the soil surrounding the micro-pool, woody growth (cottonwoods/willows) can create operational problems for the EDB. If woody vegetation is not routinely mowed/removed, the growth can cause debris/sediment to accumulate outside of the micro-pool, which can cause problems with other EDB features. Also, tree roots can cause damage to the structural components of the outlet works. Routine management is essential for trees (removing a small tree/sapling is much cheaper and “quieter” than a mature tree).

c. Mosquitoes/Algae Treatment – Nuisance created by stagnant water can result from improper maintenance/treatment of the micro-pool. Mosquito larvae can be laid by adult mosquitoes within the permanent pool. If mosquitoes are breeding within the micro-pool this may also be an indication there is significant sediment build-up that is reducing the depth of the micro-pool. Also, aquatic vegetation that grows in shallow pools of water can decompose causing foul odors. Chemical/mechanical treatment of the micro-pool may be necessary to reduce these impacts to adjacent homeowners.

d. Petroleum/Chemical Sheen – Many indicators of illicit discharges into the storm sewer systems will be present in the micro-pool area of the EDB. These indicators can include sheens, odors, discolored soil, and dead vegetation. If it is suspected that an illicit discharge has occurred, contact the supervisor immediately. Proper removal/mitigation of contaminated soils and water in the EDB is necessary to minimize any environmental impacts downstream.

EDB-2.3.6 Outlet Works

The outlet works is the feature that drains the EDB in specified quantities and periods of time. The outlet works is typically constructed of reinforced concrete into the embankment of the EDB. The concrete structure typically has steel orifice plates anchored/embedded into it to control stormwater release rates. The larger openings (flood control) on the outlet structure typically have trash racks over them to prevent clogging. The water quality orifice plate (smaller diameter holes) will typically have a well screen covering it to prevent smaller materials from clogging it. The outlet structure is the single most important feature in the EDB operation. Proper inspection and maintenance of the outlet works is essential in ensuring the long-term operation of the EDB.

The typical maintenance items found with the outlet works are as follows:

a. Trash Rack/Well Screen Clogged – Floatable material entering the EDB will most likely make its way to the outlet structure. This material is trapped against the trash racks and well screens on the outlet structure (which is why they are there). This material must be removed on a routine basis to ensure the outlet structure drains in the specified design period.

b. Structural Damage - The outlet structure is primarily constructed of concrete, which can crack, spall, and settle. The steel trash racks and well screens are also susceptible to damage.

c. Orifice Plate Missing/Not Secure – Many times residents, property owners, or maintenance personnel will remove or loosen orifice plates if they believe the pond is not draining properly. Any modification to the orifice plate(s) will significantly affect the designed discharge rates for water quality and/or flood control. Modification of the orifice plates is not allowed without approval from El Paso County Public Works Department, Engineering Control Division.

d. Manhole Access – Access to the outlet structure is necessary to properly inspect and maintain the facility. If access is difficult or not available to inspect the structure, chances are it will be difficult to maintain as well.

e. Woody Growth/Weeds Present - Because of the constant moisture in the soil surrounding the outlet works, woody growth (cottonwoods/willows) can create operational problems for the EDB. If woody vegetation is not routinely mowed/removed, the growth can cause debris/sediment to accumulate around the outlet works, which can cause problems with other EDB features. Also, tree roots can cause damage to the structural components of the outlet works. Routine management is essential for trees (removing a small tree/sapling is much cheaper and “quieter” than a mature tree).

EDB-2.3.7 Emergency Spillway

An emergency spillway is typical of all EDBs and designed to serve as the overflow in the event the volume of the pond is exceeded. The emergency spillway is typically armored with riprap (or other hard armor) and is sometimes buried with soil. The emergency spillway is typically a weir (notch) in the pond embankment. Proper function of the emergency spillway is essential to ensure flooding does not affect adjacent properties.

The typical maintenance items found with emergency spillways are as follows:

a. Riprap Displaced – As mentioned before, the emergency spillway is typically armored with riprap to provide erosion protection. Over the life of an EDB, the riprap may shift or dislodge due to flow. Depending on the nature of the maintenance the use of heavy equipment and proper bedding material may be required to repair the riprap. See Section EDB-3.5 – EDB-3.8.

b. Erosion Present – Although the spillway is typically armored, stormwater flowing through the spillway can cause erosion damage. Erosion must be repaired to ensure the integrity of the basin embankment, and proper function of the spillway.

c. Woody Growth/Weeds Present – Management of woody vegetation is essential in the proper long-term function of the spillway. Larger trees or dense shrubs can capture larger debris entering the EDB and reduce the capacity of the spillway.

d. Obstruction Debris – The spillway must be cleared of any obstruction (man-made or natural) to ensure the proper design capacity.

EDB-2.3.8 Upper Stage (Dry Storage)

The upper stage of the EDB provides the majority of the water quality flood detention volume. This area of the EDB is higher than the bottom stage and

typically stays dry, except during storm events. The upper stage is the largest feature/area of the basin. Sometimes, the upper stage can be utilized for park space and other uses in larger EDBs. With proper maintenance of the bottom stage, micro-pool, and forebay(s), the upper stage should not experience much sedimentation; however, bottom elevations should be monitored to ensure adequate volume.

The typical maintenance items found with upper stages are as follows:

a. Vegetation Sparse – The upper basin is the most visible part of the EDB, and therefore aesthetics is important. Adequate and properly maintained vegetation can greatly increase the overall appearance and acceptance of the EDB by the public. In addition, vegetation can reduce the potential for erosion and subsequent sediment transport to the other areas of the pond.

b. Woody Growth/Undesirable Vegetation – Although some trees and woody vegetation may be acceptable in the upper basin, some thinning of cottonwoods and willows may be necessary. Remember, the basin will have to be dredged to ensure volume, and large trees and shrubs will be difficult to protect during that operation.

c. Standing Water/Boggy Areas – Standing water or boggy areas in the upper stage is typically a sign that some other feature in the pond is not functioning properly. Routine maintenance (mowing, trash removal, etc) can be extremely difficult for the upper stage if the ground is saturated. If this inspection item is checked, make sure you have identified the root cause of the problem.

d. Sediment Accumulation – Although other features within the EDB are designed to capture sediment, the upper storage area will collect sediment over time. Excessive amounts of sedimentation will result in a loss of storage volume. It may be more difficult to determine if this area has accumulated sediment without conducting a field survey.

Below is a list of indicators:

1. Ground adjacent to the trickle channel appears to be several inches higher than the concrete/riprap trickle channel.
2. Standing water or boggy areas in upper stage
3. Uneven grades or mounds
4. Bottom Stage, Micro-pool, or Forebay has excessive amounts of sediment

e. Erosion (banks and bottom) – The bottom grades of the dry storage area are typically flat enough that erosion should not occur. However, inadequate vegetative cover may result in erosion of the upper stage. Erosion that occurs in the upper stage can result in increased

dredging/maintenance of the bottom stage/micro-pool.

f. Trash/Debris – Trash and debris can accumulate in the upper area after large events, or from illegal dumping. Over time, this material can accumulate and clog the EDB outlet works.

g. Maintenance Access – Most EDBs typically have a gravel/concrete maintenance access path to either the upper stage or forebay. This access path should be inspected to ensure the surface is still drivable. Some of the smaller EDBs may not have maintenance access paths; however, the inspector should verify that access is available from adjacent properties.

EDB-2.3.9 Miscellaneous

There are a variety of inspection/maintenance issues that may not be attributed to a single feature within the EDB. This category on the inspection form is for maintenance items that are commonly found in the EDB, but may not be attributed to an individual feature.

a. Encroachment in Easement Area – Private lots/property can sometimes be located very close to the EDBs, even though they are required to be located in tracts with drainage easements. Property owners may not place landscaping, trash, fencing, or other items within the easement area that may adversely affect maintenance or the operation of the facility.

b. Graffiti/Vandalism – Damage to the EDB infrastructure can be caused by vandals. If criminal mischief is evident, the inspector should forward this information to the El Paso County Police Department.

c. Public Hazards – Public hazards include items such as vertical drops of greater than 4-feet, containers of unknown/suspicious substances, exposed metal/jagged concrete on structures. **If any hazard is found within the facility area that poses an immediate threat to public safety, call 911 immediately!**

d. Burrowing Animals/Pests – Prairie dogs and other burrowing rodents may cause damage to the EDB features and negatively affect the vegetation within the EDB.

e. Other – Any miscellaneous inspection/maintenance items not contained on the form should be entered here.

EDB-2.4 Inspection Forms

EDB Inspection forms are located in Appendix D. Inspection forms shall be completed by the person(s) conducting the inspection activities. Each form shall be reviewed and submitted by the property owner or property manager to El Paso County per the requirements of the Inspection and Maintenance Plan. These inspection forms shall be kept indefinitely and made available to El Paso County upon request.

EDB-3 MAINTAINING EXTENDED DETENTION BASINS (EDBS)

EDB-3.1 Maintenance Personnel

Maintenance personnel must be qualified to properly maintain EDBs. Inadequately trained personnel can cause additional problems resulting in additional maintenance costs.

EDB-3.2 Equipment

It is imperative the appropriate equipment and tools are taken to the field with the operations crew. The types of equipment/tools will vary depending on the task at hand. Below is a basic list of tools, equipment, and material(s) that may be necessary to perform maintenance on an EDB:

- 1.) Loppers/Tree Trimming Tools
- 2.) Mowing Tractors
- 3.) Trimmers (extra string)
- 4.) Shovels
- 5.) Rakes
- 6.) All Surface Vehicle (ASVs)
- 7.) Skid Steer
- 8.) Back Hoe
- 9.) Track Hoe/Long Reach Excavator
- 10.) Dump Truck
- 11.) Jet-Vac Machine
- 12.) Engineers Level (laser)
- 13.) Riprap (Minimum - Type M, or as shown on the approved civil plans)
- 14.) Filter Fabric
- 15.) Erosion Control Blanket(s)

- 16.) Seed Mix (See seed mix in the *Rules and Regulations Regarding Stormwater (Quality) Discharge for Construction Activities*, Std Det. SM, Seeding & Mulching)
- 17.) Illicit Discharge Cleanup Kits
- 18.) Trash Bags
- 19.) Tools (wrenches, screw drivers, hammers, etc)
- 20.) Chain Saw
- 21.) Confined Space Entry Equipment
- 22.) Approved Stormwater Facility Inspection and Maintenance Plan

Some of the items identified above may not be needed for every maintenance operation. However, this equipment should be available to the maintenance operations crews should the need arise.

EDB-3.3 Safety

Vertical drops may be encountered in areas located within and around the facility. Avoid walking on top of retaining walls or other structures having a significant vertical drop. If a vertical drop within the EDB is identified as greater than 48" in height, make the appropriate note/comment on the maintenance inspection form.

EDB-3.4 Maintenance Forms

The EDB Maintenance Form provides a record of each maintenance operation performed by maintenance contractors. The EDB Maintenance Form shall be filled out in the field after the completion of the maintenance operation. Each form shall be reviewed and submitted by the property owner or property manager to El Paso County per the requirements of the Inspection and Maintenance Plan. The EDB Maintenance form is located in Appendix E.

EDB-3.5 Maintenance Categories and Activities

A typical EDB Maintenance Program will consist of three broad categories of work. Within each category of work, a variety of maintenance activities can be performed on an EDB. A maintenance activity can be specific to each feature within the EDB, or general to the overall facility. This section of the SOP explains each of the categories and briefly describes the typical maintenance activities for an EDB.

A variety of maintenance activities are typical of EDBs. The maintenance activities range in magnitude from routine trash pickup to the reconstruction of drainage infrastructure. Below is a description of each maintenance activity, the objectives, and frequency of actions:

EDB-3.6 Routine Maintenance Activities

The majority of this work consists of regularly scheduled mowing and trash and debris pickups for stormwater management facilities during the growing season. This includes items such as the removal of debris/material that may be clogging the outlet structure well screens and trash racks. It also includes activities such as weed control, mosquito treatment, and algae treatment. These activities normally will be performed numerous times during the year. These items can be completed without any prior correspondence with El Paso County; however, completed inspection and maintenance forms shall be submitted to El Paso County for each inspection and maintenance activity in accordance with the Inspection and Maintenance Plan.

The Maintenance Activities are summarized below, and further described in the following sections.

**TABLE – EDB-2
Summary of Routine Maintenance Activities**

Maintenance Activity	Minimum Frequency	Look for:	Maintenance Action
Mowing	Twice annually	Excessive grass height/aesthetics	Mow grass to a height of 4" to 6"
Trash/Debris Removal	Twice annually	Trash & debris in EDB	Remove and dispose of trash and debris
Outlet Works Cleaning	As needed - after significant rain events – twice annually min.	Clogged outlet structure; ponding water	Remove and dispose of debris/trash/sediment to allow outlet to function properly
Weed control	Minimum twice annually	Noxious weeds; Unwanted vegetation	Treat w/ herbicide or hand pull; Consult the local weed specialist
Mosquito Treatment	As needed	Standing water/mosquito habitat	Treat w/ EPA approved chemicals
Algae Treatment	As needed	Standing water/ Algal growth/green color	Treat w/ EPA approved chemicals

EDB-3.6.1 Mowing

Occasional mowing is necessary to limit unwanted vegetation and to improve the overall appearance of the EDB. Native vegetation should be mowed to a height of 4-to-6 inches tall. Grass clippings should be collected and disposed of properly.

Frequency – Routine - Minimum of twice annually or depending on aesthetics.

EDB-3.6.2 Trash/Debris Removal

Trash and debris must be removed from the entire EDB area to minimize outlet clogging and to improve aesthetics. This activity must be performed prior to mowing operations.

Frequency – Routine – Prior to mowing operations and minimum of twice annually and should be done after significant storm events.

EDB-3.6.3 Outlet Works Cleaning

Debris and other materials can clog the outlet work's well screen, orifice plate(s) and trash rack. This activity must be performed anytime other maintenance activities are conducted to ensure proper operation.

Frequency - Routine – After significant rainfall event or concurrently with other maintenance activities.

EDB-3.6.4 Weed Control

Noxious weeds and other unwanted vegetation must be treated as needed throughout the EDB. This activity can be performed either through mechanical means (mowing/pulling) or with herbicide. Consultation with the local Weed Inspector is highly recommended prior to the use of an herbicide. All herbicide applications should be applied in accordance with the manufacturer's recommendations.

Frequency – Routine – As needed based on inspections.

EDB-3.6.5 Mosquito/Algae Treatment

Treatment of permanent pools is necessary to control mosquitoes and undesirable aquatic vegetation that can create nuisances. Only EPA approved chemicals/materials can be used in areas that are warranted.

Frequency – As needed.

EDB- 3.7 Minor Maintenance Activities

This work consists of a variety of isolated or small-scale maintenance or operational problems. Most of this work can be completed by a small crew, tools, and small equipment. These items require prior correspondence with El Paso County Water Staff and require completed inspection and maintenance forms to be submitted to the El Paso County Water Staff for each inspection and maintenance activity.

**Table – EDB-3
Summary of Minor Maintenance Activities**

Maintenance Activity	Minimum Frequency	Look for:	Maintenance Action
<u>Sediment Removal*</u>	As needed; typically every 1 –2 years	Sediment build-up; decrease in pond volume	Remove and dispose of sediment
Erosion Repair	As needed, based upon inspection	Rills/gullies forming on side slopes, trickle channel, other areas	Repair eroded areas Revegetate; address source of erosion
Vegetation Removal/Tree Thinning	As needed, based upon inspection	Large trees/wood vegetation in lower chamber of pond	Remove vegetation; restore grade and surface
Drain Cleaning/Jet Vac	As needed, based upon inspection	Sediment build-up /non draining system	Clean drains; Jet Vac if needed

*Usually from the forebay, trickle channel, and/or micro-pool

EDB-3.7.1 Sediment Removal

Sediment removal is necessary to maintain the original design volume of the EDB and to ensure proper function of the infrastructure. Regular sediment removal (minor) from the forebay, inflow(s), and trickle channel can significantly reduce the frequency of major sediment removal activities (dredging) in the upper and lower stages. The minor sediment removal activities can typically be addressed with shovels and smaller equipment.

Stormwater sediments removed from EDBs do not meet the criteria of “hazardous waste”. However, these sediments are contaminated with a wide array of organic and inorganic pollutants and handling must be done with care. Sediments from permanent pools must be carefully removed to minimize turbidity, further sedimentation, or other adverse water quality impacts. Sediments should be transported by motor vehicle only after they are dewatered. All sediments must be taken to a landfill for proper disposal. Prompt and thorough cleanup is important should a spill occur during transportation.

Frequency – Nonroutine – As necessary based upon inspections. Sediment removal in the forebay, trickle channel, and micro-pool may be necessary as frequently as every 1-2 years.

EDB-3.7.2 Erosion Repair

The repair of eroded areas is necessary to ensure the proper function of the EDB, minimize sediment transport, and to reduce potential impacts to other features. Erosion can vary in magnitude from minor repairs to trickle channels, energy dissipaters, and rilling to major gullies in the embankments

and spillways. The repair of eroded areas may require the use of excavators, earthmoving equipment, riprap, concrete, erosion control blankets, and turf reinforcement mats. Major erosion repair to the pond embankments, spillways, and adjacent to structures will require consultation with El Paso County Water and Engineering Staff.

Frequency – Nonroutine – As necessary based upon inspections.

EDB-3.7.3 Vegetation Removal/Tree Thinning

Dense stands of woody vegetation (willows, shrubs, etc) or trees can create maintenance problems for the infrastructure within an EDB. Tree roots can damage structures and invade pipes/channels thereby blocking flows. Also, trees growing in the upper and lower stages of the EDB will most likely have to be removed when sediment/dredging operations occur. A small tree is easier to remove than a large tree, therefore, regular removal/thinning is imperative. All trees and woody vegetation that is growing in the bottom of the EDB or near structures (inflows, trickle channels, outlet works, emergency spillways, etc) should be removed. Any trees or woody vegetation in the EDB should be limited to the upper portions of the pond banks.

Frequency – Nonroutine – As necessary based upon inspections.

EDB-3.7.4 Clearing Drains/Jet-Vac

An EDB contains many structures, openings, and pipes that can be frequently clogged with debris. These blockages can result in a decrease of hydraulic capacity and create standing water in areas outside of the micro-pool. Many times the blockage to this infrastructure can be difficult to access and/or clean. Specialized equipment (jet-vac machines) may be necessary to clear debris from these difficult areas.

Frequency – Nonroutine – As necessary based upon inspections.

EDB-3.8 Major Maintenance Activities

This work consists of larger maintenance/operational problems and failures within the stormwater management facilities. All of this work requires consultation with El Paso County to ensure the proper maintenance is performed. This work requires El Paso County Water Staff review the original design before approval of the proposed maintenance. **A public improvements permit shall be required for all major maintenance activities.** This work may also require more specialized maintenance equipment, design/details, submittal of plans to El Paso County for review and approval, surveying, or assistance through private contractors and consultants.

**Table – EDB-4
Summary of Major Maintenance Activities**

Maintenance Activity	Minimum Frequency	Look for:	Maintenance Action
Major Sediment Removal	As needed – based upon scheduled inspections	Large quantities of sediment; reduced pond capacity	Remove and dispose of sediment. Repair vegetation as needed
Major Erosion Repair	As needed – based upon scheduled inspections	Severe erosion including gullies, excessive soil displacement, areas of settlement, holes	Repair erosion – find cause of problem and address to avoid future erosion
Structural Repair	As needed – based upon scheduled inspections	Deterioration and/or damage to structural components – broken concrete, damaged pipes, outlet works	Structural repair to restore the structure to its original design

EDB-3.8.1 Major Sediment Removal

Major sediment removal consists of removal of large quantities of sediment or removal of sediment from vegetated areas. Care shall be given when removing large quantities of sediment and sediment deposited in vegetated areas. Large quantities of sediment need to be carefully removed, transported and disposed of. Vegetated areas need special care to ensure design volumes and grades are preserved.

Major sediment removal activities will require larger and more specialized equipment. The major sediment activities will also require surveying with an engineer’s level, and consultation with El Paso County Water and Engineering Staff to ensure design volumes/grades are achieved. Pond volume recertification will be required in accordance with El Paso County’s drainage criteria manual.

Frequency – Nonroutine – Repair as needed based upon inspections.

EDB-3.8.2 Major Erosion Repair

Major erosion repair consists of filling and revegetating areas of severe erosion. Determining the cause of the erosion as well as correcting the condition that caused the erosion should also be part of the erosion repair. Care should be given to ensure design grades and volumes are preserved. Any condition/repair affecting design grades or pond volumes requires consultation with El Paso County Water and Engineering Staff.

Frequency – Nonroutine – Repair as needed based upon inspections.
EDB-3.8.3 Structural Repair

An EDB includes a variety of structures that can deteriorate or be damaged during the course of use and routine maintenance. These structures are constructed of steel and concrete that can degrade or be damaged and may need to be repaired or re-constructed from time to time. These structures include items like outlet works, trickle channels, forebays, inflows and other features. In-house operations staff can perform some of the minor structural repairs. Major repairs to structures may require input from a structural engineer and specialized contractors. Consultation with El Paso County and Engineering Staff shall take place prior to all structural repairs.

Frequency – Nonroutine – Repair as needed based upon inspections.

A P P E N D I X C - 2

Grass Buffers and Grass Swales

Standard Operation Procedures
for
Inspection and Maintenance

Grass Buffers and Grass Swales
(GB-GS)

September 2010

Table of Contents

GB-GS-1	BACKGROUND	3
GB-GS-2	INSPECTING GRASS BUFFERS AND SWALES (GB-GS)	3
GB-GS-2.1	Access and Easements	3
GB-GS-2.2	Stormwater Management Facilities Locations	3
GB-GS-2.3	Grass Buffer - Grass Swale (GB-GS) Features	3
GB-GS-2.3.1	Grass Swale Bottom and Side Slopes; Grass Buffer Strips.....	4
GB-GS-2.3.2	Inflow Points	5
GB-GS-2.3.3	Underdrain System.....	5
GB-GS-2.3.4	Grade Control Level Spreader.....	6
GB-GS-2.3.5	Irrigation	6
GB-GS-2.3.6	Miscellaneous.....	7
GB-GS-2.4	Inspection Forms.....	7
GB-GS-3	MAINTAINING GRASS BUFFERS & GRASS SWALES (GB-GS).....	7
GB-GS-3.1	Maintenance Personnel.....	7
GB-GS-3.2	Equipment	8
GB-GS-3.3	Maintenance Forms.....	8
GB-GS-3.4	Maintenance Categories and Activities.....	8
GB-GS-3.5	Routine Maintenance Activities	9
GB-GS-3.5.1	Trash/Debris Removal.....	10
GB-GS-3.5.2	Mowing	10
GB-GS-3.5.3	Irrigation	10
GB-GS-3.5.4	Weed Control	10
GB-GS-3.5.5	Mosquito Treatment.....	11
GB-GS-3.5.6	Level Spreader (Grass Buffer only)	11
GB-GS-3.5.7	Rodent Damage	11
GB-GS-3.6	Minor Maintenance Activities.....	11
GB-GS-3.6.1	Sediment Removal	12
GB-GS-3.6.2	Erosion Repair.....	12
GB-GS-3.6.3	Vegetation Removal	13
GB-GS-3.6.4	Revegetation	13
GB-GS-3.6.5	Irrigation (Automatic)	13
GB-GS-3.6.6	Level Spreader	13
GB-GS-3.6.7	Fertilization/Soil Amendment.....	14
GB-GS-3.6.8	Vehicle Tracks.....	14
GB-GS-3.7	Major Maintenance Activities.....	14
GB-GS-3.7.1	Major Sediment/Pollutant Removal	15
GB-GS-3.7.2	Major Erosion Repair.....	16
GB-GS-3.7.3	Structural Repair	16
GB-GS-3.7.4	GB-GS Rebuild.....	16

GB-GS-1 BACKGROUND

Grass Buffers and Grass Swales are common types of Stormwater Management Facilities utilized within the Front Range of Colorado. Grass Buffers and Grass Swales promote filtration, infiltration, and settling to reduce runoff volume.

Grass Buffers are uniformly graded and densely vegetated areas of turf grass. They are designed to accommodate sheet flow rather than concentrated or channelized flow. They are typically located adjacent to impervious areas such as parking lots or along roads. Grass Buffers are designed to evenly distribute runoff across the width of the buffer to achieve uniform sheet-flow conditions. A flow spreader may be incorporated for this purpose. In some cases, grass buffers may have underdrain systems.

Grass Swales are densely vegetated drainage ways with low-pitched side slopes that collect and convey runoff. Design of their longitudinal slope and cross section forces the flow to be slow and shallow, thereby facilitating sedimentation while limiting erosion. Berms or check dams may be installed perpendicular to the flow to decrease the slope and slow down the flow. Grass swales are used in open space and landscaped areas to collect and convey overland flows, and can be used as an alternative to curb and gutter (when approved by the County Engineer) to collect and convey street flows. Some grass swales are designed with underdrain systems.

GB-GS-2 INSPECTING GRASS BUFFERS AND SWALES (GB-GS)

GB-GS-2.1 Access and Easements

Inspection and maintenance personnel may utilize the stormwater facility map located in Appendix G containing the locations of the access points and maintenance easements of the GB-GSs within this development.

GB-GS-2.2 Stormwater Management Facilities Locations

Inspection and maintenance personnel may utilize the stormwater facility map located in Appendix G containing the locations of the GB-GSs within this development.

GB-GS-2.3 Grass Buffer - Grass Swale (GB-GS) Features

GB-GSs are unique stormwater quality facilities, in that they are typically viewed as landscaping or ground cover, and are often overlooked as water quality treatment facilities. GB-GSs have a number of features designed to serve a particular function. It is important for maintenance personnel to understand the function of each of these features. Below is a list of the common features of a Grass Swale or Grass Buffer and the corresponding maintenance inspection items anticipated:

**Table GB-GS-1
Typical Inspection & Maintenance Requirements Matrix**

	Sediment Removal	Mowing Weed control	Trash & Debris Removal	Erosion	Removal/ Replacement	Structural Repair
Swale Bottom	X	X	X	X		
Side Slope		X	X	X		
Buffer Strip	X	X	X	X		
Inflows	X	X	X	X	X	X
Underdrain System*					X	
Grade Control/Level Spreader				X		X
Irrigation System					X	

*If the design and inspection allows, flushing of the system may be all that is needed.

GB-GS-2.3.1 Grass Swale Bottom and Side Slopes; Grass Buffer Strips

Grass Swales and Grass Buffers require general maintenance of the turf grass and repair of any rill or gully development. The bottom and side slopes of grass swales and the area of grass buffer strips should be maintained with dense vegetative cover, and should not be eroded or bare. Inspection over the first few years will help to determine if any problems are developing.

The typical maintenance items required at the side slopes and bottoms of grass swales and within grass buffer areas are as follows:

a. Sediment Accumulation – The purpose of the grass swale or buffer is to slow down flow and allow sedimentation to occur. To prevent a loss in performance of the swale or buffer, sediment that accumulates must be removed on a timely basis.

b. Vegetation Sparse – Grass Swales and Buffers rely on a healthy, dense cover of grass to decrease the flow velocities and promote sedimentation and infiltration. Grasses that are diseased, dying or otherwise damaged should be replaced. All bare areas should be reseeded or patched. Causes which contribute to the damaged grass cover, including lack of adequate irrigation, traces of pedestrian or vehicular traffic, uncontrolled weeds, excessive sedimentation accumulation, etc., should be identified and remedied.

c. Erosion Present – Lack of adequate vegetative cover or excessive flow velocities may result in rill or gully development, and erosion of the swale or buffer strip. Erosion will require maintenance to prevent further damage to the area and to prevent sediment transport.

d. *Standing Water/Boggy Areas* – Grass swales and buffers are generally intended to drain and be dry in between rain events. If areas of standing water are present, the swale or buffer may need to be evaluated for proper grade to ensure drainage or the addition of underdrains. In some cases, where underdrains are used, the underdrains should be inspected to ensure that they are not clogged.

GB-GS-2.3.2 Inflow Points

Inflow points are the points of stormwater discharge into the swale or buffer. Inflow points are typically pipe outfalls, other grass swales or buffers, or curb cuts from upstream impervious areas, such as parking lots. Some form of energy dissipation is typically provided immediately downstream of the inflow point into the grass swale or buffer. Energy dissipation devices may include riprap aprons, or flow spreader devices.

The typical maintenance items required at inflow points are as follows:

- a. *Riprap Displaced/Rundown Damaged* – Often, because of the repeated impact/force of water, the riprap can shift and settle. If any portion of the riprap rundown or apron appears to have settled, if soil is present between the riprap, or if the riprap has shifted, maintenance may be required to ensure future erosion is prevented.
- b. *Erosion Present/Outfall Undercut* – In some situations, an energy dissipater may have not been provided, or may not have been sized, constructed, or maintained appropriately and erosion has occurred. Any erosion within the vicinity of the inflow point will require maintenance to prevent damage to the structure(s) and sediment transport within the facility.
- c. *Sediment Accumulation* – Because of the turbulence in the water created by the energy dissipater, sediment often deposits immediately downstream of the inflow point. To prevent a loss in performance, sediment that accumulates in this area must be removed on a timely basis.

GB-GS-2.3.3 Underdrain System

Some grass swales and buffers that have a flatter slope or soils which do not allow adequate percolation or are in areas with a continuous base flow may have been installed with an underdrain system. Underdrains typically consist of a layer of geotextile fabric, gravel storage area and perforated PVC pipe. The geotextile fabric is utilized to prevent the filter material from entering the underdrain system. The gravel storage area allows for storage of treated stormwater runoff prior to the discharge of the runoff through the perforated PVC pipe.

The typical maintenance activities required for the underdrain system are as follows:

With proper maintenance of the grassed areas, there should be a minimum amount of maintenance required on the underdrain system. Generally the only maintenance performed on the underdrain system is jet-vac cleaning in the event it becomes clogged.

GB-GS-2.3.4 Grade Control Level Spreader

Grass swales installed in areas with steep longitudinal slopes often necessitate the use of grade control checks or drop structures. Grade control structures are typically either concrete walls or rip rap structures that serve to provide a reinforced drop at specific locations in the channel, reducing the longitudinal slope between the control structures.

Level Spreaders are installed on the upstream of grass buffers to evenly distribute flows along the design length. Level spreaders may consist of slotted curbing, modular block porous pavement, level walls or other spreader devices.

The typical maintenance activities required for grade control structures and level spreaders are as follows:

a. Erosion present – Grade control structures and level spreaders are provided to reduce the potential for erosion of the grassed swale or buffer areas. Erosion within the vicinity of the control structure or level spreader indicates the structure is not functioning as intended and requires maintenance to prevent future erosion and damage. Or, review the original design if erosion becomes chronic.

b. Structural damage – Structural damage can occur at anytime along the life of the facility. Typically, structural damage occurs with the deterioration of concrete, including cracking, spalling or settling and the erosion and deterioration of the riprap structures. Level spreaders may settle unevenly creating low areas, which concentrate the flows. Partial or full replacement may be required depending on the extent of the damage.

GB-GS-2.3.5 Irrigation

Grass Buffers and Grass Swales depend on healthy, dense turf grass to function, and therefore require an irrigation system, to provide a consistent water supply. Typically, the condition of the grass cover will provide evidence of the effectiveness and maintenance needs of the irrigation system.

The typical maintenance activities required for irrigation systems are as follows:
Irrigation systems will generally require routine periodic maintenance and

adjustment to ensure proper amounts of water are being applied given the weather conditions, and that they are providing coverage to all areas of the grass to eliminate bare spots.

GB-GS-2.3.6 Miscellaneous

There are a variety of inspection/maintenance issues that may not be attributed to a single feature within the GB-GS. This category on the inspection form is for maintenance items commonly found in the GB-GS, but may not be attributed to an individual feature.

a. Encroachment in Easement Area – The El Paso County requires GB-GS be located in tracts or drainage easements. Property owners may not place landscaping, trash, fencing, or other items within the easement area that may adversely affect maintenance or the operation of the facility.

b. Public Hazards – Public hazards include items such as containers of unknown/suspicious substances, and exposed metal/jagged concrete on structures. **If any unknown/suspicious hazard is found within the facility area that poses an immediate threat to public safety, call 911 immediately.**

c. Burrowing Animals/Pests– Prairie dogs and other burrowing rodents may cause damage to the GB-GS features and negatively affect the vegetation within the GB-GS.

d. Other – Any miscellaneous inspection/maintenance items not contained on the form should be entered here.

GB-GS-2.4 Inspection Forms

GB-GS Inspection forms are located in Appendix D. Inspection forms shall be completed by the person(s) conducting the inspection activities. Each form shall be reviewed and submitted by the property owner or property manager to the El Paso County per the requirements of the Inspection and Maintenance Plan. These inspection forms shall be kept indefinitely and made available to the El Paso County upon request

GB-GS-3 MAINTAINING GRASS BUFFERS & GRASS SWALES (GB-GS)

GB-GS-3.1 Maintenance Personnel

Maintenance personnel must be experienced to properly maintain GB-GSs. Inadequately trained personnel can cause additional problems resulting in additional maintenance costs.

GB-GS-3.2 Equipment

It is imperative the appropriate equipment and tools are taken to the field with the operations crew. The types of equipment/tools will vary depending on the task at hand. Below is a basic list of tools, equipment, and material(s) that may be necessary to perform maintenance on a GB-GS:

- 1.) Mowing Tractors
- 2.) Trimmers (extra string)
- 3.) Shovels
- 4.) Rakes
- 5.) All Surface Vehicle (ASVs)
- 6.) Engineers Level (laser)
- 7.) Erosion Control Blanket(s)
- 8.) Mulch
- 9.) Sod or Seed (See seed mix in the *Rules and Regulations Regarding Stormwater (Quality) Discharge for Construction Activities*, Std Det. SM, Seeding & Mulching)
- 10.) Illicit Discharge Cleanup Kits
- 11.) Trash Bags
- 12.) Jet-Vac Equipment
- 13.) Stormwater Facility Inspection and Maintenance Plan

Some of the items identified above may not be needed for every maintenance operation. However, this equipment should be available to the maintenance operations crews should the need arise.

GB-GS-3.3 Maintenance Forms

The GB-GS Maintenance Form provides a record of each maintenance operation performed by maintenance contractors. The GB-GS Maintenance Form shall be filled out in the field after the completion of the maintenance operation. Each form shall be reviewed and submitted by the property owner or property manager to the El Paso County per the requirements of the Inspection and Maintenance Plan. The GB-GS Maintenance form is located in Appendix E.

GB-GS-3.4 Maintenance Categories and Activities

A typical GB-GS Maintenance Program will consist of three broad categories of work: Routine, Minor and Major. Within each category of work, a variety of maintenance activities can be performed on a GB-GS. A maintenance activity can be specific to each feature within the GB-GS, or general to the overall facility. This section of the SOP explains each of the categories and briefly describes the typical maintenance activities for a GB-GS.

A variety of maintenance activities are typical of GB-GSs. The maintenance activities range in magnitude from routine trash pickup to the reconstruction of the GB-GS or underdrain system. Below is a description of each maintenance activity, the objectives, and frequency of actions.

GB-GS-3.5 Routine Maintenance Activities

The majority of this work consists of scheduled mowing, trash and debris pickups and landscape care for the GB-GS during the growing season. It also includes activities such as weed control. These activities normally will be performed numerous times during the year. These items do not require any prior approval by the El Paso County, however, completed inspection and maintenance forms shall be submitted to the El Paso County for each inspection and maintenance activity in accordance with the Inspection and Maintenance plan.

The Routine Maintenance Activities are summarized below, and further described in the following sections.

**Table GB-GS-2
Summary of Routine Maintenance Activities**

Maintenance Activity	Minimum Frequency	Indication Action is Needed:	Maintenance Action
Trash/Debris Removal	Twice annual and before mowing	Trash & debris in GB-GS	Remove and properly dispose of trash and debris
Mowing	Routine – as necessary to maintain 2” – 4” grass height	Excessive grass height/aesthetics	2”-4” grass height for turf grass; 4” to 6” for native grass
Irrigation (Automatic)	Three times annually	Areas of insufficient or excess watering; broken or missing parts	SPRING: start up system; test for even coverage and correct timer settings SUMMER: test for even coverage and correct timer settings FALL: drain and winterized system (follow watering regulations)
Irrigation (Not Automatic)	As needed to maintain healthy grass	Areas of insufficient or excess watering	Water as needed to maintain healthy grass; (follow watering regulations)
Weed Control	Minimum twice annually	Noxious weeds; Unwanted vegetation	Treat w/herbicide or hand pull; consult a local Weed Inspector
Mosquito Treatment	As needed, based upon inspections	Standing water/ mosquito habitat	Perform maintenance to eliminate standing water*; Treat w/ EPA approved chemicals
Level Spreader (Grass Buffer only)	As needed, based upon inspections	Evidence of uneven flow/localized erosion	Look for cause; repair, fill or revegetate areas of erosion
Rodent Damage	As needed, based upon inspections	Holes, small piles of dirt, raised burrows	Evaluate damage; contact Parks Dept. or Division of Wildlife for guidance

*See Section GB-GS-2.3.1d for further discussion

GB-GS-3.5.1 Trash/Debris Removal

Trash and debris must be removed from the GB-GS area to allow for proper functioning and to improve aesthetics. This activity must be performed prior to mowing operations.

Frequency – Routine – Prior to mowing operations and a minimum of twice annually.

GB-GS-3.5.2 Mowing

Routine mowing of the turf grass embankments is necessary to maintain an appropriate grass height and to improve the overall appearance of the GB-GS. Turf grass should be mowed to a height of 2 to 4- inches (4 – 6- inches for native grass) and shall be bagged to prevent potential contamination of the filter media, especially if there is an underdrain system.

Frequency – Routine – as necessary to maintain grass height.

GB-GS-3.5.3 Irrigation

Irrigation systems should be maintained in proper working order to provide an adequate water supply to support the grass cover. When automatic irrigation systems are not available, alternate methods for providing a water supply during times of drought must be provided.

Automatic irrigation systems should be maintained routinely throughout the growing season to ensure that they are providing the appropriate amounts of water, and are providing complete coverage of the area. Sprinkler heads should be adjusted as necessary, and checked for broken or missing parts.

Frequency - Routine as needed throughout the growing season, plus the following:

SPRING: Start up the system and test for even coverage and correct timer settings.

SUMMER: Test for even coverage and correct timer settings.

FALL: Drain and winterize the system.

GB-GS-3.5.4 Weed Control

Noxious weeds and other unwanted vegetation must be treated as needed throughout the GB-GS. This activity can be performed either through mechanical means (mowing/pulling) or with herbicide. Consultation with a local Weed Inspector is highly recommended prior to the use of herbicide. Herbicides should be utilized sparingly and as a last resort. All herbicide applications should be in

accordance with the manufacturer's recommendations.

Frequency – Routine – As needed based upon inspections.

GB-GS-3.5.5 Mosquito Treatment

GB-GS facilities are intended to drain, and should not have areas of standing water which creates mosquito habitat. Causes of the standing water or boggy conditions should be investigated and remediated as necessary to eliminate the standing water. Only EPA approved chemicals should be applied in accordance with the recommendations of the manufacturer. See Section GB-GS-2.3.1d.

Frequency – As needed based upon inspections.

GB-GS-3.5.6 Level Spreader (Grass Buffer only)

Evidence of uneven flow and localized erosion downstream of the level spreader indicates the flow is not evenly distributed along the length of the spreader. Areas of erosion should be repaired, filled and revegetated. Causes for the erosion should be investigated and repaired.

Frequency – As needed based upon inspections.

GB-GS-3.5.7 Rodent Damage

Small holes, piles of dirt, and raised burrows are evidence of rodent damage. Damaged areas should be repaired and revegetated. Consultation with an animal control specialist or the Division of Wildlife may be required for persistent problems.

Frequency – As needed based on inspections.

GB-GS-3.6 Minor Maintenance Activities

This work consists of a variety of isolated or small-scale maintenance/operational problems. Most of this work can be completed by a small crew, hand tools, and small equipment. These items require approval by the El Paso County. Completed inspection and maintenance forms shall be submitted to the El Paso County for each inspection and maintenance activity.

**Table GB-GS-3
Summary of Minor Maintenance Activities**

Maintenance Activity	Minimum Frequency	Indication Action is Needed:	Maintenance Action
Sediment Removal	As needed.	Sediment build-up.	Remove and properly dispose of sediment
Erosion Repair	As needed, based upon inspection	Rills and gullies forming on slopes and other areas	Repair eroded areas & revegetate; address cause
Vegetation Removal	As needed, based upon inspection	Trees, willows, shrubs impeding flow	Remove vegetation; restore correct grade and surface
Revegetation	As needed, based upon inspection	Areas without grass	Replace grass by sodding or seeding
Irrigation (Automatic)	As needed, based upon inspection.	Evidence of broken or missing parts	Replace parts and test system
Level Spreader (Grass Buffer Only)	As needed, based upon inspection.	Evidence of uneven flow; erosion; or rills/gullies	Repair sections of level spreader and address cause
Fertilization or Soil Amendment	As needed, minimize fertilization	Grass with pale color; areas with poor grass growth not due to irrigation problems	Consult with turf specialist; Test soil
Vehicle Tracks (Along Roadways)	As needed, based upon inspection	Depressions from vehicle tracks; vegetation damage	Repair and fill depressions; sod or seed damaged areas

GB-GS-3.6.1 Sediment Removal

Sediment removal is necessary to ensure proper function of the grass swale or buffer. Care should be taken when removing sediment to prevent damage to the turf grass and surrounding areas. Excessive amounts of sediment are an indication of upstream erosion or lack of adequate BMPs during construction activities. Causes for contributions of excess sediment should be investigated and addressed.

Frequency – As needed based upon inspections.

GB-GS-3.6.2 Erosion Repair

The repair of eroded areas is necessary to ensure the proper functioning of the GB-GS, to minimize sediment transport, and to reduce potential impacts to other features. Erosion can vary in magnitude from minor repairs to vegetation and embankments, to rills and gullies in the embankments and inflow points. The repair of eroded areas may require the use of excavators, riprap, new poured-in-

place concrete, and sod. Extreme care should be taken when utilizing motorized or heavy equipment to ensure damage to the underdrain system, if present, does not occur. Major erosion in a GS-GB is generally the result of excessive velocities caused by steep slopes. It may be necessary to make design improvements to the swale or buffer when erosion becomes a major maintenance item.

Frequency – As necessary, based upon inspections.

GB-GS-3.6.3 Vegetation Removal

Weeds, Shrubs, Willows and other unwanted vegetation that develops in the grass swale or buffer area may impede the flow and cause standing water or back flow problems. It is necessary to remove unwanted vegetation as soon as it appears. Remove the unwanted vegetation, and restore the correct grade. Revegetate with seed or sod. Supplement irrigation as needed until new vegetation is sufficiently established.

Frequency – As necessary, based upon inspections.

GB-GS -3.6.4 Revegetation

Bare areas should be repaired as soon as possible. Repair bare areas with appropriate grass seed or sod. Supplement irrigation as needed until new vegetation is sufficiently established. Causes of the problem, such as inadequate water supply or diseased grasses, should be investigated and resolved.

Frequency – As necessary, based upon inspections.

GB-GS-3.6.5 Irrigation (Automatic)

Irrigation systems require routine maintenance in accordance with the manufacturer's recommendations (valves, timer, etc.), and maintenance of the pipe and heads to ensure even coverage is being applied, and there are no missing or broken parts. Timing systems should be checked to verify the correct amount of water is being applied to the grassed areas for the seasonal conditions.

Frequency – As necessary, based upon inspections.

GB-GS-3.6.6 Level Spreader

Level Spreaders that are no longer level, or have developed damaged areas of cracking or spalling, allow flows to concentrate in these depressed areas instead of being distributed over the length of the structure. Also, build up of grasses

along the edge of the spreader may create an uneven flow distribution. Rills, gullies and other erosion that develop downstream of level spreaders should be repaired and reseeded or sodded. Causes of the erosion should be investigated and addressed.

Frequency – As necessary, based upon inspections.

GB-GS-3.6.7 Fertilization/Soil Amendment

Grass Buffers and Swales rely on healthy, dense turf in order to function properly. Grasses that appear to be diseased, dying or unhealthy may require amendments. Fertilizers should be applied in the minimum amounts recommended by the manufacturer. Check for insect infestation also.

Frequency – As necessary, based upon inspections.

GB-GS-3.6.8 Vehicle Tracks

GB-GSs adjacent to roadway sections or drive aisles in parking lots may be damaged by vehicle tracks. Rutted areas should be filled in and revegetated as soon as possible. Frequent problems associated with vehicle traffic (such as around corners) may require a barrier or sign to avoid vehicular traffic within the grassed areas.

Frequency – As necessary, based upon inspections.

GB-GB-3.7 Major Maintenance Activities

This work consists of larger maintenance/operational problems and failures within the stormwater management facilities. All of this work requires consultation with the El Paso County Water Staff to ensure the proper maintenance is performed. This work requires the El Paso County Water and Engineering Staff review the original design and construction drawings to assess the situation before approval of the proposed maintenance. This work may also require more specialized maintenance equipment, design/details, submittal of plans to the El Paso County for review and approval, surveying, or assistance through private contractors and consultants.

**Table GB-GS-4
Summary of Major Maintenance Activities**

Maintenance Activity	Minimum Frequency	Look for:	Maintenance Action
Major Sediment/Pollutant Removal	As needed – based upon scheduled inspections	Large quantities of sediment	Remove and dispose of sediment. Repair vegetation as needed
Major Erosion Repair	As needed – based upon scheduled inspections	Severe erosion including gullies, excessive soil displacement, areas of settlement, holes	Repair erosion – find cause of problem and address to avoid future erosion
Structural Repair	As needed – based upon scheduled inspections	Deterioration and/or damage to structural components – level spreader, grade control structures, irrigation components, and ponding water.	Structural repair to restore the structure to its original design
GB-GS Rebuild	As needed – due to complete failure of BMP	Removal of filter media and underdrain system	Contact El Paso County Water Staff

GB-GS-3.7.1 Major Sediment/Pollutant Removal

Major sediment removal consists of removal of large quantities of pollutants/sediment /landscaping material. Stormwater sediments removed from GB-GSs do not meet the regulatory definition of “hazardous waste”. However, these sediments can be contaminated with a wide array of organic and inorganic pollutants and handling must be done with care to insure proper removal and disposal. Sediments should be transported by motor vehicle only after they are dewatered. All sediments must be taken to a licensed landfill for proper disposal. Should a spill occur during transportation, prompt and thorough cleanup and disposal is imperative. Vegetated areas need special care to ensure design volumes and grades are preserved or may need to be replaced due to the removal activities.

Frequency – Non-routine – Repair as needed, based upon inspections.

GB-GS-3.7.2 Major Erosion Repair

Major erosion repair consists of filling and revegetating areas of severe erosion. Determining the cause of the erosion as well as correcting the condition that caused the erosion should also be part of the erosion repair. Care should be given to ensure design grades and volumes are preserved.

Frequency – Non-routine – Repair as needed, based upon inspections.

GB-GS-3.7.3 Structural Repair

A GB-GS generally includes level spreader and grade control structure that can deteriorate or be damaged during the service life of the facility. These structures are constructed of steel and concrete that can degrade or be damaged and may need to be repaired or re-constructed from time to time. Major repairs to structures may require input from a structural engineer and specialized contractors. Consultation with the El Paso County Water and Engineering Staff shall take place prior to all structural repairs.

Frequency – Non-routine – Repair as needed, based upon inspections.

GB-GS-3.7.4 GB-GS Rebuild

In very rare cases, a GB-GS may need to be rebuilt. Generally, the need for a complete rebuild is a result of improper construction, improper maintenance resulting in structural damage to the underdrain system, if present, or extensive contamination of the GB-GS. Consultation with the El Paso County Water and Engineering Staff shall take place prior to any rebuild project.

Frequency – Non-routine – As needed based upon inspections.

A P P E N D I X D

Inspection Forms



EXTENDED DETENTION BASIN (EDB) INSPECTION FORM

Date: _____

Subdivision/Business Name: _____ Inspector: _____

Subdivision/Business Address: _____

Weather: _____

Date of Last Rainfall: _____ Amount: _____ Inches

Property Classification: Residential Multi Family Commercial Other: _____
(Circle One)

Reason for Inspection: Routine Complaint After Significant Rainfall Event
(Circle One)

INSPECTION SCORING - For each facility inspection item, insert one of the following scores:
0 = No deficiencies identified 2 = Routine maintenance required
1 = Monitor (potential for future problem) 3 = Immediate repair necessary
N/A = Not applicable

FEATURES

1.) Inflow Points

- Riprap Displaced
- Erosion Present/Outfall Undercut
- Sediment Accumulation
- Structural Damage (pipe, end-section, etc.)
- Woody Growth/Weeds Present

2.) Forebay

- Sediment/Debris Accumulation
- Concrete Cracking/Failing
- Drain Pipe/Wier Clogged (not draining)
- Wier/Drain Pipe Damage

3.) Trickle Channel (Low-flow)

- Sediment/Debris Accumulation
- Concrete/Riprap Damage
- Woody Growth/Weeds Present
- Erosion Outside Channel

4.) Bottom Stage (Micro-Pool)

- Sediment/Debris Accumulation
- Woody Growth/Weeds Present
- Bank Erosion
- Mosquitoes/Algae Treatment
- Petroleum/Chemical Sheen

5.) Outlet Works

- Trash Rack/Well Screen Clogged
- Structural Damage (concrete, steel, subgrade)
- Orifice Plate(s) Missing/Not Secure
- Manhole Access (cover, steps, etc.)
- Woody Growth/Weeds Present

6.) Emergency Spillway

- Riprap Displaced
- Erosion Present
- Woody Growth/Weeds Present
- Obstruction/Debris

7.) Upper Stage (Dry Storage)

- Vegetation Sparse
- Woody Growth/Undesirable Vegetation
- Standing Water/Boggy Areas
- Sediment Accumulation
- Erosion (banks and bottom)
- Trash/Debris
- Maintenance Access

8.) Miscellaneous

- Encroachment in Easement Area
- Graffiti/Vandalism
- Public Hazards
- Burrowing Animals/Pests
- Other

Inspection Summary / Additional Comments: _____

OVERALL FACILITY RATING (Circle One)

- 0 = No Deficiencies Identified 2 = Routine Maintenance Required
- 1 = Monitor (potential for future problem exists) 3 = Immediate Repair Necessary

This inspection form shall be kept indefinitely and made available to the City of Aurora upon request.



GRASS BUFFER-GRASS SWALE INSPECTION FORM

Date: _____

Subdivision/Business Name: _____ Inspector: _____

Subdivision/Business Address: _____

Weather: _____

Date of Last Rainfall: _____ Amount: _____ Inches

Property Classification: Residential Multi Family Commercial Other: _____
(Circle One)

Reason for Inspection: Routine Complaint After Significant Rainfall Event
(Circle One)

INSPECTION SCORING - For each facility inspection item, insert one of the following scores:
0 = No deficiencies identified 2 = Routine maintenance required
1 = Monitor (potential for future problem) 3 = Immediate repair necessary
N/A = Not applicable

FEATURES

1.) Grass Swale Bottom & Side Slopes

- Sediment/Debris Accumulation
- Vegetation Cover
- Erosion Present
- Standing Water/Boggy Areas

2.) Grass Buffer

- Sediment/Debris Accumulation
- Vegetation Cover
- Erosion Present
- Standing Water/Boggy Areas

3.) Inflow Points

- Rip Rap Displaced/Rundown or Pipe Damage
- Erosion Present/Outfall Undercut
- Sediment Accumulation

4.) Underdrain System

- Standing water/Not draining
- Evidence of clogged system

5.) Grade Control

- Erosion Present
- Structural Damage

6.) Level Spreader

- Erosion Present
- Structural Damage
- Unlevel/Uneven Distribution of flow

7.) Irrigation

- General Grass Condition
- Bare Spots
- Broken sprinkler heads

8.) Miscellaneous

- Encroachment in Easement Area
- Public Hazards
- Burrowing Animals/Pests
- Other

Inspection Summary / Additional Comments: _____

OVERALL FACILITY RATING (Circle One)

0 = No Deficiencies Identified 2 = Routine Maintenance Required
1 = Monitor (potential for future problem exists) 3 = Immediate Repair Necessary

This inspection form shall be kept indefinitely and made available to the City of Aurora upon request.

A P P E N D I X E

Maintenance Forms



EXTENDED DETENTION BASIN (EDB) MAINTENANCE FORM

Subdivision/Business Name: _____ Completion Date: _____

Subdivision/Business Address: _____ Contact Name: _____

Maintenance Category: Routine Restoration Rehabilitation
(Circle All That Apply)

MAINTENANCE ACTIVITIES PERFORMED

ROUTINE WORK

- MOWING
- TRASH/DEBRIS REMOVAL
- OUTLET WORKS CLEANING (TRASH RACK/WELL SCREEN)
- WEED CONTROL (HERBICIDE APPLICATION)
- MOSQUITO TREATMENT
- ALGAE TREATMENT

RESTORATION WORK

- SEDIMENT REMOVAL
 - FOREBAY
 - TRICKLE CHANNEL
 - INFLOW
- EROSION REPAIR
 - INFLOW POINT
 - TRICKLE CHANNEL
- VEGETATION REMOVAL/TREE THINNING
 - INFLOW(S)
 - TRICKLE CHANNEL
 - UPPER STAGE
 - BOTTOM STAGE
- REVEGETATION
- JET-VAC/CLEARING DRAINS
 - FOREBAY
 - OUTLET WORKS
 - INFLOWS

REHABILITATION WORK

- SEDIMENT REMOVAL (DREDGING)
 - BOTTOM STAGE
 - UPPER STAGE
- EROSION REPAIR
 - OUTLET WORKS
 - UPPER STAGE
 - BOTTOM STAGE
 - SPILLWAY
- STRUCTURAL REPAIR
 - INFLOW
 - OUTLET WORKS
 - FOREBAY
 - TRICKLE CHANNEL

OTHER _____

ESTIMATED TOTAL MANHOURS: _____

EQUIPMENT/MATERIAL USED: _____

COMMENTS/ADDITIONAL INFO: _____

This Maintenance Activity Form shall be kept indefinitely and made available to the City of Aurora upon request.



**GRASS BUFFERS AND GRASS SWALES
(GB-GS)
MAINTENANCE FORM**

Subdivision/Business Name: _____ Completion Date: _____

Subdivision/Business Address: _____ Contact Name: _____

Maintenance Category: Routine Restoration Rehabilitation
(Circle all that apply)

MAINTENANCE ACTIVITIES PERFORMED

ROUTINE WORK

- MOWING
- TRASH/DEBRIS REMOVAL
- OUTLET WORKS CLEANING (TRASH RACK/WELL SCREEN)
- WEED CONTROL (HERBICIDE APPLICATION)

RESTORATION WORK

- SEDIMENT REMOVAL
 - INFLOW POINT
 - SWALE BOTTOM
 - SIDE SLOPE
 - BUFFER STRIP
- EROSION REPAIR
 - INFLOW POINT
 - SWALE BOTTOM
 - SIDE SLOPE
 - BUFFER STRIP
 - GRADE CONTROL/LEVEL SPREADER
- REVEGETATION
 - SWALE BOTTOM
 - SIDE SLOPE
 - BUFFER STRIP

REHABILITATION WORK

- SEDIMENT REMOVAL (DREDGING)
 - SWALE BOTTOM
 - INFLOW POINT
- EROSION REPAIR
 - INFLOW POINT
 - SWALE BOTTOM
 - SIDE SLOPE
 - BUFFER STRIP
- STRUCTURAL REPAIR
 - INFLOW
 - UNDERDRAIN
 - LEVEL SPREADER

OTHER _____

ESTIMATED TOTAL MANHOURS: _____

EQUIPMENT/MATERIAL USED: _____

COMMENTS/ADDITIONAL INFO: _____

This Maintenance Activity Form shall be kept indefinitely and made available to the City of Aurora upon request.

A P P E N D I X F

Annual Inspection and Maintenance Reporting Form

Annual Inspection and Maintenance Reporting Form
for
Stormwater Facilities

(This form shall be submitted to the El Paso County prior to May 31 of each year along with the Inspection Forms and Maintenance Forms as required for the property/subdivision)

Date: _____

**To: El Paso County
Department of Public Works
Attn: Stormwater Division
3275 Akers Drive
Colorado Springs, Colorado 80922**

Re: Certification of Inspection and Maintenance; Submittal of forms

Property/Subdivision Name: _____

Property Address: _____

Contact Name: _____

I verify that the required stormwater facility inspections and required maintenance have been completed in accordance with the Stormwater Facilities Maintenance Agreement and the Inspection and Maintenance Plan associated with the above referenced property.

The required Stormwater Facility Inspection and Maintenance forms are hereby provided.

Name of Party Responsible for Inspection
& Maintenance

Property Owner

Authorized Signature

Signature

A P P E N D I X G

Inspection and Maintenance Site Plan(s)

Check Lists

Facilities Map Checklist

EDB Checklist

GB-GS Checklist

**INSPECTION AND MAINTENANCE SITE PLANS
STORMWATER FACILITIES MAP
CHECKLIST FOR REQUIRED ITEMS**

Stormwater facilities map shall include:

- Labels for all streets (includes line work for edge of street and street name)
- Line work for right-of-way lines, lot lines, and tracts
- Line work and labels for all major drainage ways
- Label roadways, developments, etc adjacent to project site
- Labels for all BMPs being constructed on project site including a summary table when multiple BMPs are present
- Legend for identifying features/line types on drawing (optional)

INSPECTION AND MAINTENANCE SITE PLANS EXTENDED DETENTION BASIN (EDB) CHECKLIST FOR REQUIRED ITEMS

PLAN AND PROFILE SHEET

Plan view shall include:

- Location and labels for all major features of EDB (inflow structure(s), forebay, micro-pool, trickle channel, access road, outlet work(s), spillway, maintenance access ramps, embankment, etc.)
- Contours
- Other utilities in vicinity of EDB
- Cross-reference to EDB Operation and Maintenance Details sheet
- Line work for right-of-way lines, lot lines, easements, and tracts
- Hatch indicating permanent water elevation in micro-pool.

Profile view shall include:

- Location and labels for all major features of EDB (inflow structure(s), forebay, micro-pool, trickle channel, access road, outlet work(s), spillway, maintenance access ramps, embankment, etc.)
- Invert elevations at major features of EDB (inflow structure(s), forebay, micro-pool, outlet work(s))
- Permanent pool elevation of micro-pool
- Water quality water surface elevation
- Water surface elevation of all applicable storm events
- Label for upper and bottom stages for EDB

DETAIL SHEET

Detail sheet shall include:

- Volume provided by the EDB forebay and micro-pool, including the WQCV
- WQCV drain time
- Seed mix
- Total mow area including approximate mow boundaries on each side of EDB
- Duplicate the following tables from the "Standard Operation Procedure for Extended Detention Basin Inspection and Maintenance" document:
 - Inspection and Maintenance Requirements at Specific EDB Features

- Summary of Routine Maintenance Activities for an EDB
 - Summary of Minor Maintenance Activities for an EDB
 - Summary of Major Maintenance Activities for an EDB
- Water quality outlet works detail
- Water quality plate detail
- Maintenance access road detail
- Trickle channel typical section
- Forebay edge detail (or cross section) which includes maximum allowed sediment depth in forebay
- Forebay release structure detail
- Spillway detail(s), including cutoff wall

**INSPECTION AND MAINTENANCE SITE PLANS
GRASS SWALES/GRASS BUFFERS (GS/GB)
CHECKLIST FOR REQUIRED ITEMS**

PLAN SHEET

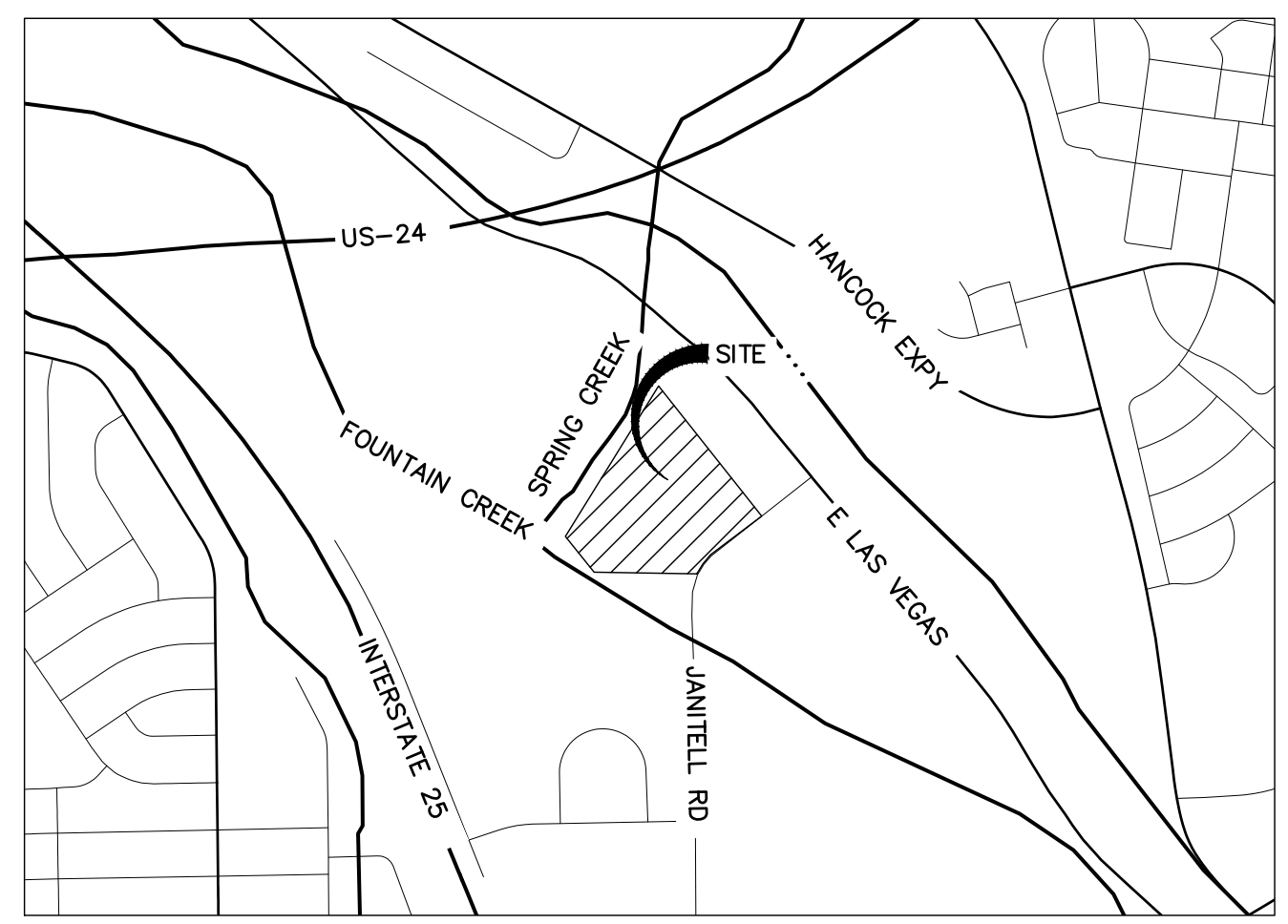
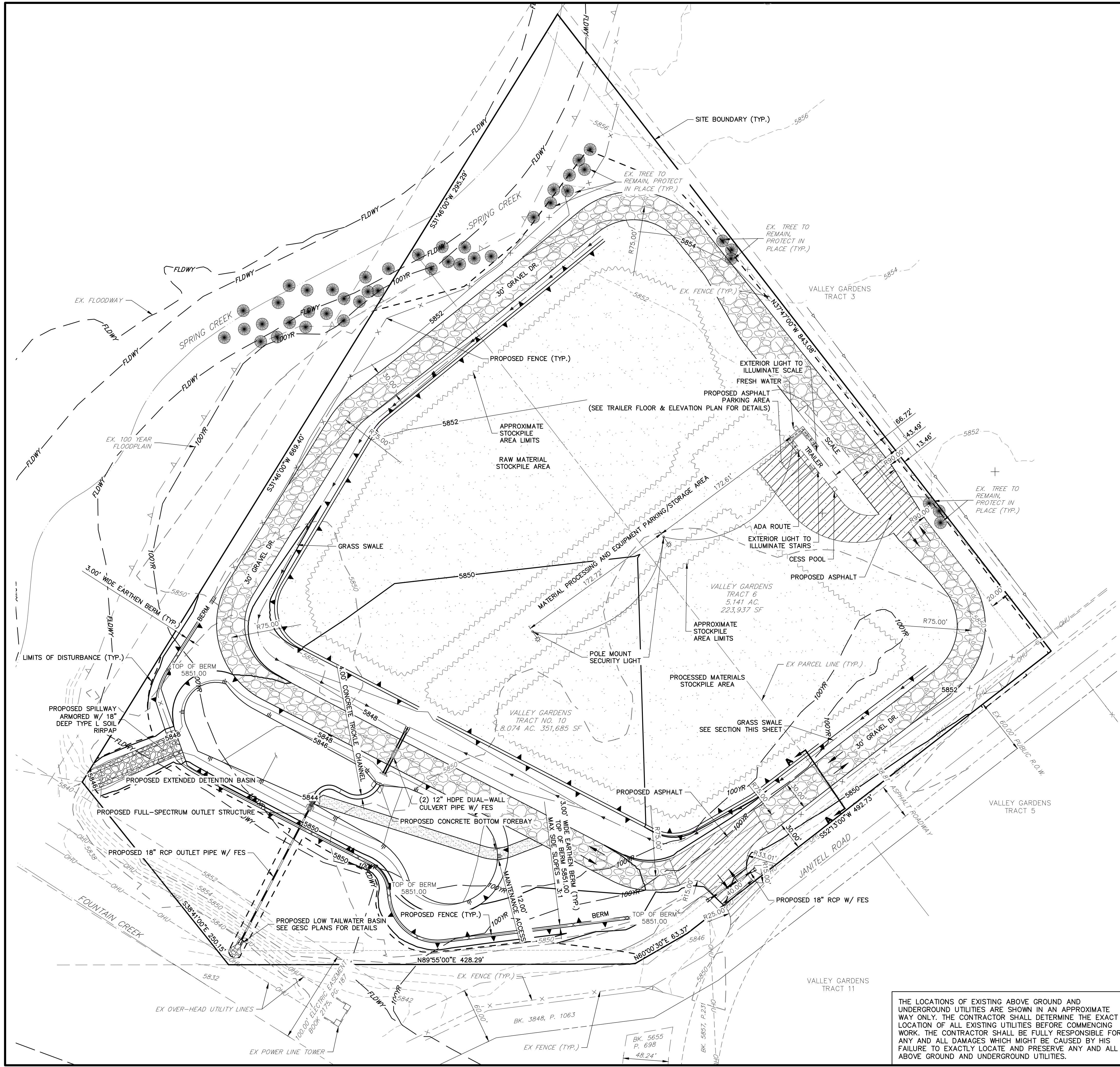
Plan view shall include:

- Location of grass swale(s) and/or buffer(s)
- Contours
- Line work for right-of-way lines, lot lines, easements, and tracts
- Labels for streets adjacent to grass swale(s)/buffer(s)
- Line work for all storm sewer structures
- Cross-reference to Grass Swale/Buffer Operation and Maintenance Details sheet

DETAIL SHEET

Detail sheet shall include:

- Duplicate the following tables from the “Standard Operation Procedure for Grass Swales/Grass Buffers Inspection and Maintenance” document:
 - Typical Inspection and Maintenance Requirements Matrix
 - Summary of Routine Maintenance Activities
 - Summary of Minor Maintenance Activities
 - Summary of Major Maintenance Activities
- Typical grass swale and/or buffer section including typical horizontal and vertical dimensions, side slopes, subgrade material, and underdrain (if applicable).
- Underdrain details (if applicable) including trench dimensions, perforated PVC dimensions, and trench fill material.



VICINITY MAP
SCALE: NTS

OWNER
 ASPHALT CONCRETE RECYCLING, LLC
 PERRY HASTINGS, MANAGER
 2350 FRANCEVILLE COAL MINE RD
 COLORADO SPRINGS, CO 80929

LEGAL DESCRIPTION:
 A PORTION OF THIS SITE WITHIN THE 100-YEAR FLOOD PLAIN PER FEMA MAP NO. 08041C741 G, DATED DECEMBER 07, 2018

TITLE INFORMATION WAS PROVIDED BY THE CLIENT AS FOLLOWS:
 TITLE COMPANY: LAND TITLE GUARANTEE COMPANY
 COMMITMENT NO: SC55079047
 EFFECTIVE DATE: 11-01-2019
 THIS SURVEY DOES NOT CONSTITUTE A TITLE SEARCH OR OPINION

UNITS OF MEASUREMENT: US SURVEY FEET

ADDRESS: JANITELL RD

ZONE: M
 INDUSTRIAL
 FRONT SETBACK (JANITELL) = 15'
 REAR SETBACK (NORTH) = 20'
 SIDE SETBACK (NORTH WEST) = 0'

ASSESSORS PARCEL NO: 6429101011 & 6428201008

FLOODPLAIN:
 A PORTION OF THIS SITE WITHIN THE 100-YEAR FLOOD PLAIN PER FEMA MAP NO. 08041C741 G, DATED DECEMBER 07, 2018

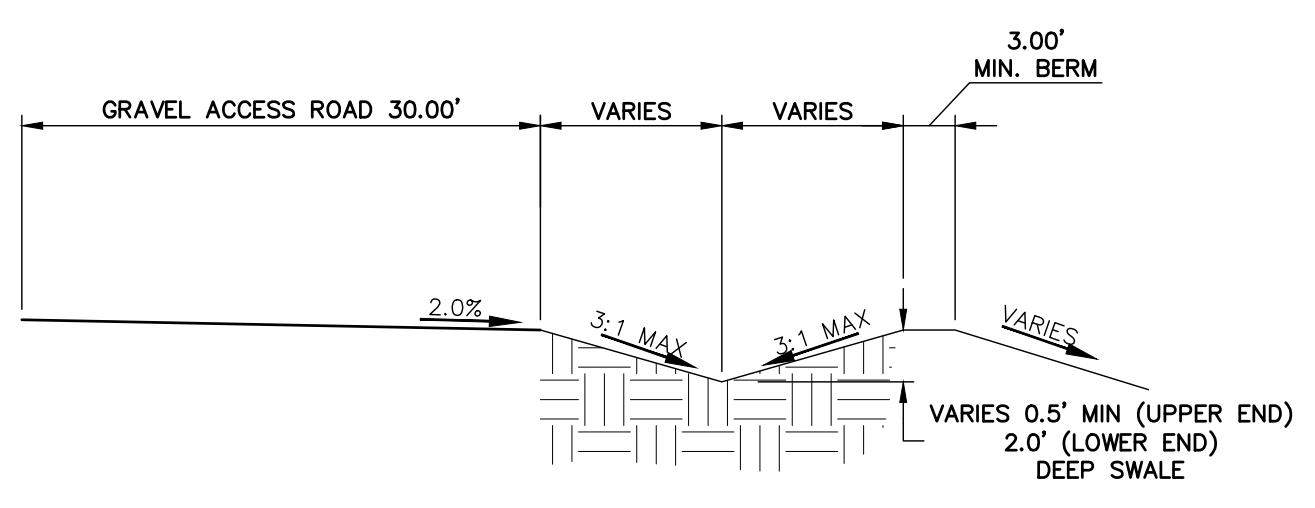
USE(S):
 RECYCLED ASPHALT & CONCRETE PROCESSING & SALES

DEVELOPMENT TIME TABLE:
 SPRING 2020

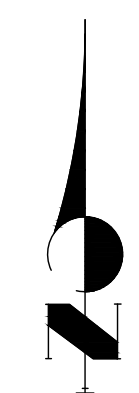
AREA:	AREA (SF)	PERCENT
OVERALL:	575,628 SF	100%
TEMPORARY TRAILER:	750 SF	0.10%
GRAVEL:	62,691 SF	10.6%
LANDSCAPE:	496,447 SF	86.6%
ASPHALT:	15,740 SF	2.7%

- SITE NOTES:**
1. ALL PARKING AND DRIVEWAY AREAS TO MEET H-20 LOAD SPECS WITH GRAVEL ON CRUSHED ASPHALT OR ASPHALT WHERE SHOWN
 2. CISTERN AND CESSPOOL TO BE UTILIZED. FOR WATER AND SEWER TO TEMPORARY TRAILER. LOCATIONS WHERE SHOWN ON PLAN
 3. EXISTING TEMPORARY OFFICE TRAILER TO REMAIN. AS SHOWN ON PLANS
 4. GRADING FOR THIS SITE SHALL CONFORM TO THE COUNTY APPROVED GRADING PLAN, 11/11/2019
 5. ALL LIGHT STANDARDS ARE TO BE SHIELDED SO AS TO CONTAIN THE ILLUMINATION ON SITE. THE FIXTURE SHALL BE A FULL CUTOFF DESIGN WITH NO SAG LENSES PERMITTED.
 6. WAIVER REQUESTED SUBMITTED FOR SCREENING ON SOUTH SIDE ALONG JANITELL. IT BORDERS EXISTING INDUSTRIAL USES AND ARE THEREFORE UNNECESSARY. THERE IS AN EXISTING AND PROPOSED 6" CHAIN LINK FENCE (6'CLF); SHOWN ON THE PLANS THAT RUNS THE LENGTH OF SAID PROPERTY LINES.
 7. FOR ACCESS, OWNER TO USE EXISTING DRIVEWAY. WILL RESULT IN LESS THAN 50 TRIPS PER HOUR/400 TRIPS PER DAY.
 8. MAX HEIGHT OF THE STOCK PILES 50'
 9. THE PARTIES RESPONSIBLE FOR THIS PLAN HAVE FAMILIARIZED THEMSELVES WITH ALL CURRENT ACCESSIBILITY CRITERIA AND SPECIFICATIONS AND THE PROPOSED PLAN REFLECTS ALL SITE ELEMENTS REQUIRED BY THE APPLICABLE ADA DESIGN STANDARDS AND GUIDELINES AS PUBLISHED BY THE UNITED STATES DEPARTMENT OF JUSTICE. APPROVAL OF THIS PLAN BY EL PASO COUNTY DOES NOT ASSURE COMPLIANCE WITH THE ADA OR ANY REGULATIONS OR GUIDELINES ENACTED OR PROMULGATED UNDER OR WITH RESPECT TO SUCH LAWS.

SITE DRAINAGE:
 DRAINAGE WILL CONFORM TO THE COUNTY APPROVED DRAINAGE LETTER



TYPICAL DIVERSION DITCH
 CROSS SECTION
 A-A
 NTS



50 25 0 50 100
 ORIGINAL SCALE: 1" = 50'



THE LOCATIONS OF EXISTING ABOVE GROUND AND UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL ABOVE GROUND AND UNDERGROUND UTILITIES.

UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE AGENCIES, OR ENGINEERING APPROVES THEIR USES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ACR SITE DEVELOPMENT
 705 CRESTFIELD GROVE
 COLORADO SPRINGS, CO 80906
 DUANE HAYS
 (719) 338-9902
 DUANE@HAYSCOMPANY.NET

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 A Western Company
 Centennial 303-740-9888 • Colorado Springs 719-588-2883
 Fort Collins 970-491-9888 • www.jrengineering.com

BY	DATE	REVISION

H-SCALE 1"=50'
 V-SCALE N/A
 DATE 05-21-20
 DESIGNED BY RB
 DRAWN BY JEA
 CHECKED BY

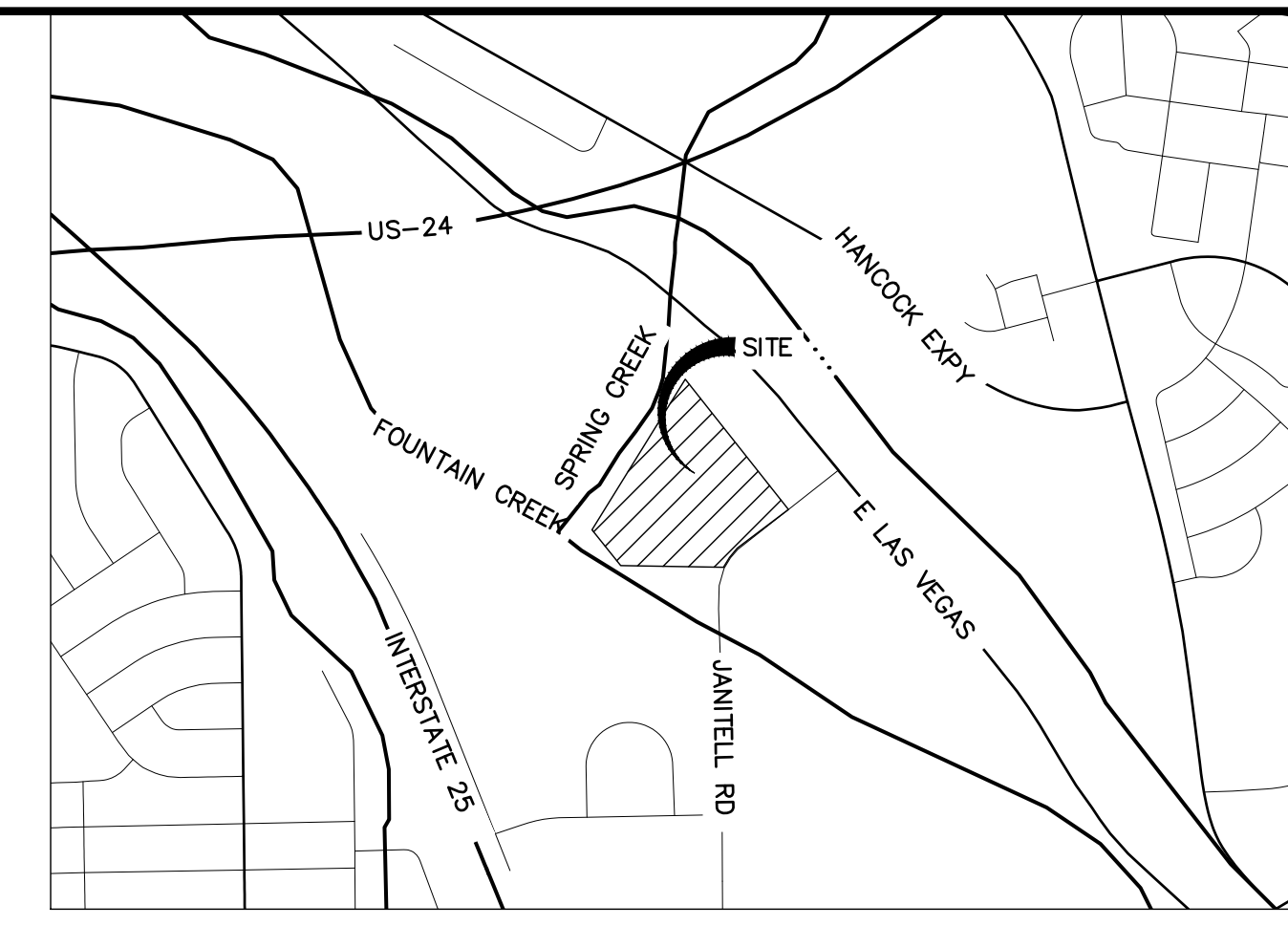
ACR SITE DEVELOPMENT
 PLAN
 SITE PLAN
 PPR-19-052

SHEET 1 OF 1
 JOB NO. 25176.00

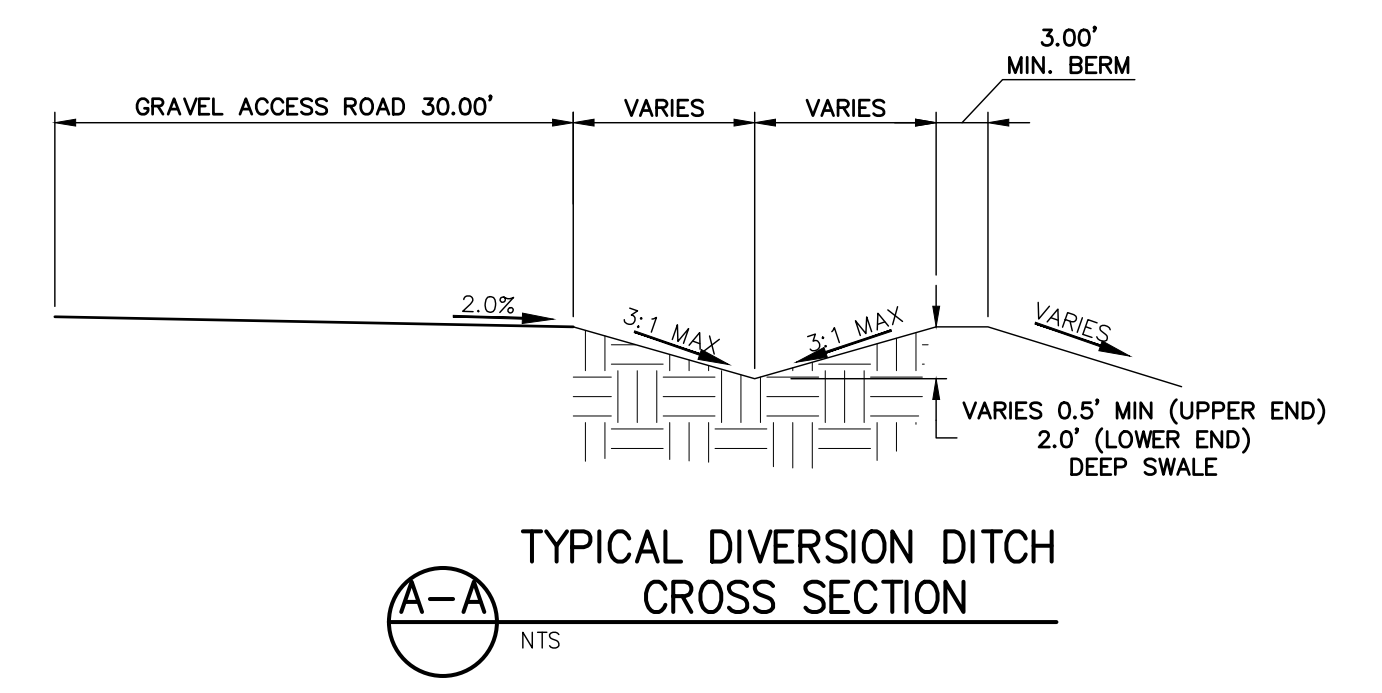
ASPHALT CONCRETE RECYCLING PROPOSED CONDITIONS DRAINAGE MAP

BASIN SUMMARY TABLE							
Tributary Sub-basin	Area (acres)	Percent Impervious	C _s	C ₁₀₀	t _c (min)	Q _s (cfs)	Q ₁₀₀ (cfs)
A	10.89	25%	0.24	0.47	25.3	7.2	23.3
B	2.17	0%	0.08	0.35	6.9	0.8	6.0
C	0.70	3%	0.11	0.37	5.0	0.4	2.3

DESIGN POINT SUMMARY TABLE		
DP	Q _s	Q ₁₀₀
1	7.2	23.3
2	0.8	6.0
3	0.4	2.3



VICINITY MAP
SCALE: NTS

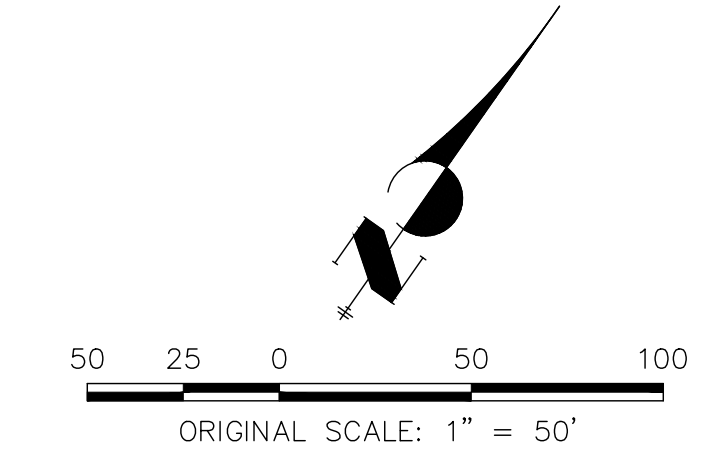
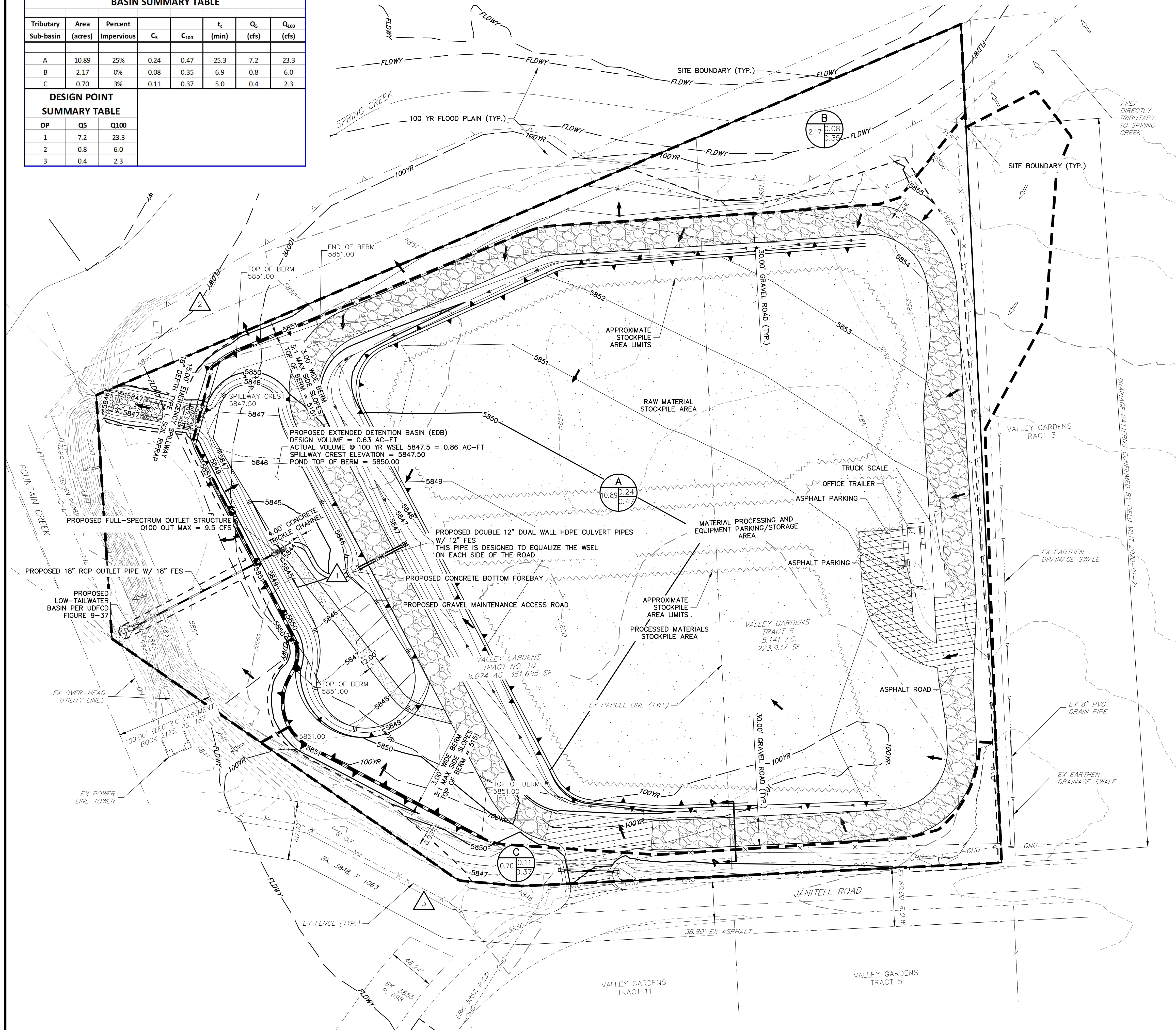


TYPICAL DIVERSION DITCH CROSS SECTION
A-A
NTS

NOTE:
1. SEE GESC PLANS FOR POND STRUCTURE DETAILS

LAYER LINETYPE LEGEND

	EXISTING	PROPOSED
SECTION LINE	---	---
BOUNDARY LINE	---	---
PROPERTY LINE	---	---
EASEMENT LINE	---	---
RIGHT OF WAY	---	---
CENTERLINE	---	---
ELECTRIC	E - - - - E	E - - - - E
FIBER OPTIC	FO - - - - FO	FO - - - - FO
GAS MAIN	G - - - - G	G - - - - G
IRRIGATION MAIN	IRR - - - - IRR	IRR - - - - IRR
OVERHEAD UTILITY	OHU - - - - OHU	OHU - - - - OHU
SANITARY SEWER	S - - - - S	S - - - - S
STORM SEWER	---	---
TELEPHONE	T - - - - T	T - - - - T
WATER MAIN	W - - - - W	W - - - - W
SWALE/WATERWAY FLOWLINE	---	---
INDEX CONTOUR	6100	6100
INTERMEDIATE CONTOUR	6100	6100
DEPRESSION CONT. (INDEX)	6100	6100
DEPRESSION CONT. (INTER)	---	---
CURB & GUTTER	---	---
WALL	---	---
BASIN ID	ID AC C _s Q ₁₀₀	△
DESIGN POINT DESIGNATION	△	△
FLOW DIRECTION (PROPOSED)	→	→
FLOW DIRECTION (EXISTING)	→	→
SUB-BASIN DRAINAGE AREA	---	---



2000-5176.00
ASPHALT CONCRETE RECYCLING
PROPOSED CONDITIONS DRAINAGE MAP
2020-05-21
SHEET 1 OF 1



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GRADING AND EROSION CONTROL STANDARD NOTES

1. 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.
2. 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 VOLUME 2. ANY DEVIATIONS FROM REGULATIONS AND STANDARDS MUST BE REQUESTED, AND APPROVED, IN WRITING.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. FINAL STABILIZATION MUST BE IMPLEMENTED AT ALL APPLICABLE CONSTRUCTION SITES. FINAL STABILIZATION IS ACHIEVED WHEN ALL 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.
9. ALL PERMANENT STORMWATER MANAGEMENT FACILITIES SHALL BE INSTALLED AS DESIGNED IN THE APPROVED PLANS. ANY PROPOSED CHANGES THAT AFFECT THE DESIGN OR FUNCTION OF PERMANENT STORMWATER MANAGEMENT STRUCTURES MUST BE APPROVED BY THE ECM ADMINISTRATOR PRIOR TO IMPLEMENTATION.
10. 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.
11. 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).
12. 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.
13. 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.
14. 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.
15. EROSION CONTROL BLANKETING OR OTHER PROTECTIVE COVERING SHALL BE USED ON SLOPES STEEPER THAN 3:1.
16. 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.
17. 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.
18. TRACKING OF SOILS AND CONSTRUCTION DEBRIS OFF-SITE SHALL BE MINIMIZED. MATERIALS TRACKED OFF-SITE SHALL BE CLEANED UP AND PROPERLY DISPOSED OF IMMEDIATELY.
19. 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.
20. 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 MANNER. ALL MATERIALS STORED ON-SITE SHALL BE STORED IN A NEAT, ORDERLY MANNER, IN THEIR ORIGINAL CONTAINERS, WITH ORIGINAL MANUFACTURER'S LABELS.
21. 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.
22. 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.
23. NO PERSON SHALL CAUSE THE IMPEDIMENT OF STORMWATER FLOW IN THE CURB AND GUTTER OR DITCH EXCEPT WITH APPROVED SEDIMENT CONTROL MEASURES.
24. 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, DCM 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.
25. ALL CONSTRUCTION TRAFFIC MUST ENTER/EXIT THE SITE ONLY AT APPROVED CONSTRUCTION ACCESS POINTS.
26. PRIOR TO CONSTRUCTION THE PERMITTEE SHALL VERIFY THE LOCATION OF EXISTING UTILITIES.
27. 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.
28. THE SOILS REPORT FOR THIS SITE HAS BEEN PREPARED BY ENTECH ENGINEERING INC., DATED JUNE 28TH, 2019 AND SHALL BE CONSIDERED A PART OF THESE PLANS.
29. 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
 WQCD - PERMITS
 4300 CHERRY CREEK DRIVE SOUTH
 DENVER, CO 80246-1530
 ATTN: PERMITS UNIT

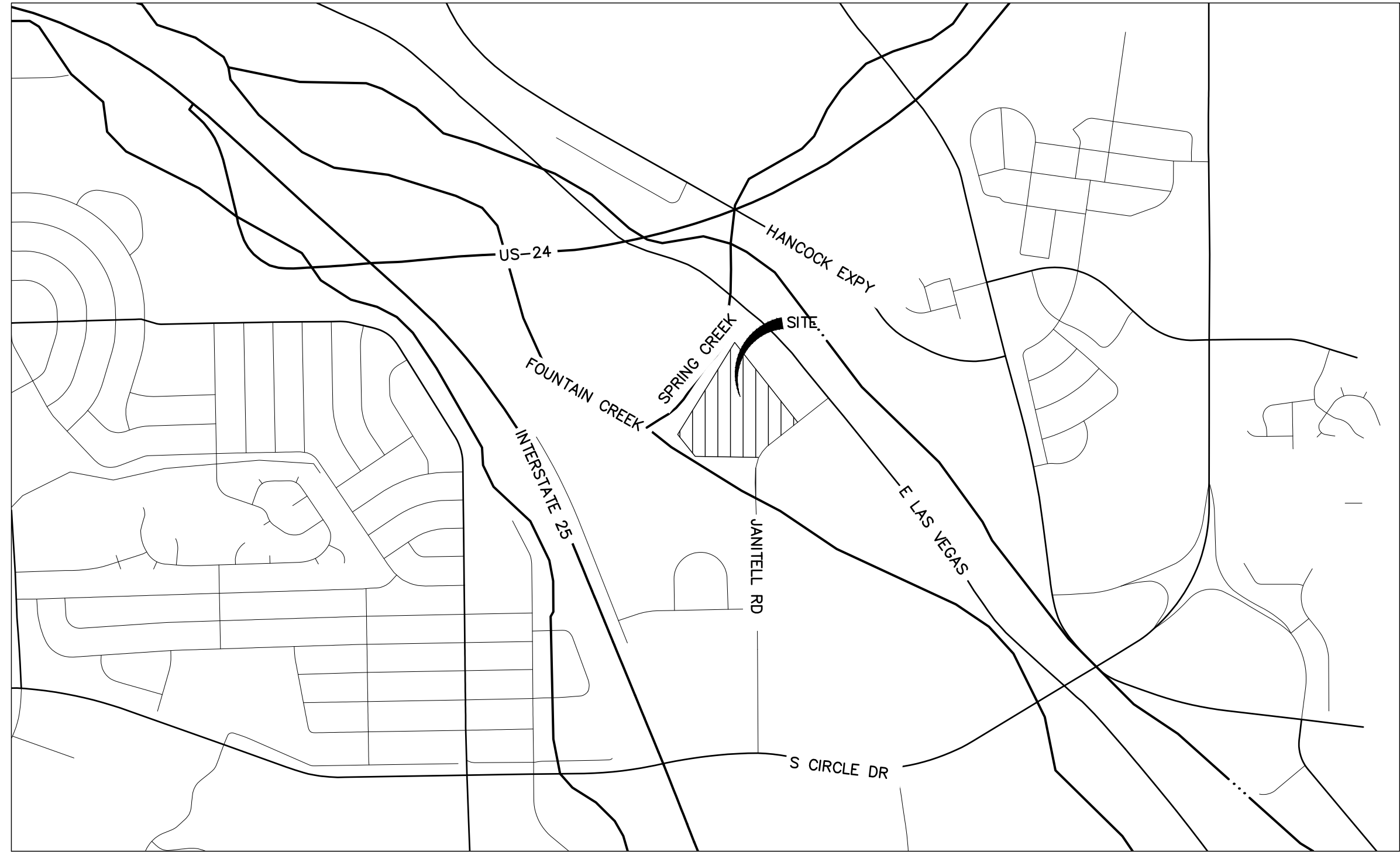
ACR SITE DEVELOPMENT PLAN

TRACT 6 & 10 VALLEY GARDENS SUBDIVISION

CITY OF COLORADO SPRINGS, COUNTY OF EL PASO

STATE OF COLORADO

GRADING AND EROSION CONTROL PLANS



VICINITY MAP
SCALE: 1"=1000'

CONTACTS:

OWNER/DEVELOPER ACR SITE DEVELOPMENT
705 CRESTFIELD GROVE
COLORADO SPRINGS, CO
P~719-338-9902

ENGINEER/SURVEYOR JR ENGINEERING, LLC
ATTN: MIKE A. BRAMLETT
5475 TECH CENTER DRIVE, SUITE 235
COLORADO SPRINGS, CO 80919
P~(303) 267-6240

SHEET INDEX

- | | |
|---------|----------------------------------|
| 1 - | COVER SHEET |
| 2 - | LEGEND |
| 3 - | GRADING AND EROSION CONTROL PLAN |
| 6 - 9 - | DETAILS |

EL PASO COUNTY STATEMENT

COUNTY PLAN REVIEW IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH COUNTY DESIGN CRITERIA. THE COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. THE COUNTY THROUGH THE APPROVAL OF THIS DOCUMENT ASSUMES NO RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.

FILED IN ACCORDANCE WITH THE REQUIREMENTS OF THE EL PASO COUNTY LAND DEVELOPMENT CODE, DRAINAGE CRITERIA MANUAL, VOLUMES 1 AND 2, AND ENGINEERING CRITERIA MANUAL AS AMENDED.

IN ACCORDANCE WITH ECM SECTION 1.12, THESE CONSTRUCTION DOCUMENTS WILL BE VALID FOR CONSTRUCTION FOR A PERIOD OF 2 YEARS FROM THE DATE SIGNED BY THE EL PASO COUNTY ENGINEER. IF CONSTRUCTION HAS NOT STARTED WITHIN THOSE 2 YEARS, THE PLANS WILL NEED TO BE RESUBMITTED FOR APPROVAL, INCLUDING PAYMENT OF REVIEW FEES AT THE PLANNING AND COMMUNITY DEVELOPMENT DIRECTORS DISCRETION.

JENNIFER IRVINE, P.E. DATE

COUNTY ENGINEER/ECM ADMINISTRATOR

ENGINEER'S STATEMENT

THIS GRADING AND EROSION CONTROL PLAN WAS PREPARED UNDER MY DIRECTION AND SUPERVISION AND IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. SAID PLAN HAS BEEN PREPARED ACCORDING TO THE CRITERIA ESTABLISHED BY THE COUNTY FOR GRADING AND EROSION CONTROL PLANS. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPARING THIS PLANS.

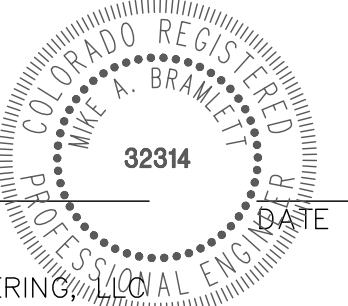
OWNER/DEVELOPER STATEMENT

I, THE OWNER/DEVELOPER HAVE READ AND WILL COMPLY WITH THE REQUIREMENT OF THE GRADING AND EROSION CONTROL PLANS.

PERRY HASTINGS DATE

ACR SITE DEVELOPMENT
2350 FRANCEVILLE COAL MINE RD
COLORADO SPRINGS, CO 80929

MIKE A. BRAMLETT, P.E.
32314
FOR AND ON BEHALF OF JR ENGINEERING



UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USES DESIGNATED BY WRITTEN AUTHORIZATION.

PREPARED FOR
ACR SITE DEVELOPMENT
705 CRESTFIELD GROVE
COLORADO SPRINGS, CO 80906
DUANE HAYS
(719) 338-9902
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A Westman Company
Centennial 303-740-9888 • Colorado Springs 719-588-2583
Fort Collins 970-491-9888 • www.jrengineering.com

BY	DATE	REVISION

H-SCALE	N/A	N/A	N/A
V-SCALE	N/A	N/A	N/A
DATE	05/21/20	RB	JEA
DESIGNED BY			
DRAWN BY			
CHECKED BY			

ACR SITE DEVELOPMENT PLAN COVER SHEET

GESC PLANS - PPR-19-052

SHEET **1** OF **9**

JOB NO. **25176.00**

LAYER LINETYPE LEGEND

	EXISTING	PROPOSED
PHASE LINE	---	---
MATCH LINE	---	---
SECTION LINE	---	---
BOUNDARY LINE	---	---
PROPERTY LINE	---	---
EASEMENT LINE	---	---
RIGHT OF WAY	---	---
R.O.W. A LINE	---	---
CENTERLINE	---	---
CITY LIMITS	---	---
WIRE FENCE	---	---
CHAIN LINK FENCE	---	---
WOOD FENCE	---	---
MASONRY FENCE	---	---
GUARDRAIL	---	---
CONC. BARRIER	---	---
CABLE TV	---	---
ELECTRIC	---	---
FIBER OPTIC	---	---
GAS MAIN	---	---
IRRIGATION MAIN	---	---
OIL/PETRO. MAIN	---	---
OVERHEAD UTILITY	---	---
SANITARY SEWER	---	---
STORM DRAIN	---	---
TELEPHONE	---	---
WATER MAIN	---	---
RAW WATER LINE	---	---
SWALE/WATERWAY FLOWLINE	---	---
DIVERSION DITCH	---	---
DIVERSION CHANNEL	---	---
MAJOR DRAINAGE BASIN	---	---
MINOR DRAINAGE BASIN	---	---
TOP OF SLOPE	---	---
TOE OF SLOPE	---	---
EDGE OF WATER	---	---
INDEX CONTOUR	---	---
INTERMEDIATE CONTOUR	---	---
DEPRESSION CONT. (INDEX)	---	---
DEPRESSION CONT. (INTER)	---	---
TOP OF CUTS	---	---
TOE OF FILLS	---	---
CUT AND FILL LINE	---	---
SILT FENCE	---	---
100 YEAR FLOODPLAIN	---	---
500 YEAR FLOODPLAIN	---	---
FLOODWAY	---	---
STORAGE/EQUIPMENT AREAS	---	---
EDGE OF WETLANDS	---	---
STONE WALL	---	---

UTILITIES LEGEND

	EXISTING	PROPOSED
STORM SEWER		
MANHOLE	⊙	●
STORM INLET	⊠	■
AREA INLET - SQUARE	□	■
AREA INLET - ROUND	○	●
FLARED END SECTION	▷	▷
RIPRAP		
SANITARY SEWER		
LINE MARKER	Mkr San ^o	
SERVICE MARKER	△	•
CLEAN-OUT	○	•
MANHOLE W/ DIRECTIONAL FLOW ARROW	⊙	●
WATER LINE		
LINE MARKER	Mkr W ^o	
SERVICE MARKER	△	•
FIRE HYDRANT	⊙	•
FIRE CONNECTION	⊙	•
MANHOLE	⊙	●
BEND	⊘	•
BLOW-OFF VALVE	⊙	•
WELL	⊙	●
METER	⊙	•
VALVE	⊙	•
REDUCER	⊙	•
THRUST BLOCK	⊙	•
CROSS	⊙	•
PLUG W/ THRUST BLOCK	⊙	•
TEE	⊙	•
REVERSE ANCHOR	⊙	•
ANODE	⊙	•
AIR & VACUUM VALVE ASSEMBLY	⊙	•
TRANSMISSION BLOW-OFF ASSEMBLY	⊙	•
GAS LINE		
MARKER	Mkr G ^o	
SERVICE MARKER	△	•
METER	⊙	•
VALVE	⊙	•
PLUG	⊙	•
TEE	⊙	•
DRY UTILITIES		
CABLE TV MARKER	Mkr TV ^o	
CABLE TELEVISION PEDESTAL	⊙	•
ELECTRIC MARKER	Mkr E ^o	
ELECTRIC SERVICE MARKER	△	•
ELECTRICAL PEDESTAL	⊙	•
ELECTRICAL METER	⊙	•
ELECTRICAL MANHOLE	⊙	•
FIBER-OPTIC MARKER	Mkr FO ^o	
IRRIGATION PEDESTAL	⊙	•
TELEPHONE MARKER	Mkr T ^o	
TELEPHONE PEDESTAL	⊙	•
TELEPHONE MANHOLE	⊙	•
UTILITY POLE	⊙	•
GUY ANCHOR	⊙	•
GUY POLE	⊙	•
MISC. UTILITIES		
VENT PIPE	VP	•
TEST HOLE DESIGNATOR	TH	•

MONUMENTATION LEGEND

ALUMINUM CAP - FOUND	●AC
BRASS CAP - FOUND	●BC
BENCHMARK - FOUND	⊕
CROSS - FOUND	+
MONUMENT - SET	○
MONUMENT - FOUND (DEFAULT)	●
MONUMENT - FOUND (ALTERNATE 1)	■
MONUMENT - FOUND (ALTERNATE 2)	⊠
MONUMENT - FOUND (ALTERNATE 3)	▲
MONUMENT - FOUND (ALTERNATE 4)	△
MONUMENT - FOUND (ALTERNATE 5)	●
MONUMENT - FOUND (ALTERNATE 6)	●
MONUMENT - FOUND (ALTERNATE 7)	●
NAIL & WASHER - FOUND	●NAIL & WASHER
PANEL - FOUND	⊕
PK NAIL - FOUND	●PK NAIL
ROW MONUMENT - FOUND	⊕
ROW MARKER - FOUND	⊕
SECTION CORNER - FOUND	⊕
SECTION CORNER - SET	⊕
QUARTER-SECTION CORNER - FOUND	⊕
QUARTER-SECTION CORNER - SET	⊕
SECTION CENTER - FOUND	⊕
SECTION CENTER - FOUND	⊕
CONTROL/TRaverse POINT - SET	⊕

TRAFFIC LEGEND

	EXISTING	PROPOSED
PARKING METER	⊕	⊕
TRAFFIC SIGNAL BOX	⊕	⊕
TRAFFIC SIGNAL POLE	⊕	⊕
TRAFFIC SIGNAL BARRICADE	⊕	⊕
GUARD RAIL POST	⊕	⊕
IMPACT ATTENUATOR	⊕	⊕
BRIDGE STYLE HIGHWAY SIGN POST	⊕	⊕
CANTILEVER STYLE HIGHWAY SIGN POST	⊕	⊕
RAILROAD MARKER/SIGN	⊕	⊕
STREET LIGHT	⊕	⊕
STREET LIGHT - SINGLE	⊕	⊕
STREET LIGHT - DOUBLE	⊕	⊕
LUMINAIRE	⊕	⊕
ALTERNATE LUMINAIRE	⊕	⊕
SIGNAL MAST ARM W/ LUMINAIRE	⊕	⊕
PEDESTAL POLE FOUNDATION	⊕	⊕
TRAFFIC SIGNAL POLE	⊕	⊕
ROUND PULL BOX	⊕	⊕
MEDIUM PULL BOX	⊕	⊕
LARGE PULL BOX (20X33X15)	⊕	⊕
SIGNAL HEAD WITHOUT BACK PLATE	⊕	⊕
SIGNAL HEAD WITH BACK PLATE	⊕	⊕
PEDESTRIAN SIGNAL HEAD	⊕	⊕
VIDEO IMAGE DETECTOR	⊕	⊕
OPTICOM DETECTOR	⊕	⊕
VEHICLE DETECTION ZONE	⊕	⊕

STORM WATER MANAGEMENT

KEY	SYMBOL
CD	
CRS	
CS	
CWA	
DD	
DV	
DW	
ECB	
IF	
IP	
MU	
OP	
PF	
PS	
RCD	
RCS	
SB	
SCL	
SF	
SR	
SSA	
ST	
STB	
TER	
TS	
TSC	
TSC F	
TSD	
VTC	
WR	

DRAINAGE REPORT PLANS

KEY	SYMBOL
##	
##	
##	
##	
##	
##	
##	
##	
##	
?	
#	
#	
#	
?	

LANDSCAPE LEGEND

	EXISTING	PROPOSED
TREE - CONIFEROUS		
TREE - DECIDUOUS		
SHRUB/BUSH		
SHRUBS AND BUSHES		
IRRIGATION BOX		
IRRIGATION SPRINKLER		
IRRIGATION VALVE		
BOLLARD		
FLAGPOLE		

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BY	DATE

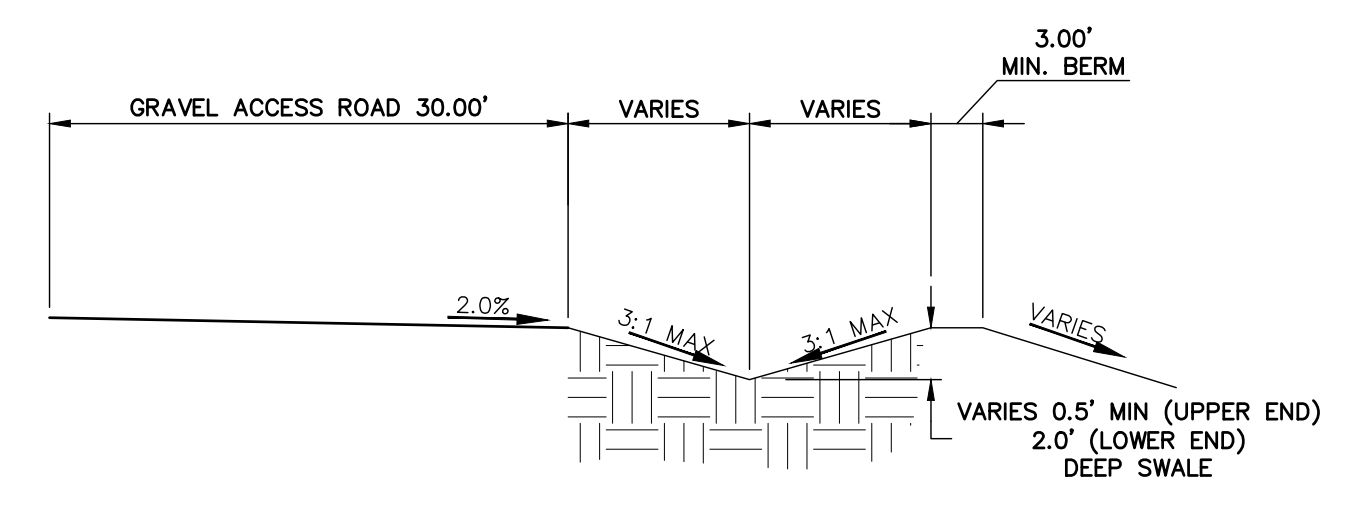
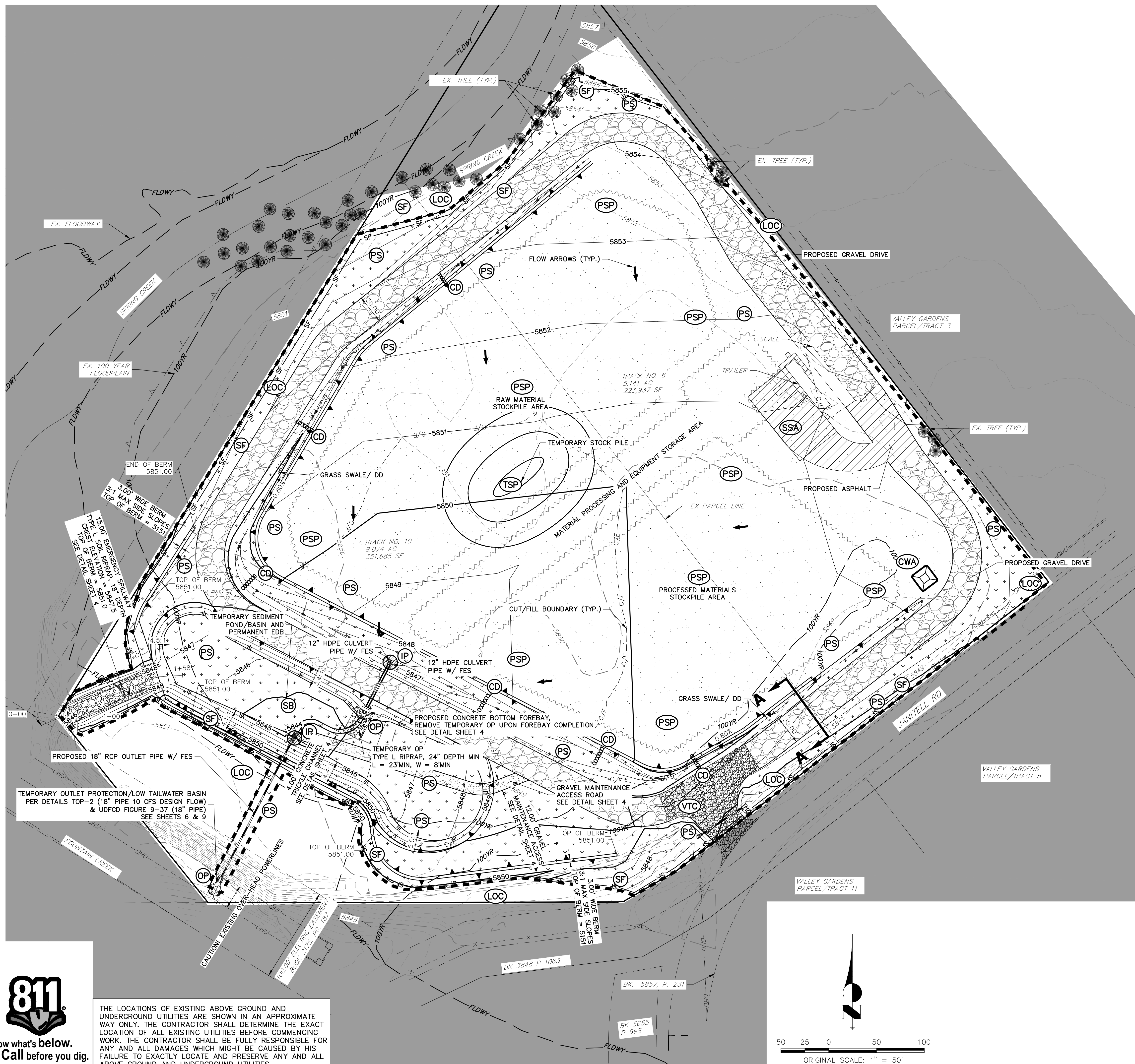
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ACR SITE DEVELOPMENT PLAN LEGEND



Know what's below.
Call before you dig.



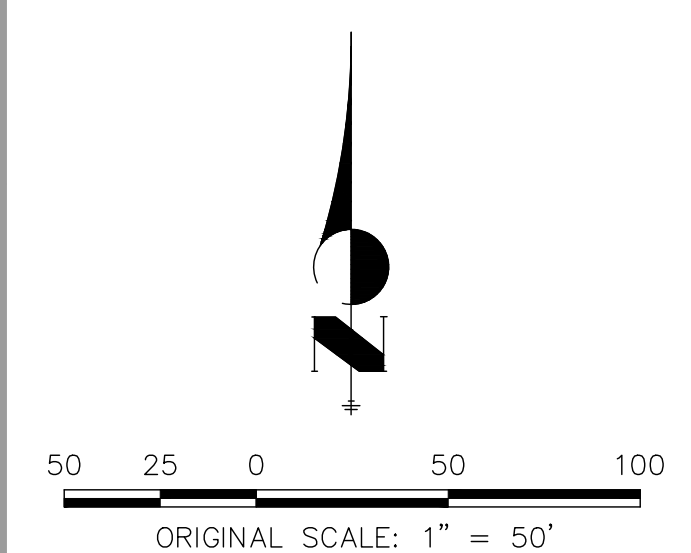
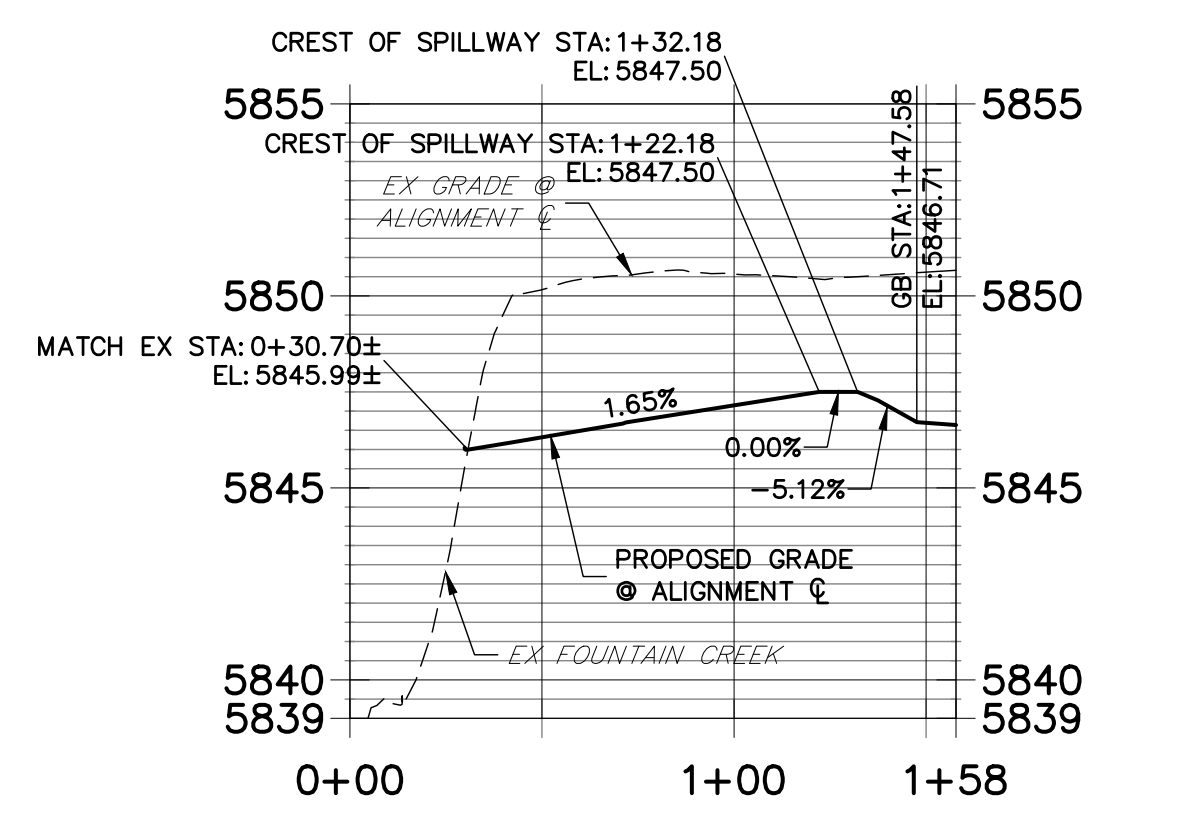
LEGEND

TEMPORARY SEDIMENT BASIN	(SB)	TOE	(TOE)
		TOP	(TOP)
SILT FENCE	(SF)		
STABILIZED STAGING AREA	(SSA)		
VEHICLE TRACKING CONTROL	(VTC)		
TEMPORARY STOCK PILE	(TSP)		
EROSION CONTROL BLANKET	(ECB)		
INLET PROTECTION	(IP)		
OUTLET PROTECTION	(OP)		
LIMITS OF CONSTRUCTION	(LOC)		
CONCRETE WASHOUT AREA	(CWA)		
PERMANENT SEEDING	(PS)		
CHECK DAM	(CD)		
PERMANENT STOCK PILE	(PSP)		

GROUND COVER LEGEND

GRAVEL	(GRAVEL)
PERMANENT MATERIAL STOCKPILES	(PMS)
PERMANENT SEEDING	(PS)
ASPHALT PAVING	(ASP)

**EMERGENCY SPILLWAY PROFILE
STA 0+00.00 TO 1+57.79**



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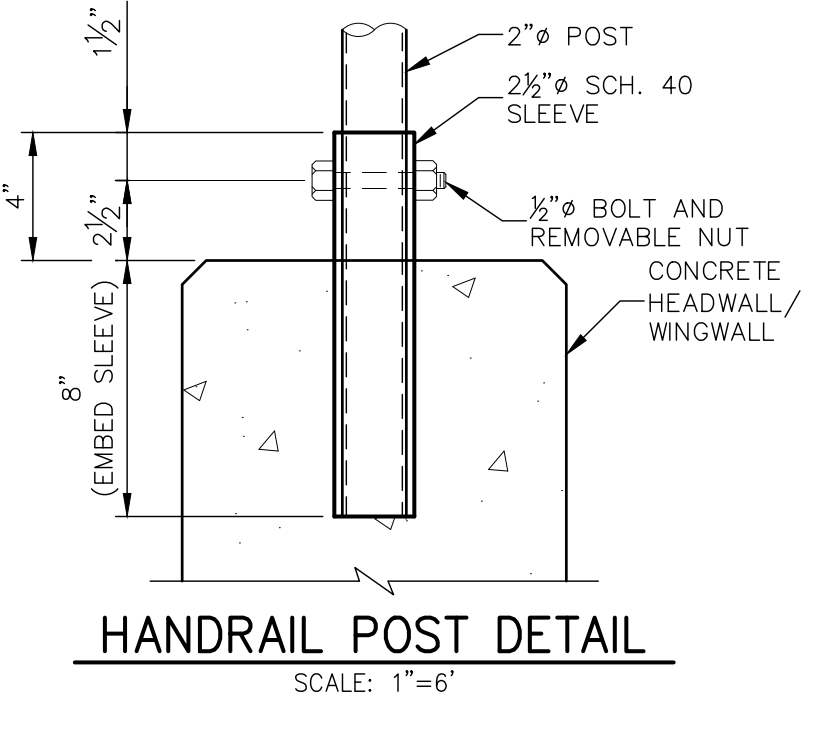
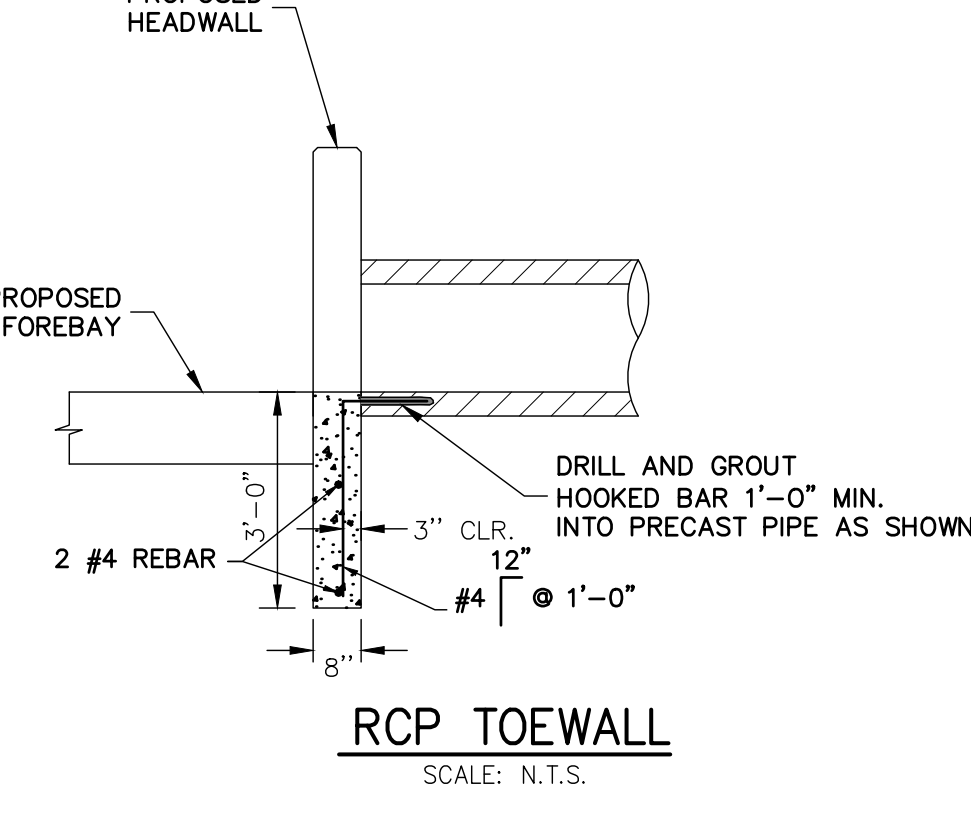
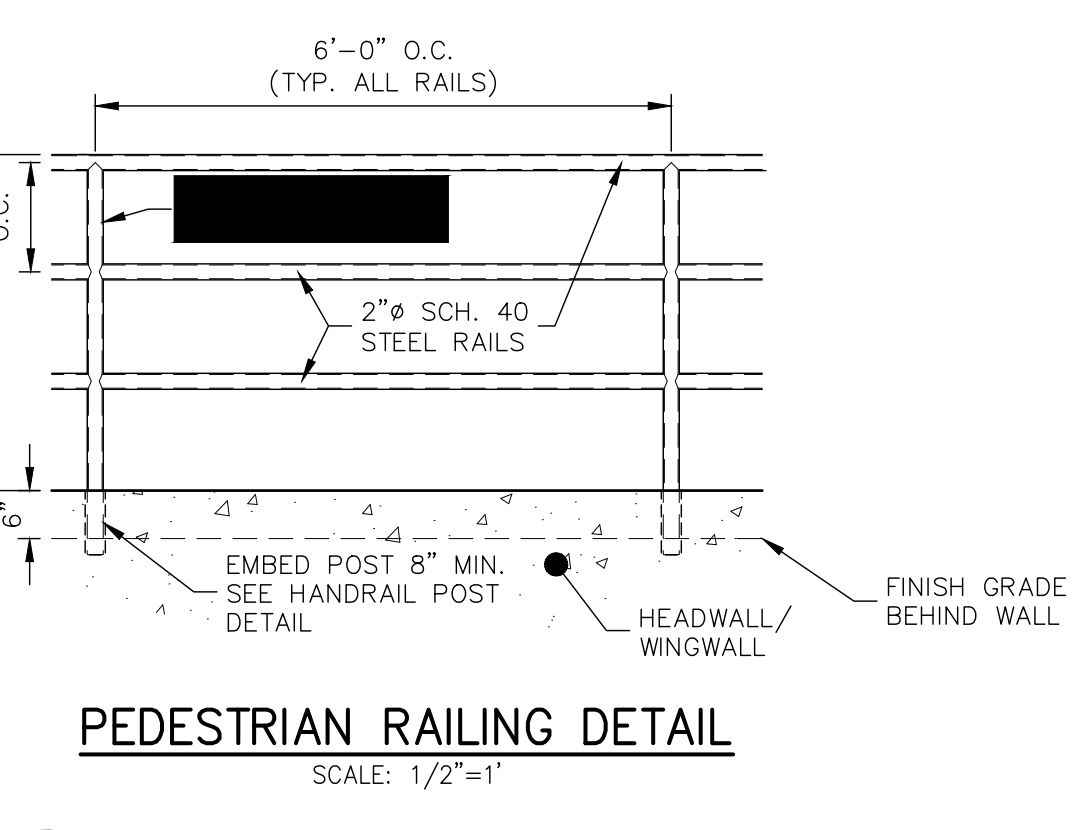
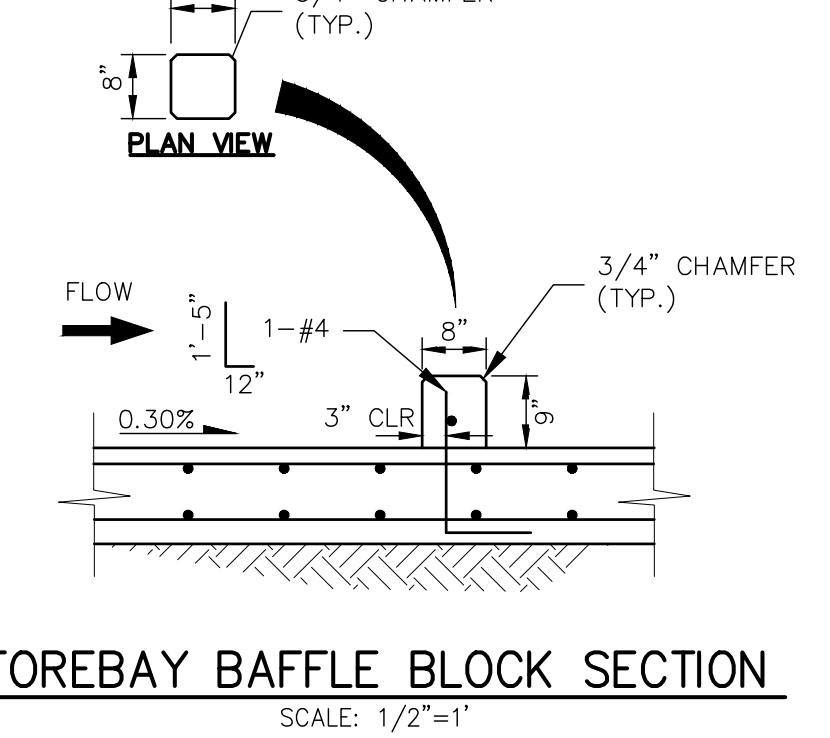
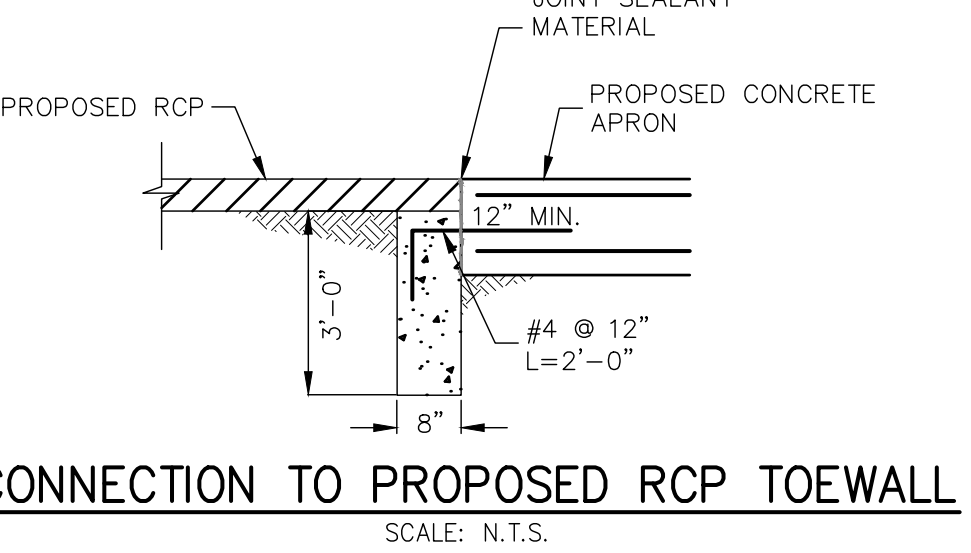
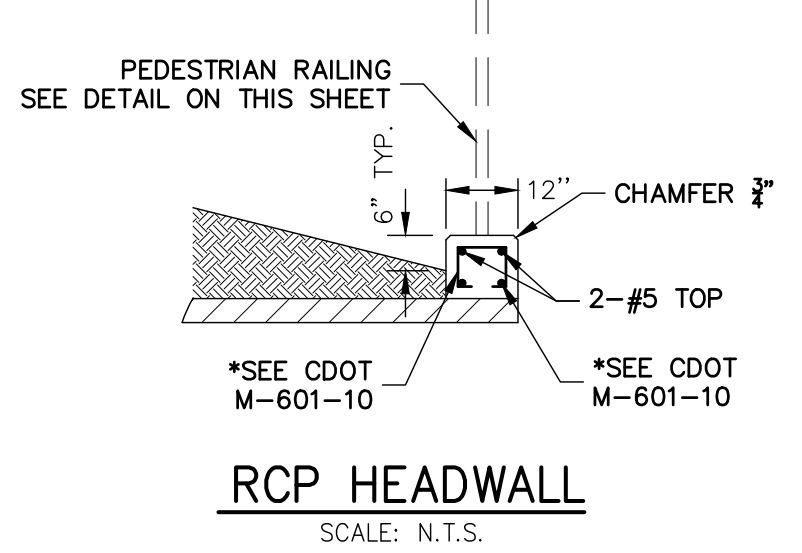
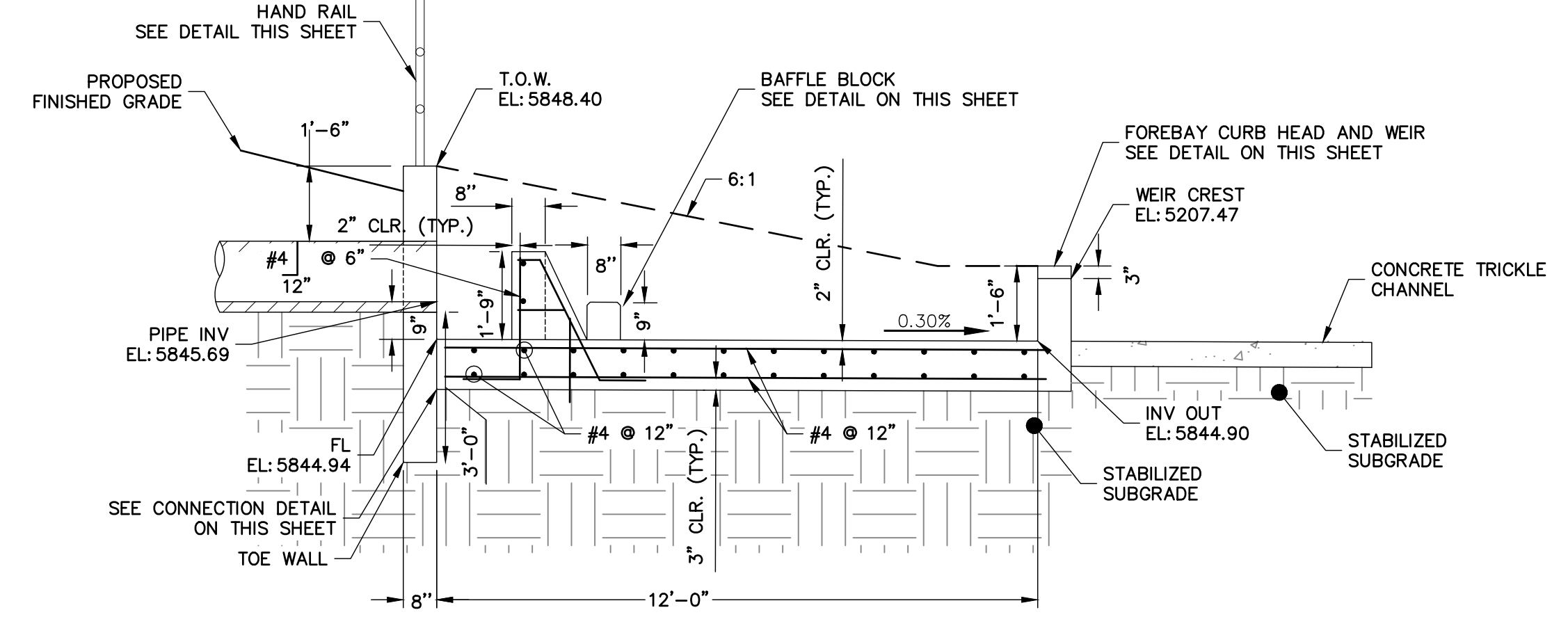
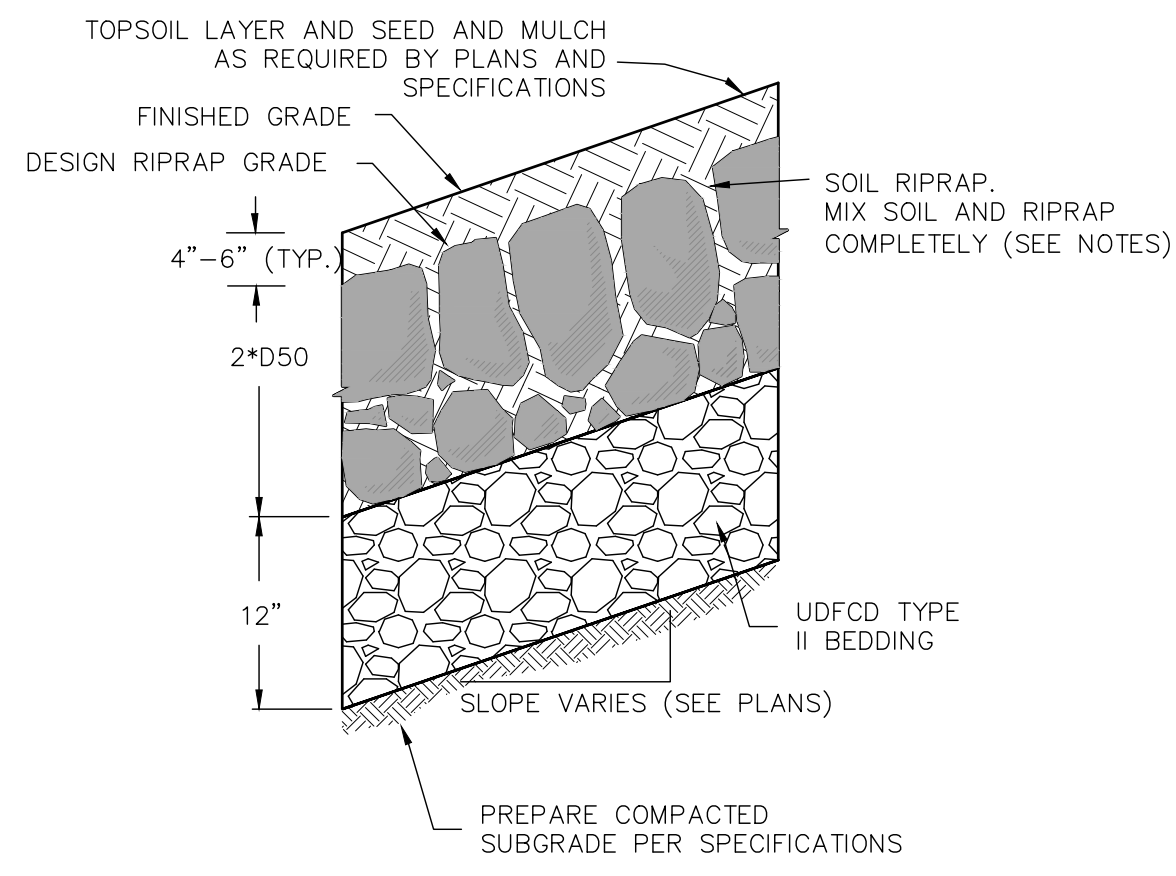
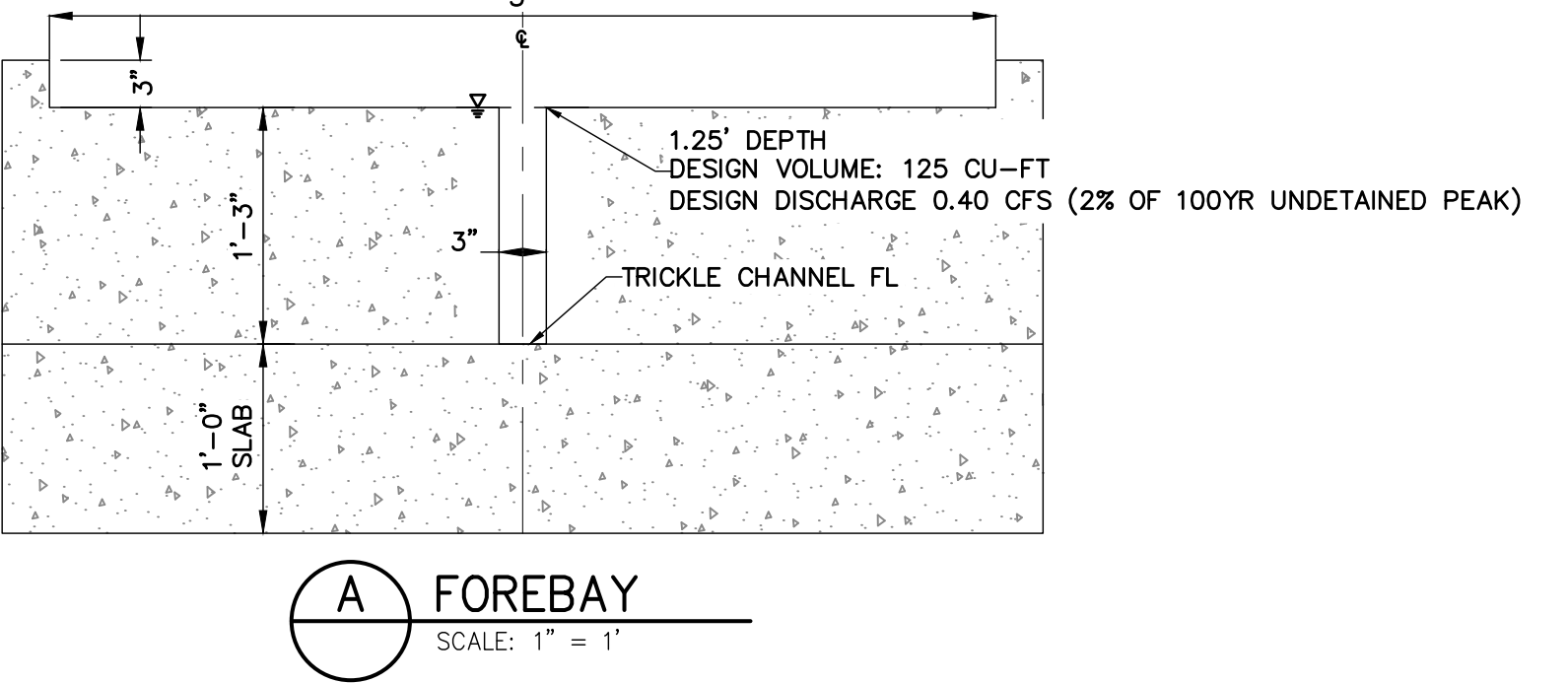
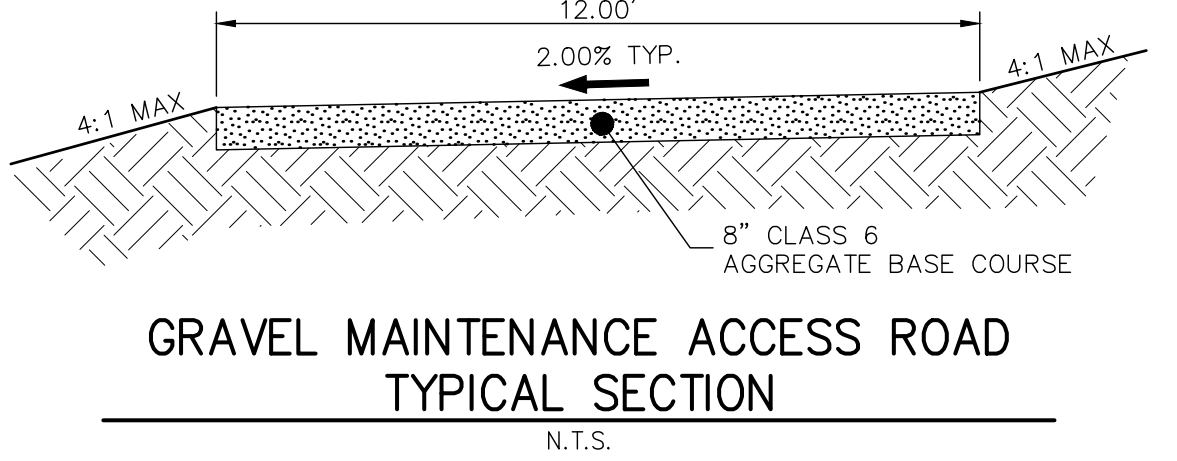
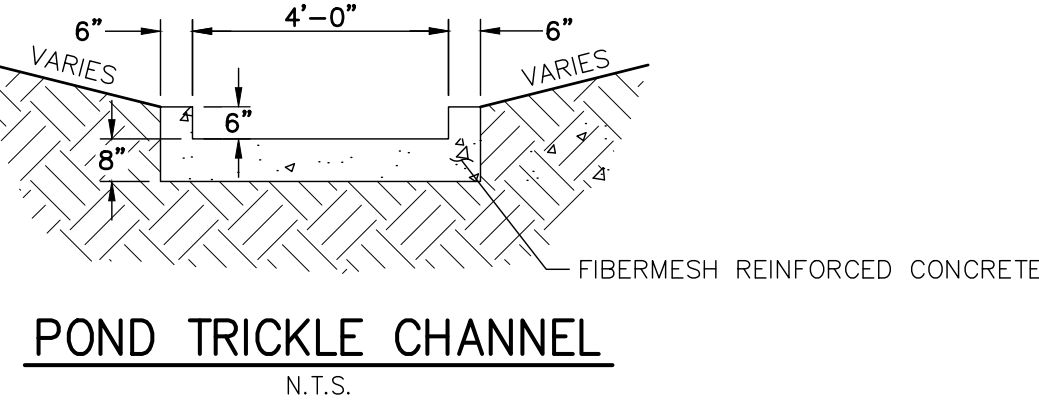
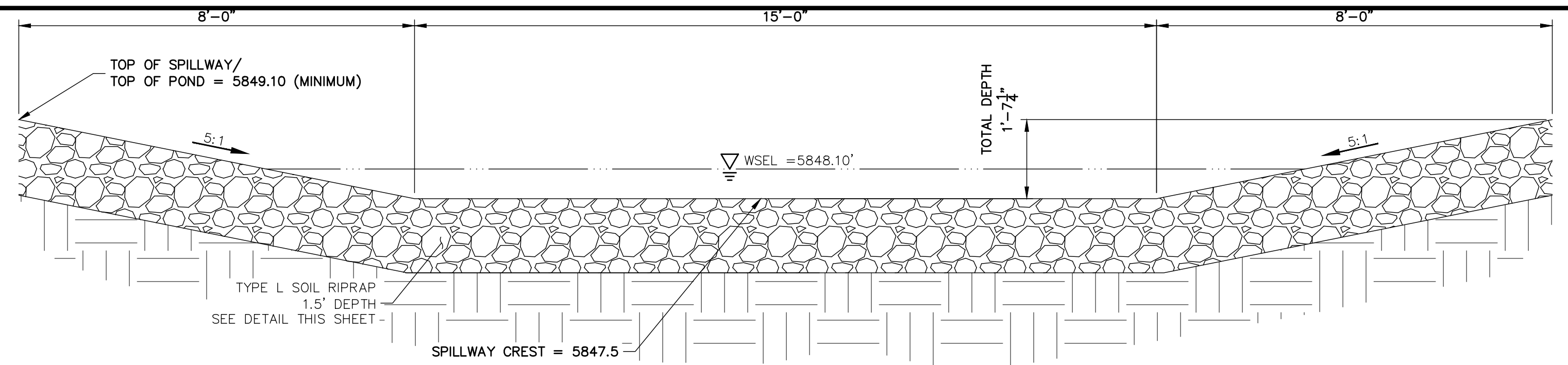
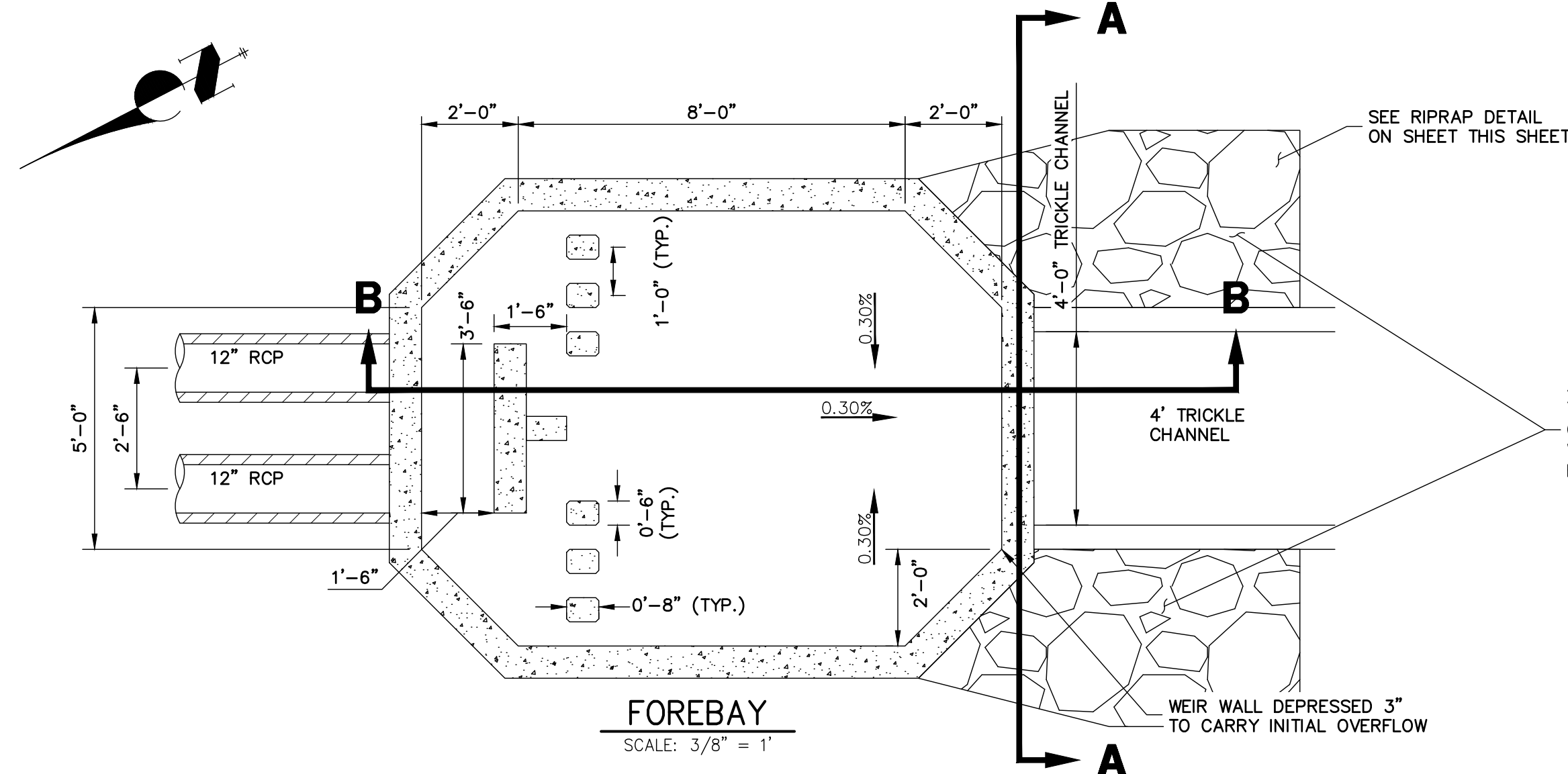
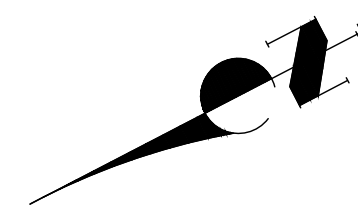
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1"=50'	N/A	05/21/20			

ACR SITE DEVELOPMENT PLAN
GRADING AND EROSION CONTROL PLAN

SHEET 3 OF 9
JOB NO. 25176.00



TYPE M RIPRAP

INTERMEDIATE ROCK DIMENSION (IN.)	PERCENT PASSING (%)
21	70-100
18	50-70
12	35-50
4	2-10

*TYPE M RIPRAP D50=12". D50 = MEAN PARTICLE SIZE (INTERMEDIATE DIMENSION) BY WEIGHT.

- RIPRAP NOTES:**
- SOIL RIPRAP DETAILS ARE APPLICABLE TO SLOPED AREAS. REFER TO THE SITE PLAN ACTUAL LOCATION AND LIMITS.
 - MIX UNIFORMLY 65% RIPRAP BY VOLUME WITH 35% OF APPROVED SOIL BY VOLUME PRIOR TO PLACEMENT.
 - PLACE STONE-SOIL MIX TO RESULT IN SECURELY INTERLOCKED ROCK AT THE DESIGN THICKNESS AND GRADE. COMPACT AND LEVEL TO ELIMINATE ALL VOIDS AND ROCKS PROJECTING ABOVE DESIGN RIPRAP TOP GRADE.
 - CRIMP OR TACKIFY MULCH OR USE APPROVED HYDROMULCH AS CALLED FOR IN THE PLANS AND SPECIFICATIONS.
 - ROCK SHALL BE HARD, DURABLE, ANGULAR IN SHAPE, AND FREE FROM CRACKS, OVERBURDEN, SHALE, AND ORGANIC MATTER.
 - NEITHER BREADTH NOR THICKNESS OF A SINGLE STONE SHOULD BE LESS THAN ONE-THIRD ITS LENGTH, AND ROUNDED STONE SHOULD BE AVOIDED.
 - THE ROCK SHOULD SUSTAIN A LOSS OF NOT MORE THAN 40% AFTER 500 REVOLUTIONS IN AN ABRASION TEST (LOS ANGELES MACHINE ASTM C-535-69) AND SHOULD SUSTAIN A LOSS OF NOT MORE THAN 10% AFTER 12 CYCLES OF FREEZING AND THAWING (AASHTO TEST 103 FOR LEDGE ROCK PROCEDURE A). ROCK HAVING A MINIMUM SPECIFIC GRAVITY OF 2.65 IS PREFERRED; HOWEVER, IN NO CASE SHOULD ROCK HAVE A SPECIFIC GRAVITY LESS THAN 2.50.

CAST-IN-PLACE STRUCTURAL NOTES:

- ALL CONCRETE SHALL BE CLASS D IN ACCORDANCE WITH CDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.
 - ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE FRESH CONCRETE IS POURED.
 - ALL CONSTRUCTION JOINTS NOT SHOWN ON THE PLANS SHALL BE APPROVED BY THE ENGINEER.
 - THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION.
 - STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH CDOT STD. M-206-1.
 - DO NOT BACKFILL UNTIL CONCRETE HAS REACHED DESIGN STRENGTH, F_c.
 - GRADE 60 REINFORCING STEEL AND EPOXY COATED ARE REQUIRED.
 - THE MINIMUM LAP SPlice LENGTH FOR EPOXY COATED REINFORCING BARS SHALL BE:
- | BAR SIZE: | #4 | #5 | #6 | #7 | #8 | #9 | #10 | #11 |
|----------------|-------|-------|--------|-------|-------|-------|--------|-------|
| SPlice LENGTH: | 1'-3" | 1'-6" | 1'-10" | 2'-2" | 3'-8" | 4'-8" | 5'-11" | 7'-3" |
- THE MINIMUM LAP SPlice LENGTH FOR BLACK REINFORCING BARS SHALL BE:
- | BAR SIZE: | #4 | #5 | #6 | #7 | #8 | #9 | #10 | #11 |
|----------------|-------|-------|-------|--------|-------|-------|--------|--------|
| SPlice LENGTH: | 1'-0" | 1'-4" | 1'-7" | 1'-10" | 2'-5" | 3'-1" | 3'-11" | 4'-10" |
- REINFORCING BARS SHALL BE DEFORMED AND SHALL HAVE A MINIMUM OF 2" CLEARANCE.
 - ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3/4".
 - IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATIONS OF EXISTING STRUCTURES AND EXISTING UTILITIES, PRIOR TO CONSTRUCTION OF THE CAST-IN-PLACE STRUCTURES. FIELD MODIFICATIONS OF PRECAST UNITS TO ACCOMMODATE CAST-IN-PLACE STRUCTURES WILL ONLY BE ACCEPTABLE WITH THE ENGINEER'S APPROVAL.
 - CONTRACTOR SHALL SUBMIT STEEL REINFORCING SHOP DRAWINGS FOR ALL CAST-IN-PLACE STRUCTURES FOR ENGINEER'S APPROVAL PRIOR TO CONSTRUCTION.

ENGINEER'S STATEMENT

THIS GRADING AND EROSION CONTROL PLAN WAS PREPARED UNDER MY DIRECTION AND SUPERVISION AND IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. SAID PLAN HAS BEEN PREPARED ACCORDING TO THE CRITERIA ESTABLISHED BY THE COUNTY FOR GRADING AND EROSION CONTROL PLANS. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPARING THIS PLANS.



MIKE A. BRAMLETT, P.E.
COLORADO P.E. 32314
FOR AND ON BEHALF OF JR ENGINEERING



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WALL NOTES:

- HEADWALLS FOR PIPES SHALL BE CONSTRUCTED IN ACCORDANCE WITH CDOT STANDARD PLAN M-601-10.
- WINGWALLS SHALL BE CONSTRUCTED IN ACCORDANCE WITH CDOT STANDARD PLAN M-601-20.

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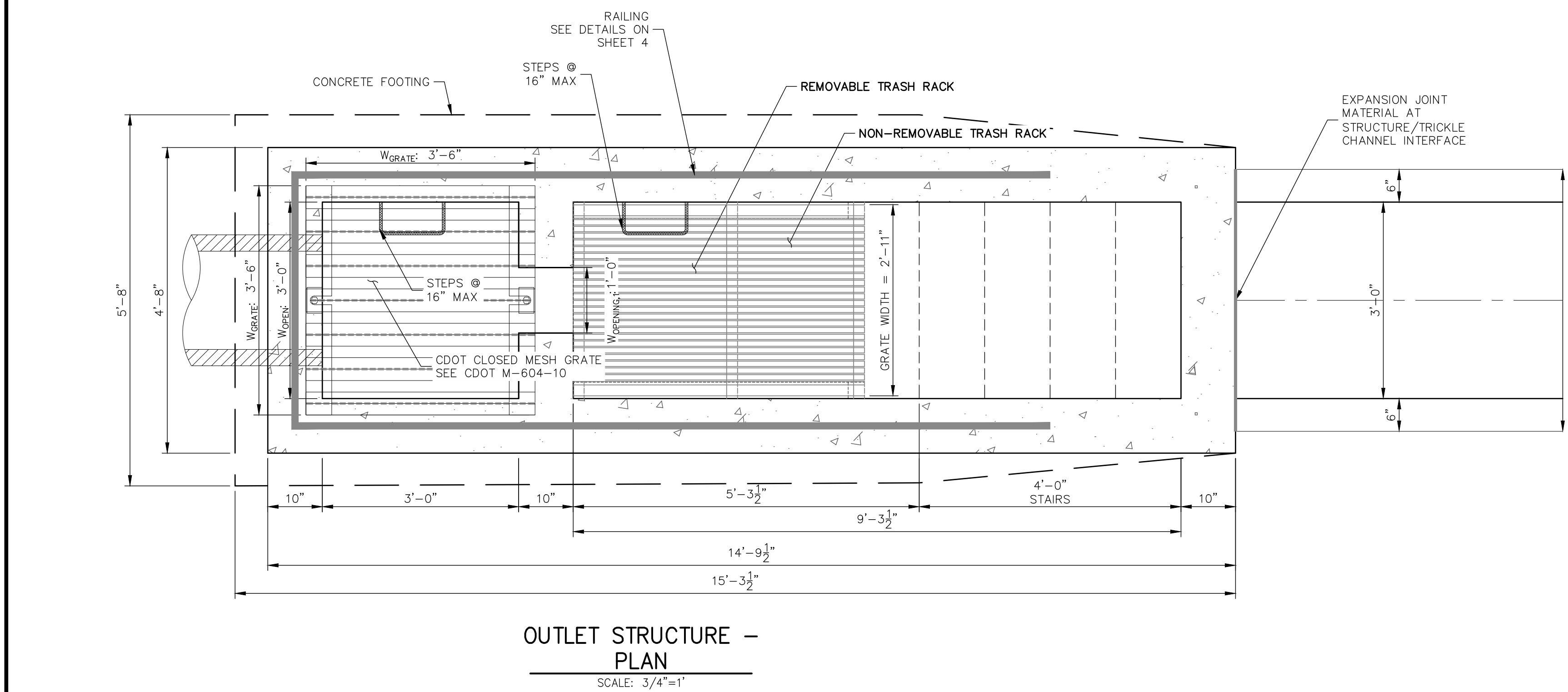
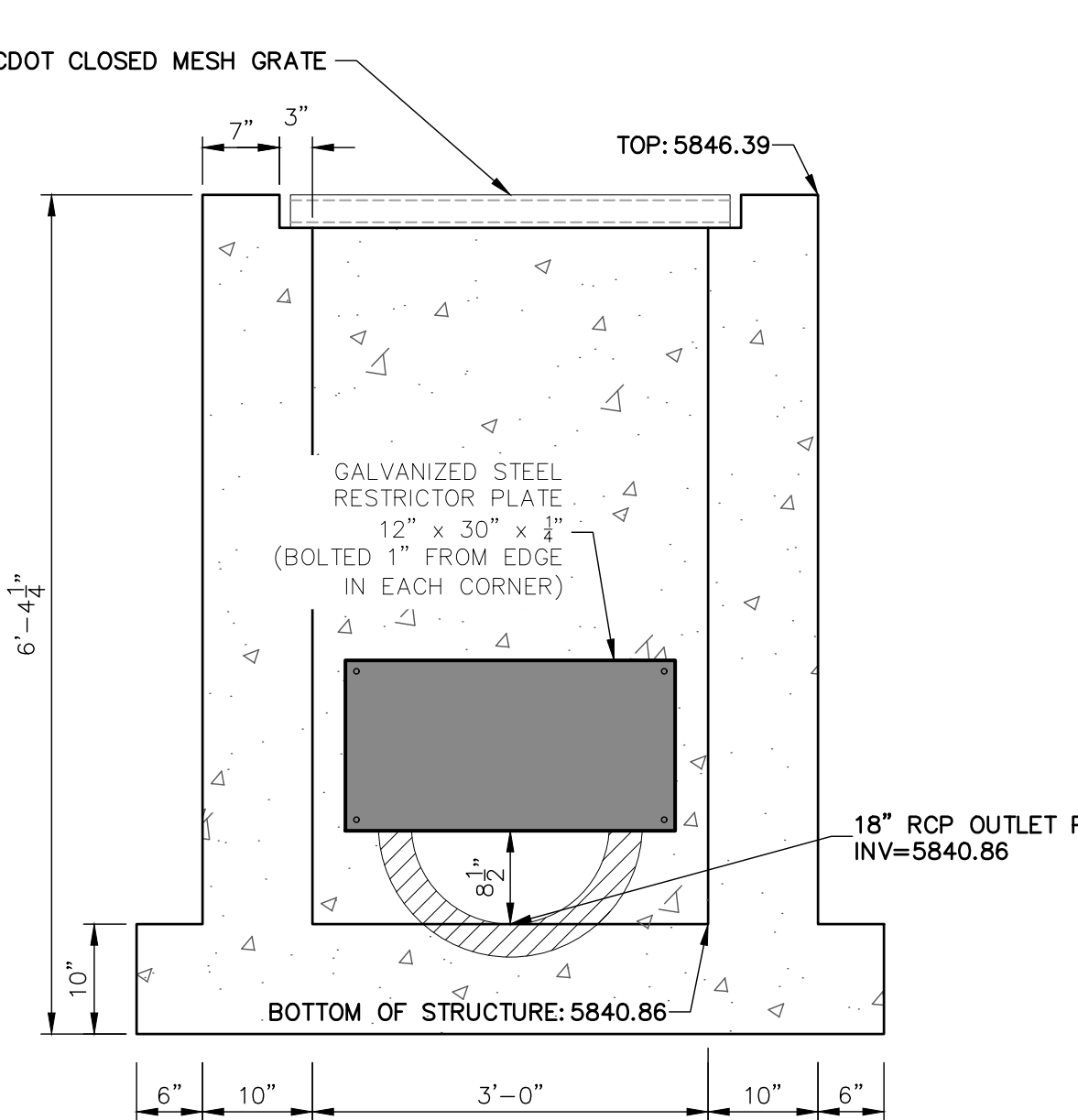
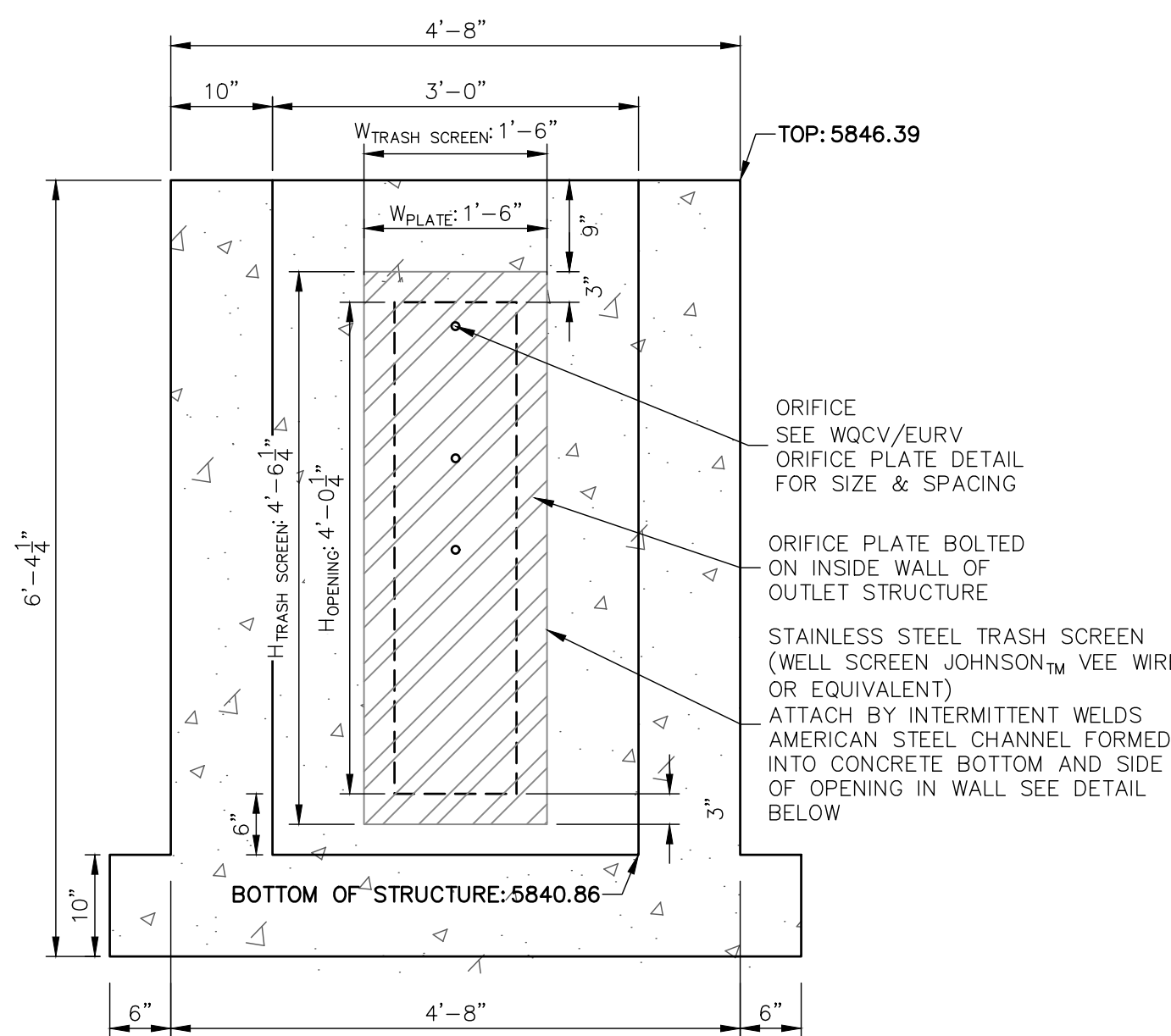
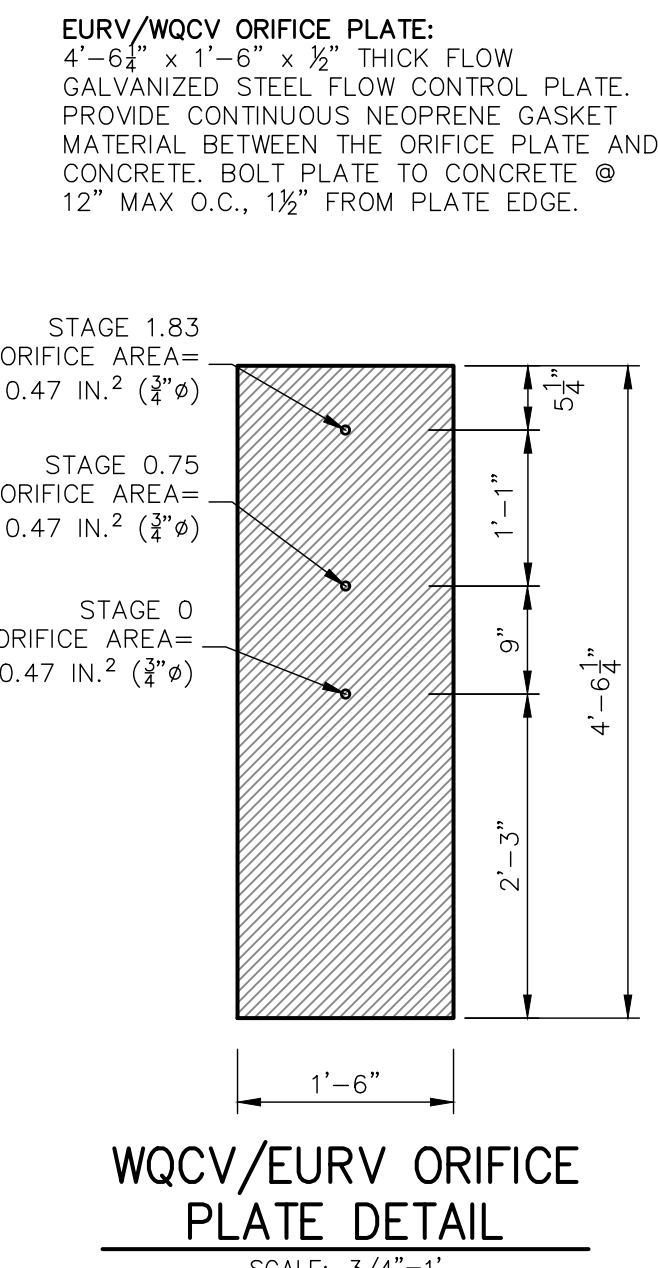
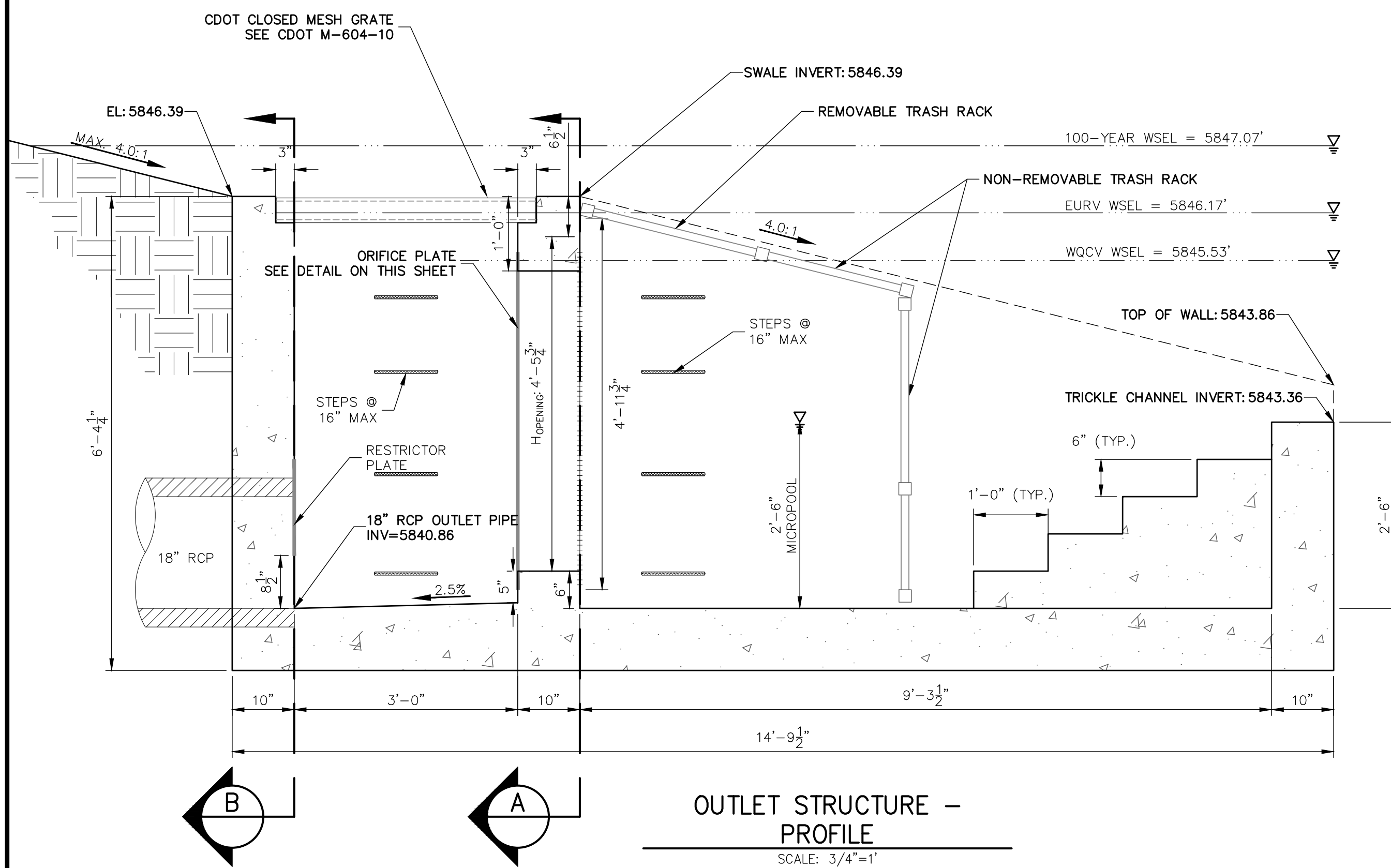
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		DRAWN BY	JEA
		CHECKED BY	

ACR SITE DEVELOPMENT PLAN

POND STRUCTURE DETAILS

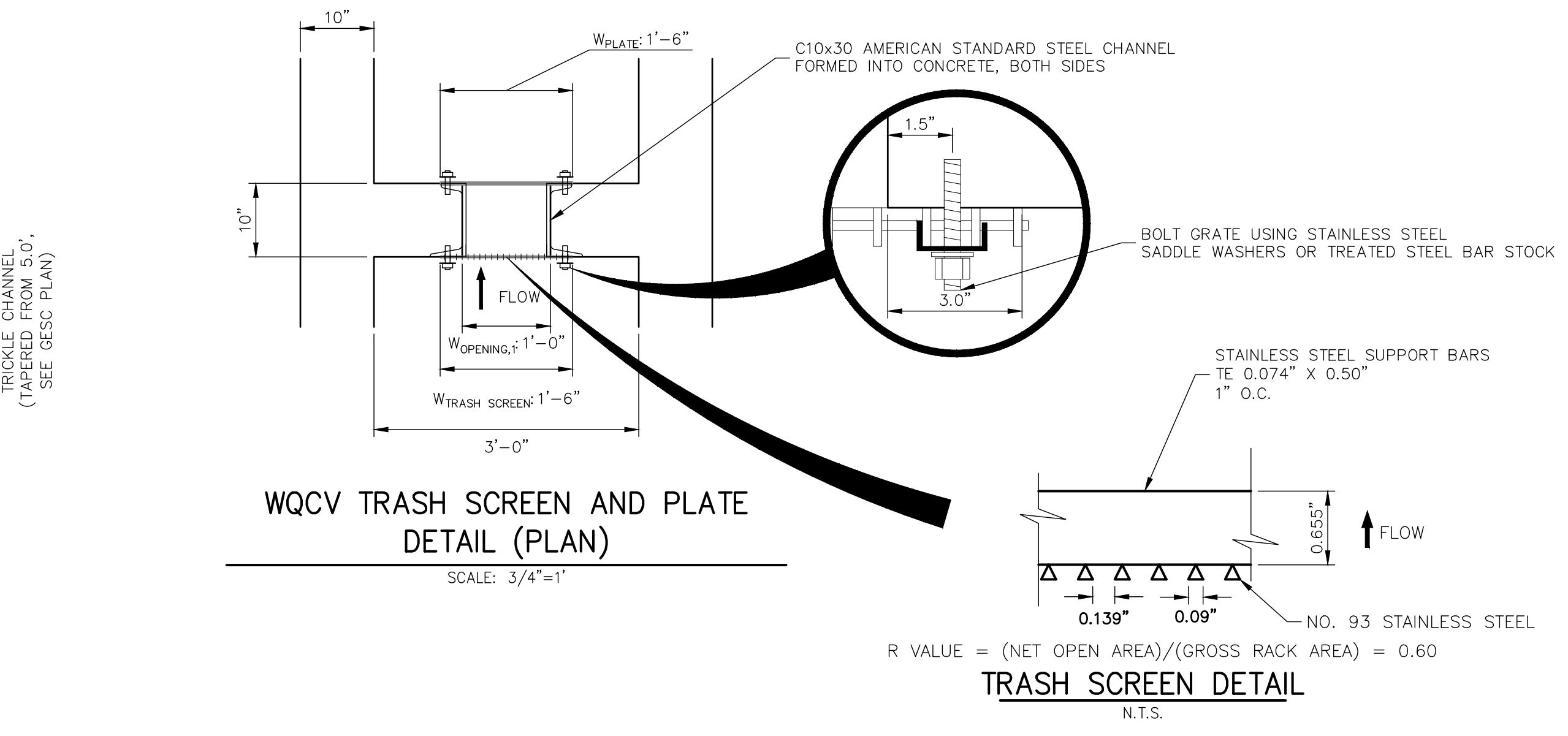
SHEET 4 OF 9

JOB NO. 25176.00



A SECTION A AT ORIFICE (FRONT) WALL
SCALE: 3/4"=1'

B SECTION B AT OUTLET (REAR) WALL
SCALE: 3/4"=1'



TRASH SCREEN DETAIL
N.T.S.
R VALUE = (NET OPEN AREA)/(GROSS RACK AREA) = 0.60

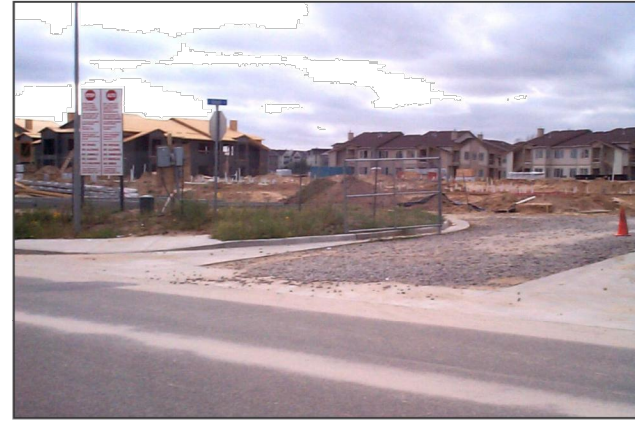
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		J.R. ENGINEERING A Westman Company Centennial 303-740-9383 • Colorado Springs 719-588-2583 Fort Collins 970-491-9888 • www.jrengineering.com	
H-SCALE 3/4" = 1'	V-SCALE 3/4" = 1'	No. 1	REVISION
		DATE 05/21/20	DESIGNED BY REB
		DRAWN BY REB	CHECKED BY
ACR SITE DEVELOPMENT PLAN POND STRUCTURE DETAILS		SHEET 5 OF 9	JOB NO. 25176.00

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Vehicle Tracking

What it is

Vehicle tracking refers to the stabilization of construction entrances, roads, parking areas, and staging areas to prevent the tracking of sediment from the construction site.



When and Where to use it

- All points where vehicles exit the construction site onto a public road.
- Construction entrance/exit should be located at permanent access locations if at all possible.
- Construction roads and parking areas.
- Loading and unloading areas.
- Storage and staging areas.
- Where trailers are parked.
- Any construction area that receives high vehicular traffic.

When and Where NOT to use it

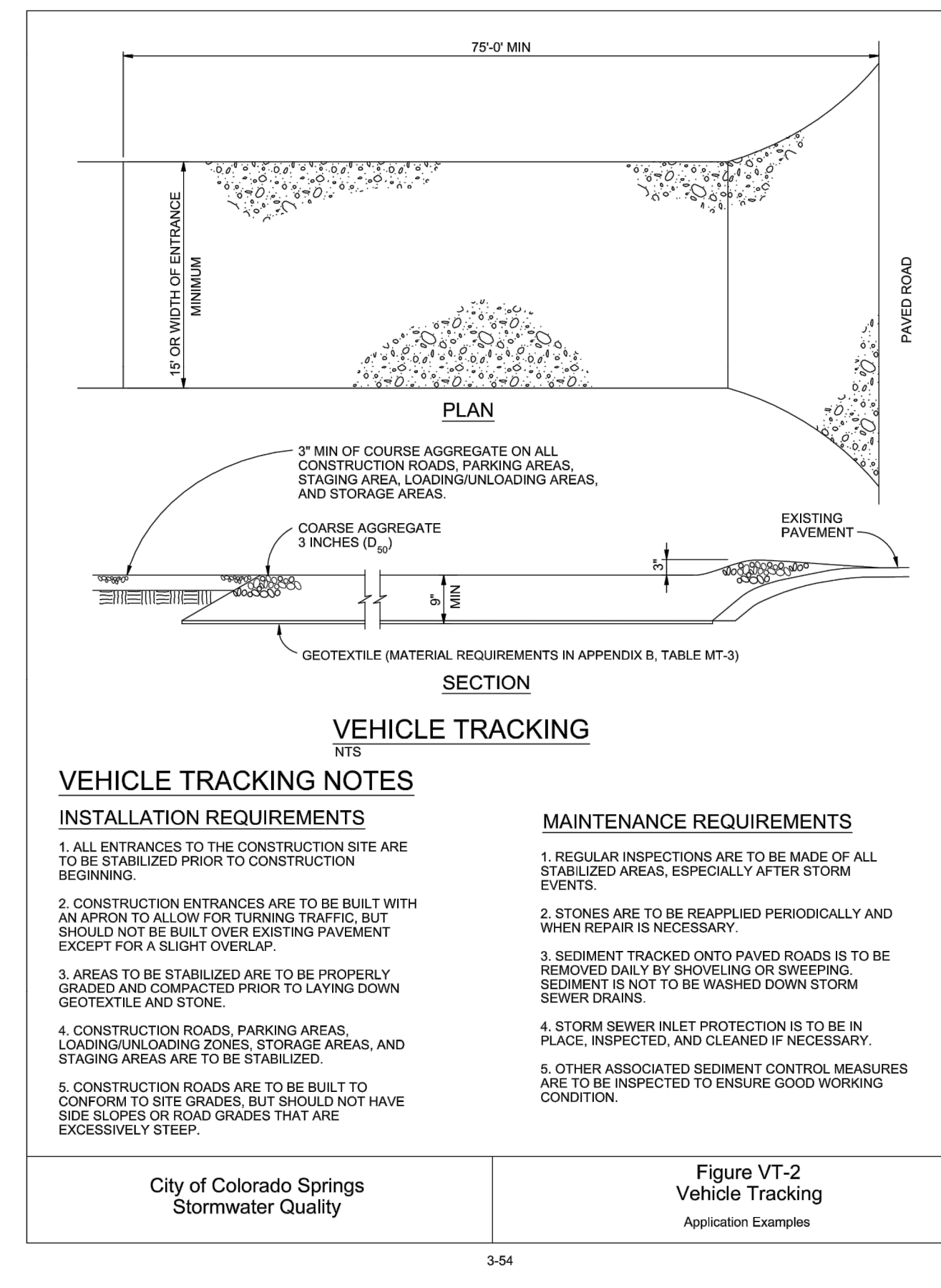
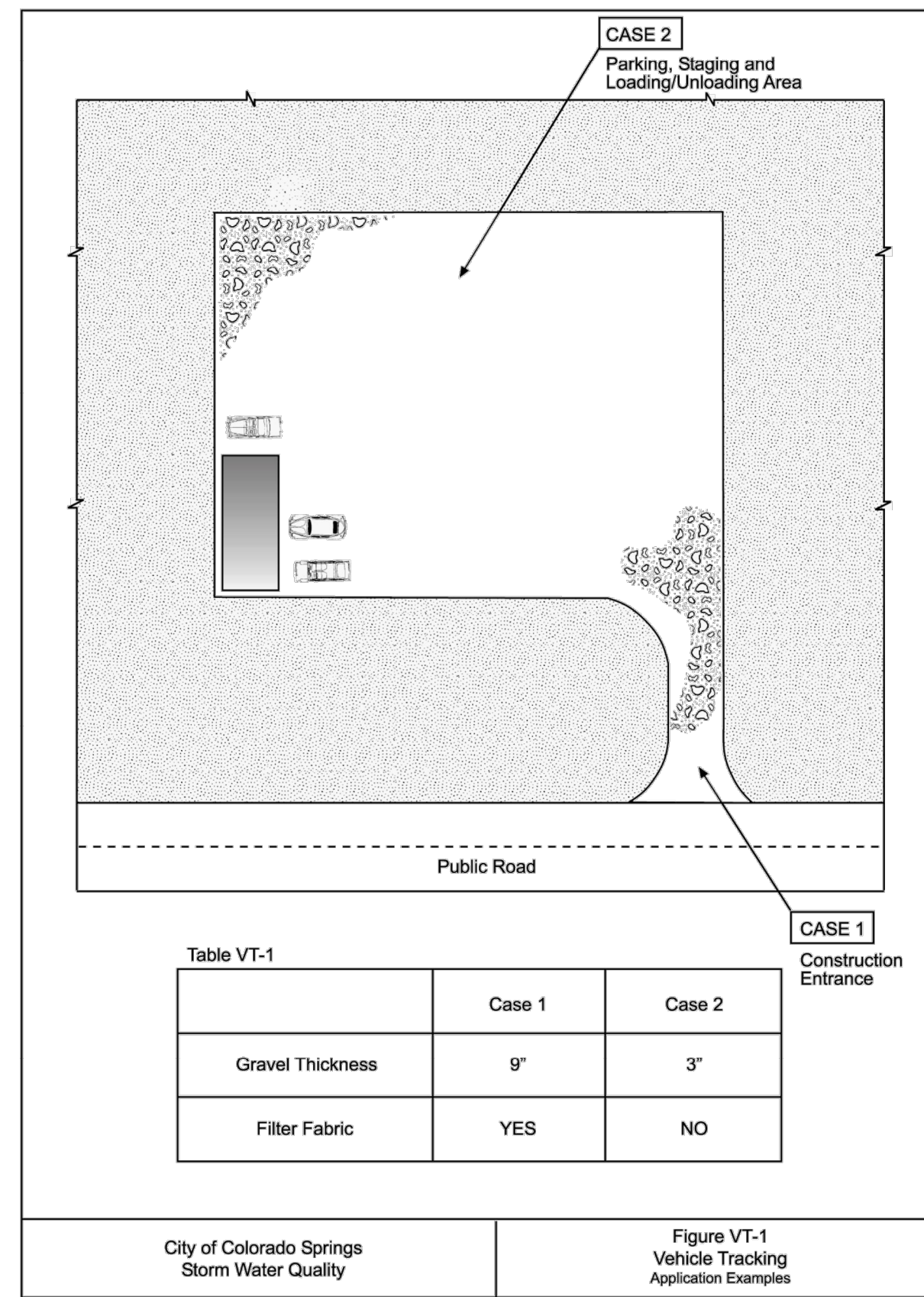
- The vehicle tracking area should not be located in areas that are wet or where soils erode easily.



This picture shows an unstabilized entrance where dirt is being tracked onto a public road.

Construction Details and Maintenance Requirements

Figure VT-1 and VT-2 provide construction details and maintenance requirements for vehicle tracking.



STORMWATER QUALITY BMP MANUAL

3-52

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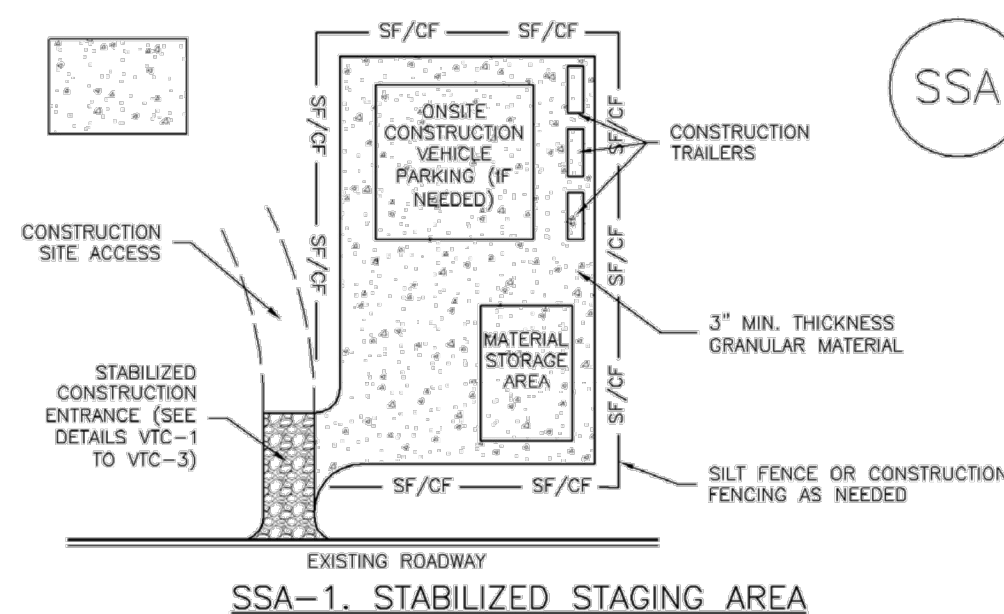
3-53

City of Colorado Springs Stormwater Quality

Figure VT-2 Vehicle Tracking Application Examples

3-54

Stabilized Staging Area (SSA) SM-6



SSA-1. STABILIZED STAGING AREA

STABILIZED STAGING AREA INSTALLATION NOTES

- SEE PLAN VIEW FOR:
 - LOCATION OF STAGING AREA(S).
 - CONTRACTOR MAY ADJUST LOCATION AND SIZE OF STAGING AREA WITH APPROVAL FROM THE LOCAL JURISDICTION.
- STABILIZED STAGING AREA SHOULD BE APPROPRIATE FOR THE NEEDS OF THE SITE. OVERSIZING RESULTS IN A LARGER AREA TO STABILIZE FOLLOWING CONSTRUCTION.
- STAGING AREA SHALL BE STABILIZED PRIOR TO OTHER OPERATIONS ON THE SITE.
- THE STABILIZED STAGING AREA SHALL CONSIST OF A MINIMUM 3" THICK GRANULAR MATERIAL.
- UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, ROCK SHALL CONSIST OF DOT SECT. #703, AASHTO #3 COARSE AGGREGATE OR 6" (MINUS) ROCK.
- ADDITIONAL PERIMETER BMPs MAY BE REQUIRED INCLUDING BUT NOT LIMITED TO SILT FENCE AND CONSTRUCTION FENCING.

STABILIZED STAGING AREA MAINTENANCE NOTES

- INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
- FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
- WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
- ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY IF RUTTING OCCURS OR UNDERLYING SUBGRADE BECOMES EXPOSED.

November 2010 Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3

SSA-3

SM-6 Stabilized Staging Area (SSA) SM-6

STABILIZED STAGING AREA MAINTENANCE NOTES

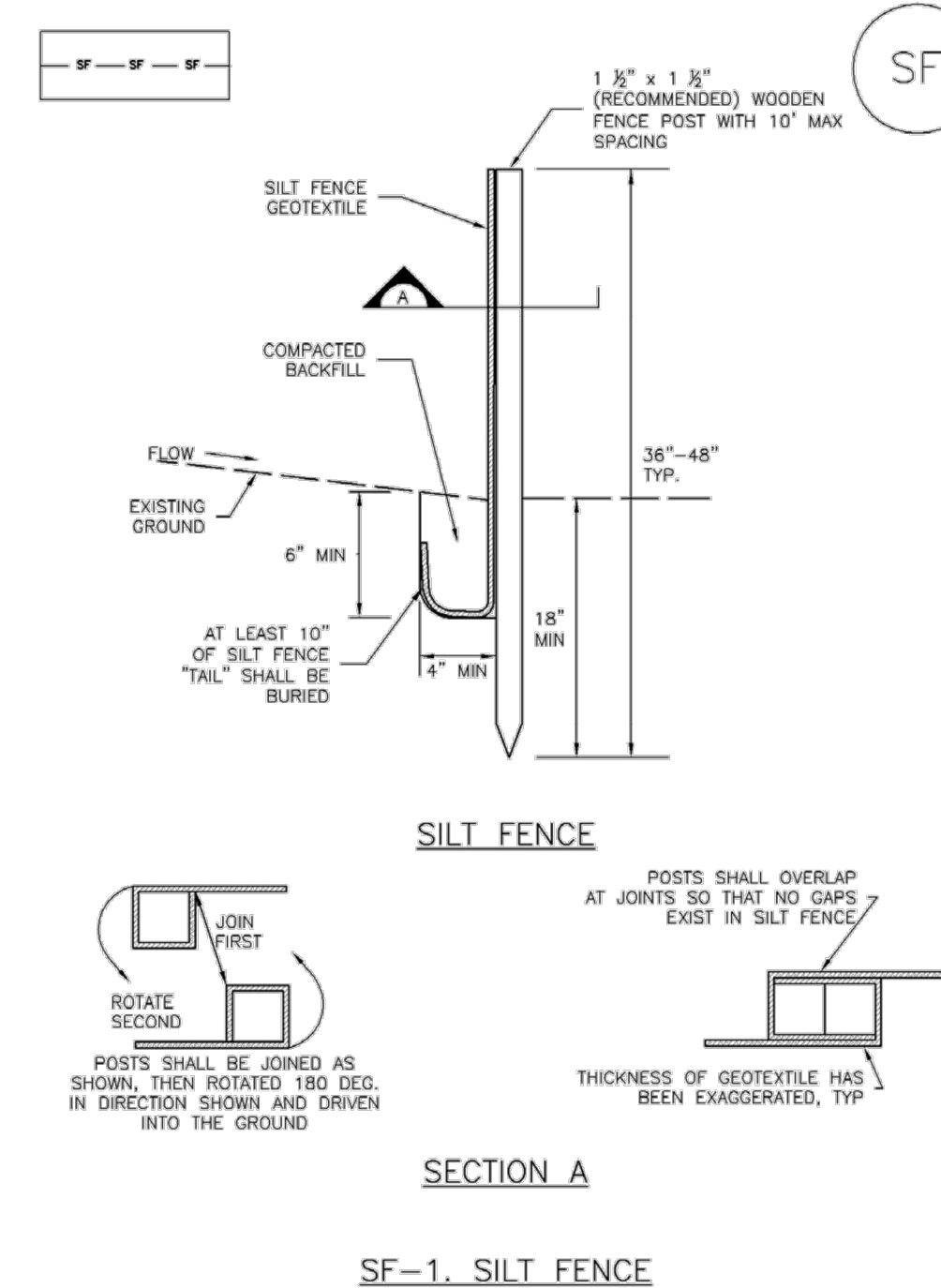
- STABILIZED STAGING AREA SHALL BE ENLARGED IF NECESSARY TO CONTAIN PARKING, STORAGE, AND UNLOADING/LOADING OPERATIONS.
 - THE STABILIZED STAGING AREA SHALL BE REMOVED AT THE END OF CONSTRUCTION. THE GRANULAR MATERIAL SHALL BE REMOVED OR, IF APPROVED BY THE LOCAL JURISDICTION, USED ON SITE, AND THE AREA COVERED WITH TOPSOIL, SEEDING AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY LOCAL JURISDICTION.
- NOTE:** MANY MUNICIPALITIES PROHIBIT THE USE OF RECYCLED CONCRETE AS GRANULAR MATERIAL FOR STABILIZED STAGING AREAS DUE TO DIFFICULTIES WITH RE-ESTABLISHMENT OF VEGETATION IN AREAS WHERE RECYCLED CONCRETE WAS PLACED.
- NOTE:** MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM USDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

(DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO, NOT AVAILABLE IN AUTOCAD)

SSA-4 Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3

November 2010

Silt Fence (SF) SC-1



November 2010 Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3

SF-3

SC-1 Silt Fence (SF) SC-1

SILT FENCE INSTALLATION NOTES

- SILT FENCE MUST BE PLACED AWAY FROM THE TOE OF THE SLOPE TO ALLOW FOR WATER PONDING. SILT FENCE AT THE TOE OF A SLOPE SHOULD BE INSTALLED IN A FLAT LOCATION AT LEAST SEVERAL FEET (2-5 FT) FROM THE TOE OF THE SLOPE TO ALLOW ROOM FOR PONDING AND DEPOSITION.
- A UNIFORM 6" X 4" ANCHOR TRENCH SHALL BE EXCAVATED USING TRENCHER OR SILT FENCE INSTALLATION DEVICE. NO ROAD GRADERS, BACKHOES, OR SIMILAR EQUIPMENT SHALL BE USED.
- COMPACT ANCHOR TRENCH BY HAND WITH A "JUMPING JACK" OR BY WHEEL ROLLING. COMPACTION SHALL BE SUCH THAT SILT FENCE RESISTS BEING PULLED OUT OF ANCHOR TRENCH BY HAND.
- SILT FENCE SHALL BE PULLED TIGHT AS IT IS ANCHORED TO THE STAKES. THERE SHOULD BE NO NOTICEABLE SAG BETWEEN STAKES AFTER IT HAS BEEN ANCHORED TO THE STAKES.
- SILT FENCE FABRIC SHALL BE ANCHORED TO THE STAKES USING 1" HEAVY DUTY STAPLES OR NAILS WITH 1" HEADS. STAPLES AND NAILS SHOULD BE PLACED 3" ALONG THE FABRIC DOWN THE STAKE.
- AT THE END OF A RUN OF SILT FENCE ALONG A CONTOUR, THE SILT FENCE SHOULD BE TURNED PERPENDICULAR TO THE CONTOUR TO CREATE A "J-HOOK." THE "J-HOOK" EXTENDING PERPENDICULAR TO THE CONTOUR SHOULD BE OF SUFFICIENT LENGTH TO KEEP RUNOFF FROM FLOWING AROUND THE END OF THE SILT FENCE (TYPICALLY 10' - 20').
- SILT FENCE SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.

SILT FENCE MAINTENANCE NOTES

- INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.
 - FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
 - WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
 - SEDIMENT ACCUMULATED UPSTREAM OF THE SILT FENCE SHALL BE REMOVED AS NEEDED TO MAINTAIN THE FUNCTIONALITY OF THE BMP, TYPICALLY WHEN DEPTH OF ACCUMULATED SEDIMENTS IS APPROXIMATELY 6".
 - REPAIR OR REPLACE SILT FENCE WHEN THERE ARE SIGNS OF WEAR, SUCH AS SAGGING, TEARING, OR COLLAPSE.
 - SILT FENCE IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION, OR IS REPLACED BY AN EQUIVALENT PERIMETER SEDIMENT CONTROL BMP.
 - WHEN SILT FENCE IS REMOVED, ALL DISTURBED AREAS SHALL BE COVERED WITH TOPSOIL, SEEDING AND MULCHED OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.
- NOTE:** MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM USDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

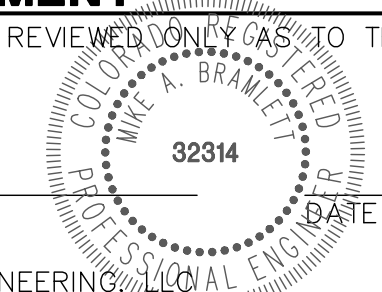
SF-4 Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3

November 2010

ENGINEER'S STATEMENT

STANDARD DETAILS SHOWN WERE REVIEWED ONLY AS TO THEIR APPLICATION ON THIS PROJECT

MIKE A. BRAMLETT, P.E.
COLORADO P.E. 32314
FOR AND ON BEHALF OF JR ENGINEERING



UNTIL SUCH TIME AS THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, JR ENGINEERING APPROVES THEIR USE AS DESIGNATED BY WRITTEN AUTHORIZATION.

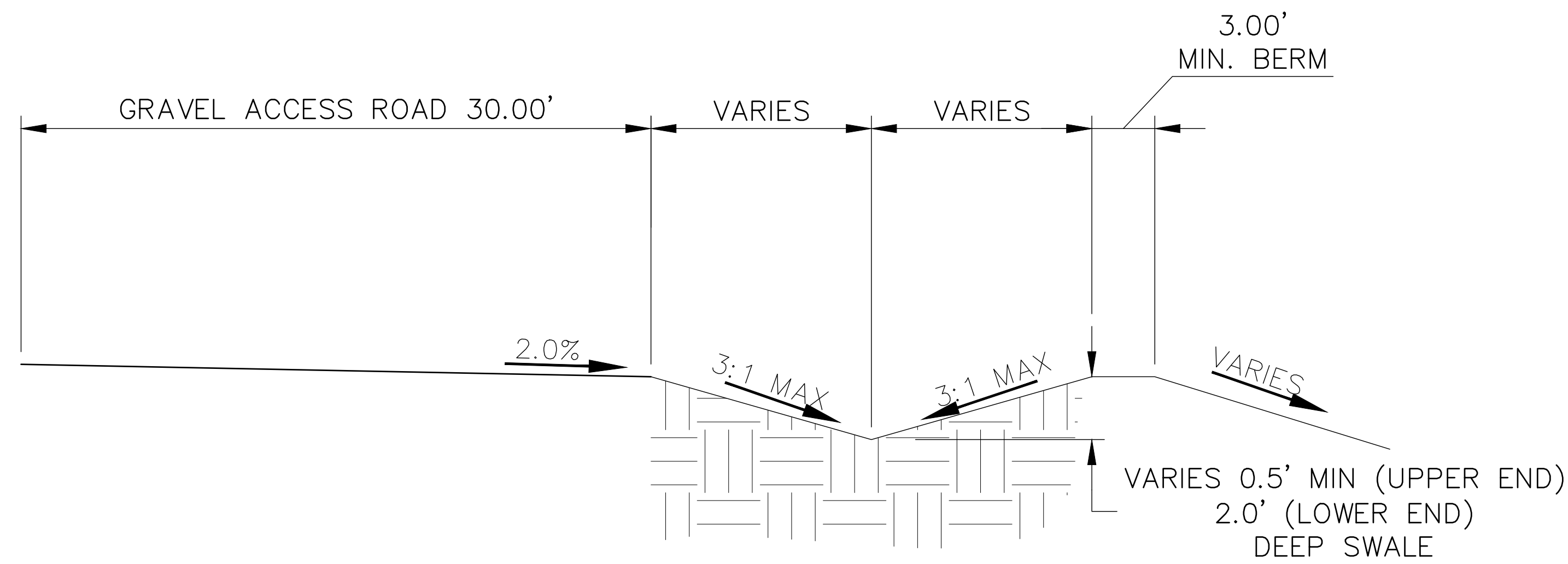
PREPARED FOR
ACR SITE DEVELOPMENT
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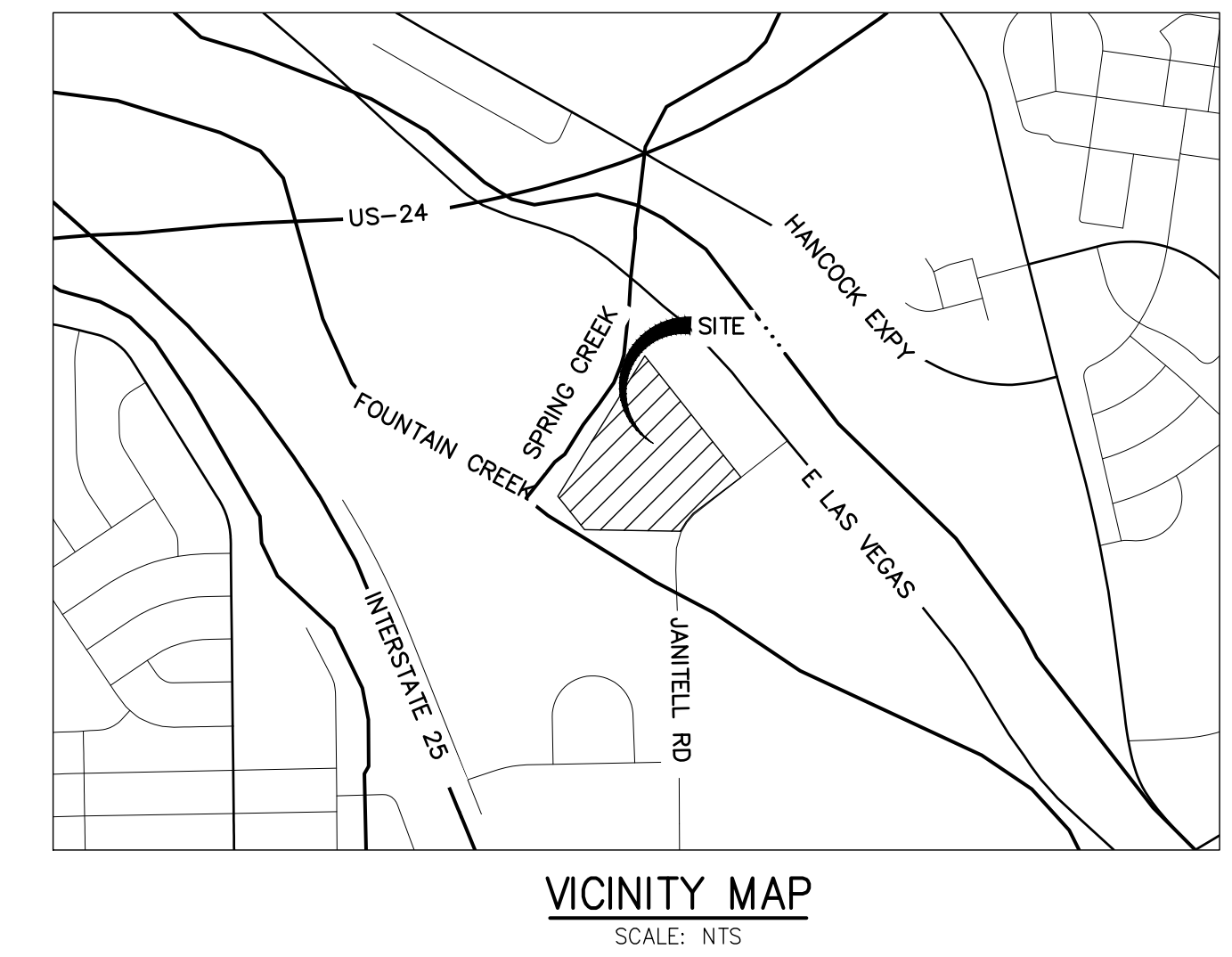
BY	DATE	REVISION

H-SCALE	N/A	V-SCALE	N/A	DATE	DESIGNED BY	DRAWN BY	CHECKED BY
				05/21/20	RB	JEA	

ACR SITE DEVELOPMENT PLAN	DETAILS 1
SHEET 6 OF 9	JOB NO. 25176.00



TYPICAL DIVERSION DITCH CROSS SECTION
 A-A
 NTS



UNLESS SHOWN OTHERWISE, ALL DIMENSIONS ARE IN FEET AND DECIMALS THEREOF.
 THESE DRAWINGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, OR ENGINEERING APPROVES THEIR USE AS SHOWN. THESE DRAWINGS ARE DESIGNED BY WRITTEN AUTHORIZATION.
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TABLE GB-GS-1
SUMMARY OF MAJOR MAINTENANCE ACTIVITIES

Maintenance Activity	Minimum Frequency	Indication Action is Needed:	Maintenance Action
Trash/Debris Removal	Twice annual and before mowing	Trash & debris in GB-GS	Remove and properly dispose of trash and debris
Mowing	Routine - as necessary to maintain 2" - 4" grass height	Excessive grass height/aesthetics	2"-4" grass height for turf grass; 4" to 6" for native grass
Irrigation (Automatic)	Three times annually	Areas of insufficient or excess watering; broken or missing parts	SPRING: start up system; test for even coverage and correct timer settings SUMMER: test for even coverage and correct timer settings FALL: drain and winterized system (follow watering regulations)
Irrigation (Not Automatic)	As needed to maintain healthy grass	Areas of insufficient or excess watering	Water as needed to maintain healthy grass; (follow watering regulations)
Weed Control	Minimum twice annually	Noxious weeds; Unwanted vegetation	Treat w/herbicide or hand pull; consult a local Weed Inspector
Mosquito Treatment	As needed, based upon inspections	Standing water/ mosquito habitat	Perform maintenance to eliminate standing water*. Treat w/ EPA approved chemicals
Level Spreader (Grass Buffer only)	As needed, based upon inspections	Evidence of uneven flow/localized erosion	Look for cause; repair, fill or revegetate areas of erosion
Rodent Damage	As needed, based upon inspections	Holes, small piles of dirt, raised burrows	Evaluate damage; contact Parks Dept. or Division of Wildlife for guidance

*See Section GB-GS 2.3.1.d for further discussion.

TABLE GB-GS-2
SUMMARY OF MAJOR MAINTENANCE ACTIVITIES

Maintenance Activity	Minimum Frequency	Indication Action is Needed:	Maintenance Action
Sediment Removal	As needed.	Sediment build-up.	Remove and properly dispose of sediment
Erosion Repair	As needed, based upon inspection	Rills and gullies forming on slopes and other areas	Repair eroded areas & revegetate; address cause
Vegetation Removal	As needed, based upon inspection	Trees, willows, shrubs impeding flow	Remove vegetation; restore correct grade and surface
Revegetation	As needed, based upon inspection	Areas without grass	Replace grass by sodding or seeding
Irrigation (Automatic)	As needed, based upon inspection.	Evidence of broken or missing parts	Replace parts and test system
Level Spreader (Grass Buffer Only)	As needed, based upon inspection.	Evidence of uneven flow, erosion; or rills/gullies	Repair sections of level spreader and address cause
Fertilization or Soil Amendment	As needed, minimize fertilization	Grass with pale color; areas with poor grass growth not due to irrigation problems	Consult with turf specialist; Test soil
Vehicle Tracks (Along Roadways)	As needed, based upon inspection	Depressions from vehicle tracks; vegetation damage	Repair and fill depressions; sod or seed damaged areas

TABLE GB-GS-3
SUMMARY OF MAJOR MAINTENANCE ACTIVITIES

Maintenance Activity	Minimum Frequency	Look for:	Maintenance Action
Major Sediment/Pollutant Removal	As needed - based upon scheduled inspections	Large quantities of sediment	Remove and dispose of sediment. Repair vegetation as needed
Major Erosion Repair	As needed - based upon scheduled inspections	Severe erosion including gullies, excessive soil displacement, areas of settlement, holes	Repair erosion - find cause of problem and address to avoid future erosion
Structural Repair	As needed - based upon scheduled inspections	Deterioration and/or damage to structural components - level spreader, grade control structures, irrigation components, and ponding water.	Structural repair to restore the structure to its original design
GB-GS Rebuild	As needed - due to complete failure of BMP	Removal of filter media and underdrain system	Contact City of Aurora Water Staff

NOTES

- SEE ATTACHED SITE PLAN TO SERVE AS FACILITIES MAP.
- SEE ATTACHED GESC PLAN SHEETS AND PROPOSED BASIN MAP FOR PROPOSED SWALE/DIVERSION DITCH AND EXTENDED DETENTION BASIN LOCATIONS AND DESIGN.

TABLE EDB-1
SUMMARY OF MINOR MAINTENANCE ACTIVITIES

Maintenance Activity	Minimum Frequency	Look for:	Maintenance Action
Sediment Removal*	As needed; typically every 1-2 years	Sediment build-up; decrease in pond volume	Remove and dispose of sediment
Erosion Repair	As needed, based upon inspection	Rills/gullies forming on side slopes, trickle channel, other areas	Repair eroded areas Revegetate; address source of erosion
Vegetation Removal/Tree Thinning	As needed, based upon inspection	Large trees/wood vegetation in lower chamber of pond	Remove vegetation; restore grade and surface
Drain Cleaning/Jet Vac	As needed, based upon inspection	Sediment build-up/non draining system	Clean drains; Jet Vac if needed

*Usually from the forebay, trickle channel, and/or micropool

TABLE EDB-2
SUMMARY OF ROUTINE MAINTENANCE ACTIVITIES

Maintenance Activity	Minimum Frequency	Look for:	Maintenance Action
Mowing	Twice annually	Excessive grass height/aesthetics	Mow grass to a height of 4" to 6"
Trash/Debris Removal	Twice annually	Trash & debris in EDB	Remove and dispose of trash and debris
Outlet Works Cleaning	As needed - after significant rain events - twice annually min.	Clogged outlet structure; ponding water	Remove and dispose of debris/trash/sediment to allow outlet to function properly
Weed control	Minimum twice annually	Noxious weeds; Unwanted vegetation	Treat w/ herbicide or hand pull; Consult the local weed specialist
Mosquito Treatment	As needed	Standing water/mosquito habitat	Treat w/ EPA approved chemicals
Algae Treatment	As needed	Standing water/ Algal growth/green color	Treat w/ EPA approved chemicals

TABLE EDB-3
SUMMARY OF MAJOR MAINTENANCE ACTIVITIES

Maintenance Activity	Minimum Frequency	Look for:	Maintenance Action
Major Sediment Removal	As needed - based upon scheduled inspections	Large quantities of sediment; reduced pond capacity	Remove and dispose of sediment. Repair vegetation as needed
Major Erosion Repair	As needed - based upon scheduled inspections	Severe erosion including gullies, excessive soil displacement, areas of settlement, holes	Repair erosion - find cause of problem and address to avoid future erosion
Structural Repair	As needed - based upon scheduled inspections	Deterioration and/or damage to structural components - broken concrete, damaged pipes, outlet works	Structural repair to restore the structure to its original design

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H-SCALE	V-SCALE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	BY	DATE	REVISION	
								No.	DATE
N/A	N/A	01/30/20	RB	RB					

ACR
 O & M DETAIL SHEET
 PPR-19-052



Know what's below.
 Call before you dig.