WILSON &COMPANY
5755 Mark Dabling Blvd, Ste.100
Colorado Springs, CO 80919
719-520-5800 phone
719-520-1080 fax

Stormwater Management Plan

North Gate/Struthers PWQ Pond

El Paso County, CO

Wilson Project Number: 15-100-081-00

Prepared for:
El Paso County

Prepared by:
Wilson & Company, Inc.
5755 Mark Dabling Blvd., Ste. 100
Colorado Springs, CO 80918

August 21, 2024

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. If such work is performed in accordance with the grading and erosion control plan, the work will not become a hazard to life and limb, endanger property, or adversely affect the safety, use, or stability of a public way, drainage channel, or other property.

Printed Name: _____ Date: _____

Phone Number: _____ Seal:

CONTRACTOR'S STATEMENT

I will comply with the requirements of the Grading and Erosion Control Plan including temporary control measure inspection requirements and final stabilization requirements. I acknowledge the responsibility to determine whether the construction activities on these plans require Colorado Discharge Permit System (CDPS) permitting for stormwater discharges associated with construction activity.

Name of Contractor: _____

Authorized Signature: _____ Date: _____

Title: _____

Phone Number: _____

Address: _____

Email Address: _____

OWNER'S STATEMENT

The owner will comply with the requirements of the Grading and Erosion Control Plan and Stormwater Management Plan including temporary control measure inspection requirements and final stabilization requirements according to the El Paso County Stormwater Criteria. I acknowledge the responsibility to determine whether the construction activities on these plans require Colorado Discharge Permit System (CDPS) permitting for stormwater discharges associated with construction activity.

Owner Signature: _____ Date: _____

Name of Owner: _____ Phone: _____

Title: _____ Email: _____

EL PASO COUNTY GRADING AND EROSION CONTROL REVIEW

This Grading and Erosion Control Plan is reviewed and filed in accordance with County criteria.

_____Date: _____

For the County Engineer

Notes: _____

_____

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INTRODUCTION

The purpose of this report is to develop a Stormwater Management Plan and a Grading and Erosion Control Plan for the construction of the *North Gate/Struthers Proposed Water Quality (PWQ) Pond* project located between the I-25 northbound and southbound thoroughfare and between North Gate Boulevard and Smith Creek which will consist of a PWQ Pond adjacent to North Gate Boulevard as well as a proposed storm sewer network that runs along North Gate Boulevard and Struthers Road. The plan covers site development from initial site preparation through site grading, utility installation, construction of required structures and any additional proposed developments and also includes the removal of all construction equipment and temporary control measures, and accounts for street sweeping and final stabilization of the site. This plan is based on the Colorado Department of Public Health and Environment, Water Quality Control Division Standards and the Urban Storm Drainage Criteria Manual.

SITE DESCRIPTION

Project Location

The *North Gate/Struthers PWQ Pond* project is a parcel of land located in the southeast quarter of Section 1, Township 12 South, Range 67, West of the 6th P.M. also southwest quarter of Section 6, Township 12 South, Range 66, West of the 6th P.M. Also northwest quarter of Section 7, Township 12 South, Range 66, Also northeast quarter of Section 12, Township 12 South, Range 67, West of the 6th P.M., County of El Paso, State of Colorado. A vicinity map has been provided in Appendix A of the report to show the general property location.

Site Description

The North Gate/Struthers PWQ Pond proposed project area is estimated at 7.83 acres with the anticipation of all of the project area being disturbed. The project is located along Struthers Road and North Gate Boulevard. Portions of the project, including the proposed pond, are within a Colorado Department of Transportation (CDOT) easement for I-25 on land owned by the United States Air Force Academy (USAFA). North Gate Boulevard, east of the northbound I-25 ramps, has been recently annexed by the City of Colorado Springs. Struthers Road is located in unincorporated El Paso County.

Current Site Conditions

The current state of the proposed pond site is an existing vacant field with scattered trees and vegetation situated between the northbound (NB) and southbound (SB) roadways of Interstate 25, bounded on the north by North Gate Boulevard and on the south by Smith Creek. This area lies primarily within the USAF Prebles Meadow Jumping Mouse Conservation Area limits. The proposed location for the storm network consists primarily of developed roadway with portions of the network in the grassy regions south of North Gate Boulevard. The existing vegetive cover along the project corridor was estimated at 75% based on areal and street-level imagery and site inspections.

Currently, there is limited public storm infrastructure along Struthers Road and North Gate Boulevard. Academy Gateway has an internal storm network with a treatment pond that outfalls

into the North Gate roadway. The RidgePointe apartment complex has its own treatment pond which overflows into an inlet that outfalls to the surface south of the intersection of Struthers Road and North Gate Boulevard. Past improvements along I-25 directed this project corridor runoff into ditches along the roadway. The runoff flows south then west to a water quality pond in the southeast gore of the westernmost roundabout.

This project proposes underground storm sewer beginning at location of the proposed PWQ pond described above and running east along south side of North Gate Boulevard, crossing the I-25 NB off-ramp, and continuing east to the intersection with Struthers Road where it turns north and continues to the existing manhole just west of Shepard Heights.

The existing topography in the vicinity of the proposed PWQ Pond site is such that the stormwater runoff sheet flows from the east and west highway embankments of I-25. There is no runoff from the I-25 roadway as it is collected, treated, and released outside of the project limits. Othe roadway stormwater in the area is collected by a pond in the southeast gore of the westernmost roundabout as the ditches along North Gate Boulevard collects the sheet flow as the roadway runs at an average slope of 2.45 percent. The slope along the North Gate Boulevard roadway where the proposed network will be, slopes up from east to west at an average of 2.54 percent. The stormwater runoff of North Gate Boulevard is caught by the existing swales and median adjacent to it and continues to be consistent until the site crosses into the area of grass around the existing roundabout.

Stormwater runoff sheet flows from North Gate Boulevard and the existing roundabout where the berm adjacent to the road steadily becomes steeper until the site transitions into the roundabout. As it crosses into the roundabout as well as the median within the roundabout there is an existing storm inlet that runoff from the roundabout on both sides of the median will capture as the inlet is the low-point within the median which is utilized to catch runoff from the roundabout as it is a berm. On the side of the roundabout which is distinguished as an entryway to it, stormwater runoff also sheet flows to the berm on the other side opposite to the median which contains three existing rip rap check dams. The limits of disturbance then transitions where the berm curves to a high point that catches runoff from the existing field adjacent to the roundabout and a continuing North Gate Boulevard. The existing field is a much larger grassy area that sheet flows into the berm and the three existing rip raps within it at an average slope of 3.84 percent.

Once the existing site exits the large grassy area it then crosses North Gate Boulevard and sheet flow runoff diverges in the center of the road to its respective berm. The site continues along North Gate Boulevard until it intersects with Struthers road its stormwater runoff is caught by the existing berm adjacent to it and continues to be until the flow is channelized by the curb and gutter beginning at the north west corner of the intersection of North Gate Boulevard and Struthers Road which can be considered a low-point for Struthers Road. The slope steadily increases from the intersection of North Gate Boulevard and Struthers Road to the end of the limits of disturbance on Struthers road as it runs at an average of 5.78 percent. The curb and gutter continues along Struthers Road to capture the sheet flow from the roadway. As the site goes along Struthers Road and the private roadway into Academy Gateway has a storm inlet as well as another inlet along Struthers Road that captures stormwater runoff from Struthers Road and its

curb and gutter as it increases in grade. The site concludes as it crosses Struthers Road and sheet flows towards the previously stated storm inlets and reaches an existing ditch that sheet flows stormwater runoff from Ridge Point Subdivision as well as Struthers Road. There are no stream crossings within the project limits.

Hydrologic Soil Group of the proposed site was determined to be Group "B" and Group "D" as presented by the NRCS Soil Report shown in Appendix C. HSG B soils are predominantly sand and sandy loam in nature with a moderately higher erosion potential than HSG D soils which are predominantly clay in nature with more resistance to erosion. For further soils information see the Geotechnical Report in Appendix E.

Description of Construction Activity

The *North Gate/Struthers PWQ Pond* project will consist of the construction of one (1) water quality pond and one (1) storm sewer network. The construction activities covered in this plan include earthwork, utility construction, paving and landscaping. The major construction activities that may impact stormwater runoff include grading, installation of utilities, and stormwater infrastructure construction. It is the intent of this report to implement Best Management Practices (BMP) for enhancing the quality of stormwater discharges during and after the construction activity.

Proposed Sequence for Major Activities

Due to the presence of the Prebles Meadow Jumping Mouse habitat in the project area, the limits of disturbance for the project have been minimized where possible and do not allow for large construction staging areas. Therefore, the Contractor is required to determine locations needed for stageing areas, stockpile locations, etc., but shall not increase the disturbed area for the project.

All perimeter controls such as construction fence and silt fence shall be properly placed and erected before construction activities commence as prescribed in the plans. Erosion control devices such as vehicle tracking control pads, stabilized staging areas, sediment control logs, rock socks and necessary inlet protection shall be appropriately placed as prescribed in the plans to limit sediment capture by nearby inlets.

Vehicle tracking control pads will be placed at the proposed access road location in the northwest corner of the proposed pond site south of North Gate Boulevard and north of Smith Creek. The location of any additional vehicle tracking control pads needed for project access will be determined by the Contractor but shall adhere to the parameters outlined in the Construction Control Measures found in Appendix D and shall not result in an increase in disturbed area.

Stabilized staging area locations will be determined by the Contractor and shall adhere to the parameters outlined in the Construction Control Measures found in Appendix D and shall not result in an increase in disturbed area.

Concrete washout areas will be placed at the Contractor's discretion but shall adhere to the parameters outlined in the Construction Control Measures found in Appendix D and shall not result in any additional disturbed area.

All devices and controls shall be monitored by the contractor to ensure proper working order and replaced or repaired as necessary. Sweet sweeping must also occur within this phase. Additional protections on-site and off-site may be added at the discretion of the contractor on duty (see the Grading and Erosion Control Plan in Appendix F for proposed locations. See the Grading and Erosion Control on site to view any modifications.)

Construction activities will primarily consist of pond excavation, rough grading, and installation of storm sewer infrastructure. Access drives will be graded to within 0.1' of final grade. Erosion control devices used during construction include: the continued use of the silt fence, sediment control logs and rock socks, vehicle tracking control pads, concrete washout areas, stabilized stockpile areas, and inlet protection. Additional inlet protection shall be provided for new inlets. The construction dumpster will remain on site, and portable toilets will be relocated as necessary. Sweet sweeping must also occur during construction activities.

All temporary erosion control measures may not be removed until all on-site areas tributary to the temporary controls have achieved final stabilization and completed grading according to the City of Colorado Springs Stormwater Construction Manual. Final Stabilization will occur in any disturbed areas in such a way that most accurately matches the surrounding vegetation or other stabilization. For construction within grassy areas, landscaping and permanent seeding must occur. The finish grading, paving and the installation of the permanent BMPs for the site must occur. Street Sweeping should also occur and the roadways must be sufficiently cleaned up and removed of all potential sediment and erosion for full stabilization of the site.

Runoff Coefficients

The basis of design for the project conservatively estimated 90% imperviousness across the entirety of the tributary basin. Runoff coefficients for the 5-Year and 100-Year for a 90% estimate are 0.76 and 0.84 respectively.

Potential Pollution Sources

Stated by the USDCM Volume 3, Potential pollution sources during construction for this site include:

- All disturbed and stored soils
- Vehicle tracking of sediments
- Management of contaminated soils
- Loading and unloading operations
- Outdoor storage activities (building materials, fertilizers, chemicals, etc.)
- Vehicle and equipment maintenance and fueling
- Significant dust or particulate generating processes
- Routine maintenance activities involving fertilizers, pesticides, detergents, fuels, solvents, oils, etc.
- On-site waste management practices (waste piles, liquid wastes, dumpsters, etc.)
- Concrete truck/equipment washing, including the concrete truck chute and associated fixtures and equipment

- Dedicated asphalt and concrete batch plants
- Non-industrial waste sources such as worker trash and portable toilets
- Other areas or procedures where potential spills can occur

Non-Stormwater Discharge Components

Non-stormwater discharges will include water used for dust control, and vehicle rinsing, potable waterline flushing, hydrant flushing, hydrostatic testing, sprinkler system testing, soil conditioning, and compressor condensation. The excess water from these non-storm water discharges shall be routed to the existing storm sewer system. If groundwater is encountered, appropriate measures will be taken to protect all storm water discharge points as necessary. Throughout construction if any springs or other discharges are encountered, the accumulated water will be routed to the existing storm sewer system and all applicable dewatering permits will be obtained.

Outfall and Receiving Waters

The site is located within the Smith Creek drainage basin. Storm water is collected and conveyed by the proposed storm network which outfalls into the proposed pond where it is treated and further conveyed through the outfall structure on the southwest end of the pond into Smith Creek which ultimately flows into Monument Creek. The Smith Creek Drainage Basin drains in a westerly direction towards Monument Creek.

SITE MAP

Construction site boundaries and areas of soil disturbance are shown on the Grading and Erosion Control (GEC) Plan included in Appendix F of this report.

BMPS FOR STORMWATER POLLUTION PREVENTION

Erosion and Sediment Controls

Structural Practices

Currently the pond site consists of open space with native grass and trees along the banks of Smith Creek. Special control measures such as sediment control logs, rock socks, inlet protection, vehicle tracking controls and concrete washout will be incorporated during construction and grading activities to prevent erosion and sediment from leaving the site. See the attached GEC Plan to be used during construction. There are no outside control measures for this project.

Silt fence, construction fence, rock socks and sediment control logs located along the extents of construction will protect existing swales from construction activities until vegetation is re-established and the soil stabilized. One vehicle tracking control pad will be installed at the entrance to the proposed access road location in the northwest corner of the existing field where the PWQ Pond shall be placed to the south North Gate Boulevard to prevent construction vehicles from carrying debris into the roadways. For vehicle tracking controls and the silt fence, construction fence, sediment control log, rock socks and inlet protection BMPs see the GEC Plans

in Appendix F. These measures will limit sediment-laden runoff from the proposed construction site to the existing storm inlets and surrounding properties. Concrete truck wash-out areas will be located away from any existing or proposed storm inlets. When dry and windy conditions create fugitive dust, the exposed, un-vegetated areas shall be watered to control and limit the dust escaping the site.

Non-Structural Practices

Maintenance of the CSWMP shall include inspections of the facilities every fourteen (14) days and inspection after any precipitation event. All adjacent hardscape areas are to be swept daily. A build-up of excessive sediment occurring in flat areas, and behind silt and construction fences will be removed and redistributed within the confines of the protected area. Collapsed or torn silt and construction fences will be repaired in a timely manner. In addition, any damage or sedimentation caused by storm activity will be repaired immediately. All requirements set forth within the Urban Drainage and Flood Control District's "Good Housekeeping" guidelines from Section 5 of Chapter 5 of the 3rd Volume of the Urban Storm Drainage Criteria Manual should be followed.

If construction will be delayed for more than 14 days on any part of the site, that portion of the site shall be stabilized within 14 days. Mulching, properly attached, with a combination of soil roughening and temporary seeding will be used to satisfy this requirement. Vehicles will be required to rinse-off prior to leaving the site when muddy or extreme dusty conditions exist.

Materials Handling and Spill Prevention

Upon initial mobilization, the contractor shall immediately identify areas prone to potential spills, and any locations requiring additional erosion control measures. The contractor shall identify these areas on the stormwater management plan and include any permanent or temporary measures taken or proposed to ensure the proper containment and/or remediation of spills and erosion. The weekly reports shall identify any environmental spills, and measures taken remediate the area to appropriate standards.

The storm water management plan must be updated frequently to ensure appropriate measures are taken as construction progresses. The plan should include portable toilets and/or any containers with potential of leakage. Portable toilets shall be staked to prevent accidental over-turning.

The following are material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff.

Training:
There will be an orientation, scheduled, and post-build training with regards to stormwater and spill prevention. Below are a brief description of each training:

- Orientation training - Will consist of going over the SWMP documents and what to do if a spill occurs. This will occur when it's an individual's first time on-site.
- Scheduled training – Will occur weekly as part of the weekly OSHA lunchbox training

- Post-build training – This will occur after each phase of work. This training will consist of discussing any items that have occurred on-site and what each take away is.

Good Housekeeping:

The following good housekeeping practices will be followed onsite during the construction project:

1. An effort will be made to store only enough material required to do the job.
2. All materials stored on site will be stored in a neat, orderly manner in their appropriate containers and protected from weather or within secondary containment.
3. Products will be kept in their original containers with the original manufacturer's label.
4. Substances will not be mixed with one another unless recommended by the manufacturer.
5. Whenever possible, all of a product will be used up before disposing of the container.
6. Manufacturers' recommendations (MSDS Sheets) for proper use will be followed.
7. Any remaining chemicals shall be disposed of according to manufacturers' recommendations and in accordance with Federal, State and local regulations.
8. The SWMP Administrator(s) will inspect regularly to ensure proper use and disposal of materials onsite.

Hazardous Products:

These practices are used to reduce the risks associated with hazardous materials:

1. Products will be kept in original containers unless they are not re-sealable.
2. Original labels and material safety data will be retained.
3. Products will be stored under cover.
4. If surplus product must be disposed of, manufacturers' or local and State recommended methods for proper disposal will be followed.

Spill Control Practices:

In addition to the good housekeeping and material management practices discussed previously in this plan, the following practices will be followed for spill prevention and cleanup:
Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but are not be limited to: brooms, dust pans, mops, rags, gloves, goggles, absorbent powder / kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.

The operator will inform the jobsite personnel that if a spill of any size occurs they are to always notify the SWMP manager and, depending on the nature and severity of the spill, the operator will contact the EPA, downstream users and other regulatory agencies.

CDPHE requires that any hazardous material spill be reported when any of the following conditions occur:

- Over 25 gallons of petroleum
- 5 CCs of mercury
- Any and all raw sewage releases
- Any/all State waters impacted

If any of the above criteria is met or exceeded, the Colorado Department of Public Health and Environment, Local Emergency Planning committee, downstream users and other agencies (MS4s) will be notified. The CDPHE will be notified by telephone within 24 hours. In addition, written notification describing the spill and the cleanup procedures used will be sent to the agencies 5 days following the spill. If a spill does not meet the above criteria, reporting is not mandatory.

When any spill occurs:

1. Notify the controlling operator of the site immediately following a spill of hazardous materials or a spill that could be hazardous to the environment and/or human life.
2. Documentation of the spill should occur and its clean-up procedures.
3. At a minimum the following should be documented:
    - Nature of spill
    - Quantity of spill
    - Date/time spill occurred
    - Agency notification if necessary
    - Clean-up procedures used
    - Daily monitoring (7 days) after clean-up
    - Photographs
    - Interview(s) with any witnesses of the event

General guidelines for clean-up procedures:

- Immediately control or stop the release/spill
- Mitigate the spill area as needed with a spill prevention kit
- Obtain approved secondary containers to store any absorbents used
- Clean up/remediate area(s) impacted by the spill
- Report the spill to the Responsible Person on the jobsite for determination if further reporting is required or if emergency notification is appropriate.

WQCD Toll Free 24-hour Environmental Emergency Spill Reporting Line: 1-877-518-5608

The emergency response phone numbers for the following must be clearly shown within the construction site:

- Fire Safety (closest)
- Public Safety (closest)

- Environmental Health & Safety Division (CDPHE)
- Poison Control Center

It is the permitee's responsibility to ensure all staff, consultants and contractor employees understand the policy and procedure requirements for spill prevention, handling and clean-up policies for each type of potential spill as identified by the local health department.

Recordation – A record of all spills, leaks and over-flows that result in discharge must be documented and maintained within the Stormwater Management Plan.

FINAL STABILIZATION AND LONG TERM STORMWATER MANAGEMENT

When construction is completed all areas of the site will be stabilized through slope stabilization, re-vegetation, sod and temporary seeding. In general, the historic drainage conditions have been maintained or improved and no additional discharges have been created. The long-term responsibility for the maintenance of Grading and Erosion Control Plan will be that of the owner.

INSPECTION AND MAINTENANCE

Maintenance of the erosion control measures shall comply with the criteria set forth by the City of Colorado Springs Stormwater Construction Manual. BMP's shall be reviewed in accordance with the "Erosion Control BMP's" and/or "Sediment Control BMP's" specifications and criteria listed hereinafter. Copies of the Field Report and the digital pictures together with conclusions, notations, and recommended courses of action will be delivered to the Project Engineer.

The GEC Administrator is required to conduct self-inspections. The purpose of these inspections is to ensure that all control measures are installed according to the approved plans, appropriate as to the intended use, operating effectively, and being properly maintained.

The GEC Administrator shall, at a minimum, make a thorough inspection at least once every 14 calendar days. Also, post-storm event inspections must be conducted within 24 hours following the end of any precipitation or snowmelt event that causes surface erosion. Provided the timing is appropriate, the post-storm inspections may be used to fulfill the 14-day routine inspection requirement. Alternatively, the GEC Administrator may choose to perform self-inspections every 7 calendar days and forego post-storm event inspections. The self-inspection schedule must be identified in the GEC Administrator's most recent self-inspection. A more frequent inspection schedule than the minimum described may be necessary to ensure that control measures continue to operate as needed to comply with the GEC Plan. Site conditions such as steep grades and close proximity to a state water are reasons for increasing the frequency of self-inspections.

The GEC Administrator shall submit documentation of the self-inspections by uploading the document to the City's electronic permitting management system. Completed self-inspection forms must be submitted electronically within 5 business days of the self-inspection. The self-inspections must also be available either physically or electronically at the construction site at all times throughout the duration of the project. GEC Inspectors will review self-inspections during

City Compliance Inspections. The use of a third-party inspection program does not remove this requirement. Additionally, the use of a third-party inspection program does not relieve the Permittee of the requirement to comply with all compliance inspections. Digital pictures taken of each BMP, and copies of the report and pictures shall be delivered to the Project Engineer.

For sites or portions of sites where construction activities have been completed and final stabilization measures installed but final stabilization has not yet been achieved, the GEC Administrator shall make a thorough inspection of their stormwater control measures at least once every month. Post-storm event inspections must continue to be conducted within 24 hours following the end of any precipitation or snowmelt event that causes surface erosion. The GEC Plan must be amended to indicate those areas where construction activities have been completed but final stabilization has not yet been achieved that will be inspected once a month. When site conditions make the schedule required in this section impractical, the permittee may petition the City to grant an alternate inspection schedule. The alternative inspection schedule may not be implemented prior to written approval by the City and incorporation into the CSWMP. The Permittee is responsible to confirm that the frequency of inspections is sufficient to ensure that control measures remain in good working condition at all times.

Records of inspection shall be maintained for review at all times. These records shall include a record of any spills along with a record of remedial action taken to prevent further spills. Should changes in the Stormwater Management Plan become necessary, this SWMP shall be amended as necessary to control pollutants from entering the stormwater discharge.

The following are inspection and maintenance practices that will be used to maintain erosion and sediment control BMPs:

- All measures will be maintained in good working order; if a repair is necessary, it will be initiated immediately following the report.
- Built up sediment shall be removed from inlet protection, silt fence, etc. when it has reached one-half the height of the protection device, or if there is any evidence that sediment is bypassing the BMP device.
- Regular inspection and testing of equipment and operational systems to uncover conditions such as cracks or slow leaks, which could cause breakdowns or failures that result in discharge of pollutants to downstream facilities

Records of inspection shall be maintained for review at all times. These records shall include a record of any spills along with a record of remedial action taken to prevent further spills. Should changes in the Grading and Erosion Control Plan become necessary, this SWMP shall be amended as necessary to control pollutants from entering the stormwater discharge

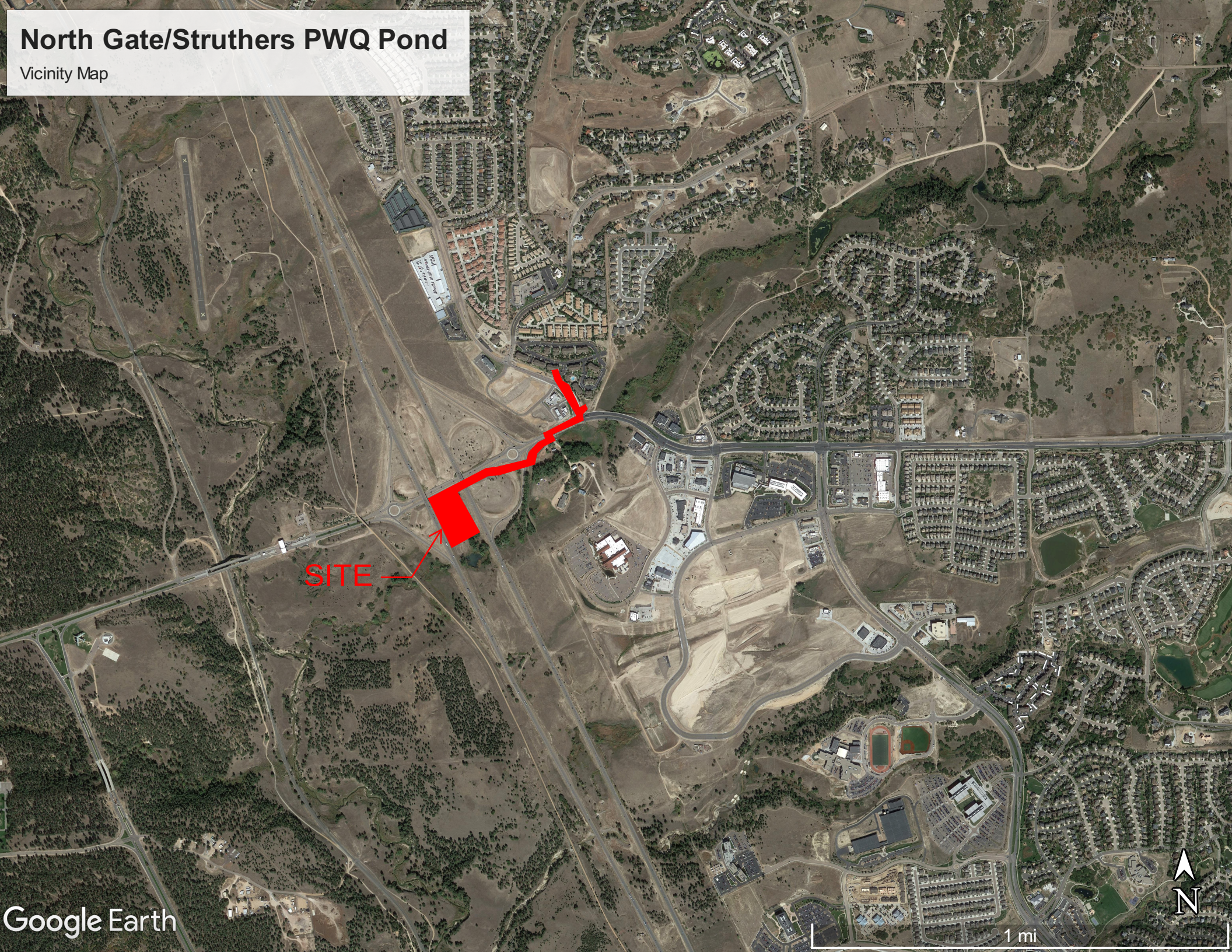
REFERENCES

1. El Paso County Stormwater Management Plan Checklist, October 2021
2. City of Colorado Springs Stormwater Construction Manual, January 2020.
3. City of Colorado Springs Drainage Criteria Manual, May 2014.
4. City of Colorado Springs Engineering Criteria Manual, July 2010
5. Urban Storm Drainage Criteria Manual, Urban Drainage and Flood Control District, March 1969, Revised: August 2018.
6. Colorado Department of Public Health and Environment, Water Quality Control Division Guidelines; Denver, Colorado.

APPENDIX A
Vicinity Map

North Gate/Struthers PWQ Pond

Vicinity Map



APPENDIX B
El Paso County Storm Water Management Plan Checklist

3275 Akers Drive
Colorado Springs, CO 80922
Phone 719-520-6460
Fax 719-520-6879
www.elpasoco.com

EL PASO COUNTY
STORMWATER MANAGEMENT PLAN CHECKLIST

EPC Project Number:

Revised: October 2021

		Applicant	EPC
1. STORMWATER MANAGEMENT PLAN (in the "Applicant" column specify the page number for each item)			
1	Applicant (owner/designated operator), SWMP Preparer, Qualified Stormwater Manager, and Contractor Information. (On cover/title sheet)		
2	Table of Contents	x	
3	Site description and location to include: vicinity map with nearest street/crossroads description	x	
4	Narrative description of construction activities proposed (e.g., may include clearing and grubbing, temporary stabilization, road grading, utility / storm installation, final grading, final stabilization, and removal of temporary control measures)	x	
5	Phasing plan – may require separate drawings indicating initial, interim, and final site phases for larger projects. Provide "living maps" that can be revised in the field as conditions dictate	x	
6	Proposed sequence for major activities: Provide a construction schedule of anticipated starting and completion dates for each stage of land-disturbing activity depicting conservation measures anticipated, including the expected date on which the final stabilization will be completed	x	
7	Estimates of the total site area and area to undergo disturbance; current area of disturbance must be updated on the SWMP as changes occur	x	
8	Soil erosion potential and impacts on discharge that includes a summary of the data used to determine soil erosion potential	x	
9	A description of existing vegetation at the site and percent ground cover and method used to determine ground cover	x	
10	Location and description of all potential pollution sources including but not limited to: disturbed and stored soils; vehicle tracking; management of contaminated soils; loading and unloading operations; outdoor storage of materials; vehicle and equipment maintenance and fueling; significant dust generating process; routine maintenance activities involving fertilizers, pesticides, herbicides, detergents, fuels, solvents, oils, etc.; on-site waste management; concrete truck/equipment washing; dedicated asphalt, concrete batch plants and masonry mixing stations; non-industrial waste such as trash and portable toilets	x	
11	Material handling to include spill prevention and response plan and procedures	x	
12	Spill prevention and pollution controls for dedicated batch plants	x	
13	Other SW pollutant control measures to include waste disposal and off-site soil tracking	x	
14	Location and description of any anticipated allowable non-stormwater discharge (ground water, springs, irrigation, discharge covered by CDPHE Low Risk Guidance, etc.)	x	
15	Name(s) of ultimate receiving waters; size, type and location of stormwater outfall or storm sewer system discharge	x	
16	Description of all stream crossings located within the project area or statement that no streams cross the project area	x	

3275 Akers Drive
Colorado Springs, CO 80922
Phone 719-520-6460
Fax 719-520-6879
www.elpasoco.com

EL PASO COUNTY
STORMWATER MANAGEMENT PLAN CHECKLIST

EPC Project Number:

Revised: October 2021

		Applicant	EPC
17	SWMP Map to include:		
17a	construction site boundaries	x	
17b	flow arrows to depict stormwater flow directions	x	
17c	all areas of disturbance	x	
17d	areas of cut and fill	x	
17e	areas used for storage of building materials, soils (stockpiles) or wastes	x	
17f	location of any dedicated asphalt / concrete batch plants	x	
17g	location of all structural control measures	x	
17h	location of all non-structural control measures	x	
17i	springs, streams, wetlands and other surface waters, including areas that require maintenance of pre-existing vegetation within 50 feet of a receiving water	x	
18	Narrative description of all structural control measures to be used. Modifications to EPC standard control measures must meet or exceed County-approved details	x	
19	Description of all non-structural control measures to be used including seeding, mulching, protection of existing vegetation, site watering, sod placement, etc.	x	
20	Technical drawing details for all control measure installation and maintenance; custom or other jurisdiction's details used must meet or exceed EPC standards	x	
21	Procedure describing how the SWMP is to be revised	x	
22	Description of Final Stabilization and Long-term Stormwater Quality (describe nonstructural and structural measures to control SW pollutants after construction operations have been completed, including detention, water quality control measure etc.)	x	
23	Specification that final vegetative cover density is to be 70% of pre-disturbed levels	x	
24	Outline of permit holder inspection procedures to install, maintain, and effectively operate control measures to manage erosion and sediment	x	
25	Record keeping procedures identified to include signature on inspection logs and location of SWMP records on-site	x	
26	If this project relies on control measures owned or operated by another entity, a documented agreement must be included in the SWMP that identifies location, installation and design specifications, and maintenance requirements and responsibility of the control measure(s)	x	
	Please note: all items above must be addressed. If not applicable, explain why, simply identifying "not applicable" will not satisfy CDPHE requirement of explanation.		
2. ADDITIONAL REPORTS/PERMITS/DOCUMENTS			
a	Grading and Erosion Control Plan (signed)		
b	Erosion and Stormwater Quality Control Permit (ESQCP) (signed)		

3275 Akers Drive
Colorado Springs, CO 80922
Phone 719-520-6460
Fax 719-520-6879
www.elpasoco.com

EL PASO COUNTY
STORMWATER MANAGEMENT PLAN CHECKLIST

EPC Project Number:

Revised: October 2021

		Applicant	EPC
3. APPLICANT COMMENTS			
a			
b			
c			
4. CHECKLIST REVIEW CERTIFICATIONS			
a	Applicant: The Stormwater Management 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 and State for Stormwater Management Plans. _____ _____ Engineer of Record and/or Date Qualified Stormwater Manager Signature		
b	Review Engineer: The Stormwater Management Plan was reviewed and found to meet the checklist requirements except where otherwise noted or allowed by an approved deviation request. _____ _____ Review Engineer Date		

APPENDIX C
NRCS Soil Resource Report for North Gate/Struthers PWQ Project

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for El Paso County Area, Colorado

April 9, 2020

Preface

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

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

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

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

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

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Custom Soil Resource Report
Soil Map

Map Scale: 1:5,010 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
10	Blendon sandy loam, 0 to 3 percent slopes	19.2	71.9%
42	Kettle-Rock outcrop complex	6.5	24.3%
101	Ustic Torrifluvents, loamy	1.0	3.8%
Totals for Area of Interest		**26.6**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

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

El Paso County Area, Colorado

10—Blendon sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 3671
Elevation: 6,000 to 6,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blendon and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blendon

Setting

Landform: Terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

A - 0 to 10 inches: sandy loam
Bw - 10 to 36 inches: sandy loam
C - 36 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 2 percent
Available water storage in profile: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Sandy Foothill (R049BY210CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

42—Kettle-Rock outcrop complex

Map Unit Setting

National map unit symbol: 368j
Elevation: 6,800 to 7,700 feet
Frost-free period: 110 to 130 days
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 60 percent
Rock outcrop: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 8 to 40 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 60 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

101—Ustic Torrifluvents, loamy

Map Unit Setting

National map unit symbol: 3673
Elevation: 5,500 to 7,000 feet
Mean annual precipitation: 13 to 16 inches
Mean annual air temperature: 47 to 52 degrees F
Frost-free period: 125 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Ustic torrifluvents and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ustic Torrifluvents

Setting

Landform: Flood plains, stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy, clayey, stratified loamy

Typical profile

A - 0 to 6 inches: variable
C - 6 to 60 inches: stratified loamy sand to clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: Saline Overflow LRU's A & B (R069XY037CO)
Other vegetative classification: OVERFLOW (069BY036CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

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APPENDIX D
Construction Control Measure Details

Construction Fence (CF) SM-3

Description

A construction fence restricts site access to designated entrances and exits, delineates construction site boundaries, and keeps construction out of sensitive areas such as natural areas to be preserved as open space, wetlands and riparian areas.

Photograph CF-1. A construction fence helps delineate areas where existing vegetation is being protected. Photo courtesy of Douglas County.

Appropriate Uses

A construction fence can be used to delineate the site perimeter and locations within the site where access is restricted to protect natural resources such as wetlands, waterbodies, trees, and other natural areas of the site that should not be disturbed.

If natural resource protection is an objective, then the construction fencing should be used in combination with other perimeter control BMPs such as silt fence, sediment control logs or similar measures.

Design and Installation

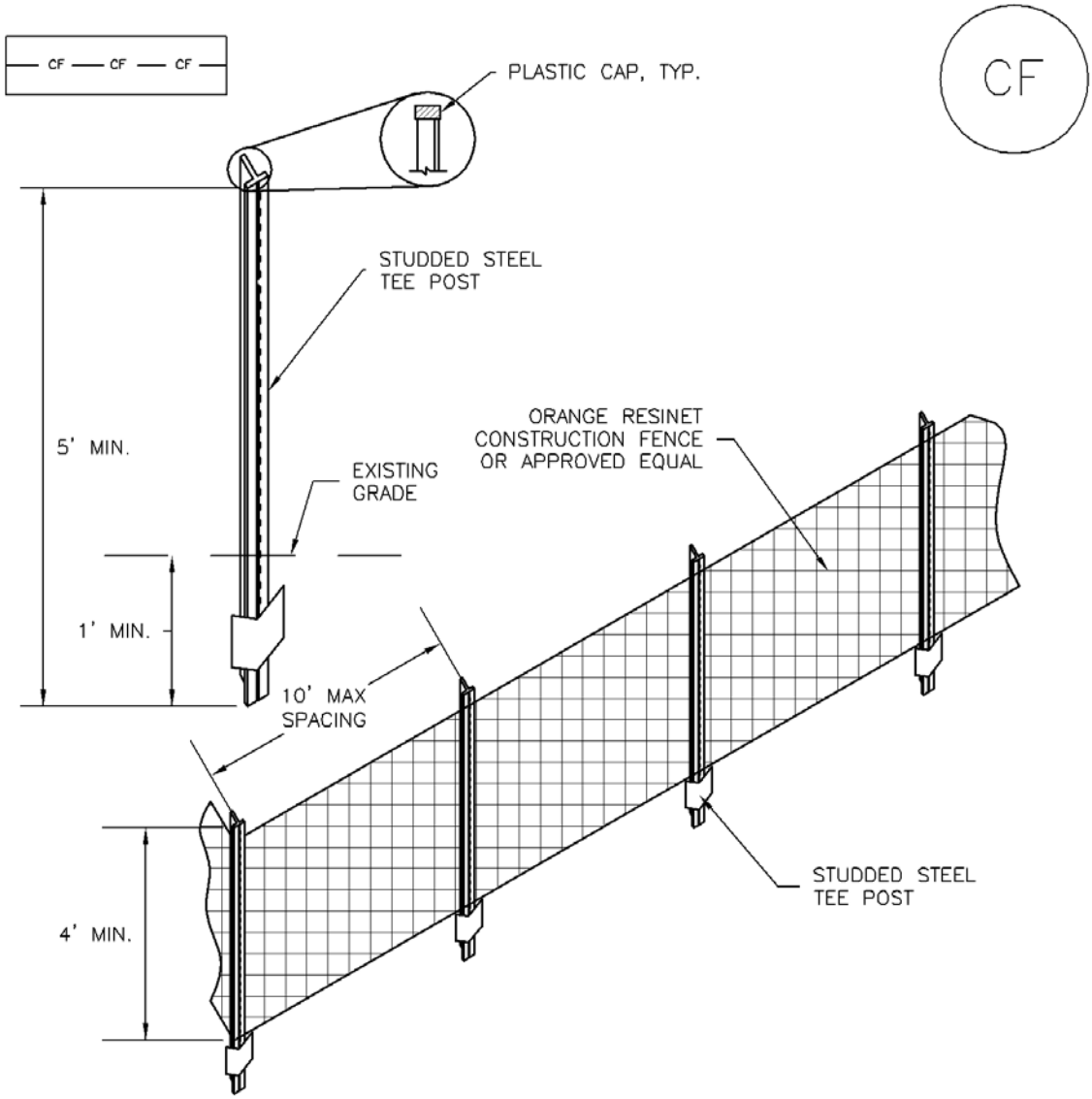
Construction fencing may be chain link or plastic mesh and should be installed following manufacturer's recommendations. See Detail CF-1 for typical installations.

Do not place construction fencing in areas within work limits of machinery.

Maintenance and Removal

- Inspect fences for damage; repair or replace as necessary.
- Fencing should be tight and any areas with slumping or fallen posts should be reinstalled.
- Fencing should be removed once construction is complete.

Construction Fence	
Functions	
Erosion Control	No
Sediment Control	No
Site/Material Management	Yes



CF–1. PLASTIC MESH CONSTRUCTION FENCE

CONSTRUCTION FENCE INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   –LOCATION OF CONSTRUCTION FENCE.

2. CONSTRUCTION FENCE SHOWN SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.

3. CONSTRUCTION FENCE SHALL BE COMPOSED OF ORANGE, CONTRACTOR–GRADE MATERIAL THAT IS AT LEAST 4' HIGH. METAL POSTS SHOULD HAVE A PLASTIC CAP FOR SAFETY.

4. STUDDED STEEL TEE POSTS SHALL BE UTILIZED TO SUPPORT THE CONSTRUCTION FENCE. MAXIMUM SPACING FOR STEEL TEE POSTS SHALL BE 10'.

5. CONSTRUCTION FENCE SHALL BE SECURELY FASTENED TO THE TOP, MIDDLE, AND BOTTOM OF EACH POST.

CONSTRUCTION FENCE MAINTENANCE NOTES

1. 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.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. CONSTRUCTION FENCE SHALL BE REPAIRED OR REPLACED WHEN THERE ARE SIGNS OF DAMAGE SUCH AS RIPS OR SAGS. CONSTRUCTION FENCE IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.

5. WHEN CONSTRUCTION FENCES ARE REMOVED, ALL DISTURBED AREAS ASSOCIATED WITH THE INSTALLATION, MAINTENANCE, AND/OR REMOVAL OF THE FENCE SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED, OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

(DETAIL ADAPTED FROM TOWN OF PARKER, COLORADO, NOT AVAILABLE IN AUTOCAD)

SILT FENCE

SF

1.0 DESCRIPTION

- Silt fence is a temporary sediment barrier consisting of woven geotextile fabric attached to supporting posts and trenched into the soil.

2.0 PURPOSE

- Used to intercept sheet flow prior to leaving a construction site.
- May be used around the perimeter of a construction site.

3.0 IMPLEMENTATION

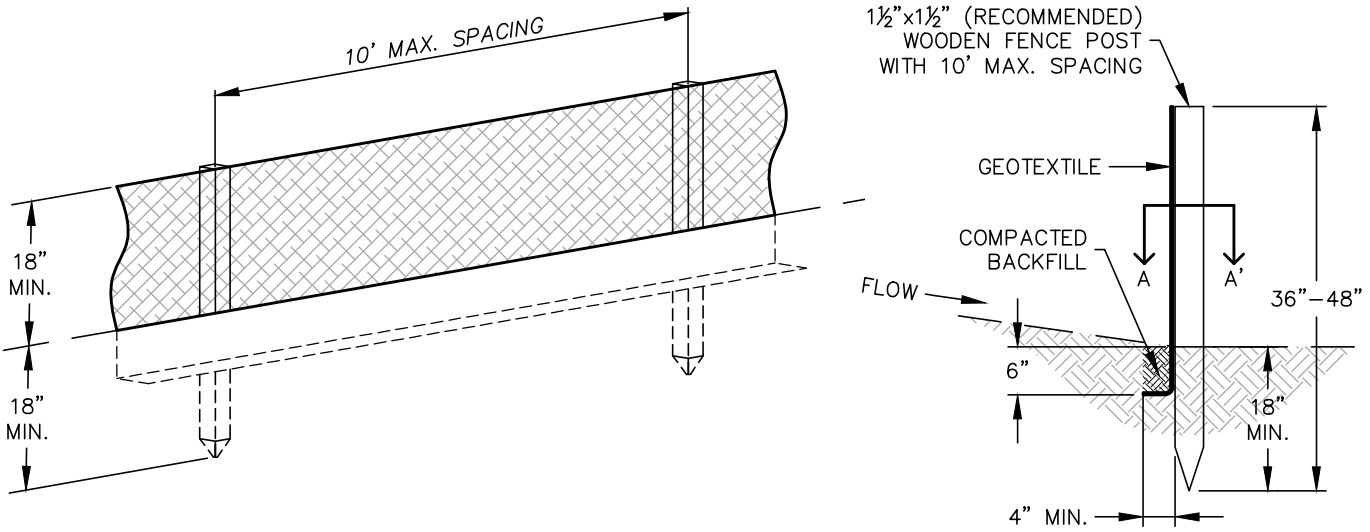
- Install silt fence to intercept sheet flow runoff from disturbed areas.
- Silt fence is not designed to be used as a filter fabric.
- Do not install silt fence across streams, channels, swales, ditches, or other drainageways.
- Install silt fence along the contour of slopes or in a manner to avoid creating concentrated flow (i.e. "J-hook" installation).
- The maximum tributary drainage area per 100 liner feet of silt fence is 1/4 acre.
- Properly installed silt fence should not be easily pulled out by hand and there should be no gaps between the ground and fabric.

4.0 TIMING

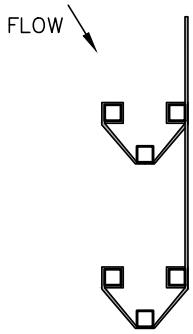
- Install prior to land disturbing activities.
- Remove silt fence after the upstream area has been permanently stabilized.

5.0 MAINTENANCE

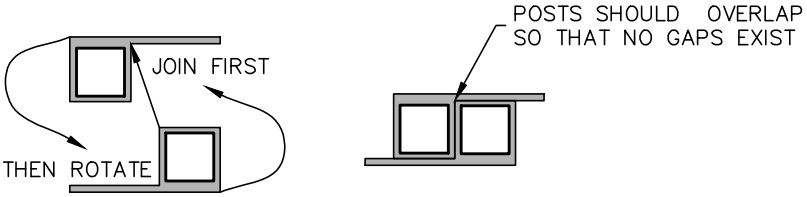
- Remove and properly dispose of sediment when it has accumulated to 1/2 of the height of the exposed silt fence.
- Inspect for and repair or replace damaged silt fence.



SILT FENCE



J-HOOK INSTALLATION



SECTION A-A'

INSTALLATION NOTES

1. SILT FENCE MUST BE PLACED ON A FLAT SURFACE 2'–5' AWAY FROM TOE OF THE SLOPE TO ALLOW FOR PONDING AND DEPOSITION.
2. COMPACT THE TRENCH USING A JUMPING JACK OR WHEEL ROLLING TO THE POINT THAT THE FENCE RESISTS BEING PULLED OUT OF THE GROUND BY HAND.
3. SILT FENCE SHALL BE TAUT WITH NO SAGS AFTER IT HAS BEEN ANCHORED.
4. FABRIC SHALL BE ATTACHED TO POSTS WITH 1" HEAVY DUTY STAPLES OR 1" NAILS. THESE SHOULD BE PLACED VERTICALLY DOWN THE POST, 3" APART.
5. THE PREFERRED INSTALLATION METHOD USES A TRENCHER OR SILT FENCE INSTALLATION DEVICE.
6. INSTALL SILT FENCE ALONG THE CONTOUR OF THE SLOPES OR IN A MANNER TO AVOID CREATING CONCENTRATED FLOW (SUCH AS A "J–HOOK" INSTALLATION).

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ACCUMULATED SEDIMENT MUST BE REMOVED WHEN THE HEIGHT REACHES ½ OF THE DESIGN HEIGHT OF THE SILT FENCE.
3. SILT FENCE MUST REMAIN UNTIL THE UPSTREAM DISTURBANCE AREA IS STABILIZED.
4. PERMANENTLY STABILIZE AREA AFTER SILT FENCE IS REMOVED.

SF

STORMWATER ENTERPRISE

SILT FENCE

APPROVED:

CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		900–SF

VEHICLE TRACKING CONTROL

VTC

1.0 DESCRIPTION

- Vehicle tracking control consists of a pad of coarse stone aggregate placed on a geotextile filter fabric.

2.0 PURPOSE

- Used to reduce the tracking of sediment onto roadways by construction vehicles.
- As vehicles drive over the VTC device, mud and sediment is removed from the tires.

3.0 IMPLEMENTATION

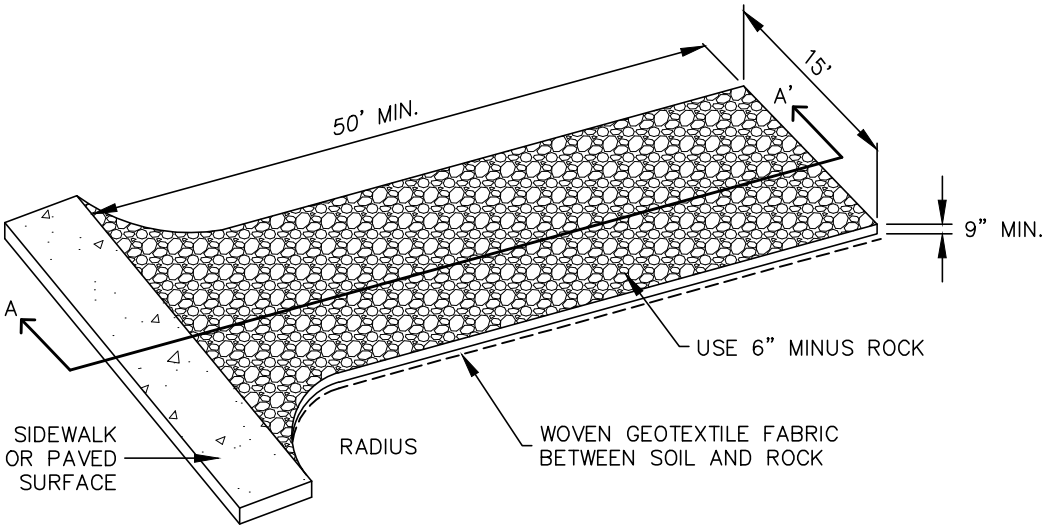
- Locate at construction entrance/exit.
- Organize site to ensure that all vehicles use the vehicle tracking control device.
- Where possible, grade VTC device to drain to construction site rather than to street.

4.0 TIMING

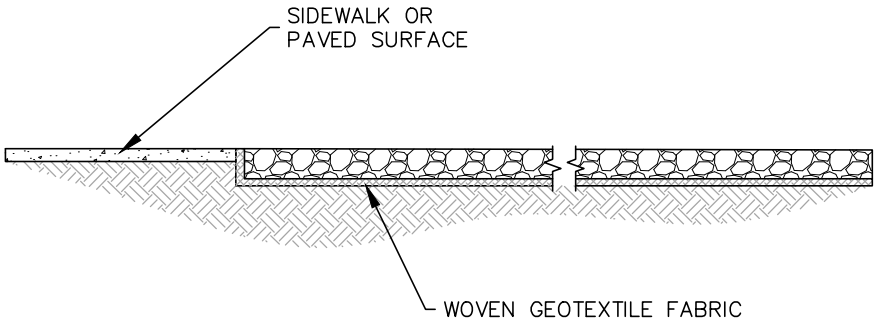
- Install prior to land disturbing activities.
- Remove when the potential for sediment migration onto adjacent roadways no longer exists (typically after site has been stabilized). Permanently stabilized area after vehicle tracking control is removed.

5.0 MAINTENANCE

- Roughen, replace, and/or add rock as needed to maintain a consistent depth and to prevent sediment tracking onto adjacent street.
- Sediment tracked onto the adjacent road shall be removed daily, by sweeping or shoveling, and never washed down storm drains.



AGGREGATE VEHICLE TRACKING CONTROL



SECTION A-A'

INSTALLATION NOTES

1. A STABILIZED CONSTRUCTION ENTRANCE/EXIT SHOULD BE LOCATED AT ALL POINTS WHERE VEHICLES EXIT THE CONSTRUCTION SITE TO ADJACENT ROADWAY.
2. STABILIZED CONSTRUCTION ENTRANCE/EXITS SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
3. RADIUS MUST BE ADEQUATE FOR INTENDED CONSTRUCTION VEHICLE TURNING.
4. ROCK SHOULD CONSIST OF 6" MINUS ROCK.
5. INSTALL CONSTRUCTION FENCE ON BOTH SIDES OF VEHICLE TRACKING CONTROL PAD WHEN NEEDED OR REQUIRED BY INSPECTOR.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. SEDIMENT TRACKED ONTO THE ADJACENT ROAD SHALL BE REMOVED DAILY, BY SWEEPING OR SHOVELING, AND NEVER WASHED DOWN STORM DRAINS.
3. ROUGHEN, REPLACE AND/OR ADD ROCK AS NEEDED TO MAINTAIN CONSISTENT DEPTH AND TO PREVENT SEDIMENT TRACKING ONTO ADJACENT STREET.
4. PERMANENTLY STABILIZE AREA AFTER VEHICLE TRACKING CONTROL IS REMOVED.

VTC

STORMWATER ENTERPRISE

VEHICLE TRACKING CONTROL

APPROVED:

CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		900-VTC

CONCRETE WASHOUT AREA

CWA

1.0 DESCRIPTION

- Concrete washout areas consist of either an excavated pit or a prefabricated haul-away container designed to contain concrete and concrete waste water.

2.0 PURPOSE

- Used to contain concrete and concrete waste water when the chutes of concrete mixers and hoppers of concrete pumps are rinsed out after delivery.
- Concrete washout areas consolidate solids for easier disposal and prevent runoff of concrete waste water, which is alkaline and contains high levels of chromium.

3.0 IMPLEMENTATION

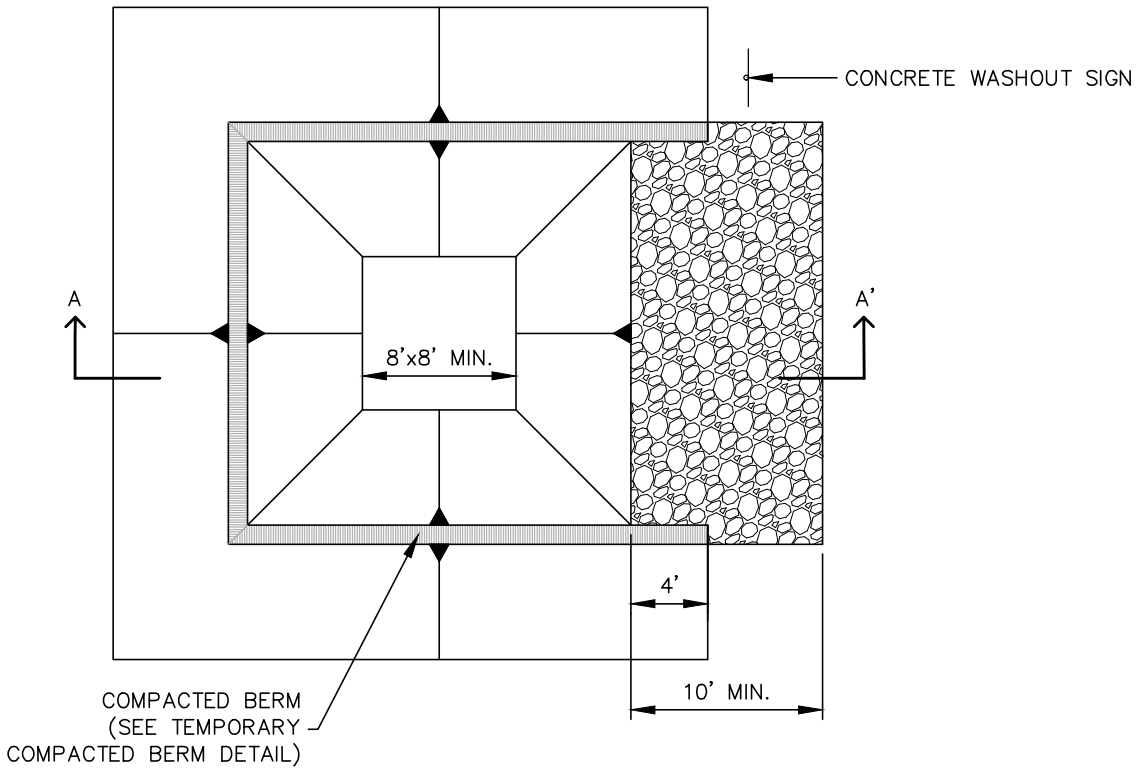
- Locate at least 50 feet away from State Waters, measured horizontally. Unlined concrete washout areas must be located at least 400 feet away from State Waters, and at least 1000 feet away from wells or drinking water sources.
- Do not locate in areas where shallow groundwater may be present, such as near natural drainages, springs, or wetlands.
- Do not place in areas subject to run-on.
- Label areas with appropriate signage.
- The addition of solvents, flocculents, or acid to wash water is prohibited.

4.0 TIMING

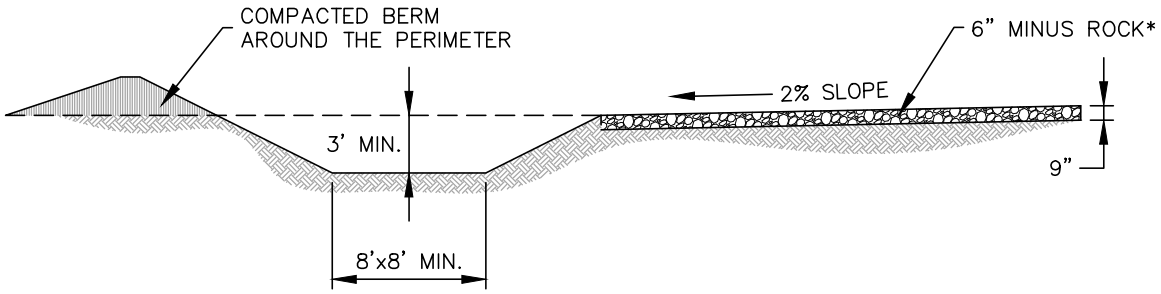
- Install prior to concrete activities.
- Remove after concrete activities have concluded.

5.0 MAINTENANCE

- Clean out facilities once they are 2/3 full, or construct new facilities for additional capacity.
- Concrete waste must be permanently disposed of off-site in an appropriate manner.



CONCRETE WASHOUT AREA PLAN



SECTION A-A'

*ROCK REQUIRED BASED ON SITE CONDITIONS AT THE DISCRETION OF THE GEC INSPECTOR

CWA

STORMWATER ENTERPRISE

CONCRETE WASHOUT AREA

APPROVED:

CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		900-CWA-1

INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   –LOCATION OF CONCRETE WASHOUT AREA
2. LOCATE AT LEAST 50' AWAY FROM STATE WATERS MEASURED HORIZONTALLY.
3. AN IMPERMEABLE LINER (16 MIL. MINIMUM THICKNESS) IS REQUIRED IF CONCRETE WASH AREA IS LOCATED WITHIN 400' OF STATE WATERS OR 1000' OF WELLS OR DRINKING WATER SOURCES.
4. DO NOT LOCATE IN AREAS WHERE SHALLOW GROUNDWATER MAY BE PRESENT.
5. THE CONCRETE WASH AREA SHALL BE INSTALLED PRIOR TO CONCRETE PLACEMENT ON SITE.
6. CONCRETE WASH AREA SHALL INCLUDE A FLAT SUBSURFACE PIT THAT IS AT LEAST 8' BY 8'.
7. BERM SURROUNDING SIDES AND BACK OF CONCRETE WASH AREA SHALL HAVE A MINIMUM HEIGHT OF 2 FEET.
8. CONCRETE WASH AREA ENTRANCE SHALL BE SLOPED 2% TOWARDS THE CONCRETE WASH AREA.
9. SIGNS SHALL BE PLACED AT THE CONCRETE WASH AREA.
10. USE EXCAVATED MATERIAL FOR PERIMETER BERM CONSTRUCTION.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. THE CONCRETE WASH AREA SHALL BE REPAIRED, CLEANED, OR ENLARGED AS NECESSARY TO MAINTAIN CAPACITY FOR CONCRETE WASTE. CONCRETE MATERIALS ACCUMULATED IN THE PIT SHALL BE REMOVED ONCE THE MATERIALS HAVE REACHED A DEPTH OF ⅔ THE HEIGHT OF THE CONCRETE WASH AREA.
3. CONCRETE WASHOUT WATER, WASTED PIECES OF CONCRETE, AND ALL OTHER DEBRIS IN THE SUBSURFACE PIT SHALL BE TRANSPORTED FROM THE JOB SITE IN A WATER–TIGHT CONTAINER AND DISPOSED OF PROPERLY.
4. THE CONCRETE WASH AREA SHALL REMAIN IN PLACE UNTIL ALL CONCRETE FOR THE PROJECT IS PLACED.
5. PERMANENTLY STABILIZE AREA AFTER CONCRETE WASH AREA IS REMOVED.

CWA

STORMWATER ENTERPRISE

CONCRETE WASHOUT AREA

APPROVED:

CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		900–CWA–2

PORTABLE TOILET

PT

1.0 DESCRIPTION

- The portable toilet detail provides requirements for portable toilet use on construction sites.

2.0 PURPOSE

- Used to minimize the risk of pollutant migration to State Waters.

3.0 IMPLEMENTATION

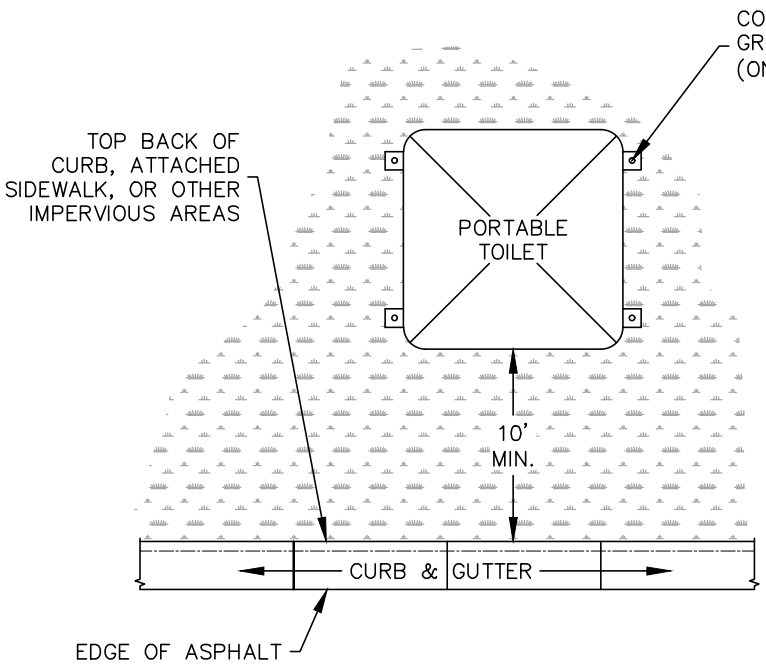
- Place portable toilet a minimum of 10 feet from the back of curb or on a trailer for road projects or sites that are mostly paved.
- Anchor portable toilet to the ground, at a minimum of two opposing corners (on a diagonal) using U-shaped rebar stakes.

4.0 TIMING

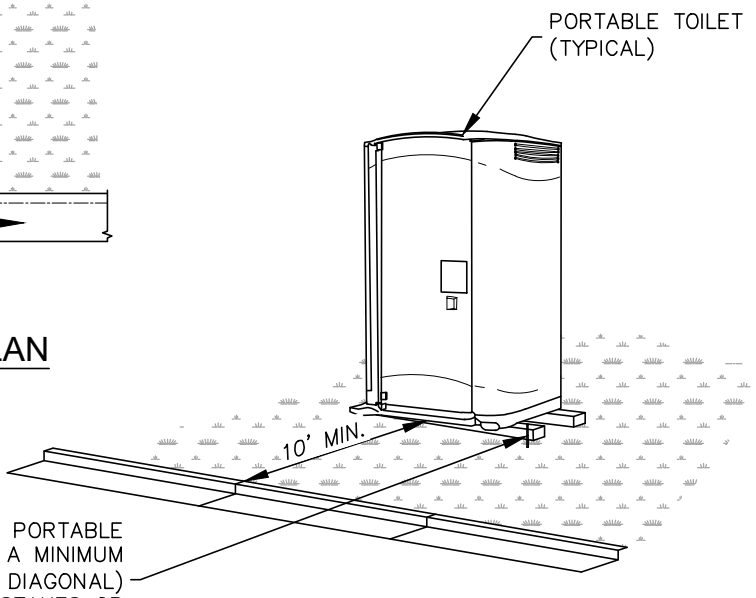
- Install as needed.
- Remove prior to the end of construction. Permanently stabilize any disturbed areas associated with the installation, maintenance, and/or removal of the toilets.

5.0 MAINTENANCE

- Portable toilets shall be serviced at the necessary intervals to eliminate the possibility of overflow.



PORTABLE TOILET PLAN



ISOMETRIC

INSTALLATION NOTES

1. PORTABLE TOILETS SHALL BE PLACED A MINIMUM OF 10 FEET BEHIND ALL CURBS, SIDEWALKS, AND OTHER IMPERVIOUS AREAS; 50 FEET FROM STORM INLETS, AND 100 FEET FROM WATERWAYS.
2. PORTABLE TOILETS IN THE RIGHT-OF-WAY ARE REQUIRED TO BE PLACED ON MOBILE TRAILERS AND MUST BE ANCHORED OR WEIGHTED DOWN. PORTABLE TOILETS MAY BE INSTALLED IN ACCORDANCE WITH NOTE #1 IN STAGING AREAS/YARDS.
3. PORTABLE TOILETS SHALL BE SECURELY ANCHORED TO THE GROUND USING U-SHAPED REBAR STAKES, OR OTHER EFFECTIVE ANCHORING.
4. ANCHORING SHALL BE POSITIONED ON AT LEAST TWO OPPOSING (DIAGONAL) CORNERS.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. PORTABLE TOILETS SHALL BE SERVICED AT THE NECESSARY INTERVALS TO ELIMINATE THE POSSIBILITY OF OVERFLOW.
3. WHEN THE PORTABLE TOILETS ARE REMOVED, ANY DISTURBED AREAS ASSOCIATED WITH THE INSTALLATION, MAINTENANCE, AND/OR REMOVAL OF THE TOILETS MUST BE PERMANENTLY STABILIZED.

PT

STORMWATER ENTERPRISE

PORTABLE TOILET

APPROVED:

CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
2/19/19	10/7/19	900-PTM

Stabilized Staging Area (SSA) SM-6

Description

A stabilized staging area is a clearly designated area where construction equipment and vehicles, stockpiles, waste bins, and other construction-related materials are stored. The contractor office trailer may also be located in this area. Depending on the size of the construction site, more than one staging area may be necessary.

Photograph SSA-1. Example of a staging area with a gravel surface to prevent mud tracking and reduce runoff. Photo courtesy of Douglas County.

Appropriate Uses

Most construction sites will require a staging area, which should be clearly designated in SWMP drawings. The layout of the staging area may vary depending on the type of construction activity. Staging areas located in roadways due to space constraints require special measures to avoid materials being washed into storm inlets.

Design and Installation

Stabilized staging areas should be completed prior to other construction activities beginning on the site. Major components of a stabilized staging area include:

- Appropriate space to contain storage and provide for loading/unloading operations, as well as parking if necessary.
- A stabilized surface, either paved or covered, with 3-inch diameter aggregate or larger.
- Perimeter controls such as silt fence, sediment control logs, or other measures.
- Construction fencing to prevent unauthorized access to construction materials.
- Provisions for Good Housekeeping practices related to materials storage and disposal, as described in the Good Housekeeping BMP Fact Sheet.
- A stabilized construction entrance/exit, as described in the Vehicle Tracking Control BMP Fact Sheet, to accommodate traffic associated with material delivery and waste disposal vehicles.

Over-sizing the stabilized staging area may result in disturbance of existing vegetation in excess of that required for the project. This increases costs, as well as requirements for long-term stabilization following the construction period. When designing the stabilized staging area, minimize the area of disturbance to the extent practical.

Stabilized Staging Area	
Functions	
Erosion Control	Yes
Sediment Control	Moderate
Site/Material	Yes

Minimizing Long-Term Stabilization Requirements

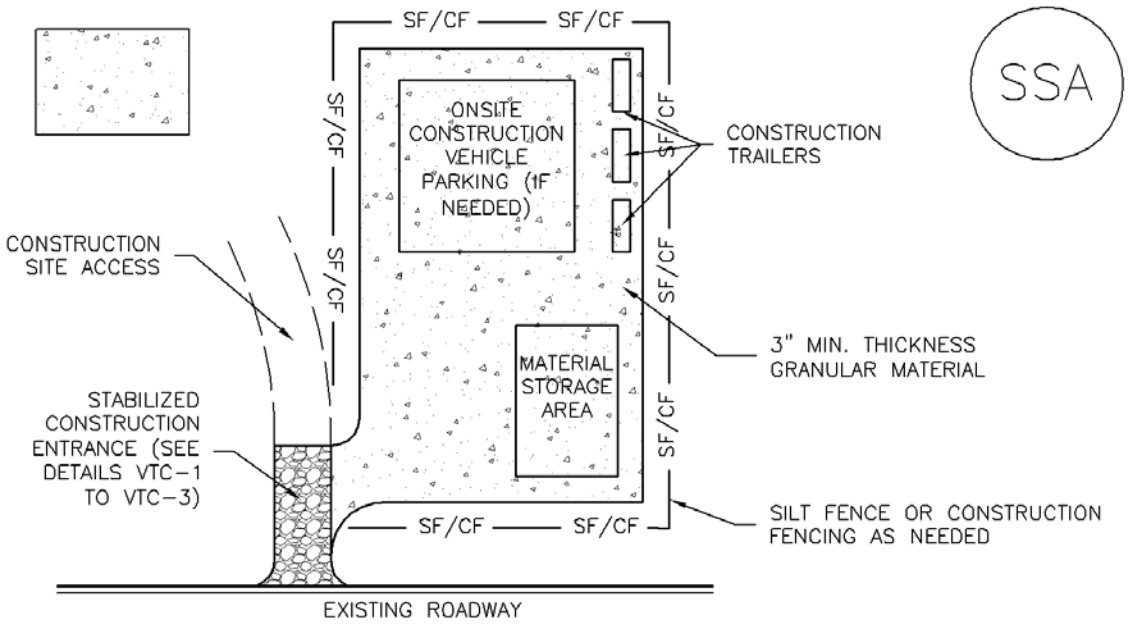
- Utilize off-site parking and restrict vehicle access to the site.
- Use construction mats in lieu of rock when staging is provided in an area that will not be disturbed otherwise.
- Consider use of a bermed contained area for materials and equipment that do not require a stabilized surface.
- Consider phasing of staging areas to avoid disturbance in an area that will not be otherwise disturbed.

See Detail SSA-1 for a typical stabilized staging area and SSA-2 for a stabilized staging area when materials staging in roadways is required.

Maintenance and Removal

Maintenance of stabilized staging areas includes maintaining a stable surface cover of gravel, repairing perimeter controls, and following good housekeeping practices.

When construction is complete, debris, unused stockpiles and materials should be recycled or properly disposed. In some cases, this will require disposal of contaminated soil from equipment leaks in an appropriate landfill. Staging areas should then be permanently stabilized with vegetation or other surface cover planned for the development.



SSA–1. STABILIZED STAGING AREA

STABILIZED STAGING AREA INSTALLATION NOTES

1. SEE PLAN VIEW FOR
   –LOCATION OF STAGING AREA(S).
   –CONTRACTOR MAY ADJUST LOCATION AND SIZE OF STAGING AREA WITH APPROVAL FROM THE LOCAL JURISDICTION.

2. STABILIZED STAGING AREA SHOULD BE APPROPRIATE FOR THE NEEDS OF THE SITE. OVERSIZING RESULTS IN A LARGER AREA TO STABILIZE FOLLOWING CONSTRUCTION.

3. STAGING AREA SHALL BE STABILIZED PRIOR TO OTHER OPERATIONS ON THE SITE.

4. THE STABILIZED STAGING AREA SHALL CONSIST OF A MINIMUM 3" THICK GRANULAR MATERIAL.

5. UNLESS OTHERWISE SPECIFIED BY LOCAL JURISDICTION, ROCK SHALL CONSIST OF DOT SECT. #703, AASHTO #3 COARSE AGGREGATE OR 6" (MINUS) ROCK.

6. ADDITIONAL PERIMETER BMPs MAY BE REQUIRED INCLUDING BUT NOT LIMITED TO SILT FENCE AND CONSTRUCTION FENCING.

STABILIZED STAGING AREA MAINTENANCE NOTES

1. 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.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY IF RUTTING OCCURS OR UNDERLYING SUBGRADE BECOMES EXPOSED.

STABILIZED STAGING AREA MAINTENANCE NOTES

5. STABILIZED STAGING AREA SHALL BE ENLARGED IF NECESSARY TO CONTAIN PARKING, STORAGE, AND UNLOADING/LOADING OPERATIONS.

6. 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, SEEDED 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 UDFCD 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)

INLET PROTECTION

IP

1.0 DESCRIPTION

- Inlet protection consists of a permeable sediment barrier installed around a storm inlet.

2.0 PURPOSE

- Used to minimize the amount of sediment and debris entering a storm drainage system prior to permanent stabilization of the contributing disturbed area.
- Inlet protection slows down runoff velocity to filter runoff and to promote sedimentation prior to entry into a storm drainage system.

3.0 IMPLEMENTATION

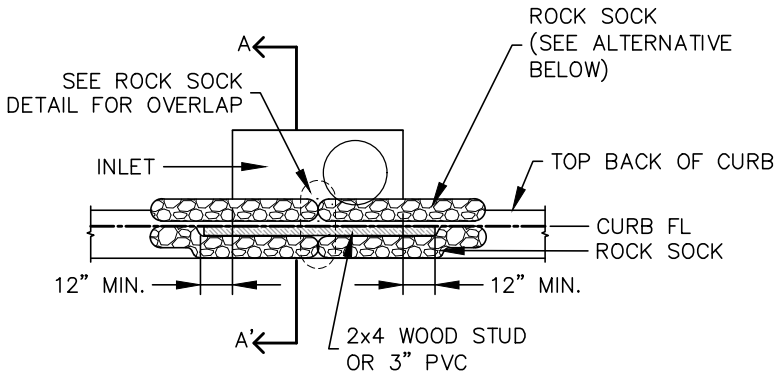
- Install inlet protection at storm sewer inlets that are operable and receiving runoff from disturbed areas during construction.
- Place inlet protection to allow the inlet to function without completely blocking flows into the inlet in a manner than causes localized flooding.
- Inlet protection is not a stand-alone control measure and should be used in conjunction with other upgradient control measures. Inlet protection in areas with a contributing drainage area of one acre or larger must be part of a treatment train.
- When selecting the type of inlet protection, consider factors such as type of inlet, traffic, anticipated flows, ability to secure the inlet protection, safety, and other site-specific conditions.

4.0 TIMING

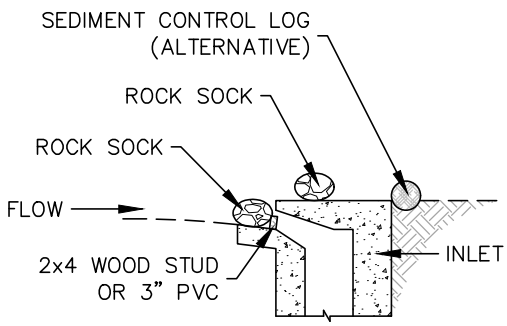
- Install prior to land disturbing activities, or immediately after inlet installation.
- Remove and properly dispose of inlet protection after the contributing drainage area has been permanently stabilized.

5.0 MAINTENANCE

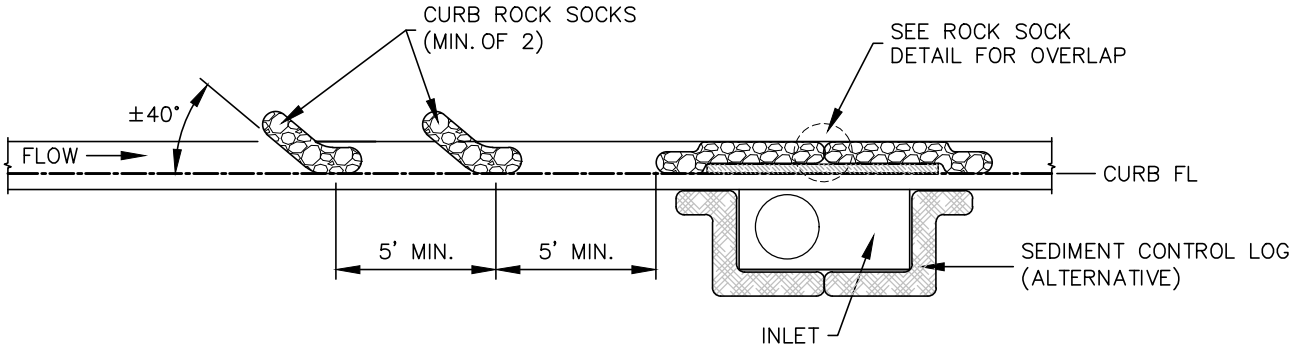
- Remove and properly dispose of sediment when it has accumulated to 1/2 of the design depth of the inlet barrier.
- Inspect for holes or tears that can result in sediment directly entering the inlet.
- Inspect for displaced inlet protection that is no longer protecting the inlet.



CURB INLET PROTECTION PLAN



SECTION A-A'



CURB ROCK SOCKS UPSTREAM OF INLET PROTECTION

INSTALLATION NOTES

1. SEE ROCK SOCK DETAIL FOR INSTALLATION REQUIREMENTS.
2. PLACEMENT OF THE ROCK SOCK SHALL BE APPROXIMATELY 40 DEGREES FROM THE CURB.
3. ROCK SOCKS ARE TO BE FLUSH WITH THE CURB AND SPACED A MINIMUM OF 5' APART.
4. AT LEAST TWO CURB ROCK SOCKS IN SERIES ARE REQUIRED UPSTREAM OF ON-GRADIENT INLETS.
5. ADDITIONAL ROCK SOCKS MAY BE REQUIRED AT GEC INSPECTOR'S DISCRETION.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ACCUMULATED SEDIMENT MUST BE REMOVED WHEN THE HEIGHT REACHES ½ OF THE DESIGN DEPTH OF THE INLET BARRIER.
3. ROCK SOCKS MUST REMAIN UNTIL THE UPSTREAM DISTURBANCE AREA IS STABILIZED.
4. PERMANENTLY STABILIZE AREA BEHIND INLET AFTER ROCK SOCKS ARE REMOVED WHEN REMOVAL IS APPROPRIATE.

IP-1

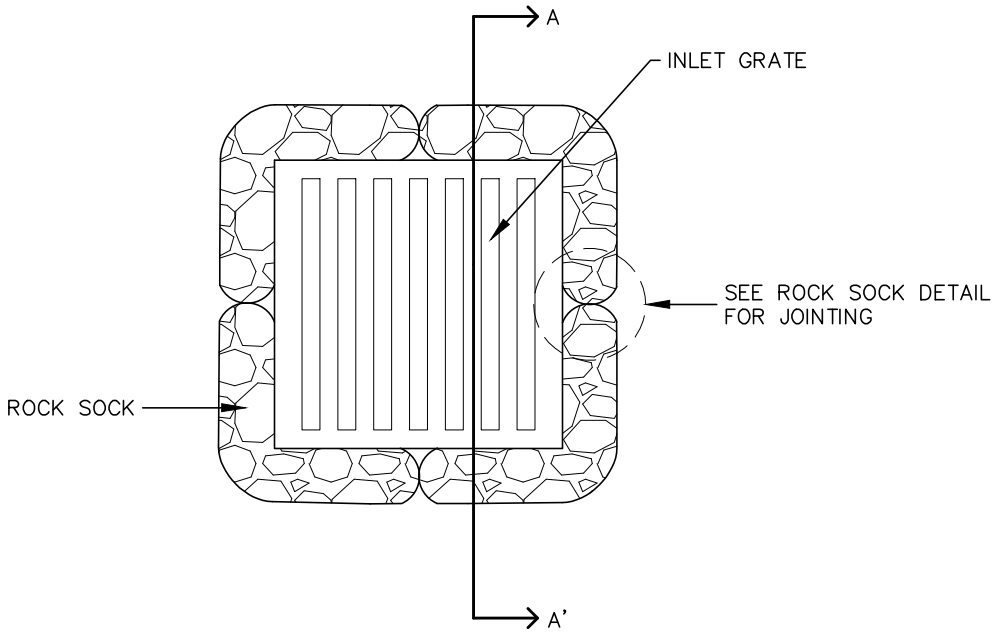
STORMWATER ENTERPRISE

ON-GRADE INLET PROTECTION

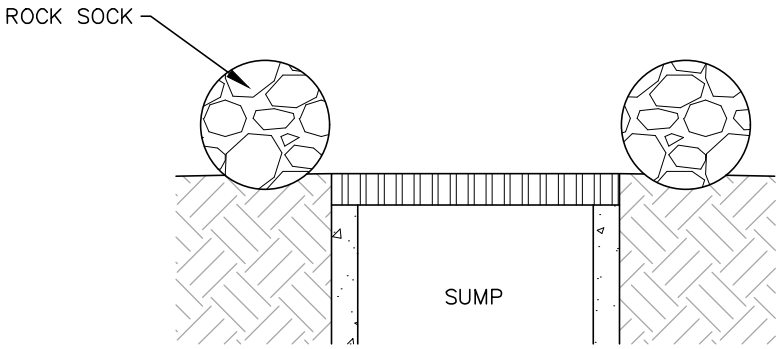
APPROVED:

CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		900-IP-1



ROCK SOCK SUMP INLET PROTECTION PLAN



SECTION A-A'

INSTALLATION NOTES

1. SEE ROCK SOCK DETAIL FOR INSTALLATION REQUIREMENTS.
2. SEDIMENT CONTROL LOGS MAY BE USED IN PLACE OF ROCK SOCKS IN PERVIOUS AREAS. INSTALL PER SEDIMENT CONTROL LOG DETAIL

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ACCUMULATED SEDIMENT MUST BE REMOVED WHEN THE HEIGHT REACHES ½ OF THE DESIGN DEPTH OF THE INLET BARRIER.
3. ROCK SOCKS MUST REMAIN UNTIL THE UPSTREAM DISTURBANCE AREA IS STABILIZED.
4. PERMANENTLY STABILIZE AREA AROUND INLET AFTER ROCK SOCKS ARE REMOVED WHEN REMOVAL IS APPROPRIATE.

IP-2

STORMWATER ENTERPRISE

SUMP INLET PROTECTION

APPROVED:

CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		900-IP-2

ROCK SOCK

RS

1.0 DESCRIPTION

- A rock sock consists of gravel that has been wrapped by wire mesh or a geotextile to form an elongated cylindrical filter.

2.0 PURPOSE

- Used to slow down the velocity of runoff to filter runoff and to promote sedimentation.
- Rock socks are typically used as either perimeter control or as a part of inlet protection.

3.0 IMPLEMENTATION

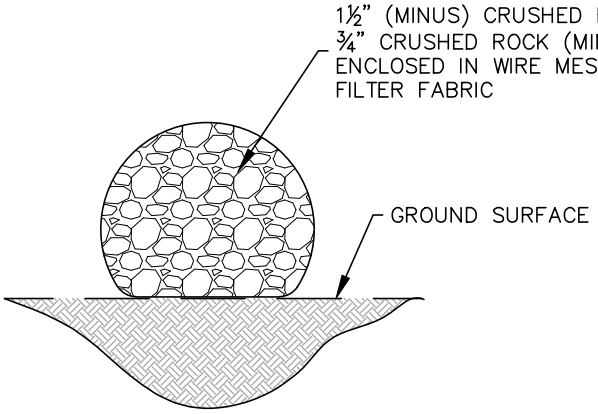
- Rock socks do not require trenching or staking, and are able to be placed on hard surfaces where trenching or staking would be impossible.
- The maximum tributary drainage area per 100 liner feet of rock socks is 1/4 acre.
- When placed in a gutter adjacent to a curb, rock socks should protrude no more than two feet from the curb in order for traffic to pass safely.

4.0 TIMING

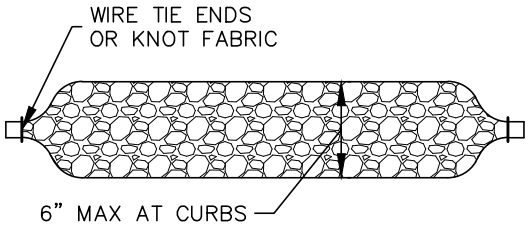
- Install prior to land disturbing activities, or immediately after inlet installation.
- Remove and properly dispose of inlet protection after the contributing drainage area has been permanently stabilized.

5.0 MAINTENANCE

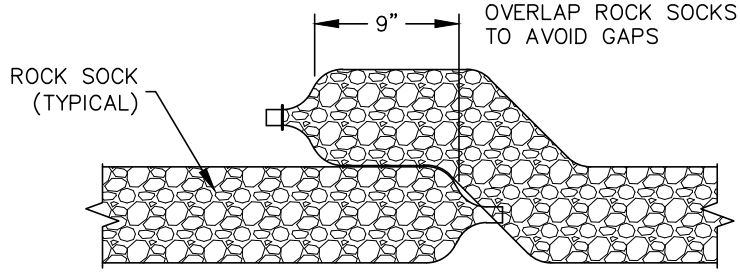
- Remove and properly dispose of sediment when it has accumulated to 1/2 of the height of the rock sock.
- Inspect for and replace damaged or displaced rock socks.



ROCK SOCK SECTION



ROCK SOCK PLAN



ROCK SOCK OVERLAP

GRADATION TABLE	
	MASS PERCENT PASSING SQUARE MESH SIEVES
	No. 4
2"	100
1½"	90–100
1"	20–55
¾"	0–15
⅜"	0–5
MATCHES SPECIFICATIONS FOR No. 4 COARSE AGGREGATE FOR CONCRETE PER AASHTO M–43. ALL ROCK SHALL BE FRACTURED FACE, ALL SIDES	

INSTALLATION NOTES

1. CRUSHED ROCK SHALL BE BETWEEN MAX. 1½" (MINUS) IN SIZE WITH A FRACTURED FACE (ALL SIDES) AND SHALL COMPLY WITH GRADATION SHOWN ON THIS SHEET AND MIN. ¾" CRUSHED ROCK.
2. WIRE MESH SHALL HAVE OPENINGS SMALLER THAN THE SMALLEST SIZE ROCK.
3. WIRE MESH SHALL BE SECURED USING 'HOG RINGS' OR WIRE TIES AT 6" CENTERS ALONG ALL JOINTS AND AT 2" CENTERS ON ENDS OF SOCKS.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ROCK SOCKS SHALL BE REPLACED IF THEY BECOME HEAVILY SOILED OR DAMAGED BEYOND REPAIR.
3. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN THE DEPTH REACHES ½ OF THE HEIGHT OF THE ROCK SOCK.
4. ROCK SOCKS ARE TO REMAIN IN PLACE UNTIL DISTURBED AREA IS STABILIZED.
5. PERMANENTLY STABILIZE AREA AFTER ROCK SOCKS HAVE BEEN REMOVED.

RS

STORMWATER ENTERPRISE

ROCK SOCK

APPROVED:

CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		900–RS

SEDIMENT CONTROL LOG

SCL

1.0 DESCRIPTION

- A sediment control log is a temporary sediment barrier consisting of a linear roll of natural materials such as straw, compost, excelsior or coconut fiber.

2.0 PURPOSE

- Used to intercept sheet flow prior to leaving a construction site.
- May be used around the perimeter of a construction site.
- Placed on long slopes to slow down flows.

3.0 IMPLEMENTATION

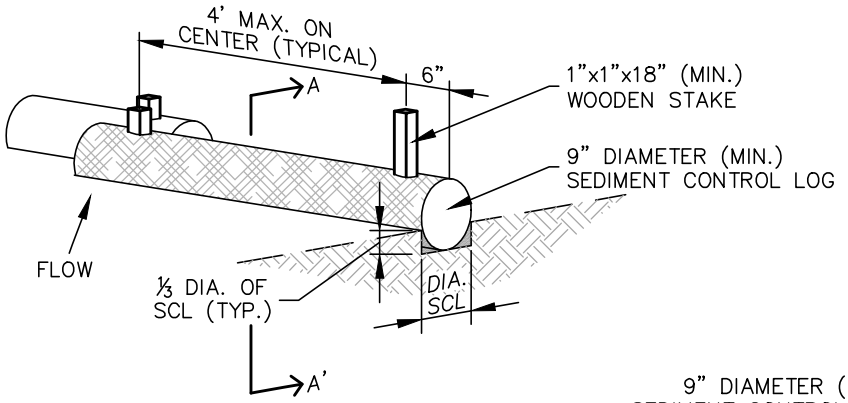
- Install sediment control logs to intercept sheet flow runoff from disturbed areas.
- Install sediment control logs along the contour of slopes or in a manner to avoid creating concentrated flow.
- Place sediment control logs against sidewalk or back of curb when adjacent to these features.
- The maximum tributary drainage area per 100 liner feet of sediment control logs is 1/4 acre.
- Sediment control logs shall consist of straw, compost, excelsior or coconut fiber, and shall be free from any noxious weed seeds or defects.

4.0 TIMING

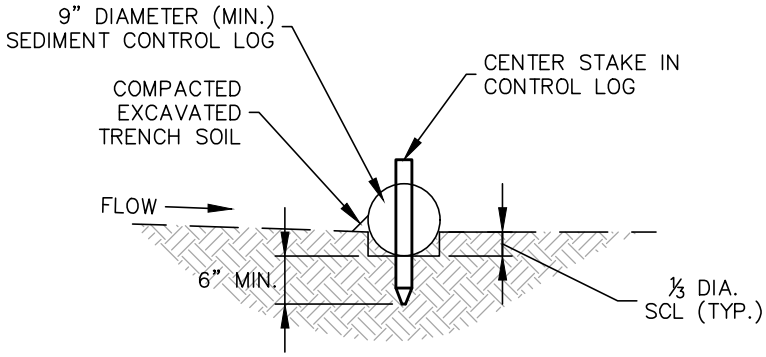
- Install prior to land disturbing activities.
- Remove sediment control logs after the upstream area has been permanently stabilized.

5.0 MAINTENANCE

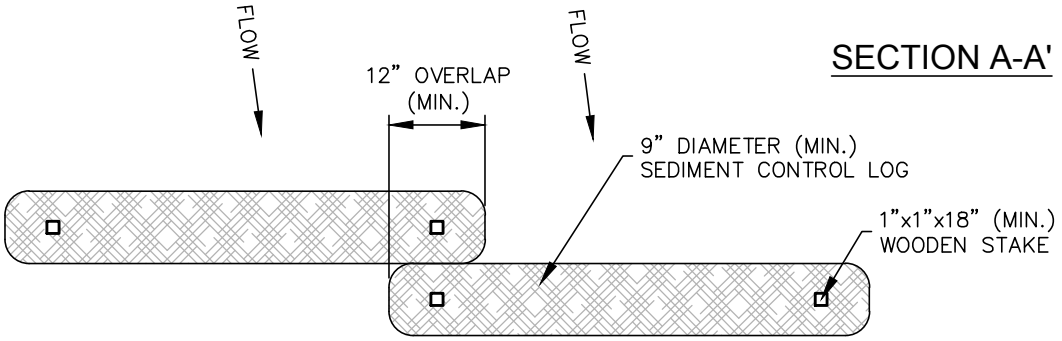
- Remove and properly dispose of sediment when it has accumulated to 1/2 of the height of the exposed sediment control log.
- Inspect for and repair or replace damaged sediment control logs.



SEDIMENT CONTROL LOG



SECTION A-A'



SEDIMENT CONTROL LOG JOINTS

INSTALLATION NOTES

1. ALL SEDIMENT CONTROL LOGS MUST BE EMBEDDED TO ⅓ OF THE HEIGHT OF THE LOG
2. LARGER DIAMETER SEDIMENT CONTROL LOGS NEED TO BE EMBEDDED DEEPER.
3. PLACE SEDIMENT CONTROL LOG AGAINST SIDEWALK OR BACK OF CURB WHEN ADJACENT TO THESE FEATURES.
4. SEDIMENT CONTROL LOGS SHALL CONSIST OF STRAW, COMPOST, EXCELSIOR OR COCONUT FIBER, AND SHALL BR FREE FROM ANY NOXIOUS WEED SEEDS OF DEFECTS INCLUDING RIPS, HOLES AND OBVIOUS WEAR.
5. IF USING AS SLOPE PROTECTION, INSTALL SEDIMENT CONTROL LOGS ALONG THE CONTOUR.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ACCUMULATED SEDIMENT MUST BE REMOVED WHEN THE HEIGHT REACHES ½ OF THE HEIGHT OF THE SEDIMENT CONTROL LOG.
3. PERMANENTLY STABILIZE AREA AFTER SEDIMENT CONTROL LOGS HAVE BEEN REMOVED.

SCL

STORMWATER ENTERPRISE

SEDIMENT CONTROL LOGS

APPROVED:

CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		900-SCL

SEEDING AND MULCHING

SM

1.0 DESCRIPTION

- The preparation of soil, application of much, and application of seed to disturbed areas.

2.0 PURPOSE

- Used to control runoff and erosion on disturbed areas by establishing vegetative cover.
- Reduces erosion and sediment loss.
- Provides permanent stabilization in disturbed areas.

3.0 IMPLEMENTATION

- All soil testing, soil amendment and fertilizer documentation, and seed load and bag tickets must be added to the CSWMP.
- Properly prepare soil prior to seeding and mulching.
- Apply seed mixes as specified in the City of Colorado Springs Stormwater Construction Manual. Alternative seed mixes are acceptable if included in an approved Landscaping Plan.
- Mulch seeded areas using hay or straw mulch, hydraulic mulching, or install erosion control blanket.

4.0 TIMING

- Seed and mulch disturbed areas after final grading.
- Seeding and mulching may also be used as a temporary erosion control measure during construction.

5.0 MAINTENANCE

- Repair and reseed bare areas as necessary.
- Restrict vehicle access to seeded areas.

SEEDING & MULCHING

ALL SOIL TESTING, SOILS AMENDMENT AND FERTILIZER DOCUMENTATION, AND SEED LOAD AND BAG TICKETS MUST BE ADDED TO THE CSWMP.

SOIL PREPARATION

1. IN AREAS TO BE SEEDED, THE UPPER 6 INCHES OF THE SOIL MUST NOT BE HEAVILY COMPACTED, AND SHOULD BE IN FRIABLE CONDITION. LESS THAN 85% STANDARD PROCTOR DENSITY IS ACCEPTABLE. AREAS OF COMPACTION OR GENERAL CONSTRUCTION ACTIVITY MUST BE SCARIFIED TO A DEPTH OF 6 TO 12 INCHES PRIOR TO SPREADING TOPSOIL TO BREAK UP COMPACTED LAYERS AND PROVIDE A BLENDING ZONE BETWEEN DIFFERENT SOIL LAYERS.
2. AREAS TO BE PLANTED SHALL HAVE AT LEAST 4 INCHES OF TOPSOIL SUITABLE TO SUPPORT PLANT GROWTH.
3. THE CITY RECOMMENDS THAT EXISTING AND/OR IMPORTED TOPSOIL BE TESTED TO IDENTIFY SOIL DEFICIENCIES AND ANY SOIL AMENDMENTS NECESSARY TO ADDRESS THESE DEFICIENCIES. SOIL AMENDMENTS AND/OR FERTILIZERS SHOULD BE ADDED TO CORRECT TOPSOIL DEFICIENCIES BASED ON SOIL TESTING RESULTS.
4. TOPSOIL SHALL BE PROTECTED DURING THE CONSTRUCTION PERIOD TO RETAIN ITS STRUCTURE AVOID COMPACTION, AND TO PREVENT EROSION AND CONTAMINATION. STRIPPED TOPSOIL MUST BE STORED IN AN AREA AWAY FROM MACHINERY AND CONSTRUCTION OPERATIONS, AND CARE MUST BE TAKEN TO PROTECT THE TOPSOIL AS A VALUABLE COMMODITY. TOPSOIL MUST NOT BE STRIPPED DURING UNDESIRABLE WORKING CONDITIONS (E.G. DURING WET WEATHER OR WHEN SOILS ARE SATURATED). TOPSOIL SHALL NOT BE STORED IN SWALES OR IN AREAS WITH POOR DRAINAGE.

SEEDING

1. ALLOWABLE SEED MIXES ARE INCLUDED IN THE CITY OF COLORADO SPRINGS STORMWATER CONSTRUCTION MANUAL. ALTERNATIVE SEED MIXES ARE ACCEPTABLE IF INCLUDED IN AN APPROVED LANDSCAPING PLAN.
2. SEED SHOULD BE DRILL-SEEDED WHENEVER POSSIBLE
   - SEED DEPTH MUST BE ⅓ TO ½ INCHES WHEN DRILL-SEEDING IS USED
3. BROADCAST SEEDING OR HYDRO-SEEDING WITH TACKIFIER MAY BE SUBSTITUTED ON SLOPES STEEPER THAN 3:1 OR ON OTHER AREAS NOT PRACTICAL TO DRILL SEED.
   - SEEDING RATES MUST BE DOUBLED FOR BROADCAST SEEDING OR INCREASED BY 50% IF USING A BRILLION DRILL OR HYDRO-SEEDING
   - BROADCAST SEEDING MUST BE LIGHTLY HAND-RAKED INTO THE SOIL

MULCHING

1. MULCHING SHOULD BE COMPLETED AS SOON AS PRACTICABLE AFTER SEEDING, HOWEVER PLANTED AREAS MUST BE MULCHED NO LATER THAN 14 DAYS AFTER PLANTING.
2. MULCHING REQUIREMENTS INCLUDE:
   - HAY OR STRAW MULCH
     - ONLY CERTIFIED WEED-FREE AND CERTIFIED SEED-FREE MULCH MAY BE USED. MULCH MUST BE APPLIED AT 2 TONS/ACRE AND ADEQUATELY SECURED BY CRIMPING AND/OR TACKIFIER.
     - CRIMPING MUST NOT BE USED ON SLOPES GREATER THAN 3:1 AND MULCH FIBERS MUST BE TUCKED INTO THE SOIL TO A DEPTH OF 3 TO 4 INCHES.
     - TACKIFIER MUST BE USED IN PLACE OF CRIMPING ON SLOPES STEEPER THAN 3:1.
   - HYDRAULIC MULCHING
     - HYDRAULIC MULCHING IS AN OPTION ON STEEP SLOPES OR WHERE ACCESS IS LIMITED.
     - IF HYDRO-SEEDING IS USED, MULCHING MUST BE APPLIED AS A SEPARATE, SECOND OPERATION.
     - WOOD CELLULOSE FIBERS MIXED WITH WATER MUST BE APPLIED AT A RATE OF 2,000 TO 2,500 POUNDS/ACRE, AND TACKIFIER MUST BE APPLIED AT A RATE OF 100 POUNDS/ACRE.
   - EROSION CONTROL BLANKET
     - EROSION CONTROL BLANKET MAY BE USED IN PLACE OF TRADITIONAL MULCHING METHODS.

SM

STORMWATER ENTERPRISE

SEEDING & MULCHING

APPROVED:

CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		900-SM

STOCKPILE PROTECTION

SP

1.0 DESCRIPTION

- Perimeter control placed around stockpiles of soil and other erodible materials.

2.0 PURPOSE

- Used to avoid the migration of sediment and other materials from stockpiles.

3.0 IMPLEMENTATION

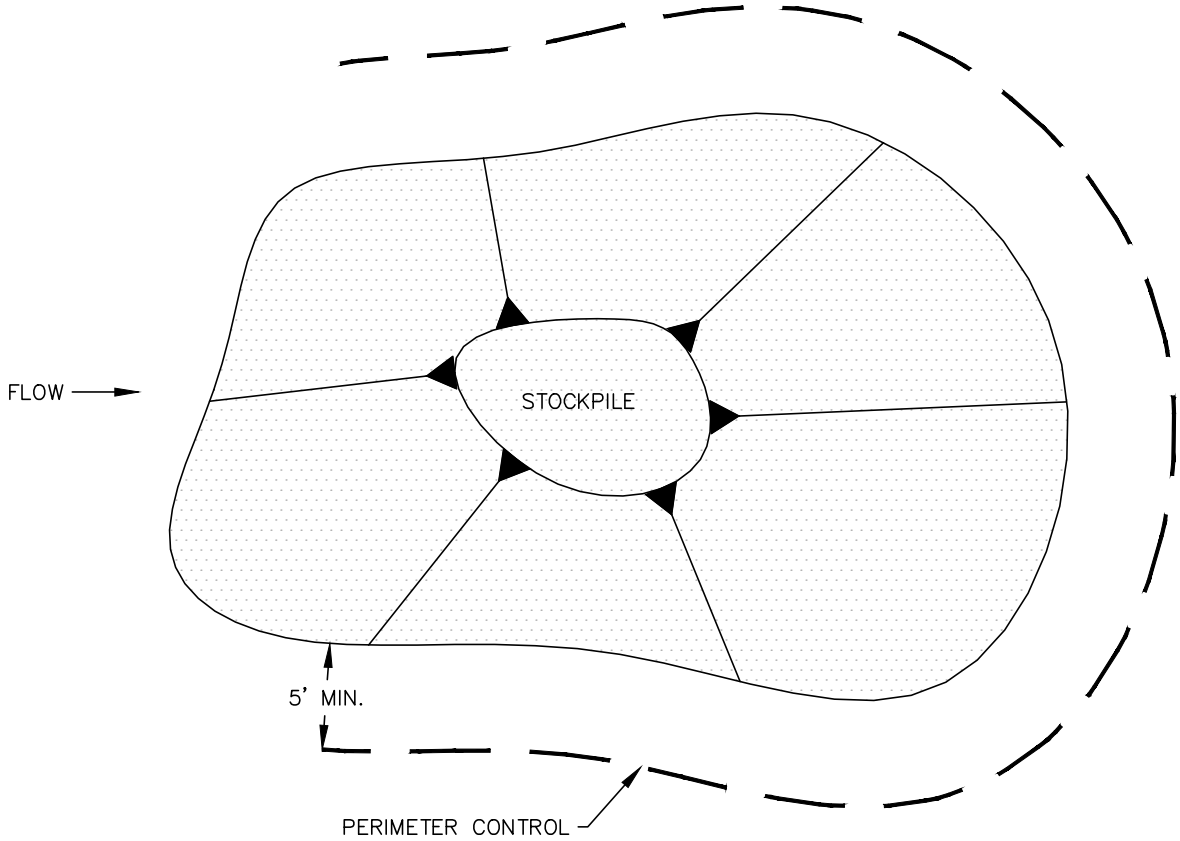
- Install perimeter control around stockpile on downgradient side.
- Stockpile perimeter controls may not be required for stockpiles on the interior portion of a construction site where other downgradient controls including perimeter control are in place.

4.0 TIMING

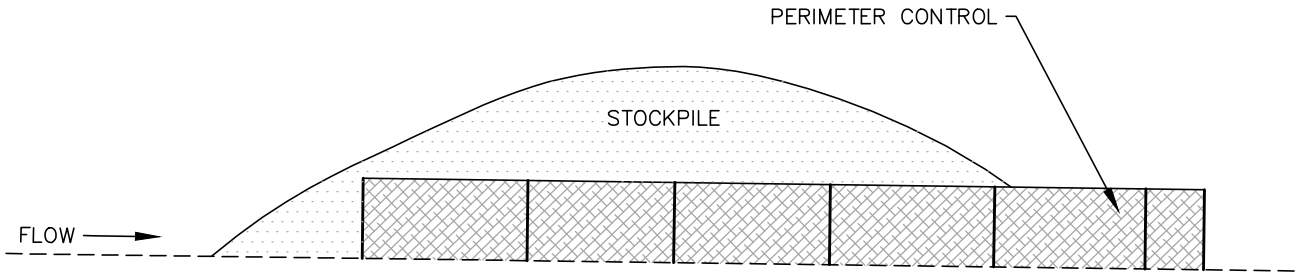
- Install immediately after stockpile has formed or limits are known, whichever occurs first.
- Remove stockpile protection after the stockpile has been removed.

5.0 MAINTENANCE

- Remove and properly dispose of sediment according to the perimeter control detail.
- If perimeter controls must be moved to access stockpile, replace perimeter controls by the end of the work day.
- Inspect for and repair and/or replace perimeter controls as needed to maintain functionality.



STOCKPILE PROTECTION PLAN



STOCKPILE PROTECTION ELEVATION

INSTALLATION NOTES

1. INSTALL PERIMETER CONTROL AROUND STOCKPILE ON DOWNGRADIENT SIDE. PERIMETER CONTROL MUST BE SUITABLE TO SITE CONDITIONS AND INSTALLED ACCORDING TO THE RELEVANT DETAIL.
2. FOR STOCKPILES ON THE INTERIOR PORTION OF A CONSTRUCTION SITE, WHERE OTHER DOWNGRADIENT CONTROLS INCLUDING PERIMETER CONTROL ARE IN PLACE, STOCKPILE PERIMETER CONTROLS MAY NOT BE REQUIRED.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. IF PERIMETER CONTROLS MUST BE MOVED TO ACCESS STOCKPILE, REPLACE PERIMETER CONTROLS BY THE END OF THE WORK DAY.
3. ACCUMULATED SEDIMENT MUST BE REMOVED ACCORDING TO PERIMETER CONTROL DETAIL.

SP

STORMWATER ENTERPRISE

STOCKPILE PROTECTION

APPROVED:

CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		900-SP

Sediment Trap (ST) SC-8

Description

Sediment traps are formed by excavating an area or by placing an earthen embankment across a low area or drainage swale. Sediment traps are designed to capture drainage from disturbed areas less than one acre and allow settling of sediment.

Photograph ST-1. Sediment traps are used to collect sediment-laden runoff from disturbed area. Photo courtesy of EPA Menu of BMPs.

Appropriate Uses

Sediment traps can be used in combination with other layers of erosion and sediment controls to trap sediment from small drainage areas (less than one acre) or areas with localized high sediment loading. For example, sediment traps are often provided in conjunction with vehicle tracking controls and wheel wash facilities.

Design and Installation

A sediment trap consists of a small excavated basin with an earthen berm and a riprap outlet. The berm of the sediment trap may be constructed from the excavated material and must be compacted to 95 percent of the maximum density in accordance with ASTM D698. An overflow outlet must be provided at an elevation at least 6 inches below the top of the berm. See Detail ST-1 for additional design and installation information.

Maintenance and Removal

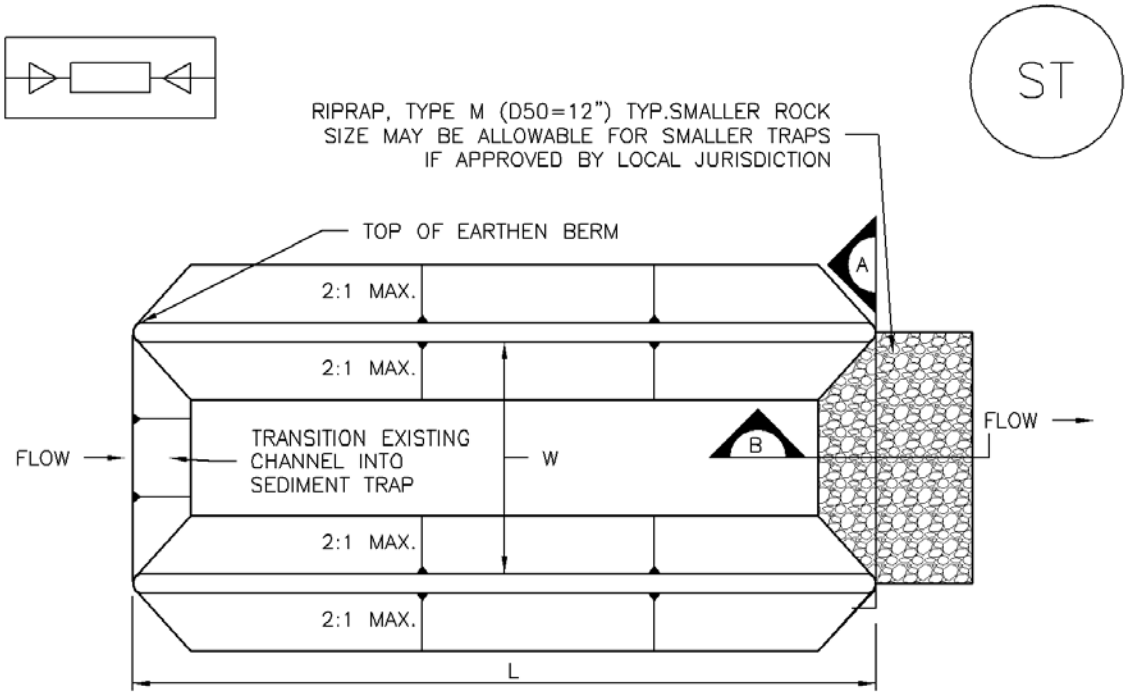
Inspect the sediment trap embankments for stability and seepage.

Remove accumulated sediment as needed to maintain the effectiveness of the sediment trap, typically when the sediment depth is approximately one-half the height of the outflow embankment.

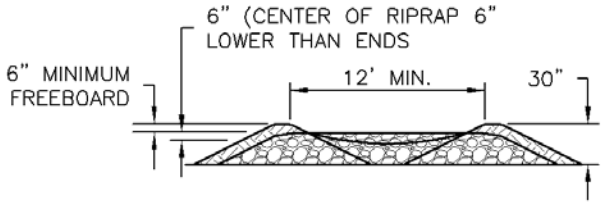
Inspect the outlet for debris and damage. Repair damage to the outlet, and remove all obstructions.

A sediment trap should not be removed until the upstream area is sufficiently stabilized. Upon removal of the trap, the disturbed area should be covered with topsoil and stabilized.

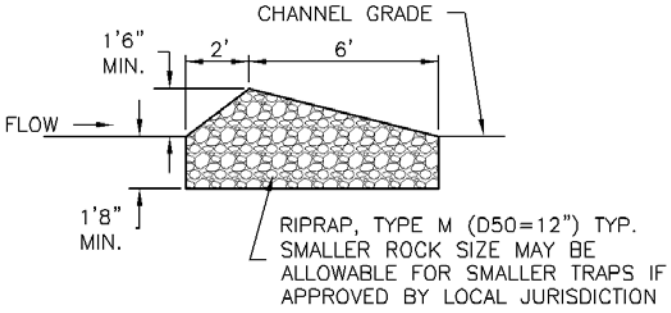
Sediment Trap	
Functions	
Erosion Control	No
Sediment Control	Yes
Site/Material Management	No



SEDIMENT TRAP PLAN



SECTION A



SECTION B

ST–1. SEDIMENT TRAP

SEDIMENT TRAP INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   –LOCATION, LENGTH AND WIDTH OF SEDIMENT TRAP.

2. ONLY USE FOR DRAINAGE AREAS LESS THAN 1 ACRE.

3. SEDIMENT TRAPS SHALL BE INSTALLED PRIOR TO ANY UPGRADIENT LAND–DISTURBING ACTIVITIES.

4. SEDIMENT TRAP BERM SHALL BE CONSTRUCTED FROM MATERIAL FROM EXCAVATION. THE BERM SHALL BE COMPACTED TO 95% OF THE MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D698.

5. SEDIMENT TRAP OUTLET TO BE CONSTRUCTED OF RIPRAP, TYPE M (D50=12") TYP.SMALLER ROCK SIZE MAY BE ALLOWABLE FOR SMALLER TRAPS IF APPROVED BY LOCAL JURISDICTION.

6. THE TOP OF THE EARTHEN BERM SHALL BE A MINIMUM OF 6" HIGHER THAN THE TOP OF THE RIPRAP OUTLET STRUCTURE.

7. THE ENDS OF THE RIPRAP OUTLET STRUCTURE SHALL BE A MINIMUM OF 6" HIGHER THAN THE CENTER OF THE OUTLET STRUCTURE.

SEDIMENT TRAP MAINTENANCE NOTES

1. 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.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. REMOVE SEDIMENT ACCUMULATED IN TRAP AS NEEDED TO MAINTAIN THE FUNCTIONALITY OF THE BMP, TYPICALLY WHEN THE SEDIMENT DEPTH REACHES ½ THE HEIGHT OF THE RIPRAP OUTLET.

5. SEDIMENT TRAPS SHALL REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.

6. WHEN SEDIMENT TRAPS ARE REMOVED, THE DISTURBED AREA SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

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

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

Street Sweeping and Vacuuming (SS) SM-7

Description

Street sweeping and vacuuming remove sediment that has been tracked onto roadways to reduce sediment transport into storm drain systems or a surface waterway.

Photograph SS-1. A street sweeper removes sediment and potential pollutants along the curb line at a construction site. Photo courtesy of Tom Gore.

Appropriate Uses

Use this practice at construction sites where vehicles may track sediment offsite onto paved roadways.

Design and Installation

Street sweeping or vacuuming should be conducted when there is noticeable sediment accumulation on roadways adjacent to the construction site. Typically, this will be concentrated at the entrance/exit to the construction site. Well-maintained stabilized construction entrances, vehicle tracking controls and tire wash facilities can help reduce the necessary frequency of street sweeping and vacuuming.

On smaller construction sites, street sweeping can be conducted manually using a shovel and broom. Never wash accumulated sediment on roadways into storm drains.

Maintenance and Removal

- Inspect paved roads around the perimeter of the construction site on a daily basis and more frequently, as needed. Remove accumulated sediment, as needed.
- Following street sweeping, check inlet protection that may have been displaced during street sweeping.
- Inspect area to be swept for materials that may be hazardous prior to beginning sweeping operations.

Street Sweeping/ Vacuuming	
Functions	
Erosion Control	No
Sediment Control	Yes
Site/Material Management	Yes

STOCKPILE PROTECTION

SP

1.0 DESCRIPTION

- Perimeter control placed around stockpiles of soil and other erodible materials.

2.0 PURPOSE

- Used to avoid the migration of sediment and other materials from stockpiles.

3.0 IMPLEMENTATION

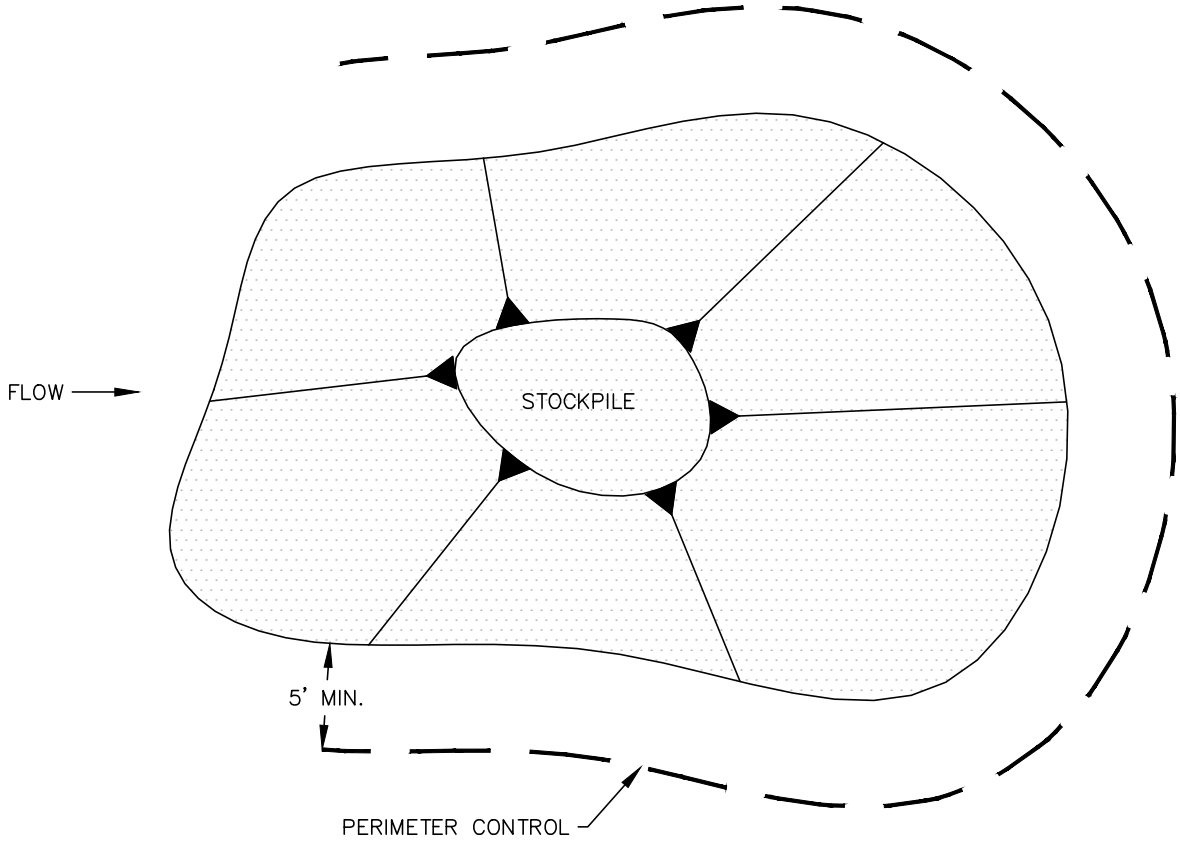
- Install perimeter control around stockpile on downgradient side.
- Stockpile perimeter controls may not be required for stockpiles on the interior portion of a construction site where other downgradient controls including perimeter control are in place.

4.0 TIMING

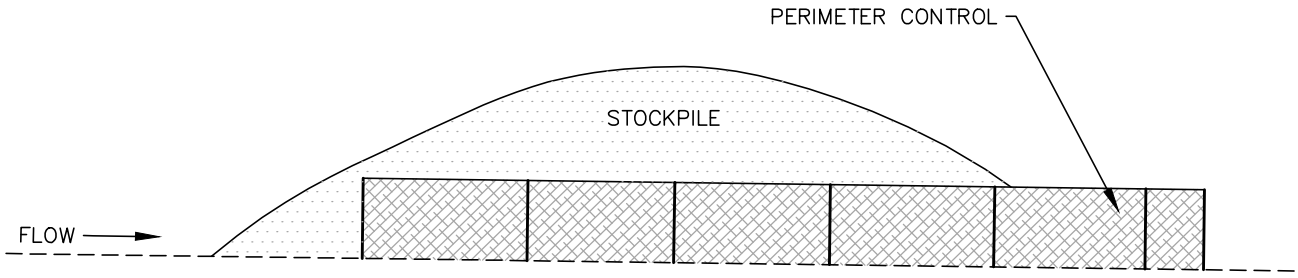
- Install immediately after stockpile has formed or limits are known, whichever occurs first.
- Remove stockpile protection after the stockpile has been removed.

5.0 MAINTENANCE

- Remove and properly dispose of sediment according to the perimeter control detail.
- If perimeter controls must be moved to access stockpile, replace perimeter controls by the end of the work day.
- Inspect for and repair and/or replace perimeter controls as needed to maintain functionality.



STOCKPILE PROTECTION PLAN



STOCKPILE PROTECTION ELEVATION

INSTALLATION NOTES

1. INSTALL PERIMETER CONTROL AROUND STOCKPILE ON DOWNGRADIENT SIDE. PERIMETER CONTROL MUST BE SUITABLE TO SITE CONDITIONS AND INSTALLED ACCORDING TO THE RELEVANT DETAIL.
2. FOR STOCKPILES ON THE INTERIOR PORTION OF A CONSTRUCTION SITE, WHERE OTHER DOWNGRADIENT CONTROLS INCLUDING PERIMETER CONTROL ARE IN PLACE, STOCKPILE PERIMETER CONTROLS MAY NOT BE REQUIRED.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. IF PERIMETER CONTROLS MUST BE MOVED TO ACCESS STOCKPILE, REPLACE PERIMETER CONTROLS BY THE END OF THE WORK DAY.
3. ACCUMULATED SEDIMENT MUST BE REMOVED ACCORDING TO PERIMETER CONTROL DETAIL.

SP

STORMWATER ENTERPRISE

STOCKPILE PROTECTION

APPROVED:

CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		900-SP

CULVERT INLET PROTECTION

CIP

1.0 DESCRIPTION

- Culvert inlet protection consists of a permeable sediment barrier installed upstream of a flared end section entrance to a culvert or storm sewer.

2.0 PURPOSE

- Used to prevent sediment and debris from entering a culvert or storm drainage system prior to permanent stabilization of the contributing disturbed area.
- Culvert inlet protection slows down runoff velocity to filter runoff and to promote sedimentation prior to entry into a culvert or storm drainage system.

3.0 IMPLEMENTATION

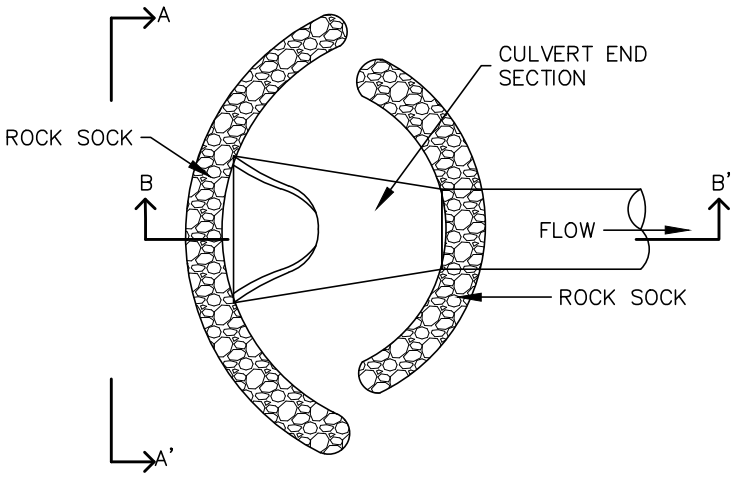
- Install culvert inlet protection at flared end section inlets to culverts and storm sewers that are operable and receiving runoff from disturbed areas during construction.
- Culvert inlet protection is not a stand-alone control measure and should be used in conjunction with other upgradient control measures. Culvert inlet protection with a contributing drainage area including of one acre or more of disturbed area must be part of a treatment train.

4.0 TIMING

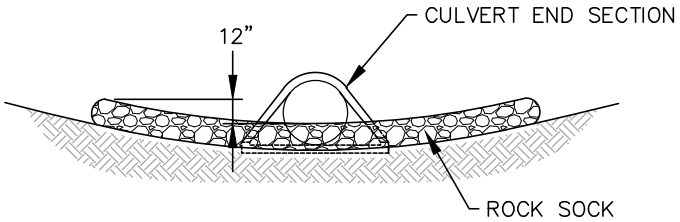
- Install prior to land disturbing activities, or immediately after pipe installation.
- Remove and properly dispose of culvert inlet protection after the contributing drainage area has been permanently stabilized.

5.0 MAINTENANCE

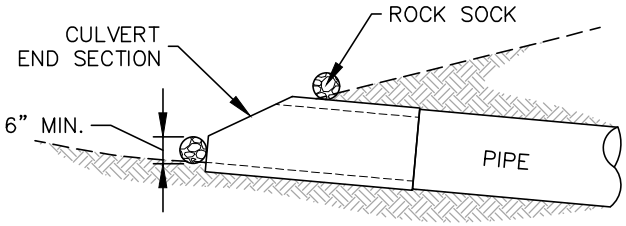
- Remove and properly dispose of sediment when it has accumulated to 1/2 of the height of the rock sock.
- Inspect for displaced rock socks that are no longer protecting the inlet.



CULVERT INLET PROTECTION PLAN



SECTION A-A'



SECTION B-B'

INSTALLATION NOTES

1. SEE ROCK SOCK DETAIL.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ACCUMULATED SEDIMENT UPSTREAM OF THE CULVERT SHALL BE REMOVED WHEN THE SEDIMENT DEPTH IS ½ HEIGHT OF THE ROCK SOCK.
3. CULVERT INLET PROTECTION SHALL REMAIN UNTIL THE UPSTREAM AREA IS PERMANENTLY STABILIZED.

CIP

STORMWATER ENTERPRISE

CULVERT INLET PROTECTION

APPROVED:

CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		900-CIP

Rolled Erosion Control Products (RECP) EC-6

Description

Photograph RECP-1. Erosion control blanket protecting the slope from erosion and providing favorable conditions for revegetation.

Rolled Erosion Control Products (RECPs) include a variety of temporary or permanently installed manufactured products designed to control erosion and enhance vegetation establishment and survivability, particularly on slopes and in channels. For applications where natural vegetation alone will provide sufficient permanent erosion protection, temporary products such as netting, open weave textiles and a variety of erosion control blankets (ECBs) made of biodegradable natural materials (e.g., straw, coconut fiber) can be used. For applications where natural vegetation alone will not be sustainable under expected flow conditions, permanent rolled erosion control products such as turf reinforcement mats (TRMs) can be used. In particular, turf reinforcement mats are designed for discharges that exert velocities and sheer stresses that exceed the typical limits of mature natural vegetation.

Appropriate Uses

RECPs can be used to control erosion in conjunction with revegetation efforts, providing seedbed protection from wind and water erosion. These products are often used on disturbed areas on steep slopes, in areas with highly erosive soils, or as part of drainageway stabilization. In order to select the appropriate RECP for site conditions, it is important to have a general understanding of the general types of these products, their expected longevity, and general characteristics.

The Erosion Control Technology Council (ECTC 2005) characterizes rolled erosion control products according to these categories:

- **Mulch control netting**: A planar woven natural fiber or extruded geosynthetic mesh used as a temporary degradable rolled erosion control product to anchor loose fiber mulches.
- **Open weave textile**: A temporary degradable rolled erosion control product composed of processed natural or polymer yarns woven into a matrix, used to provide erosion control and facilitate vegetation establishment.
- **Erosion control blanket (ECB)**: A temporary degradable rolled erosion control product composed of processed natural or polymer fibers which are mechanically, structurally or chemically bound together to form a continuous matrix to provide erosion control and facilitate vegetation establishment. ECBs can be further differentiated into rapidly degrading single-net and double-net types or slowly degrading types.

Rolled Erosion Control Products	
Functions	
Erosion Control	Yes
Sediment Control	No
Site/Material Management	No

- **Turf Reinforcement Mat (TRM)**: A rolled erosion control product composed of non-degradable synthetic fibers, filaments, nets, wire mesh, and/or other elements, processed into a permanent, three-dimensional matrix of sufficient thickness. TRMs, which may be supplemented with degradable components, are designed to impart immediate erosion protection, enhance vegetation establishment and provide long-term functionality by permanently reinforcing vegetation during and after maturation. Note: TRMs are typically used in hydraulic applications, such as high flow ditches and channels, steep slopes, stream banks, and shorelines, where erosive forces may exceed the limits of natural, unreinforced vegetation or in areas where limited vegetation establishment is anticipated.

Tables RECP-1 and RECP-2 provide guidelines for selecting rolled erosion control products appropriate to site conditions and desired longevity. Table RECP-1 is for conditions where natural vegetation alone will provide permanent erosion control, whereas Table RECP-2 is for conditions where vegetation alone will not be adequately stable to provide long-term erosion protection due to flow or other conditions.

Table RECP-1. ECTC Standard Specification for Temporary Rolled Erosion Control Products
(Adapted from Erosion Control Technology Council 2005)

Product Description	Slope Applications*		Channel Applications*	Minimum Tensile Strength[1]	Expected Longevity
	Maximum Gradient	C Factor[2,5]	Max. Shear Stress[3,4,6]		
Mulch Control Nets	5:1 (H:V)	≤0.10 @ 5:1	0.25 lbs/ft^2 (12 Pa)	5 lbs/ft (0.073 kN/m)	Up to 12 months
Netless Rolled Erosion Control Blankets	4:1 (H:V)	≤0.10 @ 4:1	0.5 lbs/ft^2 (24 Pa)	5 lbs/ft (0.073 kN/m)	
Single-net Erosion Control Blankets & Open Weave Textiles	3:1 (H:V)	≤0.15 @ 3:1	1.5 lbs/ft^2 (72 Pa)	50 lbs/ft (0.73 kN/m)	
Double-net Erosion Control Blankets	2:1 (H:V)	≤0.20 @ 2:1	1.75 lbs/ft^2 (84 Pa)	75 lbs/ft (1.09 kN/m)	
Mulch Control Nets	5:1 (H:V)	≤0.10 @ 5:1	0.25 lbs/ft^2 (12 Pa)	25 lbs/ft (0.36 kN/m)	24 months
Erosion Control Blankets & Open Weave Textiles (slowly degrading)	1.5:1 (H:V)	≤0.25 @ 1.5:1	2.00 lbs/ft^2 (96 Pa)	100 lbs/ft (1.45 kN/m)	24 months
Erosion Control Blankets & Open Weave Textiles	1:1 (H:V)	≤0.25 @ 1:1	2.25 lbs/ft^2 (108 Pa)	125 lbs/ft (1.82 kN/m)	36 months

* C Factor and shear stress for mulch control nettings must be obtained with netting used in conjunction with pre-applied mulch material. (*See Section 5.3 of Chapter 7 Construction BMPs for more information on the C Factor*.)

[1] Minimum Average Roll Values, Machine direction using ECTC Mod. ASTM D 5035.

[2] C Factor calculated as ratio of soil loss from RECP protected slope (tested at specified or greater gradient, H:V) to ratio of soil loss from unprotected (control) plot in large-scale testing.

[3] Required minimum shear stress RECP (unvegetated) can sustain without physical damage or excess erosion (> 12.7 mm (0.5 in) soil loss) during a 30-minute flow event in large-scale testing.

[4] The permissible shear stress levels established for each performance category are based on historical experience with products characterized by Manning's roughness coefficients in the range of 0.01 - 0.05.

[5] Acceptable large-scale test methods may include ASTM D 6459, or other independent testing deemed acceptable by the engineer.

[6] Per the engineer's discretion. Recommended acceptable large-scale testing protocol may include ASTM D 6460, or other independent testing deemed acceptable by the engineer.

Table RECP-2. ECTC Standard Specification for Permanent[1] Rolled Erosion Control Products
(Adapted from: Erosion Control Technology Council 2005)

Product Type	Slope Applications	Channel Applications	
TRMs with a minimum thickness of 0.25 inches (6.35 mm) per ASTM D 6525 and UV stability of 80% per ASTM D 4355 (500 hours exposure).	Maximum Gradient	Maximum Shear Stress[4,5]	Minimum Tensile Strength[2,3]
	0.5:1 (H:V)	6.0 lbs/ft^2 (288 Pa)	125 lbs/ft (1.82 kN/m)
	0.5:1 (H:V)	8.0 lbs/ft^2 (384 Pa)	150 lbs/ft (2.19 kN/m)
	0.5:1 (H:V)	10.0 lbs/ft^2 (480 Pa)	175 lbs/ft (2.55 kN/m)

[1] For TRMs containing degradable components, all property values must be obtained on the non-degradable portion of the matting alone.

[2] Minimum Average Roll Values, machine direction only for tensile strength determination using ASTM D 6818 (Supersedes Mod. ASTM D 5035 for RECPs)

[3] Field conditions with high loading and/or high survivability requirements may warrant the use of a TRM with a tensile strength of 44 kN/m (3,000 lb/ft) or greater.

[4] Required minimum shear stress TRM (fully vegetated) can sustain without physical damage or excess erosion (> 12.7 mm (0.5 in.) soil loss) during a 30-minute flow event in large scale testing.

[5] Acceptable large-scale testing protocols may include ASTM D 6460, or other independent testing deemed acceptable by the engineer.

Design and Installation

RECPs should be installed according to manufacturer's specifications and guidelines. Regardless of the type of product used, it is important to ensure no gaps or voids exist under the material and that all corners of the material are secured using stakes and trenching. Continuous contact between the product and the soil is necessary to avoid failure. Never use metal stakes to secure temporary erosion control products. Often wooden stakes are used to anchor RECPs; however, wood stakes may present installation and maintenance challenges and generally take a long time to biodegrade. Some local jurisdictions have had favorable experiences using biodegradable stakes.

This BMP Fact Sheet provides design details for several commonly used ECB applications, including:

ECB-1 Pipe Outlet to Drainageway

ECB-2 Small Ditch or Drainageway

ECB-3 Outside of Drainageway

Staking patterns are also provided in the design details according to these factors:

- ECB type
- Slope or channel type

For other types of RECPs including TRMs, these design details are intended to serve as general guidelines for design and installation; however, engineers should adhere to manufacturer's installation recommendations.

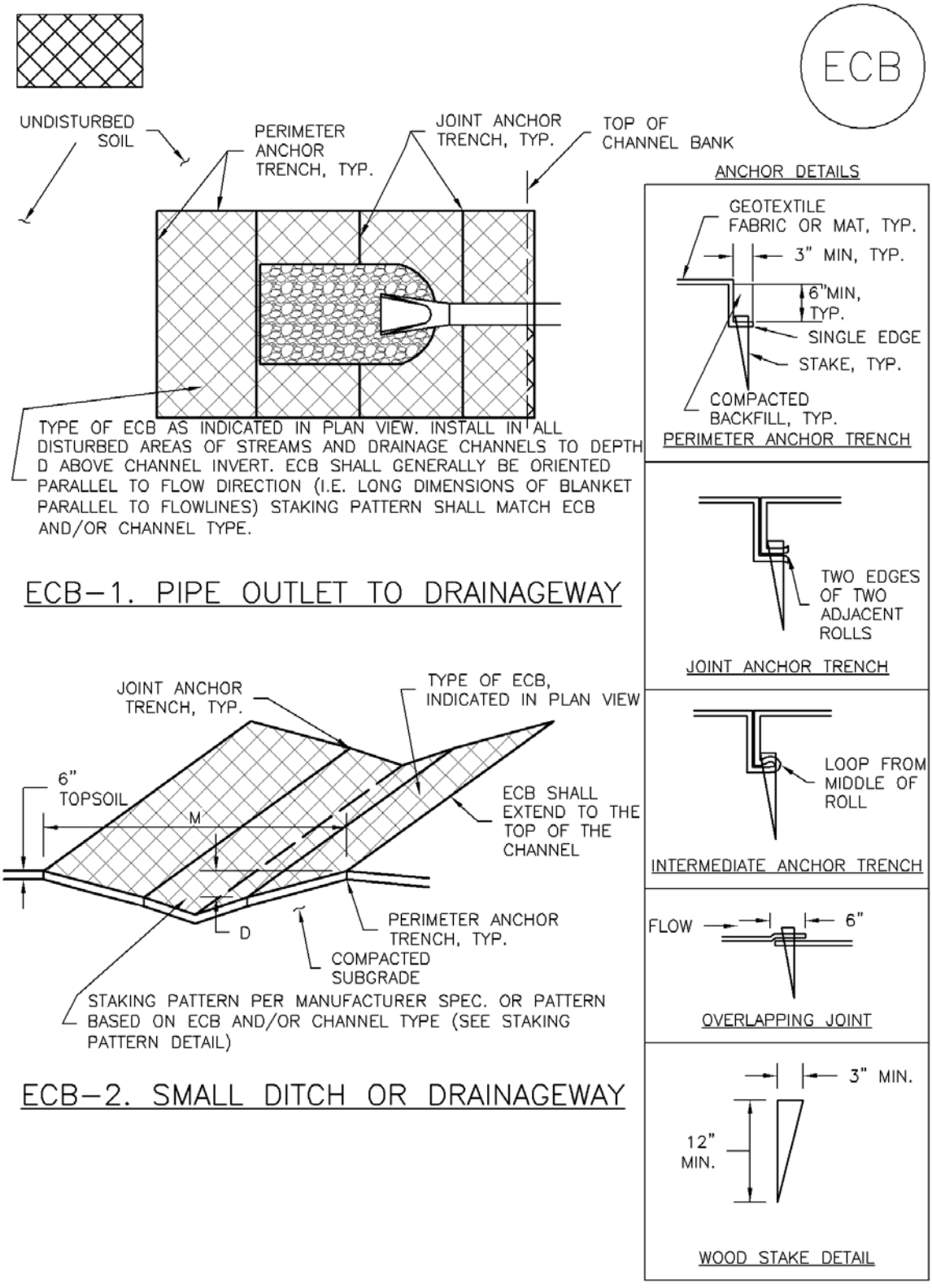
Maintenance and Removal

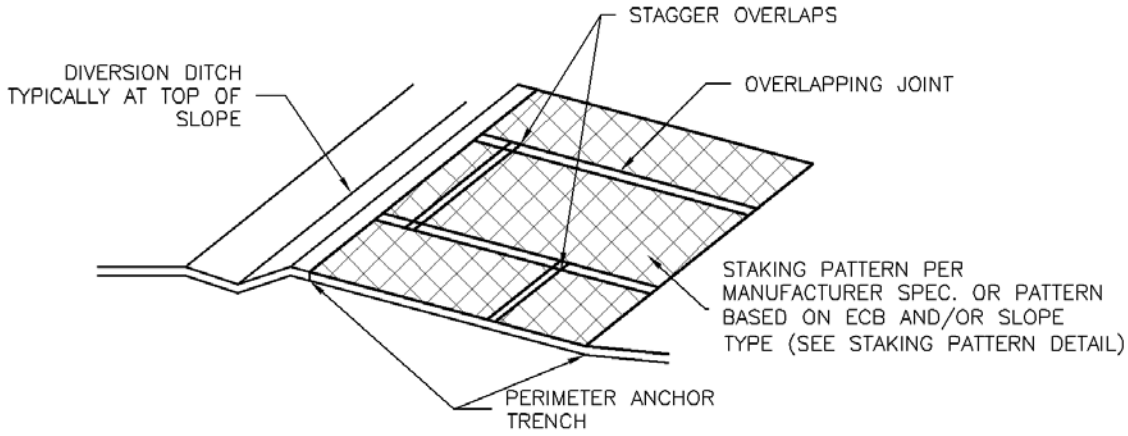
Inspection of erosion control blankets and other RECPs includes:

- Check for general signs of erosion, including voids beneath the mat. If voids are apparent, fill the void with suitable soil and replace the erosion control blanket, following the appropriate staking pattern.
- Check for damaged or loose stakes and secure loose portions of the blanket.

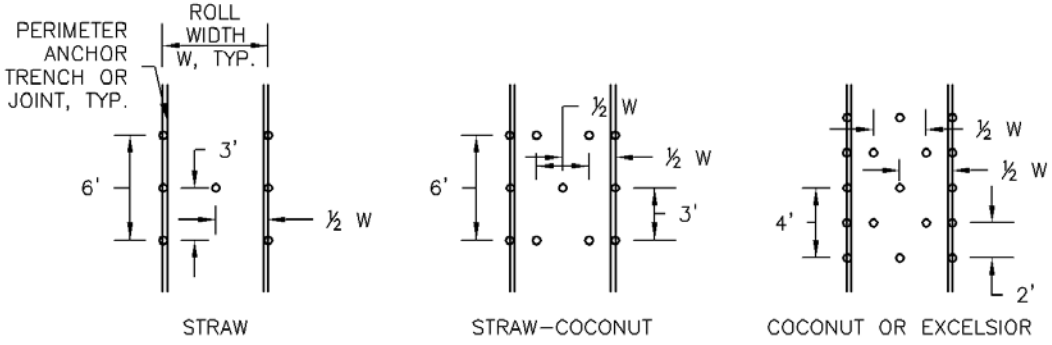
Erosion control blankets and other RECPs that are biodegradable typically do not need to be removed after construction. If they must be removed, then an alternate soil stabilization method should be installed promptly following removal.

Turf reinforcement mats, although generally resistant to biodegradation, are typically left in place as a dense vegetated cover grows in through the mat matrix. The turf reinforcement mat provides long-term stability and helps the established vegetation resist erosive forces.

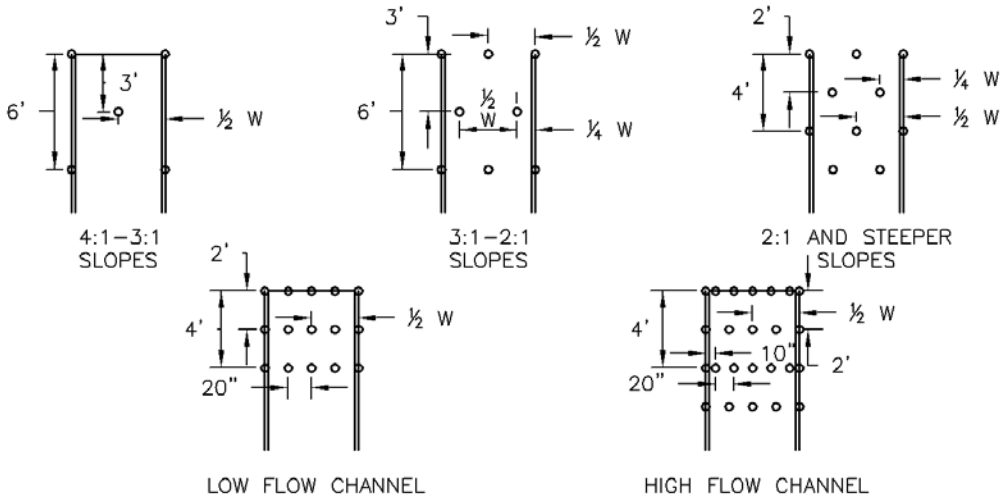

ECB
UNDISTURBED SOIL
PERIMETER ANCHOR TRENCH, TYP.
JOINT ANCHOR TRENCH, TYP.
TOP OF CHANNEL BANK
TYPE OF ECB AS INDICATED IN PLAN VIEW. INSTALL IN ALL DISTURBED AREAS OF STREAMS AND DRAINAGE CHANNELS TO DEPTH D ABOVE CHANNEL INVERT. ECB SHALL GENERALLY BE ORIENTED PARALLEL TO FLOW DIRECTION (I.E. LONG DIMENSIONS OF BLANKET PARALLEL TO FLOWLINES) STAKING PATTERN SHALL MATCH ECB AND/OR CHANNEL TYPE.
ECB–1. PIPE OUTLET TO DRAINAGEWAY
JOINT ANCHOR TRENCH, TYP.
TYPE OF ECB, INDICATED IN PLAN VIEW
6" TOPSOIL
M
ECB SHALL EXTEND TO THE TOP OF THE CHANNEL
D
PERIMETER ANCHOR TRENCH, TYP.
COMPACTED SUBGRADE
STAKING PATTERN PER MANUFACTURER SPEC. OR PATTERN BASED ON ECB AND/OR CHANNEL TYPE (SEE STAKING PATTERN DETAIL)
ECB–2. SMALL DITCH OR DRAINAGEWAY
ANCHOR DETAILS
GEOTEXTILE FABRIC OR MAT, TYP.
3" MIN, TYP.
6" MIN, TYP.
SINGLE EDGE STAKE, TYP.
COMPACTED BACKFILL, TYP.
PERIMETER ANCHOR TRENCH
TWO EDGES OF TWO ADJACENT ROLLS
JOINT ANCHOR TRENCH
LOOP FROM MIDDLE OF ROLL
INTERMEDIATE ANCHOR TRENCH
FLOW
6"
OVERLAPPING JOINT
3" MIN.
12" MIN.
WOOD STAKE DETAIL



ECB–3. OUTSIDE OF DRAINAGEWAY



STAKING PATTERNS BY ECB TYPE



STAKING PATTERNS BY SLOPE OR CHANNEL TYPE

EROSION CONTROL BLANKET INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - –LOCATION OF ECB.
   - –TYPE OF ECB (STRAW, STRAW–COCONUT, COCONUT, OR EXCELSIOR).
   - –AREA, A, IN SQUARE YARDS OF EACH TYPE OF ECB.

2. 100% NATURAL AND BIODEGRADABLE MATERIALS ARE PREFERRED FOR RECPs, ALTHOUGH SOME JURISDICTIONS MAY ALLOW OTHER MATERIALS IN SOME APPLICATIONS.

3. IN AREAS WHERE ECBs ARE SHOWN ON THE PLANS, THE PERMITTEE SHALL PLACE TOPSOIL AND PERFORM FINAL GRADING, SURFACE PREPARATION, AND SEEDING AND MULCHING. SUBGRADE SHALL BE SMOOTH AND MOIST PRIOR TO ECB INSTALLATION AND THE ECB SHALL BE IN FULL CONTACT WITH SUBGRADE. NO GAPS OR VOIDS SHALL EXIST UNDER THE BLANKET.

4. PERIMETER ANCHOR TRENCH SHALL BE USED ALONG THE OUTSIDE PERIMETER OF ALL BLANKET AREAS.

5. JOINT ANCHOR TRENCH SHALL BE USED TO JOIN ROLLS OF ECBs TOGETHER (LONGITUDINALLY AND TRANSVERSELY) FOR ALL ECBs EXCEPT STRAW WHICH MAY USE AN OVERLAPPING JOINT.

6. INTERMEDIATE ANCHOR TRENCH SHALL BE USED AT SPACING OF ONE–HALF ROLL LENGTH FOR COCONUT AND EXCELSIOR ECBs.

7. OVERLAPPING JOINT DETAIL SHALL BE USED TO JOIN ROLLS OF ECBs TOGETHER FOR ECBs ON SLOPES.

8. MATERIAL SPECIFICATIONS OF ECBs SHALL CONFORM TO TABLE ECB–1.

9. ANY AREAS OF SEEDING AND MULCHING DISTURBED IN THE PROCESS OF INSTALLING ECBS SHALL BE RESEEDED AND MULCHED.

10. DETAILS ON DESIGN PLANS FOR MAJOR DRAINAGEWAY STABILIZATION WILL GOVERN IF DIFFERENT FROM THOSE SHOWN HERE.

TABLE ECB–1. ECB MATERIAL SPECIFICATIONS

TYPE	COCONUT CONTENT	STRAW CONTENT	EXCELSIOR CONTENT	RECOMMENDED NETTING**
STRAW*	–	100%	–	DOUBLE/ NATURAL
STRAW–COCONUT	30% MIN	70% MAX	–	DOUBLE/ NATURAL
COCONUT	100%	–	–	DOUBLE/ NATURAL
EXCELSIOR	–	–	100%	DOUBLE/ NATURAL

*STRAW ECBs MAY ONLY BE USED OUTSIDE OF STREAMS AND DRAINAGE CHANNEL.
**ALTERNATE NETTING MAY BE ACCEPTABLE IN SOME JURISDICTIONS

EROSION CONTROL BLANKET MAINTENANCE NOTES

1. 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.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. ECBs SHALL BE LEFT IN PLACE TO EVENTUALLY BIODEGRADE, UNLESS REQUESTED TO BE REMOVED BY THE LOCAL JURISDICTION.

5. ANY ECB PULLED OUT, TORN, OR OTHERWISE DAMAGED SHALL BE REPAIRED OR REINSTALLED. ANY SUBGRADE AREAS BELOW THE GEOTEXTILE THAT HAVE ERODED TO CREATED A VOID UNDER THE BLANKET, OR THAT REMAIN DEVOID OF GRASS SHALL BE REPAIRED, RESEEDED AND MULCHED AND THE ECB REINSTALLED.

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

(DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO AND TOWN OF PARKER COLORADO, NOT AVAILABLE IN AUTOCAD)

APPENDIX E
Geotechnical Report

Geotechnical Engineering Report

North Gate / Struthers PWQ Pond & Storm Sewer
Colorado Springs, Colorado
February 20, 2023 (Revised August 2, 2024)
Terracon Project No. 23195091

Prepared for:
Wilson & Company
Colorado Springs, Colorado

Prepared by:
Terracon Consultants, Inc.
Wheat Ridge, Colorado

February 20, 2023 (Revised August 2, 2024)

Wilson & Company
5755 Mark Dabling Blvd, Suite 220
Colorado Springs, Colorado 80919

Attn: Mr. Vance Fossinger
P: (719) 302-6742
E: vancel.Fossinger@wilconco.com

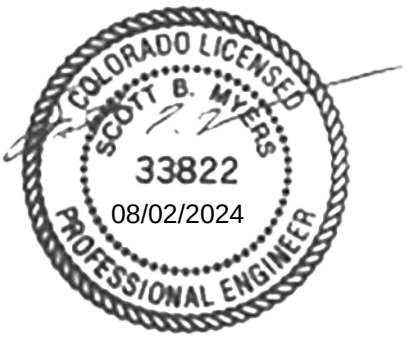
Re: Geotechnical Engineering Report
North Gate / Struthers PWQ Pond & Storm Sewer
Colorado Springs, Colorado
Terracon Project No. 23195091

Mr. Fossinger:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Amendment No. 1 to Project No. 15-100-08101, dated October 24, 2022. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of new storm sewer system and water quality pond for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.



Nick M. Novotny, P.G., C.E.G.
Geotechnical Department Manager

Scott B. Myers, P.E.
Senior Regional Consultant

REPORT TOPICS

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Note: This report was originally delivered in a web-based format. For more interactive features, please view your project online at client.terracon.com.

FIGURES

GEOMODEL

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION RESULTS
PAVEMENT DESIGN CALCULATIONS
SUPPORTING INFORMATION

Note: Refer to each individual Attachment cover page for a listing of contents.

REPORT SUMMARY

Topic [1]	Overview Statement [2]
Project Description	The project consists of constructing 2,700 linear feet of storm sewer line and associated 3.5-acre permanent water quality pond. The storm sewer alignment will begin near the intersection of Struthers Road and Shepard Heights, continuing south along Struthers Road before turning west along North Gate Boulevard. The sewer diameter ranges from 24 to 48 inches and will be installed at depths of approximately 5 to 15 feet below existing grades. There are several manhole structures planned along the alignment. The sewer line will terminate at a proposed permanent water quality pond between the north and south bound lanes of Interstate 25. The pond outlet will tie into an existing storm sewer west of the project site. The pond will have a rip-rap lined spillway as well as a concrete outlet structure. Slopes for the proposed pond are planned to be on the order of about 20 percent or 5H:1V (Horizontal to Vertical) or flatter.
Geotechnical Characterization – Sewer Line Alignment	Subsurface conditions encountered in the borings along the sewer line alignment (Boring Nos. B-1 to B-5) generally consisted of sand soils with varying amounts of clay, silt, and gravel and fat clay soils with varying amounts of sand to depths of about 12 feet and the maximum depth explored of about 20 feet in Boring Nos. B-1, B-2 and B-5. In Boring Nos. B-3 and B-4 the native soils were underlain by claystone bedrock to the maximum depths explored of about 20 feet. Existing fill material was encountered in Boring No. B-2. The existing fill materials were encountered to depths of about 2 feet. The existing fill materials generally consisted of sand soils with varying amounts of silt. Groundwater was encountered in four of the five borings during field exploration. Groundwater was encountered at depths ranging from 6 to 15 feet below the existing ground surface. The shallowest groundwater encountered was in Boring No. B-5 at a depth of about 6 feet below ground surface.
Geotechnical Characterization – Proposed Water Quality Pond	Subsurface conditions encountered in the borings in the area of the proposed water quality pond (Boring Nos. P-1 to P-3, PZ-1 to PZ-4, and S-1) generally consisted of 5 to 8 feet of existing fill materials underlain by native soils consisting of sand with varying amounts of silt and gravel to varying depths of about 12 to 23 feet. The existing fill materials generally consisted of sand soils with varying amounts of silt and clay. The native soils were underlain by bedrock consisting of claystone, siltstone, and sandstone to the maximum depths explored of about 25 to 30½ feet. Groundwater was encountered in all of the exploratory borings for the proposed water quality pond at varying depths of about 4 to 16 feet when the borings were drilled.
Earthwork	Areas of loose soil should be overexcavated and re-compacted as engineered fill. Onsite soils, including existing fill materials, are generally reusable as engineered fill for this project.

Topic [1]	Overview Statement [2]
Excavation Concerns	Temporary dewatering will be required to install the sewer line based on the groundwater levels encountered in our borings and the invert elevations interpolated from the provided drawings. Temporary dewatering may also be required for construction of the northern portion of the proposed pond. Based on the provided plans, groundwater in the northern portion of the pond around Boring No. P-1 was above the bottom of the proposed pond at the time of our field exploration. Conventional excavation equipment should be capable of completing the required excavations. Excavations are anticipated to reach as deep as 15 feet. Excavations within the native soils should be able to be accomplished with conventional excavation equipment. We do not anticipate excavations will extend into the underlying bedrock materials, but if excavations do extend into these materials heavy-duty excavation equipment may be required. Excavations should be properly constructed in compliance with Occupational Safety and Health Administration (OSHA) guidelines.
Pavements	This report includes recommendations for asphalt pavements for Struthers Road and North Gate Boulevard. At the time of this report, we understand a Traffic Study has not been performed for Struthers Road and North Gate Boulevard. The pavement thickness recommendations presented in this report are based on Struthers Road having a functional classification of Urban Principal Arterial, 4-lane, and North Gate Boulevard having a functional classification of Urban Expressway, 4-lane. The design life for the pavements is 20 years. The Equivalent Single Axle Load (ESAL) for the classifications is as follows: ■ Struthers Road: 5,256,000 ESALs ■ North Gate Boulevard: 7,884,000 ESALs
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Geotechnical Engineering Report

North Gate / Struthers PWQ Pond & Storm Sewer

Colorado Springs, Colorado

Terracon Project No. 23195091

February 20, 2023 (Revised August 2, 2024)

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed storm sewer and permanent water quality pond. The proposed storm sewer is to be constructed along the southern end of Struthers Road, along North Gate Boulevard between Struthers Road and the median of I-25. The proposed pond will be located in the median of I-25, south of North Gate Boulevard in Colorado Springs, Colorado.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater levels
- Earthwork
- Storm sewer line recommendations
- Lateral earth pressures
- Manhole foundation design and construction
- Pond design and construction
- Pavement design and construction

The geotechnical engineering Scope of Services for this project consisted of two phases of exploration. Terracon's initial investigation began with exploratory borings conducted within the general area of the proposed water quality pond. Terracon was later contacted to perform exploration and testing along Struthers Road and North Gate Boulevard, as well as additional exploration and installation of piezometers within the proposed pond area. Plans showing the site and boring locations are shown in the **Site Location and Exploration Plans** section. The results of the laboratory testing performed on soil and bedrock samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section.

A supplemental exploration was performed for the water quality pond to evaluate environmental and hydrologic conditions within the area of the proposed water quality pond. Results of the supplemental exploration are provided under a separate cover.

This report was revised on August 2, 2024 to provide alternate recommendations for the proposed storm sewer and the water quality pond.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration.

Item	Description
Existing Improvements	Struthers Road and North Gate Boulevard are paved with asphalt, and have concrete curb, gutters and sidewalks.
Existing Topography	Based on the provided 60% plans, existing grade along the alignment ranges from approximately 6,748.5 feet on the eastern end and falls to approximately 6,675 feet at the western end of the alignment.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning.

Item	Description
Information Provided	Wilson & Co provided the following PDF documents: ■ Struthers & North Gate_WQP_60%REV Plans Sheets 1 though 12 ■ El Paso County Engineering Criteria Manual, revision 6, dated December 13, 2016 (herein referred to as The Standards)
Project Description	The project consists of constructing 2,700 linear feet of storm sewer line and associated 3.5-acre permanent water quality pond. The storm sewer alignment will begin near the intersection of Struthers Road and Shepard Heights, continuing south along Struthers Road before turning west along North Gate Boulevard. The sewer diameter ranges from 24 to 48 inches and will be installed at depths of approximately 5 to 15 feet below existing grades. There are several manhole structures planned along the alignment. The sewer line will terminate at a proposed permanent water quality pond between the north and south bound lanes of Interstate 25. The pond outlet will tie into an existing storm sewer west of the project site. The pond will have a rip-rap lined spillway as well as a concrete outlet structure. Slopes for the proposed pond are planned to be on the order of about 20 percent or 5:1 (Horizontal to Vertical) or flatter.

Item	Description
Grading/Slopes	Final grades will match existing grades for the sewer line installation. No cut/fill is proposed for the sewer alignment. Cuts for the proposed pond are anticipated to be on the order of about 9 feet on the northern end of the pond and about 4 feet on the southern end of the pond. A 9 foot embankment will be constructed on the southern end of the pond. Slopes for the proposed pond are planned to be on the order of about 20 percent or 5:1 (Horizontal to Vertical) of flatter.
Maximum Excavation Depth	Sewer line installation: about 15 feet Water quality pond: about 9 feet
Pavements	This report includes recommendations for asphalt pavements to be reconstructed along Struthers Road and North Gate Boulevard after construction of the proposed storm sewer. At the time of this report, we understand a Traffic Study has not been performed for Struthers Road and North Gate Boulevard. The pavement thickness recommendations presented in this report are based on Struthers Road having a functional classification of Urban Principal Arterial, 4-lane, and North Gate Boulevard having a functional classification of Urban Expressway, 4-lane. The design life for the pavements is 20 years. The Equivalent Single Axle Load (ESAL) for the classifications is as follows: ■ Struthers Road: 5,256,000 ESALs ■ North Gate Boulevard: 7,884,000 ESALs

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting, and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section and the GeoModel can be found in the **Figures** section of this report. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Subsurface Profile

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	**Asphalt**	Asphalt; about 4 to 6 inches
2	**Apparent Aggregate Base Course**	Apparent Aggregate Base Course; approximately 6 inches
3	**Fill Materials**	Fill materials consisting of sand soils with varying amounts of silt and clay
4	**Native Sand Soils**	Well to poorly graded sand; with varying amounts of silt and clay; loose to very dense
5	**Native Clay Soils**	Fat clay; with varying amounts of sand; high plasticity; stiff to hard
6	**Bedrock**	Bedrock consisting of claystone, siltstone and sandstone; firm to hard

Stratification boundaries on the boring logs represent the approximate location of changes in soil and material types; in situ, the transition between materials may be gradual. Further details of the borings can be found on the boring logs in the **Exploration Results**.

Based on the results of the laboratory testing and our experience in the area, the native clay soils have low to high expansive potential, while the sand fill materials and native sand soils are considered to have nil to low expansive potential. Based on our experience in the area, the claystone, siltstone and sandstone bedrock are considered to have nil to low expansive potential. A summary of laboratory test results is included in the **Exploration Results**.

Groundwater Conditions

The borings were observed while drilling and upon completion of drilling for the presence and level of groundwater. The water levels encountered in the boreholes can be found on the boring logs in **Exploration Results** and are summarized below.

Boring No.	Shallowest depth to groundwater encountered while or upon completion of drilling[1] (feet)	Shallowest elevation to groundwater encountered while drilling or upon completion of drilling (feet above Mean Sea Level)
B-1	None encountered to the maximum depth explored of 20 feet	--
B-2	16	6,707
B-3	14	6,699

Boring No.	Shallowest depth to groundwater encountered while or upon completion of drilling[1] (feet)	Shallowest elevation to groundwater encountered while drilling or upon completion of drilling (feet above Mean Sea Level)
B-4	8	6,682
B-5	6	6,675
S-1	16	6,660
P-1	6	6,670
P-2	16	6,664
P-3	13	6,661
PZ-1[2]	8	6,668
PZ-2[2]	4	6,673
PZ-3[2]	7	6,660
PZ-4[2]	16	6,651

1. Due to safety concerns, borings were backfilled immediately after completion in Boring Nos. B-1 to B-5, S-1, and P-1 to P-3. Therefore, subsequent groundwater measurements were not obtained.
2. Temporary piezometers were installed in Boring Nos. PZ-1 to PZ-4.

These observations represent groundwater conditions at the time of the field exploration and may not be indicative of other times or at other locations. Groundwater levels can be expected to fluctuate with varying seasonal and weather conditions.

GEOTECHNICAL OVERVIEW

Based on subsurface conditions encountered in the borings, the site appears suitable for the proposed construction from a geotechnical point of view, provided certain precautions and design and construction recommendations outlined in this report are followed. We have identified geotechnical conditions that could impact design and construction of the proposed storm sewer line, proposed water quality pond, and replacement pavements.

Temporary Dewatering

Groundwater was encountered as shallow as 4 feet below existing site grades in the exploratory borings during the field explorations. Based on the provided plans and measured groundwater

depths, a temporary dewatering system will be necessary for the installation of the proposed storm sewer and most likely the northern portion of the water quality pond.

Based on the subsurface conditions encountered in the exploratory borings, a temporary dewatering system consisting of well points could be considered. We recommend that a specialty dewatering contractor be contacted to consult on the most efficient temporary dewatering recommendations for the proposed project.

Shoring

Excavations as deep as 15 feet below existing grades are anticipated for the installation of the storm sewer line. If excavations slopes cannot be safely excavated in accordance with Occupational Health and Safety Administration (OSHA) requirements, shoring will be required to reach the planned excavation depths. The depth of excavations, adjacent utilities, and subsurface soils will influence the type of shoring system that may be used. A qualified shoring contractor should be contacted to design and install the shoring system for the installation of the sewer line.

Existing Fill Materials

Up to approximately 2 feet of fill materials were encountered in the borings drilled along the alignment of the storm sewer, while up to about 8 feet of existing fill was encountered in the area of the proposed pond. It should be noted that fill depths presented in the boring logs are approximate and the depth, lateral extents, and composition of fill should be expected to vary. The existing fill can be reused as engineered fill below pavements and for the pond construction, provided any deleterious materials are removed. New engineered fill should meet the requirements of imported soils in the **Material Types** subsection in **Earthwork**.

EARTHWORK

Earthwork is anticipated to include, removing portions of existing pavements, clearing and grubbing, excavations, and engineered fill placement. All earthwork on the project should be observed and evaluated by Terracon.

Site Preparation

Strip and remove existing pavements, vegetation, organics and other deleterious materials from proposed utility and pavement areas. All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction.

Stripped materials consisting of vegetation, unsuitable fills and organic materials should be wasted from the site or used to revegetate landscaped areas or exposed slopes after completion of grading operations.

Although evidence of underground facilities such as vaults, septic tanks, and foundations was not observed during the site reconnaissance, such features could be encountered during construction. If unexpected fills or underground facilities are encountered, such features should be removed and the excavation thoroughly cleaned prior to backfill placement and/or construction.

Excavations within the native soils should be able to be accomplished with conventional excavation equipment. We do not anticipate excavations will extend into the underlying bedrock materials, but if excavations do extend into these materials heavy-duty excavation equipment may be required.

Based on the provided plans and measured groundwater depths, a temporary dewatering system will be necessary for the installation of the proposed storm sewer and most likely the northern portion of the water quality pond. We recommend that a specialty dewatering contractor be contacted to consult on the most efficient temporary dewatering recommendations for the proposed project.

The stability of subgrade soils may be affected by precipitation and seasonal groundwater conditions, repetitive construction traffic or other factors. Where unstable conditions are encountered or develop during construction, workability may be improved by overexcavation of wet zones and mixing these soils with crushed gravel or recycled concrete and recompaction.

Material Types

Fill for this project should be classified as engineered fill. Engineered fill is material that meets the criteria presented in this report and has been properly moisture conditioned, compacted and documented. Engineered fill should meet the following material property requirements:

Soil Type [1]	USCS and AASHTO Classification	Acceptable Locations for Placement
On-site sand soils	SM, SP, SW-SM, SC A-1 through A-3	The on-site sand soils are considered acceptable for use as engineered fill
On-site highly plastic clays	CH A-6 and A-7	Highly plastic clay soils should not be reused as engineered fill below pavements but may be used for construction of the proposed pond.
On-site claystone, siltstone and sandstone bedrock	N/A	Claystone, siltstone, and sandstone bedrock, if encountered, are not considered suitable for reuse as engineered fill.
Imported soils	Varies	Imported soils meeting the gradation outlined herein can be considered suitable for use as structural and/or general fill.

Soil Type [1]	USCS and AASHTO Classification	Acceptable Locations for Placement

1. Engineered fill should consist of approved materials free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site.

Imported soils for use as engineered fill should conform to the following:

Gradation	Percent finer by weight (ASTM C136)
1”	100
No. 4 Sieve	50 - 80
No. 200 Sieve	<35

Soil Properties	Value
R-Value (below pavements)	50 (min.)
Liquid Limit	20 (max)
Plastic Index	10 (max)
Expansive Potential [1] (below pavements)	0 percent (max)

1. Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at one percent below optimum water content. The sample is confined under a 150 psf surcharge and submerged.

Fill Compaction Requirements

Engineered fill should meet the following compaction requirements.

Item	Structural Fill
Maximum lift thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack, plate compactor) is used
Minimum compaction requirements [1, 2, 3]	98% of the materials maximum dry density

Item	Structural Fill
Water content range [2, 4]	Within three percent of optimum water content

1. We recommend that engineered fill be tested for water content and compaction during placement. Should the results of the in-place density tests indicate the specified water or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified water and compaction requirements are achieved.
2. Maximum dry density and optimum water content as determined by the Standard Proctor test (D698).
3. If the granular material is a coarse sand or gravel, or of a uniform size, or has a low fines content, compaction comparison to relative density may be more appropriate. In this case, granular materials should be compacted to at least 70% relative density (ASTM D4253 and D4254).
4. Moisture contents should be maintained low enough to allow for satisfactory compaction to be achieved without the compacted fill material becoming unstable under the weight of construction equipment or during proof-rolling. Indications of unstable soil can include pumping or rutting.

Grading and Drainage

All grades must be adjusted to provide positive drainage away from excavations during construction. Infiltration of water into utility excavations must be prevented during construction. Water permitted to pond near or adjacent to the perimeter of the utilities (either during or post-construction) can result in soil movements.

Exposed ground should be sloped at a minimum of 10 percent grade for at least 10 feet beyond the perimeter of above grade structures, where possible. Backfill against manhole structure walls and in utility trenches should be well compacted and free of all construction debris to reduce the possibility of water infiltration. To limit water infiltration, we recommend using flowable fill as backfill around the perimeter of the manhole structures. After construction and prior to project completion, we recommend that verification of final grading be performed to document that positive drainage, as described above, has been achieved.

Flatwork and pavements will be subject to post construction movement. Maximum grades practical should be used for paving and flatwork to prevent areas where water can pond. In addition, allowances in final grades should take into consideration post-construction movement of flatwork, particularly if such movement would be critical.

Earthwork Construction Considerations

Excavations for the proposed sewer line and water quality pond are anticipated to be accomplished with conventional construction equipment. There is a potential for the on-site soils to become unstable near the level of groundwater, particularly under repetitive construction traffic.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Care should be taken to maintain the moisture content of the subgrade prior to placement of the manhole structures, pipes, and earthen embankments. Construction traffic (if any) over prepared subgrade should be minimized and avoided to the extent practical. Construction traffic over the processed subgrade will eventually reduce the moisture content and increase the density of the subgrade. Subsequent wetting of these materials will result in undesirable movement.

The site should also be graded to prevent ponding of surface water on prepared subgrade or in excavations. In areas where water is allowed to pond over a period of time, the affected area should be removed and allowed to dry out.

Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, until approved by the Geotechnical Engineer prior to placement of additional lifts. In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. If unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

STORM SEWER RECOMMENDATIONS

We anticipate that the proposed storm sewer will be underlain by native soils and claystone bedrock. The following paragraphs present design and construction recommendations for the proposed storm sewer.

Deep Backfill Zones

The magnitude of settlement of the deep backfill zones associated with storm sewer installations will be directly related to the type of fill material used, the degree of compaction, and the thickness of the fill zone. The following table outlines the anticipated movement of backfill based on the depth of excavation and material type used.

Excavation Depth (feet)	Estimated Backfill Movement (inch)
10	Less than about 1 inch
15	About 1 inch

These estimates assume that the degree of compaction for fill zones is maintained in accordance with this report. Using clean gravel or controlled low-strength materials (CLSM) backfill could reduce settlement. The use CLSM should meet the requirements of the Colorado Department of Transportation specifications.

Storm Sewer Design Recommendations

Based on the geotechnical engineering analyses, subsurface exploration and laboratory test results utilities may be constructed on the native soils and claystone, provided the owner is willing to risk some potential movement. Design recommendations for storm sewer are presented in the following table.

Description	Value
Bedding recommendations	4 inches of clean gravel bedding material should be placed below the bottom of new storm sewer pipe.
Storm Sewer Subgrade Preparation	Where bedrock or soft/loose unstable soils are exposed in the base of the excavation, these materials should be overexcavated to a depth of at least 12 inches below the bottom of the pipe and replaced with 4 inches of bedding below the pipe and 8 inches of ¾-inch angular stone wrapped in a geotextile below the bedding material.

Description	Value
Geotextile Fabric	A Class 3 geotextile fabric such as a Mirafi N140 or equivalent should be wrapped around the 8 inches of ¾ inch rock.

Manhole Structure Foundation Recommendations

Based on the subsurface conditions encountered in the exploratory borings at the proposed manhole structure locations and results of the laboratory testing, the proposed manhole structures may be constructed on a mat foundation system, provided some movement can be tolerated. The proposed manhole structures are assumed to be constructed of precast concrete, therefore the bottom of each precast manhole structure is anticipated to act as a mat slab foundation.

Design recommendations for mat foundation systems are presented in the following table and paragraphs.

Description	Value
Overexcavation/Modification Depth	Scarify the subgrade a minimum of 12 inches, moisture condition, and compact to subgrade.
Supporting Stratum	Native soils, claystone bedrock, or new engineered fill
Maximum Net Allowable Bearing Pressure [1,2]	2,000 psf
Modulus of Subgrade Reaction	130 pci
Approximate Total Movement from Foundation Loads [3]	About 1 inch

1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. This pressure assumes that any existing fill or lower strength soils, if encountered, will be excavated and replaced with engineered fill.
2. Maximum allowable soil bearing pressure can be increased by 1/3 for transient loading conditions.
3. Foundation movement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the thickness of engineered fill (if any), and the quality of the earthwork operations and footing construction.

POND DESIGN AND CONSTRUCTION RECOMMENDATIONS

The sewer line will terminate at a proposed permanent water quality pond between the north and south bound lanes of Interstate 25. The pond outlet will tie into an existing storm sewer west of the project site. The pond will have a rip-rap lined spillway as well as a concrete outlet structure. We understand that the pond is currently designed without a liner.

Cuts for the proposed pond are anticipated to be on the order of about 9 feet on the northern end of the pond and about 4 feet on the southern end of the pond. A 9 foot embankment will be constructed on the southern end of the pond.

Shallow Groundwater

Based on the groundwater elevation determined from our field exploration, as presented in the following table, groundwater will be encountered the northern portion of the proposed pond.

Boring No.	Shallowest elevation to groundwater encountered while drilling or upon completion of drilling [1] (feet)	Approximate bottom of pond elevation (feet)
P-1	6,670	6,667.5
P-2	6,664	6,666
P-3	6,661	6,665

1. Due to safety concerns, borings were backfilled immediately after completion. Therefore, subsequent groundwater measurements were not obtained.

The possibility of water seepage into the northern portion of the pond should be considered in the design of the proposed pond. Temporary dewatering will most likely be required to construct the northern portion of the pond. Based on the subsurface conditions encountered in the exploratory borings, a temporary dewatering system consisting of well points could be considered. We recommend that a specialty dewatering contractor be contacted to consult on the most efficient temporary dewatering recommendations for the proposed project.

Although groundwater is anticipated to be below the bottom of the majority of the pond, where water is in close proximity to the bottom of the pond unstable soil conditions may be encountered during construction. If unstable soil conditions are encountered, stabilization of these soils may be required. A stabilization technique commonly used in these soil conditions is to knead large angular rock into the loose soils. An alternative technique is to use a combination of a geogrid and granular fill materials. If unstable soil conditions develop during construction, we should be contacted to provide site specific stabilization recommendations at that time.

Pond Slopes

Slopes for the proposed pond are planned to be on the order of about 20 percent or 5:1 (Horizontal to Vertical) or flatter. Provided pond slopes consist of on-site sand soils or imported fill and are properly compacted, it has been our experience these materials are capable of maintaining 20 percent slopes. However, a formal slope stability analyses was not performed to assess the stability of the proposed pond slopes. In order to determine the anticipated factor of safety against slope failure for the proposed pond slopes, formal slope stability analyses should be performed.

Concrete Trickle Channel

Based on the results of our subsurface exploration, we anticipate the concrete trickle channel will be constructed on native sand soils and will have a low risk of movement. We recommend the subgrade soils below the trickle channel be scarified to a minimum depth of about 12 inches, properly moisture conditioned and compacted prior to concrete placement. If required, new fill materials beneath the trickle channel should be placed and compacted as outlined in the **Earthwork** section of this report.

Pond Construction

Up to about 8 feet of existing fill materials were encountered in the borings drilled in the proposed pond areas (Boring Nos. P-1 to P-3, PZ-1 to PZ-4, and S-1). We are not aware if the existing fill materials were properly moisture conditioned and compacted during placement and consider the fill to be uncontrolled. Structures constructed on uncontrolled fill could experience several inches of movement due to the settlement of the fill materials. Provided the owner is willing to accept the risk of movement, the proposed embankment may be constructed on the existing fill materials.

Prior to placing engineered fill for the proposed pond construction, the subgrade soils should be scarified a minimum of 12 inches, moisture conditioned and compacted as recommended in the **Earthwork** section of this report.

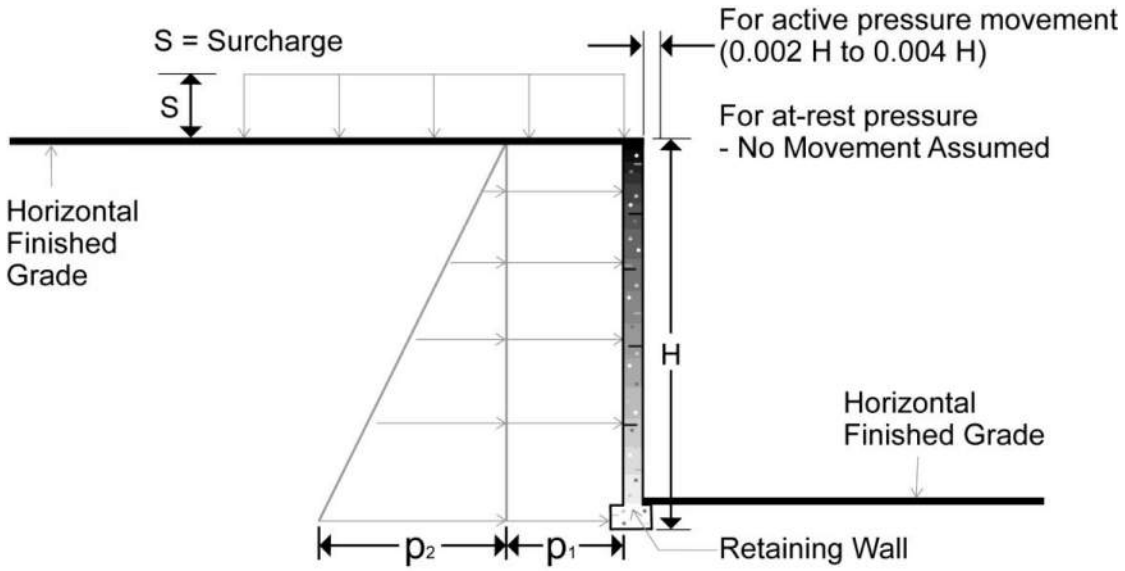
After preparing the pond embankment subgrade, the area of the embankment should be proof-rolled in order to identify soft, loose or unstable soils. If unstable soils are encountered, stabilization efforts will be required prior to construction of the embankment and placement of engineered fill. If unstable soil conditions are encountered during construction, we should be contacted to provide site specific stabilization recommendations at that time.

All finished surfaces of the proposed pond and the portion of the embankment to receive riprap, should be properly moisture conditioned and compacted. For cut slope areas of the pond, some benching, overbuilding and regrading may be required to achieve uniform compaction at final grade.

We recommend riprap for the spillway be designed and installed in general accordance with the Colorado Department of Transportation (CDOT) specifications.

LATERAL EARTH PRESSURES FOR TEMPORARY SHORING AND MANHOLE STRUCTURES

Temporary shoring and manhole structure walls with unbalanced backfill levels should be designed for earth pressures at least equal to those indicated in the following table. Reinforced concrete walls with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to those indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The "at-rest" condition assumes no wall movement. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls.



Earth Pressure Conditions	Lateral Earth Pressure Coefficient	Equivalent Fluid Density (pcf)	Surcharge Pressure, p_1 (psf)	Earth Pressure, p_2 (psf)
Active (Ka)	Sand – 0.33	40	(0.33)S	(40)H
At-Rest (Ko)	Sand – 0.50	60	(0.50)S	(60)H
Passive (Kp)	Sand – 3.00	300	---	---

Applicable conditions to the above include:

- For active earth pressure, wall must rotate about base, with top lateral movements of about 0.002 H to 0.004 H, where H is wall height

- For passive earth pressure to develop, wall must move horizontally to mobilize resistance.
- Uniform surcharge, where S is surcharge pressure
- In-situ soil backfill weight a maximum of 120 pcf
- Horizontal backfill, compacted to at least 95 percent of standard Proctor maximum dry density
- Loading from heavy compaction equipment not included
- No hydrostatic pressures acting on wall
- No dynamic loading
- No safety factor included in soil parameters

To control hydrostatic pressure behind below-grade walls we recommend that a drain be installed below the wall, with a collection pipe leading to a reliable discharge. If this is not possible, then combined hydrostatic and lateral earth pressures should be calculated for lean clay backfill using an equivalent fluid weighing 90 and 100 pcf for active and at-rest conditions, respectively. For granular backfill, an equivalent fluid weighing 85 and 90 pcf should be used for active and at-rest, respectively. These pressures do not include the influence of surcharge, equipment, or floor loading; these values should be added where applicable. Heavy construction equipment (such as cranes) should not operate within a distance closer than the exposed height of retaining walls to prevent lateral pressures more than those provided.

PAVEMENTS

General Pavement Comments

Design of pavements for the project have been performed in general accordance with the guidelines outlined by the *1993 Guideline for Design of Pavement Structures* by the American Association of State Highway and Transportation Officials (AASHTO) and El Paso County's *Engineering Criteria Manual (ECM) – Revision 6* (Standards).

Design Traffic

Traffic loads for Struthers Road and North Gate Boulevard were based on assumed functional classifications presented in the following table. We should be contacted to confirm and/or modify the recommendations contained herein if actual traffic volumes differ from the assumed values shown.

Road	Roadway Functional Classification	20 year EASLs
Struthers Road	Principal Arterial, 4-Lane	5,256,000
North Gate Boulevard	Urban – Expressway 4-Lane	7,884,000

Pavement Design Parameters

Laboratory test results indicate that the subgrade materials classify A-1-a, A-1-b and A-2-4, soils with a group index of 0 according to the American Association of State Highway and Transportation Officials (AASHTO) classification system. The majority of the subgrade soils classified as A-1-b, therefore that soil classification was used in pavement thickness design. A Hveem Stabilometer R-value test (AASHTO T-190) was performed on a bulk sample from Boring No. B-3 and resulted in an R-value of 52. based on our experience with similar subgrade soils and seasonal variations, an R-value of 52 was used for the pavement thickness design for the proposed roads. The R-value was used to calculate a resilient modulus (M_R) of approximately 14,000 psi based on the Standards.

Recommended Minimum Pavement Sections

The pavement thickness designs were performed using strength coefficients and minimum thicknesses in accordance with the Standards. The following strength coefficients were used for the pavement designs:

Pavement Component	Strength Coefficient
Hot Mix Asphalt (HMA)	0.44
Aggregate Base Course (ABC)	0.11

Using the traffic volume assumptions and resilient modulus of the A-1-b soils, structural numbers (SN) of 3.52 and 3.64 were calculated for Struthers Road and North Gate Boulevard, respectively. The recommended pavement thicknesses for hot mix asphalt (HMA) pavement using the traffic loading, subgrade soil strength, and the design parameters presented in the Standards are summarized in the table below:

Traffic Area	Alternative	Preliminary Pavement Thickness (Inches)		
		Asphalt Concrete (HMA)	Aggregate Base Course (ABC)	Total
Struthers Road	A	8	--	8
	B	6	6	12
North Gate Boulevard	A	8 ½	--	8 ½
	B	6	8	14

During construction, some existing pavement sections may be encountered that do not match the above recommended pavement section thicknesses. The above minimum section thicknesses

should be met, even if the existing sections encountered are less than the recommended thicknesses.

Materials Specifications

Pavement construction and materials should conform to the latest version of The Standards

For analysis of pavement costs, the following specifications should be considered for each pavement component:

Pavement Component	Colorado Department of Transportation Criteria
HMA	Grading S or SX
ABC	Class 5 or 6

Pavement Maintenance

Future performance of pavements constructed at this site will be dependent upon several factors, including:

- Maintaining stable moisture content of the subgrade soils both before and after pavement construction.
- Providing for a planned program of preventative maintenance.

The performance of all pavements can be enhanced by minimizing excess moisture, which can reach the subgrade soils. The following recommendations should be implemented:

- Site grading at a minimum 2 percent grade onto or away from the pavements.
- Water should not be allowed to pond behind curbs.
- Compaction of any utility trenches for landscaped areas to the same criteria as the pavement subgrade.
- Sealing all landscaped areas in or adjacent to pavements, or providing drains to reduce the risk of moisture migration to subgrade soils.
- Placing compacted backfill against the exterior side of curb and gutter.
- Placing curb, gutter, and/or sidewalk directly on subgrade soils without the use of base course materials.

Preventative maintenance should be planned and provided for an ongoing pavement management program in order to enhance future pavement performance. Preventative maintenance activities are intended to slow the rate of pavement deterioration.

Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first priority when implementing a planned pavement maintenance program.

Pavement Construction Considerations

Site grading is generally accomplished early in the construction phase. However, as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, or rainfall. As a result, the pavement subgrade may not be suitable for pavement construction and corrective action will be required. The subgrade should be carefully evaluated at the time of pavement construction for signs of disturbance or excessive rutting. If disturbance has occurred, pavement subgrade areas should be reworked, moisture conditioned, and properly compacted to the recommendations in this report immediately prior to paving.

We recommend the pavement areas be rough graded and then thoroughly proofrolled with a loaded tandem axle dump truck prior to final grading and paving. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted fills. All pavement areas should be moisture conditioned and properly compacted to the recommendations in this report immediately prior to paving.

The placement of a partial pavement thickness for use during construction is not recommended without a detailed pavement analysis incorporating construction traffic. In addition, if the actual traffic varies from the assumptions outlined above, we should be contacted to confirm and/or modify the pavement thickness recommendations outlined above.

CORROSIVITY

The following table lists the results of laboratory water-soluble sulfate, pH, chlorides, and electrical resistivity testing performed on samples obtained during our field exploration. These values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Boring No.	Sample Depth (feet)	Water-Soluble Sulfate [1] (% by mass)	pH	Chlorides (mg/kg)	Electrical Resistivity (ohm-cm)
B-2	0 – 5	<0.10	7.38	130	2328
B-3	0 – 5	<0.10	7.46	200	1164

1. Results of water-soluble sulfate testing indicate that samples of the on-site soils have an exposure class of S0 when classified in accordance with Table 19.3.1.1 of the American Concrete Institute (ACI) Design Manual. The results of the testing indicate ASTM Type I Portland Cement is suitable for project concrete in contact with on-site soils. However, if there is no (or minimal) cost differential, use of ASTM Type II Portland Cement is recommended for additional sulfate resistance of construction concrete. Concrete should be designed in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 19.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials, or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

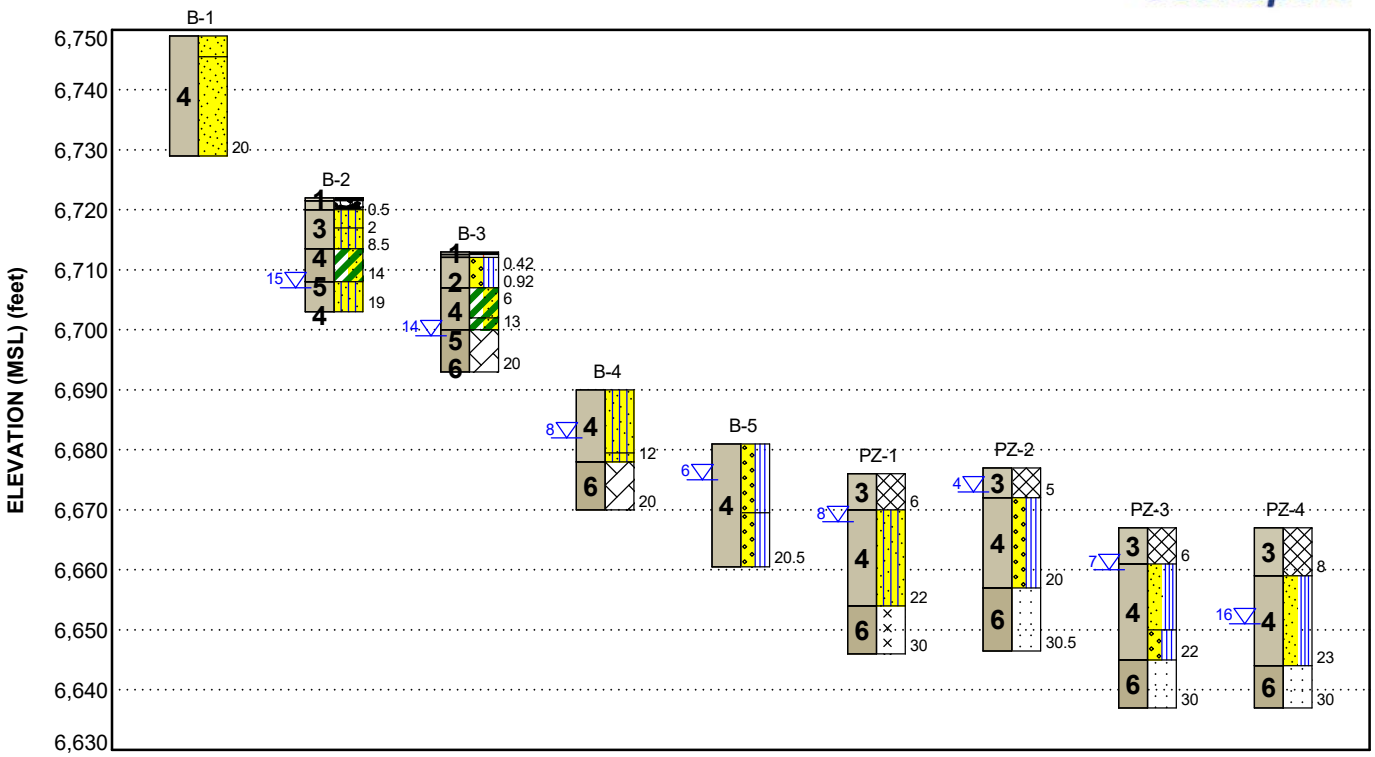
FIGURES

Contents:

GeoModel

GEOMODEL

North Gate / Struthers PWQ Pond & Storm Sewer ■ Colorado Springs, Colorado
Terracon Project No. 23195091



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	**Asphalt**	Asphalt; approximately 6 to 10 Inches
2	**Aggregate Base Course**	Aggregate Base Course; approximately 6 Inches
3	**Fill Materials**	Fill materials consisting of sand soils with varying amounts of silt
4	**Native Sand Soils**	Well to Poorly Graded Sand; with varying amounts of silt and clay; loose to very dense
5	**Native Clay Soils**	Fat Clay; with varying amounts of sand; high plasticity; stiff to hard
6	**Bedrock**	Bedrock consisting of claystone; firm to very hard

LEGEND

- Poorly-graded Sand
- Asphalt
- Fill
- Silty Sand
- Fat Clay with Sand
- Aggregate Base Course
- Well-graded Sand with Silt
- Claystone
- Fill
- Siltstone
- Sandstone
- Poorly-graded Sand with Silt

NOTES:

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.

▽ First Water Observation
▽ Second Water Observation

The groundwater levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Boring Layout and Elevations: The locations of the borings are presented in the **Site Location and Exploration Plans**. The borings were located in the field by overlaying the site plan on Bing Maps, recording the latitude and longitude coordinates, and staking the borings using a handheld, recreational-grade GPS unit. The accuracy of the latitude and longitude values is typically about +/- 25 feet when obtaining the values using this method. Elevations at the borings were interpolated to the nearest foot from the provided 60 percent drawings "North Gate/Struthers PWQ Pond Storm Sewer and Detention Plan" dated May 28, 2021. The accuracy of the boring locations and elevations should only be assumed to the level implied by the methods used.

Subsurface Exploration Procedures: The borings were drilled with CME-55 truck-mounted drill rig with hollow-stem augers. During the drilling operations, lithologic logs of the borings were recorded by the field engineer. Relatively undisturbed samples were obtained at selected intervals utilizing a 2-inch outside diameter standard split spoon sampler and a 3½-inch outside diameter modified Dames and Moore sampler. Bulk samples were obtained from auger cuttings. Penetration resistance values were recorded in a manner similar to the standard penetration test (SPT). This test consists of driving the sampler into the ground with a 140-pound hammer free falling through a distance of 30 inches. The number of blows required to advance the barrel sampler 12 inches (18 inches for standard split-spoon samplers, final 12 inches are recorded) or the interval indicated is recorded and can be correlated to the standard penetration resistance value (N-value). The blow count values are indicated on the boring logs at the respective sample depths, barrel sampler blow counts are not considered N-values.

An automatic hammer was used to advance the samplers in the borings performed on this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count value by increasing the penetration per hammer blow over what would be obtained using the cathead and rope method. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

The standard penetration test provides a reasonable indication of the in-place density of sandy type materials, but only provides an indication of the relative stiffness of cohesive materials since the blow count in these soils may be affected by the soils moisture content. In addition, considerable care should be exercised in interpreting the N-values in gravelly soils, particularly where the size of the gravel particle exceeds the inside diameter of the sampler.

Groundwater measurements were obtained in the borings at the time of drilling. Boring Nos. B-1 through B-5 were backfilled with auger cuttings and patched with cold patch asphalt after drilling. Some settlement of the backfill and patches may occur and should be repaired as soon as possible.

Laboratory Testing

Samples retrieved during the field exploration were returned to the laboratory for observation by the Geotechnical Engineer and were classified in general accordance with the Unified Soil Classification System presented in the **Supporting Information**.

At this time, an applicable laboratory-testing program was formulated to determine engineering properties of the subsurface materials. Following the completion of the laboratory testing, the field descriptions were confirmed or modified as necessary, and the boring logs were prepared. The boring logs are included in the **Exploration Results**.

Laboratory test results are included in the **Exploration Results**. These results were used for the geotechnical engineering analyses and the development of foundation, earthwork, and pavement recommendations. All laboratory tests were performed in general accordance with the applicable local or other accepted standards.

Selected soil samples were tested for the following engineering properties:

- Water content
- Dry density
- Grain size distribution
- Atterberg limits
- Swell/consolidation
- Water-soluble sulfate content
- Chlorides
- pH
- Electrical resistivity
- R-Value

SITE LOCATION AND EXPLORATION PLANS

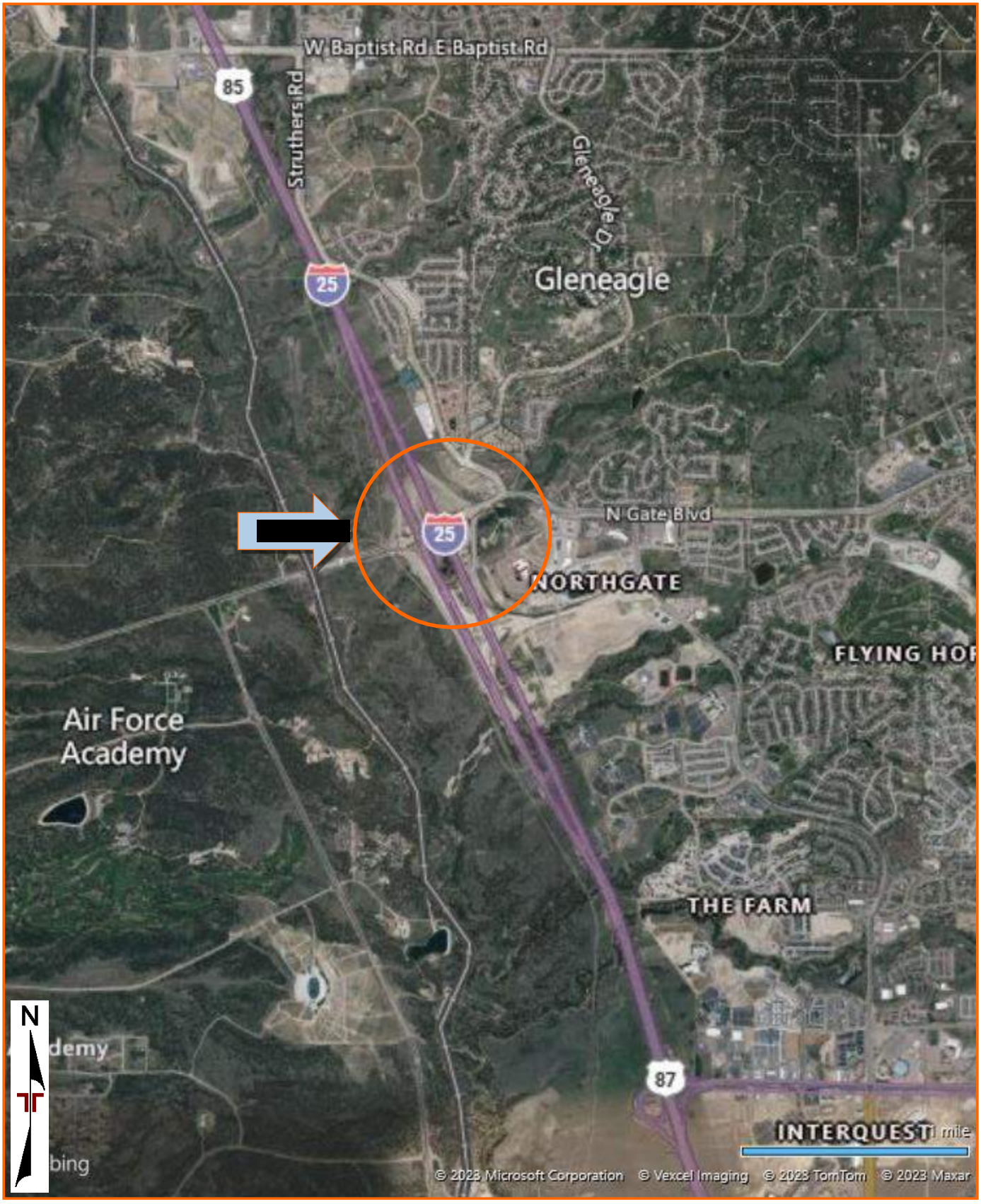
Contents:

Site Location Plan
Exploration Plan with Project Overlay
Exploration Plan with Soils Overlay
Pavement Thickness Plan

Note: All attachments are one page unless noted above.

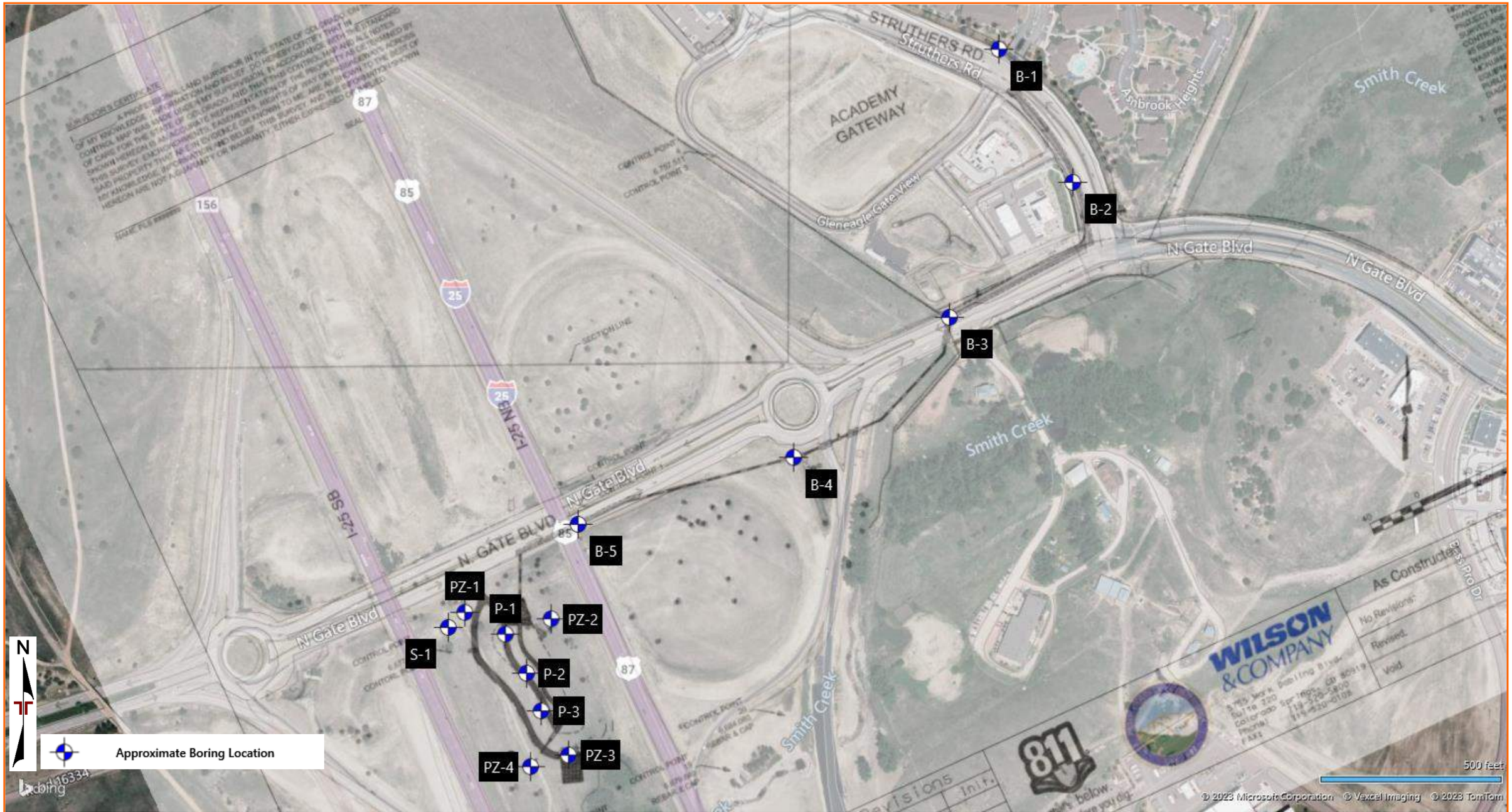
SITE LOCATION PLAN

North Gate / Struthers PWQ Pond & Storm Sewer
Colorado Springs, Colorado
June 12, 2023 (Revised August 2, 2024) ■ Terracon Project No. 23195091



AERIAL PHOTOGRAPHY PROVIDED
BY MICROSOFT BING MAPS

EXPLORATION PLAN WITH PROJECT OVERLAY
North Gate / Struthers PWQ Pond & Storm Sewer
Colorado Springs, Colorado
June 12, 2023 (Revised August 2, 2024) ■ Terracon Project No. 23195091



AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN WITH AASHTO SOIL CLASSIFICATIONS

North Gate / Struthers PWQ Pond & Storm Sewer
Colorado Springs, Colorado
June 12, 2023 (Revised August 2, 2024) ■ Terracon Project No. 23195091

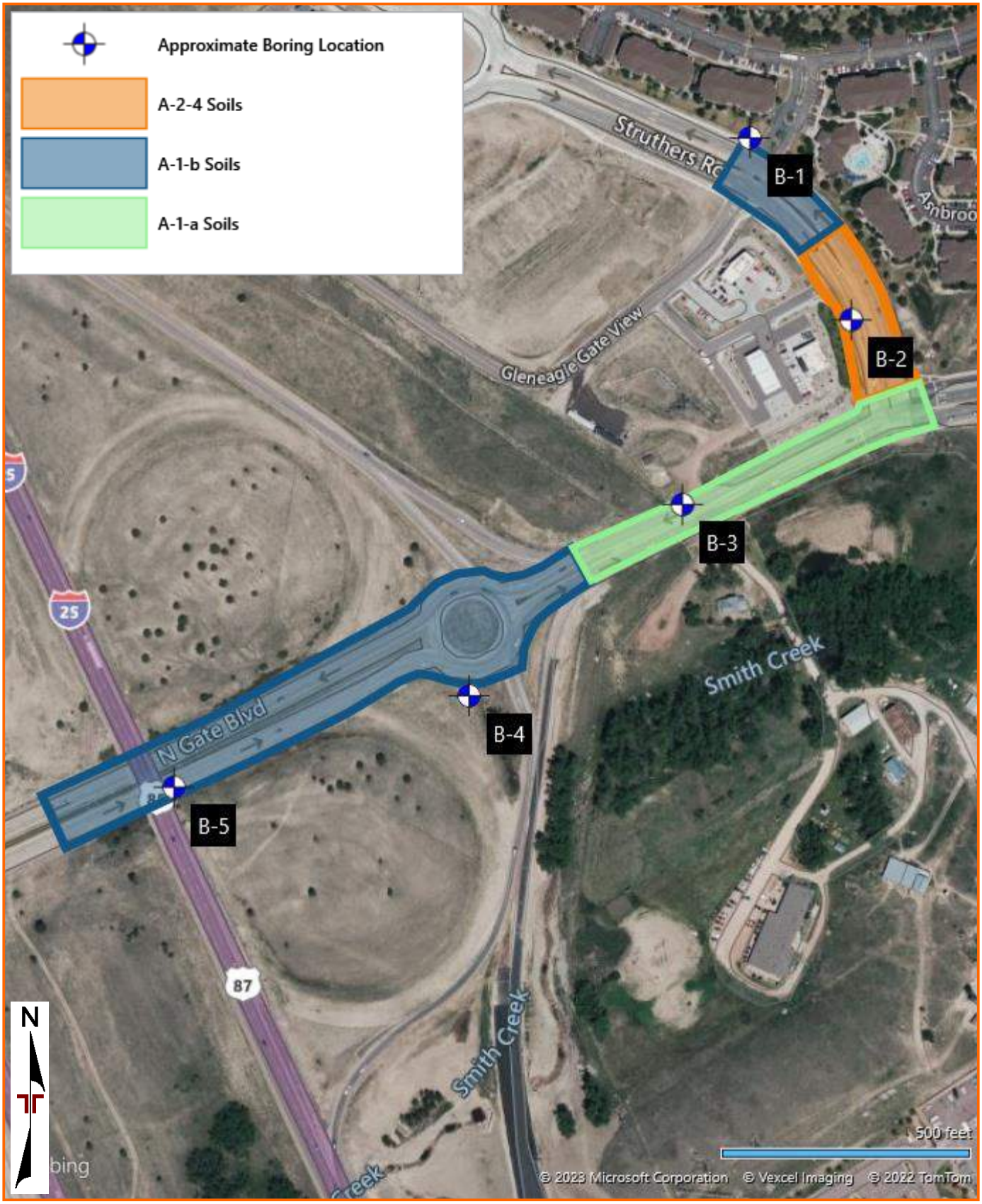


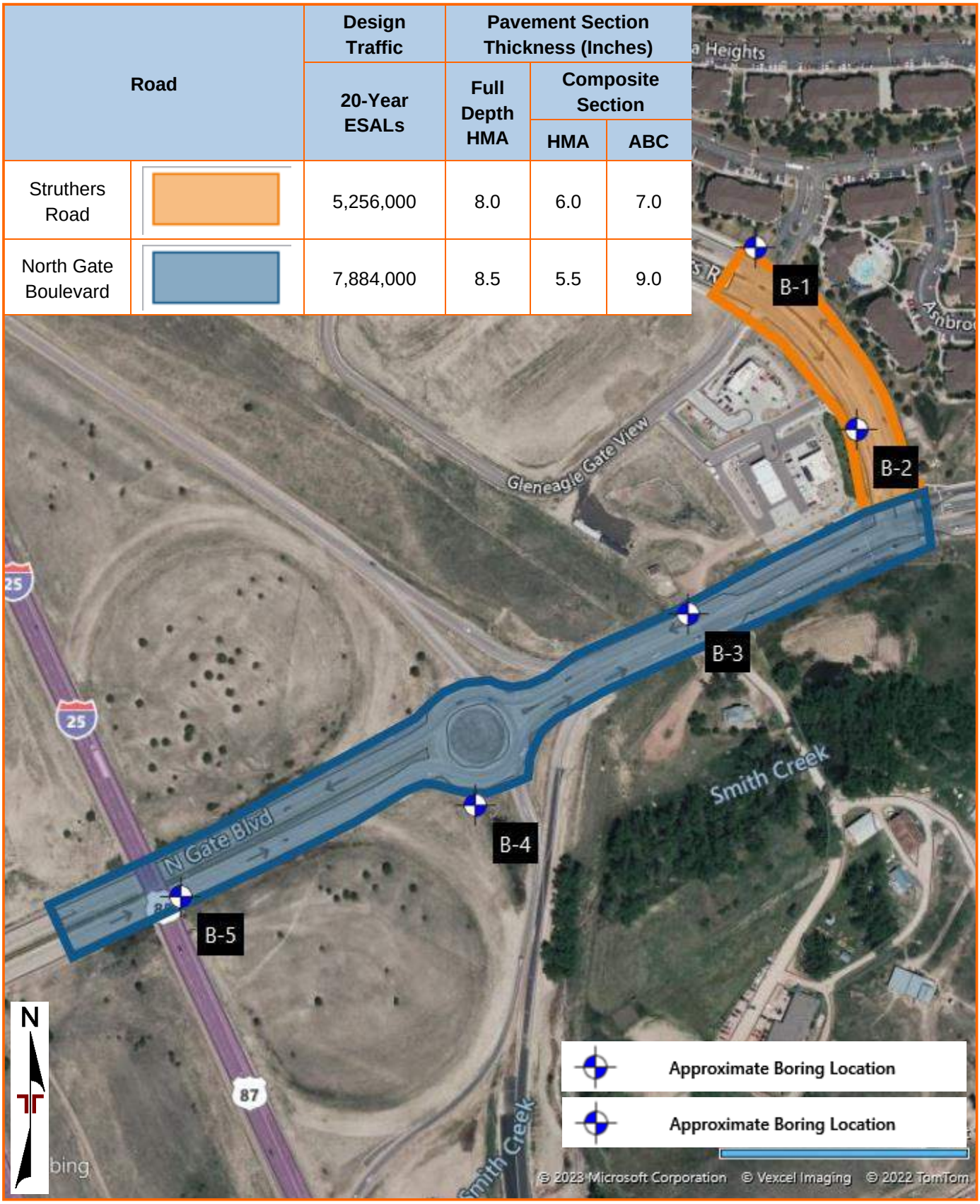
DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN WITH PROJECT OVERLAY

North Gate / Struthers PWQ Pond & Storm Sewer
Colorado Springs, Colorado
June 12, 2023 (Revised August 2, 2024) ■ Terracon Project No. 23195091

Road		Design Traffic	Pavement Section Thickness (Inches)		
		20-Year ESALs	Full Depth HMA	Composite Section	
				HMA	ABC
Struthers Road		5,256,000	8.0	6.0	7.0
North Gate Boulevard		7,884,000	8.5	5.5	9.0



AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

Contents:

Boring Logs (Boring Nos. B-1 through B-5, S-1, P-1 through P-3, and PZ-1 through PZ-4)
Swell Consolidation Test
Grain Size Distribution - USCS (3 pages)
Grain Size Distribution – AASHTO (2 pages)
Moisture-Density Relationship
R-Value
Corrosivity
Summary of Laboratory Testing Results

Note: All attachments are one page unless noted above.

BORING LOG NO. B-1

PROJECT: North Gate / Struthers PWQ Pond & Storm Sewer

CLIENT: Wilson & Company Inc Engineers & Architects Colorado Springs, Colorado

SITE: Colorado Springs, Colorado

LOCATION See Exploration Plan

Latitude: 39.0299° Longitude: -104.8290°

Station: STA 36+25

Approximate Surface Elev.: 6749 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	INSTALLATION DETAILS	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4			**POORLY GRADED SAND (SP)**, A-1-b, fine to coarse grained, nonplastic, light brown to brown, moist, medium dense					9-13		3.7			
		3.5	6745.5+/-										
			Approximate elevation of bottom of Storm Sewer: 6745.5		5			8-16		5.3	116	NP	4
								7-14		6.3	109		
					10			17-16		4.9	108		
					15			12-19					
		20.0	6729+/-		20			10-21		6.9	111		
			Boring Terminated at 20 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Elevation of bottom of Storm Sewer: 6744ft

Hammer Type: Automatic

Advancement Method:
6 Inch OD Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Not encountered

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Started: 12-14-2022 | Boring Completed: 12-14-2022

Drill Rig: CME-55 | Driller: Site Services

Project No.: 23195091

BORING LOG NO. B-2

PROJECT: North Gate / Struthers PWQ Pond & Storm Sewer

CLIENT: Wilson & Company Inc Engineers & Architects Colorado Springs, Colorado

SITE: Colorado Springs, Colorado

LOCATION See Exploration Plan

Latitude: 39.0289° Longitude: -104.8283°

Station: STA 31+00

Approximate Surface Elev.: 6722 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DESCRIPTION	INSTALLATION DETAILS	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		0.5	6721.5+/-	**ASPHALT**, approximately 6 Inches										
3		2.0	6720+/-	**FILL - SILTY SAND (SM)**, A-2-4 (0), fine to coarse grained, light brown, moist					14-15		8.4	107	NP	31
4		5.0	6717+/-	**SILTY SAND (SM)**, A-2-4 (0), fine to coarse grained, gray to very dark gray, moist, very loose to medium dense		5			2-4		5.7	109		
				Approximate elevation of bottom of Storm Sewer: 6717					7-11					
5		8.5	6713.5+/-	**FAT CLAY WITH SAND (CH)**, A-7-6 (22), high plasticity, gray to dark gray, moist, stiff		10			5-6	0.7 @ 500 psf	31.2	86	53-27-26	79
4		14.0	6708+/-	**SILTY SAND (SM)**, fine to coarse grained, light brown, moist to wet, medium dense		15			14-21		9.5			
		19.0	6703+/-	***Boring Terminated at 19 Feet***										

Stratification lines are approximate. In-situ, the transition may be gradual.

Elevation of bottom of Storm Sewer: 6719ft

Hammer Type: Automatic

Advancement Method:
4 Inch OD Solid Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite
Surface Capped with Asphalt

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 15 feet while drilling*

Caved at 15 feet

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Started: 12-14-2022 | Boring Completed: 12-14-2022

Drill Rig: CME-55 | Driller: Site Services

Project No.: 23195091

BORING LOG NO. B-3

PROJECT: North Gate / Struthers PWQ Pond & Storm Sewer

CLIENT: Wilson & Company Inc Engineers & Architects Colorado Springs, Colorado

SITE: Colorado Springs, Colorado

LOCATION See Exploration Plan

Latitude: 39.0279° Longitude: -104.8294°

Station: STA 25+80

Approximate Surface Elev.: 6713 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DESCRIPTION	INSTALLATION DETAILS	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		0.4	6712.6+/-	**ASPHALT**, approximately 5 Inches										
2		0.9	6712.1+/-	**FILL - AGGREGATE BASE COURSE**, approximately 6 Inches										
4									5-7		5.7	112	NP	1
									6-8		3.2	113	NP	6
		6.0	6707+/-	**WELL GRADED SAND WITH SILT (SW-SM)**, A-1-a (0), fine to coarse grained, light brown to reddish brown, moist, loose		5								
5				**FAT CLAY WITH SAND (CH)**, with clayey sand lenses, fine to coarse grained, reddish brown with gray streaks, moist, stiff to hard					4-11		15.6	110		
									17-48					
		11.0	6702+/-			10								
				Approximate elevation of bottom of Storm Sewer: 6702										
		13.0	6700+/-				▽							
6				**CLAYSTONE**, A-6 (8), gray with oxidation streaks, moist to wet, firm to hard					16-25		16.0		34-19-15	67
						15								
		20.0	6693+/-						50/5"					
				Boring Terminated at 20 Feet		20								

Stratification lines are approximate. In-situ, the transition may be gradual.

Elevation of bottom of Storm Sewer: 6702ft

Hammer Type: Automatic

Advancement Method:
6 Inch OD Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite
Surface Capped with Asphalt

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 14 feet while drilling*

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Started: 12-14-2022 | Boring Completed: 12-14-2022

Drill Rig: CME-55 | Driller: Site Services

Project No.: 23195091

BORING LOG NO. B-4

PROJECT: North Gate / Struthers PWQ Pond & Storm Sewer

CLIENT: Wilson & Company Inc Engineers & Architects Colorado Springs, Colorado

SITE: Colorado Springs, Colorado

LOCATION See Exploration Plan

Latitude: 39.0269° Longitude: -104.8310°

Station: STA 19+25

Approximate Surface Elev.: 6690 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	INSTALLATION DETAILS	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4			**SILTY SAND (SM)**, fine to coarse grained, brown to light brown to reddish brown, moist to wet, medium dense to very dense					10-15		3.8	114		
								10-11		4.1	116		
					5								
						▽		13-38		11.5	118		
								50/5"					
		10.5	6679.5+/-		10								
		12.0	Approximate elevation of bottom of Storm Sewer: 6679.5 6678+/-										
6			**CLAYSTONE**, A-6 (4), gray, moist to wet, hard					50-50/4"		1.6			
					15								
		20.0	6670+/-					15-50/5"				34-21-13	51
			Boring Terminated at 20 Feet		20								

Stratification lines are approximate. In-situ, the transition may be gradual.

Elevation of bottom of Storm Sewer: 6679ft

Hammer Type: Automatic

Advancement Method:
6 Inch OD Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 8 feet while drilling*

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Started: 12-15-2022 | Boring Completed: 12-15-2022

Drill Rig: CME-55 | Driller: Site Services

Project No.: 23195091

BORING LOG NO. B-5

PROJECT: North Gate / Struthers PWQ Pond & Storm Sewer

CLIENT: Wilson & Company Inc Engineers & Architects Colorado Springs, Colorado

SITE: Colorado Springs, Colorado

LOCATION See Exploration Plan
Latitude: 39.0264° Longitude: -104.8331°
Station: STA 13+15
Approximate Surface Elev.: 6681 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	INSTALLATION DETAILS	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4													
								12-21		6.6	118	NP	8
								16-23		8.5			
					5	▽							
								7-12					
								8-11					
					10								
		11.5	6669.5+/-										
		Approximate elevation of bottom of Storm Sewer: 6669.5 with clayey sand horizons, light gray											
					15			5-6-4 N=10		13.5			
		20.5	6660.5+/-		20			38-50/5"		12.8			
		Boring Terminated at 20.5 Feet											

WELL GRADED SAND WITH SILT (SW-SM), A-1-b (0), fine to coarse grained, nonplastic, light brown, moist to wet, loose to very dense

Stratification lines are approximate. In-situ, the transition may be gradual.
Elevation of bottom of Storm Sewer: 6669ft

Hammer Type: Automatic

Advancement Method:
6 Inch OD Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 6 feet while drilling*

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Started: 12-14-2022 | Boring Completed: 12-14-2022
Drill Rig: CME-55 | Driller: Site Services
Project No.: 23195091

BORING LOG NO. S-1

PROJECT: North Gate / Struthers PWQ Pond & Storm Sewer

CLIENT: Wilson & Company Inc Engineers & Architects Colorado Springs, Colorado

SITE: Colorado Springs, Colorado

LOCATION See Exploration Plan

Latitude: 39.0256° Longitude: -104.8343°

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	INSTALLATION DETAILS	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
3		0.0						7-8		4.9	107		
								5-6		5.2	108		
					5								
								7-13		6.2	106		
								7-9		10.3	111	NP	5
4					10								
								7-9		7.8	119		
					15	▽							
								6-8-14 N=22		17.5			
					20								
6								20-30-50/4" N=80/10"		11.8			
					25								

FILL - CLAYEY SAND (SC), fine to medium grained, dark brown, loose

6.0

POORLY GRADED SAND WITH SILT (SP-SM), fine to medium grained, light brown and orangish brown, loose to medium dense

18.0

WEATHERED CLAYSTONE, gray to dark gray, firm

22.0

CLAYSTONE, gray to dark gray, very hard

25.5

Boring Terminated at 25.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4-inch solid-stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 16 feet while drilling*

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Started: 10-01-2019 | Boring Completed: 10-01-2019

Drill Rig: CME-55 | Driller: Vine Laboratories

Project No.: 23195091

BORING LOG NO. P-1

PROJECT: North Gate / Struthers PWQ Pond & Storm Sewer

CLIENT: Wilson & Company Inc Engineers & Architects Colorado Springs, Colorado

SITE: Colorado Springs, Colorado

LOCATION See Exploration Plan

Latitude: 39.0255° Longitude: -104.8338°

MODEL LAYER	DEPTH	ELEVATION (Ft.)		INSTALLATION DETAILS	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
3	0.0		**FILL - POORLY GRADED SAND WITH SILT (SP-SM)**, fine to medium grained, dark brown, medium dense					13-16		7.4	121	NP	9
								10-13		8.4	111		
					5	▽							
								6-10		19.6	107		
								8-11					
4					10								
					15			5-3-7 N=10		12.3			
					20			9-10-20 N=30		12.0			
					25			13-11-12 N=23		11.6			
6	22.0		**WEATHERED CLAYSTONE**, light gray, firm										
	27.0		**CLAYSTONE**, gray, very hard					N=50/5"		24.0			
	30.0		***Boring Terminated at 29.5 Feet***										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4-inch solid-stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 6 feet while drilling*

▽ *Water observed at 6 feet on 10/4/19*

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Started: 10-01-2019 | Boring Completed: 10-01-2019

Drill Rig: CME-55 | Driller: Vine Laboratories

Project No.: 23195091

BORING LOG NO. P-2

PROJECT: North Gate / Struthers PWQ Pond & Storm Sewer

CLIENT: Wilson & Company Inc Engineers & Architects Colorado Springs, Colorado

SITE: Colorado Springs, Colorado

LOCATION See Exploration Plan

Latitude: 39.0252° Longitude: -104.8336°

MODEL LAYER	DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4	0		**FILL - CLAYEY SAND (SC)**, fine to medium grained, dark brown and gray, loose to medium dense, with silty sand lenses							
						18-19	3.2	114		
				5		16-20	8.0	104		
						3-4	9.2	116	32-25-7	35
	9.0				▽					
			POORLY GRADED SAND WITH SILT (SP-SM), fine to medium grained, light brown and gray, medium dense, with lenses of clay	10		7-13	32.6	79		
						20-31	13.3	117		
				15	▽					
6						16-24-50 N=74	15.9			
				20						
						30-50/5" N=50/5"	16.1			
	25.0			25						
			Boring Terminated at 25 Feet							

INSTALLATION DETAILS

WATER LEVEL OBSERVATIONS

SWELL (%)

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4-inch solid-stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 16 feet while drilling*

▽ *Water observed at 9 feet on 10/4/19*

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Started: 10-01-2019 | Boring Completed: 10-01-2019

Drill Rig: CME-55 | Driller: Vine Laboratories

Project No.: 23195091

BORING LOG NO. P-3

PROJECT: North Gate / Struthers PWQ Pond & Storm Sewer

CLIENT: Wilson & Company Inc Engineers & Architects Colorado Springs, Colorado

SITE: Colorado Springs, Colorado

LOCATION See Exploration Plan

Latitude: 39.0250° Longitude: -104.8334°

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	INSTALLATION DETAILS	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4		0.0											
								16-17		2.6	116		
								12-13		10.7	117		
					5								
								4-6		8.0	115		
								2-4		12.2	105		
					10	▽							
						▽							
								12-50/5" N=50/5"		15.4	119		
6					15								
								24-17-12 N=29		17.5			
					20								
								14-26-50/3" N=76/9"		15.6			
		12.0			25								
		25.5											

FILL - CLAYEY SAND, fine to medium grained, dark brown to varying shades of gray, very loose to medium dense

CLAYSTONE, gray, weathered to very hard

Boring Terminated at 25.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4-inch solid-stem auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 13 feet while drilling*

▽ *Water observed at 10 feet on 10/4/19*

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Started: 10-01-2019 | Boring Completed: 10-01-2019

Drill Rig: CME-55 | Driller: Vine Laboratories

Project No.: 23195091

BORING LOG NO. PZ-1

PROJECT: North Gate / Struthers PWQ Pond & Storm Sewer

CLIENT: Wilson & Company Inc Engineers & Architects Colorado Springs, Colorado

SITE: Colorado Springs, Colorado

LOCATION See Exploration Plan

Latitude: 39.0257° Longitude: -104.8341°

Approximate Surface Elev.: 6676 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	INSTALLATION DETAILS	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
3			**FILL - WELL GRADED SAND WITH SILT (SW-SM)**, fine to coarse grained, light to dark brown to brown, moist, loose to medium dense					11-14		5.2	115		
								5-6		5.3		NP	9
		6.0	6670+/-		5								
4			**SILTY SAND (SM)**, fine to coarse grained, nonplastic, light brown to brown, moist to wet, loose to very dense			▽		7-11					
								6-10					
					10								
								4-4-4 N=8					
					15								
								9-30-30 N=60					
					20								
6								28-50/4"				NP	67
					25								
		30.0	6646+/-					50/1"					
			Boring Terminated at 30 Feet		30								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6 Inch OD Hollow Stem Auger

Abandonment Method:
A temporary piezometer was constructed in the boring.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 8 feet while drilling*

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Started: 12-15-2022 | Boring Completed: 12-15-2022

Drill Rig: CME-55 | Driller: Site Services

Project No.: 23195091

BORING LOG NO. PZ-2

PROJECT: North Gate / Struthers PWQ Pond & Storm Sewer

CLIENT: Wilson & Company Inc Engineers & Architects Colorado Springs, Colorado

SITE: Colorado Springs, Colorado

LOCATION See Exploration Plan

Latitude: 39.0256° Longitude: -104.8333°

Approximate Surface Elev.: 6677 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DESCRIPTION	INSTALLATION DETAILS	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
3				**FILL - SILTY SAND (SM)**, fine to coarse grained, gray, moist to wet, loose to medium dense					10-11					
							▽		7-8-9 N=17					
		5.0	6672+/-			5			7-8-9 N=17					
4				**WELL GRADED SAND WITH SILT (SW-SM)**, fine to coarse grained, tan to brown, moist to wet, medium dense		10			5-5-6 N=11				NP	9
						15			3-4-6 N=10					
		20.0	6657+/-			20			11-16-22 N=38				NP	39
6				**SANDSTONE**, gray, moist to wet, hard		25			10-25-50/4"					
		30.5	6646.5+/-			30			19-38-35 N=73				NP	34
				Boring Terminated at 30.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6 Inch OD Hollow Stem Auger

Abandonment Method:
A temporary piezometer was constructed in the boring.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 4 feet while drilling*

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Started: 12-19-2022 | Boring Completed: 12-19-2022

Drill Rig: CME-75 | Driller: Terracon - Fort Collins

Project No.: 23195091

BORING LOG NO. PZ-3

PROJECT: North Gate / Struthers PWQ Pond & Storm Sewer

CLIENT: Wilson & Company Inc Engineers & Architects Colorado Springs, Colorado

SITE: Colorado Springs, Colorado

LOCATION See Exploration Plan

Latitude: 39.0246° Longitude: -104.8331°

Approximate Surface Elev.: 6667 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	INSTALLATION DETAILS	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
3			**FILL - SILTY SAND (SM)**, fine to coarse grained, brown, moist, medium dense					9-7-7 N=14		4.1			
								3-3-9 N=12		11.8		NP	14
		6.0	6661+/-		5								
4			**POORLY GRADED SAND WITH SILT (SP-SM)**, fine to coarse grained, light brown to brown, moist to wet, loose to medium dense			▽		2-1-4 N=5		27.2			
								2-4-6 N=10				NP	10
					10								
								4-6-4 N=10					
		17.0	6650+/-		15								
			WELL GRADED SAND WITH SILT (SW-SM), fine to coarse grained, light brown to brown, moist to wet, medium dense					8-12				NP	8
		22.0	6645+/-		20								
6			**SANDSTONE**, gray, moist to wet, hard to very hard					50/5"				NP	5
					25								
		30.0	6637+/-					50/3"					
			Boring Terminated at 30 Feet		30								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6 Inch OD Hollow Stem Auger

Abandonment Method:
A temporary piezometer was constructed in the boring.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 7 feet while drilling*

Terracon
4172 Center Park Dr
Colorado Springs, CO

Boring Started: 12-19-2022 | Boring Completed: 12-19-2022

Drill Rig: CME 75 | Driller: Terracon - Fort Collins

Project No.: 23195091

BORING LOG NO. PZ-4

PROJECT: North Gate / Struthers PWQ Pond & Storm Sewer

CLIENT: Wilson & Company Inc Engineers & Architects Colorado Springs, Colorado

SITE: Colorado Springs, Colorado

LOCATION See Exploration Plan

Latitude: 39.0245° Longitude: -104.8335°

Approximate Surface Elev.: 6667 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DESCRIPTION	INSTALLATION DETAILS	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
3				**FILL - SILTY SAND (SM)**, fine to coarse grained, brown to black to light gray, moist, loose to medium dense					10-12		5.4	116		
									15-21		5.2	122		
		8.0	6659+/-			5			2-9		18.0	97	NP	14
4				**POORLY GRADED SAND WITH SILT (SP-SM)**, fine to coarse grained, brown to black to light gray, moist to wet, loose to medium dense		10			7-9					
						15	▽		9-15		12.6			
						20			4-8				NP	6
6				**SANDSTONE**, gray, moist to wet, very hard		25			35-50/2"					
		30.0	6637+/-											
				Boring Terminated at 30 Feet		30								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6 Inch OD Hollow Stem Auger

Abandonment Method:
A temporary piezometer was constructed in the boring.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 16 feet while drilling*

Terracon
4172 Center Park Dr
Colorado Springs, CO

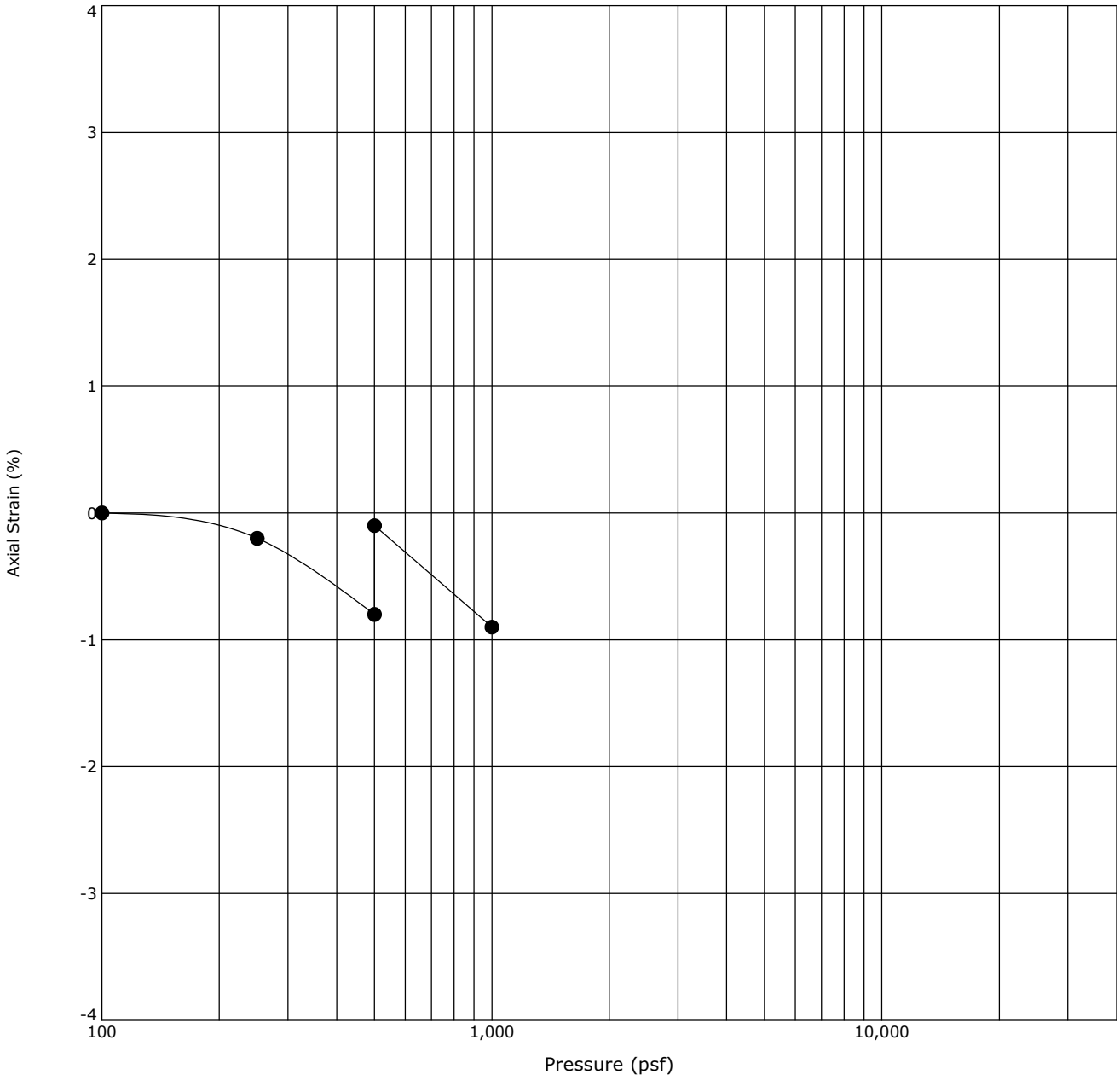
Boring Started: 12-15-2022 | Boring Completed: 12-15-2022

Drill Rig: CME-55 | Driller: Site Services

Project No.: 23195091

Terracon
4172 Center Park Dr
Colorado Springs, CO

Swell Consolidation Test

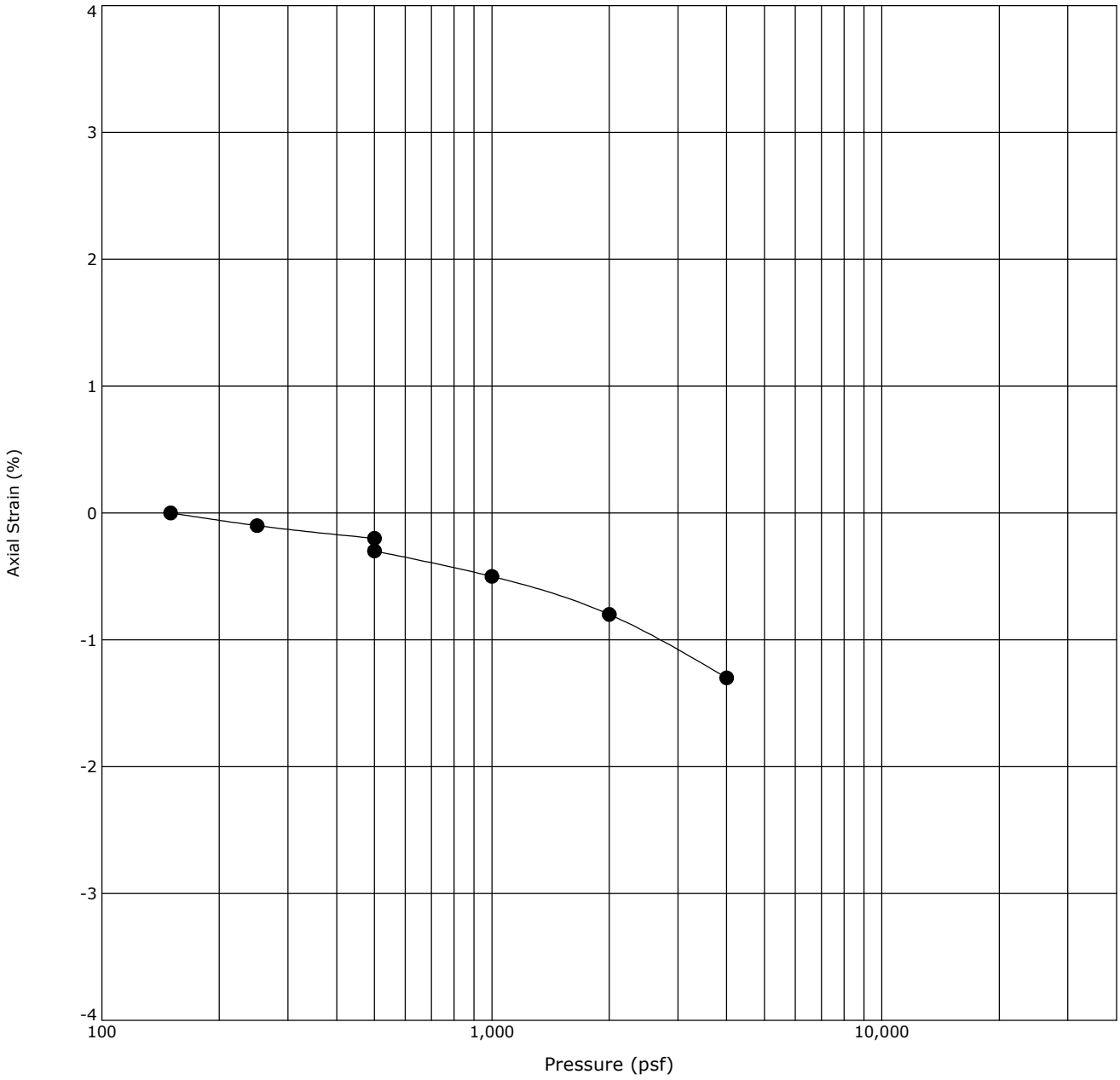


Boring ID		Depth (Ft)	Description	AASHTO	γ_d(pcf)	WC (%)
●	B-2	9 - 10	FAT CLAY with SAND	A-7-6 (22)	86	31.2

Notes: Water added at 500 psf

Terracon
4172 Center Park Dr
Colorado Springs, CO

Swell Consolidation Test

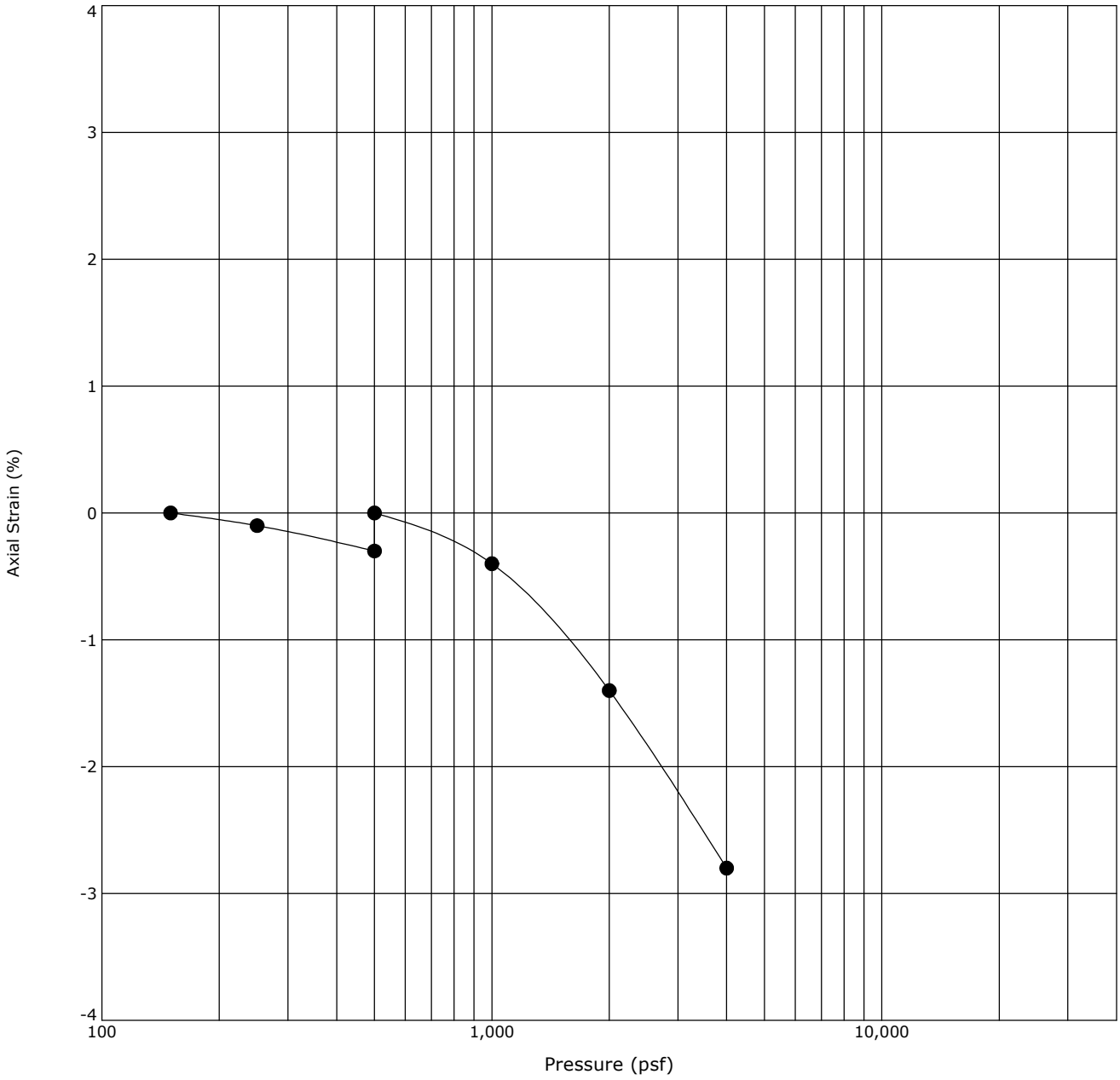


Boring ID		Depth (Ft)	Description	AASHTO	γ_d(pcf)	WC (%)
●	P-1	7 - 8			107	19.6

Notes: Sample inundated with water at 500 pounds per square foot (psf).

Terracon
4172 Center Park Dr
Colorado Springs, CO

Swell Consolidation Test

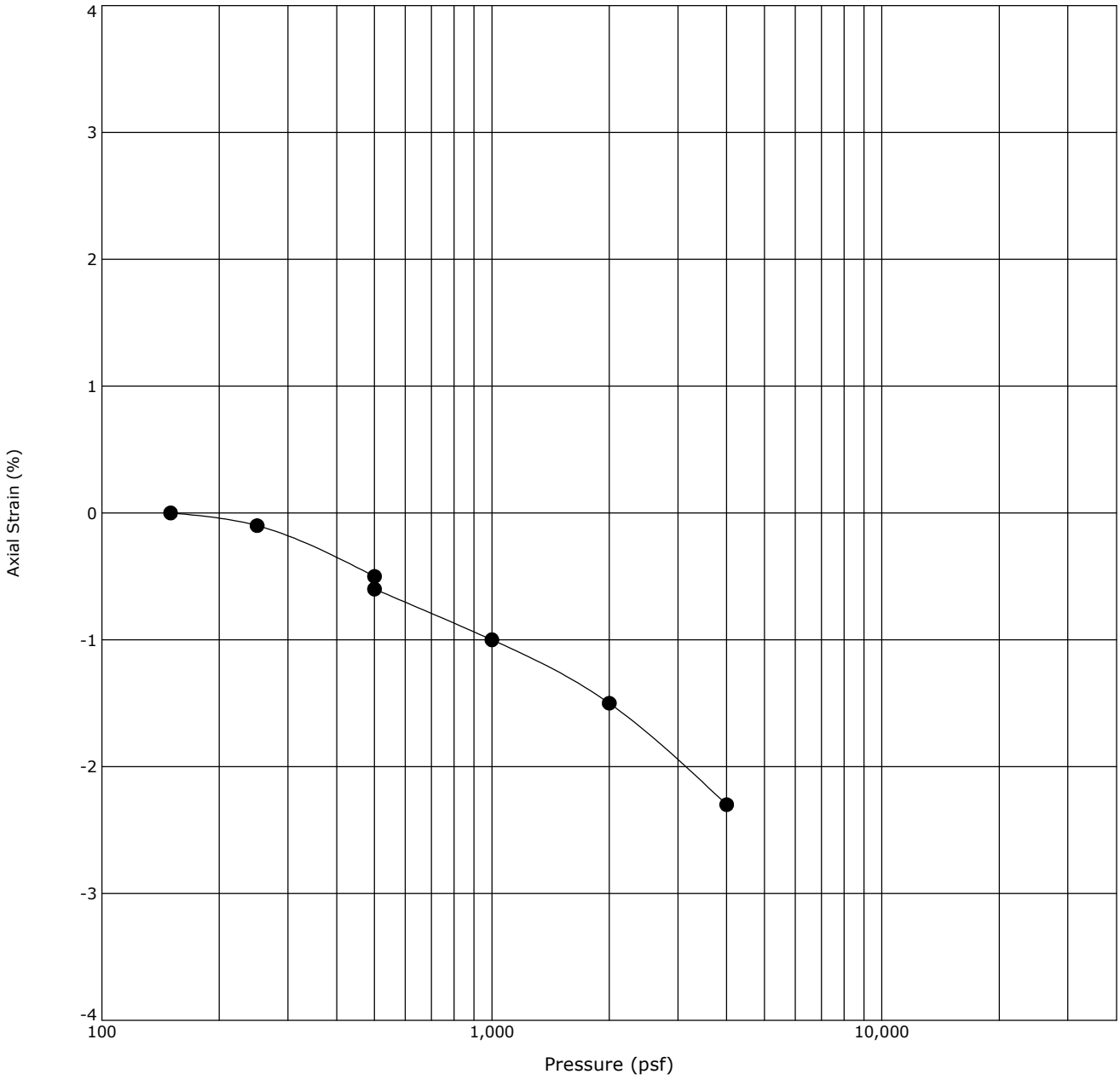


Boring ID	Depth (Ft)	Description	AASHTO	γ_d(pcf)	WC (%)
● P-2	7 - 8	SILTY SAND	A-2-4 (0)	79	32.6

Notes: Sample inundated with water at 500 pounds per square foot (psf).

Terracon
4172 Center Park Dr
Colorado Springs, CO

Swell Consolidation Test



Boring ID	Depth (Ft)	Description	AASHTO	γ_d(pcf)	WC (%)
● P-3	7 - 8			115	8.0

Notes: Sample inundated with water at 500 pounds per square foot (psf).

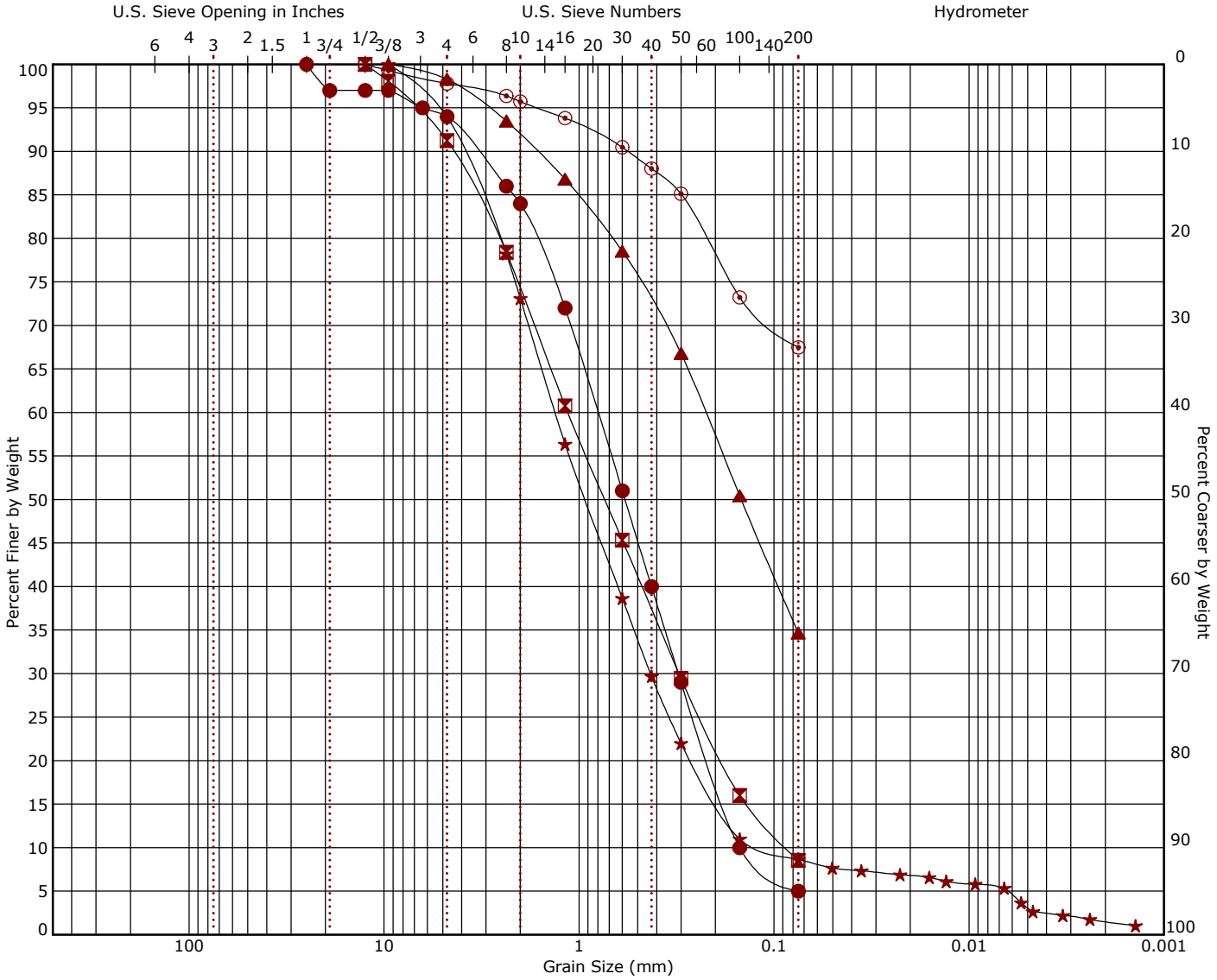
North Gate / Struthers PWQ Pond & Storm Sewer
Colorado Springs | Colorado

Terracon Project No. 23195091

Terracon
4172 Center Park Dr
Colorado Springs, CO

Grain Size Distribution

ASTM D422 / ASTM C136



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	Description	USCS	LL	PL	PI	Cc	Cu
●	S-1	9 - 10	POORLY GRADED SAND with SILT	SP-SM	NP	NP	NP	0.80	5.34
⊠	P-1	2 - 3	POORLY GRADED SAND with SILT	SP-SM	NP	NP	NP	0.96	13.28
▲	P-2	7 - 8	SILTY SAND	SM	32	25	7		
★	PZ-1	4 - 5	WELL-GRADED SAND with SILT	SW-SM	NP	NP	NP	1.25	11.82
⊙	PZ-1	24 - 25	SANDY SILT	ML	NP	NP	NP		

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
●	S-1	9 - 10	25	0.802	0.31	0.15	0.0	6.0	89.0	5.0		
⊠	P-1	2 - 3	12.5	1.141	0.307	0.086	0.0	8.8	82.7	8.5		
▲	P-2	7 - 8	9.5	0.225			0.0	1.7	63.6	34.7		
★	PZ-1	4 - 5	9.5	1.323	0.43	0.112	0.0	6.1	85.3		5.5	3.1
⊙	PZ-1	24 - 25	12.5				0.0	2.2	30.3	67.5		

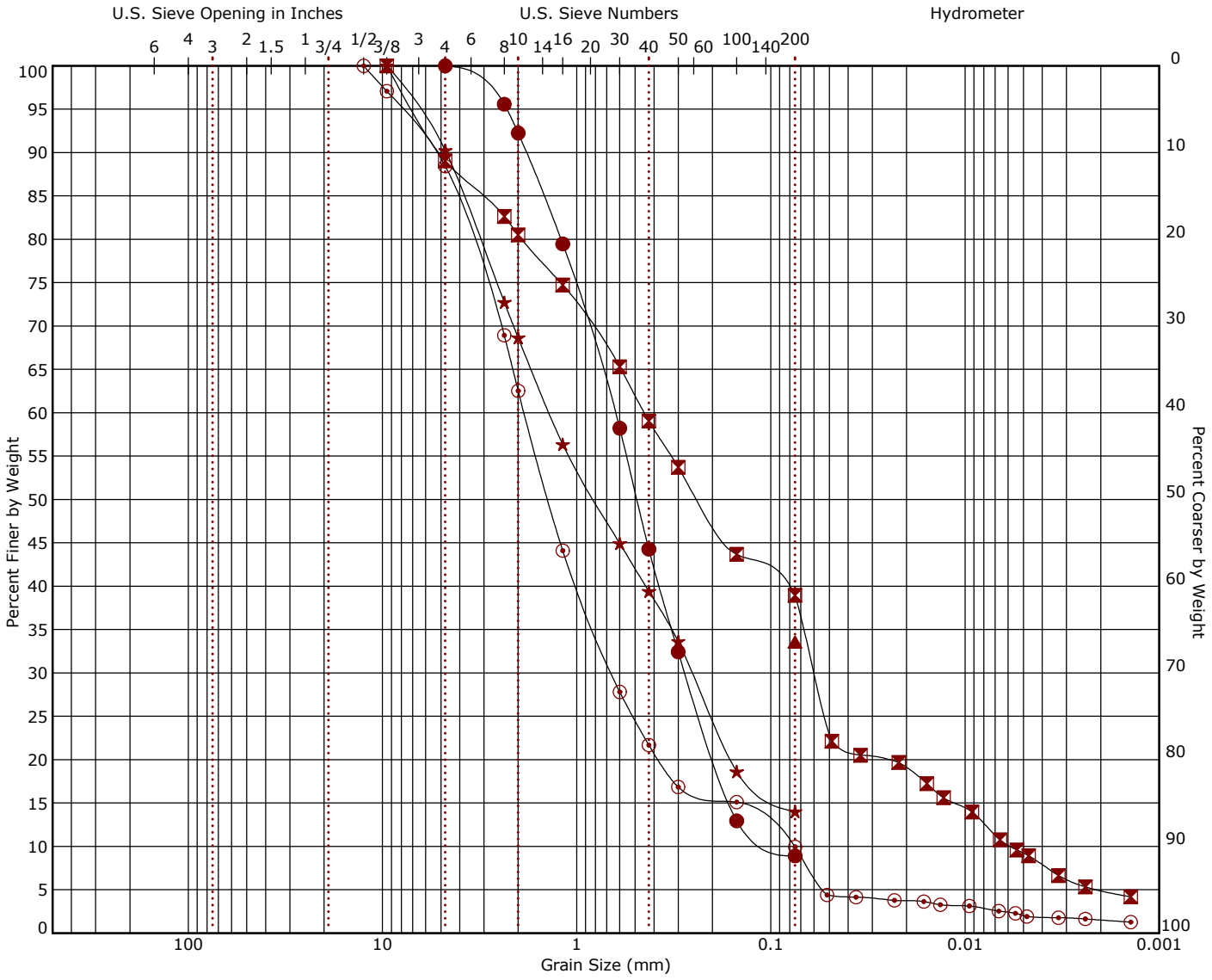
North Gate / Struthers PWQ Pond & Storm Sewer
Colorado Springs | Colorado

Terracon Project No. 23195091

Terracon
4172 Center Park Dr
Colorado Springs, CO

Grain Size Distribution

ASTM D422 / ASTM C136



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	Description	USCS	LL	PL	PI	Cc	Cu
●	PZ-2	9 - 10.5	WELL-GRADED SAND with SILT	SW-SM	NP	NP	NP	1.32	7.02
⊠	PZ-2	19 - 20.5	SILTY SAND	SM	NP	NP	NP	1.36	77.31
▲	PZ-2	29 - 30.5	SILTY SAND	SM	NP	NP	NP		
★	PZ-3	4 - 5.5	SILTY SAND	SM	NP	NP	NP		
⊙	PZ-3	9 - 10.5	POORLY GRADED SAND with SILT	SP-SM	NP	NP	NP	3.07	24.62

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
●	PZ-2	9 - 10.5	4.75	0.635	0.275	0.09	0.0	0.0	91.1	8.9		
⊠	PZ-2	19 - 20.5	9.5	0.448	0.059	0.006	0.0	11.0	50.1		29.7	9.2
▲	PZ-2	29 - 30.5	0.075							33.6		
★	PZ-3	4 - 5.5	9.5	1.38	0.254		0.0	9.7	76.2	14.0		
⊙	PZ-3	9 - 10.5	12.5	1.86	0.657	0.076	0.0	11.6	78.5		7.9	2.0

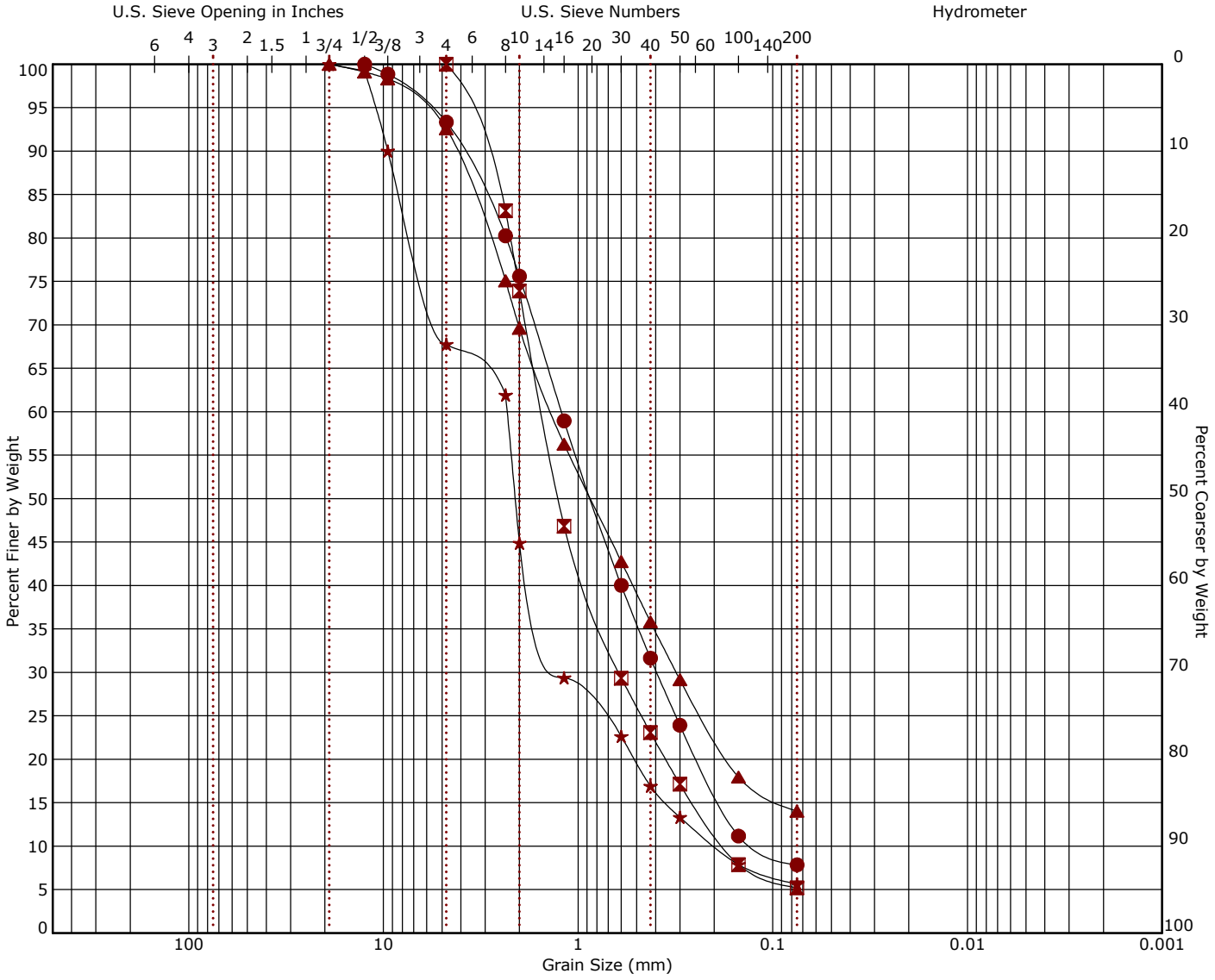
North Gate / Struthers PWQ Pond & Storm Sewer
Colorado Springs | Colorado

Terracon Project No. 23195091

Terracon
4172 Center Park Dr
Colorado Springs, CO

Grain Size Distribution

ASTM D422 / ASTM C136



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	Description	USCS	LL	PL	PI	Cc	Cu
●	PZ-3	19 - 20	WELL-GRADED SAND with SILT	SW-SM	NP	NP	NP	1.09	10.37
⊠	PZ-3	24 - 25	WELL-GRADED SAND with SILT	SW-SM	NP	NP	NP	1.41	8.67
▲	PZ-4	7 - 8	SILTY SAND	SM	NP	NP	NP		
★	PZ-4	19 - 20	POORLY GRADED SAND with SILT and GRAVEL	SP-SM	NP	NP	NP	3.19	11.80

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
●	PZ-3	19 - 20	12.5	1.22	0.395	0.118	0.0	6.7	85.5	7.8		
⊠	PZ-3	24 - 25	4.75	1.525	0.616	0.176	0.0	0.0	94.8	5.2		
▲	PZ-4	7 - 8	19	1.367	0.313		0.0	7.4	78.5	14.0		
★	PZ-4	19 - 20	19	2.316	1.205	0.196	0.0	32.2	62.1	5.6		

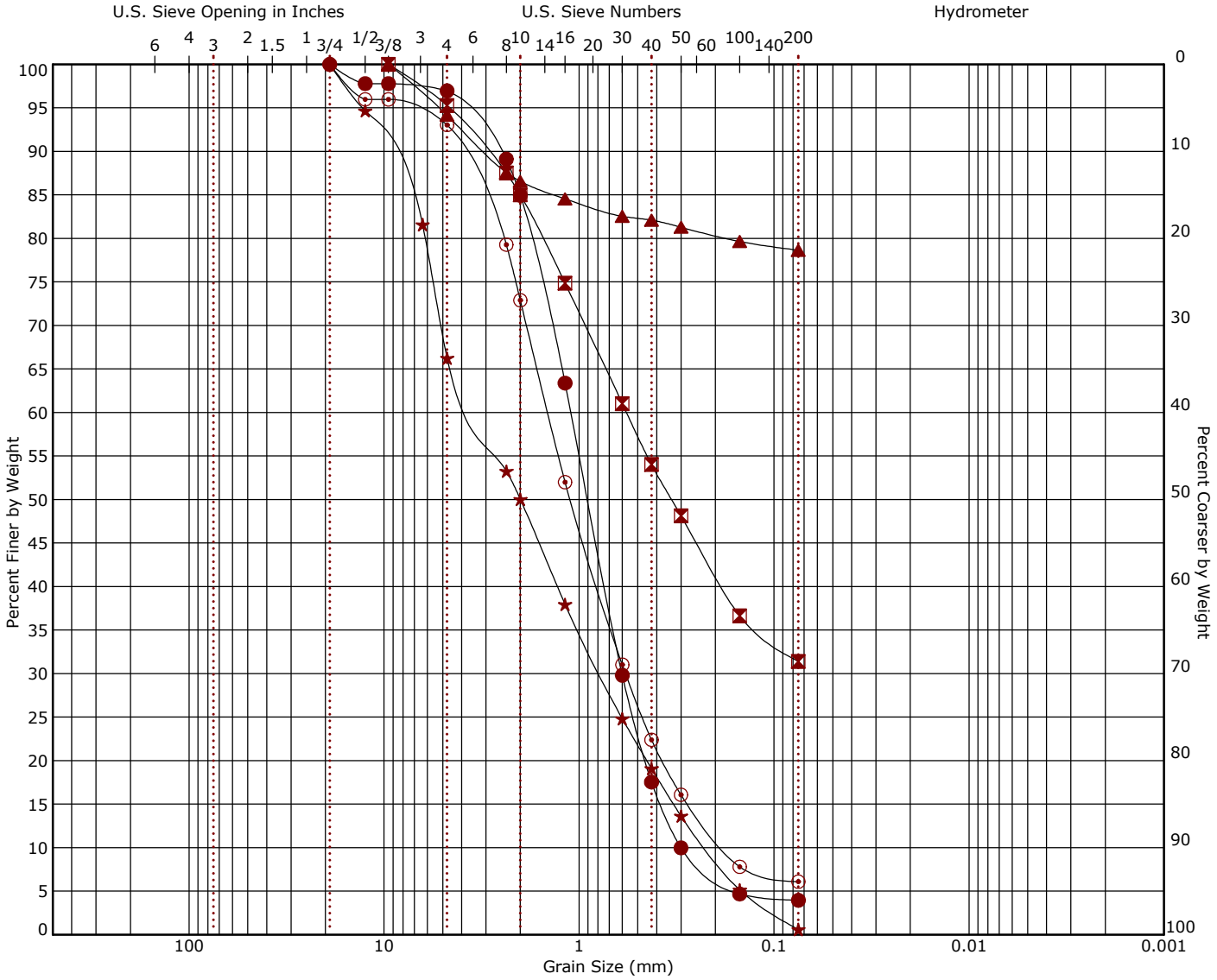
North Gate / Struthers PWQ Pond & Storm Sewer
Colorado Springs | Colorado

Terracon Project No. 23195091

Terracon
4172 Center Park Dr
Colorado Springs, CO

Grain Size Distribution

ASTM D422 / ASTM C136



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	Description	AASHTO	LL	PL	PI	Cc	Cu
●	B-1	4 - 5	A-1-b (0)	A-1-b (0)	NP	NP	NP	1.10	3.67
⊠	B-2	0 - 5	A-2-4 (0)	A-2-4 (0)	NP	NP	NP		
▲	B-2	9 - 10	A-7-6 (22)	A-7-6 (22)	53	27	26		
★	B-3	0 - 5	A-1-a (0)	A-1-a (0)	NP	NP	NP	0.81	15.23
⊙	B-3	4 - 5	A-1-b (0)	A-1-b (0)	NP	NP	NP	1.27	8.01

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
●	B-1	4 - 5	19	1.102	0.602	0.3	0.0	3.0	93.0	4.0		
⊠	B-2	0 - 5	9.5	0.57			0.0	4.7	63.9	31.4		
▲	B-2	9 - 10	9.5				0.0	5.8	15.5	78.6		
★	B-3	0 - 5	19	3.394	0.784	0.223	0.0	33.8	65.6	0.6		
⊙	B-3	4 - 5	19	1.444	0.576	0.18	0.0	7.0	86.9	6.1		

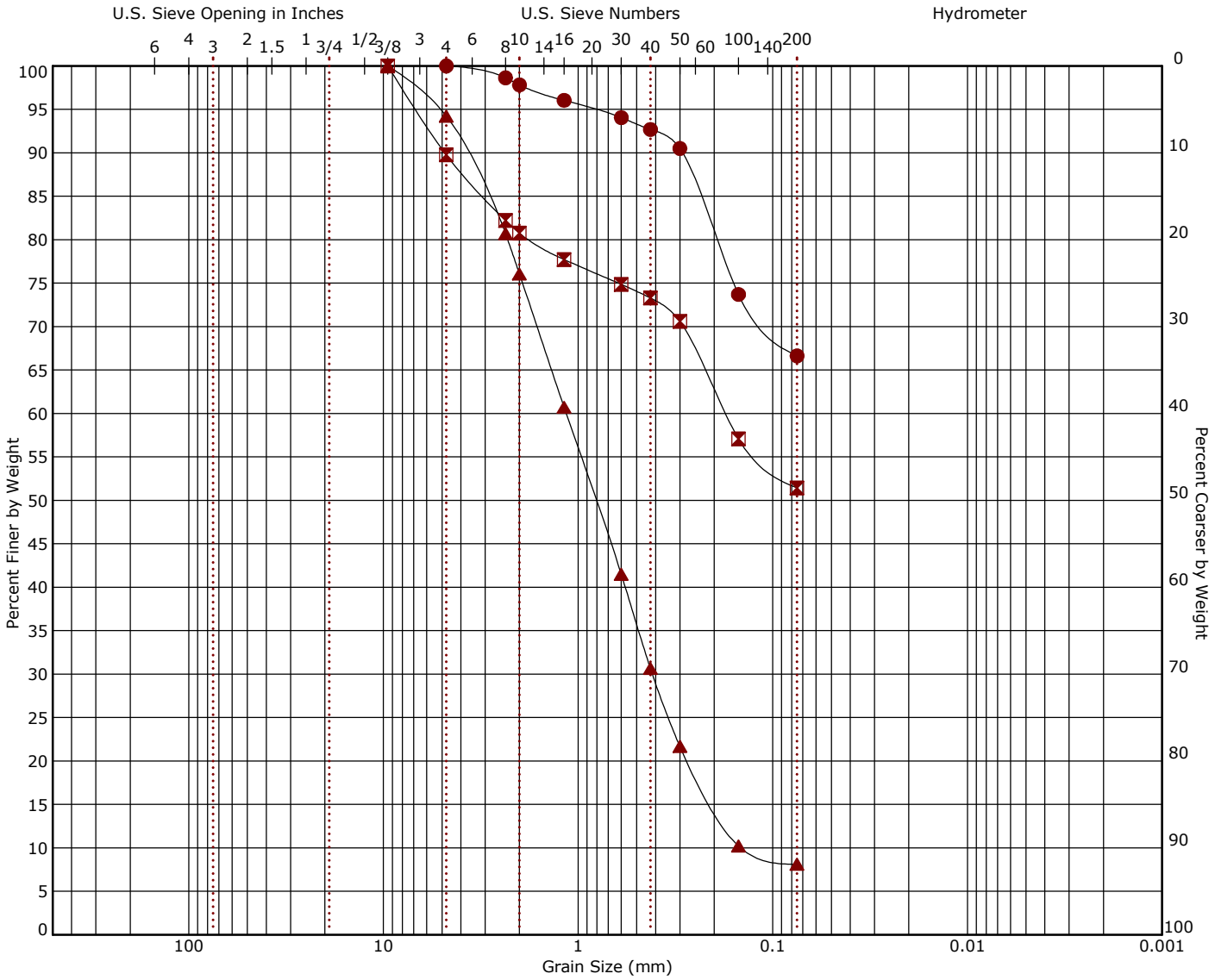
North Gate / Struthers PWQ Pond & Storm Sewer
Colorado Springs | Colorado

Terracon Project No. 23195091

Terracon
4172 Center Park Dr
Colorado Springs, CO

Grain Size Distribution

ASTM D422 / ASTM C136



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Boring ID	Depth (Ft)	Description	AASHTO	LL	PL	PI	Cc	Cu
● B-3	14 - 15	A-6 (8)	A-6 (8)	34	19	15		
⊠ B-4	19 - 20	A-6 (4)	A-6 (4)	34	21	13		
▲ B-5	2 - 3	A-1-b (0)	A-1-b (0)	NP	NP	NP	1.07	8.24

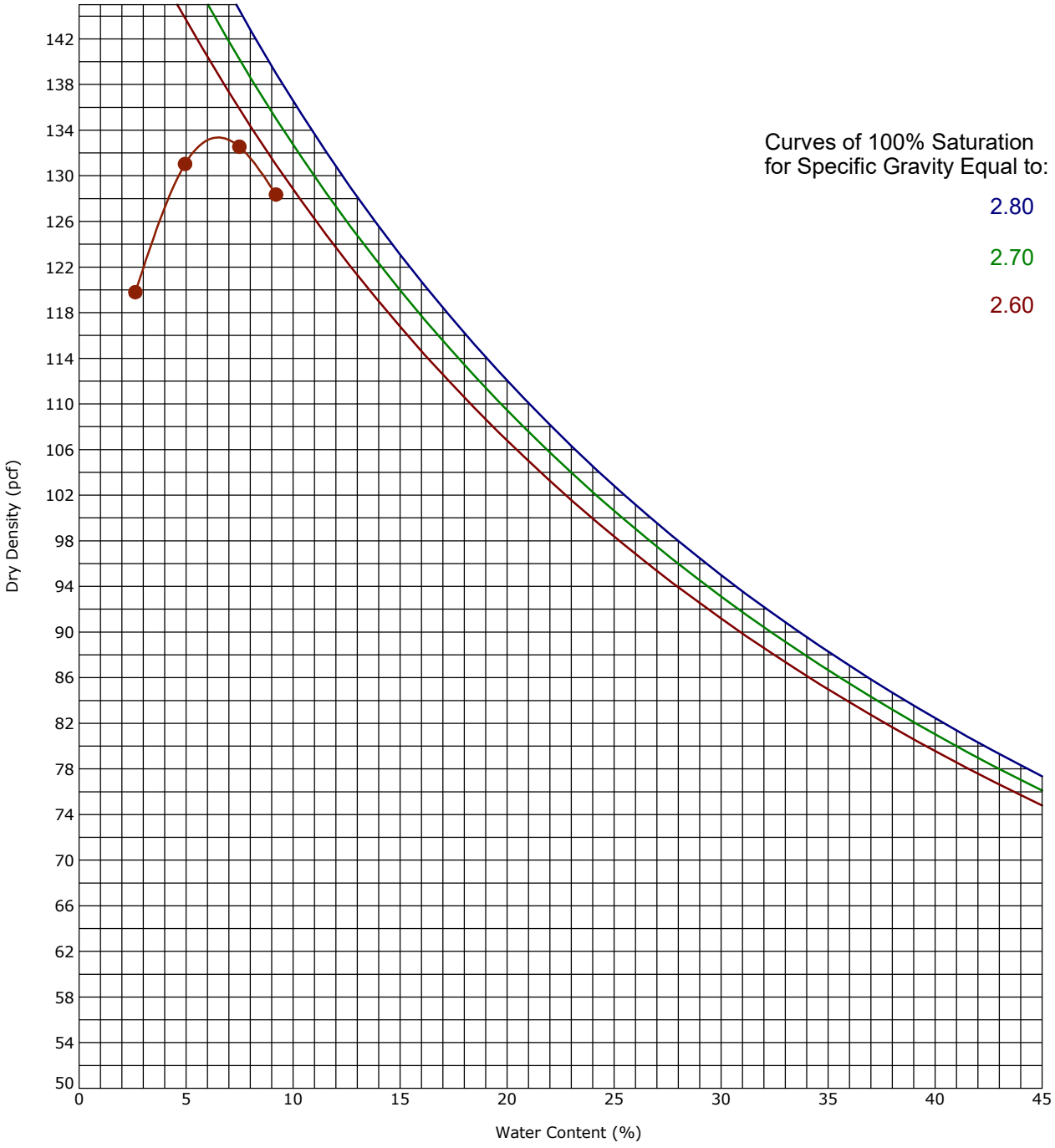
Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
● B-3	14 - 15	4.75				0.0	0.0	33.4	66.6		
⊠ B-4	19 - 20	9.5	0.174			0.0	10.2	38.3	51.4		
▲ B-5	2 - 3	9.5	1.151	0.414	0.14	0.0	5.8	86.1	8.1		

North Gate / Struthers PWQ Pond & Storm Sewer
Colorado Springs | Colorado
Terracon Project No. 23195091

Terracon
4172 Center Park Dr
Colorado Springs, CO

Moisture-Density Relationship

ASTM D698/D1557



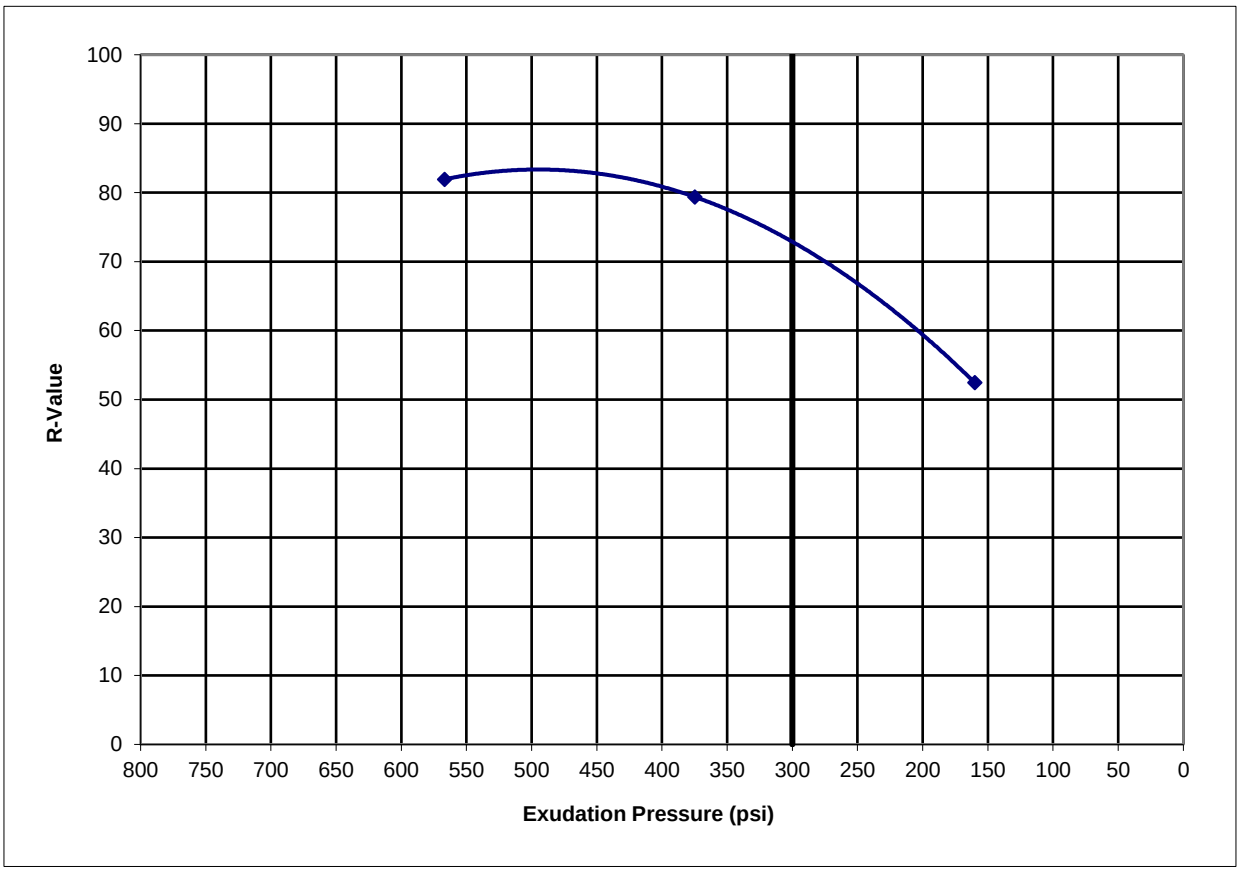
Boring ID	Depth (Ft)	Description of Materials
B-3	0 - 5	POORLY GRADED SAND with GRAVEL (SP)

Fines (%)	Fraction >19mm size (%)	LL	PL	PI	Test Method	Maximum Dry Density (pcf)	Optimum Water Content (%)
1	99	NP	NP	NP	AASHTO T180 Method A	133.4	6.6

PROJECT:	North Gate / Struthers PWQ Pond &Storm Sewer	**JOB NO:**	23195091
LOCATION:	Colorado Springs, CO	**WORK ORDER NO:**	
MATERIAL:	A-1-a (0)	**LAB NO:**	B-3@0-5'
SAMPLE SOURCE:	B-3@0-5'	**DATE RECEIVED:**	01/05/23

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN I. D.	**A**	**B**	**C**
Moisture Content	9.0%	8.1%	7.7%
Compaction Pressure (psi)	100	350	350
Specimen Height (inches)	2.46	2.47	2.52
Dry Density (pcf)	134.7	135.5	136.3
Horiz. Pres. @ 1000lbs (psi)	28.0	12.0	11.0
Horiz. Pres. @ 2000lbs (psi)	54.0	21.0	19.0
Displacement	4.45	4.30	4.09
Expansion Pressure (psi)	0.0	0.0	0.0
Exudation Pressure (psi)	160	375	567
R Value	52	79	82



R Value at 300 PSI = 72.9

CHEMICAL LABORATORY TEST REPORT

Project Number: 23195091
Service Date: 10/14/19
Report Date: 10/23/19
Task:

Terracon
750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Client

Wilson & Company Inc Engineers & Architects
Colorado Springs, Colorado

Project

North Gate / Struthers PWQ Pond & Storm Sewer

Sample Submitted By: Terracon (23) **Date Received:** 10/8/2019 **Lab No.: 19-1146**

Results of Corrosion Analysis

Sample Number	
Sample Location	S-1
Sample Depth (ft.)	1.0-5.0
pH Analysis, ASTM G 51	8.31
Water Soluble Sulfate (SO4), ASTM C 1580 (mg/kg)	132
Chlorides, ASTM D 512, (mg/kg)	42
Resistivity, ASTM G 57, (ohm-cm)	2134

Analyzed By: Trisha Campo

Trisha Campo
Chemist

750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Client

Wilson & Company Inc Engineer & Architects

Project

North Gate / Struthers PWQ Pond & Storm Sewer

Sample Submitted By: Terracon (23) **Date Received:** 1/9/2023 **Lab No.: 23-0035**

Results of Corrosion Analysis

Sample Number	--	--
Sample Location	B-2	B-3
Sample Depth (ft.)	0.0-5.0	0.0-5.0
pH Analysis, ASTM D4972	7.38	7.46
Water Soluble Sulfate (SO4), ASTM D516 (mg/kg)	162	151
Chlorides, ASTM D512, (mg/kg)	130	200
Saturated Minimum Resistivity, ASTM G 57, (ohm-cm)	2328	1164

Analyzed By

Nathan Campo
Engineering Technician II

SUMMARY OF LABORATORY TEST RESULTS

North Gate / Struthers PWQ Pond & Storm Sewer, Colorado Springs, Colorado

Terracon Project No. 23195091

Boring No.	Depth (ft)	USCS Class.	AASHTO Class. (Group Index)	Initial Water Content (%)	Initial Dry Density (pcf)	Swell/Consolidation		R-Value	Moisture-Density Relationship			Particle Size Distribution, Percent Passing by Weight					Atterberg Limits		Water Soluble Sulfates (mg/kg)	Sulfides (ppm)	Chlorides (mg/kg)	pH	Total Salts (mg/kg)	Red-Ox (mV)	Resistivity (ohm-cm)	Remarks
						Surcharge (ksf)	Swell (%)		Maximum Dry Density (pcf)	Optimum Water Content (%)	Test Method	3/4"	#4	#10	#40	#200	LL	PI								
B-1	2			4																						4
B-1	4	SP	A-1-b (0)	5	116							100	97	85	18	4	NV	NP								3,4
B-1	7			6	109																					4
B-1	9			5	108																					4
B-1	19			7	11																					4
B-2	0 - 5	SM	A-2-4 (0)									100	95	85	54	31	NV	NP	162		130	7.38			+2328	3
B-2	2			8	108																					4
B-2	4			6	109																					4
B-2	9	CH	A-7-6 (22)	31	86	0.5	0.7					100	94	87	82	79	53	26								3,4
B-2	14			10																						4
B-3	0 - 5	SP	A-1-a (0)					72.9	133.4	6.6	T180A	100	66	50	19	1	NV	NP	151		200	7.46			+1164	3,7
B-3	2			6	112																					4
B-3	4	SW-SM	A-1-b (0)	3	113							100	93	73	22	6	NV	NP								3,4
B-3	7-8			16	110																					4
B-3	14	CL	A-6 (8)	16								100	100	98	93	67	34	15								3,4
B-4	2			4	114																					4
B-4	4			4	116																					4
B-4	7			12	119																					4
B-4	14			2																						4
B-4	19	CL	A-6 (4)									100	90	81	73	51	34	13								3
B-5	2	SW-SM	A-1-b (0)	7	118							100	94	76	31	8	NV	NP								3,4
B-5	4			9																						4
B-5	14			14																						4
B-5	19			13																						4
S-1	2			5	107																					4
S-1	4			5	108																					4
S-1	7			6	106																					4
S-1	9	SP-SM		10	111							97	94	84	40	5	0	0								3,4
S-1	14			8	119																					4
S-1	19			18																						4
S-1	24			12																						4
P-1	2	SP-SM		7	121							100	91	75	38	9	NV	NP								3,4
P-1	4			8	111																					4
P-1	7			20	107	0.5	-0.1																			3,4
P-1	9			12																						4
P-1	14			12																						4
P-1	24			12																						4
P-1	29			24																						4
P-2	2			3	114																					4
P-2	4			8	104																					4

Notes:

Initial Dry Density and Initial Water Content are in-situ values unless otherwise noted.

* = Partially disturbed sample

\- = Compression/settlement

NV = no value

NP = non-plastic

Remarks:

1 Remolded Compacted density (about 95% of ASTM D698 maximum density near optimum moisture content)

2 Remolded Compacted density (about 95% of ASTM D1557 maximum density near optimum moisture content)

3 Water added to sample

4 Dry density and/or moisture content determined from one ring of a multi-ring sample

5 Minus #200 Only

6 Moisture-Density Relationship Test Method ASTM D698/AASHTO T99

7 Moisture-Density Relationship Test Method ASTM D1557/AASHTO T180

SUMMARY OF LABORATORY TEST RESULTS

North Gate / Struthers PWQ Pond & Storm Sewer, Colorado Springs, Colorado

Terracon Project No. 23195091

Boring No.	Depth (ft)	USCS Class.	AASHTO Class. (Group Index)	Initial Water Content (%)	Initial Dry Density (pcf)	Swell/Consolidation		R-Value	Moisture-Density Relationship			Particle Size Distribution, Percent Passing by Weight					Atterberg Limits		Water Soluble Sulfates (mg/kg)	Sulfides (ppm)	Chlorides (mg/kg)	pH	Total Salts (mg/kg)	Red-Ox (mV)	Resistivity (ohm-cm)	Remarks
						Surcharge (ksf)	Swell (%)		Maximum Dry Density (pcf)	Optimum Water Content (%)	Test Method	3/4"	#4	#10	#40	#200	LL	PI								
P-2	7	SM		9	116	0.5	0.3					100	98	92	73	35	32	7								3,4
P-2	9			33	79																					4
P-2	14			13	117																					4
P-2	19			16																						4
P-2	24			16																						4
P-3	2			3	116																					4
P-3	4			11	117																					4
P-3	7			8	115	0.5	-0.1																			3,4
P-3	9			12	105																					4
P-3	14			15	119																					4
P-3	19			18																						4
P-3	24			16																						4
PZ-1	2			5	115																					4
PZ-1	4	SW-SM		5								100	94	73	30	9	NV	NP								3,4
PZ-1	24	ML										100	98	96	88	67	NV	NP								3
PZ-2	9	SW-SM										100	100	92	44	9	NV	NP								3
PZ-2	19	SM										100	89	81	59	39	NV	NP								3
PZ-2	29	SM														34	NV	NP								3,5
PZ-2	2			4																						4
PZ-3	4	SM		12								100	90	69	39	14	NV	NP								3,4
PZ-3	9	SP-SM		27								100	88	63	22	10	NV	NP								3,4
PZ-3	19	SW-SM										100	93	76	32	8	NV	NP								3
PZ-3	24	SW-SM										100	100	74	23	5	NV	NP								3
PZ-4	2			5	116																					4
PZ-4	4			5	122																					4
PZ-4	7	SM		18	97							100	93	70	36	14	NV	NP								3,4
PZ-4	14			13																						4
PZ-4	19	SP-SM										100	68	45	17	6	NV	NP								3

Notes:

Initial Dry Density and Initial Water Content are in-situ values unless otherwise noted.

* = Partially disturbed sample

- = Compression/settlement

NV = no value

NP = non-plastic

Remarks:

1 Remolded Compacted density (about 95% of ASTM D698 maximum density near optimum moisture content)

2 Remolded Compacted density (about 95% of ASTM D1557 maximum density near optimum moisture content)

3 Water added to sample

4 Dry density and/or moisture content determined from one ring of a multi-ring sample

5 Minus #200 Only

6 Moisture-Density Relationship Test Method ASTM D698/AASHTO T99

7 Moisture-Density Relationship Test Method ASTM D1557/AASHTO T180

PAVEMENT DESIGN CALCULATIONS

Contents:

Pavement Thickness Design - Struthers Road
Pavement Thickness Design - North Gate Boulevard

Note: All attachments are one page unless noted above.

Pavement Thickness Design
Struthers Road

DESIGN DATA

Traffic Load - ESAL	=	5,256,000
Design Life - Years	=	20
Resilient Modulus - M_R (psi)	=	13,168
Reliability - R (%)	=	90
Initial Serviceability	=	4.5
Terminal Serviceability	=	2.0
Serviceability Loss - PSI	=	2.5
Overall Deviation - S_o	=	0.44

DESIGN CALCULATION RESULTS

Based on the following equation:

$$\log_{10}(18k\ ESAL) = Z_R x S_o + 9.36 x \log_{10}(SN+1) - 0.20$$
$$+\log_{10}(PSI/(4.2-1.5))/(0.4+(1094/(SN+1)^{5.19}))+2.32 x \log_{10}(M_R) - 8.07$$

Structural Number - SN	=	3.4

PAVEMENT THICKNESS DESIGN EQUATION

$$SN = C_1 D_1 m_1 + C_2 D_2 m_2$$

where

C_1 = Strength Coefficient - Asphalt	=	0.44
C_2 = Strength Coefficient - Aggregate Base Course	=	0.11
m_1 = Drainage Coefficient	=	1.0
m_2 = Drainage Coefficient	=	1.0

D_1 = Depth of Asphalt (inches)

D_2 = Depth of Stabilized Base (inches)

PAVEMENT THICKNESS RESULTS

Full Depth Asphalt

D_1	=	8.0 inches

Asphalt + Aggregate Base Course

D_1 (Asphalt)	=	6.0 inches
D_2 (Aggregate Base Course)	=	7.0 inches

Pavement Thickness Design
North Gate Boulevard

DESIGN DATA

Traffic Load - ESAL	=	7,884,000
Design Life - Years	=	20
Resilient Modulus - M_R (psi)	=	13,168
Reliability - R (%)	=	90
Initial Serviceability	=	4.5
Terminal Serviceability	=	2.0
Serviceability Loss - PSI	=	2.5
Overall Deviation - S_o	=	0.44

DESIGN CALCULATION RESULTS

Based on the following equation:

$$\log_{10}(18k\ ESAL) = Z_R x S_o + 9.36 x \log_{10}(SN+1) - 0.20$$
$$+\log_{10}(PSI/(4.2-1.5))/(0.4+(1094/(SN+1)^{5.19}))+2.32 x \log_{10}(M_R) - 8.07$$

Structural Number - SN	=	3.6

PAVEMENT THICKNESS DESIGN EQUATION

$$SN = C_1 D_1 m_1 + C_2 D_2 m_2$$

where

C_1 = Strength Coefficient - Asphalt	=	0.44
C_2 = Strength Coefficient - Aggregate Base Course	=	0.11
m_1 = Drainage Coefficient	=	1.0
m_2 = Drainage Coefficient	=	1.0

D_1 = Depth of Asphalt (inches)

D_2 = Depth of Stabilized Base (inches)

PAVEMENT THICKNESS RESULTS

Full Depth Asphalt

D_1	=	8.5 inches

Asphalt + Aggregate Base Course

D_1 (Asphalt)	=	6.0 inches
D_2 (Aggregate Base Course)	=	9.0 inches

SUPPORTING INFORMATION

Contents:

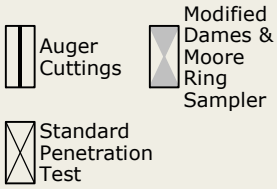
General Notes
Unified Soil Classification System

Note: All attachments are one page unless noted above.

Terracon
4172 Center Park Dr
Colorado Springs, CO

General Notes

Sampling



Water Level

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

Field Tests

N	Standard Penetration Test Resistance (Blows/Ft.)
(HP)	Hand Penetrometer
(T)	Torvane
(DCP)	Dynamic Cone Penetrometer
UC	Unconfined Compressive Strength
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

Descriptive Soil Classicification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

Relative Density of Coarse-Grained Soils (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance			**Consistency of Fine-Grained Soils** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance				**Bedrock**		
Relative Density	**Standard Penetration or N-Value (Blows/Ft.)**	**Ring Sampler (Blows/Ft.)**	**Consistency**	**Unconfined Compressive Strength Qu (tsf)**	**Standard Penetration or N-Value (Blows/Ft.)**	**Ring Sampler (Blows/Ft.)**	**Ring Sampler (Blows/Ft.)**	**Standard Penetration or N-Value (Blows/Ft.)**	**Consistency**
Very Loose	0 - 3	0 - 6	Very Soft		0 - 1	< 3	< 30	< 20	Weathered
Loose	4 - 9	7 - 18	Soft	0.25 to 0.50	2 - 4	3 - 4	30 - 49	20 - 29	Firm
Medium Dense	10 - 29	19 - 58	Medium Stiff		4 - 8	5 - 9	50 - 89	30 - 49	Medium Hard
Dense	30 - 50	59 - 98	Stiff	1.00 to 2.00	8 - 15	10 - 18	90 - 119	50 - 79	Hard
Very Dense	> 50	> 99	Very Stiff		15 - 30	19 - 42	> 119	>79	Very Hard
			Hard	> 4.00	> 30	> 42			

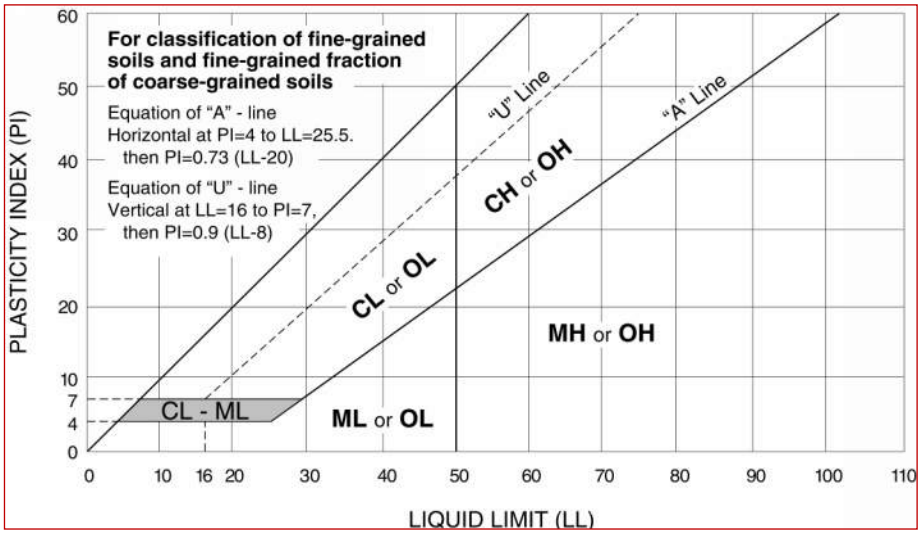
Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu≥4 and 1≤Cc≤3 [E]	GW	Well-graded gravel [F]
			Cu<4 and/or [Cc<1 or Cc>3.0] [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu≥6 and 1≤Cc≤3 [E]	SW	Well-graded sand [I]
			Cu<6 and/or [Cc<1 or Cc>3.0] [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.



APPENDIX F
Grading and Erosion Control Plans
And Landscaping Plans

NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

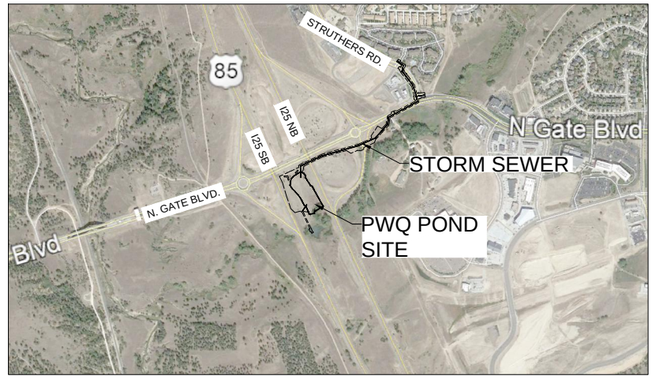
STRUTHERS RD AND NORTH GATE BLVD

CDOT PROJECT NO. C040-042 (21233)

GRADING AND EROSION CONTROL PLAN

CITY OF COLORADO SPRINGS, COUNTY OF EL PASO, STATE OF COLORADO.

INDEX OF SHEETS		
SUBSET SHEET	DRAWING DESCRIPTION	SHEET NO.
EC-3.01	GEC COVER	36
EC-3.02	GEC AND SURFACING PLAN	37
EC-3.03	GEC AND SURFACING PLAN	38
EC-3.04	GEC AND SURFACING PLAN	39
EC-3.05	GEC AND SURFACING PLAN	40
EC-3.06	GEC NOTES	41
EC-3.07	GEC DETAILS	42
EC-3.08	GEC DETAILS	43
EC-3.09	GEC DETAILS	44



VICINITY MAP
SCALE 1"=2000'

Engineer's Statement for GEC Plan within construction drawing set: These detailed plans and specifications were prepared under my direction and supervision. Said plans and specifications have been prepared according to critieria established by the County for detailed roadway, drainage, grading and erosion control plans and specifications, and said plans and specifications are in conformity with applicable master drainage plans and master transportation plans. Said plans and specifications meet the purposes for which the particular roadway and drainage facilities are designed and are correct to the best of my knowledge and belief. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparation of the detailed plans and specifications.

Vancel Fossinger, P.E.
Engineer of Record Signature

Date: 11/12/24

COLORADO REGISTERED
VANCEL S FOSSINGER
31972
PROFESSIONAL ENGINEER
11/12/24
Vancel Fossinger

El Paso County:

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.

County Engineer / ECM Administrator Date

Print Date: November 12, 2024
File Name: 3.01 GEC STORM - COVER.DWG
Horiz. Scale: Vert. Scale:
Unit Information Unit Leader

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Date:	Comments	Init.

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Revised:
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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT
GEC COVER

Designer: NAB
Detailer: KDL
Sheet Subset: GEC
Structure Numbers:
Subset Sheets: EC-3.01

Project No./Code
CDOT Project No. C040-042 (21233)
Sheet Number
36 OF 58

11/12/2024 C:\users\mgrafer\appdata\local\bentley\projectwise\wci_projects\d0411886\3.01 GEC STORM - COVER.dwg

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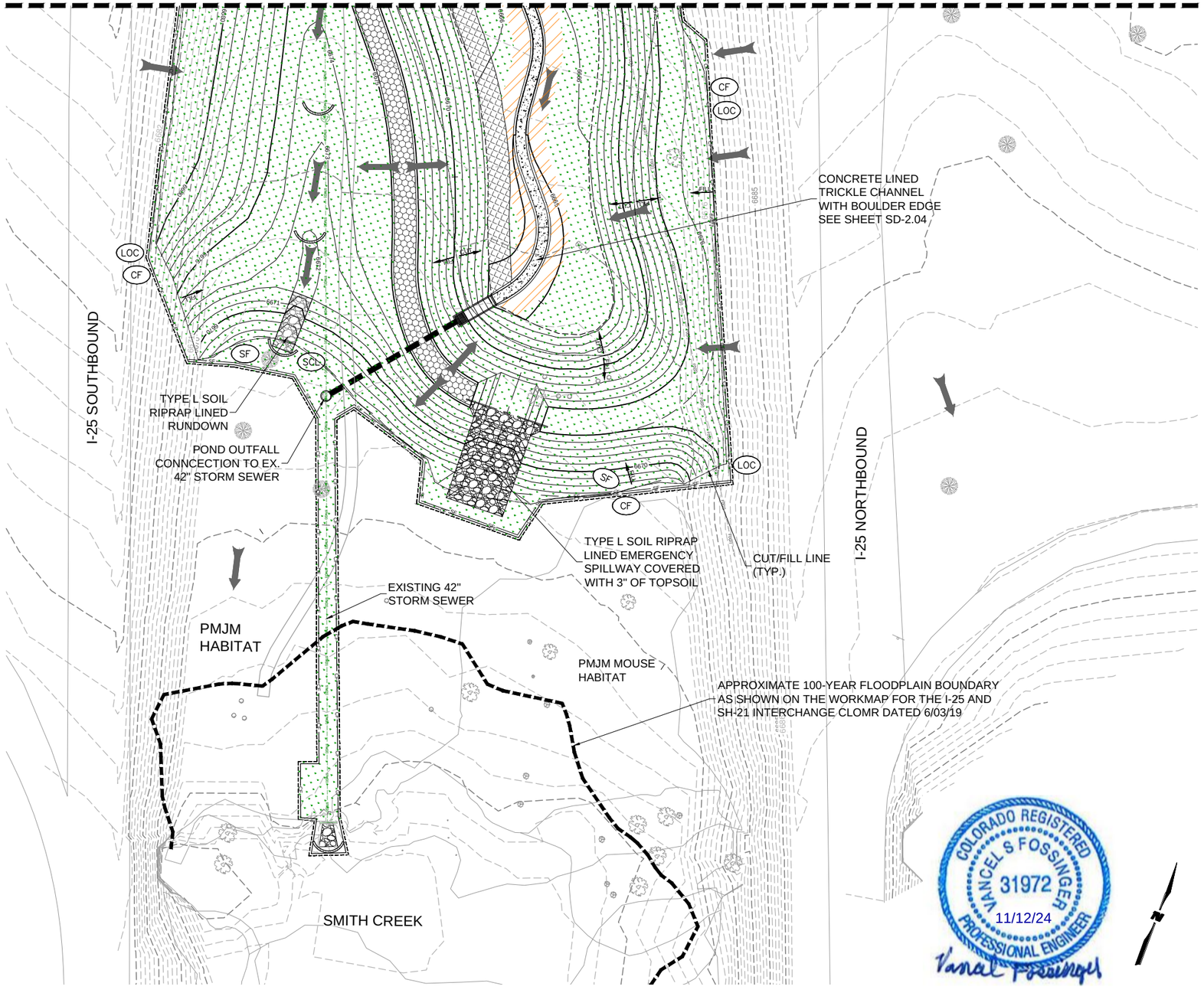

EXISTING GROUND COVER DESCRIPTION

EXISTING GROUND COVER VARIES THROUGH THE PROJECT DISTURBANCE AREA. AT AND IMMEDIATELY ADJACENT TO SMITH CREEK THERE ARE CATTAILS AND WILLOW SHRUBS. THE I-25 MEDIAN AREA BETWEEN THE FRINGE OF SMITH CREEK AND NORTH GATE BOULEVARD IS VEGETATED WITH NATIVE GRASSES, SCATTERED WEEDS AND SPARSE SHRUBS. GROUND COVER IN THE NORTHGATE BOULEVARD PORTION OF THE DISTURBANCE AREA VARIES FROM ASPHALT PAVEMENT TO NATIVE GRASSES WITH SOME WEEDS. GROUND COVER IN THE STRUTHERS ROAD PORTION OF THE DISTURBANCE AREA IS NEARLY ALL ASPHALT PAVEMENT WITH SMALL PORTIONS OF TURF GRASS AND LANDSCAPE ROCK.

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LOC	CONSTRUCTION BOUNDARY/ LIMITS OF DISTURBANCE	
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SSA	STABILIZED STAGING AREA LOCATION TBD BY CONTRACTOR	(INITIAL)
SCL	SEDIMENT CONTROL LOG	(INITIAL)
RS	ROCK SOCKS	(INITIAL)
IP	INLET PROTECTION	(INITIAL) / (INTERIM)
PT	PORTABLE TOILET	(INITIAL)
SP	STOCKPILE	(INTERIM)
	FLOW ARROW	
	VEHICLE TRACTION CONTROL	(INITIAL)
	CONCRETE WASHOUT AREA LOCATION TBD BY CONTRACTOR	(INITIAL)
	TEMP EROSION CONTROL BLANKET AND NATIVE SEEDING	(FINAL)
	MULCH AND NATIVE SEEDING	(FINAL)
	8" THICK ABC MAINTENANCE ROAD	(FINAL)
	12" THICK ABC MAINTENANCE ROAD	(FINAL)
	FULL DEPTH HMA	(FINAL)

NOTES:

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Print Date: November 12, 2024
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Unit Information Unit Leader

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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT
GEC AND SURFACING PLAN

Designer: NAB
Detailer: KDL
Sheet Subset: GEC
Structure Numbers:
Subset Sheets: EC-3.02

Project No./Code
CDOT Project No. C040-042 (21233)
Sheet Number
37 OF 58

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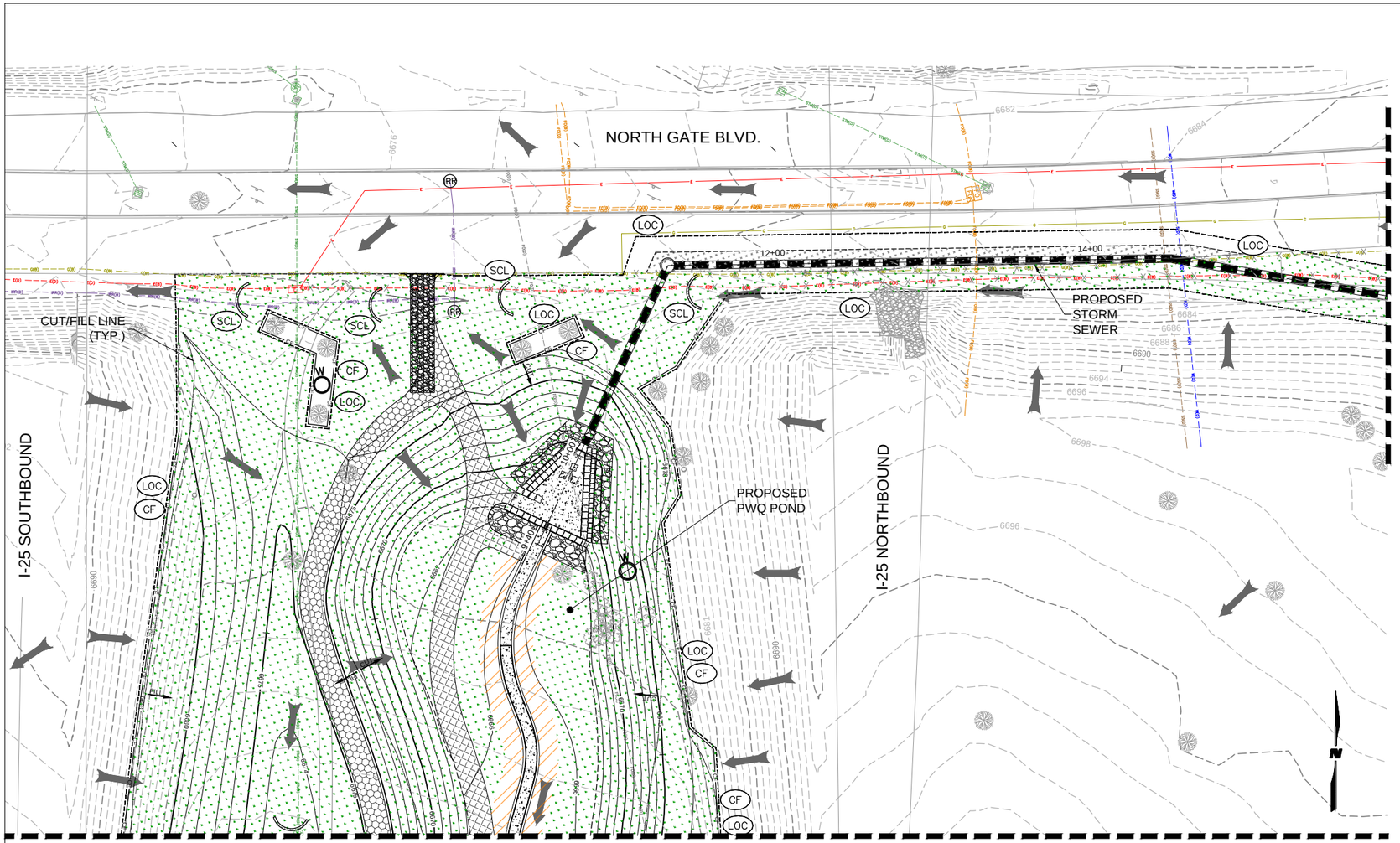

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Unit Information	Unit Leader						Void:

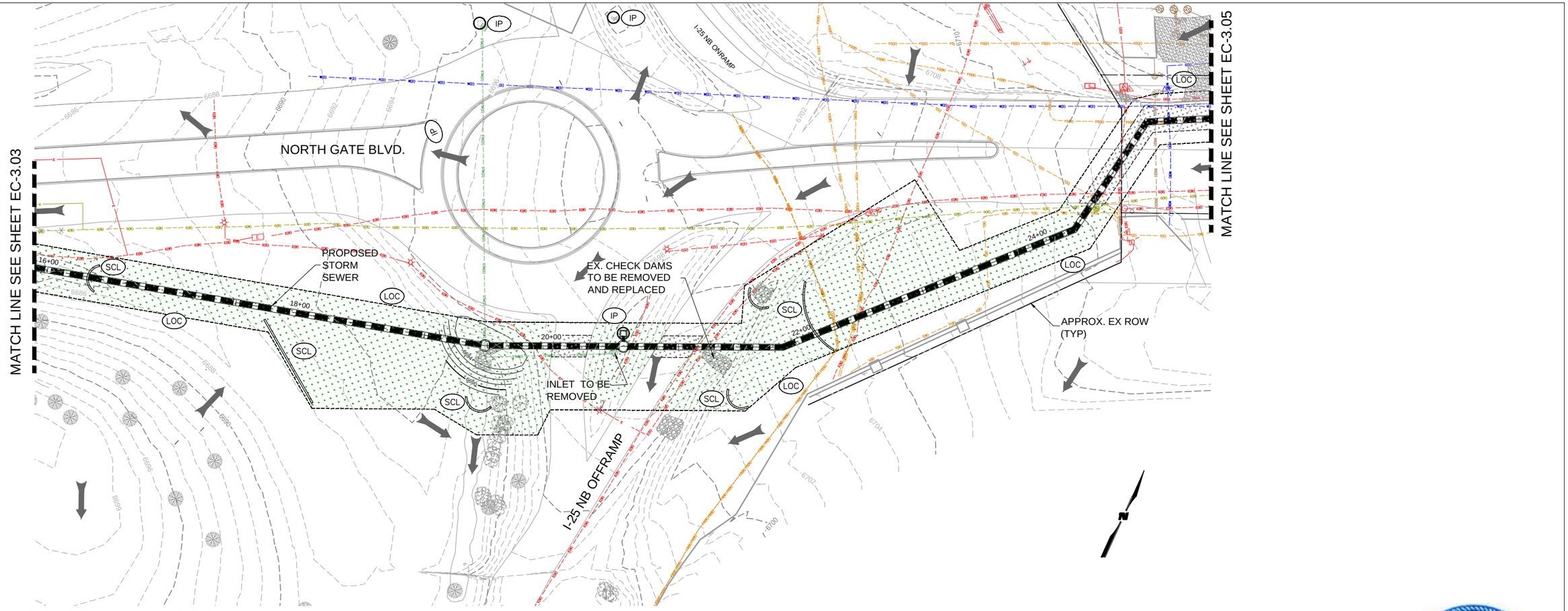
NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

GEC AND SURFACING PLAN

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	GEC	Subset Sheets:	EC-3.03

Project No./Code: CDOT Project No. C040-042 (21233)

Sheet Number: 38 OF 58



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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

GEC AND SURFACING PLAN

Designer: NAB
Detailer: KDL
Sheet Subset: GEC
Structure Numbers:
Subset Sheets: EC-3.04

Project No./Code
CDOT Project No. C040-042 (21233)

Sheet Number
39 OF 58

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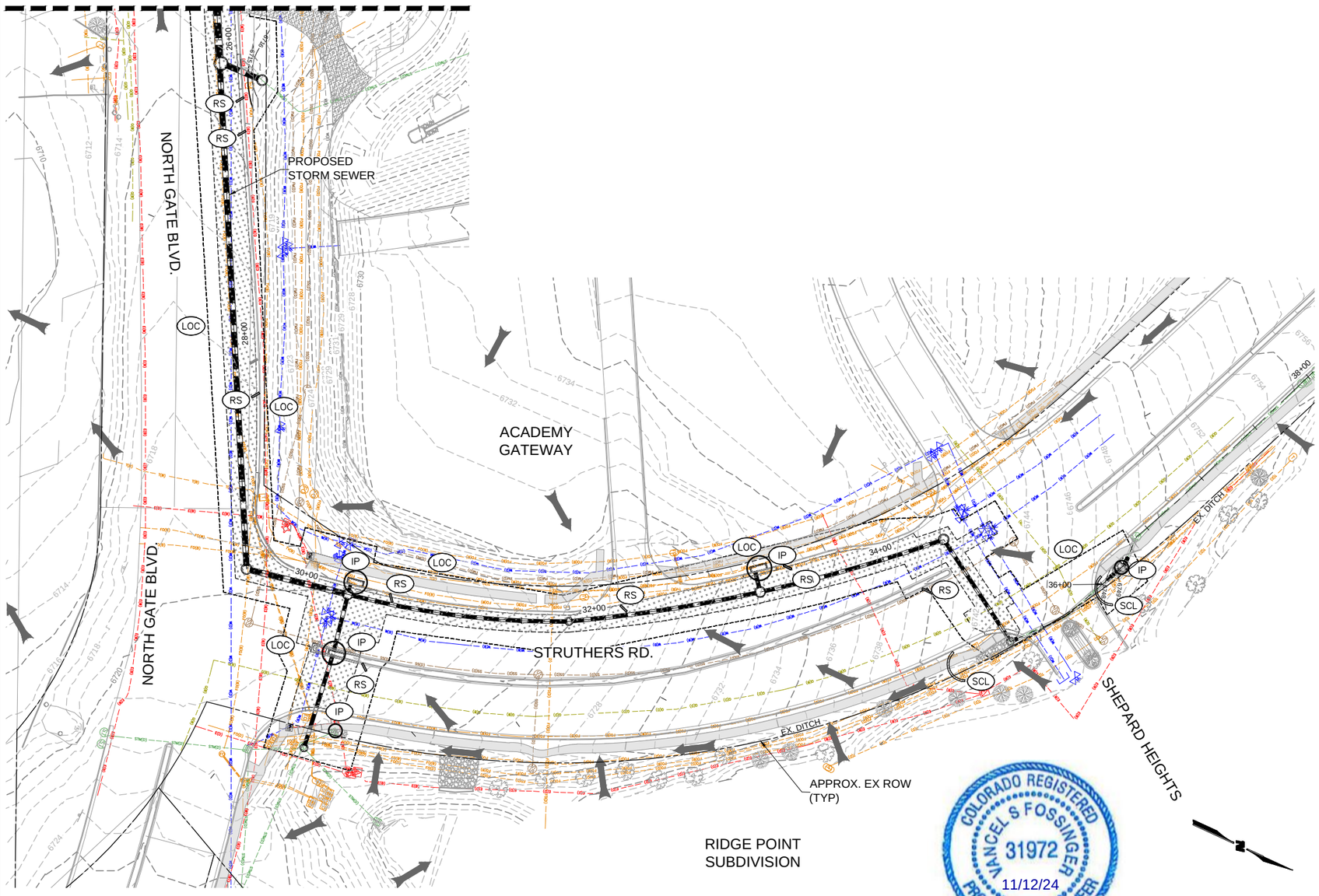

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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT			Project No./Code
GEC AND SURFACING PLAN			CDOT Project No. C040-042 (21233)
Designer: NAB	Structure Numbers		Sheet Number
Detailer: KDL			40 OF 58
Sheet Subset: GEC	Subset Sheets:	EC-3.05	

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STANDARD NOTES FOR EL PASO COUNTY GRADING AND EROSION CONTROL PLANS

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 (SMWP) 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 EFFECT 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 LOOSENED 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 SEQUENCE. 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 ONSITE 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 ONSITE 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 TERRACON CONSULTANTS INC. 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

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Horiz. Scale:	Vert. Scale:						Revised:
Unit Information	Unit Leader						Void:

NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT			Project No./Code
GEC NOTES			CDOT Project No. C040-042 (21233)
Designer: NAB	Structure Numbers		Sheet Number
Detailer: KDL			41 OF 58
Sheet Subset: GEC	Subset Sheets: EC-3.06		

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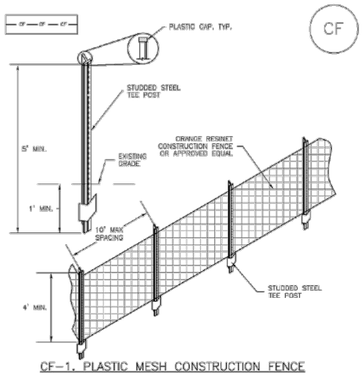


CF-1, PLASTIC MESH CONSTRUCTION FENCE

CONSTRUCTION FENCE INSTALLATION NOTES

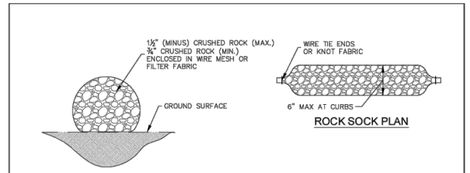
1. SEE PLAN VIEW FOR:
   -LOCATION OF CONSTRUCTION FENCE.
2. CONSTRUCTION FENCE SHOWN SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
3. CONSTRUCTION FENCE SHALL BE COMPOSED OF ORANGE, CONTRACTOR-GRADE MATERIAL THAT IS AT LEAST 4' HIGH. METAL POSTS SHOULD HAVE A PLASTIC CAP FOR SAFETY.
4. STUDDED STEEL TEE POSTS SHALL BE UTILIZED TO SUPPORT THE CONSTRUCTION FENCE. MAXIMUM SPACING FOR STEEL TEE POSTS SHALL BE 10'.
5. CONSTRUCTION FENCE SHALL BE SECURELY FASTENED TO THE TOP, MIDDLE, AND BOTTOM OF EACH POST.

CONSTRUCTION FENCE MAINTENANCE NOTES

1. 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.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. CONSTRUCTION FENCE SHALL BE REPAIRED OR REPLACED WHEN THERE ARE SIGNS OF DAMAGE SUCH AS RIPS OR SAGS. CONSTRUCTION FENCE IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND APPROVED BY THE LOCAL JURISDICTION.
5. WHEN CONSTRUCTION FENCES ARE REMOVED, ALL DISTURBED AREAS ASSOCIATED WITH THE INSTALLATION, MAINTENANCE, AND/OR REMOVAL OF THE FENCE SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED, OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

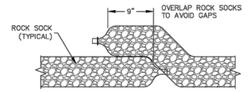
NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

[EDITING ADAPTED FROM TOWN OF PARKER, COLORADO, NOT AVAILABLE IN AUTOCAD]



ROCK SOCK PLAN

ROCK SOCK SECTION



ROCK SOCK OVERLAP

GRADATION TABLE	
	MASS PERCENT PASSING SQUARE MESH SIEVES
	No. 4
2"	100
1½"	90–100
1"	20–55
¾"	0–15
⅜"	0–5

MATCHES SPECIFICATIONS FOR No. 4 COARSE AGGREGATE FOR CONCRETE PER AASHTO M-43. ALL ROCK SHALL BE FRACTURED FACE, ALL SIDES

INSTALLATION NOTES

1. CRUSHED ROCK SHALL BE BETWEEN MAX. 1½" (MINUS) IN SIZE WITH A FRACTURED FACE (ALL SIDES) AND SHALL COMPLY WITH GRADATION SHOWN ON THIS SHEET AND MIN. ¾" CRUSHED ROCK.
2. WIRE MESH SHALL HAVE OPENINGS SMALLER THAN THE SMALLEST SIZE ROCK.
3. WIRE MESH SHALL BE SECURED USING 'HOG RINGS' OR WIRE TIES AT 6" CENTERS ALONG ALL JOINTS AND AT 2' CENTERS ON ENDS OF SOCKS.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ROCK SOCKS SHALL BE REPLACED IF THEY BECOME HEAVILY SOILED OR DAMAGED BEYOND REPAIR.
3. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN THE DEPTH REACHES ½ OF THE HEIGHT OF THE ROCK SOCK.
4. ROCK SOCKS ARE TO REMAIN IN PLACE UNTIL DISTURBED AREA IS STABILIZED.
5. PERMANENTLY STABILIZE AREA AFTER ROCK SOCKS HAVE BEEN REMOVED.

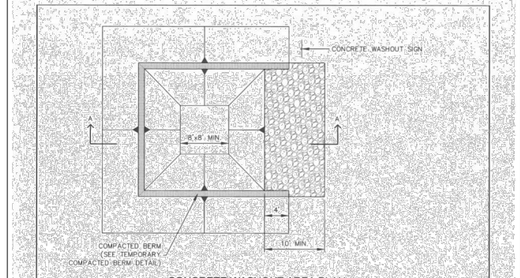
RS

STORMWATER ENTERPRISE

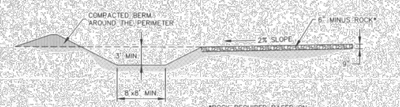
ROCK SOCK

APPROVED:
CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		500-RS



CONCRETE WASHOUT AREA PLAN



SECTION A-A

*ROCK REQUIRED BASED ON SITE CONDITIONS AT THE DISCRETION OF THE QEC INSPECTOR

CWA

STORMWATER ENTERPRISE

CONCRETE WASHOUT AREA

APPROVED:
CITY ENGINEER

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10/7/19	8/19/2020	500-CWA-1

INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   -LOCATION OF CONCRETE WASHOUT AREA
2. LOCATE AT LEAST 50' AWAY FROM STATE WATERS, MEASURED HORIZONTALLY.
3. AN IMPERMEABLE LINER (16 MIL. MINIMUM THICKNESS) IS REQUIRED IF CONCRETE WASH AREA IS LOCATED WITHIN 400' OF STATE WATERS OR 1000' OF WELLS OR DRINKING WATER SOURCES.
4. DO NOT LOCATE IN AREAS WHERE SHALLOW GROUNDWATER MAY BE PRESENT.
5. THE CONCRETE WASH AREA SHALL BE INSTALLED PRIOR TO CONCRETE PLACEMENT ON SITE.
6. CONCRETE WASH AREA SHALL INCLUDE A FLAT SUBSURFACE PIT THAT IS AT LEAST 8' BY 8'.
7. BERM SURROUNDING SIDES AND BACK OF CONCRETE WASH AREA SHALL HAVE A MINIMUM HEIGHT OF 2 FEET.
8. CONCRETE WASH AREA ENTRANCE SHALL BE SLOPED 2% TOWARDS THE CONCRETE WASH AREA.
9. SIGNS SHALL BE PLACED AT THE CONCRETE WASH AREA.
10. USE EXCAVATED MATERIAL FOR PERIMETER BERM CONSTRUCTION.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. THE CONCRETE WASH AREA SHALL BE REPAIRED, CLEANED, OR ENLARGED AS NECESSARY TO MAINTAIN CAPACITY FOR CONCRETE WASTE. CONCRETE MATERIALS ACCUMULATED IN THE PIT SHALL BE REMOVED ONCE THE MATERIALS HAVE REACHED A DEPTH OF ½ THE HEIGHT OF THE CONCRETE WASH AREA.
3. CONCRETE WASHOUT WATER, WASTED PIECES OF CONCRETE, AND ALL OTHER DEBRIS IN THE SUBSURFACE PIT SHALL BE TRANSPORTED FROM THE JOB SITE IN A WATER-TIGHT CONTAINER, AND DISPOSED OF PROPERLY.
4. THE CONCRETE WASH AREA SHALL REMAIN IN PLACE UNTIL ALL CONCRETE FOR THE PROJECT IS PLACED.
5. PERMANENTLY STABILIZE AREA AFTER CONCRETE WASH AREA IS REMOVED.

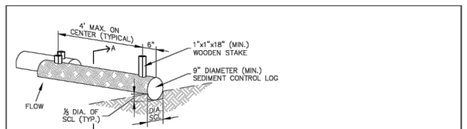
CWA

STORMWATER ENTERPRISE

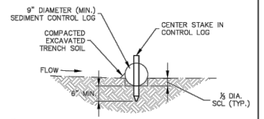
CONCRETE WASHOUT AREA

APPROVED:
CITY ENGINEER

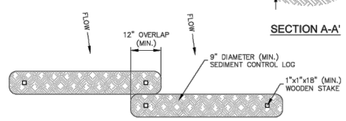
ISSUED:	REVISED:	DRAWING NO.
10/7/19	8/19/2020	500-CWA-1



SEDIMENT CONTROL LOG



SECTION A-A'



SEDIMENT CONTROL LOG JOINTS

INSTALLATION NOTES

1. ALL SEDIMENT CONTROL LOGS MUST BE EMBEDDED TO ⅓ OF THE HEIGHT OF THE LOG.
2. LARGER DIAMETER SEDIMENT CONTROL LOGS NEED TO BE EMBEDDED DEEPER.
3. PLACE SEDIMENT CONTROL LOG AGAINST SIDEWALK OR BACK OF CURB WHEN ADJACENT TO THESE FEATURES.
4. SEDIMENT CONTROL LOGS SHALL CONSIST OF STRAW, COMPOST, EXCELSIOR OR COCONUT FIBER, AND SHALL BE FREE FROM ANY NOXIOUS WEED SEEDS OF DEFECTS INCLUDING RIPS, HOLES AND OBVIOUS WEAR.
5. IF USING AS SLOPE PROTECTION, INSTALL SEDIMENT CONTROL LOGS ALONG THE CONTOUR.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ACCUMULATED SEDIMENT MUST BE REMOVED WHEN THE HEIGHT REACHES ½ OF THE HEIGHT OF THE SEDIMENT CONTROL LOG.
3. PERMANENTLY STABILIZE AREA AFTER SEDIMENT CONTROL LOGS HAVE BEEN REMOVED.

SCL

STORMWATER ENTERPRISE

SEDIMENT CONTROL LOGS

APPROVED:
CITY ENGINEER

ISSUED:	REVISED:	DRAWING NO.
10/7/19		500-SCL

Print Date: November 12, 2024		Sheet Revisions			
File Name: 3.06 GEC - DETAILS.DWG		Date:	Comments	Init.	
Horiz. Scale: Vert. Scale:					
Unit Information Unit Leader					

Know what's below. Call before you dig.

EL PASO COUNTY, COLORADO EST. 1861

WILSON & COMPANY
5755 Mark Dabling Blvd.
Suite 100
Colorado Springs, CO 80919
Phone: 719-520-5800
FAX: 719-520-0108

As Constructed

No Revisions:

Revised:

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NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

GEC DETAILS

Designer:	NAB	Structure Numbers	
Detailer:	KDL		
Sheet Subset:	GEC	Subset Sheets:	EC-3.07

Project No./Code

CDOT Project No. C040-042 (21233)

Sheet Number

42 OF 58

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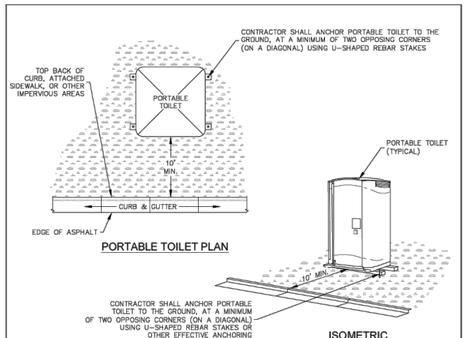


PORTABLE TOILET PLAN

ISOMETRIC

INSTALLATION NOTES

1. PORTABLE TOILETS SHALL BE PLACED A MINIMUM OF 10 FEET BEHIND ALL CURBS, SIDEWALKS, AND OTHER IMPERVIOUS AREAS; 50 FEET FROM STORM INLETS, AND 100 FEET FROM WATERWAYS.
2. PORTABLE TOILETS IN THE RIGHT-OF-WAY ARE REQUIRED TO BE PLACED ON MOBILE TRAILERS AND MUST BE ANCHORED OR WEIGHTED DOWN. PORTABLE TOILETS MAY BE INSTALLED IN ACCORDANCE WITH NOTE #1 IN STAGING AREAS/YARDS.
3. PORTABLE TOILETS SHALL BE SECURELY ANCHORED TO THE GROUND USING U-SHAPED REBAR STAKES, OR OTHER EFFECTIVE ANCHORING.
4. ANCHORING SHALL BE POSITIONED ON AT LEAST TWO OPPOSING (DIAGONAL) CORNERS.

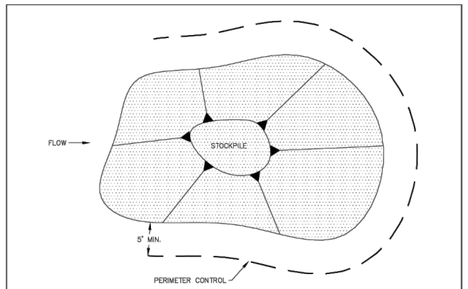
MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. PORTABLE TOILETS SHALL BE SERVICED AT THE NECESSARY INTERVALS TO ELIMINATE THE POSSIBILITY OF OVERFLOW.
3. WHEN THE PORTABLE TOILETS ARE REMOVED, ANY DISTURBED AREAS ASSOCIATED WITH THE INSTALLATION, MAINTENANCE, AND/OR REMOVAL OF THE TOILETS MUST BE PERMANENTLY STABILIZED.

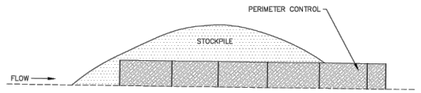
PT

PORTABLE TOILET

STORMWATER ENTERPRISE | APPROVED: CITY ENGINEER | ISSUED: 2/19/19 | REVISED: 10/7/19 | DRAWING NO. 900-PTM



STOCKPILE PROTECTION PLAN



STOCKPILE PROTECTION ELEVATION

INSTALLATION NOTES

1. INSTALL PERIMETER CONTROL AROUND STOCKPILE ON DOWNGRADIENT SIDE. PERIMETER CONTROL MUST BE SUITABLE TO SITE CONDITIONS AND INSTALLED ACCORDING TO THE RELEVANT DETAIL.
2. FOR STOCKPILES ON THE INTERIOR PORTION OF A CONSTRUCTION SITE, WHERE OTHER DOWNGRADIENT CONTROLS INCLUDING PERIMETER CONTROL ARE IN PLACE, STOCKPILE PERIMETER CONTROLS MAY NOT BE REQUIRED.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. IF PERIMETER CONTROLS MUST BE MOVED TO ACCESS STOCKPILE, REPLACE PERIMETER CONTROLS BY THE END OF THE WORK DAY.
3. ACCUMULATED SEDIMENT MUST BE REMOVED ACCORDING TO PERIMETER CONTROL DETAIL.

SP

STOCKPILE PROTECTION

STORMWATER ENTERPRISE | APPROVED: CITY ENGINEER | ISSUED: 10/7/19 | REVISED: | DRAWING NO. 900-SP

SEEDING & MULCHING

ALL SOIL TESTING, SOILS AMENDMENT AND FERTILIZER DOCUMENTATION, AND SEED LOAD AND BAG TICKETS MUST BE ADDED TO THE CSWMP.

SOIL PREPARATION

1. IN AREAS TO BE SEEDED, THE UPPER 6 INCHES OF THE SOIL MUST NOT BE HEAVILY COMPACTED, AND SHOULD BE IN FRIABLE CONDITION. LESS THAN 85% STANDARD PROCTOR DENSITY IS ACCEPTABLE. AREAS OF COMPACTION OR GENERAL CONSTRUCTION ACTIVITY MUST BE SCARIFIED TO A DEPTH OF 6 TO 12 INCHES PRIOR TO SPREADING TOPSOIL TO BREAK UP COMPACTED LAYERS AND PROVIDE A BLENDING ZONE BETWEEN DIFFERENT SOIL LAYERS.
2. AREAS TO BE PLANTED SHALL HAVE AT LEAST 4 INCHES OF TOPSOIL SUITABLE TO SUPPORT PLANT GROWTH.
3. THE CITY RECOMMENDS THAT EXISTING AND/OR IMPORTED TOPSOIL BE TESTED TO IDENTIFY SOIL DEFICIENCIES AND ANY SOIL AMENDMENTS NECESSARY TO ADDRESS THESE DEFICIENCIES. SOIL AMENDMENTS AND/OR FERTILIZERS SHOULD BE ADDED TO CORRECT TOPSOIL DEFICIENCIES BASED ON SOIL TESTING RESULTS.
4. TOPSOIL SHALL BE PROTECTED DURING THE CONSTRUCTION PERIOD TO RETAIN ITS STRUCTURE AVOID COMPACTION, AND TO PREVENT EROSION AND CONTAMINATION. STRIPPED TOPSOIL MUST BE STORED IN AN AREA AWAY FROM MACHINERY AND CONSTRUCTION OPERATIONS, AND CARE MUST BE TAKEN TO PROTECT THE TOPSOIL AS A VALUABLE COMMODITY. TOPSOIL MUST NOT BE STRIPPED DURING UNDESIRABLE WORKING CONDITIONS (E.G. DURING WET WEATHER OR WHEN SOILS ARE SATURATED). TOPSOIL SHALL NOT BE STORED IN SWALES OR IN AREAS WITH POOR DRAINAGE.

SEEDING

1. ALLOWABLE SEED MIXES ARE INCLUDED IN THE CITY OF COLORADO SPRINGS STORMWATER CONSTRUCTION MANUAL. ALTERNATIVE SEED MIXES ARE ACCEPTABLE IF INCLUDED IN AN APPROVED LANDSCAPING PLAN.
2. SEED SHOULD BE DRILL-SEEDED WHENEVER POSSIBLE
   - SEED DEPTH MUST BE ¼ TO ½ INCHES WHEN DRILL-SEEDING IS USED
3. BROADCAST SEEDING OR HYDRO-SEEDING WITH TACKIFIER MAY BE SUBSTITUTED ON SLOPES STEEPER THAN 3:1 OR ON OTHER AREAS NOT PRACTICAL TO DRILL SEED.
   - SEEDING RATES MUST BE DOUBLED FOR BROADCAST SEEDING OR INCREASED BY 50% IF USING A BRILLION DRILL OR HYDRO-SEEDING
   - BROADCAST SEEDING MUST BE LIGHTLY HAND-RAKED INTO THE SOIL

MULCHING

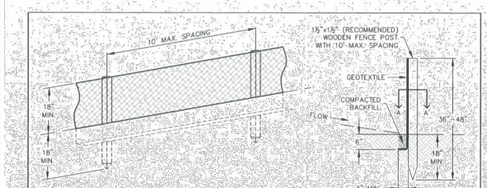
1. MULCHING SHOULD BE COMPLETED AS SOON AS PRACTICABLE AFTER SEEDING, HOWEVER PLANTED AREAS MUST BE MULCHED NO LATER THAN 14 DAYS AFTER PLANTING.
2. MULCHING REQUIREMENTS INCLUDE:
   - HAY OR STRAW MULCH
     - ONLY CERTIFIED WEED-FREE AND CERTIFIED SEED-FREE MULCH MAY BE USED. MULCH MUST BE APPLIED AT 2 TONS/ACRE AND ADEQUATELY SECURED BY CRIMPING AND/OR TACKIFIER.
     - CRIMPING MUST NOT BE USED ON SLOPES GREATER THAN 3:1 AND MULCH FIBERS MUST BE TUCKED INTO THE SOIL TO A DEPTH OF 3 TO 4 INCHES.
     - TACKIFIER MUST BE USED IN PLACE OF CRIMPING ON SLOPES STEEPER THAN 3:1.
   - HYDRAULIC MULCHING
     - HYDRAULIC MULCHING IS AN OPTION ON STEEP SLOPES OR WHERE ACCESS IS LIMITED.
     - IF HYDRO-SEEDING IS USED, MULCHING MUST BE APPLIED AS A SEPARATE, SECOND OPERATION.
     - WOOD CELLULOSE FIBERS MIXED WITH WATER MUST BE APPLIED AT A RATE OF 2,000 TO 2,500 POUNDS/ACRE, AND TACKIFIER MUST BE APPLIED AT A RATE OF 100 POUNDS/ACRE.
   - EROSION CONTROL BLANKET
     - EROSION CONTROL BLANKET MAY BE USED IN PLACE OF TRADITIONAL MULCHING METHODS.

SEE LANDSCAPING PLANS FOR SEE MIXTURE

SM

SEEDING & MULCHING

STORMWATER ENTERPRISE | APPROVED: CITY ENGINEER | ISSUED: 10/7/19 | REVISED: | DRAWING NO. 900-SM



SILT FENCE

J-HOOK INSTALLATION

SECTION A-A'

INSTALLATION NOTES

1. SILT FENCE MUST BE PLACED ON A FLAT SURFACE 2'-5' AWAY FROM TOE OF THE SLOPE TO ALLOW FOR PONDING AND DEPOSITION.
2. COMPACT THE TRENCH USING A JUMPING JACK OR WHEEL ROLLING TO THE POINT THAT THE FENCE RESISTS BEING PULLED OUT OF THE GROUND BY HAND.
3. SILT FENCE SHALL BE TAUT WITH NO SAGS AFTER IT HAS BEEN ANCHORED.
4. FABRIC SHALL BE ATTACHED TO POSTS WITH 1" HEAVY DUTY STAPLES OR 1" NAILS. THESE SHOULD BE PLACED VERTICALLY DOWN THE POST, 3" APART.
5. THE PREFERRED INSTALLATION METHOD USES A TRENCHER OR SILT FENCE INSTALLATION DEVICE.
6. INSTALL SILT FENCE ALONG THE CONTOUR OF THE SLOPES OR IN A MANNER TO AVOID CREATING CONCENTRATED FLOW (SUCH AS A "J-HOOK" INSTALLATION).

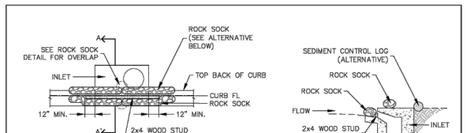
MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ACCUMULATED SEDIMENT MUST BE REMOVED WHEN THE HEIGHT REACHES ½ OF THE DESIGN HEIGHT OF THE SILT FENCE.
3. SILT FENCE MUST REMAIN UNTIL THE UPSTREAM DISTURBANCE AREA IS STABILIZED.
4. PERMANENTLY STABILIZE AREA AFTER SILT FENCE IS REMOVED.

SF

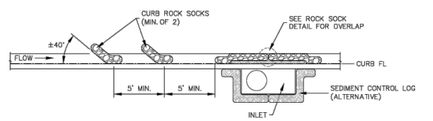
SILT FENCE

STORMWATER ENTERPRISE | APPROVED: (CHIEF ENGINEER) | ISSUED: 10/7/19 | REVISED: 8/19/2020 | DRAWING NO. 900-SF



CURB INLET PROTECTION PLAN

SECTION A-A'



CURB ROCK SOCKS UPSTREAM OF INLET PROTECTION

INSTALLATION NOTES

1. SEE ROCK SOCK DETAIL FOR INSTALLATION REQUIREMENTS.
2. PLACEMENT OF THE ROCK SOCK SHALL BE APPROXIMATELY 40 DEGREES FROM THE CURB.
3. ROCK SOCKS ARE TO BE FLUSH WITH THE CURB AND SPACED A MINIMUM OF 5' APART.
4. AT LEAST TWO CURB ROCK SOCKS IN SERIES ARE REQUIRED UPSTREAM OF ON-GRADIENT INLETS.
5. ADDITIONAL ROCK SOCKS MAY BE REQUIRED AT GEC INSPECTOR'S DISCRETION.

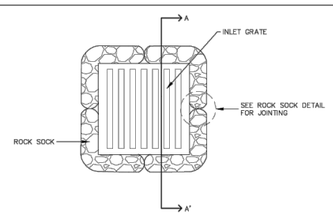
MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ACCUMULATED SEDIMENT MUST BE REMOVED WHEN THE HEIGHT REACHES ½ OF THE DESIGN DEPTH OF THE INLET BARRIER.
3. ROCK SOCKS MUST REMAIN UNTIL THE UPSTREAM DISTURBANCE AREA IS STABILIZED.
4. PERMANENTLY STABILIZE AREA BEHIND INLET AFTER ROCK SOCKS ARE REMOVED WHEN REMOVAL IS APPROPRIATE.

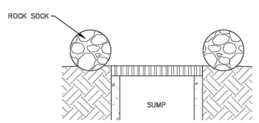
IP-1

ON-GRADE INLET PROTECTION

STORMWATER ENTERPRISE | APPROVED: CITY ENGINEER | ISSUED: 10/7/19 | REVISED: | DRAWING NO. 900-IP-1



ROCK SOCK SUMP INLET PROTECTION PLAN



SECTION A-A'

INSTALLATION NOTES

1. SEE ROCK SOCK DETAIL FOR INSTALLATION REQUIREMENTS.
2. SEDIMENT CONTROL LOGS MAY BE USED IN PLACE OF ROCK SOCKS IN PERVIOUS AREAS. INSTALL PER SEDIMENT CONTROL LOG DETAIL

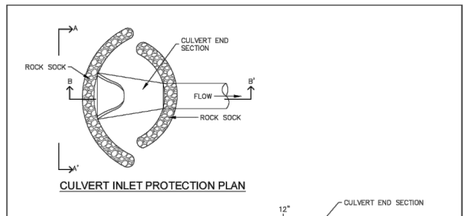
MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ACCUMULATED SEDIMENT MUST BE REMOVED WHEN THE HEIGHT REACHES ½ OF THE DESIGN DEPTH OF THE INLET BARRIER.
3. ROCK SOCKS MUST REMAIN UNTIL THE UPSTREAM DISTURBANCE AREA IS STABILIZED.
4. PERMANENTLY STABILIZE AREA AROUND INLET AFTER ROCK SOCKS ARE REMOVED WHEN REMOVAL IS APPROPRIATE.

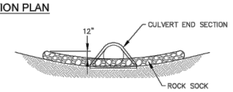
IP-2

SUMP INLET PROTECTION

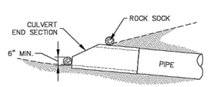
STORMWATER ENTERPRISE | APPROVED: CITY ENGINEER | ISSUED: 10/7/19 | REVISED: | DRAWING NO. 900-IP-2



CULVERT INLET PROTECTION PLAN



SECTION A-A'



SECTION B-B'

INSTALLATION NOTES

1. SEE ROCK SOCK DETAIL.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. ACCUMULATED SEDIMENT UPSTREAM OF THE CULVERT SHALL BE REMOVED WHEN THE SEDIMENT DEPTH IS ½ HEIGHT OF THE ROCK SOCK.
3. CULVERT INLET PROTECTION SHALL REMAIN UNTIL THE UPSTREAM AREA IS PERMANENTLY STABILIZED.

CIP

CULVERT INLET PROTECTION

STORMWATER ENTERPRISE | APPROVED: CITY ENGINEER | ISSUED: 10/7/19 | REVISED: | DRAWING NO. 900-CIP

Street Sweeping and Vacuuming (SS) SM-7

Description

Street sweeping and vacuuming remove sediment that has been tracked onto roadways to reduce sediment transport into storm drain systems or a surface waterway.

Photograph SS-1. A street sweeper removes sediment and potential pollutants along the curb line at a construction site. Photo courtesy of Tom Gore.

Appropriate Uses

Use this practice at construction sites where vehicles may track sediment offsite onto paved roadways.

Design and Installation

Street sweeping or vacuuming should be conducted when there is noticeable sediment accumulation on roadways adjacent to the construction site. Typically, this will be concentrated at the entrance/exit to the construction site. Well-maintained stabilized construction entrances, vehicle tracking controls and tire wash facilities can help reduce the necessary frequency of street sweeping and vacuuming.

On smaller construction sites, street sweeping can be conducted manually using a shovel and broom. Never wash accumulated sediment on roadways into storm drains.

Maintenance and Removal

- Inspect paved roads around the perimeter of the construction site on a daily basis and more frequently, as needed. Remove accumulated sediment, as needed.
- Following street sweeping, check inlet protection that may have been displaced during street sweeping.
- Inspect area to be swept for materials that may be hazardous prior to beginning sweeping operations.

Street Sweeping/ Vacuuming	
Functions	
Erosion Control	No
Sediment Control	Yes
Site/Material Management	Yes

Print Date: November 12, 2024	Sheet Revisions		
File Name: 3.07 GEC - DETAILS.DWG	Date:	Comments	Init.
Horiz. Scale: Vert. Scale:			
Unit Information Unit Leader			

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

WILSON & COMPANY
5755 Mark Dabling Blvd.
Suite 100
Colorado Springs, CO 80919
Phone: 719-520-5800
FAX: 719-520-0108

As Constructed

No Revisions:

Revised:

Void:

NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT

GEC DETAILS

Designer: NAB
Detailer: KDL
Structure Numbers:
Sheet Subset: GEC
Subset Sheets: EC-3.08

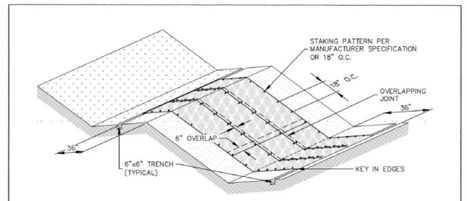
Project No./Code

CDOT Project No. C040-042 (21233)

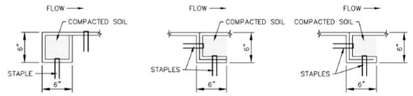
Sheet Number

43 OF 58

11/12/2024 C:\users\mgrater\appdata\local\bentley\projectwise\wcl_projects\d0411886\3.07 GEC - DETAILS.dwg



EROSION CONTROL BLANKET



ECB

STORMWATER ENTERPRISE — EROSION CONTROL BLANKET

APPROVED: DIRECT SUPERVISOR

ISSUED:	REVISED:	DRAWING NO.
10/7/19	8/19/2020	900-ECB-1

INSTALLATION NOTES

1. 100% NATURAL AND BIODEGRADABLE MATERIALS ARE REQUIRED FOR EROSION CONTROL BLANKETS. TRM PRODUCTS MAY ME USED WHERE APPROPRIATE AS DESIGNATED BY THE ENGINEER.
2. IN AREAS WHERE EROSION CONTROL BLANKETS ARE SHOWN ON THE PLANS, THE PERMITTEE SHALL PLACE TOPSOIL AND PERFORM FINAL GRADING, SURFACE PREPARATION, AND SEEDING AND MULCHING. SUBGRADE SHALL BE SMOOTH AND MOIST PRIOR TO EROSION CONTROL BLANKET INSTALLATION, AND THE EROSION CONTROL BLANKET SHALL BE IN FULL CONTACT WITH THE SUBGRADE. NO GAPS OR VOIDS SHALL EXIST UNDER THE BLANKET.
3. PERIMETER ANCHOR TRENCH SHALL BE USED ALONG THE OUTSIDE PERIMETER OF ALL BLANKET AREAS.
4. JOINT ANCHOR TRENCH SHALL BE USED TO JOIN ROLLS OF EROSION CONTROL BLANKETS TOGETHER (LONGITUDINALLY AND TRANSVERSELY) FOR ALL EROSION CONTROL BLANKETS.
5. INTERMEDIATE CHECK SLOT OR STAPLE CHECK SHALL BE INSTALLED EVERY 15' DOWN SLOPES. IN DRAINAGEWAYS, INSTALL CHECK SLOTS EVERY 25' PERPENDICULAR TO FLOW DIRECTION.
6. OVERLAPPING JOINT DETAIL SHALL BE USED TO JOIN ROLLS OF EROSION CONTROL BLANKETS TOGETHER FOR EROSION CONTROL BLANKETS ON SLOPES.
7. MATERIAL SPECIFICATIONS OF EROSION CONTROL BLANKETS SHALL CONFORM TO TABLE ECB–1.
8. ANY AREAS OF SEEDING AND MULCHING DISTURBED IN THE PROCESS OF INSTALLING EROSION CONTROL BLANKETS SHALL BE RESEEDED AND MULCHED.
9. STRAW EROSION CONTROL BLANKETS SHALL NOT BE USED WITHIN STREAMS AND DRAINAGE CHANNELS.
10. COMPACT ALL TRENCHES.

MAINTENANCE NOTES

1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. EROSION CONTROL BLANKETS SHALL BE LEFT IN PLACE TO EVENTUALLY BIODEGRADE. TRM MUST BE REMOVED AT THE DISCRETION OF THE GEC INSPECTOR.
3. ANY EROSION CONTROL BLANKET PULLED OUT, TORN, OR OTHERWISE DAMAGED SHALL BE REPAIRED OR REINSTALLED. ANY SUBGRADE AREAS BELOW GEOTEXTILE THAT HAVE ERODED TO CREATE A VOID UNDER THE BLANKET, OR THAT REMAIN DEVOID OF GRASS SHALL BE REPAIRED, RESEEDED AND MULCHED AND THE EROSION CONTROL BLANKET REINSTALLED.

TABLE ECB–1, EROSION CONTROL BLANKET MATERIAL SPECIFICATIONS

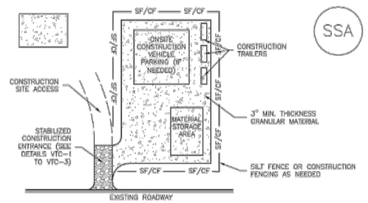
TYPE	COCONUT CONTENT	STRAW CONTENT	EXCELSIOR CONTENT	RECOMMENDED NETTING
STRAW	–	100%	–	DOUBLE/ NATURAL
STRAW–COCONUT	30% MIN.	70% MAX.	–	DOUBLE/ NATURAL
COCONUT	100%	–	–	DOUBLE/ NATURAL
EXCELSIOR	–	–	100%	DOUBLE/ NATURAL

ECB

STORMWATER ENTERPRISE — EROSION CONTROL BLANKET

APPROVED: DIRECT SUPERVISOR

ISSUED:	REVISED:	DRAWING NO.
10/7/19	8/19/2020	900-ECB-2



SSA–1, STABILIZED STAGING AREA

STABILIZED STAGING AREA INSTALLATION NOTES

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

STABILIZED STAGING AREA MAINTENANCE NOTES

1. 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.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. ROCK SHALL BE REAPPLIED OR REGRADED AS NECESSARY IF RUTTING OCCURS OR UNDERLYING SUBGRADE BECOMES EXPOSED.

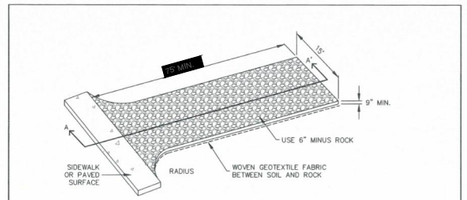
STABILIZED STAGING AREA MAINTENANCE NOTES

5. STABILIZED STAGING AREA SHALL BE ENLARGED IF NECESSARY TO CONTAIN PARKING, STORAGE, AND UNLOADING/LOADING OPERATIONS.
6. 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, SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY LOCAL JURISDICTION.

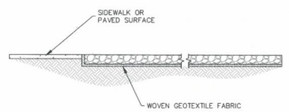
NOTE: MANY MUNICIPALITIES PROHIBIT THE USE OF RECYCLED CONCRETE AS GRANULAR MATERIAL FOR STABILIZED STAGING AREAS DUE TO DIFFICULTIES WITH RE–ESTABLISHMENT OF VEGETATION IN AREAS WHERE RECYCLED CONCRETE WAS PLACED.

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD 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)



AGGREGATE VEHICLE TRACKING CONTROL



SECTION A-A'

INSTALLATION NOTES

1. A STABILIZED CONSTRUCTION ENTRANCE/EXIT SHOULD BE LOCATED AT ALL POINTS WHERE VEHICLES EXIT THE CONSTRUCTION SITE TO ADJACENT ROADWAY.
2. STABILIZED CONSTRUCTION ENTRANCE/EXITS SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
3. RADIUS MUST BE ADEQUATE FOR INTENDED CONSTRUCTION VEHICLE TURNING.
4. ROCK SHOULD CONSIST OF 6" MINUS ROCK.
5. INSTALL CONSTRUCTION FENCE ON BOTH SIDES OF VEHICLE TRACKING CONTROL PAD WHEN NEEDED OR REQUIRED BY INSPECTOR.

MAINTENANCE NOTES

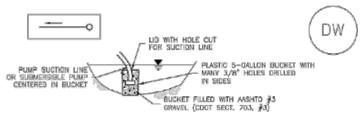
1. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN CONTROL MEASURES IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
2. SEDIMENT TRACKED ONTO THE ADJACENT ROAD SHALL BE REMOVED DAILY, BY SWEEPING OR SHOVELING, AND NEVER WASHED DOWN STORM DRAINS.
3. ROUGHEN, REPLACE AND/OR ADD ROCK AS NEEDED TO MAINTAIN CONSISTENT DEPTH AND TO PREVENT SEDIMENT TRACKING ONTO ADJACENT STREET.
4. PERMANENTLY STABILIZE AREA AFTER VEHICLE TRACKING CONTROL IS REMOVED.

VTC

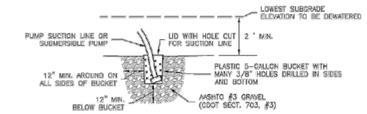
STORMWATER ENTERPRISE — VEHICLE TRACKING CONTROL

APPROVED: DIRECT SUPERVISOR

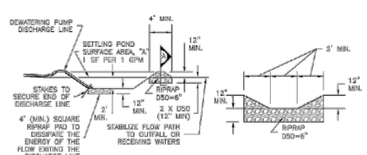
ISSUED:	REVISED:	DRAWING NO.
10/7/19	8/19/2020	900-VTC



DW–1. DEWATERING POND ALREADY FILLED WITH WATER

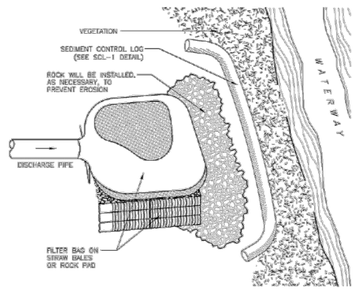


DW–2. DEWATERING SUMP FOR SUBMERSED PUMP



DW–3. SUMP DISCHARGE SETTLING BASIN

SETTLING BASIN SECTION A



DW–4. DEWATERING FILTER BAG

DEWATERING INSTALLATION NOTES

1. SEE PLAN VIEW FOR
   –LOCATION OF DEWATERING EQUIPMENT.
   –TYPE OF DEWATERING OPERATION (DW–1 TO DW–4).
2. THE OWNER OR CONTRACTOR SHALL OBTAIN A CONSTRUCTION DISCHARGE (DEWATERING) PERMIT FROM THE STATE PRIOR TO ANY DEWATERING OPERATIONS DISCHARGING FROM THE SITE. ALL DEWATERING SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE PERMIT.
3. THE OWNER OR OPERATOR SHALL PROVIDE, OPERATE, AND MAINTAIN DEWATERING SYSTEMS OF SUFFICIENT SIZE AND CAPACITY TO PERMIT EXCAVATION AND SUBSEQUENT CONSTRUCTION IN DRY CONDITIONS AND TO LOWER AND MAINTAIN THE GROUNDWATER LEVEL A MINIMUM OF 2–FEET BELOW THE LOWEST POINT OF EXCAVATION AND CONTINUOUSLY MAINTAIN EXCAVATIONS FREE OF WATER UNTIL BACK–FILLED TO FINAL GRADE.

DEWATERING INSTALLATION NOTES

4. DEWATERING OPERATIONS SHALL USE ONE OR MORE OF THE DEWATERING SUMPS SHOWN ABOVE, WELL POINTS, OR OTHER MEANS APPROVED BY THE LOCAL JURISDICTION TO REDUCE THE PUMPING OF SEDIMENT, AND SHALL PROVIDE A TEMPORARY SEDIMENT BASIN OR FILTRATION BMP TO REDUCE SEDIMENT TO ALLOWABLE LEVELS PRIOR TO RELEASE OFF SITE OR TO A RECEIVING WATER. A SEDIMENT BASIN MAY BE USED IN LIEU OF SUMP DISCHARGE SETTLING BASIN SHOWN ABOVE IF A 4–FOOT–SQUARE RIPRAP PAD IS PLACED AT THE DISCHARGE POINT AND THE DISCHARGE END OF THE LINE IS STAKED IN PLACE TO PREVENT MOVEMENT OF THE LINE.

DEWATERING MAINTENANCE NOTES

1. 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.
2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.
3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.
4. DEWATERING BMPs ARE REQUIRED IN ADDITION TO ALL OTHER PERMIT REQUIREMENTS.
5. TEMPORARY SETTLING BASINS SHALL BE REMOVED WHEN NO LONGER NEEDED FOR DEWATERING OPERATIONS. ANY DISTURBED AREA SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.

Print Date: November 12, 2024		Sheet Revisions			Know what's below. Call before you dig.	As Constructed	NORTH GATE BOULEVARD / STRUTHERS ROAD DRAINAGE AND PERMANENT WATER QUALITY POND PROJECT
File Name: 3.07 GEC – DETAILS.DWG		Date:	Comments	Init.		No Revisions:	GEC DETAILS
Horiz. Scale: Vert. Scale:					WILSON & COMPANY 5755 Mark Dabling Blvd. Suite 100 Colorado Springs, CO 80919 Phone: 719-520-5800 FAX: 719-520-0108	Revised:	Designer: NAB / Detailer: KDL / Sheet Subset: GEC
Unit Information Unit Leader						Void:	Structure Numbers / Subset Sheets: EC-3.09

Project No./Code
CDOT Project No. C040-042 (21233)
Sheet Number
44 OF 58

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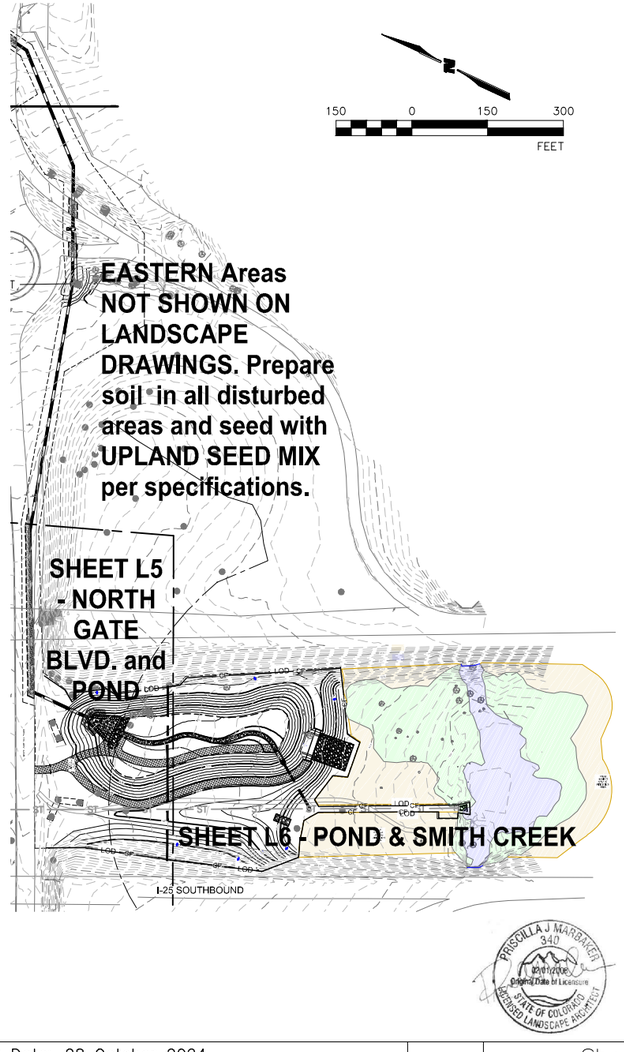
LANDSCAPE SHEET LEGEND

L1 Landscape Cover and General Notes
L2 Soil Amendment, Warranty and General Planting Notes
L3 Seeding and Planting Notes
L4 Plant List
L5 Planting Plan - North Gate Boulevard and Pond
L6 Planting Plan - Pond and Smith Creek

LANDSCAPE SHEET LAYOUT



GENERAL RESTORATION NOTES

1. Vegetative cover at the end of the warranty period will be consistent with the surrounding undisturbed habitats.
2. EROSION MITIGATION GUIDELINES FOR THE LANDSCAPE CONTRACTOR
   - 2.1. The contractor shall limit areas where bare ground exists.
     - 2.1.1. When these areas are temporary impacts, reseeding will be promptly initiated. Revegetate all temporarily impacted areas with specified native seed mixes to reduce erosion.
   - 2.2. Erosion, stormwater, and pollution control BMPs will be implemented during construction to minimize direct impacts to wetlands, streams and riparian areas through erosion and sediment discharge.
     - 2.2.1. Erosion and sediment control measures shall strictly adhere to the erosion control plans. Including but not limited to:
       - 2.2.1.1. Utilize vehicle tracking control devices at the site entrance(s).
       - 2.2.1.2. Placement of concrete washout areas, equipment refueling, and staging areas in upland areas at least 100 feet away from wetlands, creeks, and riparian areas. These areas will be located outside any Preble's habitat. The contractor will have a spill prevention plan.
       - 2.2.1.3. All stockpiles shall be protected from sediment transport by surface roughening, watering, and perimeter silt fencing if/as required by the Stormwater Management Plan.
3. NOXIOUS WEED CONTROL DURING CONSTRUCTION
   - 3.1. Noxious weeds will be controlled by the contractor in all disturbed areas and will be implemented from mobilization through the contracted warranty period.
   - 3.2. Noxious weeds will be controlled by the contractor in all impacted habitat areas until 0 percent of Colorado Noxious Weed Act (Colorado Revised Statutes [CRS] 35-5.5-1011-119) List A species and less than 5 percent of List B or 10 percent of list C species are found in overall plant cover from transects or plot data.
     - 3.2.1. To avoid the continued spreading of noxious weeds, all discrete populations of Colorado List A, B, or C noxious weeds found in or within 100 feet of the restoration area will be sprayed with the appropriate herbicide(s) prior to construction. Always follow all label recommendations, precautions and restrictions when using any herbicide. Read and comply with all herbicide labels, organic or non-organic, for application rates, mixing instructions, protective equipment, re-entry period, grazing or harvest restrictions and other safety information. Herbicides should be applied only by responsible, licensed applicators.
4. PREBLE'S MOUSE HABITAT
   - 4.1. A qualified ecologist or landscape architect shall provide a briefing to the contractor prior to ground disturbance to discuss the project and ensure understanding of avoidance and minimization measures. Conservation measures are thoroughly described on page 11-12 of the biological assessment.
   - 4.2. Construction access in Preble's mouse habitat will be confined to areas identified as impact areas on the plans or by the qualified ecologist or landscape architect.
     - 4.2.1. Habitat areas, specifically high-quality Preble's mouse habitat such as dense willow areas, will be identified and impacts to these areas will be fully minimized.
     - 4.2.2. No construction staging will be allowed in high-quality Preble's mouse habitat.
     - 4.2.3. Preble's mouse habitat adjacent to construction zones will be fenced to prevent construction equipment and other disturbances from occurring in these areas.
     - 4.2.4. Access for mitigation work in Preble's Mouse Habitat will be by foot. No ATVs, pickups or large equipment are permitted.
5. Follow requirements of all specifications. Review and resolve any discrepancies with the Owners Representative prior to starting work with the USAFA Revegetation and Erosion Control Standards, Sept 2024.
6. Contractor and Owner's Representative shall verify the correct location of all underground utilities in the field prior to commencing work.
6. Contractor and Owner's Representative shall verify the requirements of the Biological Assessment prior to commencing work.
7. Contractor shall not willfully proceed with construction as designed when it is obvious that unknown obstructions and/or grade differences exist that may not have been known during design. Such conditions shall be immediately brought to the attention of the Owner's Representative for a decision. The Contractor shall assume full responsibility for all necessary revision due to failure to give such notification.
8. Construction materials, equipment, fuels, lubricants, and other petroleum distillates should not be stored or stockpiled within 100 horizontal feet of the creek or other aquatic habitats such as ponds and wetlands. Equipment fueling and servicing should occur only within approved designated areas.
9. Refer to notes for staking method, soil preparation, plant pit dimensions and backfill requirements.

GENERAL PERFORMANCE MONITORING NOTES

The objective of monitoring is to ensure that the Preble's mitigation measures have been properly implemented, to evaluate the success of the efforts by identifying issues that could prevent or interfere with the establishment of self-sustaining restoration and enhancement areas, and to suggest remedial activity recommendations to remedy these issues. Monitoring evaluates the status of the restoration and enhancement measures, including plant composition, density, and site hydrology.

1. Annual mitigation monitoring will be conducted by El Paso County during the growing season.
2. An annual mitigation monitoring report will be written by El Paso County and submitted by El Paso County to USAFA and USFWS (Project stakeholders or regulators) before December 1 of each year and will extend for five (5) years after completion of the mitigation installation or until Project regulators determine that the success criteria have been met.
   - 2.1. Problems that could prevent or interfere with the establishment of the mitigation area will be brought to the attention of the Owner, designated oversight team, and Project regulators.
   - 2.2. The Owner or Project Engineer will review and approve alterations to mitigation area design necessary for successful mitigation.
   - 2.3. All recommended remedial actions will be communicated to the Owner and designated oversight team and will be implemented after they have been approved by the Project regulators.
   - 2.4. The Owner and/or designated oversight team will annually assess results of the vegetation monitoring efforts to determine the success of Preble's habitat restoration.
3. Success criteria for the Preble's mouse habitat restoration and mitigation includes:
   - 3.1. Site preparation for seeding and planting will use a high-quality amendments consistent with the USAFA Revegetation and Erosion Control Standards, September 2024 and the Biological Assessment.
   - 3.2. Plant Survival shall be in accordance with the USAFA Revegetation and Erosion Control Standards, September 2024.
     - 3.2.1. At least 80% of planted shrubs in each planting bed or pod will survive.
     - 3.2.2. At least 80% of the willow stakes in each planting bed or pod will survive.
     - 3.2.3. 100% of planted trees will survive.
     - 3.2.4. Throughout the planted mitigation area, at least 70 percent of the total cover is established with native plant species and growing without showing signs of stress or the continued need for irrigation. This requirement is independent of the stormwater construction permit.
   - 3.3. Noxious weeds and other invasive species will be controlled in restored and enhanced areas and weed control will be conducted for five years or until it is considered successful when 0 percent of Colorado Department of Agriculture (CDA) designated List A species and less than 5 percent of List B species and 10 percent of list C species are found in overall plant cover from ocular estimates.
   - 3.4. Final vegetative cover will be consistent with the surrounding undisturbed habitat.

PRISCILLA J MARBAUGH 340 10/31/2024 Original Date of Licensure STATE OF COLORADO REGISTERED LANDSCAPE ARCHITECT

Landscape Cover Sheet

Print Date: 28 October 2024	Sheet Revisions			As Constructed	Project No./Code
File Name: 24.10.28_STRUTHERS LANDSCAPE.DWG	Date:	Comments	Init.	No Revisions:	NORTH GATE / STRUTHERS PWQ POND LANDSCAPE
Horiz. Scale: Vert. Scale:				Revised:	176103
Unit Information Unit Leader				Void:	Designer: PJM / Detailer: PJM / Sheet Subset: Landscape / Structure Numbers / Subset Sheets: L1
TAPS associates 540 Buckeye, Terrace Level Colorado Springs, CO 80919 phone: 719.593.1540					Sheet Number 53 OF 58

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SOIL AMENDMENT and FINISH GRADING NOTES

1. No work should be done when soil is frozen, snow covered, wet, or muddy.
2. Contractor to verify positive drainage in all areas to be planted or seeded.
3. Before soil amendment is imported, placed, and incorporated, till subsoil in areas to be planted and seeded with the Loamy/Clayey Foothills Seed Mix (Upland Mix) to a depth of 12” and in accordance with the USAFA Revegetation and Erosion Control Standards, September 2024.

   3.1. SUBSOIL SOIL TESTING
   3.2. After subsoil tilling per note #3 above, follow soil testing procedures in the USAFA Revegetation and Erosion Control Standards, September 2024.

4. COMPOST and SOIL AMENDMENT
   4.1. Amend areas to be planted and seeded with Upland Seed Mix per soil test results and the USAFA Revegetation and Erosion Control Standards, September 2024.
   4.2. The minimum amount of compost to be applied is 3cy/1,000sf.
   4.3. Before seeding and mulch application, compost, soil humates and/or fertilizers should be mixed as needed per soil-nutrient testing results.
   4.4. Incorporate soil amendments to a depth of 6" in accordance with the USAFA Revegetation and Erosion Control Standards, September 2024.
   4.5. Grade amended soil to eliminate rough, low, or soft areas and to insure positive drainage.
   4.6. Shrubs in On-site Upland Mitigation Areas: Scarify each shrub planting pit. Backfill each shrub planting pit with mixture of 1/3 compost and ⅔ native soil.

5. FINISH GRADE
   5.1. For all areas where drill seeding is not feasible, finished grades shall be left rough and natural with soil clods no greater than 3 inches in diameter, no smooth surfaces.
   5.2. For drill seeded areas, grades will be flat and smooth to allow for even seeding.

PRISCILLA J MARBAKER 340 10/01/2006 Original Date of Licensure STATE OF COLORADO REGISTERED LANDSCAPE ARCHITECT

WARRANTY NOTES

1. Contractor shall provide a 2-year warranty on all plant material, willow stakes, seeding, and workmanship.
2. WARRANTY PERIOD (Landscape Establishment Period)
   2.1. The beginning of the warranty period depends upon receipt of the written Notice of Substantial Landscape Completion from the Engineer.
   2.2. If the Notice of Substantial Landscape Completion is issued during the spring planting season, the Landscape Establishment period begins immediately and lasts for a period of 24 months. If the Notice of Substantial Landscape Completion is issued at any other time, the Landscape Establishment period begins at the start of the next spring planting season and lasts for a period of 24 months.

3. WARRANTY MAINTENANCE (Landscape Establishment)
   During the Warranty/ Landscape Establishment period, the Contractor shall water, cultivate, and prune the plants and repair, replace, or readjust guy material, stakes, and posts as required or directed by the Engineer. Contractor shall reshape plant saucers, repair washouts and gullies, replace lost wood chip mulch, keep all planting sites free from weeds and do other work necessary to maintain the plants in a healthy and vigorous growing condition. This includes seasonal spraying or deep root watering with approved insecticides or fungicides as required. The Contractor shall remove all guying wire, straps, and stakes at the end of the Warranty/Landscape Establishment period.
   3.1. PLANTS: Replacement plant material shall be of the same species and size as the stressed, decayed, or dead plant material as the condition is observed.
   3.2. WATERING: The contractor will provide a work plan that details how water volume is measured or estimated to ensure each plant receives the specified quantity.
      3.2.1. Trees planted shall be watered twice per month by the Contractor at the rate of 30 gallons per tree per watering for the months May through October, and once per month at the rate of 30 gallons per tree for the months November through April of all time following planting and the warranty period.
      3.2.2. Shrubs planted in Northgate Boulevard upland area shall be watered twice per month by the Contractor at the rate of 10 gallons per shrub per watering for the months May through October and shall be watered once per month at the rate of 10 gallons per shrub for the months November through April of all time following planting and the warranty period.
      3.2.3. Shrubs planted in PMJM habitat areas shall be watered twice per month by the Contractor at the rate of 3 gallons per shrub per watering for the months May through October and shall be watered once per month at the rate of 3 gallons per shrub for the months November through April of all time following planting and the warranty period.
   3.3. SEEDED AREAS: The Contractor shall restore and reseed eroded areas and areas of poor establishment per Sections 212 and 213 of the CDOT specifications.
4. Vegetative cover at the end of the warranty period will be consistent with the surrounding undisturbed habitats.
5. During warranty period, Contractor shall mow or cut riparian vegetation in the “permanent impact” areas (the graded areas) to a height of 4-6 inches above the ground during the active season, while Preble's mice are still active and can move away (May-August). This will create a less desirable habitat for hibernation, which usually starts by late September.

6. NOXIOUS WEED CONTROL During the Warranty Period
   6.1. Noxious weeds will be controlled by the contractor in all impacted habitat areas until 0 percent of Colorado Noxious Weed Act (Colorado Revised Statutes [CRS] 35-5.5-1011-119) List A species and less than 5 percent of List B or 10 percent of list C species are found in overall plant cover from transects or plot data.
   6.2. Noxious weed control will be implemented through the contracted warranty period.

GENERAL PLANTING and SEEDING NOTES

1. All plant material shall conform to the sizes given in the plant list and shall be nursery grown in accordance with the "American Standard for Nursery Stock", latest edition. www.anla.org
2. All planting shall be in accordance with standard American Association of Nurserymen procedures and specifications, and in accordance with the USAFA Revegetation and Erosion Control Standards, Sept 2024.
3. Contractor and Owner's Representative shall verify the correct location of **all** underground utilities in the field prior to installation of any plant materials.
4. Contractor shall be responsible for the safety of those associated with the work, pedestrians and the general public throughout the duration of the contract.
5. Obtain approval from Architect's or Owner's Representative before making any substitutions or changes.
6. Quantities shown on the plant list are for the Contractor's convenience only and are not guaranteed to be accurate. In the event of a discrepancy between quantities shown on the plan and quantities shown on the plant list, the quantities on the plan shall apply.
7. Contractor shall not willfully proceed with construction as designed when it is obvious that unknown obstructions and/or grade differences exist that may not have been known during design. Such conditions shall be immediately brought to the attention of the Owner's Representative for a decision. The Contractor shall assume full responsibility for all necessary revision due to failure to give such notification.
8. Contractor is responsible for installing all landscape shown on this plan.

9. QUALIFIED ECOLOGIST WILL DIRECT AND SUPERVISE ALL PLANTINGS
   9.1. Contractor is responsible for contacting the ecologist or landscape architect for all required inspections. Provide at least 48 hours' notice to schedule inspections.
   9.2. After the site has been staked, but prior to clearing, grubbing, and earthwork activities, the contractor, engineer, and ecologist shall walk the site to evaluate and locate existing plant material to be protected and identify plant material that may be salvaged within the designated limits of construction.
   9.3. Planting locations will be field fit based on the appropriate hydrology at the time of restoration.
10. No equipment will be allowed in the restoration area immediately following seeding until establishment.
11. The use of chemicals such as soil stabilizers, dust palliatives, herbicides, growth inhibitors, deicing salts, etc., should be in accordance with the manufacturer's recommended application rates, frequency, and instructions. These chemicals should not be used, stored, or stockpiled within 100 horizontal feet of flowing water or other aquatic habitats such as ponds and wetlands.
12. Refer to specifications and notes for staking method, soil preparation, plant pit dimensions and backfill requirements.
13. WATERING: Water in newly planted nursery stock and unrooted cuttings in non-irrigated areas. Contractor shall furnish and supply the correct amount of water to the area receiving unrooted cuttings and nursery stock to keep the plants in a healthy and vigorous condition. All plantings shall be watered within four (4) hours of placement. All plant material shown on the plans (excluding seeded areas) shall be watered to ensure successful establishment. Rate of flow shall allow the water to soak into the soil adjacent to the planting. At no time shall watering operations be applied at a rate or intensity that causes surface run off.
14. MAINTENANCE DURING CONSTRUCTION. Landscape maintenance and watering shall start immediately upon placement of first permanent landscaping and continue until the Notice of Substantial Landscape Completion has been received. The Contractor shall maintain the seeded areas, nursery stock and unrooted cuttings in a healthy and vigorous growing condition to ensure successful establishment.

15. CONSTRUCTION TIMING
   15.1. Any trees or shrubs to be removed for the project will be removed during the non-nesting season for migratory birds (between September 1 and March 31)
   15.2. Seeding shall be performed in unfrozen ground in accordance with the USAFA Revegetation and Erosion Control Standards, September 2024.
   15.3. Planting shall be performed between September 1 and when the ground freezes, and when the ground thaws and May 15.
   15.4. Sandbar willow (Salix exigua) and peach leaf willow (Salix amygdaloides) stakes must be harvested from within the limits of construction or other legally accessible sites nearby while dormant (Nov - after leaf drop to April - prior to bud break).

Landscape Notes

Print Date: 28 October 2024	Sheet Revisions		
File Name: 24.10.28_STRUTHERS LANDSCAPE.DWG	Date:	Comments	Init.
Horiz. Scale: Vert. Scale:			
Unit Information Unit Leader			
TAPS associates 540 Buckeye, Terrace Level Colorado Springs, CO 80919 phone: 719.593.1540			

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As Constructed	NORTH GATE / STRUTHERS PWQ POND LANDSCAPE		Project No./Code
No Revisions:			176103
Revised:	Designer: PJM	Structure Numbers	Sheet Number
Void:	Detailer: PJM		54 OF 58
	Sheet Subset: Landscape	Subset Sheets: L2	

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SEEDING NOTES

1. No work should be done when soils are frozen, snow covered, wet, or muddy.
2. Complete ALL soil amendment and finish grading work prior seeding.
3. After soil amendment, and finish grading is completed in the restoration area, seeding will take place within 48 hours (or sooner as required by the erosion control plan).

4. SEEDING
   - 4.1. Drill seeding will be the required seeding method; however, where terrain doesn't allow drill seeding, hand-broadcast method at double the rate is acceptable.
     - 4.1.1. Prior to seed purchase, all areas to be hand broadcast must be approved by the project ecologist or landscape architect.
     - 4.1.2. In drill seeded areas, grades will be flat to allow for even seeding.
     - 4.1.3. In hand broadcast areas, grades will be rough (plus or minus 3 inches), not smooth or flattened.
   - 4.2. Drill seeding
     - 4.2.1. Seed should be pre-purchased and stored in a cool, dry, rodent free location until ready for use.
     - 4.2.2. All seed bags found onsite should be tagged and labeled. Seed bag tags should have the following information: project name, total pounds pure live seed (PLS), and the scientific names and seeding rate for each species.
     - 4.2.3. Apply an appropriate amount of seed throughout the site using a drill seeding method at the rates specified. Adjust as necessary to ensure even and complete coverage of varied seed sizes.
     - 4.2.4. Adjust drill depth to ensure good seed to soil contact and that most seeds have ~1/4 to ½ inch coverage.
   - 4.3. Hand Broadcast Seeding
     - 4.3.1. Where hand broadcasting is approved, apply an appropriate amount of seed throughout the site using a hand broadcast method at double the drill seed rate, seed bags should be divided into two equal parts prior to application. Similarly, divide the application area into two zones (loosely, or using field measurements). Apply half the stock of seed to the half of the project area carefully, keeping track of percent used vs. percent of area still needing to be covered. Adjust as necessary to ensure even and complete coverage.
     - 4.3.2. After hand-broadcast seeding, rake the area using a sturdy metal bow rake to ensure good seed to soil contact and that most seeds have ~1/4 to ½ inch coverage.
     - 4.3.3. All finished grades will be left rough and natural with soil clods no greater than 3 inches in diameter, no smooth surfaces or straight edges.
   - 4.4. Seeded areas must be delineated (e.g., flagged) for avoidance from heavy equipment.

5. SEEDED AREA MULCHING
   - 5.1. Place erosion control blankets as designated on the civil plans within 24 hours of seeding.
   - 5.2. All areas not covered by erosion control blankets shall be hydromulched with mechanically defibrated virgin wood fiber at a rate of 2,500 lbs/acre with 150 lbs/acre of organic psyllium derived tackifier. Hydromulching must take place within 24 hours of seeding.

6. RECOMMENDED SEED VENDORS
   - 6.1. Arkansas Valley Seed 4333 Hwy. 66 Longmont, CO 80504 (877) 907-3337 www.avseeds.com
   - 6.2. Pawnee Buttes Seed 605 25th St. Greeley, CO 80632 (800) 782-5947 www.pawneebuttesseed.com
   - 6.3. Western Native Seed P.O. Box 188 Coaldale, CO 81222 (719) 942-3935 www.westernnativeseed.com

PLANTING NOTES

1. All plant beds and planting areas to be mulched with shredded aspen mulch to a depth of 3" unless otherwise noted on drawings or specifications.

2. LIVE WILLOW STAKE HARVEST AND INSTALLATION
   - 2.1. Sandbar willow (Salix exigua) and peach leaf willow (Salix amygdaloides) stakes must be harvested from within the limits of construction or other legally accessible sites nearby while dormant (Nov - after leaf drop to April - prior to bud break). All areas for harvest shall be approved by the ecologist prior to cutting and the ecologist will oversee the willow stake harvest operation.
     - 2.1.1. Avoid harvesting and installing crack willow (Salix fragilis), which resembles peach leaf willow but is non-native and invasive in Colorado.
     - 2.1.2. When harvesting outside of the limits of construction, remove no more than 20% of the branches from any single willow clump, do not remove more than 30% of the overall canopy cover from any willow stand and harvest stems evenly through the stand.
   - 2.2. Stakes shall be 3-feet in length and ½ to 1 inch diameter at the base. The stem shall be pruned of all branches with the bottom end cut at a 45-degree angle and the top end cut at a 90-degree angle.
   - 2.3. As stakes are cut, the bottom end shall be immediately placed into water. Once harvested, stakes shall be completely submerged in cold water-for at least 72 hours, but not more than 14 days, prior to planting. The storage location shall be shaded to maintain a cold-water temperature. The stakes will be kept wet until placed into the ground and will not be stored out of water for more than 10 minutes prior to planting.
   - 2.4. Stake planting spacing shall be 1.5-foot on center, located 1-2.5 feet above water surface level. Stakes shall be installed to a depth of 24-inches ensuring that the bottom end is placed in or at the top of the water table.
   - 2.5. All cuttings should be trimmed after installation to ensure that no more than 1/4 of their length is left above ground, to avoid unnecessary desiccation (drying).
   - 2.6. Pilot holes should be backfilled by stamping/stepping down around the installed cutting, or pouring a thick mud-slurry mix, to remove any air pockets. Willow "air prune" and will not grow roots if air pockets remain in the pilot hole.
   - 2.7. Willow staking will occur where they have the best chance of survival.

3. CONTAINERIZED PLANT MATERIAL INSTALLATION
   - 3.1. All containerized plant material must be inspected for health, size, and species upon arrival onsite, notify the ecologist at least 3 business days prior to delivery. Alternatively, local nursery inspection of plants may be arranged prior to delivery. Please notify the ecologist at least 3 business days prior to scheduled delivery.
   - 3.2. All plant material should be watered prior to transport and covered during transport. Water plant material once it arrives onsite and store in a shaded location.
   - 3.3. The contractor will mark all planting locations for adjustment and approval by the ecologist prior to installation.
     - 3.3.1. Containerized plantings will occur where they have the best chance of survival.
     - 3.3.2. Planting locations will be field fit based on the appropriate hydrology at the time of restoration.
   - 3.4. When installing shrubs, dig each planting hole 1.5 to 2 times the width of the rootball.
   - 3.5. Shrubs shall be deep planted, when necessary and as plant material size allows to ensure placement of the rootball in the capillary fringe (moist soil) immediately above the water table.
   - 3.6. Per the planting plan, plant 2 species per planting pod (group), with roughly 15-20 containers of each those species, totaling roughly 30-40 plants per planting pod.
     - 3.6.1. Mark the approximate center of each planting pod with a 4' stake - to easily identify the location for watering
   - 3.7. Create watering basins for all shrubs (except willow stakes). All 60 cubic inch (ci) shrub bed watering dishes shall be 3 inches deep by 2 feet in diameter.
   - 3.8. Once planted, all shrubs shall be watered so that the entire rootball and soil around the rootball are inundated. Water thoroughly on the day of planting.
   - 3.9. Shrubs will be watered from time of planting through the warranty period. See Warranty Notes.

4. RECOMMENDED CONTAINERIZED PLANT MATERIAL VENDORS:
   - 4.1. Aquatic and Wetland Nursery Heidi Windell heidi@aquaticandwetland.com Phone: 303-442-4766 ext. "115" https://aquaticandwetlandnursery.com
   - 4.2. North Fork Native Plants 1499 South 6000 West Rexburg, ID 83440 Phone: 208-354-3691 info@northforknativeplants.com http://www.northforknativeplants.com

PRISCILLA J MARBAUGH 340 — Registered Landscape Architect — State of Colorado

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Landscape Notes

Print Date: 28 October 2024	Sheet Revisions		
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Horiz. Scale: Vert. Scale:			
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As Constructed	NORTH GATE / STRUTHERS PWQ POND LANDSCAPE			Project No./Code
No Revisions:				176103
Revised:	Designer: PJM	Structure Numbers		Sheet Number
Void:	Detailer: PJM			55 OF 58
	Sheet Subset: Landscape	Subset Sheets:	L3	

PLANT LIST

QUANTITY	SYM	SCIENTIFIC NAME	COMMON NAME	GROWTH FORM	SIZE	SPACING (O.C.)
PREBLE'S MOUSE HABITAT PLANTINGS near SMITH CREEK						
40	af	Amorpha fruticosa	Leadplant	Shrub	60 ci	3'
40	cs	Cornus sericea	Redosier Dogwood	Shrub	60 ci	3'
40	pa	Prunus americana	American Plum	Shrub	60 ci	3'
60	pv	Prunus virginiana	Chokecherry	Shrub	60 ci	3'
40	ra	Ribes aurem	Golden Currant	Shrub	60 ci	3'
40	rw	Rosa woodsii	Woods' Rose	Shrub	60 ci	3'
10	sa	Salix amygdaloides	Peach leaf willow	Stakes	36" long	10'
850	se	Salix exigua	Sand bar willow	Stakes	36" long	3'
60	so	Symphoricarpos occidentalis	Western Snowberry	Shrub	60 ci	3'
		O.C. = On center; ci = Cubic inch; A 60 ci Deepot 60 = 2.5" diameter x 14"deep				
NORTH GATE BOULEVARD PLANTING						
20	ac	Amorpha canescens	Silvery Leadplant	Shrub	5 gal	3'
9	cm	Cercocarpus montanus	Mountain Mahogany	Shrub	5 gal	4'
29	en	Ericameria nauseosa	Rubber Rabbitbrush (Chrysothamnus nauseosus)	Shrub	5 gal	3'
8	fp	Fallugia paradoxa	Apache Plume	Shrub	5 gal	5'
2	JS	Juniperus scopulorum	Rocky Mountain Juniper	Tree	5 gal	8'
6	PE	Piñon Pine	Pinus edulis	Tree	5 gal	15'
3	PP	Pinus ponderosa	Ponderosa Pine	Tree	5 gal	30'
14	pb	Prunus besseyi	Western Sandcherry	Shrub	5 gal	4'
59	rt	Rhus trilobata	Skunkbush Sumac	Shrub	5 gal	3'
7	rc	Ribes cereum	Wax Currant	Shrub	5 gal	3'
26	wrw	Rosa woodsii	Western Wild Rose	Shrub	5 gal	3'
13	QG	Quercus gambelii	Gambel Oak	Tree	5 gal	12'
12	yg	Yucca glauca	Plains Yucca	Shrub	5 gal	2'

SEEDING MIXES

Table 3: Riparian Seed Mix

Riparian Mix						
Scientific Name	Variety*	Common Name	PLS lbs/ac	% by Weight	PLS/ sq ft	% of PLS/sq ft
Graminoids						
Carex nebrascensis	vns.	Nebraska sedge	1.50	4	18	12
Distichlis spicata	vns.	inland saltgrass	1.20	3	14	9
Elymus canadensis	vns.	Canada wildrye	6.30	16	17	11
Elymus lanceolatus ssp. lanceolatus	vns.	thickspike wheatgrass	4.00	10	14	9
Elymus trachycaulus	San Luis or White River	slender wheatgrass	3.00	8	11	7
Juncus arcticus ssp. littoralis	vns.	mountain rush	0.06	0	15	10
Panicum virgatum	vns.	switchgrass	3.00	8	18	11
Pascopyrum smithii	Arriba	western wheatgrass	1.00	3	3	2
Sporobolus airoides	Salado	alkali sacaton	0.25	1	10	6
Sporobolus cryptandrus	vns.	sand dropseed	0.08	0	10	6
Triticum aestivum x Secale cereale	vns.	Quickguard	10.00	26	3	2
		Graminoid Totals	30.39	78	133	85
Forbs						
Asclepias speciosa	vns.	showy milkweed	4.50	12	7	5
Cleome serrulata	vns.	Rocky Mountain beeplant	3.00	8	5	3
Helianthus maximiliani	vns.	Maxmilian sunflower	0.90	2	4	3
Rudbeckia hirta	vns.	blackeyed susan	0.12	0	5	3
Verbena hastata	vns.	swamp verbena	0.08	0	3	2
		Forb Totals	8.60	22	24	15
		Total	**38.99**	**100**	**157**	**100**

*vns. = variety not specified

Table 5: Loamy/Clayey Foothills Seed Mix (UPLAND MIX)

Loamy/Clayey Foothills Mix						
Scientific Name	Variety*	Common Name	PLS lbs/ac	% by Weight	PLS/ sq ft	% of PLS/sq ft
Graminoids						
Andropogon gerardii	vns.	big bluestem	2.00	4	6	4
Bouteloua curtipendula	vns.	sideoats grama	3.20	6	14	10
Bouteloua dactyloides	vns.	buffalograss	7.20	14	9	6
Bouteloua gracilis	CO Native	blue grama	0.85	2	16	11
Elymus elymoides	vns.	bottlebrush squirreltail	2.50	5	11	8
Hesperostipa comata ssp. comata	vns.	needle and thread	2.60	5	7	5
Koeleria macrantha	Sims Mesa	prairie junegrass	0.29	1	15	11
Nassella viridula	vns.	green needlegrass	3.10	6	13	9
Pascopyrum smithii	Arriba	western wheatgrass	6.50	13	16	11
Schizachyrium scoparium	Cimarron	little bluestem	2.00	4	12	8
Triticum aestivum x Secale cereale	vns.	Quickguard	15.00	30	5	3
		Graminoid Totals	45.24	90	125	85
Forbs						
Artemisia frigida	vns.	prairie sagewort	0.03	0	3	2
Dalea purpurea var. purpurea	vns.	purple prairie clover	1.20	2	6	4
Ratibida columnifera	vns.	upright prairie coneflower	0.30	1	5	3
Sphaeralcea coccinea	vns.	scarlet globemallow	0.50	1	6	4
Vicia americana	vns.	American vetch	3.00	6	2	2
		Forb Totals	5.03	10	22	15
		Total	**50.27**	**100**	**147**	**100**

*vns. = variety not specified

PRISCILLA J MARBAKER 340 Registered Professional Landscape Architect STATE OF COLORADO

Plant List and Details

Print Date: 28 October 2024
File Name: 24.10.28_STRUTHERS LANDSCAPE.DWG
Horiz. Scale: Vert. Scale:
Unit Information Unit Leader

TAPS associates
540 Buckeye, Terrace Level
Colorado Springs, CO 80919
phone: 719.593.1540

Sheet Revisions

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NORTH GATE / STRUTHERS
PWQ POND
LANDSCAPE

Designer: PJM
Detailer: PJM
Sheet Subset: Landscape
Structure Numbers:
Subset Sheets: L4

Project No./Code
176103

Sheet Number
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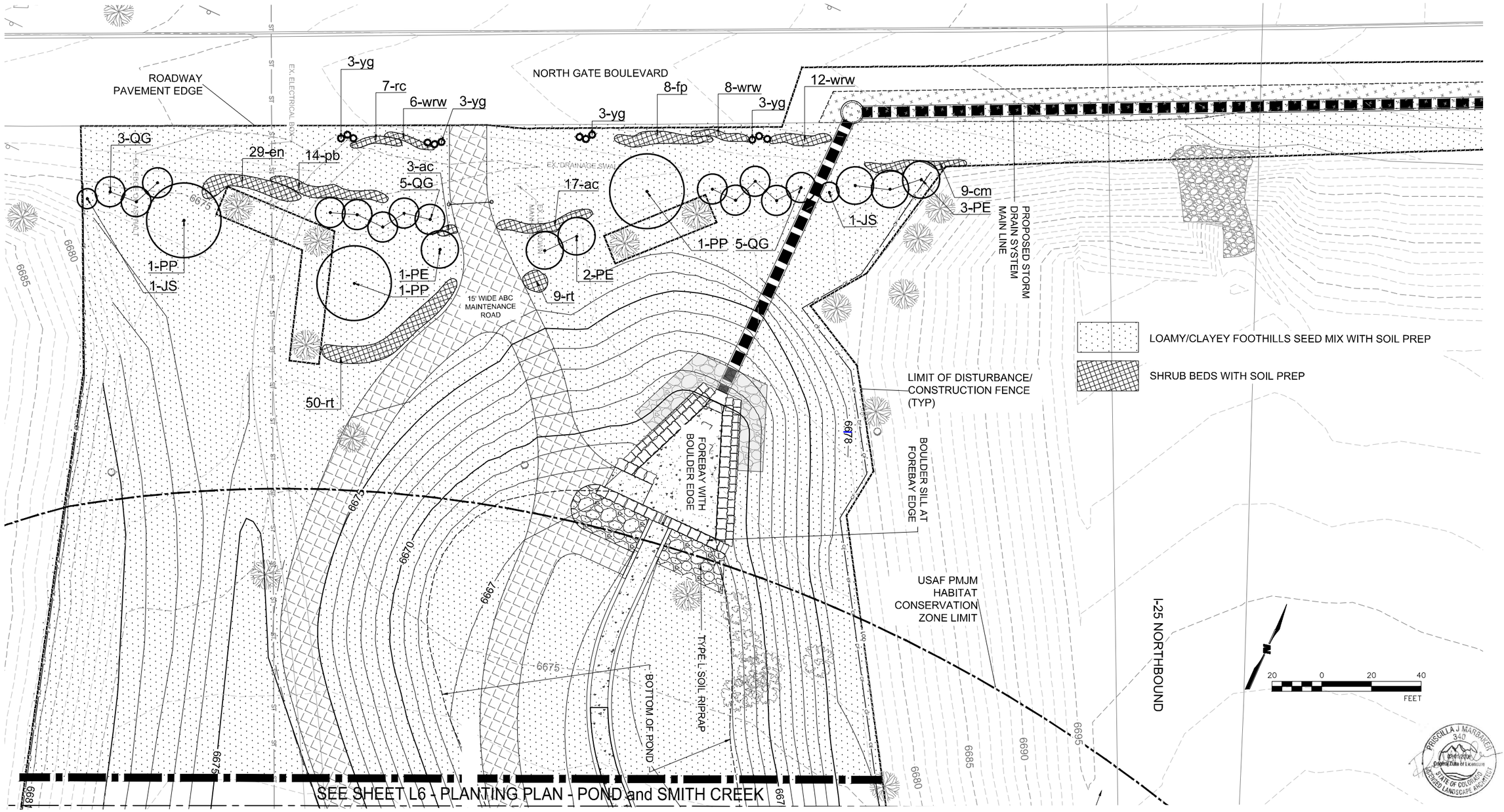

PLANTING PLAN - NORTH GATE BOULEVARD and POND

1" = 20'-0"

Planting Plan - North Gate Blvd. and Pond

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Horiz. Scale: Vert. Scale:			
Unit Information Unit Leader			

TAPS associates
540 Buckeye, Terrace Level
Colorado Springs, CO 80919
phone: 719.593.1540

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

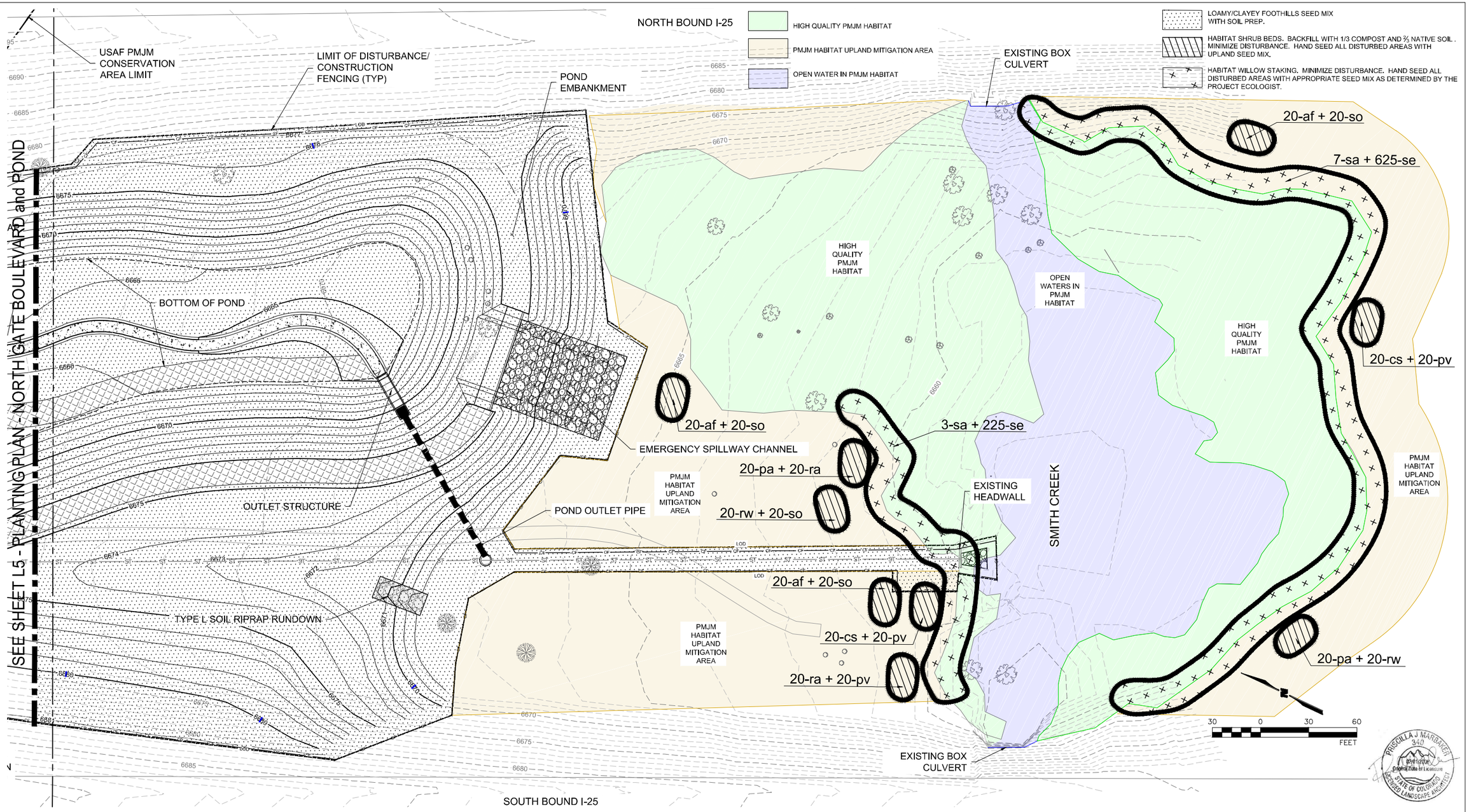
EL PASO COUNTY, COLORADO EST. 1861

WILSON & COMPANY
5755 Mark Dabling Blvd.
Suite 100
Colorado Springs, CO 80919
Phone: 719-520-5800
FAX: 719-520-0108

As Constructed	NORTH GATE / STRUTHERS PWQ POND LANDSCAPE			Project No./Code
No Revisions:				176103
Revised:	Designer: PJM	Structure Numbers		Sheet Number
Void:	Detailer: PJM			57 OF 58
	Sheet Subset: Landscape	Subset Sheets:	L5	

PRISCILLA J MARBAKER 340 LANDSCAPE ARCHITECT Original Date of Licensure STATE OF COLORADO REGISTERED LANDSCAPE ARCHITECT

10/28/2024 C:\Users\twoba\TAPS\PROJECTS\Northgate STRUTHERS Stormwater\24.10.28_Struthers Landscape.dwg



PLANTING PLAN - POND and SMITH CREEK

1" = 20'-0"

Planting Plan - Pond and Smith Creek

Print Date: 28 October 2024	Sheet Revisions		
File Name: 24.10.28_STRUTHERS LANDSCAPE.DWG	Date:	Comments	Init.
Horiz. Scale: Vert. Scale:			
Unit Information Unit Leader			

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Colorado Springs, CO 80919
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Void:	Detailer: PJM		58 OF 58
	Sheet Subset: Landscape	Subset Sheets: L6	

PRISCILLA J MARBAKER 940 Registered Professional Landscape Architect STATE OF COLORADO

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