GRADING, EROSION, AND SEDIMENT CONTROL (GESC) PLAN (STORMWATER MANAGEMENT PLAN)
Park Meadows – Garage and Retail

Address:
8517 Park Meadows
Center Drive
Lone Tree, CO 80124

Prepared:
March 8, 2024

Revised:
May 7, 2024

Prepared for:
Park Meadows Mall, LLC/Park Meadows Anchor Acquisition, LLC

8401 Park Meadows Center Drive

Lone Tree, CO 80124

303.595.7000

Prepared by:
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I. Certifications

The Grading, Erosion and Sediment Control Plan included herein has been placed in the City of Lone Tree file for this project and appears to fulfill applicable City of Lone Tree and Douglas County Grading, Erosion and Sediment Control criteria, as amended. Additional grading, erosion and sediment control measures may be required of the permittee(s) due to unforeseen erosion problems or if the submitted GESC Plan does not function as intended. The requirements of this GESC Plan shall run with the land and be the obligation of the permittee(s) until such time as the GESC Plan is properly completed, modified, or voided.

DEVELOPER CERTIFICATION

Park Meadows Mall, LLC/Park Meadows Anchor Acquisition hereby certifies that the grading, erosion and sediment control facilities for the Park Meadows – Garage and Retail shall be constructed according to the design presented in this report. I understand that the City of Lone Tree does not and will not assume liability for the grading, erosion and sediment control facilities designed and/or certified by my engineer and that the City of Lone Tree reviews GESC plans; but cannot, on behalf of the Park Meadows – Garage and Retail, guarantee that final review will absolve Brookfield Properties and/or their successors and/or assigns of future liability for improper design.

_____ _____

PROJECT OWNER/REPRESENTATIVE Date

Park Meadows Mall, LLC/Park Meadows Anchor Acquisition

ENGINEER CERTIFICATION

The Grading, Erosion and Sediment Control (GESC) report included herein has been prepared under my direct supervision in accordance with the requirements of the City of Lone Tree and the Douglas County Grading, Erosion and Sediment Control Criteria Manual, as amended.

John O'Rourke, P.E.
State Of Colorado Registration No 43327
On Behalf of Harris Kocher Smith

II. General Location and Site Description

A. Location

The Park Meadows – Garage and Retail development (Site) lies within Lot 4-C-1 of the Park Meadows Town Center Filing 1-A, 1st Amendment. The Project is situated in Section 3, Township 6 South, Range 67 West of the 6th Principal Meridian, Douglas County, Colorado. A Vicinity Map is located in Appendix A of this report.

The Site is situated in Park Meadows Mall bound by the existing JCPenney garage to the west, Park Meadows Ring Road to the north, existing parking lots to the east, and the Park Meadows Mall food court to the south. The Site is bounded by right-of-way on the north by East County Line Road, on the west by South Yosemite Street, and the south by State Route 470 and on the east by Interstate Highway 25. Numerous developments immediately surround the site, which includes hotels, restaurants, and retail stores.

B. Nature of Construction Activity

The existing Park Meadows Mall consists of approximately 102 acres of existing parking, roadway, and building area. In the area of the proposed project, the existing site is an asphalt paved parking lot with small areas of landscaping.

The Site will be developed as mixed-use with a garage structure and retail buildings with pedestrian plaza space. The proposed development will include numerous vehicle and pedestrian access pathways. In general, project stormwater flows will be routed to a series of proposed inlets and storm sewer, which will connect to the existing storm sewer in the area, and discharge to the existing Detention Basin A south of the Site.

C. Sequence of Major Activities

The proposed sequence for major activities is described in detail in the Stormwater Management Considerations section below.

D. Estimates of Site Area

The Site disturbance is approximately 4.92 acres. The entire Site is expected to be disturbed by clearing, excavation, grading, and other construction activities. The exact limits of disturbance are shown on the Grading, Erosion, and Sediment Control Plans located in Appendix D.

The Site earthwork is anticipated to generate approximately 298 cubic yards of cut and 7,558 cubic yards of fill; therefore, the approximate net earthwork consists of 7,259 cubic yards of import to be transported on-site. Truck routes for any export sites will be submitted to the County after they have been determined by the

Contractor. The earthwork volumes listed above do not take into account volumes associated with utility spoils and foundations. The earthwork numbers are approximate and should be independently verified by the contractor prior to construction.

Land disturbances will include existing asphalt paved parking lots with small areas of landscaping within the construction area.

E. Summary of Existing Data

Existing soil data from the Preliminary Geotechnical Engineering Study & Proposed Mixed-Use Development Soil Report for Park Meadows Mall was used in the development of the Site construction plans and Grading, Erosion, and Sediment Control Plan (GESC). Soil conditions from both sources are described in more detail in the Soils section below.

F. Existing Vegetation

Existing vegetation includes only small areas of landscaping within the proposed construction site. There are no known wetlands within the Site limits of disturbance.

G. Potential Pollution Sources

The location and description of all potential pollutant sources including ground surface disturbing activities, vehicle fueling, and storage of fertilizers or chemicals, etc. is detailed below in the Potential Pollution Sources section.

H. Potential Non-Stormwater Discharges

Non-Stormwater components of discharge, such as underground springs, groundwater dewatering, permitted dewatering activities, and landscape irrigation return flow are not anticipated to occur with this development, However, the contractor shall be responsible to monitor for such discharges, and notify the engineer in such an event.

I. Receiving Water(s)

All runoff from the sub-basin will drain through roof drains and tie to the proposed and existing storm sewer system and is ultimately routed to the existing Detention Pond A that is located to the southwest of site.

III. Drainage Patterns

The proposed project area will collect runoff via existing and proposed drainage infrastructure for this project and proposed grade areas within the completed project site. Rooftop runoff will drain from downspouts to a designated basin design point that is located by a stormwater inlet. Runoff from proposed grade areas within

the completed project site are also designed to flow to a designated basin design point by a stormwater inlet. Inlets are then designed to lead runoff to proposed and existing storm sewer lines located on the north and south ends of the completed project site. The stormwater ultimately discharges to the Existing Detention Pond A, via existing storm sewer systems

A review of the Flood Insurance Rate Map (FIRM), Community Panel Number 0835-0034 G, 0053G, 0061H, the Site/Project does not lie within a FEMA designated floodplain as shown on the attached FIRMette Map in Appendix A.

IV. Soils

A. Soils

The Site generally slopes from Park Meadows Ring Road down to the west towards the Park Meadows Mall, with grades ranging from 1% to 4%. According to the Natural Resources Conservation Service's (NRCS) – Web Soil Survey for the Park Meadows area, the underlying soils are primarily RmE Renohill-Buick compiles which are classified as Hydrologic Group C/D. A copy of the Soil Survey is included in Appendix B.

B. Geotechnical Engineering Report

A Geotechnical Engineering Study was prepared by Kumar & Associates dated December 11, 2020 for Brookfield Properties. The report contains results of laboratory soils testing, boring logs, and geotechnical recommendations needed to aid in the design and construction of this building expansion. These recommendations were used to aid in the engineering design process for this building expansion.

V. Erosion and Sediment Control Measures (BMP's)

The following BMP's shall be implemented as indicated, prior to and during construction activities on the Site. This plan indicates the purpose of and estimated timing of implementation of such BMP's. The contractor's representative shall be vigilant in ensuring that additional BMP placement is implemented immediately in the event of deficiencies or any unforeseen erosion conditions.

A. Silt Fence

Silt fence is utilized along the limits of construction (in areas of acceptable grade) to filter Site runoff, prior to reaching the adjacent channel or slope. Silt fence shall be placed along the contour, at the base of any disturbed area, as shown on the Initial GESC Plan. When silt fence is not installed along the contour, a "J-Hook" installation may be appropriate to ensure that the BMP does not create concentrated flow parallel to the silt fence. The contractor shall also install new silt fence if the initial GESC Plan shows existing silt fence and the fence is no longer in place. Silt fence can be replaced by sediment control log.

B. Inlet Protection

All storm sewer inlets that are made operable during construction or previously exist adjacent to, or located within the Site, must be protected to prevent sediment-laden runoff from entering the storm sewer system. Inlet protection locations are indicated on the GESC Plan. Different types of inlet protection are required (before and after paving), in accordance with the details shown on the plan. Inlet protection measures may be removed after upstream areas are stabilized. The contractor shall inspect all existing inlet protection and replace if necessary. The contractor shall install new inlet protection on all existing inlets that show existing inlet protection that is no longer in place.

C. Stabilized Staging Area

One stabilized staging area (used for equipment storage, parking, and a loading /unloading zone) is identified on the GESC Plan.

D. Vehicle Tracking Control

The vehicle tracking control locations are identified on the GESC Plan, to prevent the transport (by vehicles) of mud and dirt onto the paved surface. Whenever sediment is transported onto a roadway, the road shall be cleaned at the end of each day, or at the frequency requested by the governing municipality. Sediment shall be removed by shoveling, sweeping, or other approved methods. Street washing shall not be allowed until after sediment has been removed (in an approved manner).

E. Concrete Washout Area

A concrete washout area is identified on the GESC Plan. This area shall be combined with a vehicle tracking control pad to minimize mud transport.

F. Seeding and Mulching

All disturbed areas shall be seeded and mulched within 30 days of initial exposure, or 7 days after grading is substantially complete in a given area.

Seed shall be applied using a mechanical drill, to a depth of ¼-inch, with row spacing not more than 6 inches. Seed mixes shall conform to the GESC Plan Standard Notes and Details.

Mulch shall be applied within 24-hours of seeding. Mulch shall be weed and seed free, long-stemmed straw. At least 50% (by weight) shall be 10-inches or more, in length. Mulch shall be applied at a rate of 4000 pounds per acre and be mechanically anchored to a minimum depth of 2-inches.

G. Dust Mitigation

The contractor shall have measures on-site during overlot grading to mitigate airborne dust pollutants. Two recommended methods are water trucks and surface roughening. Water trucks will be used to moisten soil access drives to reduce the amount of dust created by wind and on-site construction traffic. Surface roughening will be provided on all disturbed surfaces within 2-days of disturbance.

H. Surface Roughening

Surface roughening provides temporary stabilization of disturbed areas from water and wind erosion. The soil surface is considered to be roughened if depressions are created 2 to 4-inches deep and are spaced approximately 4 to 6-inches apart. Surface roughening shall be performed on all disturbed, graded areas of the Site (except in areas where buildings, pavement, or sod are to be placed within 7-days). Surface roughening should follow along the contours of the slope. Care should be taken not to allow vehicles on treated slopes, as tire tracks will smooth the roughened surface and encourage runoff to collect into channels.

I. Temporary Soil Stockpile

A temporary soil stockpile is shown on the GESC Plan. The stockpile shall have perimeter protection that shall consist of silt fence (particularly on the downhill side of the stockpile) and rock socks, or sediment control logs (on the upslope side of the stockpile). The stockpile surface shall be stabilized with surface roughening, temporary seeding and mulching, erosion control blankets, or soil binders. Soils that will be stockpiled for more than 60 days should be seeded and mulched with a temporary grass cover once the stockpile is placed (within 14 days). If the perimeter protection must be moved to access the soil stockpile, the perimeter controls shall be replaced by the end of the workday.

J. Construction Fence

Construction fence is used to delineate all limits of construction around a site. Proposed construction fence locations can be viewed within the GESC Plans.

VI. SWMP Administrator

The stormwater management plan (SWMP) administrator shall be the Site superintendent. The Site superintendent is responsible for implementing and maintaining the Grading, Erosion and Sediment Control Plan. The SWMP administrator shall contact the engineer of record for development and revisions of the GESC.

VII. Construction Schedule

Construction operations are anticipated to begin in July of 2024. The following schedule outlines the expected construction schedule:

Preliminary Construction Schedule	
Install Initial BMPs	July 2024
Site Grading	July 2024 – October 2024
Install Interim BMPs	October 2024
Site Construction	October 2024 – October 2025
Final Site Stabilization	October 2025

VIII. Stormwater Management Considerations

Stormwater management for the Site will be accomplished by a 3-Phase process of BMP installation. Specific BMPs are indicated on the Grading, Erosion and Sediment Control Plan.

A. Phase One

Installation of the vehicle tracking control, downhill silt fence, construction fence, stabilized staging area, stockpile protection, concrete washout area, sediment control log, and inlet protection for existing inlets will take place at this time. The contractor shall verify what existing BMPs are in place and replace any that have been removed or are no longer functioning properly.

B. Phase Two

Grading operations will commence, and soil will be imported offsite. Diversion ditches will be removed where no longer necessary and graded in where necessary. Utility installation including landscape drain, sanitary sewer services (inlet protection will now be placed around proposed storm sewer inlets), fire hydrant and building water service installation will also commence. Curb, gutter, concrete, and asphalt paving activities will follow utility work. Concrete sidewalk work will follow paving activities. All landscaping work will follow the completion of the exterior finishes.

The contractor shall have measures on-site at all times to mitigate airborne dust pollutants. Temporary measures will be taken to control runoff during this phase by a continuation of downhill silt fence. Maintenance of all previously installed erosion control measures shall be ongoing throughout this phase.

C. Phase Three

Permanent seeding/mulching of non-formally landscaped areas will take place at this time. A request for final inspection shall be made. After final Site stabilization has been reached, temporary BMP measures can be removed.

IX. Potential Pollution Sources

A. Disturbed and Stored Soils

Disturbed and stored soils are a potential pollution source for the Site. The disturbed and stored soils will be controlled by implementing a silt fence, sediment control logs, along with seeding and mulching.

B. Vehicle Tracking of Sediments

Vehicle tracking of sediments is a potential pollution source for the Site and will be controlled by vehicle tracking control pads located at all construction entrances.

C. Contaminated Soils

According to the geotechnical report provided by Kumar and Associates (December 11th, 2020), it is not anticipated that contaminated soils will be a potential pollution source for the Site. The contractor shall be responsible to monitor for contaminated soils and notify the engineer if discovered.

D. Loading and Unloading Operations

Loading and unloading operations is a potential pollution source for the Site. Loading and unloading operations shall take place within the stabilized staging area.

E. Outdoor Storage Activities

Outdoor storage activities are a potential pollution source for the Site. Materials are sometimes used at a construction site that present a potential for contamination of stormwater runoff. These may include, but are not limited to: building materials, fuel, oil, lubricants, paints, solvents, concrete curing compounds, pesticides, fertilizers, chemicals, and herbicides, etc. The contractor shall designate an area where these products should be stored in an enclosure, container, or lined earthen dike, constructed to prevent discharge of these materials in runoff from the Site. These barriers will also function to contain spilled materials from contact with surface runoff. Standard Operating Procedures for material spill containment and cleanup are provided in Appendix C.

F. Vehicle and Equipment Maintenance and Fueling

Vehicle and equipment maintenance and fueling is a potential pollution source for the Site. Measures shall also be taken to prevent spills or leaks of fuel, oils, lubricants, antifreeze, and other contaminant fluids from construction vehicles to protect groundwater and stormwater runoff. All equipment maintenance shall be performed in a designated area, and measures such as drip pans shall be used to contain petroleum products. Spills of construction materials should be cleaned up immediately and disposed of properly. The contractor shall routinely inspect equipment for leaks that could lead to discharge of petroleum products into surface runoff. A spill kit should be located on site at all times and readily available to all workers.

G. Dust or Particulate Generating Processes

Significant dust or particulate generating processes are not a potential pollution source for the Site; however, minor dust or particulate may be generated during the grading process. Dust mitigation, surface roughening, and seeding and mulching shall be implemented to mitigate airborne dust pollutants.

H. Routine Maintenance Activities

Routine maintenance activities are a potential pollution source for the Site. Refer to Outdoor Storage Activities in Section E for specific implementation criteria.

I. On-site Waste Management Practices

On-site waste management practices (waste piles, liquid wastes, dumpsters, etc.) are a potential pollution source for the Site. The contractor shall designate an area where these practices occur and shall routinely inspect and maintain the areas to eliminate the pollution source.

J. Concrete Truck/Equipment Washing

Concrete truck and equipment washing is a potential pollution source for the Site and should only occur at the designated Concrete Washout Area shown on the Grading, Erosion, and Sediment Control Plan.

K. Non-Industrial Waste Sources

Non-industrial waste sources such as worker trash and portable toilets are a potential pollution source for the Site. The contractor shall designate an area where these practices occur and shall routinely inspect and maintain the areas to eliminate the pollution source.

L. Other Areas or Procedures Where Potential Spills Can Occur

Other areas or procedures where potential spills can occur are not a potential pollution source for the Site.

M. Training

All contractor's employees and subcontractor's employees shall receive orientation training in "Spill Prevention and Response Procedures". Training will cover responsibilities and procedures to be followed in the event of an on-site material spill. Periodic training shall be conducted during weekly or monthly safety meetings. All training records shall be maintained in the construction trailer. The contractor is responsible for preparing and training Site personnel for procedures on potential spills.

X. Final Stabilization and Long-Term Stormwater Management

The post-construction condition of the Site shall have all disturbed areas from construction paved, built upon, or re-vegetated, in some manner in conformance with the approved landscape plan. It is anticipated that these areas will have sod, trees, and shrubs installed throughout the Site. Final stabilization is reached when all soil-disturbing activities at the Site have been completed, and uniform vegetative cover has been established with a density of at least 70% of pre-disturbance levels or equivalent permanent, physical erosion reduction methods have been employed.

Stormwater runoff from the Site will drain to several proposed stormwater inlets. The runoff will drain via overland flow, proposed storm sewer, and existing storm sewer. The stormwater ultimately discharges to the Detention Basin A, via existing storm sewer systems. The installation of silt fence and inlet protection will also contribute to particulate removal from the flows before the Site reaches final stabilization.

XI. Inspection and Maintenance

Inspection and maintenance of all erosion control devices is the responsibility of the contractor. Inspection of all erosion control devices should occur at the beginning and end of each construction day. The Colorado Department of Public Health and Environment (CDPHE) Stormwater Construction Permit requires that a thorough inspection of the stormwater management system be performed and documented at least every 14 days. Additionally, inspection should occur within 24 hours of any precipitation or snowmelt event that may cause surface erosion. The CDPHE permittee must document inspection results and maintain a record of the results for a period of 3-years following expiration or inactivation of permit coverage. Any erosion control devices that have been compromised or disturbed shall be replaced or reconstructed. It is the responsibility of the contractor to have all erosion control devices in place and effective, prior to a storm event.

A. Record Keeping and Documenting Inspections
B. The following items (at a minimum) must be documented as part of the Site inspections:
    i. The inspection date;
    ii. Name(s) and title(s) of personnel making the inspection;

iii. Location(s) of discharges of sediment or other pollutants from the Site;
iv. Location(s) of BMPs that need to be maintained;
v. Location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;
vi. Location(s) where additional BMPs are needed that were not in place at the time of inspection;
vii. Deviations from the minimum inspection schedule as provided in Section IX above;
viii. Description of corrective action for items iii, iv, v, and vi, above, dates corrective action(s) taken, and measures taken to prevent future violations, including requisite changes to the SWMP, as necessary; and
ix. After adequate corrective action(s) has been taken, or where a report does not identify and incidents requiring corrective action, the report shall contain a signed statement indicating the Site is in compliance with the permit to the best of the signer's knowledge and belief.

XII. Opinion of Probable Construction Cost

Estimated construction costs for erosion control items are outlined below:

CITY OF LONE TREE

GESC Permit
Opinion of Probable Cost

Project:	**Date:**

BMP No.	BMP	ID	Unit	Installation Unit Cost	Quantity	Cost
1	Check Dam	CD	LF	$ 24.00		$ -
2	Compost Blanket	CB	SF	$0.36		$ -
3	Compost Filter Berm	CFB	LF	$ 2.00		$ -
4	Concrete Washout Area	CWA	EA	$ 100.00	2	$ 200.00
5	Construction Fence	CF	LF	$ 2.00	3,500	$ 6,999.58
6	Construction Markers	CM	LF	$ 0.20		$ -
7	Curb Sock	CS	LF	$ 8.00		$ -
8	Dewatering	DW	EA	$ 600.00		$ -
9	Diversion Ditch	DD	LF	$ 1.60		$ -
10	Erosion Control Blanket	ECB	SY	$ 5.00		$ -
11	Inlet Protection	IP	LF	$ 20.00	198	$ 3,960.00
12	Reinforced Check Dam	RCD	LF	$ 36.00		$ -
13	Reinforced Rock Berm	RRB	LF	$ 9.00		$ -
14	RRB for Culvert Protection	RRC	LF	$ 9.00		$ -
15	Sediment Basin	SB	AC (1)	(2)		$ -
16	Sediment Control Log	SCL	LF	$ 2.00	451	$ 902.60
17	Sediment Trap	ST	EA	$ 600.00		$ -
18A	Seeding and Mulching - Mobilization	SM	EA	$ 1,000.00		$ -
18B	Seeding and Mulching - Installation	SM	AC	$ 750.00	1.2	$ 897.00
19	Silt Fence	SF	LF	$ 2.00	2,698	$ 5,396.76
20	Stabilized Staging Area	SSA	SY	$ 2.00	2,208	$ 4,415.84
21	Surface Roughening	SR	AC	$ 600.00		$ -
22	Temporary Slope Drain	TSD	LF	$ 30.00		$ -
23	Temporary Stream Crossing	TSC	EA	$ 1,000.00		$ -
24	Terracing	TER	AC	$ 600.00		$ -
25	Vehicle Tracking Control	VTC	EA	$ 1,000.00	6	$ 6,000.00
26	VTC with Wheel Wash	WW	EA	$ 1,500.00		$ -
27	Temporary Batch Plant Restoration		AC	$ 5,000.00		$ -
	(1) Upstream Tributary Acre			**SUB-TOTAL**		$ 28,771.78
	(2) SB Cost = $1000 +$200(Upstream Tributary Acres)			**15% CONTINGENCY**		$ 4,315.77
				GESC SURETY TOTAL (1)		**$ 33,087.55**

NOTE: (1) **MINIMUM SURETY shall be $2,500.00** (Per Section 16-31-110 of City Zoning Code) (Rev. 1-18-12)

XIII. References

1. Grading, Erosion and Sediment Control Manual (GESC), July 2019, Douglas County.

2. Urban Storm Drainage Criteria Manual, Vol. 1, 2 and 3, October 2019, Urban Drainage and Flood Control District.

3. Preliminary Geotechnical Engineering Study, Proposed Mixed-Use Development, Park Meadows Apartments, Project No. 20-1-664, December 11, 2020, Kumar & Associates, Inc.

4. Phase III Drainage Report for Park Meadows by Paller-Roberts Engineering, revised in April 1995.

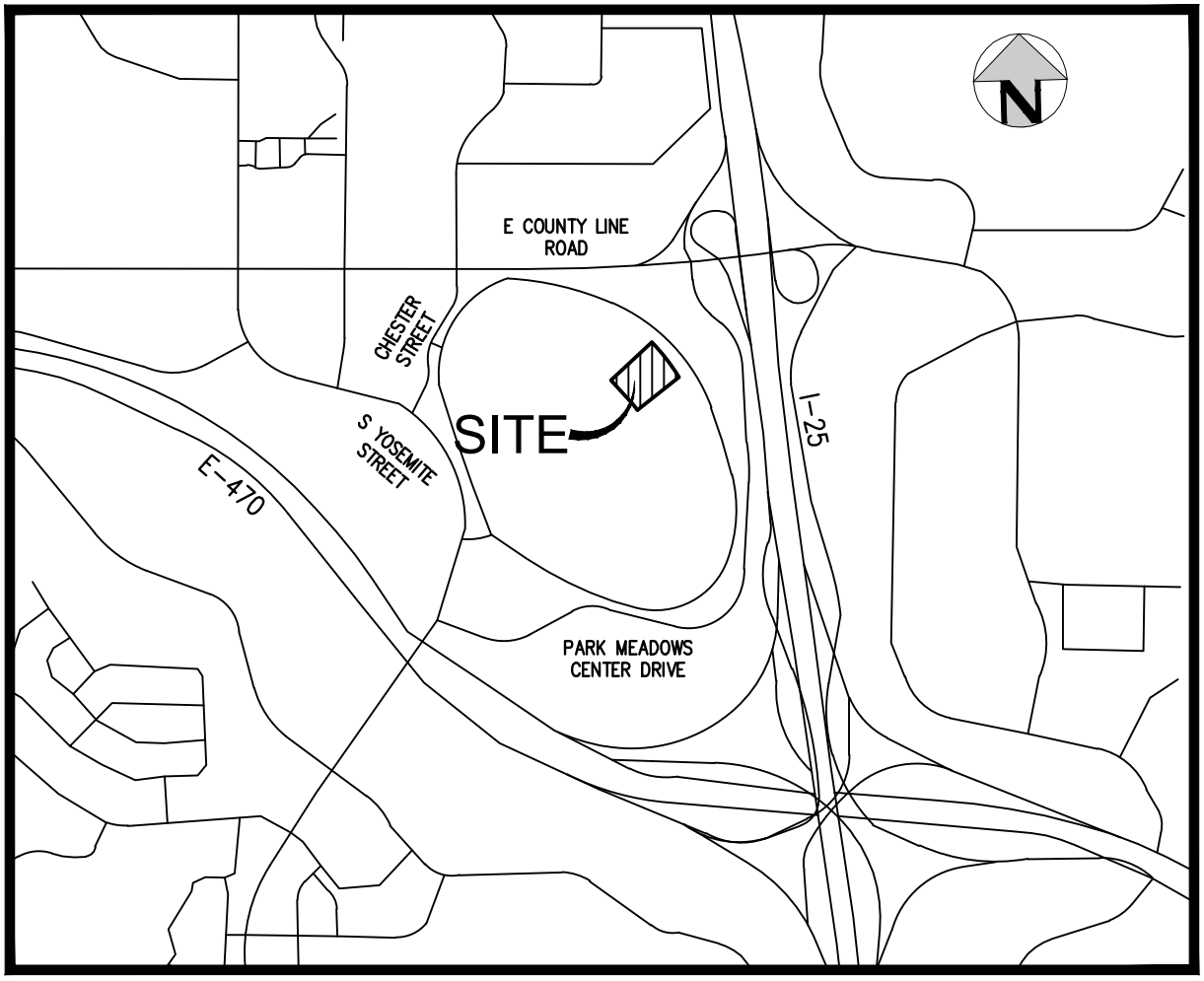
5. Drainage Report for Park Meadows Mall Expansion, Douglas County, Colorado by National Survey and Engineering as revised November 2006.

6. Flood Insurance Rate Map No. 0835-0034G, 0053G, 0061H, September 30, 2005, Federal Emergency Management Agency.

7. Colorado Department of Public Health & Environment Construction Guidance Document, July 1994, Colorado Department of Public Health & Environment Water Quality Control Division.

Appendix A

Vicinity Map & FIRMette



Vicinity Map

SCALE: 1"=1000'

National Flood Hazard Layer FIRMette

FEMA

104°52'49"W 39°34'3"N

104°52'11"W 39°33'35"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 — Cross Sections with 1% Annual Chance
- 17.5 — Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/20/2024 at 1:21 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix B

Soils Information

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 Castle Rock Area, Colorado

February 20, 2024

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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Contents

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.

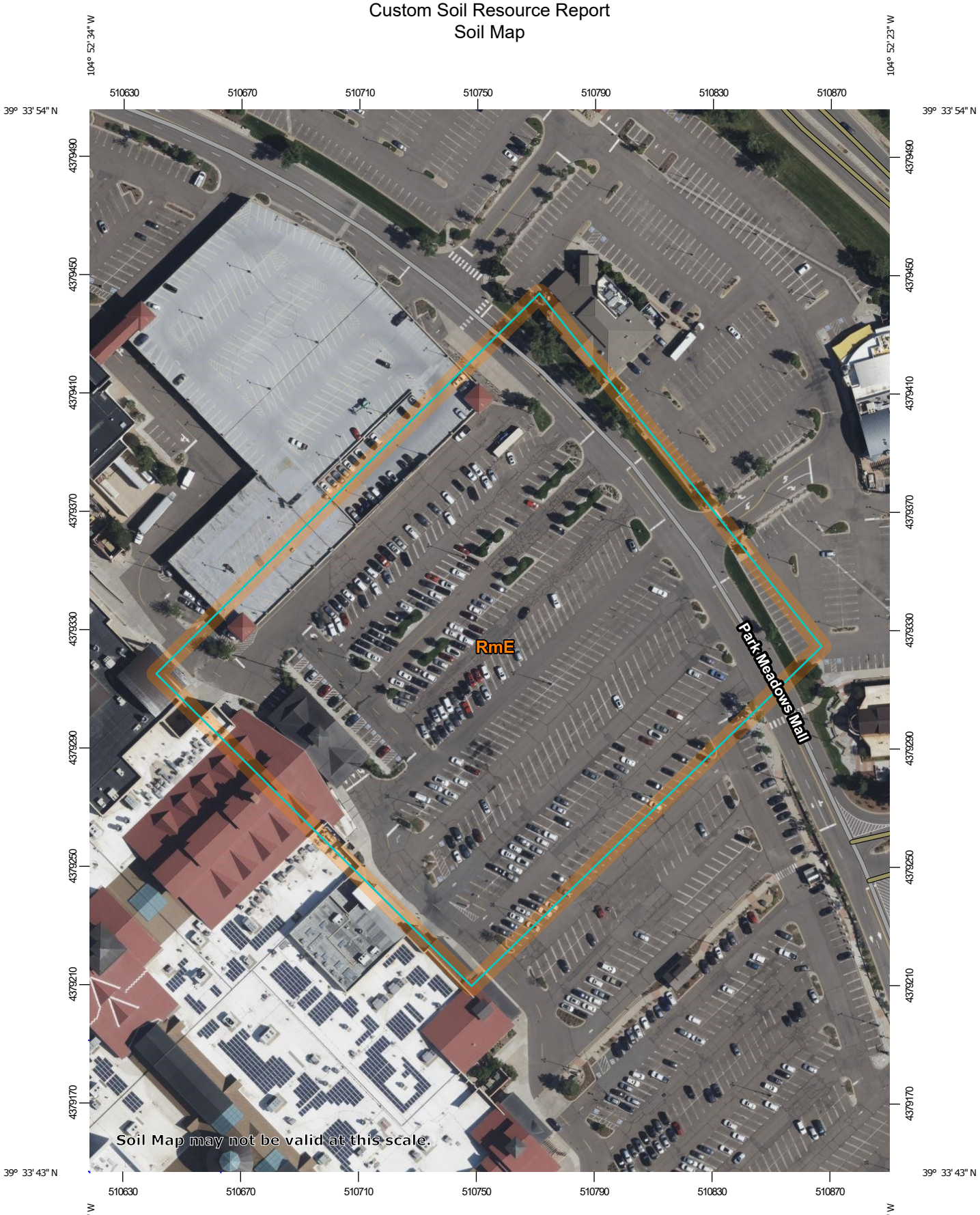
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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: 1:1,750 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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 1:20,000.

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: Castle Rock Area, Colorado
Survey Area Data: Version 16, Aug 24, 2023

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

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

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
RmE	Renohill-Buick complex, 5 to 25 percent slopes	6.5	100.0%
Totals for Area of Interest		**6.5**	**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.

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GEOTECHNICAL ENGINEERING STUDY
PROPOSED CENTRAL PARCEL MIXED DEVELOPMENT
PARK MEADOWS MALL
LONE TREE, COLORADO

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Project No. 20-1-664A

September 20, 2022

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SUMMARY

1. The borings encountered an asphalt pavement section consisting of asphalt surfacing over several inches, generally, of aggregate base course material. With the exception of two boring locations, the pavement section was underlain either directly by bedrock or by a foot or less of fill extending to bedrock. At two borings, the pavement section was underlain by fill extending to natural soils at depths of about 19 feet and 4 feet, respectively.

   The fill generally consisted of processed claystone and sandstone bedrock classifying as clayey sands or lean clay with variable sand content. The exact lateral and vertical extents of the fill, and the degree of compaction of the fill, across the site were not evaluated as part of this study. The natural soils encountered in two borings consisted of stiff to very stiff sandy lean clay.

   The bedrock consisted of thick zones of either sandstone or claystone. The sandstone was clayey in places and contained isolated to occasional claystone interbeds but was generally fine to coarse grained with some silt and isolated gravel. The claystone was generally fine grained but sandy in places and contained isolated to occasional sandstone interbeds. The bedrock was generally hard to very hard, with medium hard zones at or near the bedrock surface and was cemented in places.

   Ground water was encountered during drilling at depths ranging from about 13 feet to 24 feet below top of pavement. Stabilized groundwater was measured in seven borings at depths ranging from about 10.5 feet to 22.5 feet below top of pavement, and Boring 22-3 had groundwater at a depth of about 6 inches which represented an anomalous condition. Stabilized groundwater at the site may occur at depths of between 15 feet and 20 feet, generally. Shallower groundwater levels may occur in seams or fracture zones within the claystone bedrock. The presence and depth to groundwater may vary seasonally, particularly shallower zones within the claystone bedrock, with the deeper stabilized groundwater level fluctuating up or down about a foot or two.

2. We recommend considering straight-shaft piers drilled into bedrock be used to support the building. Piers with a minimum bedrock embedment should be designed for an allowable unit end bearing pressure of 50,000 psf. Piers should also be designed for a unit compressive skin friction of 4,000 psf for the upper 10 feet of the embedded portion of the pier and 6,000 psf for the portion embedded more than 10 feet into bedrock. Piers should have a minimum bedrock embedment equivalent to 3 times the pier diameter or 10 feet, whichever is greater and a minimum length of 20 feet.

3. Shallow spread footing foundations should be feasible for heavily loaded footings bearing on bedrock or select structural fill extending to bedrock. Allowable bearing capacities ranging from 5,500 psf to 8,000 psf are considered feasible.

4. Slab-on-grade construction should be feasible provided floor and garage slabs and movement-sensitive flatwork are underlain by a zone of engineered fill ranging in thickness from about three feet to seven feet.

5. Full-depth or layered composite asphalt pavement sections, and concrete pavement sections, should be feasible at the site depending on site subgrade conditions. Site pavement sections should be constructed as presented in the following table.

Pavement Type	Full-Depth HMA (in)	Composite HMA over ABC (in)	PCCP (in)
Light-Duty Pavements	5.0	3.5/6.0	6.0
Medium-Duty Pavements	6.0	4.0/7.0	6.0

HMA = Hot Mix Asphalt, ABC = Aggregate Base Course, PCCP= Portland Cement Concrete Pavement

PURPOSE AND SCOPE OF STUDY

This report presents the results of a design-level geotechnical engineering study for the proposed Central Parcel mixed-use development to be constructed at the Park Meadows Mall in Lone Tree, Colorado. The project site is shown on Fig. 1. The study was conducted in general accordance with the scope of work in our Proposal No. P-22-323 to Brookfield Properties, dated March 15, 2022.

A field exploration program consisting of exploratory borings was conducted to obtain information on general subsurface conditions. Samples of the soils and bedrock obtained from the exploratory borings were tested in the laboratory to determine their classification and general engineering characteristics. K+A previously performed a preliminary geotechnical engineering study for the site under our Project No. 20-1-664. The results of that study were provided in a report dated December 11, 2020. Field and laboratory data from that study were used to supplement the data obtained for this current study and are incorporated in this report.

This report has been prepared to summarize the data obtained during this study and to present our conclusions and recommendations based on our understanding of the proposed construction and the subsurface conditions encountered. Geotechnical design parameters and a discussion of geotechnical engineering considerations related to construction of the proposed development are included in the report.

PROPOSED DEVELOPMENT

We understand the development, as currently planned, will consist of two multi-story, at-grade buildings with market-rate apartment units, ground-level retail, and two related parking structures. The sides of the parking structures facing the existing Park Meadows Mall building will include structures with ground-level retail possibly additional residential levels. We assume the project will also include revised at-grade parking and other surface amenities and will cover most, if not all, of the northeast corner of the Park Meadows Mall development.

We assume the parking structure will be of cast-in-place or pre-cast concrete, the retail spaces of steel or concrete framing, and the residential levels of wood or light-gauge steel framing constructed on a podium. Foundation loads are anticipated to be moderately heavy to heavy.

Site redevelopment will include demolishing the existing pavements and abandonment and/or removal of existing buried utilities. Site grading is anticipated to generally require excavations of about 5 feet or less, although deeper excavations for new utilities may extend deeper.

If the proposed development varies significantly from that generally described above or depicted throughout this report, we should be notified to reevaluate the recommendations provided herein.

SITE CONDITIONS

The site is currently occupied by asphalt-paved surface parking located between the mall building and Park Meadows Center Drive. The parking area also includes occasional landscape areas at the ends of some of the parking strips and other areas north of the food court, sidewalks, and buried utilities. The site is essentially flat, with a maximum grade differential of about 7 feet.

SUBSURFACE CONDITIONS

Information on the subsurface conditions was obtained by drilling 14 exploratory borings at the approximate locations shown on Fig. 1. Five borings, Borings 20-1 through 20-5, were drilled for the 2020 preliminary study, and nine borings, Borings 22-1 through 22-9, were drilled for this design-level study. Graphic logs of the borings are presented on Figs. 2 and 3, and a legend and explanatory notes describing the subsurface conditions encountered are presented on Fig. 4.

The borings encountered an asphalt pavement section consisting of asphalt surfacing ranging in thickness from about 3-½ inches to about 8-¼ inches over a several inches, generally, of aggregate base course material. With the exception of two boring locations, Borings 22-1 and 22-2, the pavement section was underlain either directly by bedrock or by a foot or less of fill extending to bedrock. At Borings 22-1 and 22-2, the pavement section was underlain by fill extending to natural soils at depths of about 19 feet and 4 feet, respectively. The natural soils encountered at those boring locations extended to bedrock at depths of about 24.5 feet and 12 feet in Borings 22-1 and 22-2, respectively.

The fill encountered in the borings generally consisted of moist, brown to gray to black, processed claystone and sandstone bedrock classifying as clayey sands or lean clay with variable sand content. The sand fraction was generally fine to coarse grained. The exact lateral and vertical extents of the fill, and the degree of compaction of the fill, across the site were not evaluated as part of this study.

The natural soils encountered beneath the fill in Borings 22-1 and 22-2 consisted of moist, brown, sandy lean clay with a fine- to coarse-grained sand fraction. Based on sampler penetration resistance (blow counts), the natural clay soils were stiff to very stiff.

The bedrock encountered in the borings consisted of thick zones of either sandstone or claystone. The sandstone was clayey in places and contained isolated to occasional claystone interbeds but was generally fine to coarse grained with some silt and isolated gravel. The claystone was generally fine grained but sandy in places and contained isolated to occasional sandstone interbeds. The sandstone was slightly moist to moist to wet in places and varied from tan to brown to gray to orange-brown, and the claystone was moist to very moist in places and varied from gray to dark gray to grayish brown. Based on blow counts, the bedrock was generally hard to very hard, with medium hard zones at or near the bedrock surface and was cemented in places. A thin zone of weathered claystone bedrock was encountered at the top of bedrock in Boring 22-1.

Ground water was encountered in seven borings during drilling at depths ranging from about 13 feet to 24 feet below top of pavement. Measurements taken two days (2020 borings) and 40 or 44 days (2022 borings) after completion of drilling encountered groundwater in seven borings at depths ranging from about 10.5 feet to 22.5 feet below top of pavement. Groundwater was also encountered at a depth of 6 inches in Boring 22-3, which we consider to be a local anomaly and unrepresentative.

Where present within sandstone, the measured groundwater depths were either at or slightly above the depths encountered during drilling, which suggests stabilized groundwater at the site may occur at depths between 15 feet and 20 feet, generally. Shallower groundwater levels may occur in seams or fracture zones within the claystone bedrock. The presence and depth to groundwater may vary seasonally, particularly shallower zones within the claystone bedrock, with the deeper stabilized groundwater level fluctuating up or down about a foot or two.

LABORATORY TESTING

Samples obtained from the exploratory borings were visually classified in the laboratory by the project engineer. Laboratory testing was performed on representative samples of the fill and bedrock to evaluate in-situ moisture content and dry unit weight, grain size distribution, liquid and plastic limits, swell-consolidation characteristics, concentration of water-soluble sulfates and chlorides, and pH. The testing was conducted in general accordance with recognized ASTM International (ASTM) and Colorado Department of Transportation (CDOT) test procedures. The

results of the laboratory testing program are shown adjacent to the boring logs on Figs. 2 and 3, plotted graphically on Figs. 5 through 14, and summarized in Table I.

Swell-Consolidation Testing: Swell-consolidation testing was conducted on samples of the existing fill, natural clay soils, and bedrock to determine their compressibility and/or swell characteristics under loading and when wetted. Each sample was prepared and placed in a confining ring between porous discs. A surcharge pressure of 1,000 psf was applied to each sample, and the samples were allowed to compress to a stabilized height before being submerged in water. The samples were then inundated with water, and the change in sample height when deformation ceased was measured with a dial gauge. The samples were then loaded incrementally to maximum surcharge pressures ranging from 3,000 psf to 20,000 psf, and the sample heights were monitored until deformation practically ceased under each load increment.

The results of the laboratory swell-consolidation testing on in-situ soil samples are presented on Figs. 5 through 12 and indicate that the tested in-situ samples of the natural clay soils, clay fills, and sandstone bedrock exhibited nil to low swell potential upon wetting. Samples of claystone bedrock generally exhibited low swell potential upon wetting, although one sample from Boring 22-3 at a depth of 19 feet exhibited borderline moderate to high swell potential.

Index Properties: Samples were classified into categories of similar engineering properties in general accordance with the Unified Soil Classification System. This system is based on index properties, including liquid limit, plasticity index, and grain size distribution. Values for in-situ moisture content and dry unit weight, liquid limit and plasticity index, and the percent of soil retained on the U.S. No. 4 sieve and percent soil passing the U.S. No. 200 sieve are presented in Table I. The results of gradation tests are presented on Figs. 13 and 14.

Water-Soluble Sulfates: The concentration of water-soluble sulfates measured in samples of the overburden soils and bedrock obtained from the exploratory borings ranged from 0.00 to 0.01. These concentrations of water-soluble sulfates represent a Class S0 severity of exposure to sulfate attack on concrete exposed to these materials. The degree of attack is based on a range of Class S0 (not applicable), Class S1 (moderate), Class S2 (severe), and Class S3 (very severe) severity of exposure as presented in ACI 201.2R-16.

Based on the laboratory test results, we believe special sulfate resistant cement will not be required for concrete exposed to the on-site bedrock or fill consisting of processed on-site bedrock.

GEOTECHNICAL ENGINEERING CONSIDERATIONS

Based on the conditions encountered in the borings and anticipated finished grades and floor elevations, subsurface conditions at anticipated foundation levels for most of the proposed structures are expected to consist of claystone and/or sandstone bedrock overlain at the southwestern portion of the northernmost parking garage/retail structure by up 21 feet of fill and natural clay soils. Depending on site finished grades, subsurface conditions across most of the site for new pavements, garage base slabs, and exterior flatwork may consist of bedrock or minor thicknesses of existing fill over bedrock.

As previously discussed, the clay fills, natural clay soils, and the sandstone bedrock exhibited nil to low swell potential, and the claystone bedrock exhibited generally low swell potential with one sample exhibiting borderline moderate to high swell potential. The swell potential exhibited by these materials is consistent with our general experience at the site.

Based on our experience at the Park Meadows Mall, including the mall buildings and the outlying buildings to the east and north of the site, the east-southeast portion of the mall buildings and the outlying buildings are believed to be pier-supported with soil-supported floor slabs underlain by about 3 feet of structural fill. It is our understanding the existing buildings, and particularly the floor slabs, have generally performed as designed.

Based on the subsurface conditions encountered in the borings, we believe a similar foundation and slab support approach should be feasible for the proposed structures. Using a drilled pier foundation system for support of the buildings has the advantage of bottoming the piers in a zone of relatively stable moisture content and concentrating the loads to help offset expansive uplift forces due to swelling soils and bedrock. In addition, the required lengths of drilled piers at the site are anticipated to be relatively short, which should result in a relatively economical foundation system. For structures with heavy to very heavy foundation loads and/or that can tolerate total and differential movement greater than normal tolerances, such as the parking structures, shallow spread footing foundations also should be feasible.

Soil-supported floor slabs present a difficult problem where potentially expansive materials are present at or near floor slab elevation because sufficient dead load cannot be imposed on the slab to resist the uplift pressure generated when the underlying expansive materials are wetted and expand. However, the risk of significant heave-related slab movement is considered to be low based on the results of swell-consolidation testing and our experience at the site. As indicated in the "Floor Slabs" section of this report, use of a slab-on-grade floor will require sub-excavation beneath the slab subgrade elevation and replacement with structural fill.

Soil-supported slabs underlain by existing fill also present a difficult problem due to the potential for postconstruction settlement greater than design tolerances. Ideally, complete removal of the existing fill and replacement with structural fill should be considered. Given the thickness of the existing fill encountered in Borings 22-1 and 22-2, complete removal and replacement would be impractical. A partial removal and replacement option, or the use of aggregate piers may be considered, particularly for movement-sensitive floor slabs and exterior flatwork.

The results of the swell-consolidation testing and our experience with similar soils and bedrock indicate that it is likely feasible to use the on-site materials as site grading fill, and processed sandstone bedrock as structural fill beneath spread footing foundations and slabs. Claystone would not be suitable for use as structural fill but may be considered as site grading fill in some areas outside of the structure footprints.

FOUNDATION RECOMMENDATIONS

Due to the presence of very shallow bedrock and the anticipated relatively high foundation loads, we recommend considering straight-shaft piers drilled into bedrock be used as the primary foundation alternative for support of the proposed structures. Drilled piers have a very high success rate in the general metropolitan Denver area, and at the site, and provide high supporting capacity with little movement under structural loading. Although the bedrock underlying the site exhibits low swell potential, using a drilled pier foundation system would put the bottoms of the piers a sufficient depth into a zone of bedrock with relatively stable moisture content to help provide resistance to potential uplift related to swelling soils and bedrock. Drilled piers should also be preferred at the portion of the northernmost parking garage/retail structure underlain by local deep fill and natural soils.

Given the anticipated relatively heavy foundation loads and relatively low swell potential of the underlying bedrock, shallow spread footing foundations designed for high dead load pressures

may be feasible where bearing on bedrock or select structural fill extending to bedrock. It should be noted that a shallow foundation system would be more susceptible to total and differential movement than a drilled pier foundation system.

Drilled Pier Foundations: Using a straight-shaft pier type of foundation, each column typically is supported on a single drilled pier and the building exterior walls are founded on grade beams supported by a series of piers. Load applied to the piers is transmitted to the bedrock underlying the sites partially through peripheral shear stresses which develop on the sides of the pier and partially through end bearing.

The design and construction criteria presented below should be observed for a straight-shaft pier foundation system. The construction details should be considered when preparing project documents.

1. Piers should have a minimum bedrock embedment equivalent to 3 times the pier diameter or 10 feet, whichever is greater, and minimum length of 20 feet.

2. Piers with a minimum bedrock embedment should be designed for an allowable unit end bearing pressure of 55,000 psf. Piers should also be designed for a unit compressive skin friction of 4,000 psf for the upper 10 feet of the embedded portion of the pier and 6,000 psf for the portion embedded more than 10 feet into bedrock. Uplift due to structural loadings on the piers can be resisted using 75% of the unit compressive skin friction values plus an allowance for pier weight. Side friction should be ignored in the upper 3 feet of bedrock. Pier capacities may be increased by one-third for transient loadings.

3. Piers should also be designed for a minimum dead load pressure of 10,000 psf based on pier end area only. Application of dead load pressure is the most effective way to resist foundation movement due to swelling soils and bedrock. However, if the minimum dead load requirement cannot be achieved and the piers are spaced as far apart as practical, the pier length should be extended beyond the minimum bedrock penetration and minimum length to mitigate the dead load deficit. This can be accomplished by assuming one-half of the skin friction value given above acts in the direction to resist uplift caused by swelling soil or bedrock near the top of the pier. The owner should be aware of an increased potential for foundation movement if the recommended minimum dead load pressure is not met.

4. Piers should be designed with additional reinforcement over their full length to resist an unfactored net tensile force from swelling soil/bedrock uplift pressure of least 60,000 pounds. The net tensile force is for a 1.5-foot diameter pier with a 10,000 psf dead load pressure. For larger diameter piers with a 10,000 psf dead load pressure, the unfactored net tensile load should be increased in direct proportion to the increase in diameter. If the minimum dead load requirement is not met, the net tensile force should be further increased by the deficit between the required minimum dead load and the applied dead load. Similarly, the tensile force may be reduced if the design dead load exceeds the recommended minimum dead load.

5. The lateral capacity of the piers may be analyzed using the LPILE computer program and the parameters provided in the following table. The strength criteria provided in the table are for use with that software application only and may not be appropriate for other uses:

Material	c (psi)	ϕ	γ_T	k_s	k_c	ε_{50}	Soil Type
Existing Fill	0	30	0.072	---	---	----	1
New Granular Structural Fill	0	34	0.075	90	90	----	1
Natural Clay Soils	27	0	0.072	120	120	----	2
Bedrock	42	0	0.070	1,500	600	0.004	2

c Cohesion intercept (pounds per cubic inch)
ϕ Angle of internal friction (degrees)
γ_T Total unit weight (pounds per cubic inch)
k_s Initial static modulus of horizontal subgrade reaction (pounds per cubic inch)
k_c Initial cyclic modulus of horizontal subgrade reaction (pounds per cubic inch)
ε_{50} Strain at 50 percent of peak shear strength

Soil Types:
1. Sand (Reese)
2. Stiff Clay without Free Water (Reese)

6. Closely spaced piers will require appropriate reductions of the axial, uplift and lateral capacities based on the effective envelope of the pier group. These reductions can be avoided by spacing the piers at a distance of at least 3 pier diameters center-to-center for axial loading, 5 pier diameters center-to-center in the direction parallel to lateral loading, and 5 pier diameters center-to-center in the direction perpendicular to lateral loading. More closely spaced piers should be studied on an individual basis to determine the appropriate reduction in axial and lateral load design parameters.

If the recommended minimum center-to-center pier spacings for lateral loading cannot be achieved, we recommend the load-displacement curve (p-y curve) for an isolated pier be modified for closely spaced piers using p-multipliers to reduce all the p values on the curve. With this approach, the computed load carrying capacity of the pier in a group is reduced relative to the isolated pier capacity. The modified p-y curve should then be reentered into the LPILE software to calculate the pier deflection. The reduction in capacity for the leading pier, the pier leading the direction of movement of the group, is less than that for the trailing piers.

For center-to-center pier spacing of piers in the group in the direction of loading expressed in multiples of the pier diameter, we recommend p-multipliers of 0.7 and 1.0 for pier spacing of 3 and 5 diameters, respectively, for the leading row of piers, 0.4 and 0.85 for pier spacing of 3 and 5 diameters, respectively, for the second row of piers, and 0.3 and 0.7 for pier spacing of 3 and 5 diameters, respectively, for rows 3 and higher. For loading in a direction perpendicular to the row of piers, the p-multipliers are 1.0 for a pier spacing of 5 diameters, 0.7 for a pier spacing of 3 diameters, and 0.5 for a pier spacing of 1 diameter. P-multiplier values for other pier spacing values should be determined by interpolation. These values are consistent with Table 10.7.2.4-1 of the 2020 AASHTO LRFD Bridge Design Specifications. It will be necessary to determine the load distribution between the piers that attain deflection compatibility because the leading pier carries a higher proportion of the group load, and the pier cap prevents differential movement between the piers.

7. Based on the results of our field exploration and laboratory testing programs, and our experience with similar, properly constructed drilled pier foundations, we estimate pier settlement will be low. Generally, we estimate the settlement of drilled piers will be less than 1 inch when designed according to the criteria presented herein. The settlement of closely spaced piers will be larger and should be studied on an individual basis.

8. A minimum pier diameter of 18 inches is recommended to facilitate proper cleaning and observation of the pier hole. The pier length-to-diameter ratio should not exceed 30.

9. A 6-inch void should be provided beneath the grade beams and necessary pier caps to concentrate pier loadings and to separate expansive existing materials from the grade

beams. Absence of a void space will result in a reduction in dead load pressure which could result in upward movement of the foundation system.

10. The drilled shaft contractor should mobilize equipment of sufficient size and operating condition to achieve the required bedrock penetration. Hard to very hard bedrock with cemented zones was encountered at the site. The contractor should keep in mind much harder rock may be encountered during drilling and should be prepared to use the appropriate equipment. Drilling at the site in such zones may require the use of a core barrel or pilot hole to facilitate drilling with the required size auger.

11. The presence of water and possibly weakly cemented sandstone bedrock encountered in the exploratory borings during drilling operations indicates the use of temporary casing and dewatering equipment may be required. The requirements for dewatering can sometimes be reduced by placing concrete immediately upon cleaning and observing the pier hole and placement of the reinforcement. In no case should concrete be placed in more than 3 inches of water unless placed through an approved tremie method.

12. Difficulty may be encountered in establishing a casing seat in sandstone to achieve a positive cutoff of ground-water seepage into the hole. Additional bedrock penetration may be required to compensate for the skin friction lost due to disturbance caused by installation of the casing. Skin friction should be neglected in the cased portion of the hole. The amount of additional penetration should be determined in the field at the time of construction. The contract documents should advise potential drilled shaft contractors of these subsurface conditions. In addition, careful consideration should be given to preparing bid items to avoid high costs for potential overruns

13. For the portion of the pier extending more than 10 feet into bedrock, the bedrock should be roughened artificially to assist in the development of peripheral shear stress between the pier and the bedrock. Roughening should be accomplished installed with a grooving tool in a pattern considered appropriate by the geotechnical engineer. Horizontal grooves at 1 to 2-foot centers or helical grooves with a 1 to 2-foot pitch are acceptable patterns. Care should be taken that artificial roughening does not occur in the top 10 feet of bedrock penetration; roughening in the upper 10 feet of penetration could increase uplift forces on the pier resulting from swelling soil/bedrock. The specifications should allow the geotechnical engineer to eliminate the requirements for pier roughening if it appears that

roughening is not beneficial. This could occur if a rough surface is provided by the drilling process or if the presence of water and/or weakly cemented materials results in a degradation of the pier hole during roughening.

14. Pier holes should be properly cleaned prior to the placement of concrete.

15. When water is present outside the casing, care should be taken that concrete of sufficiently high slump is placed to a sufficiently high elevation inside the casing to prevent intrusion of the water into the concrete when the casing is withdrawn. The water should be completely displaced outside the casing by maintaining a positive hydraulic head, using the concrete inside the casing, until the casing is removed. Mixing of concrete and water near the top of the casing should not be allowed.

16. Concrete used in the piers should be a fluid mix with sufficient slump so it will fill the void between reinforcing steel and the pier hole. We recommend a concrete slump in the range of 5 to 8 inches be used.

17. Care should be taken that the pier shafts are not oversized at the top. Mushroomed pier tops can reduce the effective dead load pressure on the piers. Sono-Tubes or similar forming should be used at the top of the piers, as necessary, to prevent mushrooming of the top of the piers.

18. Concrete should be placed in pier holes the same day they are drilled. The presence of water may require that concrete be placed immediately after the pier hole is completed. Failure to place concrete the day of drilling will normally result in a requirement for additional bedrock penetration.

19. A representative of the geotechnical engineer should observe pier drilling operations on a full-time basis to assist in identification of adequate bedrock strata and monitor pier construction.

Spread Footing Foundations: The design and construction criteria presented below should be observed for a spread footing foundation system. The construction details should be considered when preparing project documents.

1. Spread footing foundations should be supported on undisturbed bedrock or select structural fill extending to bedrock. Existing fill and soft or excessively loose natural soils, if present, should be completely removed to bedrock and replaced with select structural fill. Alternatively, footings in areas of deep fill and natural soils can be supported on a zone of existing fill and/or natural soils improved using aggregate piers, as discussed in the following section of this report.

2. Select structural fill should meet the material and placement requirements presented in the "Site Grading and Earthwork" section of this report. Structural fill should extend down and out from the edges of the footings at a 1 horizontal to 1 vertical projection.

3. Spread footings should have a minimum width of 18 inches for continuous footings and 24 inches for isolated pads, and a minimum embedment of 2 feet in heated areas.

4. Exterior footings and footings beneath unheated areas should be provided with adequate soil cover above their bearing elevation for frost protection. Placement of foundations at least 36 inches below the exterior grade is recommended for this area.

5. Allowable soil bearing pressures will depend on the subgrade conditions and footing width and embedment, all of which may vary. Subgrade conditions may consist of undisturbed bedrock, select structural fill extending to bedrock, or improved existing fill and/or natural soils. We recommend the following maximum allowable soil bearing pressures:

   - Footings bearing directly on undisturbed bedrock should be designed for a maximum allowable bearing capacity of 8,000 psf.
   - Footings bearing on select structural fill extending to undisturbed bedrock should be designed for a maximum allowable bearing capacity of 5,500 psf.

   The allowable soil bearing pressures may be increased by one-third for transient loads.

   Where feasible, footings should also be designed for a minimum dead load equal to one-fourth of the maximum allowable bearing pressure.

6. Based on experience and empirical correlations between material density, compressibility, and settlement potential, we estimate total settlement for spread footings designed and

constructed as discussed in this section will be approximately 1 inch or less. Slightly higher total settlement may be experienced by footings supporting very high column loads. Differential settlements are estimated to be approximately ½ to ¾ of the total settlement. Due to the anticipated nature of the soil and bedrock bearing conditions, most of the settlement is anticipated to occur during construction and initial loading of the foundation. Footing size and bearing pressures should be determined such that estimated total settlements are reasonably consistent for differing bearing conditions.

7. The lateral resistance of a spread footing will be a combination of the sliding resistance of the footing on the foundation materials and passive earth pressure against the side of the footing. Resistance to sliding at the bottoms of the footings supported as recommended can be calculated based on a coefficient of friction of 0.35. Passive pressure provided by structural fill placed against the sides of the footings can be calculated using an equivalent fluid unit weight of 225 pcf. These lateral resistance values are working values with a factor of safety of 2.

8. Structural fill placed against the sides of the footings to resist lateral loads should meet the material and placement criteria presented in the “Site Grading and Earthwork” section of this report.

9. Granular foundation soils should be densified with a smooth vibratory compactor prior to placement of concrete.

10. Care should be taken to provide adequate surface drainage during the excavation of footings, and the contractor should have equipment available for removing water immediately from excavations following precipitation, if needed. Footing excavations that are inundated as a result of uncontrolled surface runoff may loosen or soften, requiring possible moisture conditioning and recompaction of the exposed subgrade soils, or removal of soft or excessively loose subgrade soils and replacement with select structural fill.

11. A representative of the geotechnical engineer should observe all footing excavations, observe and test compaction, and evaluate the suitability of all fill materials prior to

SEISMIC DESIGN

Based on conditions encountered in the borings, the site soil profile to a depth of 100 feet following construction is anticipated to consist generally of up to a few feet of overburden soils underlain by generally hard to very hard bedrock extending to depths greater than 100 feet. Overburden soils will classify as IBC Site Class D soils, and, based on our experience, the bedrock underlying the site should classify overall as IBC Site Class C soils. Based on our experience on sites with similar soil profiles, the site subsurface profile is considered to correspond to Site Class C. Based on the subsurface profile, site seismicity, and the anticipated depth of ground water, liquefaction is not a design consideration.

FLOOR AND GARAGE SLABS

Slab-on-grade construction at the site carries a risk of heave- or settlement-related movement should the underlying materials experience moisture change subsequent to construction. Slabs underlain by claystone bedrock will have a risk of heave-related movement, and slabs underlain by existing fill have a risk of excessive settlement. If slab movement is not acceptable, structural slabs supported by drilled piers and grade beams should be used, particularly for architectural floor slabs. Note that slab-on-grade construction would likely be the preferred alternative for structures supported on shallow foundations. With the exception of architectural floor slabs in stairwells or elevator vestibules, garage slabs can generally tolerate more movement than architectural floor slabs, making a slab-on-grade approach more feasible for garage slabs.

Considering the relative expense of a structural slab, slab-on-grade construction may be considered as an alternate to a structural slab provided the increased risk of distress resulting from slab movement is accepted by the owner and precautions are taken to reduce the effects of movement. Movement of soil-supported slabs can be mitigated by placing a zone of stabilizing fill below the slab and constructing slab-supported elements designed to accommodate movement. For slab-on-grade construction, bedrock should be removed and replaced with properly compacted, non-expansive to low swelling structural fill, or site grades should be raised sufficiently with structural fill to avoid excavating the bedrock.

In accordance with the practice in this area, the following discussion presents estimates of ground heave for different wetting depth scenarios to aid in the decision-making process for slab support systems. The risk of ground heave beneath soil-supported slabs can be reduced to a certain degree by providing a zone of non- to low-swelling, relatively impervious, compacted fill directly beneath the slabs. Heave estimate calculations can be useful in evaluating the relative

effectiveness of varying the thickness of this prepared fill zone. However, such calculations cannot address the uncertainty in the potential depth and degree of wetting that may occur under beneath the structures or the variability of swell potential across the site.

We have performed calculations to demonstrate the potential for ground heave if the claystone bedrock beneath the structures should be thoroughly wetted to significant depth, including below the depth of the compacted fill zone. The following table presents estimates of potential slab heave based on the results of swell-consolidation tests using test and analysis methods generally accepted in the Colorado Front Range. Both depth of wetting and depth of the prepared fill zone were considered as variables in the analysis.

Subslab Fill Alternative		Calculated Ground Heave (in.)		
		10 ft Depth of Wetting	15 ft Depth of Wetting	20 ft Depth of Wetting
1	No Subslab Replacement	3.6	4.7	5.7
2	7 feet of moisture-conditioned on-site or imported soil with 1% swell*	0.9	2.8	4.8
3	6 feet of non-expansive moisture-conditioned on-site or imported soil with 0.0% swell*	1.0	2.1	3.1
*Percent swell when wetted under a 200 psf surcharge pressure.				

The heave estimates for the above-listed alternatives consisting of structural sub-slab fill assumed, as noted, the on-site soils and sandstone bedrock can be processed such that they would not exhibit swell potential greater than 0.0% or 1% when remolded to 95% of the standard Proctor (ASTM D698) maximum dry density at or above optimum moisture content and wetted under a 200 psf surcharge pressure. The heave estimates also assume the upper 12 inches of the subgrade materials at the base of the subslab fill zone are prepared as recommended in the "Site Grading and Earthwork" section of this report.

As indicated by the results of the swell-consolidation tests, most of the existing fill and the sandstone bedrock exhibited nil to low swell potential. It should be feasible to moisture condition those materials to meet the swell criteria recommended in the "Site Grading and Earthwork" section of this report and assumed in the above table.

The heave estimate calculations demonstrate significant slab heave should be expected if thorough wetting of the claystone bedrock beneath the building occurs to significant depth below the bottom of the prepared fill zone. However, there are near-surface zones of sandstone bedrock

of variable thickness across the site, including lenses within the claystone, which should naturally mitigate the potential for heave in areas. In addition, However, our experience indicates the large majority of similar structures underlain by similar materials do not experience extreme moisture increases in the underlying materials to significant depth provided good surface and subsurface drainage is designed, constructed, and maintained, and good irrigation practices are followed. Of course, wetting can also occur as a result of unforeseeable influences such as plumbing leaks or breaks, or, in some cases, even due to off-site influences depending on geologic conditions.

Considering the above discussion, we believe soil-supported floor and garage slabs may be considered for the project, provided the potential for slab movement due to ground heave and associated possible distress is recognized by the owner. The intent of our recommendations for soil-supported floor slabs is to provide for conditions where there is a good chance ground heave beneath the building will not exceed amounts acceptable to the owner. The recommendations should result in heave movements that do not exceed 1 inch and are unlikely to significantly exceed 2 inches unless extreme wetting is allowed. Barring unforeseen events, we do not believe extreme wetting is likely to occur if the surface and subsurface drainage and irrigation recommendations presented in this report are followed.

If a slab-on-grade approach is selected, the following measures should be taken to mitigate or reduce slab movements and reduce the potential for damage which could result from movement should the subslab materials be subjected to moisture changes.

1. Floor slabs underlain directly or at depths of less than 8 feet by bedrock should be placed on a subslab structural fill zone corresponding to the subslab alternative selected from the above table. That criteria should apply across most of the site.

2. Provided the Owner understands and accepts the risk of post-construction slab movement greater than normally accepted design tolerances, slabs underlain by existing fills and/or natural soils extending deeper than 8 feet should be placed on a minimum of 3 feet of structural fill. Increasing the thickness of the subslab structural fill zone would correspondingly decrease the risk of post-construction movement. Alternatively, movement-sensitive slabs could be supported on a grid of aggregate piers, as discussed below.

3. Structural fill should meet the material requirements provided in the "Site Grading and Earthwork" section of this report.

4. Floor slabs should be separated from all bearing walls and columns with expansion joints which allow unrestrained vertical movement.

5. Non-bearing partitions resting on floor slabs should be provided with slip joints so that, if the slabs move, the movement cannot be transmitted to the upper structure. This detail is also important for wallboards and door frames. Slip joints that will allow at least 2 inches of vertical movement are recommended.

   If wood or metal stud partition walls are used, the slip joints should preferably be placed at the bottoms of the walls so differential slab movement won't damage the partition wall. If slab-bearing masonry block partitions are constructed, the slip joints will have to be placed at the tops of the walls. If slip joints are provided at the tops of walls and the floors move, it is likely the partition walls will show signs of distress, such as cracking. An alternative, if masonry block walls or other walls without slip joints at the bottoms are required, is to found them on grade beams and piers and to construct the slabs independently of the foundation. If slab-bearing partition walls are required, distress may be reduced by connecting the partition walls to the exterior walls using slip channels.

   Floor slabs should not extend beneath exterior doors, stem-walls, or over foundation grade beams, unless saw cut at the beam after construction.

6. Floor slab control joints should be used to reduce damage due to shrinkage cracking. Joint spacing is dependent on slab thickness, concrete aggregate size, and slump, and should be consistent with recognized guidelines such as those of the Portland Cement Association (PCA) or American Concrete Institute (ACI). The joint spacing and slab reinforcement should be established by the designer based on experience and the intended slab use.

7. If moisture-sensitive floor coverings will be used, additional mitigation of moisture penetration into the slabs, such as by use of a vapor retarder/barrier may be required. If an impervious vapor barrier membrane is used, special precautions will be required to

prevent differential curing problems which could cause the slabs to warp. American Concrete Institute (ACI) 302.1R addresses this topic.

8. All plumbing lines should be tested before operation. Where plumbing lines enter through the floor, a positive bond break should be provided. Flexible connections should be provided for slab-bearing mechanical equipment.

9. The geotechnical engineer should evaluate the suitability of proposed imported subslab fill material. Evaluation of potential imported replacement fill sources will require determination of laboratory moisture-density relationships and swell consolidation tests on remolded samples.

For subslab fill zones extending into bedrock, we recommend that an underdrain system be constructed at the base of the subslab fill zone to prevent development of perched water in the fill. Inclusion of a properly designed and constructed underdrain system will be a critical component in reducing potential slab heave. This underdrain system should be designed in accordance with recommendations in the “Underdrain Systems” section of this report.

The precautions and recommendations itemized above will not prevent the movement of floor slabs if the underlying materials are subjected to alternate wetting and drying cycles. However, the precautions should reduce the damage if such movement occurs.

Aggregate Piers: In areas of deep existing fill, aggregate piers are a commonly used ground improvement approach for support of soil-supported slabs. Soil improvement using aggregate piers is useful for providing a stiffer subgrade and higher soil modulus values and reducing settlements. Aggregate piers also reduce excavation and backfilling volumes in areas of existing fill, and associated export volumes.

Aggregate piers are typically constructed by augering or vibrating 12- to 30-inch-diameter holes to prescribed depths below foundation subgrade and backfilling the holes with lifts of highly compacted, high strength aggregate materials. Compaction both densifies the aggregate and increases lateral stress in the surrounding soils, resulting in a subgrade with a stiffer composite soil matrix. The auger method will result in spoils that will need to managed; the vibratory displacement process produces little to no spoils as the displaced soils are densified in place.

For support of floor slabs and movement-sensitive flatwork over deep fills, a grid of aggregate piers can be used. In broad areas where the slab subgrade is at or within a couple of feet of the existing fill, the pier grid should be bridged by a granular blanket of structural fill reinforced with one or two layers of an appropriate, high-strength geogrid. In broad areas where the slab subgrade will be raised more than two feet above the existing fill, a geogrid would likely not be necessary. Transitional areas should be further evaluated.

If used, pier spacing for slab support would depend on the thickness and resulting stiffness of the structural fill layer, reinforced or not. It should be feasible to achieve suitable slab performance (in terms of acceptable total and differential settlement) by extending the piers to a depth equivalent to some percentage of the thickness of the fill.

Aggregate piers are proprietary systems and the specialty contractor who installs the piers typically provides the design including the stiffness of the soil matrix and settlement criteria. The pier contractor should be required to submit the details of their proposed system, including pier group sizes and pier spacing and proposed installation depths.

EXTERIOR FLATWORK

Subgrade preparation beneath exterior flatwork immediately adjacent to the structures where reduction of heave or settlement potential is considered critical should be done in accordance with the recommendations provided in the “Floor and Garage Slabs” section of this report, including depth of over-excavation and backfilling with engineered fill. Movement-sensitive flatwork may include sidewalks, entry areas, and rigid pavements. Where reduction of movement is less of a concern, such as for sidewalks, flatwork, and rigid pavement located more than 10 feet from the buildings, subgrade preparation may be done in accordance with the subgrade preparation recommendations provided in the “Pavement Design” section of this report. Proper surface drainage measures as recommended in following sections of this report are also critical to limiting moisture- or frost-related movement.

It is extremely important that exterior flatwork and pavements be isolated from the building foundations. Many problems associated with expansive soils are related to ineffective isolation between pavements and exterior slabs and foundation-supported components of structures. Careful design detailing is necessary at locations such as exterior stairway landings and entry points. Fig. 15 shows a conceptual detail that should be considered for doorways where an exterior slab-on-grade or rigid pavement abuts the building foundation. The intent of the detail is

to allow for upward slab movement to occur without transferring upward forces into the structure by providing a double-hinged section of the slab adjacent to the grade beam. This detail is conceptual in nature and modifications should be considered based on project-specific conditions.

Upward heave-related movement of exterior flatwork adjacent to the building may result in adverse drainage conditions with runoff directed toward the building. In addition, upward movement of exterior flatwork may restrict movement of outward swinging doors. Site grading and drainage design should consider those possibilities, particularly at entryways.

LATERAL EARTH PRESSURES

Although the structures will be at-grade, below-grade structures such as elevator pits and utility vaults may be required, and parking garage ramp walls may be support backfill in places. Walls should be designed for the lateral earth pressure generated by the backfill. Lateral earth pressure is a function of the degree of rigidity of the retaining structure and the type of backfill material used.

Walls that are laterally supported and can be expected to undergo only a moderate amount of deflection should be designed for a lateral earth pressure based on the following equivalent fluid densities:

Imported free-draining granular backfill (< 5% passing No. 200 sieve) ..... 45 pcf
CDOT Class 1 (<20% passing No. 200 Sieve) ..... 50 pcf
On-site or imported, non-expansive, silty or clayey sand ..... 55 pcf

Cantilevered retaining structures that can be expected to deflect sufficiently to mobilize the full active earth pressure condition should be designed for a lateral earth pressure based on the following equivalent fluid densities:

Imported free-draining granular backfill (< 5% passing No. 200 sieve) ..... 35 pcf
Imported CDOT Class 1 (<20% passing No. 200 sieve) ..... 40 pcf
On-site or imported, non-expansive, silty or clayey sand ..... 45 pcf

The on-site clay fill and natural soils should not be used as wall backfill.

The equivalent fluid density values recommended above assume drained conditions behind the walls and a horizontal backfill surface. The buildup of water behind a wall or an upward sloping backfill surface will increase the lateral earth pressure imposed on the wall. Below-grade walls should also be designed for appropriate surcharge pressures due to adjacent structures, vehicle traffic, and construction activities. For calculating lateral pressures due to surcharge loads, we recommend using a lateral earth pressure coefficient of 0.6.

The zone of backfill placed behind walls should be sloped upward from the base of the wall at an angle no steeper than 45 degrees measured from horizontal. Wall backfill should be placed according to the compaction criteria presented in the "Site Grading and Earthwork" section of this report. Care should be taken not to over-compact the backfill since this could cause excessive lateral pressure on the wall. Hand compaction procedures, if necessary, should be used to prevent lateral pressures from exceeding the design values. Additionally, backfill compaction should begin at the wall and progress outward away from the wall to reduce the potential for excessive lateral pressure.

UNDERDRAIN SYSTEM

Underdrain systems will be required in areas where subslab fill zones extend below top of bedrock as a result of overexcavation. An underdrain system would be required to prevent accumulation of perched water in the fill zone and reduce the potential for moisture increases in the underlying bedrock, which could adversely affect the performance of shallow foundations and slab-on-grade construction. This recommendation should also be considered for flatwork areas immediately adjacent to the structures.

In areas where overexcavation extends into bedrock, an underdrain should be constructed at the base of the subslab fill zone to prevent development of perched water in the fill. The underdrain system should consist of drain lines extending along the perimeter of the over-excavated zone. The alignment of the drain system should preferably be just outside of the building perimeter, but far enough away that the drain doesn't interfere with foundation construction. Depending on the extent of the replacement fill area extending into bedrock, a system of lateral subdrains extending across the base of the fill zone may also be necessary.

Ideally, the base of the subslab excavation should be graded to slope towards the drain lines with a minimum slope of ½%; however, this may not be practical for structures with large footprint area, which may require consideration of interior lateral drains. The overall subdrain pipe system

should be sloped at a minimum slope of ½% to an overall site subdrain collection system or to a sump or sumps where water can be removed by pumping or gravity drainage. In addition, the drain lines should be provided with appropriately spaced cleanouts for maintenance and inspection, which we recommend be performed on a routine basis.

Subdrain lines should consist of rigid, perforated or slotted, PVC or similar drain pipe with a smooth internal wall placed in the bottom of the trench. A minimum pipe diameter of six inches is recommended, primarily to allow for inspections. The invert of the subdrain pipe should be placed at the base of the pipe trench, and the drain pipe should be surrounded above the invert level by a minimum of six inches of drainage aggregate, with the aggregate zone extending at least 2 feet above the base of the overexcavation. Drainage aggregate used in the subdrain system should conform to the requirements of CDOT Class B or Class C Filter Material, and the drain pipe should be factory slotted or otherwise perforated in accordance with acceptable filter criteria (i.e., Army Corps of Engineers). Alternatively, if a filter geotextile is used in subdrain trenches to wrap the drainage aggregate, the pipes may be covered by free-draining gravel not meeting filter criteria, such as AASHTO No. 57 or No. 67 Coarse Aggregate. The perforated drain pipes themselves should not be directly wrapped in geotextile due to the potential for clogging of the geotextile at the perforations or slots.

Stabilized water inflow rates are expected to be low. If pumped systems are necessary for discharge purposes, the need for high-capacity pumps is not anticipated, and we recommend considering over-sized sumps to reduce pump cycling. We also recommend including a level alarm in the event the pump ceases to function. Providing over-sized sumps would also make inspection and pump replacement easier.

Discharge of collected groundwater may require permitting by the Water Quality Control Division (WQCD) of the Colorado Department of Public Health and Environment. However, water intercepted by the underdrain system will likely consist of infiltrated surface water and not of true groundwater. We understand CDPHE is not requiring discharge permits in such cases; that would need to be confirmed with CDPHE. The Owner should be prepared to have to meet permitting requirements of the WQCD, which may include temporary and/or permanent treatment of groundwater leaving the site.

SURFACE DRAINAGE

Proper surface drainage is very important for acceptable performance of the structures and movement-sensitive exterior flatwork and pavements during construction and after the construction has been completed. Drainage recommendations provided by local, state and national entities should be followed based on the intended use of the building. The following recommendations should be used as guidelines and changes should be made only after consultation with the geotechnical engineer.

1. Excessive wetting or drying of the foundation and slab subgrades should be avoided during construction.

2. The ground surface should be sloped to drain away from the structures and movement-sensitive exterior flatwork in all directions. We recommend a minimum slope of 12 inches in the first 10 feet in unpaved areas. Site drainage beyond the 10-foot zone should be designed to promote runoff away from the structures and movement-sensitive exterior flatwork and reduce infiltration. A minimum slope of 6 inches in the first 10 feet is recommended in flatwork areas adjacent to the buildings. These slopes may be changed as required for handicap access points in accordance with the Americans with Disabilities Act.

3. The upper 1 to 2 feet of the backfill in unpaved areas should be relatively impervious material to limit infiltration of surface runoff.

4. Ponding of water should not be allowed in backfill material or in a zone within 20 feet of the foundations, whichever is greater.

5. Roof downspouts and drains should discharge well beyond the limits of all backfill.

6. Landscaping adjacent to buildings underlain by moisture-sensitive soils and bedrock should be designed to avoid irrigation requirements that would significantly increase soil moisture and potential infiltration of water within at least ten feet of the building foundations. Landscaping located within 10 feet of foundations should be designed for irrigation rates that do not significantly exceed evapotranspiration rates. Use of vegetation with low water demand and/or drip irrigation systems are frequently used methods for limiting irrigation quantities.

Lawn sprinkler heads and landscape vegetation that requires relatively heavy irrigation should be located at least 10 feet from structures and movement-sensitive flatwork. Even in areas further away, it is important to provide good drainage to promote runoff and reduce infiltration. Where feasible, main pressurized zone supply lines, including those supplying drip systems, should be located more than 10 feet from structures and movement-sensitive flatwork in the event that leaks occur. All irrigation systems, including zone supply lines, drip line, and sprinkler heads should be routinely inspected for leaks, damage, and improper operation.

SITE GRADING AND EARTHWORK

Site Grading Considerations: Excavations across the Site are anticipated to encounter existing fills, native overburden soils, and claystone and sandstone bedrock. Excavation of the existing fills and native soils can be accomplished by typical earth-moving equipment. Excavation of the bedrock will require heavy-duty earth-moving equipment and may require the use of rippers and/or pneumatic hammers in places where the bedrock is moderately to significantly cemented, which could significantly slow site earthwork.

Site Preparation: Limited thicknesses of existing fill were generally encountered at the boring locations. However, deep fills ranging in depth for about 4 feet to 19 feet were encountered in Boring 22-1 and 22-2 at the north end of the site, and deep existing fills may be locally present elsewhere across the site. Although sampler blow counts indicate the existing fills, where encountered, may have been placed under controlled conditions, the fills should be considered non-engineered and unsuitable in their current condition for support of the structures and settlement-sensitive slabs and exterior flatwork areas. Accordingly, existing fills ideally should be completely removed from within the structure footprint areas.

Over-excavated areas should be backfilled as recommended in specific sections of this report with structural fill meeting the material and compaction criteria presented in this section. For floor and garage slabs, pavements, and exterior flatwork that can tolerate some settlement-related movement, partial removal and replacement or ground improvement measures, as discussed in the “Aggregate Pier” section of this report, may be appropriate provided the owner accepts the risk of movement in excess of normally accepted tolerances.

Prior to placing shallow foundations, floor and garage slabs, exterior flatwork, and pavements, and structural or site grading fill supporting those elements, subgrade preparation should include

proofrolling with a heavily loaded, pneumatic-tired vehicle or a heavy, smooth-drum, vibratory roller compactor. Areas that deform excessively during proofrolling should be removed and replaced to achieve a reasonably stable subgrade prior to placement of floor slabs, exterior flatwork, or pavements.

Temporary Excavations and Dewatering: Excavations for the project are expected to extend into existing fill, native clay soils in places, and bedrock consisting of claystone and sandstone. Excavations may also encounter perched groundwater in places. Where sufficient lateral space is available, temporary excavations above groundwater can be constructed by overexcavating the side slopes to stable configurations in accordance with OSHA requirements. Existing fill at the site will generally classify as OSHA Type C soil, and the native clay soils will generally classify as OSHA Type B soils. The bedrock will generally classify as Type A soil, although fissured or fractured bedrock may classify as Type B and, in some cases, Type C soils depending on the degree of fissuring or fracturing and on the presence of groundwater seepage. Natural granular soils, if encountered, will tend to ravel and cave, particularly if encountered in conjunction with groundwater. Excavations encountering groundwater could require much flatter side slopes than those allowed by OSHA, or temporary shoring and/or dewatering.

Where groundwater seepage is encountered or insufficient lateral space is available due to the proximity to existing structures, traffic areas, and active underground utilities, temporary shoring may be required. It is our experience that temporary shoring systems are typically designed and built by specialty contractors and that the designers will typically develop their own design criteria based on soil data presented in the owner's geotechnical study report. We are available upon request for further consultation on temporary shoring design criteria. Temporary shoring provided in close proximity to existing structures, traffic areas, and active underground utilities should be sufficiently stiff to prevent movement.

Although not anticipated, OSHA requires excavations over 20 feet in depth be designed by a registered professional engineer. The contractor's on-site "competent person" should confirm that all necessary slope and shoring design are performed. In addition, the slopes should be monitored on a regular basis for signs of movement and safety considerations. Requirements for slope stability analysis and slope performance monitoring by the contractor should be included in the construction documents.

Surface water runoff into the excavations can act to erode and potentially destabilize the excavation side slopes and/or result in soft or loose soil conditions at the base of the excavation and should not be allowed. Diversion berms and other measures should be used to prevent surface water runoff into the excavations from occurring. If significant runoff into the excavations does occur, further excavation may be required to remove and replace the wet, soft or loose subgrade materials or to stabilize the excavation side slopes.

Apparent stabilized groundwater was measured at depths as shallow as about 11 feet, although most measurements place the groundwater level deeper. Based on the 6-inch depth to groundwater encountered in Boring 22-3, localized very shallow perched water may be encountered in places. Shallower groundwater appears to reside in fracture zones or sandstone seams within claystone bedrock. Deeper groundwater appears to reside in more permeable zones within the underlying sandstone bedrock. Groundwater seepage, if encountered, will likely occur through more weathered or highly fractured bedrock zones, or relatively permeable lenses and layers. Based on the anticipated permeability of the bedrock, groundwater will likely have a slow to moderate flow rate into excavations, if seepage zones are encountered.

Excavations extending encountering groundwater should be properly dewatered during the excavation process to help maintain stable subgrade conditions for fill placement and/or foundation construction. The requirements and type of dewatering effort will be based upon the depth of the excavation and the level of groundwater at specific locations. Based on our current understanding of site groundwater conditions, we anticipate it should be feasible to manage seepage flows into excavations by using temporary perimeter drains, perimeter trenches, and sumps, and pumping from within the excavation using trash pumps. Dewatering should continue until construction and associated backfilling extends above the groundwater table, or a permanent subdrain system is completed and in use.

Selection of dewatering measures should be the responsibility of the contractor. Dewatering quantities will depend on excavation size, water table drawdown, and soil permeability. Relatively low dewatering quantities should be anticipated based on the relatively low height of water perched above the bedrock and the anticipated relatively low permeability of the bedrock. We are available to provide estimates of ranges of temporary and, if necessary, permanent dewatering quantities for given excavation configurations based on soil gradation characteristics and estimated design groundwater levels.

Fill Material: Unless specifically modified in the preceding sections of this report, the following recommended material and compaction requirements are presented for structural fills on the project site. A geotechnical engineer should evaluate the suitability of all proposed fill materials for the project prior to placement.

1. *Select Structural Fill Beneath Spread Footing Foundations*: Select granular materials used beneath footings should consist of imported soils meeting the general requirements of CDOT Class 5 or 6 Aggregate Base Course.

2. *Structural Fill*: Structural fill used beneath floor slabs and movement-sensitive exterior flatwork should consist of suitable moisture-conditioned on-site soils or non-expansive imported soil materials. Imported fill material should have a maximum of 45% passing the No. 200 sieve, a maximum liquid limit of 35, and a maximum plasticity index of 15. Imported or on-site fill materials not meeting the above liquid limit and plasticity index criteria may be acceptable provided the maximum percentage passing the No. 200 sieve and the swell criteria outlined in Item 6 below are satisfied.

3. *General Site Grading Fill:* Site grading fill used beneath pavements and exterior flatwork no considered sensitive to movement should consist of suitable moisture-conditioned on-site soils, or non-expansive to low-swelling imported soil materials. Imported fill material should have a maximum of 70% passing the No. 200 sieve, a maximum liquid limit of 35, and a maximum plasticity index of 15. Imported or on-site fill materials not meeting the above liquid limit and plasticity index criteria may be acceptable provided the maximum percentage passing the No. 200 sieve and the swell criteria outlined in Item 6 below are satisfied.

4. *Wall Backfill*: To facilitate placement and compaction, and reduce the potential for post-construction settlement, structural backfill placed immediately against below-grade walls ideally should consist of imported granular materials generally meeting the requirements for CDOT Class 1 Structure Backfill or granular materials with less than 5% passing the No. 200 sieve. None of the on-site soils and bedrock conform to those materials.

   Use of the on-site sandy lean clays, silty to clayey sands, and processed sandstone meeting the criteria for structural fill and general site grading fill as backfill is not precluded. Note that placing and compacting silty to clayey materials as recommended herein may

require more effort and attention than would cleaner granular materials, particularly in areas requiring a high degree of compaction and where post-construction settlement is a concern.

5. *Pipe Bedding Material*: Pipe bedding material should be a clean, free draining, well-graded sand or squeegee sand meeting the permitting owner's and permitting jurisdiction's requirements. The bedding layer should be of adequate thickness to fully support the pipes when seated on top of the bedding and should have a minimum thickness of 6 inches or a thickness based on the proposed pipe type and diameter, whichever is greater.

6. *Pipe-Zone Backfill*: The pipe-zone material placed above the bedding and surrounding the pipe should consist of granular material similar to that described above for pipe bedding. To provide the required support around the pipe, the pipe-zone material should be compacted to at least 75% relative density (ASTM D 4253 and ASTM D 4254) beneath pavements and to at least 70% relative density elsewhere. The pipe-zone material should also be placed and compacted in accordance with the requirements of the pipe manufacturer.

7. *Utility Trench Backfill*: Overburden soils excavated from the utility trenches may be used for trench backfill above the pipe zone backfill provided they do not contain organics or other unsuitable materials or particles larger than 4 inches. Claystone bedrock excavated from the trenches is not considered suitable for use as trench backfill.

8. *Material Suitability*: Unless otherwise defined herein, all fill material should be non-expansive, free of vegetation, brush, sod, trash and debris, and other deleterious substances, and should not contain rocks or lumps having a diameter of more than 6 inches. The existing fills and native overburden soils should be suitable for use as general site grading fill, and some of those materials may be suitable for use as structural fill beneath floor slabs and movement-sensitive exterior flatwork. Processed sandstone may be suitable for use as structural fill and should be suitable for use as general site grading fill.

   All soil and bedrock used as structural fill, including imported materials, should be non-expansive to low swelling. Non-expansive materials should have a swell potential that does not exceed 0.5% when a sample remolded to 95% of the standard Proctor (ASTM

D698) maximum dry density at optimum moisture content is wetted under a 200 psf surcharge pressure. Under the same testing criteria, low-swelling materials should have a swell potential that does not exceed 1.0%.

Compaction Requirements: We recommend the following compaction criteria be used on the project:

1. *Moisture Content*: Fill materials should be compacted at moisture contents within 2 percentage points of the optimum moisture content for predominantly granular materials and between 0 and +3 percentage points of optimum for predominantly clay materials. The contractor should be aware that the clay soils, including on-site and imported materials, may become somewhat unstable and deform under wheel loads if placed near the upper end of the moisture range.

2. *Placement and Degree of Compaction*: Structural fill beneath foundations and soil-supported slab, and adjacent to foundations, should be placed in maximum 8-inch-thick lifts. Wall backfill may be placed in maximum 12-inch-thick lifts provided proper compaction can be achieved.

   Unless recommended otherwise in specific sections of this report, the following compaction criteria should be followed during construction:

Fill Location	Percentage of Maximum Standard Proctor Density (ASTM D-698)
Beneath Spread Footing Foundations	100%
Beneath Floor Slabs	
Upper 8 Feet of Subslab Fill	95%
Subslab Fill placed Deeper than 8 Feet	100%
Adjacent to Spread Footing Foundations	95%
Below-Grade Wall Backfill	
Upper 8 Feet of Backfill	95%
Settlement Sensitive Areas and/or Backfill Placed Deeper than 8 Feet	98%[1]
Beneath Pavements and Settlement-Sensitive Flatwork Areas	
Upper 8 Feet of Backfill	95%
Backfill Placed Deeper than 8 Feet	100%
Utility Trenches	
Interior	100%
Exterior Less Than 15 Feet thick	95%
Exterior More Than 15 Feet Thick	100%
Landscape and Other Areas	95%

[1] Some difficulty could be encountered achieving adequate compaction with small equipment to avoid exerting excessive compaction stresses on walls.

3. *Subgrade Preparation*: Areas receiving engineered fill should be prepared as recommended in specific sections of this report to provide a uniform base for fill placement. All other areas to receive engineered fill not specifically addressed herein should be scarified to a depth of at least 8 inches and compacted to at least 95% of the standard Proctor (ASTM D698) maximum dry density at moisture contents recommended above. Scarification of undisturbed sandstone bedrock is not required.

   Excessive wetting and drying of excavations and prepared subgrade areas should be avoided during construction.

Construction Monitoring: A representative of the geotechnical engineer should observe prepared fill subgrades and fill placement on a full-time basis.

PAVEMENT THICKNESS DESIGN

A pavement section is a layered system designed to distribute concentrated traffic loads to the subgrade. Performance of the pavement structure is directly related to the physical properties of the subgrade soils and traffic loadings. Soils are represented for pavement design purposes by means of a soil support value for flexible pavements and a modulus of subgrade reaction for rigid pavements.

Pavement design procedures are based on strength properties of the subgrade and pavement materials assuming stable, uniform conditions. Certain existing subgrade materials encountered at the site are potentially expansive or prone to settlement and will require additional precautions be taken to provide for adequate pavement performance. These soils are problematic only if a source of water is present. If these soils are wetted, the resulting movements can be large and erratic. Pavement design procedures address these soils only by assuming they will not become wetted. Proper surface drainage is essential for adequate performance of pavement on these soils.

Subgrade Materials: Based on the results of the field exploration and laboratory testing programs, the subgrade materials anticipated to be at or near the pavement subgrade will generally classify as A-7-6 or A-6 soils with index values ranging from 9 to 35 in accordance with the AASHTO soil classification system. The sandstone bedrock, and fill derived from sandstone bedrock, should classify as A-2-6 soils with index values of 0. Soils classifying as A-6 and A-7-6 would generally be considered to provide poor pavement subgrade, while soils classifying as A-2-6 would be

considered to provide good subgrade support. Assuming most of the soils will generally classify as A-6 and A-7-6 soils and be prepared as recommended herein, a resilient modulus value of 3,025 psi was selected for flexible pavements and a modulus of subgrade reaction of 34 pci was selected for rigid pavements.

Design Traffic: Because anticipated traffic loading information was not available at the time of report preparation, an equivalent 18-kip daily load application (EDLA) of 5 was assumed for areas restricted to automobile traffic (Light-Duty) and an EDLA of 10 was assumed for combined automobile and heavier truck traffic areas, driveways, loading and delivery areas, and fire lanes (Medium-Duty). If it is determined that actual traffic is significantly different from that estimated, we should be contacted to reevaluate the pavement thickness design.

Pavement Thickness Requirements: The pavement thicknesses were determined in accordance with the 1993 AASHTO pavement design procedures. For design, initial and terminal serviceability indices of 4.5 and 2.0, respectively, a reliability of 85 percent. A design life of 20 years was selected. If other design parameters are preferred, we should be contacted to reevaluate the recommendations presented herein. Site pavement sections should be constructed as presented in the following table.

Pavement Type	Full-Depth HMA (in)	Composite HMA over ABC (in)	PCCP (in)
Light-Duty Pavements	5.0	3.5/6.0	6.0
Medium-Duty Pavements	6.0	4.0/7.0	6.0

HMA = Hot Mix Asphalt, ABC = Aggregate Base Course, PCCP= Portland Cement Concrete Pavement

Pavement Materials: HMA and PCCP should meet the latest applicable requirements, including the current CDOT *Standard Specifications for Road and Bridge Construction (Standard)*. We recommend HMA placed for the project is designed in accordance with the SuperPave gyratory mix design method. The mix should meet Grading S specifications with a SuperPave gyratory design revolution (N_{DESIGN}) of 75. A mix meeting Grading SX specification can be used for the top lift wearing course, however, this is optional. The mix design(s) for the HMA should use a performance grade (PG) asphalt binder of PG 58-28 or PG 64-22. However, we recommend the PG 58-28 binder which tends to perform better under relatively low traffic volumes. Placement and compaction of HMA should follow current CDOT standards and specifications.

PCCP should meet Class P or D specifications and requirements in the current CDOT *Standard*. PCCP is more sensitive to distress due to movement resulting from settlement than flexible asphalt pavements. PCCP should contain sawed or formed joints to ¼ of the depth of the slab at a maximum distance of 12 to 14 feet on center.

The above PCCP thicknesses are presented as un-reinforced slabs. Based on projects with similar vehicular loading in certain areas, we recommend that dowels be provided at transverse and longitudinal joints within the slabs located in the travel lanes of heavily loaded vehicles, loading docks, and areas where truck turning movements are likely to be concentrated. Additionally, curbs and/or pans should be tied to the slabs. The dowels and tie bars will help minimize the risk for differential movements between slabs to assist in more uniformly transferring axle loads to the subgrade. The current CDOT *Standard* provides some guidance on dowel and tie bar placement, as do the CDOT *Standard Plans: M&S Standards*. The proper sealing and maintenance of joints to minimize the infiltration of surface water is critical to the performance of PCCP, especially if dowels and tie bars are not installed.

ABC materials should meet CDOT requirements for Class 6 Aggregate Base Course and should be compacted to at least 95% of the modified Proctor (ASTM D1557) maximum dry density at a moisture content within 2 percent of the optimum.

Subgrade Preparation: We recommend soils and bedrock present at pavement subgrade be excavated to a depth of at least 2 feet below HMA pavements and 3 feet below PCCP and replaced with site grading fill meeting the material and compaction requirements presented in the “Site Grading and Earthwork” section of this report. Prior to placing new fill, the fill subgrade should be scarified to a depth of 12 inches, adjusted to a moisture content within 0 and +3 percentage points of the optimum moisture content, and compacted to at least 95% of the standard Proctor (ASTM D698) maximum dry density.

Prior to placing the pavement section, the prepared pavement subgrade should be proof rolled with a heavily loaded pneumatic-tired vehicle with a gross weight of at least 50,000 pounds, a single loaded axle weight of 18,000 pounds, and a tire pressure of 100 psi, or, alternatively with a comparably heavy, smooth drum roller compactor. Pavement design procedures assume a stable subgrade. Areas that deform excessively under heavy wheel loads are not stable and should be removed and replaced to achieve a stable subgrade prior to paving. The contractor

should be aware that clay soils, including on-site and imported materials, may become somewhat unstable and deform under wheel loads if placed near the upper end of the moisture range.

Drainage: The collection and diversion of surface drainage away from paved areas is extremely important to the satisfactory performance of pavement. Drainage design should provide for the removal of water from paved areas and prevent the wetting of the subgrade soils. Joints should be routinely inspected, and joints and cracks that develop after construction should be sealed to reduce the potential for water to migrate through the pavement.

DESIGN AND CONSTRUCTION SUPPORT SERVICES

K+A should be retained to review the project plans and specifications for conformance with the recommendations provided in our report. We are also available to assist the design team in preparing specifications for geotechnical aspects of the project and perform additional studies, if necessary, to accommodate possible changes in the proposed construction.

We recommend K+A be retained to provide construction observation and testing services to document that the intent of this report and the requirements of the plans and specifications are being followed during construction. This will allow us to identify possible variations in subsurface conditions from those encountered during this study and re-evaluate our recommendations, if needed. We will not be responsible for implementation of the recommendations presented in this report by others, if we are not retained to provide construction observation and testing services.

LIMITATIONS

The conclusions and recommendations submitted in this report are based upon the data obtained from the exploratory borings at the locations indicated on Fig. 1, and the proposed type of construction. This report may not reflect subsurface variations that occur between the exploratory borings, and the nature and extent of variations across the site may not become evident until site grading and excavations are performed. If during construction, fill, soil, rock, or groundwater conditions appear to be different from those described herein, K+A should be advised at once so that a re-evaluation of the recommendations presented in this report can be made. K+A is not responsible for liability associated with interpretation of subsurface data by others.

Swelling materials occur on this site. Such materials are stable at their natural moisture content but could undergo high volume changes with changes in moisture content. The extent and amount

of perched water beneath the site as a result of area irrigation and inadequate surface drainage is difficult, if not impossible, to foresee.

The recommendations presented in this report are based on current theories and experience of our engineers on the behavior of swelling soils and bedrock in this area. The owner should be aware that there is a risk in constructing in an area of expansive materials. Following the recommendations given by a geotechnical engineer, careful construction practice, and prudent maintenance by the owner can, however, decrease the risk of foundation, slab, and pavement movement due to expansive materials.

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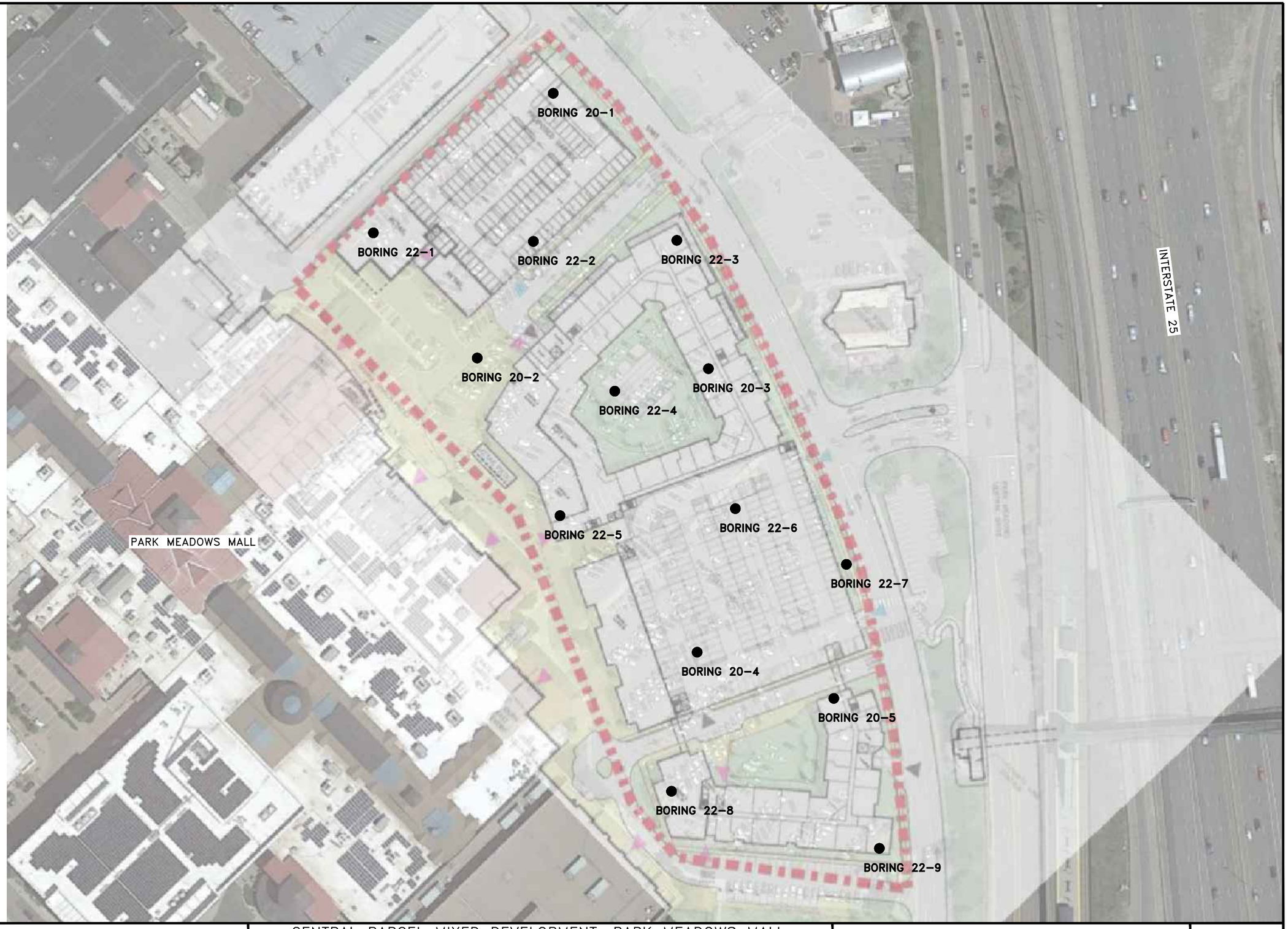

20–1–664A	Kumar & Associates	CENTRAL PARCEL MIXED DEVELOPMENT, PARK MEADOWS MALL, LONETREE, COLORADO	LOCATION OF EXPLORATORY BORINGS

Fig. 1

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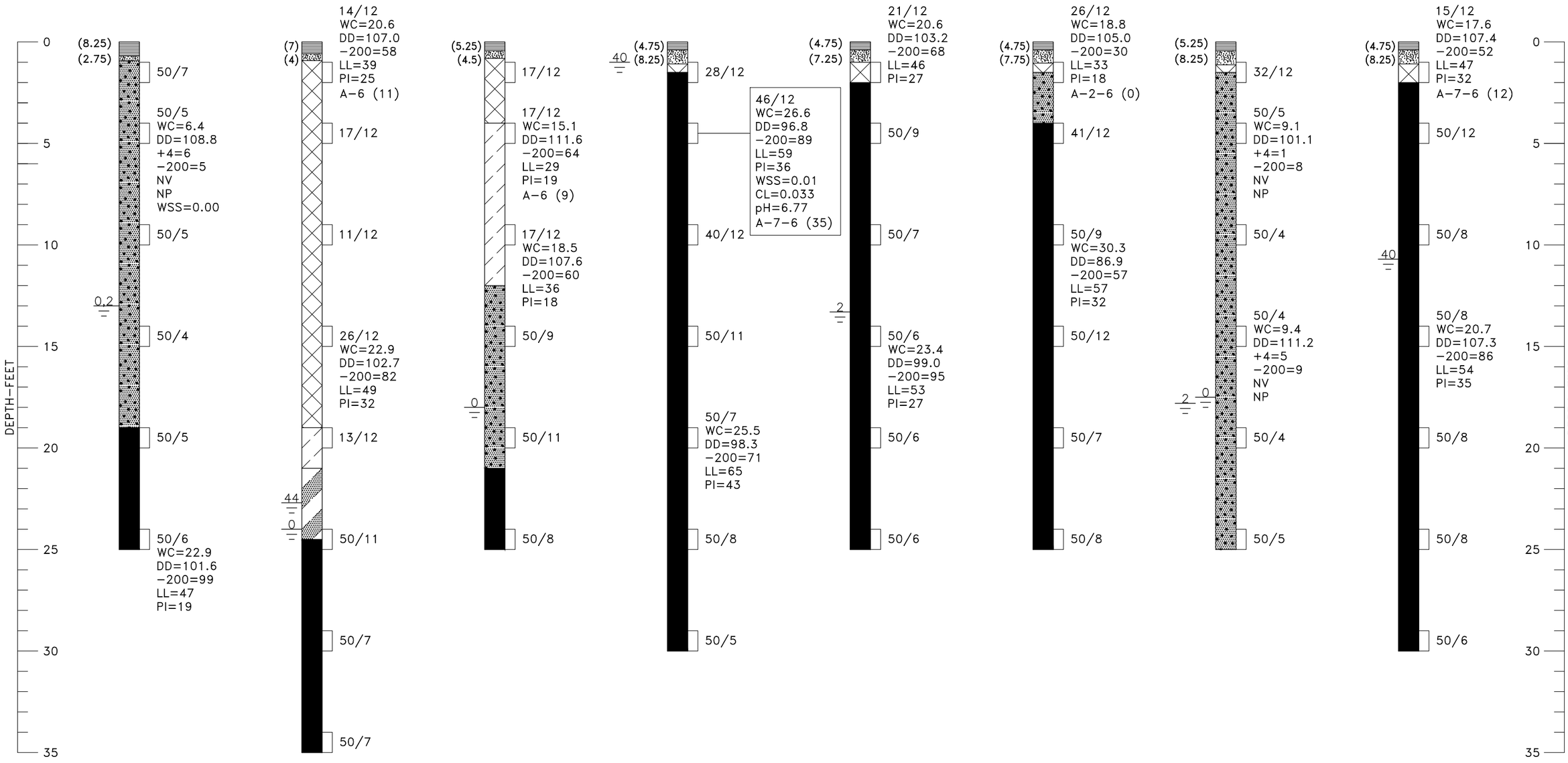
BORING 20-1 | BORING 22-1 | BORING 22-2 | BORING 22-3 | BORING 20-2 | BORING 22-4 | BORING 20-3 | BORING 22-5

PARKING GARAGE/RETAIL

RESIDENTIAL BUILDING/RETAIL



20-1-664A	Kumar & Associates	CENTRAL PARCEL MIXED DEVELOPMENT, PARK MEADOWS MALL, LONETREE, COLORADO	LOGS OF EXPLORATORY BORINGS	Fig. 2

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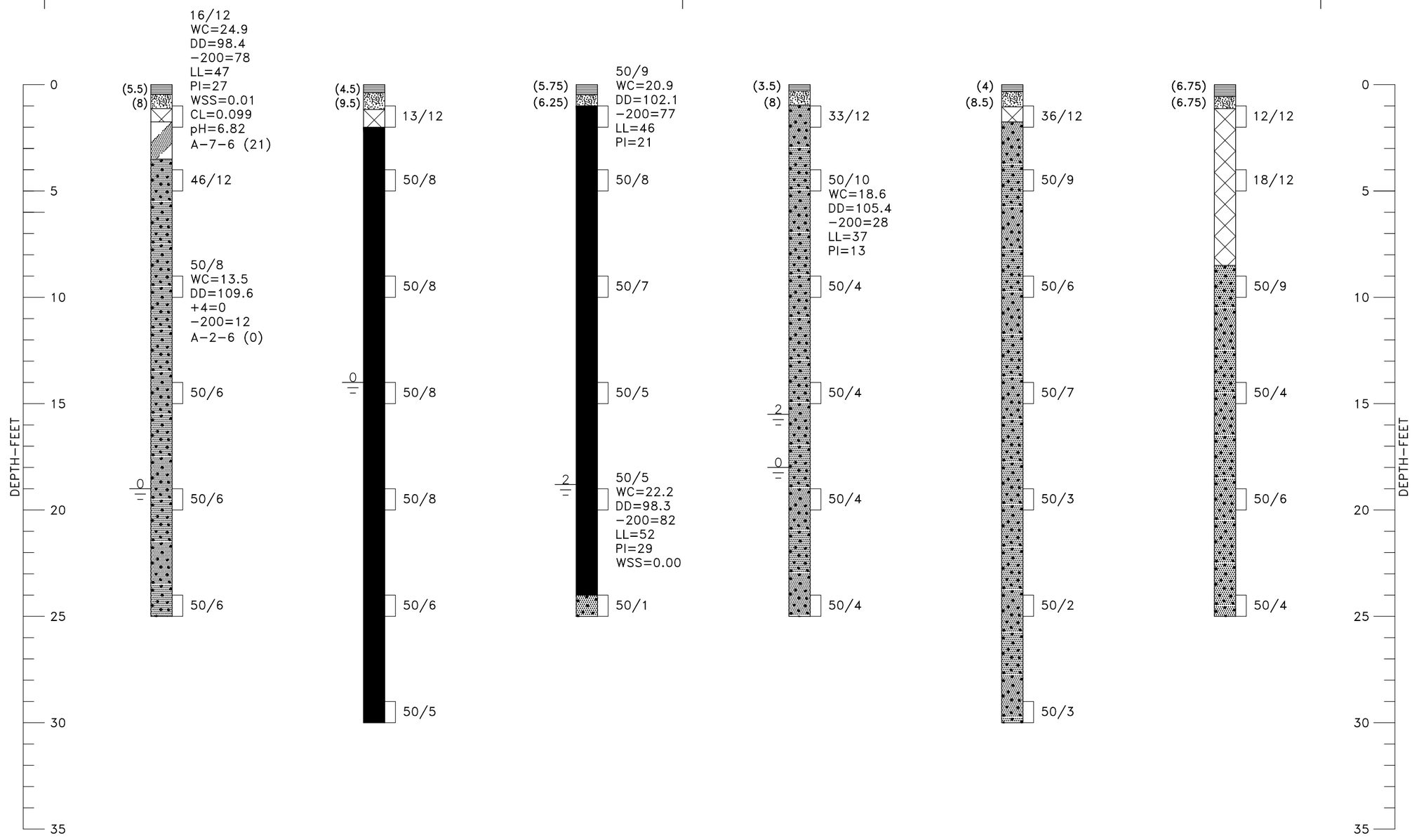

20-1-664A	Kumar & Associates	CENTRAL PARCEL MIXED DEVELOPMENT, PARK MEADOWS MALL, LONETREE, COLORADO	LOGS OF EXPLORATORY BORINGS	Fig. 3

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LEGEND

(8.25) ASPHALT, THICKNESS IN INCHES SHOWN IN PARENTHESES TO LEFT OF THE LOG.

(2.75) BASE COURSE, THICKNESS IN INCHES SHOWN IN PARENTHESES TO LEFT OF THE LOG.

FILL: LEAN CLAY WITH VARIABLE SAND CONTENT (CL) TO CLAYEY SAND (SC), (PROCESSED CLAYSTONE AND SANDSTONE), FINE TO COARSE SAND FRACTION, MOIST, BROWN TO GRAY TO BLACK.

SANDY LEAN CLAY (CL), FINE TO COARSE SAND FRACTION, STIFF TO VERY STIFF, MOIST, BROWN.

SANDSTONE BEDROCK, CLAYEY IN PLACES, ISOLATED TO OCCASIONAL CLAYSTONE INTERBEDS, FINE TO COARSE WITH ISOLATED TO OCCASIONAL GRAVEL, HARD TO VERY HARD TO MEDIUM HARD AT BEDROCK SURFACE, CEMENTED IN PLACES, SLIGHTLY MOIST TO MOIST TO WET IN PLACES, TAN TO BROWN TO GRAY TO ORANGE–BROWN.

CLAYSTONE BEDROCK, SANDY IN PLACES, ISOLATED TO OCCASIONAL CLAYEY SANDSTONE INTERBEDS, HARD TO VERY HARD TO MEDIUM HARD AT OR NEAR BEDROCK SURFACE IN PLACES, CEMENTED IN PLACES, MOIST TO VERY MOIST IN PLACES, GRAY TO DARK GRAY TO GRAY–BROWN.

WEATHERED CLAYSTONE.

DRIVE SAMPLE, 2–INCH I.D. CALIFORNIA LINER SAMPLE.

50/7 DRIVE SAMPLE BLOW COUNT. INDICATES THAT 50 BLOWS OF A 140–POUND HAMMER FALLING 30 INCHES WERE REQUIRED TO DRIVE THE SAMPLER 7 INCHES.

$\frac{0,2}{\nabla}$ DEPTH TO WATER LEVEL AND NUMBER OF DAYS AFTER DRILLING MEASUREMENT WAS MADE.

NOTES

1. THE EXPLORATORY BORINGS WERE DRILLED ON NOVEMBER 3, 2020, JULY 7, 2022, AND AUGUST 11, 2022, WITH 4–INCH–DIAMETER CONTINUOUS–FLIGHT POWER AUGERS.

2. THE LOCATIONS OF THE EXPLORATORY BORINGS WERE MEASURED APPROXIMATELY BY GPS COORDINATES FROM GOOGLE EARTH AND BY PACING FROM FEATURES SHOWN ON THE SITE PLAN PROVIDED.

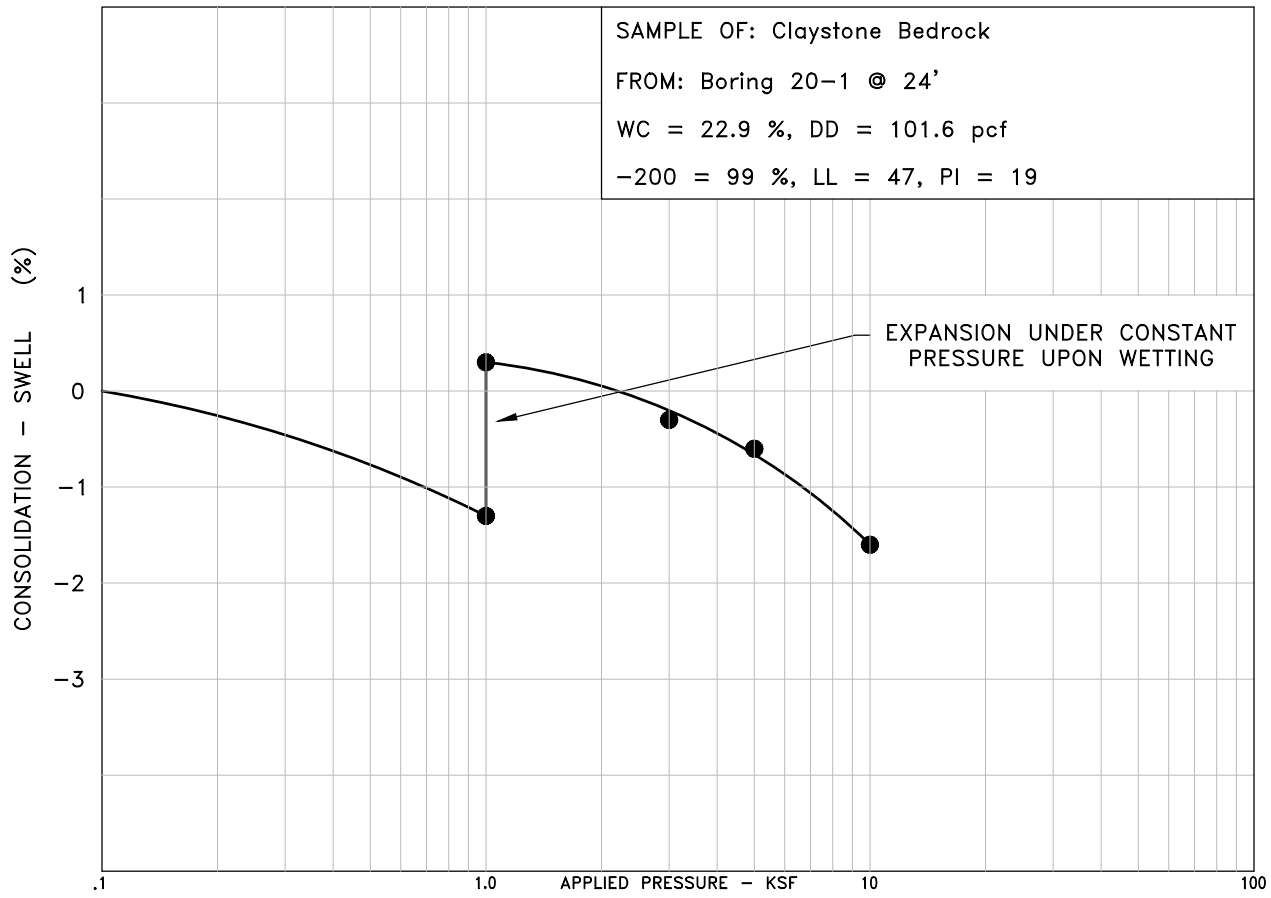
3. THE ELEVATIONS OF THE EXPLORATORY BORINGS WERE NOT MEASURED AND THE LOGS OF THE EXPLORATORY BORINGS ARE PLOTTED TO DEPTH.

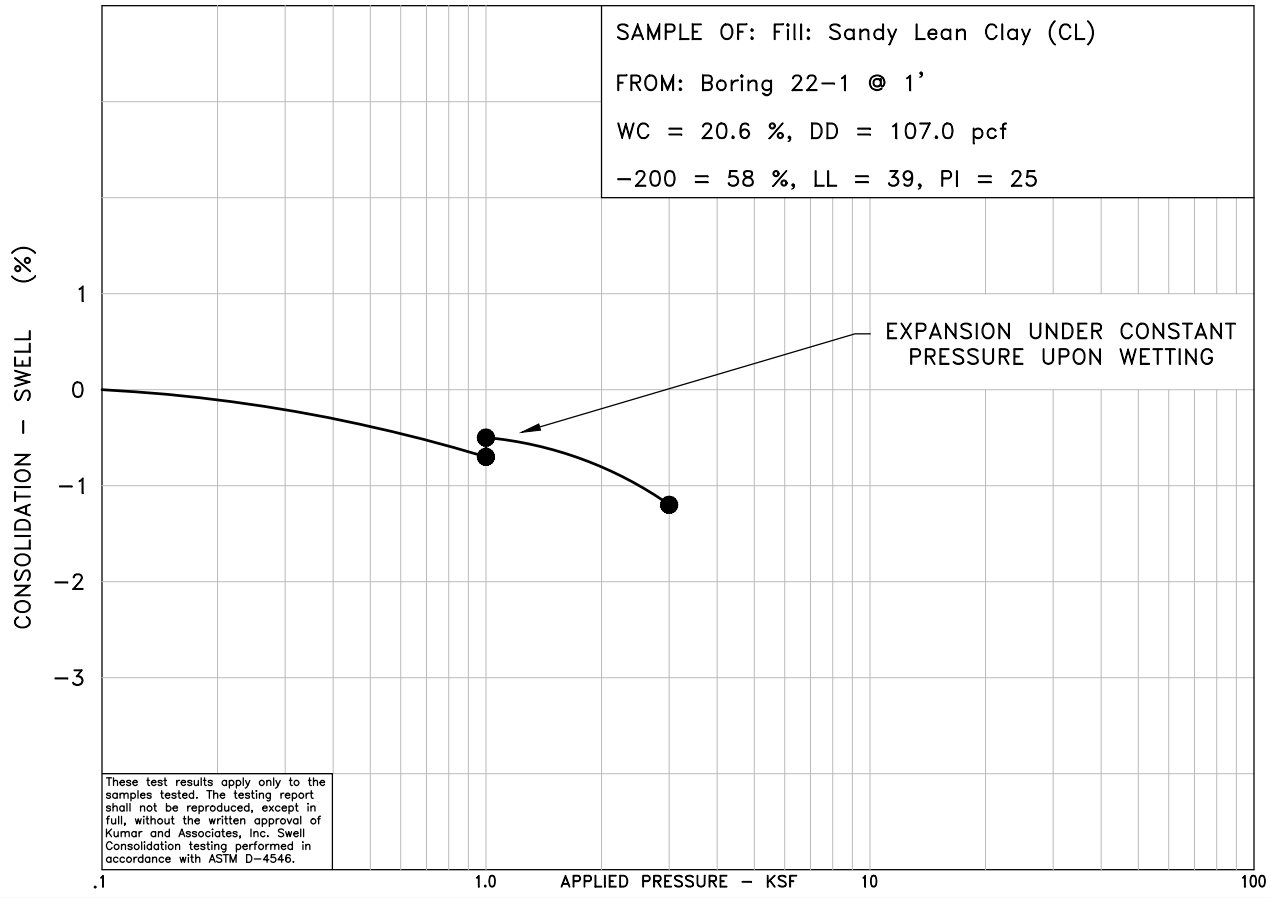
4. THE EXPLORATORY BORING LOCATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

5. THE LINES BETWEEN MATERIALS SHOWN ON THE EXPLORATORY BORING LOGS REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN MATERIAL TYPES AND THE TRANSITIONS MAY BE GRADUAL.

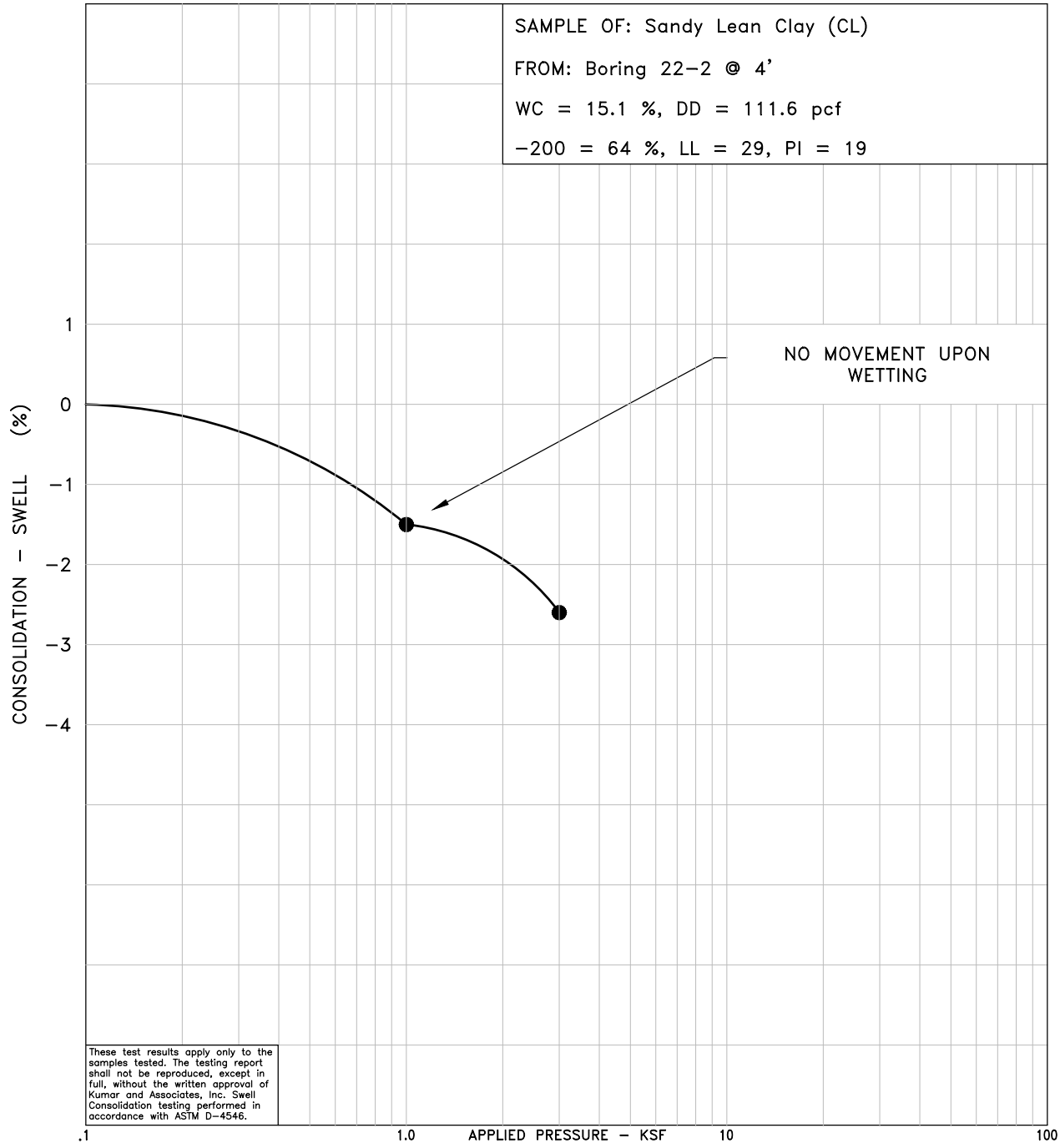
6. GROUNDWATER LEVELS SHOWN ON THE LOGS WERE MEASURED AT THE TIME AND UNDER CONDITIONS INDICATED. FLUCTUATIONS IN THE WATER LEVEL MAY OCCUR WITH TIME.

7. LABORATORY TEST RESULTS:
   - WC = WATER CONTENT (%) (ASTM D2216);
   - DD = DRY DENSITY (pcf) (ASTM D2216);
   - +4 = PERCENTAGE RETAINED ON NO. 4 SIEVE (ASTM D6913);
   - –200= PERCENTAGE PASSING NO. 200 SIEVE (ASTM D1140);
   - LL = LIQUID LIMIT (ASTM D4318);
   - PI = PLASTICITY INDEX (ASTM D4318);
   - NV = NO LIQUID LIMIT VALUE (ASTM D4318);
   - NP = NON–PLASTIC (ASTM D 4318);
   - WSS = WATER SOLUBLE SULFATES (%) (CP–L 2103);
   - pH = HYDROGEN ION CONCENTRATION (ASTM E 70);
   - CL = CHLORIDE CONTENT (%) (AASHTO T291).





20-1-664A	Kumar & Associates	SWELL-CONSOLIDATION TEST RESULTS	Fig. 5



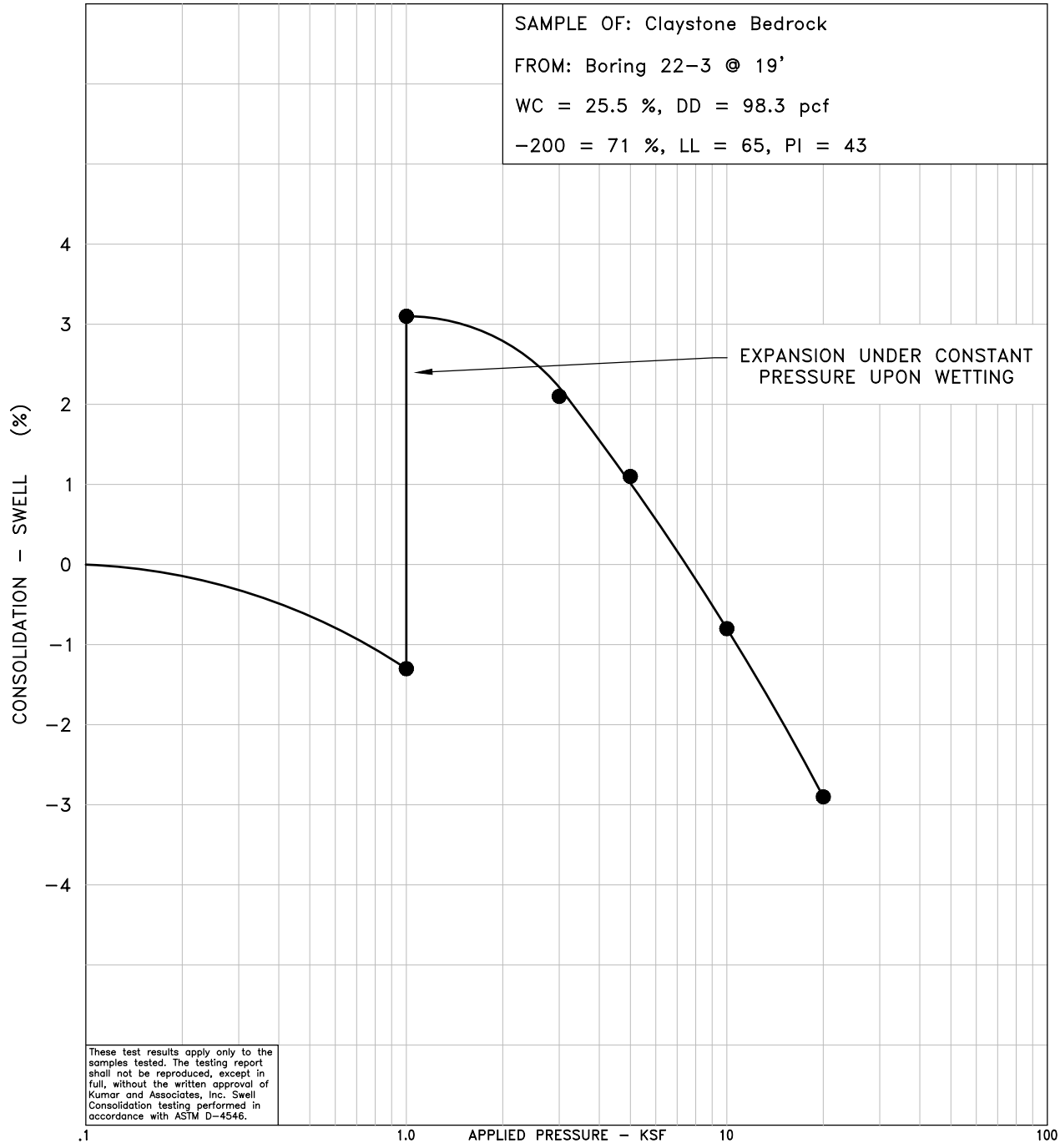
20-1-664A	Kumar & Associates	SWELL-CONSOLIDATION TEST RESULT	Fig. 6

SAMPLE OF: Claystone Bedrock

FROM: Boring 22-3 @ 19'

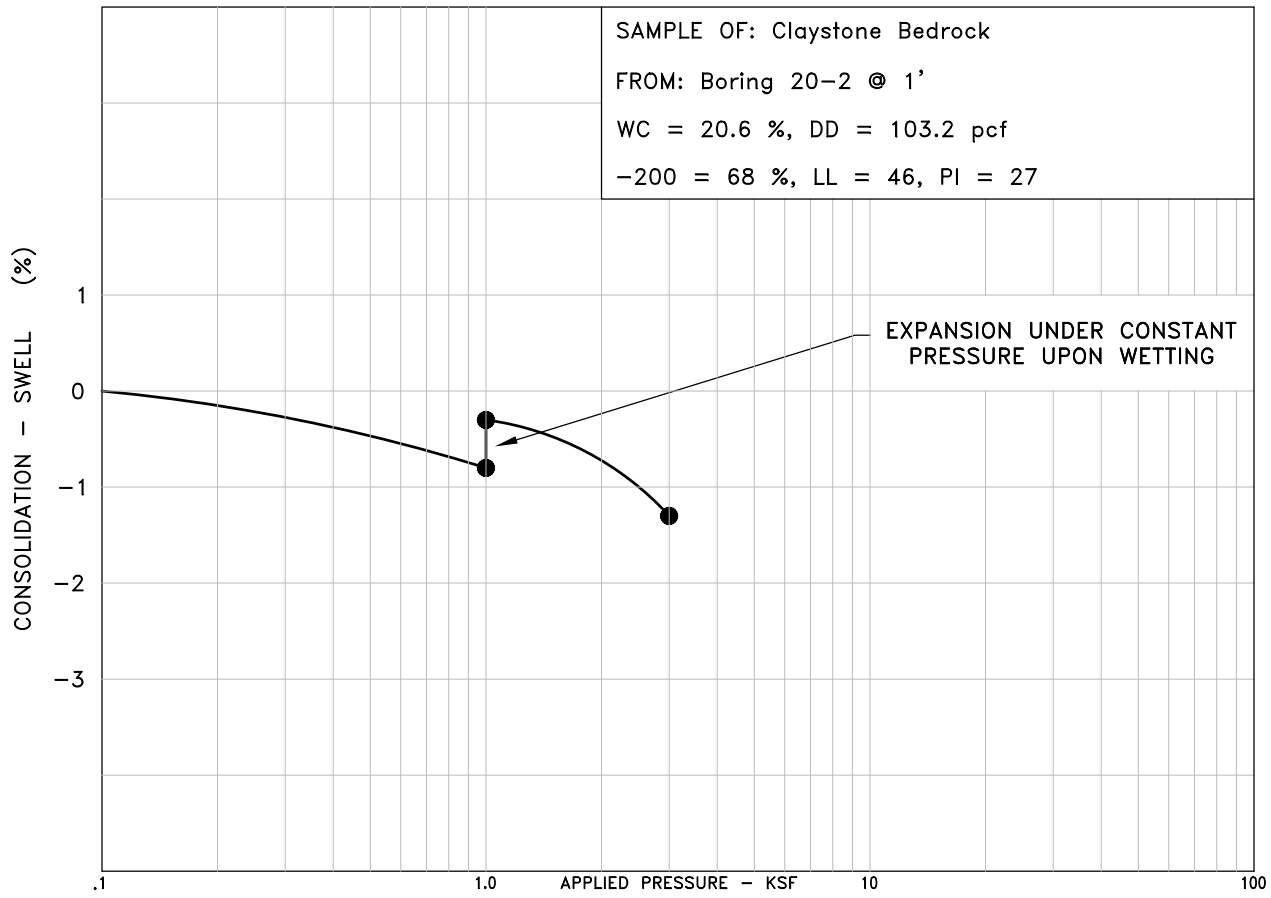
WC = 25.5 %, DD = 98.3 pcf

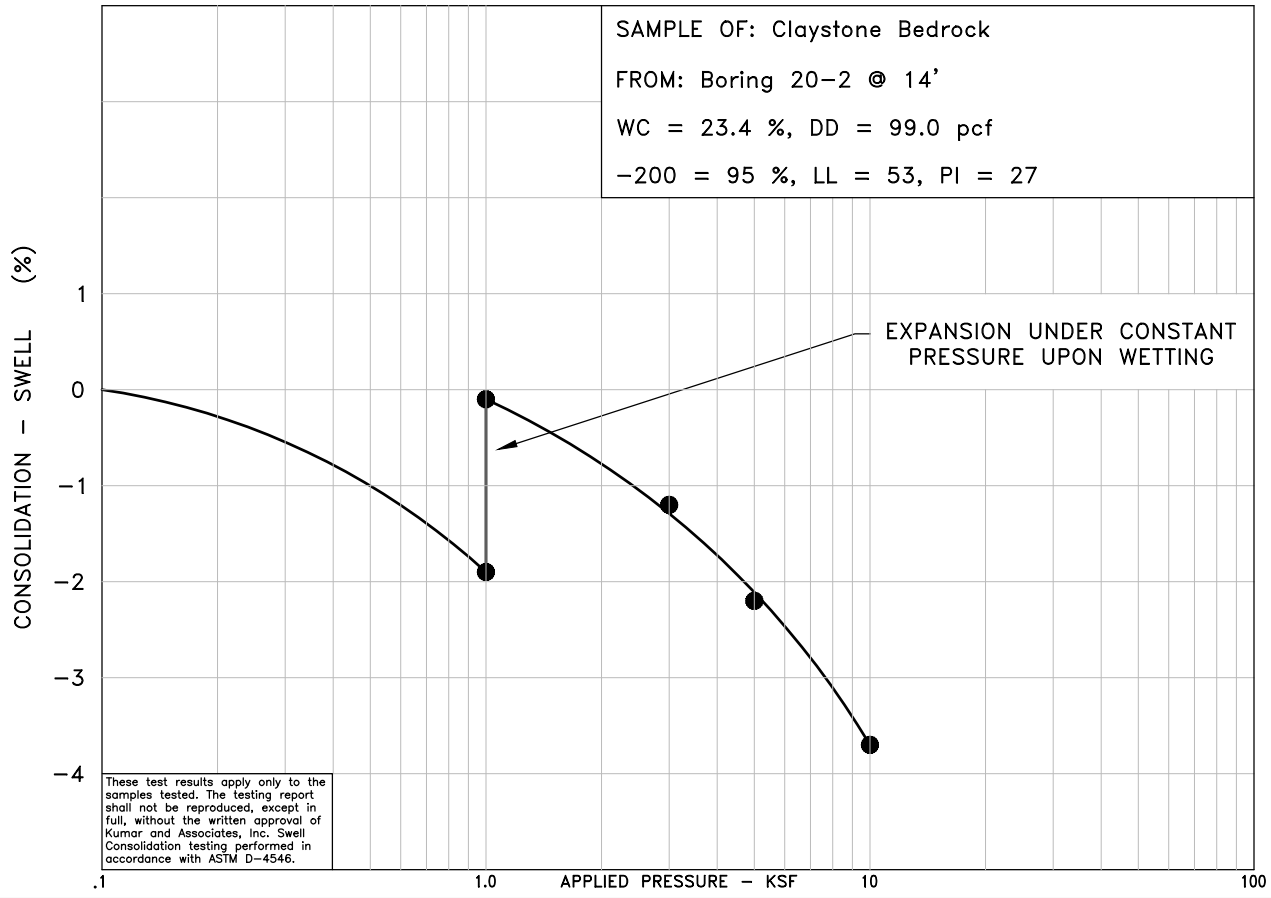
-200 = 71 %, LL = 65, PI = 43



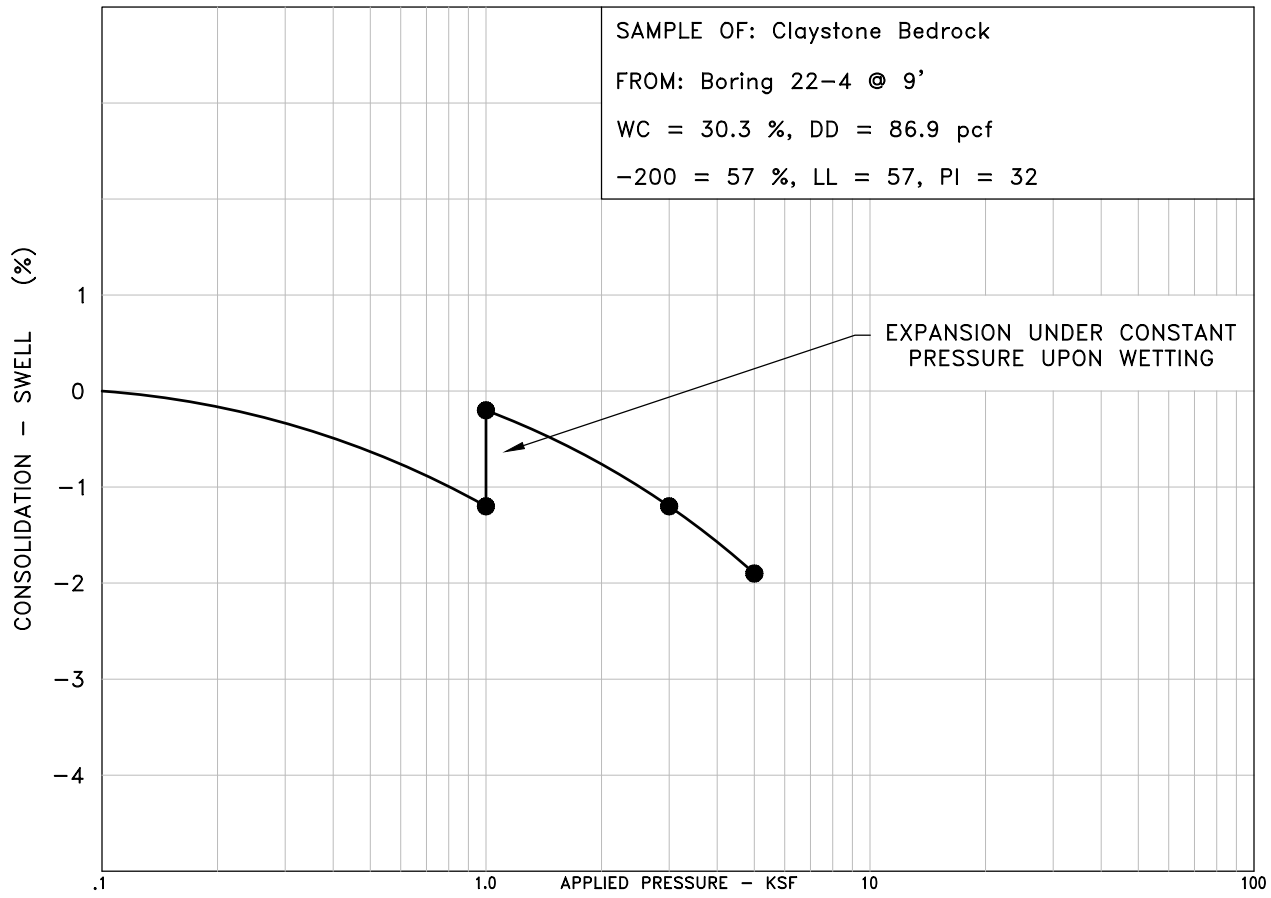
These test results apply only to the samples tested. The testing report shall not be reproduced, except in full, without the written approval of Kumar and Associates, Inc. Swell Consolidation testing performed in accordance with ASTM D-4546.

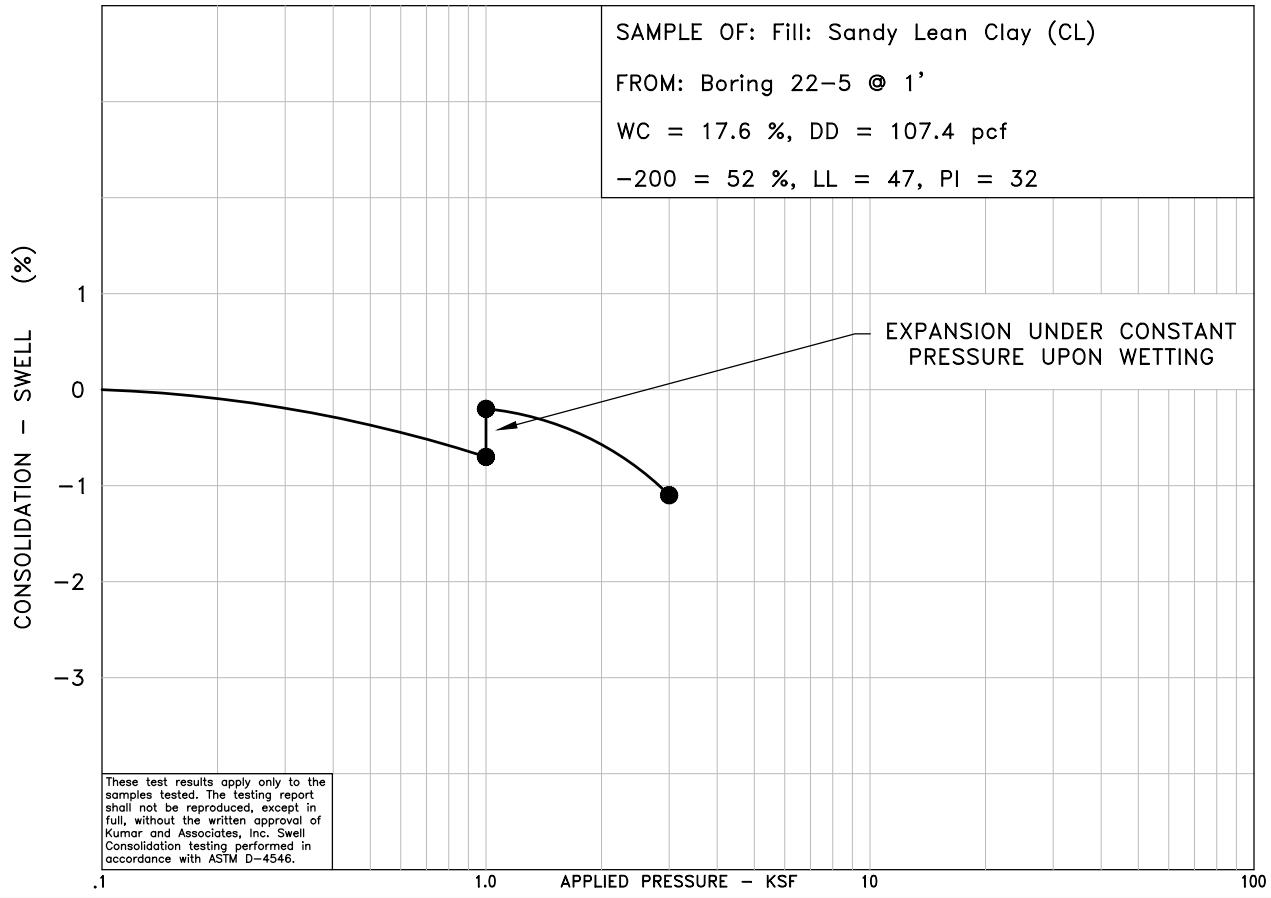
20-1-664A	Kumar & Associates	SWELL-CONSOLIDATION TEST RESULT	Fig. 7



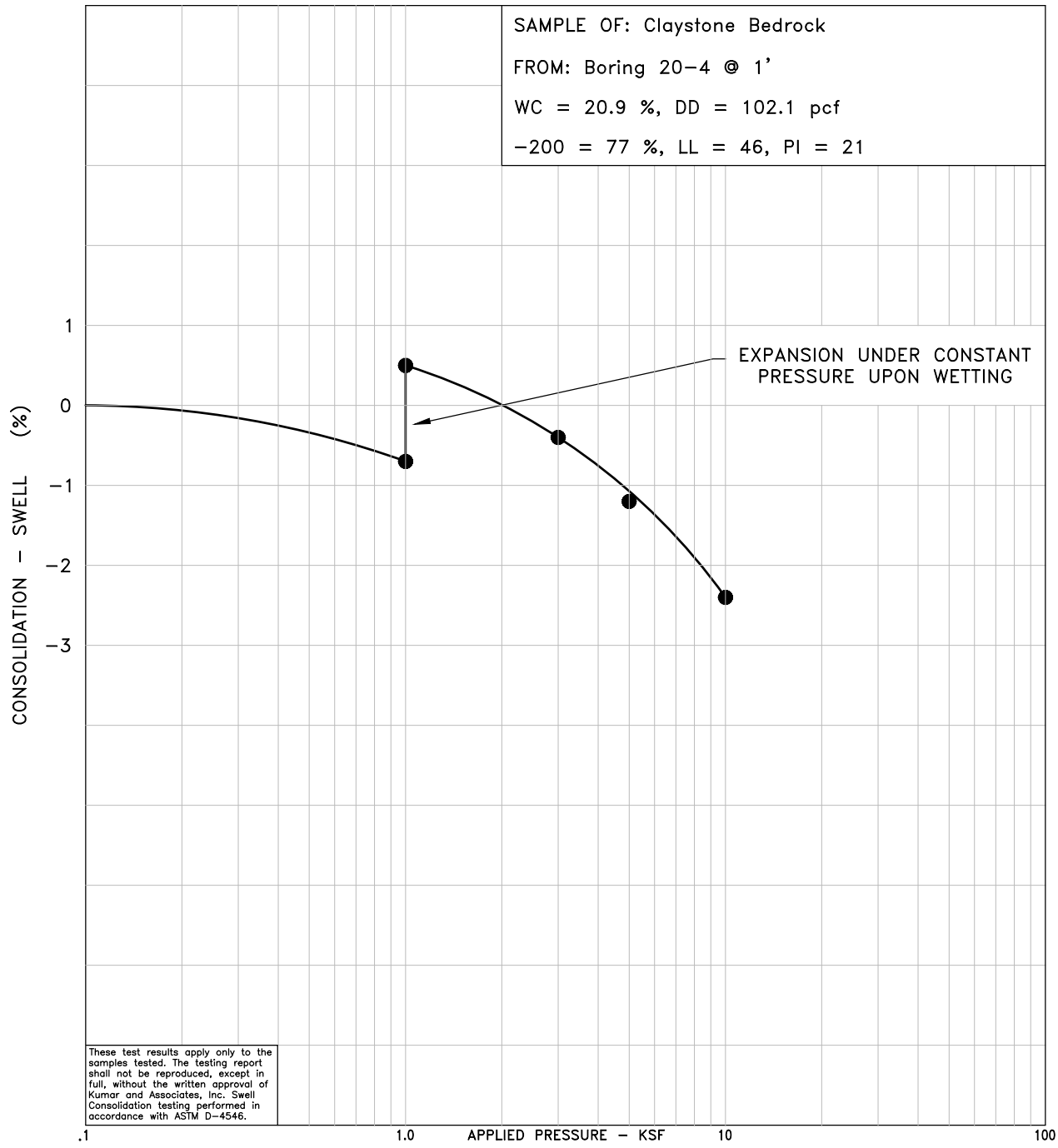


20-1-664A	Kumar & Associates	SWELL-CONSOLIDATION TEST RESULTS	Fig. 8

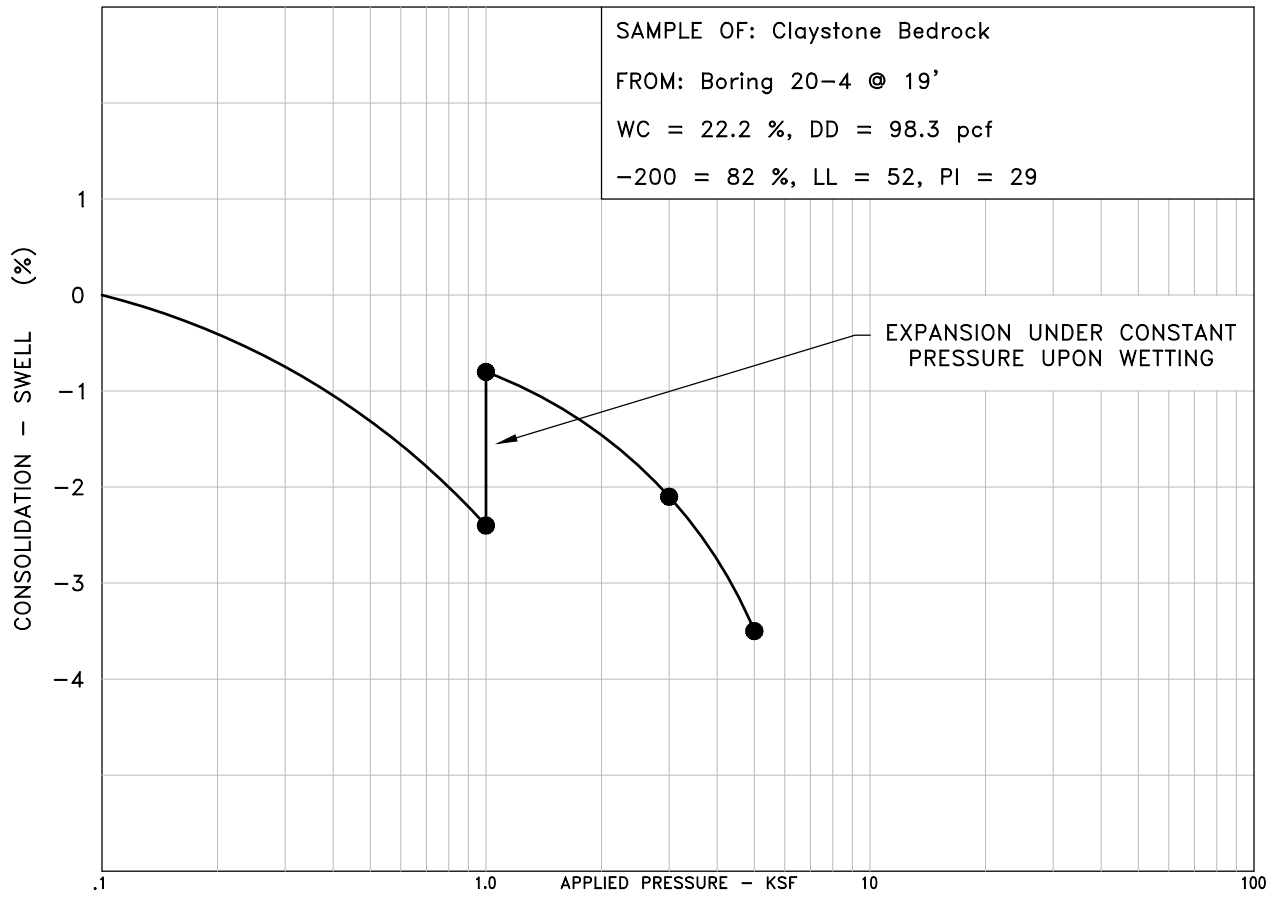


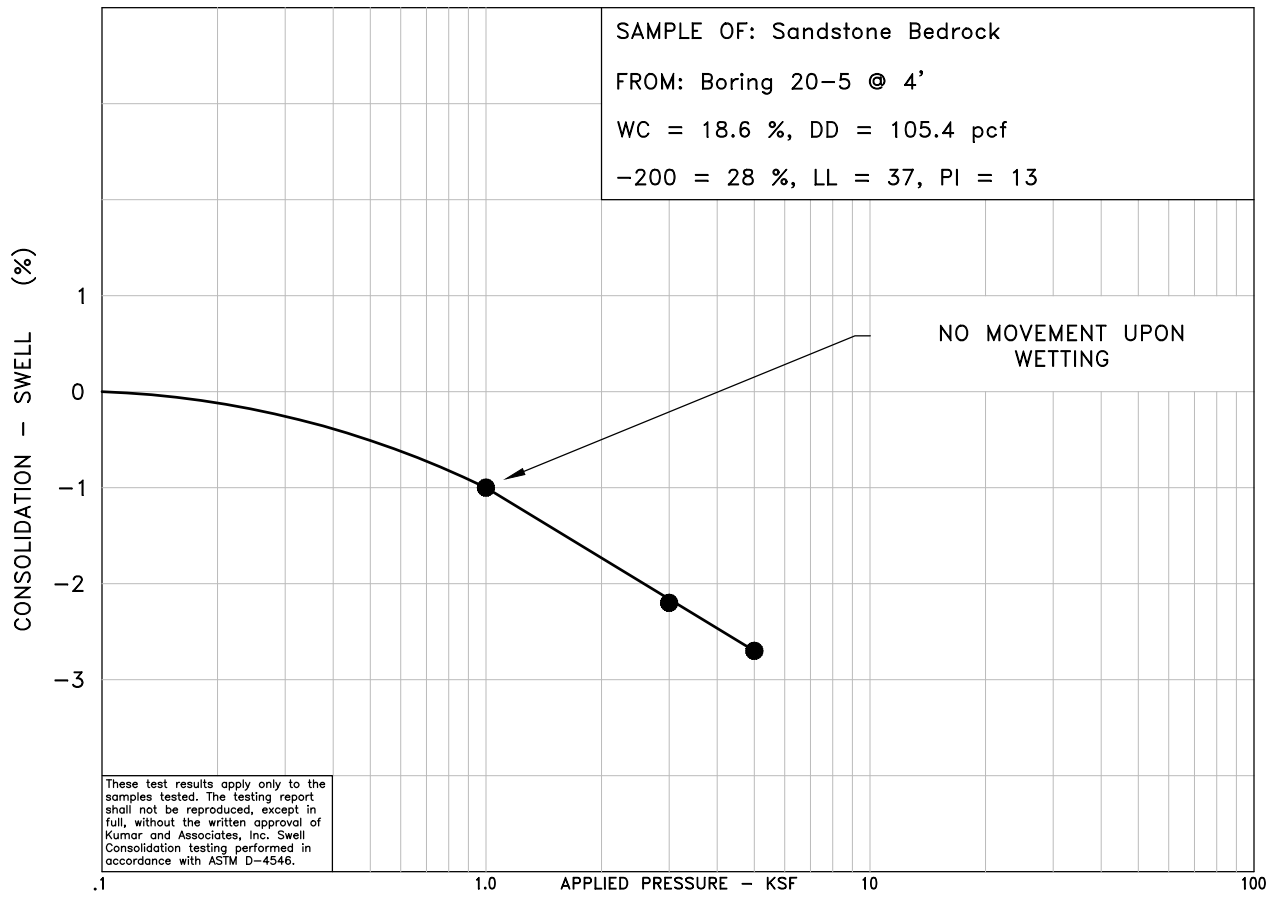


20-1-664A	Kumar & Associates	SWELL-CONSOLIDATION TEST RESULTS	Fig. 9



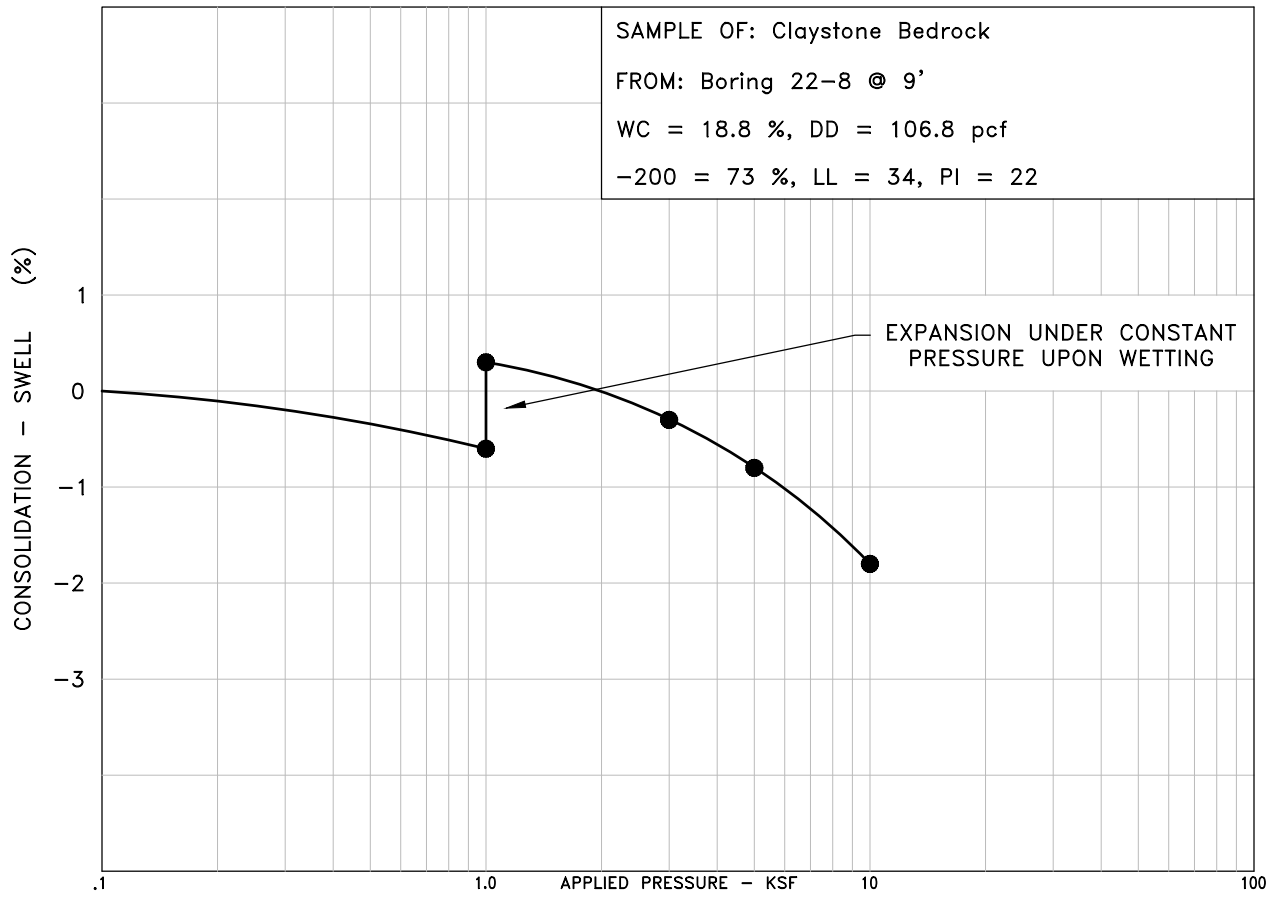
20-1-664A	Kumar & Associates	SWELL-CONSOLIDATION TEST RESULT	Fig. 10

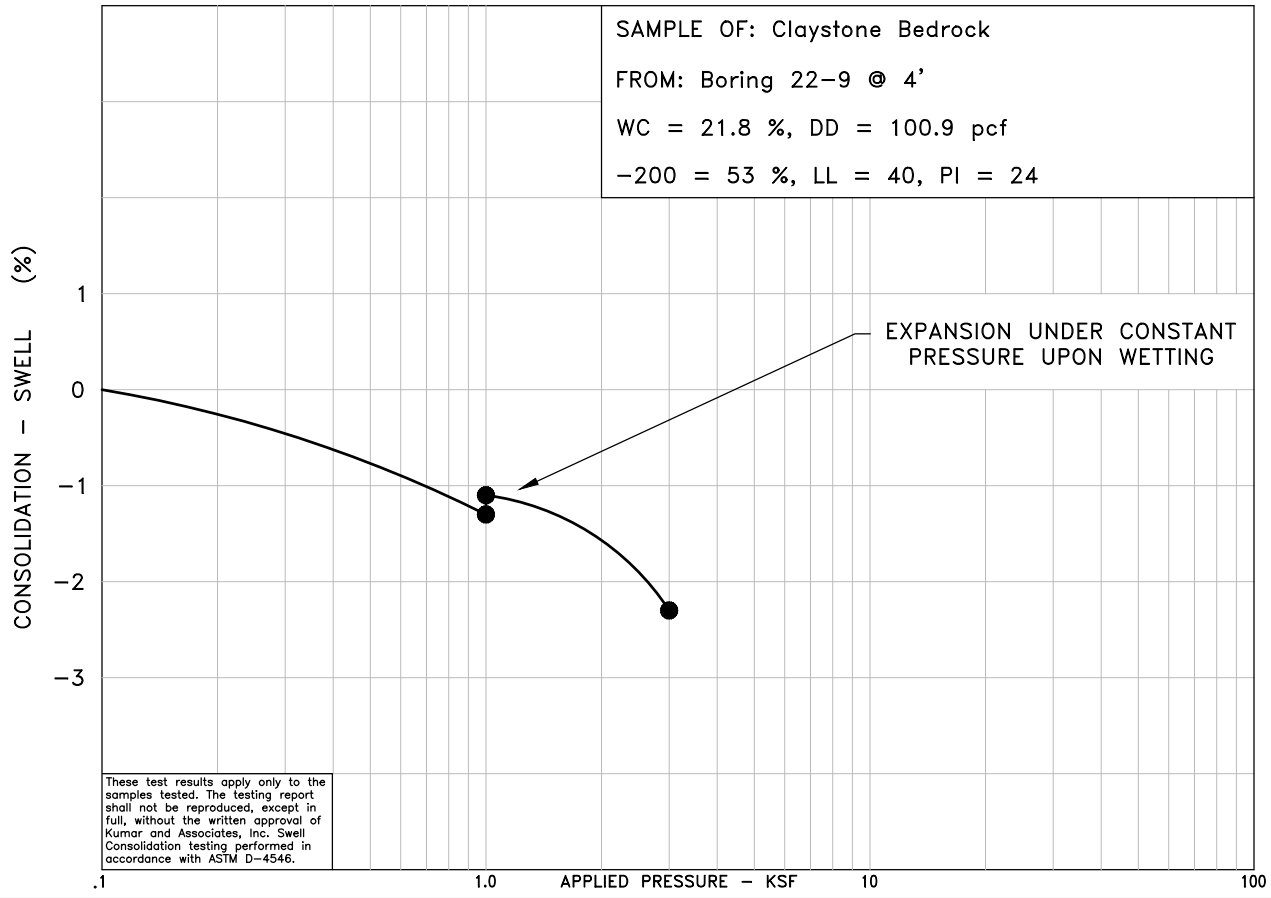




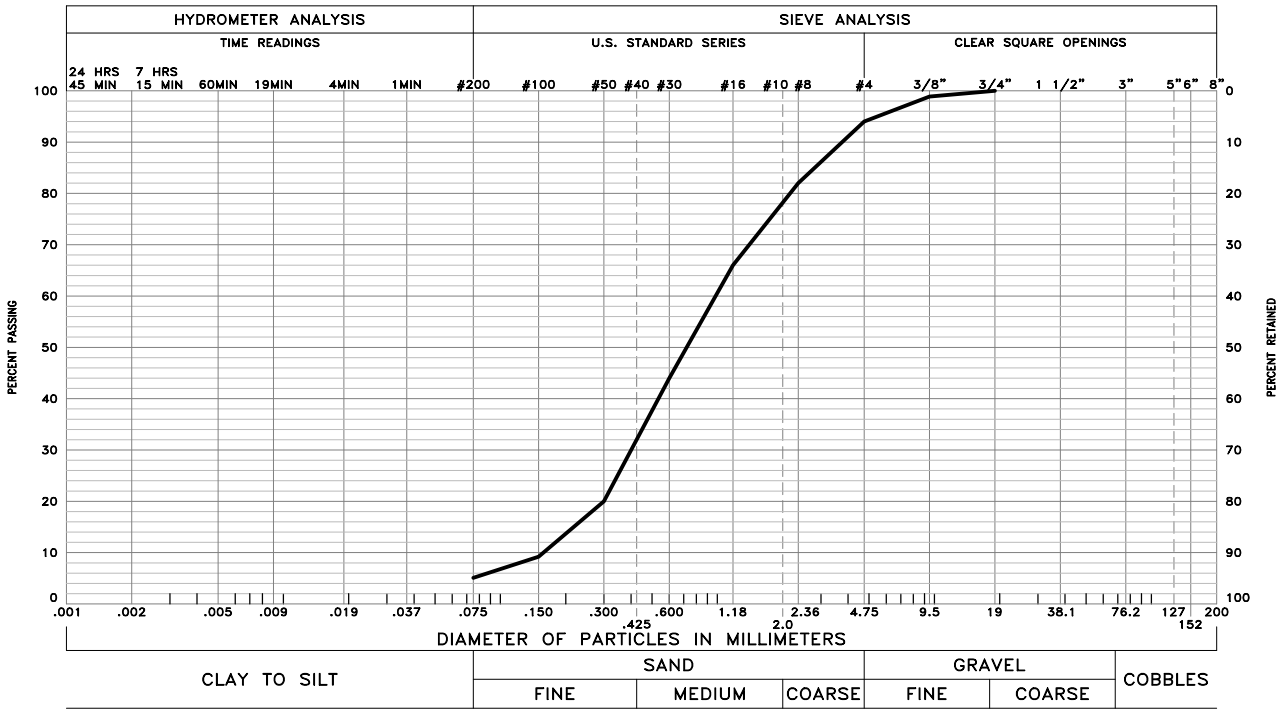
These test results apply only to the samples tested. The testing report shall not be reproduced, except in full, without the written approval of Kumar and Associates, Inc. Swell Consolidation testing performed in accordance with ASTM D-4546.

20-1-664A	Kumar & Associates	SWELL-CONSOLIDATION TEST RESULTS	Fig. 11





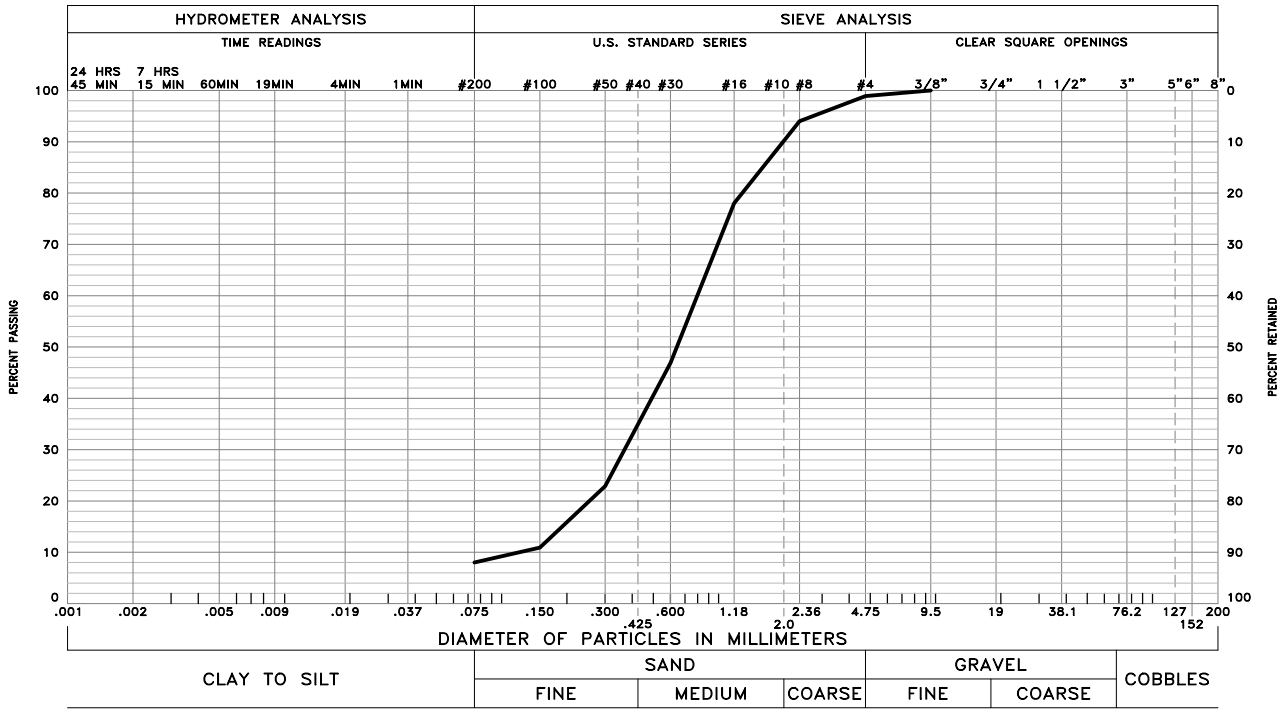
20-1-664A	Kumar & Associates	SWELL-CONSOLIDATION TEST RESULTS	Fig. 12



GRAVEL 6 % SAND 89 % SILT AND CLAY 5 %

LIQUID LIMIT NV PLASTICITY INDEX NP

SAMPLE OF: Sandstone Bedrock FROM: Boring 20-1 @ 4'

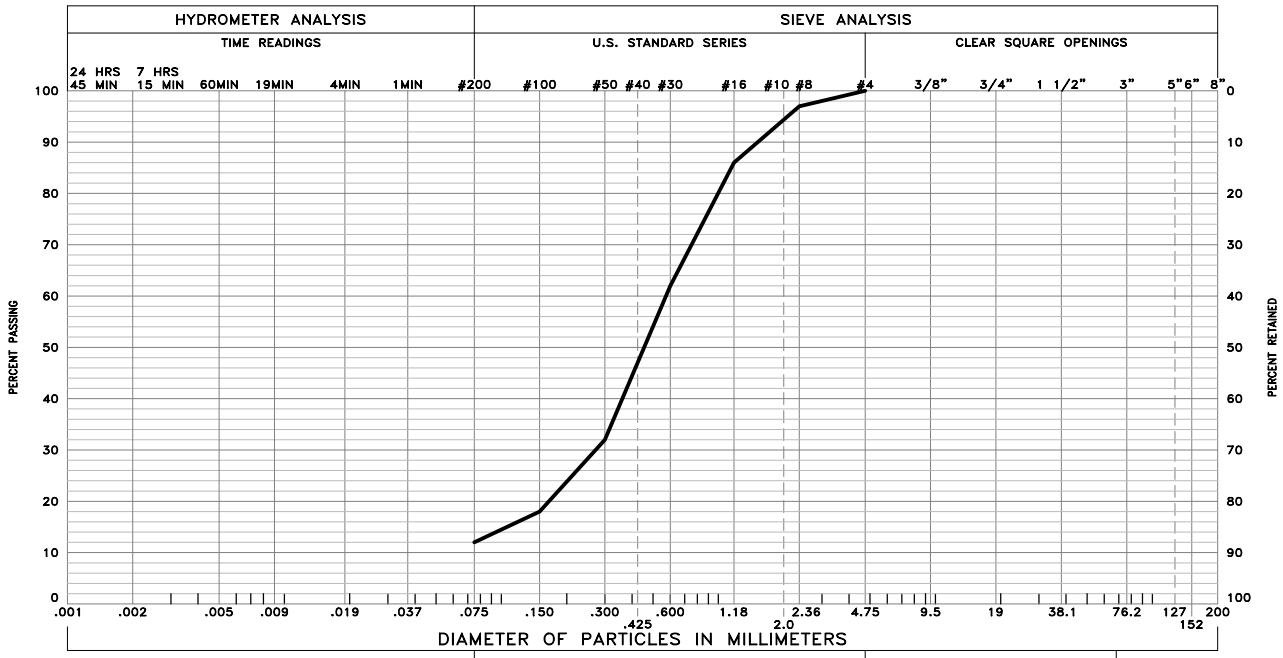


GRAVEL 1 % SAND 91 % SILT AND CLAY 8 %

LIQUID LIMIT NV PLASTICITY INDEX NP

SAMPLE OF: Sandstone Bedrock FROM: Boring 20-3 @ 4'

20-1-664A	Kumar & Associates	GRADATION TEST RESULTS	Fig. 13



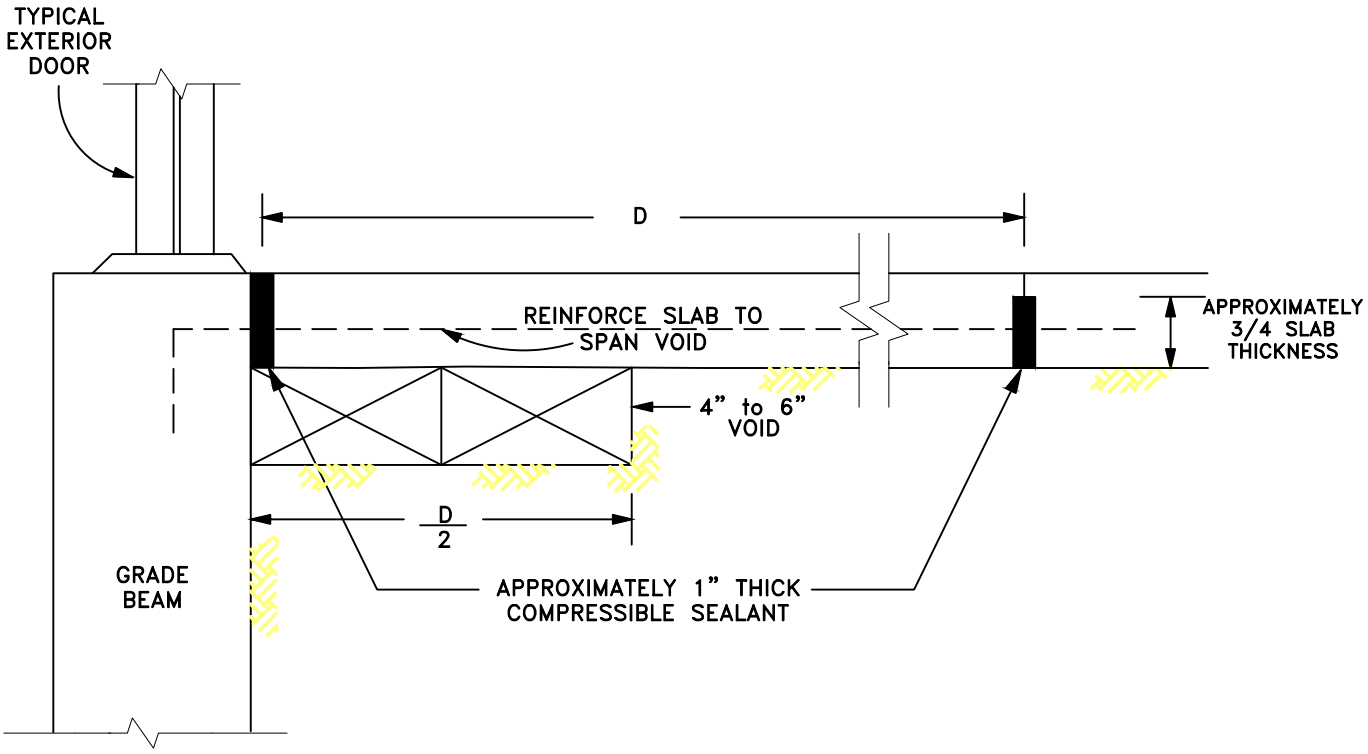
GRAVEL 0 % SAND 88 % SILT AND CLAY 12 %

LIQUID LIMIT – PLASTICITY INDEX –

SAMPLE OF: Sandstone Bedrock FROM: Boring 22-6 @ 9'

These test results apply only to the samples which were tested. The testing report shall not be reproduced, except in full, without the written approval of Kumar & Associates, Inc. Sieve analysis testing is performed in accordance with ASTM D6913, ASTM D7928, ASTM C136 and/or ASTM D1140.

20-1-664A	Kumar & Associates	GRADATION TEST RESULTS	Fig. 14



NOT TO SCALE

20-1-664A	Kumar & Associates	CONCEPTUAL "DOUBLE HINGE" DETAIL	Fig. 15

TABLE I
SUMMARY OF LABORATORY TEST RESULTS

PROJECT NO.: 20-1-664.A
PROJECT NAME: Park Meadows mall, Central Parcel
DATE SAMPLED: 11/3/2020, 7/7/2022, and 8/11/22
DATE RECEIVED: 11/6/2020 and 7/20/22

SAMPLE LOCATION		DATE TESTED	NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (pcf)	GRADATION		PERCENT PASSING NO. 200 SIEVE	ATTERBERG LIMITS		WATER SOLUBLE SULFATES (%)	MINIMUM ELECTRICAL RESISTIVITY (ohm-cm)	CHLORIDE CONTENT IN SOIL (%)	pH	AASHTO CLASSIFICATION (group index)	SOIL OR BEDROCK TYPE
BORING	DEPTH (feet)				GRAVEL (%)	SAND (%)		LIQUID LIMIT (%)	PLASTICITY INDEX (%)						
20-1	4	11/13/20	6.4	108.8	6	89	5	NV	NP	0.00					Sandstone Bedrock
20-1	24	11/13/20	22.9	101.6			99	47	19						Claystone Bedrock
20-2	1	11/13/20	20.6	103.2			68	46	27						Claystone Bedrock
20-2	14	11/13/20	23.4	99.0			95	53	27						Claystone Bedrock
20-3	4	11/13/20	9.1	101.1	1	91	8	NV	NP						Sandstone Bedrock
20-3	14	11/13/20	9.4	111.2	5	86	9	NV	NP						Sandstone Bedrock
20-4	1	11/13/20	20.9	102.1			77	46	21						Claystone Bedrock
20-4	19	11/13/20	22.2	98.3			82	52	29	0.00					Claystone Bedrock
20-5	4	11/13/20	18.6	105.4			28	37	13						Sandstone Bedrock
22-1	1	7/26/22	20.6	107.0			58	39	25					A-6 (11)	Fill: Sandy Lean Clay (CL)
22-1	14	7/26/22	22.9	102.7			82	49	32						Fill: Lean Clay with Sand (CL)
22-2	4	7/26/22	15.1	111.6			64	29	19					A-6 (9)	Sandy Lean Clay (CL)
22-2	9	7/26/22	18.5	107.6			60	36	18						Sandy Lean Clay (CL)
22-3	4	7/26/22	26.6	96.8			89	59	36	0.01		0.033	6.77	A-7-6 (35)	Claystone Bedrock
22-3	19	7/26/22	25.5	98.3			71	65	43						Claystone Bedrock
22-4	1	7/26/22	18.8	105.0			30	33	18					A-2-6 (0)	Sandstone Bedrock
22-4	9	7/26/22	30.3	86.9			57	57	32						Claystone Bedrock
22-5	1	7/26/22	17.6	107.4			52	47	32					A-7-6 (12)	Fill: Sandy Lean Clay (CL)
22-5	14	7/26/22	20.7	107.3			86	54	35						Claystone Bedrock
22-6	1	7/26/22	24.9	98.4			78	47	27	0.01		0.099	6.82	A-7-6 (21)	Fill: Lean Clay with Sand (CL)
22-6	9	7/26/22	15.5	109.6	0	88	12							A-2-6 (0)	Sandstone Bedrock
22-7	4	8/23/22	22.7	102.8			89	46	26						Claystone Bedrock
22-7	19	8/23/22	21.0	101.7			28	33	6						Sandstone Bedrock
22-8	1	8/23/22	11.8	116.7			27	46	27						Clayey Sand (SC)
22-8	9	8/23/22	18.8	106.8			73	34	22						Claystone Bedrock
22-9	4	8/23/22	21.8	100.9			53	40	24						Claystone Bedrock
22-9	9	8/23/22	19.7	106.7			49	39	15						Sandstone Bedrock
22-9	19	8/23/22	21.6	96.7			14								Sandstone Bedrock

Castle Rock Area, Colorado

RmE—Renohill-Buick complex, 5 to 25 percent slopes

Map Unit Setting

National map unit symbol: jqzy
Elevation: 5,500 to 6,200 feet
Mean annual precipitation: 15 to 17 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 120 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Renohill and similar soils: 50 percent
Buick and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Renohill

Setting

Landform: Hills
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Weathered, calcareous clayey shale

Typical profile

H1 - 0 to 3 inches: clay loam
H2 - 3 to 12 inches: clay loam
H3 - 12 to 24 inches: clay loam
H4 - 24 to 28 inches: unweathered bedrock

Properties and qualities

Slope: 5 to 25 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R049XC202CO - Loamy Foothill 14-19 PZ
Hydric soil rating: No

Description of Buick

Setting

Landform: Hills
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits over silty alluvium

Typical profile

H1 - 0 to 4 inches: loam
H2 - 4 to 15 inches: silty clay loam
H3 - 15 to 22 inches: loam
H4 - 22 to 60 inches: sandy clay loam

Properties and qualities

Slope: 5 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R049XC202CO - Loamy Foothill 14-19 PZ
Hydric soil rating: No

Minor Components

Manzanola

Percent of map unit: 6 percent
Hydric soil rating: No

Satanta

Percent of map unit: 6 percent
Hydric soil rating: No

Fondis

Percent of map unit: 6 percent
Hydric soil rating: No

Aquic haplustolls

Percent of map unit: 2 percent
Landform: Swales
Hydric soil rating: Yes

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Appendix C

Standard Operating Procedure (SOP)

Standard Operating Procedure (SOP)

Minor Spill of Material (Paint, Stain, Solvent, Glue) (Less than Reportable Quantity)

A. Purpose

The purpose of this Standard Operating Procedure is to establish uniform procedures for clean up and disposal of material from a minor accidental spill of paint, stain, solvent, or glue. The procedures outlined in this SOP are applicable to all personnel working on the Park Meadows – Garage and Retail construction site. Clean up and proper disposal of spilled material into the soil or onto the ground surface is required to ensure the material or contaminated soil does not enter or impact the waters of the state or the sanitary sewer system.

B. Summary of the Method

This procedure outlines the steps to be taken to prevent spilled material from impacting waters of the state and disposal of the resulting contaminated cleanup material.

C. Definitions

1. Material Safety Data Sheet (MSDS). The standard industry list for a product detailing the chemical make-up, safety hazards, first aid, fire fighting, and spill cleanup measures, handling, storage, and disposal methods

D. Health and Safety Warnings

Many construction materials may be flammable, cause skin and eye irritation, and may be harmful or fatal if swallowed. Caution should be used during clean up operations. The MSDS for the spilled material should be consulted to ensure personnel safety during cleanup operations.

E. Equipment and Supplies

1. Absorbent pads and booms
2. Hand equipment (shovels, brooms)
3. Waste containers (5 gallon buckets, drums)
4. Personal Protective Equipment

F. Procedural Steps

1. Shut down all equipment operating in the area to prevent ignition of the spill.
2. Quickly control the spill by stopping or securing the spill source. This could be as simple as up-righting a tipped container or shutting down a piece of equipment producing the spill.
3. Contact the Responsible Person on site to enact the emergency response contact procedure.

a. Responsible Person shall consult the MSDS for proper spill procedures and determination of Reportable Quantity for a spill. In the event the spilled quantity exceeds the reportable quantity the Responsible Person shall contact:
    1. Call 911 for fire control if necessary.
    2. Douglas County (303-660-7490)

4. Prevent migration of the spill by using an absorbent. This could include absorbent pads or booms, floor dry, cat litter, or dirt. The absorbent should be spread across the spill and along the downhill side to stop any flow.
5. If necessary to prevent the material from entering a storm inlet or manhole a dam of absorbent material should be placed in the gutter upstream from the inlet.
6. Begin cleanup of the spilled material and absorbents by placing the materials in 5 gallon, plastic buckets with lids or into a provided drum.
7. Continue cleanup until all spilled material and contaminated absorbents are removed. On a hard surface this should include sweeping of the area. Material spilled on dirt should be removed down to a level where discoloration of the soil has been removed. Water shall never be used to flush material off a surface.
8. All material shall be properly stored in a location designated by the Responsible Person on site.
9. The Responsible Person shall contact the Site Contracted Emergency Response and Disposal Co. to collect and properly dispose of the material.
10. Location of the spill will be documented on the Stormwater Maintenance Plan (SWMP) in the construction trailer.
11. Inspection of materials and equipment shall occur daily.

G. Record Management

All documentation from the incident, including incident report and incident disposal manifests, shall be maintained at Park Meadows Mall, LLC/Park Meadows Anchor Acquisition, LLC 8401 Park Meadows Center Drive, Lone Tree, CO 80124 – Ph: (303) 595-7000 for a period of 3 years from the date of the spill.

H. After Incident Briefing

All personnel involved in the incident shall attend a debriefing to determine the cause of the spill, procedures followed, and corrective actions to prevent future spills. All pertinent data shall be documented. All findings from the debriefing should be discussed at the next Safety Meeting. Douglas County shall be notified.

Standard Operating Procedure (SOP)

Minor Fuel or Oil Spill (Less than 5 Gallons)

A. Purpose

The purpose of this Standard Operating Procedure is to establish a uniform procedure for clean up and disposal of material from a minor accidental spill of fuel (gasoline or diesel) or oil (hydraulic or motor). The procedures outlined in this SOP are applicable to all personnel working on the Park Meadows – Garage and Retail construction site. Clean up and proper disposal of spilled fuel or oil into the soil or onto the ground surface is required to ensure the material or contaminated soil does not enter or impact the waters of the state or the sanitary sewer system.

B. Summary of the Method

This procedure outlines the steps to be taken to prevent spilled fuel or oil from impacting waters of the state and disposal of the resulting contaminated cleanup material.

C. Definitions

1. Material Safety Data Sheet (MSDS). The standard industry list for a product detailing the chemical make-up, safety hazards, first aid, fire fighting, and spill cleanup measures, handling, storage, and disposal methods

D. Health and Safety Warnings

Fuels and fuel oils may be extremely flammable, cause skin and eye irritation, and may be harmful or fatal if swallowed. Caution should be used during clean up operations. The MSDS for the spilled material should be consulted to ensure personnel safety during cleanup operations.

E. Equipment and Supplies

1. Absorbent pads and booms
2. Hand equipment (shovels, brooms)
3. Waste containers (5 gallon buckets, drums)
4. Personal Protective Equipment

F. Procedural Steps

1. Shut down all equipment operating in the area to prevent ignition of the spill.
2. Quickly control the spill by stopping or securing the spill source. This could be as simple as up-righting a tipped container or shutting down a piece of equipment producing the spill.
3. Contact the Responsible Person on site to enact the emergency response contact procedure.
    a. Responsible Person shall consult the MSDS for proper spill procedures and determination of Reportable Quantity for a spill.

In the event the spilled quantity exceeds the reportable quantity the Responsible Person shall contact:

1. Call 911 for fire control if necessary.
2. Douglas County: (303-660-7490)

4. Prevent migration of the spill by using an absorbent. This could include absorbent pads or booms, floor dry, cat litter, or dirt. The absorbent should be spread across the spill and along the downhill side to stop any flow.
5. If necessary to prevent the material from entering a storm inlet or manhole a dam of absorbent material should be placed in the gutter upstream from the inlet.
6. Begin cleanup of the spilled material and absorbents by placing the materials in 5 gallon, plastic buckets with lids or into a provided drum.
7. Continue cleanup until all spilled material and contaminated absorbents are removed. On a hard surface this should include sweeping of the area. Material spilled on dirt should be removed down to a level where discoloration of the soil has been removed. Water shall never be used to flush material off a surface.
8. All material shall be properly stored in a location designated by the Responsible Person on site.
9. The Responsible Person shall contact the Site Contracted Emergency Response and Disposal Co to collect and properly dispose of the material.
10. Location of the spill will be documented on the Stormwater Maintenance Plan (SWMP) in the construction trailer.
11. Inspection of materials and equipment shall occur daily.

G. Record Management

All documentation from the incident, including incident report and incident disposal manifests, shall be maintained at Park Meadows Mall, LLC/Park Meadows Anchor Acquisition, LLC 8401 Park Meadows Center Drive, Lone Tree, CO 80124 – Ph: (303) 595-7000 for a period of 3 years from the date of the spill.

H. **After Incident Briefing**

All personnel involved in the incident shall attend a debriefing to determine the cause of the spill, procedures followed, and corrective actions to prevent future spills. All pertinent data will be recorded. All findings from the debriefing should be discussed at the next Safety Meeting. Douglas County shall be notified.

Standard Operating Procedure (SOP)

Small Fuel or Oil Spill (5 Gallons to Less than 25 Gallons)

A. Purpose

The purpose of this Standard Operating Procedure is to establish a uniform procedure for clean up and disposal of material from a small accidental spill of fuel (gasoline or diesel) or oil (hydraulic, or motor). The procedures outlined in this SOP are applicable to all personnel working on the Park Meadows – Garage and Retail construction site. Clean up and proper disposal of spilled fuel or oil into the soil or onto the ground surface is required to ensure the material or contaminated soil do not enter or impact the waters of the state or the sanitary sewer system.

B. Summary of the Method

This procedure outlines the steps to be taken to prevent spilled fuel or oil from impacting waters of the state and disposal of the resulting contaminated cleanup material.

C. Definitions

1. Material Safety Data Sheet (MSDS). The standard industry list for a product detailing the chemical make-up, safety hazards, first aid, fire fighting, and spill cleanup measures, handling, storage, and disposal methods

D. Health and Safety Warnings

Fuels and fuel oils may be extremely flammable, cause skin and eye irritation, and may be harmful or fatal if swallowed. Caution should be used during clean up operations. The MSDS for the spilled material should be consulted to ensure personnel safety during cleanup operations.

E. Equipment and Supplies

1. Absorbent pads and booms
2. Hand equipment (shovels, brooms)
3. Waste containers (5 gallon buckets, drums)
4. Personal Protective Equipment

F. Procedural Steps

1. Shut down all equipment operating in the area to prevent ignition of the spill.
2. Contact the Responsible Person on site to enact the emergency response contact procedure.
    a. The Responsible Person begins contacting Emergency Response Agencies.
        1. For gasoline or diesel spill call 911 for fire control
    b. Responsible Person shall consult the MSDS for proper spill procedures and determination of Reportable Quantity for a spill.

In the event the spilled quantity exceeds the reportable quantity the Responsible Person shall contact:

1. Call 911 for fire control if necessary.
2. Colorado Environmental Release and Incident Reporting Hotline (1-877-518-5608)
3. Douglas County: (303-660-7490)

3. Attempt to control the spill by stopping or securing the spill source. This could be as simple as up-righting a tipped container or shutting down a piece of equipment producing the spill.
4. Prevent migration of the spill by using an absorbent. This could include absorbent pads or booms, floor dry, cat litter, or dirt. The absorbent should be spread across the spill and along the downhill side to stop any flow.
5. If necessary to prevent the material from entering a storm inlet or manhole a dam of absorbent material should be placed in the gutter upstream from the inlet.
6. Begin cleanup of the spilled material and absorbents by placing the materials in 5 gallon, plastic buckets with lids or into a provided drum.
7. Continue cleanup until all spilled material and contaminated absorbents are removed. On a hard surface, this should include sweeping of the area. Material spilled on dirt should be removed down to a level where discoloration of the soil has been removed. Water shall never be used to flush material off a surface.
8. All material shall be properly stored in a location designated by the Responsible Person on site.
9. The Responsible Person shall contact the Site Contracted Emergency Response and Disposal Co. to collect and properly dispose of the material.
10. Location of the spill will be documented on the Stormwater Maintenance Plan (SWMP) in the construction trailer.
11. Inspection of materials and equipment shall occur daily.

G. Record Management

All documentation from the incident, including incident report and incident disposal manifests, shall be maintained at Park Meadows Mall, LLC/Park Meadows Anchor Acquisition, LLC 8401 Park Meadows Center Drive, Lone Tree, CO 80124 – Ph: (303) 595-7000 for a period of 3 years from the date of the spill.

H. After Incident Briefing

All personnel involved in the incident shall attend a debriefing to determine the cause of the spill, procedures followed, and corrective actions to prevent future spills. All pertinent data will be recorded. The CDPHE shall be notified of a major spill by a written follow up within five days of the incident. All findings from the debriefing should be discussed at the next Safety Meeting. Douglas County shall be notified. Douglas County will require one copy of any documents that are sent to the state.

Standard Operating Procedure (SOP)

Significant Fuel or Oil Spill (25 Gallons or More)

A. Purpose

The purpose of this Standard Operating Procedure is to establish a uniform procedure for clean up and disposal of material from a significant accidental spill of fuel (gasoline or diesel) or oil (hydraulic or motor). The procedures outlined in this SOP are applicable to all personnel working on the Park Meadows – Garage and Retail construction site. Clean up and proper disposal of spilled fuel or oil into the soil or onto the ground surface is required to ensure the material or contaminated soil does not enter or impact the waters of the state or the sanitary sewer system.

B. Summary of the Method

This procedure outlines the steps to be taken to prevent spilled fuel or oil from impacting waters of the state and disposal of the resulting contaminated cleanup material.

C. Definitions

1. Material Safety Data Sheet (MSDS). The standard industry list for a product detailing the chemical make-up, safety hazards, first aid, fire fighting, and spill cleanup measures, handling, storage, and disposal methods

D. Health and Safety Warnings

Fuels and fuel oils may be extremely flammable, cause skin and eye irritation, and may be harmful or fatal if swallowed. Caution should be used during clean up operations. The MSDS for the spilled material should be consulted to ensure personnel safety during cleanup operations.

E. Equipment and Supplies

1. Absorbent pads and booms
2. Hand equipment (shovels, brooms)
3. Waste containers (5 gallon buckets, drums)
4. Personal Protective Equipment

F. Procedural Steps

1. Shut down all equipment operating in the area to prevent ignition of the spill.
2. Ensure the safety of personnel in the area. If necessary, evacuate the area and wait for Emergency Response Personnel.
3. Contact the Chain of Command on site to enact the emergency response contact procedure.
    a. Responsible Person begins contacting Emergency Response Agencies.
        1. Call 911 for fire control

2. Colorado Environmental Release and Incident Reporting Hotline (1-877-518-5608)
3. Douglas County: (303-660-7490)

b. Responsible Person consults the MSDS for spill procedure

4. If it can be safely accomplished, attempt to control the spill by stopping or securing the spill source.
5. If it can be safely accomplished, attempt to prevent migration of the spill by using an absorbent. This could include absorbent pads or booms, floor dry, cat litter, or dirt. The absorbent should be spread along the downhill side to stop any flow.
6. If it can be safely accomplished, attempt to prevent the material from entering a storm inlet or manhole by constructing a dam of absorbent material in the gutter upstream from the inlet.
7. Emergency Response Personnel should handle stabilization of the spill and initial cleanup.
8. Final cleanup and disposal of contaminated material should be handled by the Site Contracted Emergency Response and Disposal Co.
9. Location of the spill will be documented on the Stormwater Maintenance Plan (SWMP) in the construction trailer.
10. Inspection of materials and equipment shall occur daily.

G. Record Management

All documentation from the incident, including incident report and incident disposal manifests, shall be maintained at Park Meadows Mall, LLC/Park Meadows Anchor Acquisition, LLC 8401 Park Meadows Center Drive, Lone Tree, CO 80124 – Ph: (303) 595-7000 for a period of 3 years from the date of the spill.

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Appendix D

Grading, Erosion, and Sediment Control Plan

PARK MEADOWS - GARAGE AND RETAIL

SITUATED IN THE NORTH HALF OF SECTION 3, TOWNSHIP 6 SOUTH, RANGE 67
WEST OF THE 6TH P.M.
CITY OF LONE TREE, COUNTY OF DOUGLAS, STATE OF COLORADO

GRADING, EROSION AND SEDIMENT CONTROL (GESC) PLAN

LEGAL DESCRIPTION:

LOT 4-C-1, PARK MEADOWS TOWN CENTER FILING NO. 1-A, 8TH AMENDMENT, CITY OF LONE TREE, COUNTY OF DOUGLAS, STATE OF COLORADO.

BASIS OF BEARING:

BEARINGS ARE BASED ON THE NORTHWEST LINE OF LOT 4-B, PARK MEADOWS TOWN CENTER FILING NO. 1-A, 6TH AMENDMENT RECORDED AT RECEPTION NO. 2002087418 AS BEARINGS NORTH 47°09'19" EAST. SAID LINE BEING MONUMENTED AT THE NORTHEAST END BY A NAIL & TAG STAMPED "FARNSWORTH PLS 28668", AND AT THE SOUTHWEST END BY A NAIL & TAG STAMPED "FARNSWORTH PLS 38098".

BENCHMARK:

BENCHMARK IS DOUGLAS COUNTY CONTROL POINT 2113021 STAMPED" 2.113021 DC GIS" WITH A PUBLISHED ELEVATION OF 5914.49 FT (NAVD88).

PROJECT ADDRESS:

8405 PARK MEADOWS DRIVE
LONE TREE, CO 80124

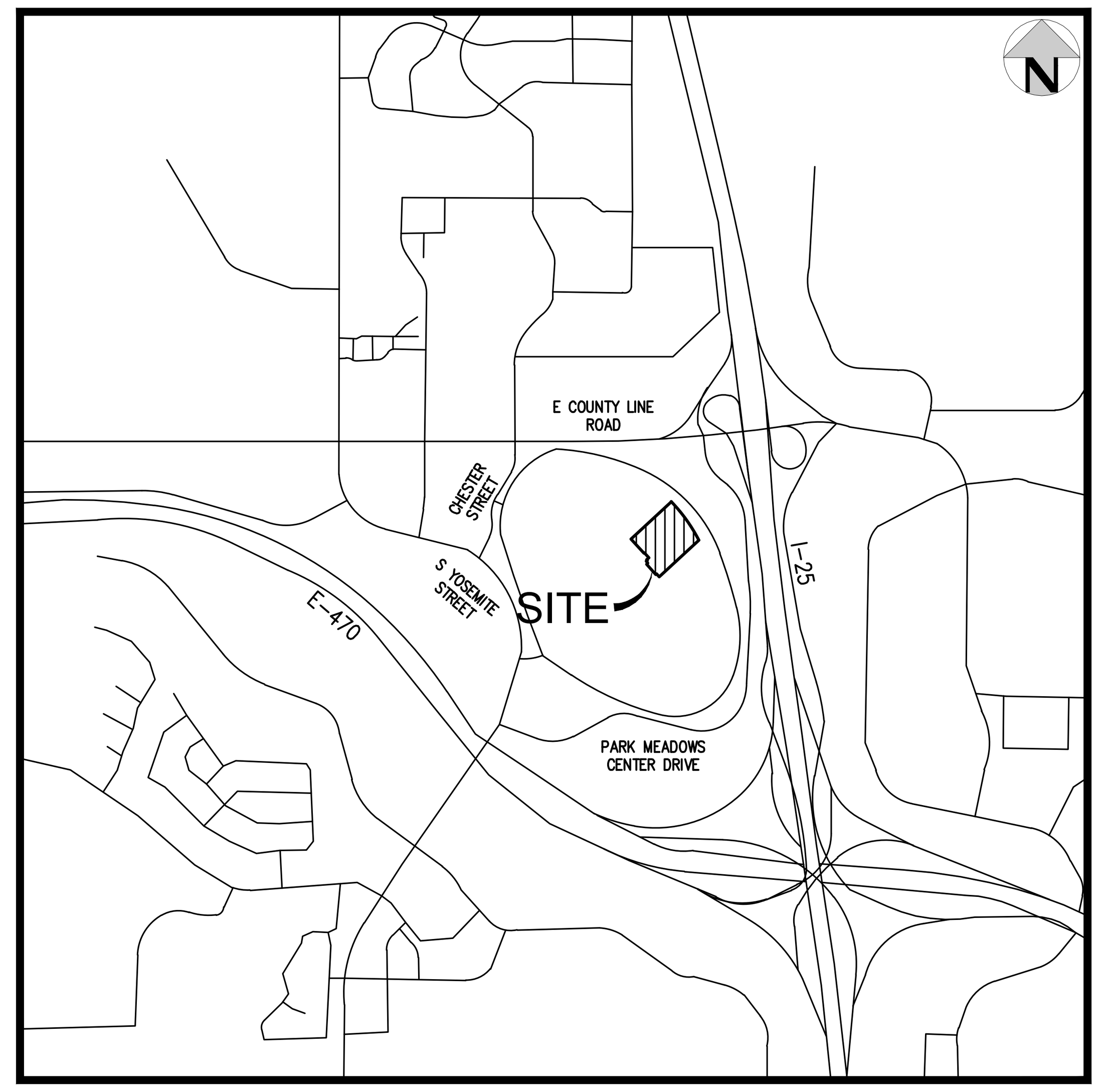
EROSION CONTROL NOTES:

IF A SEPARATE GRADING, EROSION, AND SEDIMENT CONTROL PERMIT (GESC) IS REQUIRED FOR THIS PROJECT, THE PERMITTEE MUST IMPLEMENT AND COMPLY WITH AN APPROVED GESC (EC PERMIT) AND ASSOCIATED DOCUMENTS FOR THIS PROJECT.

IF A SEPARATE GESC (EC PERMIT) IS NOT REQUIRED, THE OWNER, SITE DEVELOPER, CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL ENSURE THAT ALL POTENTIAL POLLUTANTS GENERATED DURING DEMOLITION OR CONSTRUCTION WORK ASSOCIATED WITH THIS PROJECT, BE PREVENTED FROM DISCHARGE TO STORMWATER CONVEYANCE SYSTEMS IN THE VICINITY OF THIS PROJECT SITE IN ACCORDANCE WITH THE FOLLOWING:

1. THE OWNER, SITE DEVELOPER, CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL PREVENT SEDIMENT, DEBRIS AND ALL OTHER POLLUTANTS FROM ENTERING THE STORM SEWER SYSTEM DURING ALL DEMOLITION, EXCAVATION, TRENCHING, BORING, GRADING, OR OTHER CONSTRUCTION OPERATIONS THAT ARE PART OF THIS PROJECT. THE OWNER, SITE DEVELOPER, CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL BE HELD RESPONSIBLE FOR REMEDIATION OF ANY ADVERSE IMPACTS TO THE MUNICIPAL SEPARATE STORM SEWER SYSTEM, RECEIVING WATERS, WATERWAYS, WETLANDS, AND OR OTHER PUBLIC OR PRIVATE PROPERTIES, RESULTING FROM WORK DONE AS PART OF THIS PROJECT.
2. THE OWNER, SITE DEVELOPER, CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL REMOVE ALL SEDIMENT, MUD, CONSTRUCTION DEBRIS, OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO OR, ACCUMULATE IN THE FLOW LINES STORM DRAINAGE APPURTENANCES, AND PUBLIC RIGHTS OF WAYS OF THE CITY AND COUNTY OF DENVER AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS PROJECT. ALL REMOVALS SHALL BE CONDUCTED IN A TIMELY MANNER.
3. THE OWNER, SITE DEVELOPER, CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL INSURE THAT ALL LOADS OF CUT AND FILL MATERIAL IMPORTED TO OR EXPORTED FROM THIS SITE SHALL BE PROPERLY COVERED TO PREVENT LOSS OF THE MATERIAL DURING TRANSPORT ON PUBLIC RIGHTS OF WAY." THE USE OF REBAR TO ANCHOR BEST MANAGEMENT PRACTICES, OTHER THAN PORTABLE TOILETS, IS PROHIBITED.
4. THE OWNER, SITE DEVELOPER, CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL IMPLEMENT THE FOLLOWING BEST MANAGEMENT PRACTICES (BMPS) ON SITE DURING CONSTRUCTION:
   - I. VEHICLE TRACKING CONTROL: VEHICLE TRACKING CONTROL: THIS BMP IS REQUIRED AT ALL ACCESS POINTS FOR INGRESS/EGRESS FROM OFF-SITE IMPERVIOUS SURFACES TO CONSTRUCTION SITE PERVIOUS AREAS THAT ARE USED BY VEHICULAR TRAFFIC OR CONSTRUCTION EQUIPMENT.
   - II. INLET PROTECTION: THIS BMP IS REQUIRED ON ALL EXISTING OR PROPOSED STORM SEWER INLETS IN THE VICINITY OF THE CONSTRUCTION SITE THAT MAY RECEIVE SITE RUNOFF. THE BMP MUST BE APPROPRIATE TO THE TYPE OF STORM INLET AND APPROPRIATE FOR THE GROUND SURFACE AT THE INLET.
   - III. INTERIM SITE STABILIZATION: THIS BMP IS REQUIRED TO PROVIDE A MEASURE FOR PREVENTING THE DISCHARGE OF SEDIMENT FROM CONSTRUCTION SITES WHERE OVERLOT GRADING OR OTHER SITE DISTURBANCE HAS OCCURRED. THIS BMP IS PARTICULARLY NECESSARY ON SITES WHERE CONSTRUCTION ACTIVITIES/DISTURBANCE WILL BE LIMITED TO SMALL AREAS OF THE PROJECT SITE. ACCEPTABLE BMPS INCLUDE:
     - a. PRESERVING EXISTING VEGETATION
     - b. SEEDING AND PLANTING
     - c. MULCHING
     - d. MULCHING AND SEEDING
     - e. TEMPORARY/PERMANENT RE-VEGETATION OPERATIONS
     - f. CHEMICAL SOIL STABILIZER APPLICATION (REQUIRES WMD APPROVAL)
   - IV. WASTE MANAGEMENT/CONTAINMENT: THIS BMP REQUIRES THAT ALL CONSTRUCTION WASTES, FUELS, LUBRICANTS, CHEMICAL WASTES, TRASH. SANITARY WASTES, CONTAMINATED SOILS OR DEBRIS SHALL BE CONTAINED ON SITE, PROTECTED FROM CONTACT WITH PRECIPITATION OR SURFACE RUNOFF, PERIODICALLY REMOVED FROM THE CONSTRUCTION SITE, AND PROPERLY DISPOSED OF.
   - V. SPILL PREVENTION /CONTAINMENT: THIS BMP DEFINES THE MEASURES PROPOSED FOR PREVENTING, CONTROLLING, OR CONTAINING SPILLS OF FUEL, LUBRICANTS, OR OTHER POLLUTANTS; AND PROTECTING POTENTIAL POLLUTANTS FROM CONTACT WITH PRECIPITATION OR RUNOFF.
   - VI. CHUTE WASHOUT CONTAINMENT: WATER USED IN THE CLEANING OF CEMENT TRUCK DELIVERY CHUTES SHALL BE DISCHARGED INTO A PREDEFINED, BERMED CONTAINMENT AREA ON THE JOB SITE. THE REQUIRED CONTAINMENT AREA IS TO BE BERMED SO THAT WASH WATER IS TOTALLY CONTAINED. WASH WATER DISCHARGED INTO THE CONTAINMENT AREA SHALL BE ALLOWED TO INFILTRATE OR EVAPORATE. DRIED CEMENT WASTE IS REMOVED FROM THE CONTAINMENT AREA AND PROPERLY DISPOSED OF.
     - a. SHOULD A PREDEFINED BERMED CONTAINMENT AREA NOT BE AVAILABLE DUE TO THE PROJECT SIZE, OR LACK OF AN AREA WITH A SUITABLE GROUND SURFACE FOR ESTABLISHING A CONTAINMENT AREA, PROPER DISPOSAL OF READY MIX WASHOUT AND RINSE OFF WATER AT THE JOB SITE SHALL CONFORM TO APPROVED TECHNIQUES AND PRACTICES.
     - b. THE DIRECT OR INDIRECT DISCHARGE OF WATER CONTAINING WASTE CEMENT TO THE STORM SEWER SYSTEM IS PROHIBITED.
   - VII. SWEEPING: THIS BMP REQUIRES THAT IMPERVIOUS SURFACES WHICH ARE ADJACENT TO OR CONTAINED WITHIN CONSTRUCTION SITES BE SWEPT ON A DAILY BASIS OR AS NEEDED DURING THE DAY WHEN SEDIMENT AND OTHER MATERIALS ARE TRACKED OR DISCHARGED ON TO THEM. EITHER SWEEPING BY HAND OR USE OF STREET SWEEPERS IS ACCEPTABLE. STREET SWEEPERS USING WATER WHILE SWEEPING IS PREFERRED IN ORDER TO MINIMIZE DUST. FLUSHING OFF PAVED SURFACES WITH WATER IS PROHIBITED.
   - VIII. PERIMETER CONTROL: THIS BMP REQUIRES THAT A CONSTRUCTION SITE INSTALL A PERIMETER CONTROL MEASURE ALONG THE EDGE OF THE CONSTRUCTION SITE, TO PREVENT, OR FILTER THE DISCHARGE OF SURFACE RUNOFF FROM THE CONSTRUCTION SITE. THE TYPE OF PERIMETER CONTROL USED SHALL BE DETERMINED BASED ON SITE CONDITIONS AND LOCATION. MAINTENANCE AND REPAIR OF THE CONTROL MEASURE SHALL OCCUR AS NEEDED, IN A TIMELY MANNER.
   - IX. STOCK PILES: SOILS THAT WILL BE STOCKPILED FOR MORE THAN THIRTY (30) DAYS SHALL BE PROTECTED FROM WIND AND WATER EROSION WITHIN FOURTEEN (14) DAYS OF STOCKPILE CONSTRUCTION. STABILIZATION OF STOCKPILES LOCATED WITHIN 100 FEET OF RECEIVING WATERS, OR WITH SLOPES 3 TO 1 OR GREATER SHALL BE COMPLETED WITHIN SEVEN (7) DAYS FOLLOWING STOCKPILE CONSTRUCTION. STABILIZATION AND PROTECTION OF THE STOCKPILE MAY BE ACCOMPLISHED BY ANY OF THE FOLLOWING: MULCHING, TEMPORARY/PERMANENT REVEGETATION OPERATIONS, CHEMICAL SOIL STABILIZER APPLICATION, OR EROSION CONTROL MATTING/GEOTEXTILES. IF STOCKPILES ARE LOCATED WITHIN 100 FEET OF RECEIVING WATERS, A DRAINAGEWAY OR THE SITE PERIMETER, ADDITIONAL SEDIMENT CONTROLS SHALL BE REQUIRED.
   - X. SAW CUTTING OPERATIONS: "THE CONTRACTOR SHALL PROTECT ALL STORM SEWER FACILITIES ADJACENT TO ANY LOCATION WHERE PAVEMENT CUTTING OPERATIONS INVOLVING WHEEL CUTTING, SAW CUTTING, OR ABRASIVE WATER JET CUTTING ARE TO TAKE PLACE. THE CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE OF ALL WASTE PRODUCTS GENERATED BY SAID CUTTING OPERATIONS ON A DAILY BASIS OR AS NEEDED THROUGHOUT THE WORK DAY. THE DISCHARGE OF ANY WATER CONTAMINATED BY WASTE PRODUCTS FROM CUTTING OPERATIONS TO THE STORM SEWER SYSTEM IS PROHIBITED."
   - XI. STRUCTURAL CONTROLS: DEVELOPMENT SITES THAT ARE REQUIRED TO PROVIDE DETENTION AND WATER QUALITY ENHANCEMENT FACILITIES FOR STORM RUNOFF NEED TO INSTALL THE DETENTION FACILITIES EARLY IN THE CONSTRUCTION BUILD-OUT OF THE SITE. PROJECTS THAT ARE USING UNDERGROUND DETENTION ARE REQUIRED TO INSTALL A PRETREATMENT STRUCTURE OR SEDIMENTATION BASINS AS A MEANS OF TREATING POTENTIALLY POLLUTED STORM WATER PRIOR TO ENTERING THE DETENTION STRUCTURE. USE OF THESE STRUCTURES IS REQUIRED FOR ENTRAPPING SEDIMENT AND CONSTRUCTION DEBRIS DURING THE ACTIVE CONSTRUCTION PHASE OF THE PROJECT. THE NARRATIVE SECTION OF THE MANAGEMENT PLAN IS ALSO REQUIRED TO ADDRESS OPERATION AND MAINTENANCE OF THE STRUCTURAL CONTROLS BEING USED AS AN ACTIVE CONSTRUCTION BMP.

6. EROSION AND SEDIMENT CONTROL "BEST MANAGEMENT PRACTICES" SHALL BE MAINTAINED AND KEPT IN EFFECTIVE OPERATING CONDITION FOR THE DURATION OF THIS PROJECT. ALL NECESSARY MAINTENANCE AND REPAIR SHALL BE COMPLETED IMMEDIATELY UPON DISCOVERY OF ANY DEFICIENCY OR DEFECT.



VICINITY MAP
SCALE: 1" = 1000'

SHEET INDEX

ABBREVIATIONS	
BLDG	BUILDING
BOP	BOTTOM OF PIPE
BS	BOTTOM OF STEP
BW	BOTTOM OF WALL (FG)
CONC	CONCRETE
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DR	DOOR
DS	DOWNSPOUT
E	EAST, EASTING
EGL	ENERGY GRADE LINE
EL	ELEVATION
EOA	EDGE OF ASPHALT
EOC	EDGE OF CONCRETE
EOP	EDGE OF PAVEMENT
ESMT	EASEMENT
EX	EXISTING
FES	FLARED END SECTION
FF	FINISHED FLOOR
FG	FINISHED GRADE
FH	FIRE HYDRANT
FL	FLOW LINE
GB	GRADE BREAK
GV	GATE VALVE
HC	HANDICAP
HGL	HYDRAULIC GRADE LINE
HORZ	HORIZONTAL
HP	HIGH POINT
INV	INVERT
LP	LOW POINT
LSD	LANDSCAPE DRAIN
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MJ	MECHANICAL JOINT
N	NORTH, NORTHING
PHS	PHASE
PR	PROPOSED
PVC	POLYVINYL CHLORIDE
RCP	REINFORCED CONCRETE PIPE
ROW	RIGHT-OF-WAY
SAN	SANITARY
SL	STREET LIGHT
SS	SANITARY SEWER
STA	STATION
STM	STORM
TB	THRUST BLOCK
TBC	TOP/BACK OF CURB
TOP	TOP OF PIPE
TS	TOP OF STEP
TW	TOP OF WALL (FG)
TYP	TYPICAL
UG	UNDERGROUND
WAT	WATER

NOTE:

THE GRADING, EROSION AND SEDIMENT CONTROL PLAN INCLUDED HEREIN HAS BEEN PLACED IN THE CITY OF LONE TREE FILE FOR THIS PROJECT AND APPEARS TO FULFILL THE APPLICABLE LONE TREE GRADING, EROSION, AND SEDIMENT CONTROL CRITERIA, AS AMENDED. ADDITIONAL GRADING, EROSION AND SEDIMENT CONTROL MEASURES MAY BE REQUIRED OF THE PERMITTEES, DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT FUNCTION AS INTENDED. THE REQUIREMENTS OF THIS PLAN SHALL RUN WITH THE LAND AND BE THE OBLIGATION OF THE PERMITTEES, UNTIL SUCH TIME AS THE PLAN IS PROPERLY COMPLETED, MODIFIED, OR VOIDED.

CERTIFICATION

THE GRADING, EROSION AND SEDIMENT CONTROL PLAN INCLUDED HEREIN HAS BEEN PREPARED UNDER MY DIRECT SUPERVISION IN ACCORDANCE WITH THE REQUIREMENTS OF THE GRADING, EROSION, AND SEDIMENT CONTROL (GESC) CRITERIA MANUAL OF DOUGLAS COUNTY AS AMENDED.

PRELIMINARY
NOT FOR
CONSTRUCTION

CITY OF LONE TREE

DATE

THESE CONSTRUCTION PLANS HAVE BEEN REVIEWED BY THE CITY OF LONE TREE FOR GRADING AND EROSION CONTROL IMPROVEMENTS ONLY.

ENGINEERING DIVISION ACCEPTANCE BLOCK

HARRIS KOCHER SMITH
1120 Lincoln Street, Suite 1000
Denver, Colorado 80203
P: 303.623.6300 F: 303.623.6311
HarrisKocherSmith.com
POC: LIBBEY ENDERSBE
LENDERSBE@HKSENG.COM

ISSUE DATE: 03-29-2024	PROJECT #: 231016
DATE	REVISION COMMENTS
04-05-2024	BID ADDENDUM
05-03-2024	95% PERMIT SET
05-07-2024	CITY SUBMITTAL

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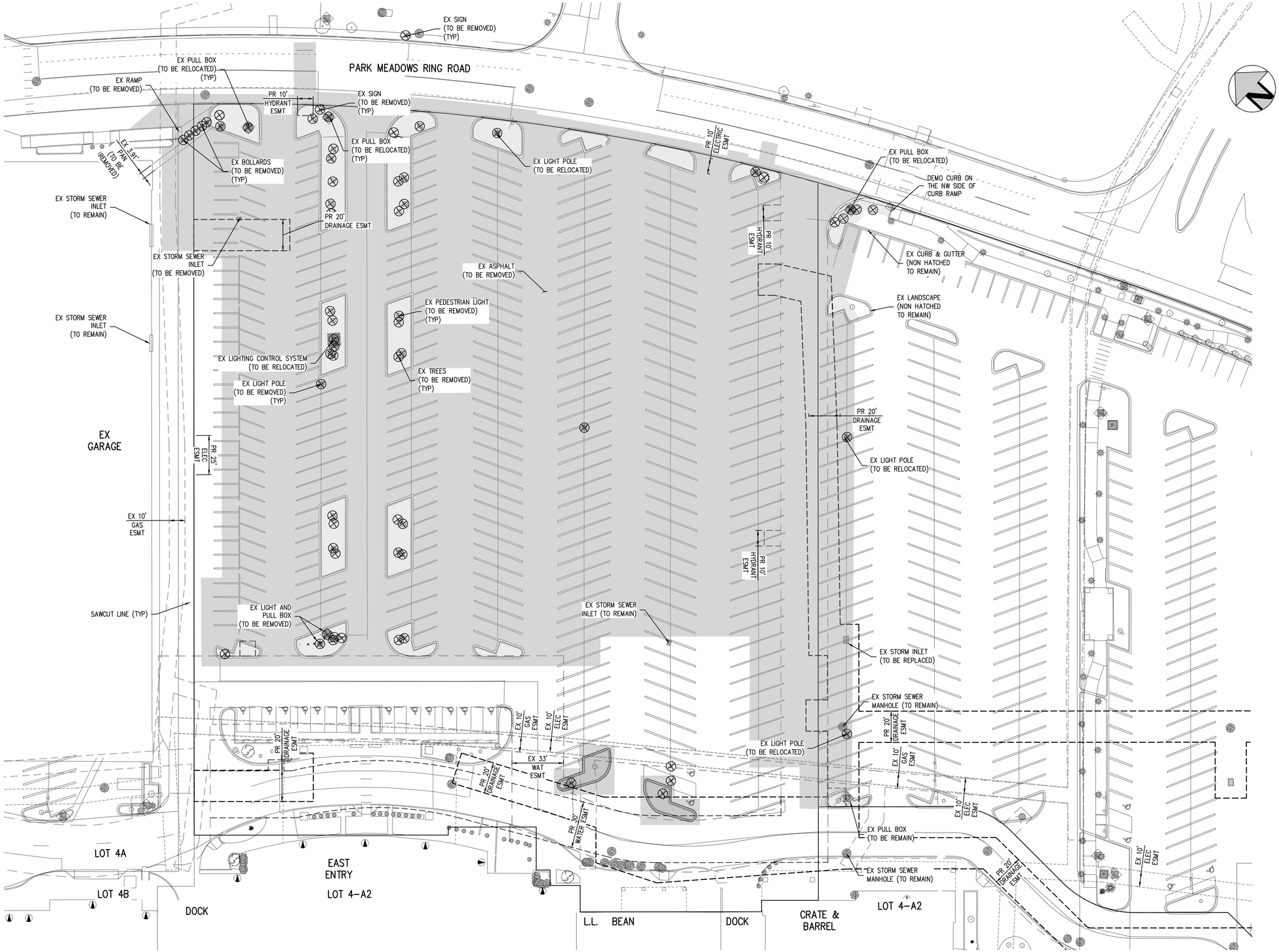

NOTES:

1. THE LIMITS OF DEMOLITION SHOWN ON THIS PLAN ARE APPROXIMATE AND ARE INTENDED TO GIVE THE CONTRACTOR A GENERAL EXPECTATION OF WHAT MAY/MAY NOT NEED TO BE REMOVED AND DEMOLISHED PRIOR TO CONSTRUCTION. THE LIMITS AND AMOUNT OF DEMOLITION MAY NEED TO BE ADJUSTED BY THE CONTRACTOR BASED ON THE MEANS AND METHODS OF CONSTRUCTION. THE EXTENT OF DEMOLITION SHALL BE VERIFIED BY THE CONTRACTOR IN THE FIELD PRIOR TO CONSTRUCTION.
2. EXISTING UTILITY MANHOLES/RIMS/BOXES/STRUCTURES/ETC. CALLED OUT TO REMAIN SHALL BE ADJUSTED TO FINAL GRADE. CONTRACTOR SHALL COORDINATE WITH UTILITY PROVIDERS TO DETERMINE THE REQUIREMENTS FOR ADJUSTING EXISTING PULL BOXES/MANHOLES/STRUCTURES/ETC.
3. THIS DEMOLITION PLAN IS FOR INFORMATION ONLY AND SHOWS KNOWN INFORMATION PROVIDED BY UTILITY PROVIDER MAPS AND SURVEY DATA AND HAS NOT BEEN INDEPENDENTLY VERIFIED BY THE ENGINEER. THE CONTRACTOR SHALL CONDUCT ITS OWN SITE VISIT AND INVESTIGATION TO DETERMINE THE DEMOLITION REQUIREMENTS NECESSARY TO CONSTRUCT THE PROJECT PER THE APPROVED CONSTRUCTION DRAWINGS.
4. THIS DEMOLITION PLAN GENERALLY COVERS ALL KNOWN IMPROVEMENTS WITHIN THE SITE.
5. FINAL SCOPE AND LIMITS OF REMOVAL/ABANDONMENT /DEMOLITION OF EXISTING UTILITIES SHALL BE DETERMINED BY THE GENERAL CONTRACTOR AFTER COORDINATION WITH THE APPLICABLE UTILITY PROVIDERS/OWNERS.
6. CONTRACTOR SHALL OBTAIN ALL REQUIRED DEMOLITION PERMITS WITH THE APPLICABLE REVIEWING AUTHORITIES PRIOR TO STARTING DEMOLITION ACTIVITIES.
7. EXISTING ELECTRICAL UTILITIES TO BE REMOVED SHALL BE REMOVED IN ACCORDANCE WITH CURRENT XCEL ENERGY SPECIFICATIONS. ALL REQUIRED PERMITS SHALL BE OBTAINED FROM XCEL ENERGY PRIOR TO MODIFICATION TO THESE UTILITIES. IN SOME CASES XCEL ENERGY, NOT THE CONTRACTOR, WILL BE RESPONSIBLE FOR REMOVAL OF CERTAIN INFRASTRUCTURE. THE CONTRACTOR SHALL COORDINATE REMOVAL OF ALL INFRASTRUCTURE WITH THE UTILITY PROVIDER.
8. EXISTING TELECOMMUNICATION, CABLE TV, PHONE LINES TO BE REMOVED SHALL BE REMOVED IN ACCORDANCE WITH THE CURRENT APPLICABLE UTILITY PROVIDERS SPECIFICATIONS. ALL REQUIRED PERMITS SHALL BE OBTAINED FROM APPLICABLE INFRASTRUCTURE OWNERS PRIOR TO MODIFICATION. THE CONTRACTOR SHALL COORDINATE REMOVAL OF ALL INFRASTRUCTURE WITH THE UTILITY PROVIDER.
9. EXISTING WASTEWATER (STORM SEWER AND SANITARY SEWER) INFRASTRUCTURE TO BE REMOVED SHALL BE REMOVED IN ACCORDANCE WITH CURRENT SOUTH GATE WATER & SANITATION DISTRICT, CITY OF LONE TREE, AND STATE SPECIFICATIONS. SEE APPROVED UTILITY PLANS FOR MORE DETAILS.
10. THE EXISTING STRUCTURES, INCLUDING THE FOUNDATIONS, SHOULD BE COMPLETELY REMOVED FROM THE SITE. ANY OTHER BELOW GRADE APPURTENANCES ASSOCIATED WITH THE STRUCTURE SHOULD ALSO BE REMOVED. ANY WELLS ENCOUNTERED SHOULD BE ABANDONED IN ACCORDANCE WITH THE REGULATIONS OF THE COLORADO STATE ENGINEER. ALL CONCRETE PADS SHOULD BE REMOVED FROM THE SITE.
11. CONTRACTOR SHALL REFER TO THE GEOTECHNICAL SITE DEVELOPMENT STUDY FOR ADDITIONAL SITE DEVELOPMENT RECOMMENDATIONS.
12. THIS PLAN DOES NOT SHOW LIMITS OF EXISTING PAVEMENT REMOVAL REQUIRED FOR UTILITY TRENCHES AND INSTALLATION.
13. CONTRACTOR SHALL COORDINATE W/ OWNER DURING CONSTRUCTION TO DETERMINE IF EX LIGHT POLES CAN BE RELOCATED OR IF THEY NEED TO BE REMOVED AND REPLACED.

LEGEND:

- EX TREE (TO BE REMOVED)
- EX SIGN (TO BE REMOVED)
- EX LIGHT POLE (TO BE REMOVED)
- EX PEDESTRIAN LIGHT (TO BE REMOVED)
- EX PULL BOX (TO BE REMOVED)
- DEMO LANDSCAPE ISLAND
- DEMO ASPHALT / CONCRETE

BENCHMARK:

BENCHMARK IS DOUGLAS COUNTY CONTROL POINT 2113021 STAMPED" 2.113021 DC GIS" WITH A PUBLISHED ELEVATION OF 5914.49 FT (NAVD88).

CITY OF LONE TREE

DATE

THESE CONSTRUCTION PLANS HAVE BEEN REVIEWED BY THE CITY OF LONE TREE FOR GRADING AND EROSION CONTROL IMPROVEMENTS ONLY.

ENGINEERING DIVISION ACCEPTANCE BLOCK

SCALE: 1" = 30'

DESIGNED BY: ODV
CHECKED BY: JDO
DRAWN BY: ODV

ISSUE DATE: 03-29-2024

DATE	REVISION COMMENTS
04-05-2024	BID ADDENDUM
05-03-2024	95% PERMIT SET
05-07-2024	CITY SUBMITTAL

HARRIS KOCHER SMITH
1120 Lincoln Street, Suite 1000
Denver, Colorado 80203
P: 303.623.6300 F: 303.623.6311
HarrisKocherSmith.com

PARK MEADOWS MALL, LLC /
PARK MEADOWS ANCHOR ACQUISITION, LLC

PARK MEADOWS - GARAGE AND RETAIL
DEMOLITION PLAN - ABOVE GRADE - PHASE 1A

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 231016
SHEET NUMBER
EC2
2 OF 17

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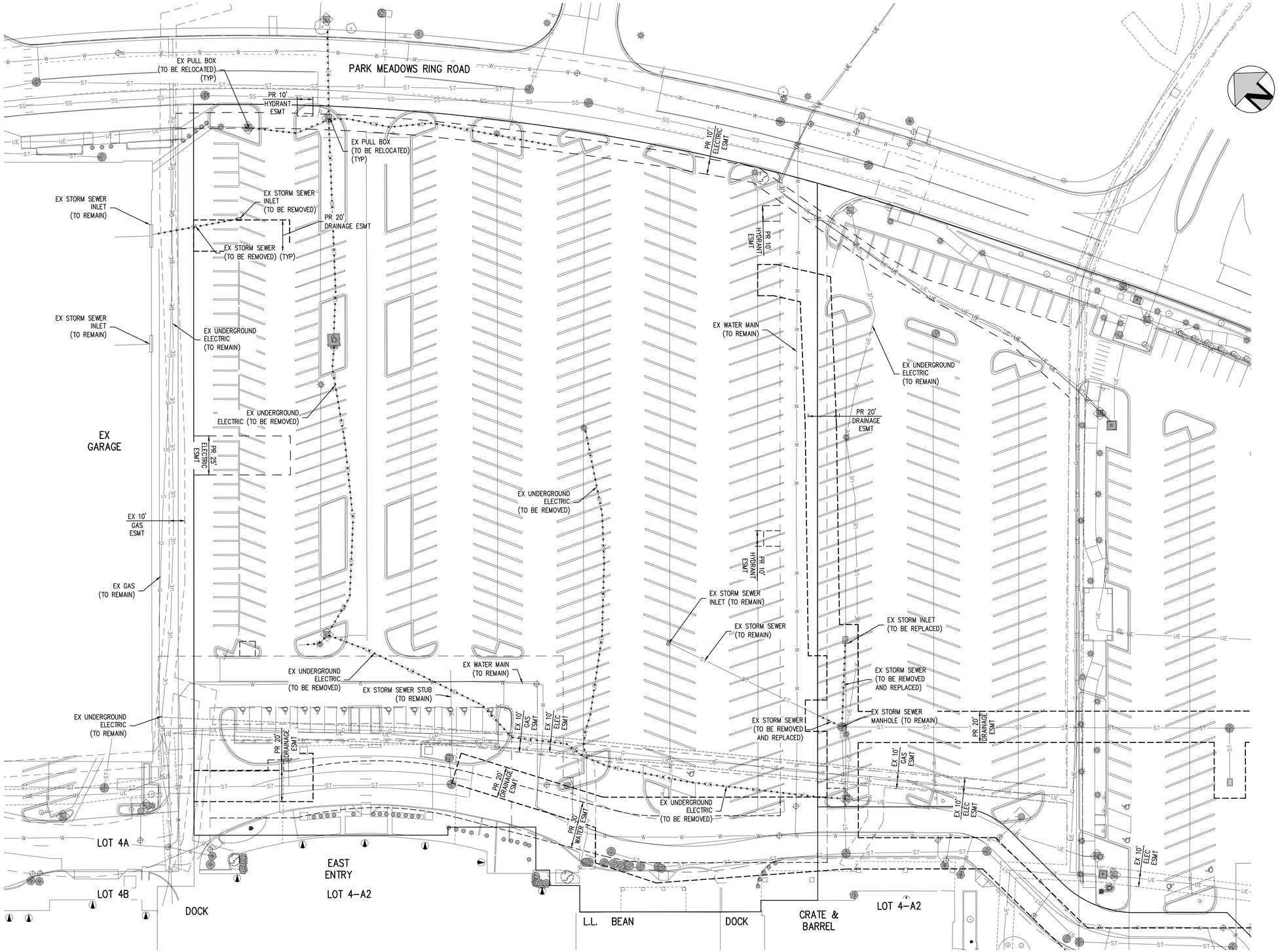

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4. THIS DEMOLITION PLAN GENERALLY COVERS ALL KNOWN IMPROVEMENTS WITHIN THE SITE.
5. FINAL SCOPE AND LIMITS OF REMOVAL/ABANDONMENT /DEMOLITION OF EXISTING UTILITIES SHALL BE DETERMINED BY THE GENERAL CONTRACTOR AFTER COORDINATION WITH THE APPLICABLE UTILITY PROVIDERS/OWNERS.
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7. EXISTING ELECTRICAL UTILITIES TO BE REMOVED SHALL BE REMOVED IN ACCORDANCE WITH CURRENT XCEL ENERGY SPECIFICATIONS. ALL REQUIRED PERMITS SHALL BE OBTAINED FROM XCEL ENERGY PRIOR TO MODIFICATION TO THESE UTILITIES. IN SOME CASES XCEL ENERGY, NOT THE CONTRACTOR, WILL BE RESPONSIBLE FOR REMOVAL OF CERTAIN INFRASTRUCTURE. THE CONTRACTOR SHALL COORDINATE REMOVAL OF ALL INFRASTRUCTURE WITH THE UTILITY PROVIDER.
8. EXISTING TELECOMMUNICATION, CABLE TV, PHONE LINES TO BE REMOVED SHALL BE REMOVED IN ACCORDANCE WITH THE CURRENT APPLICABLE UTILITY PROVIDERS SPECIFICATIONS. ALL REQUIRED PERMITS SHALL BE OBTAINED FROM APPLICABLE INFRASTRUCTURE OWNERS PRIOR TO MODIFICATION. THE CONTRACTOR SHALL COORDINATE REMOVAL OF ALL INFRASTRUCTURE WITH THE UTILITY PROVIDER.
9. EXISTING WASTEWATER (STORM SEWER AND SANITARY SEWER) INFRASTRUCTURE TO BE REMOVED SHALL BE REMOVED IN ACCORDANCE WITH CURRENT SOUTH GATE WATER & SANITATION DISTRICT, CITY OF LONE TREE, AND STATE SPECIFICATIONS. SEE APPROVED UTILITY PLANS FOR MORE DETAILS.
10. THE EXISTING STRUCTURES, INCLUDING THE FOUNDATIONS, SHOULD BE COMPLETELY REMOVED FROM THE SITE. ANY OTHER BELOW GRADE APPURTENANCES ASSOCIATED WITH THE STRUCTURE SHOULD ALSO BE REMOVED. ANY WELLS ENCOUNTERED SHOULD BE ABANDONED IN ACCORDANCE WITH THE REGULATIONS OF THE COLORADO STATE ENGINEER. ALL CONCRETE PADS SHOULD BE REMOVED FROM THE SITE.
11. CONTRACTOR SHALL REFER TO THE GEOTECHNICAL SITE DEVELOPMENT STUDY FOR ADDITIONAL SITE DEVELOPMENT RECOMMENDATIONS.
12. THIS PLAN DOES NOT SHOW LIMITS OF EXISTING PAVEMENT REMOVAL REQUIRED FOR UTILITY TRENCHES AND INSTALLATION.

LEGEND:

- PROPERTY BOUNDARY
- EX UNDERGROUND ELECTRIC (UE)
- EX UNDERGROUND TELECOM (UT)
- EX STORM SEWER LINE (ST)
- EX SANITARY SEWER LINE (SS)
- EX GAS LINE (G)
- EX WATER LINE (W)
- EX UTILITY TO BE REMOVED
- EX LIGHT POLE

BENCHMARK:

BENCHMARK IS DOUGLAS COUNTY CONTROL POINT 2113021 STAMPED" 2.113021 DC GIS" WITH A PUBLISHED ELEVATION OF 5914.49 FT (NAVD88).

CITY OF LONE TREE

DATE

THESE CONSTRUCTION PLANS HAVE BEEN REVIEWED BY THE CITY OF LONE TREE FOR GRADING AND EROSION CONTROL IMPROVEMENTS ONLY.

ENGINEERING DIVISION ACCEPTANCE BLOCK

Know what's below. Call before you dig.

SCALE: 1" = 30'

DESIGNED BY: ODV
CHECKED BY: JDO
DRAWN BY: ODV

ISSUE DATE: 03-29-2024

DATE	REVISION COMMENTS
04-05-2024	BID ADDENDUM
05-03-2024	95% PERMIT SET
05-07-2024	CITY SUBMITTAL

HARRIS KOCHER SMITH
1120 Lincoln Street, Suite 1000
Denver, Colorado 80203
P: 303.623.6300 F: 303.623.6311
HarrisKocherSmith.com

PARK MEADOWS MALL, LLC /
PARK MEADOWS ANCHOR ACQUISITION, LLC

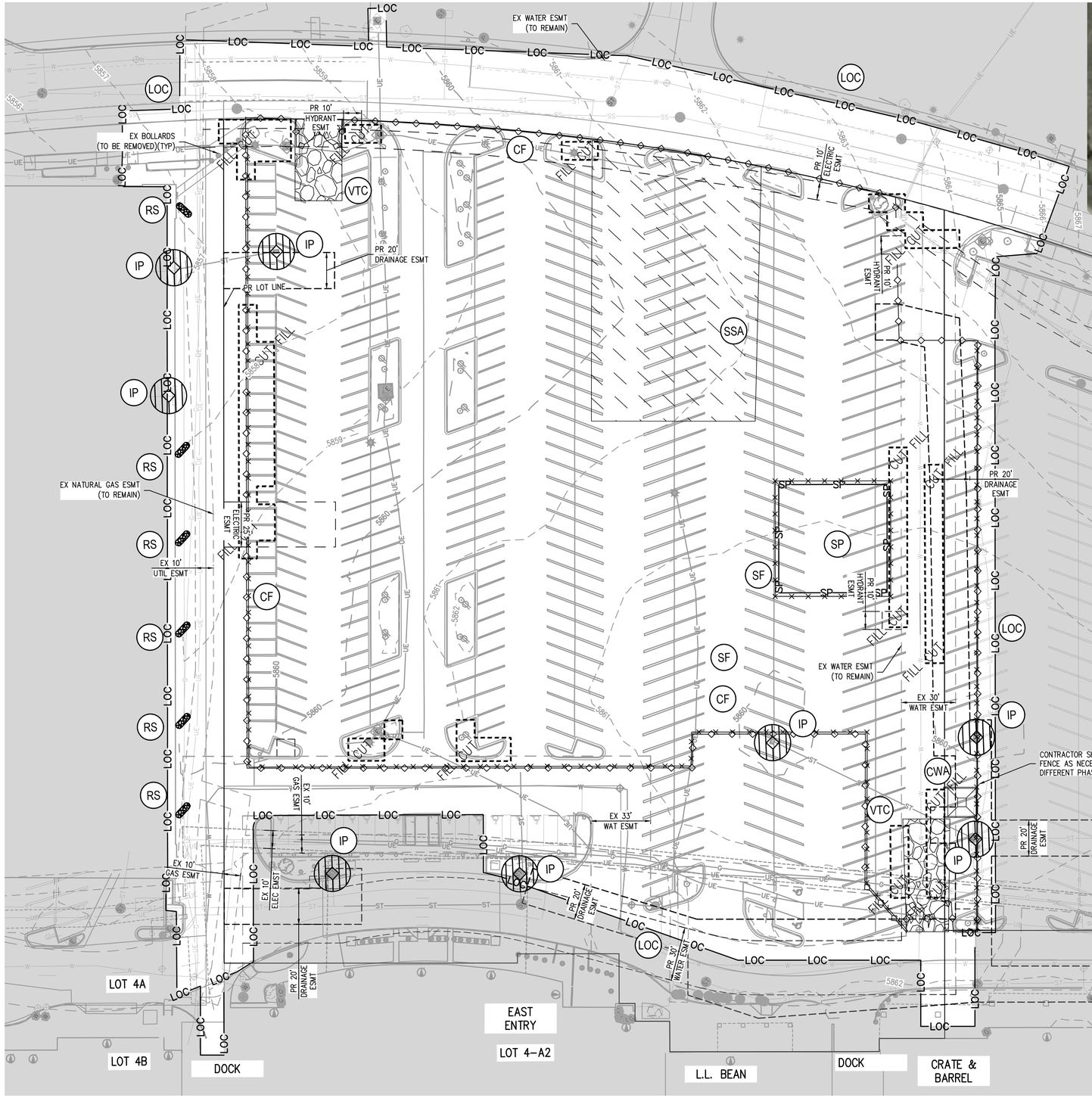
PARK MEADOWS - GARAGE AND RETAIL
DEMOLITION PLAN - BELOW GRADE - PHASE 1A

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 231016

SHEET NUMBER
EC3
3 OF 17

FILEPATH: P:\2023\231016\ENGINEERING\CD\PHASE 1A\CD_ DEMO PLAN BELOW GRADE.DWG LAYOUT: LAYOUT1
8 XREFs: cd-dsmp, e-base, e-legal, e-trail-hyd, e-util, p-base(U), p-legal, p-legal-ph01b
PLOTTED: TUE (5/07/24 1:58:13P BY: JT ROBBINS



EXISTING DETENTION POND A

SCALE: 1"=50'

SUMMARY OF APPROXIMATE EARTHWORK QUANTITIES

CUT VOLUME (CU YD)	289
FILL VOLUME (CU YD)	7,558
NET (CU YD IMPORT)	7,269
AREA OF DISTURBANCE	**4.92** ACRES

NOTE: EARTHWORK VOLUMES ARE UNADJUSTED AND DO NOT ACCOUNT FOR UTILITY SPOILS, PAVEMENT SECTION, SOIL COMPACTION/SWELL, ETC.

BMP LEGEND:

- LIMITS OF CONSTRUCTION / LIMITS OF DISTURBANCE (LOC)
- CONSTRUCTION FENCE (CF)
- SILT FENCE (SF)
- STABILIZED STAGING AREA (SSA)
- STOCKPILE PROTECTION (SP)
- VEHICLE TRACKING CONTROL (VTC)
- INLET PROTECTION (IP)
- CONCRETE WASHOUT AREA (CWA)
- SEDIMENT CONTROL LOG (SCL)
- ROCK SOCK (RS)

LEGEND

EXISTING

- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- UTILITY EASEMENT
- AREA NOT TO BE DISTURBED
- CUT/FILL BOUNDARY
- SANITARY SEWER W/ MANHOLE
- SANITARY SERVICE W/CLEANOUT
- WATER LINE AND GATE VALVE
- WATER SERVICE
- STORM SEWER W/ MANHOLE & INLETS
- FIRE HYDRANT
- STREET LIGHT
- GAS MAIN
- ELECTRIC PULL BOX
- PED/BIKE CROSSING

INITIAL PLAN

1. SEE COVER SHEET OF LONE TREE STANDARD NOTES AND DETAILS (SHEET 1 OF 3) FOR LEGEND OF BMP NAMES AND SYMBOLS.
2. SHADED BEST MANAGEMENT PRACTICES (BMPS) WERE INSTALLED IN AN EARLIER PHASE, AND UNLESS OTHERWISE INDICATED SHALL BE LEFT IN PLACE UNTIL REVEGETATION ESTABLISHMENT IS APPROVED BY THE CITY OF LONE TREE. CONTRACTOR SHALL VERIFY THE CONDITION OF ALL EXISTING BMPS AND REMOVE AND REPLACE THEM AS NECESSARY.
3. ALL EXISTING BMPS WILL NEED TO BE PROPERLY REFRESHED OR REINSTALLED BY THE CONTRACTOR TO FUNCTION AS ORIGINALLY DESIGNED.
4. SEE CONSTRUCTION PLANS FOR DETAILS OF PERMANENT DRAINAGE FACILITIES SUCH AS DETENTION FACILITIES, CULVERTS, STORM DRAINS, AND INLET AND OUTLET PROTECTION.
5. SEE DETAIL SHEET EC12-EC14 FOR EROSION CONTROL MEASURE CONSTRUCTION DETAILS.
6. CONTRACTOR SHALL SEED AND MULCH ALL DISTURBED AREAS NOT FORMALLY LANDSCAPED PER THE APPROVED LANDSCAPE PLAN SEED MIX OR THE CITY OF LONE TREE STANDARD SEED MIX.
7. ROCK SOCKS MAY BE SUBSTITUTED FOR SILT FENCE AS PERIMETER CONTROL ON HARDSCAPE SURFACE AREAS.
8. ALL EROSION AND SEDIMENT CONTROL PRACTICES AND OTHER PROTECTIVE MEASURES IDENTIFIED IN THE STORMWATER MANAGEMENT PLAN (SWMP) MUST BE MAINTAINED IN PROPER FUNCTIONING CONDITION. CONTRACTOR SHALL MONITOR ALL BMPS AND IMMEDIATELY CORRECT OR REAPPLY ANY THAT ARE NO LONGER FUNCTIONING EFFECTIVELY.
9. THE CONTRACTOR SHALL PROVIDE SURFACE ROUGHENING AND SEEDING & MULCHING DURING THE DEMOLITION AND EARTHWORK PHASES AS REQUIRED BY THE SWMP AND COUNTY/CITY INSPECTOR.
10. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING INLET PROTECTION ON ALL EXISTING STORM SEWER INLETS IMMEDIATELY ADJACENT TO AND DOWNSTREAM OF THE PROJECT SITE.
11. REMOVAL OF CONTROL MEASURES SHALL NOT OCCUR WITHOUT THE APPROVAL OF STORMWATER INSPECTOR.
12. ALL PAVED SURFACES MUST REMAIN FREE OF SEDIMENT AND REQUIRE CLEANING, INCLUDING STREET SWEEPING, AS NEEDED.
13. PORTABLE TOILETS SHALL BE PLACED ON A PERVIOUS SURFACE AND STAKED DOWN ON ALL FOUR SIDES.

BENCHMARK:

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CITY OF LONE TREE

DATE

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ENGINEERING DIVISION ACCEPTANCE BLOCK

Know what's below. Call before you dig.

30 0 30 60

SCALE: 1" = 30'

DESIGNED BY: ODV
CHECKED BY: JDO
DRAWN BY: ODV

ISSUE DATE: 03-29-2024

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HarrisKocherSmith.com

PARK MEADOWS MALL, LLC /
PARK MEADOWS ANCHOR ACQUISITION, LLC

PARK MEADOWS - GARAGE AND RETAIL
INITIAL GESC PLAN - PHASE 1A

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 231016

SHEET NUMBER

EC4

FILEPATH: P:\2023\23101\6ENGINEERING\EROSION\EC - INITIAL GESC PLAN.DWG, LAYOUT: LAYOUT1
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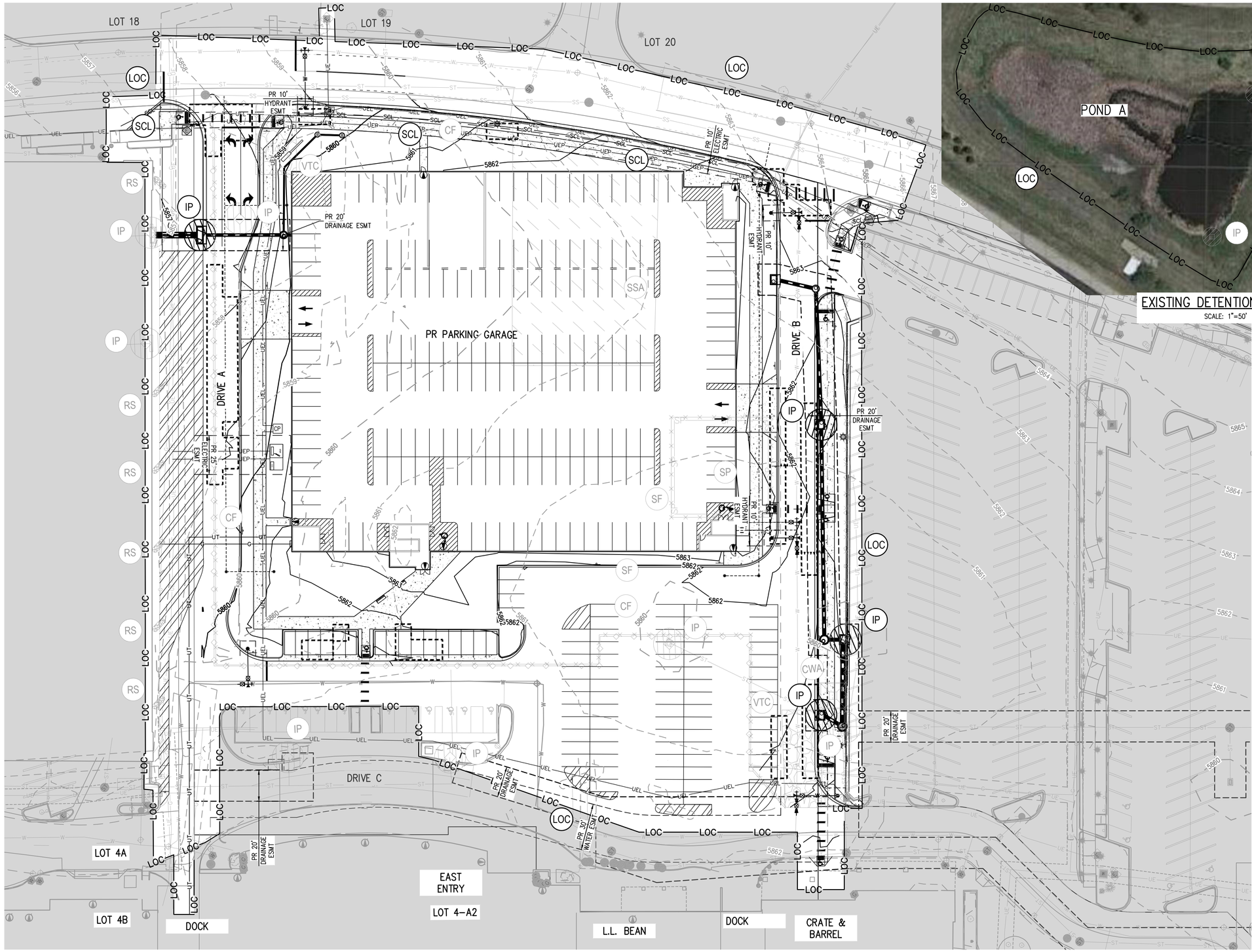
PLOTTED: TUE 05/07/24 1:58:25P BY: JT ROBBINS



EXISTING DETENTION POND A

SCALE: 1"=50'

BMP LEGEND:

LIMITS OF CONSTRUCTION / LIMITS OF DISTURBANCE	LOC
CONSTRUCTION FENCE	CF
SILT FENCE	SF
STABILIZED STAGING AREA	SSA
STOCKPILE PROTECTION	SP
VEHICLE TRACKING CONTROL	VTC
INLET PROTECTION	IP
CONCRETE WASHOUT AREA	CWA
SEDIMENT CONTROL LOG	SCL
ROCK SOCK	RS
EROSION CONTROL BLANKET	ECB

LEGEND

	EXISTING
PROPERTY BOUNDARY	
RIGHT-OF-WAY	
UTILITY EASEMENT	
AREA NOT TO BE DISTURBED	
CUT/FILL BOUNDARY	
SANITARY SEWER W/ MANHOLE	SS
SANITARY SERVICE W/CLEANOUT	
WATER LINE AND GATE VALVE	W
WATER SERVICE	
STORM SEWER W/ MANHOLE & INLETS	
FIRE HYDRANT	
STREET LIGHT	
GAS MAIN	G
ELECTRIC PULL BOX	
PED/BIKE CROSSING	

SUMMARY OF APPROXIMATE EARTHWORK QUANTITIES

CUT VOLUME (CU YD)	289
FILL VOLUME (CU YD)	7,558
NET (CU YD IMPORT)	7,259
AREA OF DISTURBANCE	**4.92** ACRES

NOTE: EARTHWORK VOLUMES ARE UNADJUSTED AND DO NOT ACCOUNT FOR UTILITY SPOILS, PAVEMENT SECTION, SOIL COMPACTION/SWELL, ETC.

INTERIM PLAN

1. SEE COVER SHEET OF LONE TREE STANDARD NOTES AND DETAILS (SHEET 1 OF 3) FOR LEGEND OF BMP NAMES AND SYMBOLS.
2. ALL LANDSCAPE DRAIN AREA INLETS SHALL HAVE INLET PROTECTION UNTIL THE UPSTREAM AREA HAS BEEN FORMALLY LANDSCAPED AND ESTABLISHED. REFER TO THE PRIVATE STORM SEWER PLANS FOR EXACT LOCATIONS OF ALL AREA INLETS.
3. SHADED BMPS INSTALLED IN THE INITIAL STAGE SHALL BE LEFT IN PLACE IN THE INTERIM STAGE.
4. ALL INTERIM BMPS, INCLUDING SEEDING AND MULCHING OF DISTURBED AREAS, MUST BE COMPLETED PRIOR TO ISSUANCE OF ANY CURB AND GUTTER PERMITS.
5. SEE CONSTRUCTION PLANS FOR DETAILS OF PERMANENT DRAINAGE FACILITIES SUCH AS DETENTION FACILITIES, CULVERTS, STORM DRAINS, AND INLET AND OUTLET PROTECTION.
6. PORTABLE TOILETS SHALL BE PLACED ON A PERVIOUS SURFACE AND STAKED DOWN ON ALL FOUR SIDES.

BENCHMARK:

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CITY OF LONE TREE

DATE

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ENGINEERING DIVISION ACCEPTANCE BLOCK

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30 0 30 60

SCALE: 1" = 30'

DESIGNED BY: ODV
CHECKED BY: JDO
DRAWN BY: ODV

ISSUE DATE: 03-29-2024

DATE	REVISION COMMENTS
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05-03-2024	95% PERMIT SET
05-07-2024	CITY SUBMITTAL

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P: 303.623.6300 F: 303.623.6311
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PARK MEADOWS MALL, LLC /
PARK MEADOWS ANCHOR ACQUISITION, LLC

PARK MEADOWS - GARAGE AND RETAIL
INTERIM GESC PLAN - PHASE 1A

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 231016

SHEET NUMBER

EC5

5 OF 17

FILEPATH: P:\2022\23210\9ENGINEERING\EROSION\EC - INTERIM GESC PLAN.DWG LAYOUT: LAYOUT1
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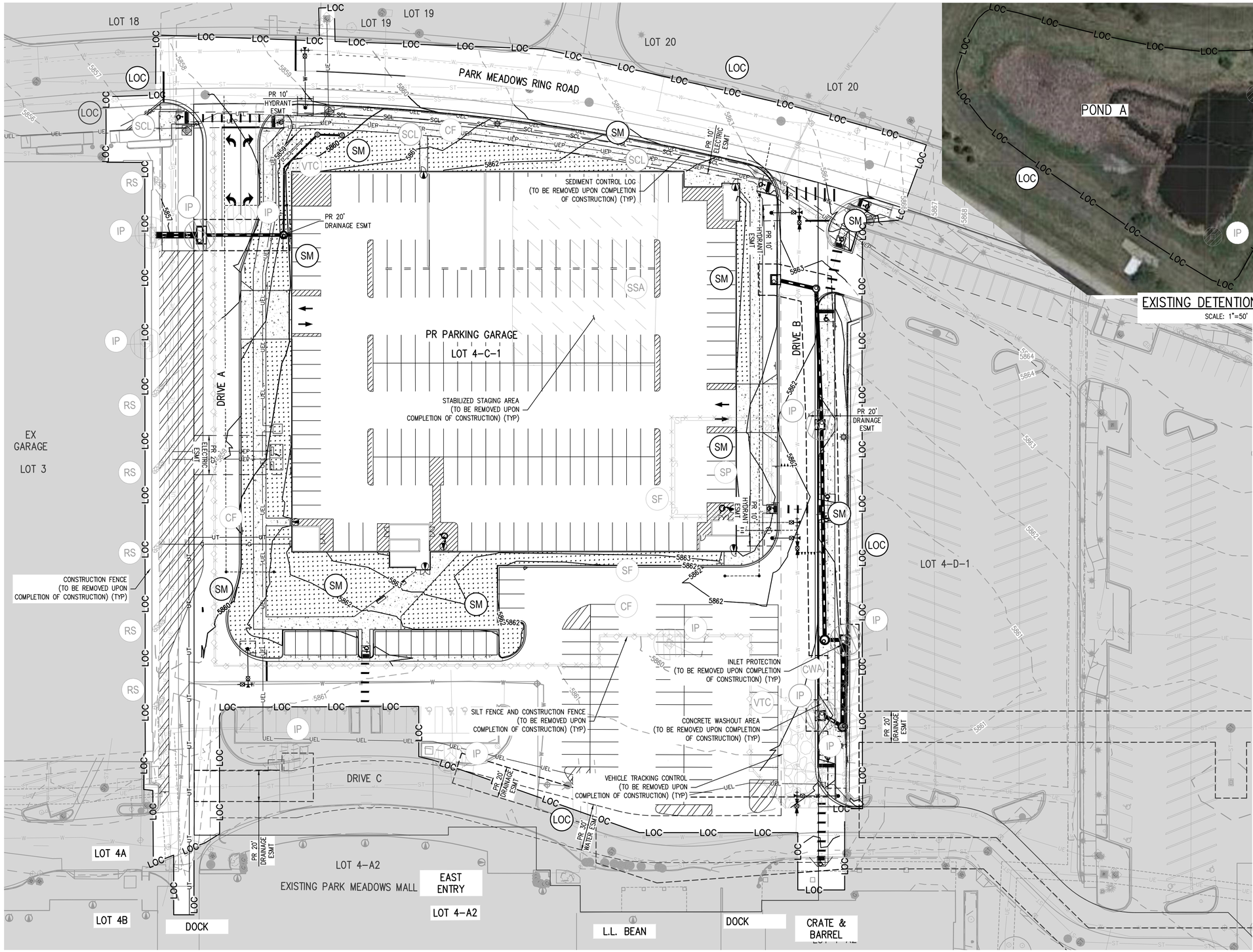
PLOTTED: TUE 05/07/24 1:58:40P BY: JTROBBINS



BMP LEGEND:

LIMITS OF CONSTRUCTION / LIMITS OF DISTURBANCE	LOC
CONSTRUCTION FENCE	CF
SILT FENCE	SF
STABILIZED STAGING AREA	SSA
STOCKPILE PROTECTION	SP
VEHICLE TRACKING CONTROL	VTC
INLET PROTECTION	IP
CONCRETE WASHOUT AREA	CWA
SEDIMENT CONTROL LOG	SCL
ROCK SOCK	RS
EROSION CONTROL BLANKET	ECB
SEEDING & MULCHING	SM

LEGEND

	EXISTING
PROPERTY BOUNDARY	
RIGHT-OF-WAY	
UTILITY EASEMENT	
AREA NOT TO BE DISTURBED	
SANITARY SEWER W/ MANHOLE	SS
SANITARY SERVICE W/CLEANOUT	
WATER LINE AND GATE VALVE	W
WATER SERVICE	
STORM SEWER W/ MANHOLE & INLETS	
FIRE HYDRANT	
STREET LIGHT	
GAS MAIN	G
ELECTRIC PULL BOX	E
FLOW ARROW	
PED/BIKE CROSSING	

NOTES:

1. SEE COVER SHEET OF LONE TREE STANDARD NOTES AND DETAILS (SHEET 1 OF 3) FOR LEGEND OF BMP NAMES AND SYMBOLS.
2. SHADED BMPS INSTALLED IN THE INITIAL AND INTERIM GESC PLANS, UNLESS OTHERWISE INDICATED, SHALL BE LEFT IN PLACE UNTIL REVEGETATION ESTABLISHMENT IS APPROVED BY THE CITY.
3. SEE CONSTRUCTION PLANS FOR DETAILS OF PERMANENT DRAINAGE FACILITIES SUCH AS DETENTION FACILITIES, CULVERTS, STORM DRAINS, AND INLET AND OUTLET PROTECTION.
4. PORTABLE TOILETS SHALL BE PLACED ON A PERVIOUS SURFACE AND STAKED DOWN ON ALL FOUR SIDES.

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CITY OF LONE TREE

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ENGINEERING DIVISION ACCEPTANCE BLOCK

Know what's below. Call before you dig.

SCALE: 1" = 30'

DESIGNED BY: EE
CHECKED BY: JDO
DRAWN BY: JTKR

ISSUE DATE: 03-29-2024	
DATE	REVISION COMMENTS
04-05-2024	BID ADDENDUM
05-03-2024	95% PERMIT SET
05-07-2024	CITY SUBMITTAL

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1120 Lincoln Street, Suite 1000
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P: 303.623.6300 F: 303.623.6311
HarrisKocherSmith.com

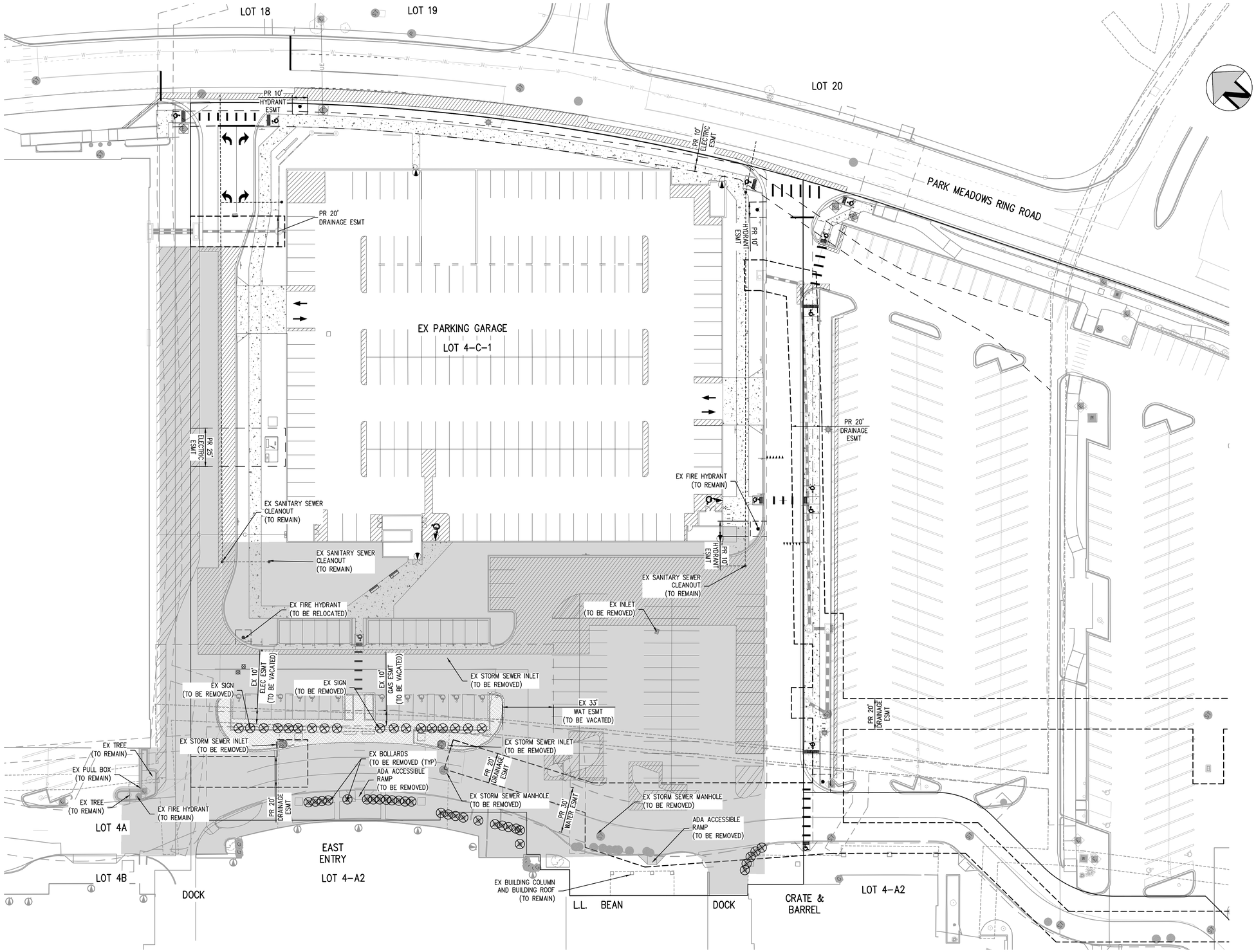
PARK MEADOWS MALL, LLC/
PARK MEADOWS ANCHOR ACQUISITION, LLC

PARK MEADOWS - GARAGE AND RETAIL
FINAL GESC PLAN - PHASE 1A

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 231016
SHEET NUMBER
EC6
6 OF 17

FILEPATH: P:\2023\231016\ENGINEERING\EROSION\EC - FINAL GESC PLAN DWG LAYOUT LAYOUT1
9 XREFs: cd-stamp, e-base, e-legal, e-util, ec - initial gesc plan, ec - interim gesc plan, p-base, p-legal-information, p-util
PLOTTED: TUE 05/07/24 1:38:35P BY: JT ROBBINS



NOTES:

1. THE LIMITS OF DEMOLITION SHOWN ON THIS PLAN ARE APPROXIMATE AND ARE INTENDED TO GIVE THE CONTRACTOR A GENERAL EXPECTATION OF WHAT MAY/MAY NOT NEED TO BE REMOVED AND DEMOLISHED PRIOR TO CONSTRUCTION. THE LIMITS AND AMOUNT OF DEMOLITION MAY NEED TO BE ADJUSTED BY THE CONTRACTOR BASED ON THE MEANS AND METHODS OF CONSTRUCTION. THE EXTENT OF DEMOLITION SHALL BE VERIFIED BY THE CONTRACTOR IN THE FIELD PRIOR TO CONSTRUCTION.
2. EXISTING UTILITY MANHOLES/RIMS/BOXES/STRUCTURES/ETC. CALLED OUT TO REMAIN SHALL BE ADJUSTED TO FINAL GRADE. CONTRACTOR SHALL COORDINATE WITH UTILITY PROVIDERS TO DETERMINE THE REQUIREMENTS FOR ADJUSTING EXISTING PULL BOXES/MANHOLES/STRUCTURES/ETC.
3. THIS DEMOLITION PLAN IS FOR INFORMATION ONLY AND SHOWS KNOWN INFORMATION PROVIDED BY UTILITY PROVIDER MAPS AND SURVEY DATA AND HAS NOT BEEN INDEPENDENTLY VERIFIED BY THE ENGINEER. THE CONTRACTOR SHALL CONDUCT ITS OWN SITE VISIT AND INVESTIGATION TO DETERMINE THE DEMOLITION REQUIREMENTS NECESSARY TO CONSTRUCT THE PROJECT PER THE APPROVED CONSTRUCTION DRAWINGS.
4. THIS DEMOLITION PLAN GENERALLY COVERS ALL KNOWN IMPROVEMENTS WITHIN THE SITE.
5. FINAL SCOPE AND LIMITS OF REMOVAL/ABANDONMENT /DEMOLITION OF EXISTING UTILITIES SHALL BE DETERMINED BY THE GENERAL CONTRACTOR AFTER COORDINATION WITH THE APPLICABLE UTILITY PROVIDERS/OWNERS.
6. CONTRACTOR SHALL OBTAIN ALL REQUIRED DEMOLITION PERMITS WITH THE APPLICABLE REVIEWING AUTHORITIES PRIOR TO STARTING DEMOLITION ACTIVITIES.
7. EXISTING ELECTRICAL UTILITIES TO BE REMOVED SHALL BE REMOVED IN ACCORDANCE WITH CURRENT XCEL ENERGY SPECIFICATIONS. ALL REQUIRED PERMITS SHALL BE OBTAINED FROM XCEL ENERGY PRIOR TO MODIFICATION TO THESE UTILITIES. IN SOME CASES XCEL ENERGY, NOT THE CONTRACTOR, WILL BE RESPONSIBLE FOR REMOVAL OF CERTAIN INFRASTRUCTURE. THE CONTRACTOR SHALL COORDINATE REMOVAL OF ALL INFRASTRUCTURE WITH THE UTILITY PROVIDER.
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9. EXISTING WASTEWATER (STORM SEWER AND SANITARY SEWER) INFRASTRUCTURE TO BE REMOVED SHALL BE REMOVED IN ACCORDANCE WITH CURRENT SOUTH GATE WATER & SANITATION DISTRICT, CITY OF LONE TREE, AND STATE SPECIFICATIONS. SEE APPROVED UTILITY PLANS FOR MORE DETAILS.
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11. CONTRACTOR SHALL REFER TO THE GEOTECHNICAL SITE DEVELOPMENT STUDY FOR ADDITIONAL SITE DEVELOPMENT RECOMMENDATIONS.
12. THIS PLAN DOES NOT SHOW LIMITS OF EXISTING PAVEMENT REMOVAL REQUIRED FOR UTILITY TRENCHES AND INSTALLATION.

LEGEND:

- PROPERTY BOUNDARY
- EX UNDERGROUND TELECOM (UT)
- EX STORM SEWER LINE (ST)
- EX SANITARY SEWER LINE (SS)
- EX GAS LINE (G)
- PHASE 1A STORM
- LIMITS OF CONSTRUCTION / LIMITS OF DISTURBANCE (LOC)
- DEMO LANDSCAPE ISLAND
- DEMO ASPHALT / CONCRETE

BENCHMARK:

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CITY OF LONE TREE

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SCALE: 1" = 30'

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DRAWN BY: JTKR

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PARK MEADOWS MALL, LLC/
PARK MEADOWS ANCHOR ACQUISITION, LLC

PARK MEADOWS - GARAGE AND RETAIL
DEMOLITION PLAN - ABOVE GRADE - PHASE 1B

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 231016
SHEET NUMBER
EC7
7 OF 17

FILEPATH= P:\2023\23101619\ENGINEERING\CD\PHASE 1B\CD_DEMO PLAN ABOVE GRADE.PH01B.DWG LAYOUT: LAYOUT1
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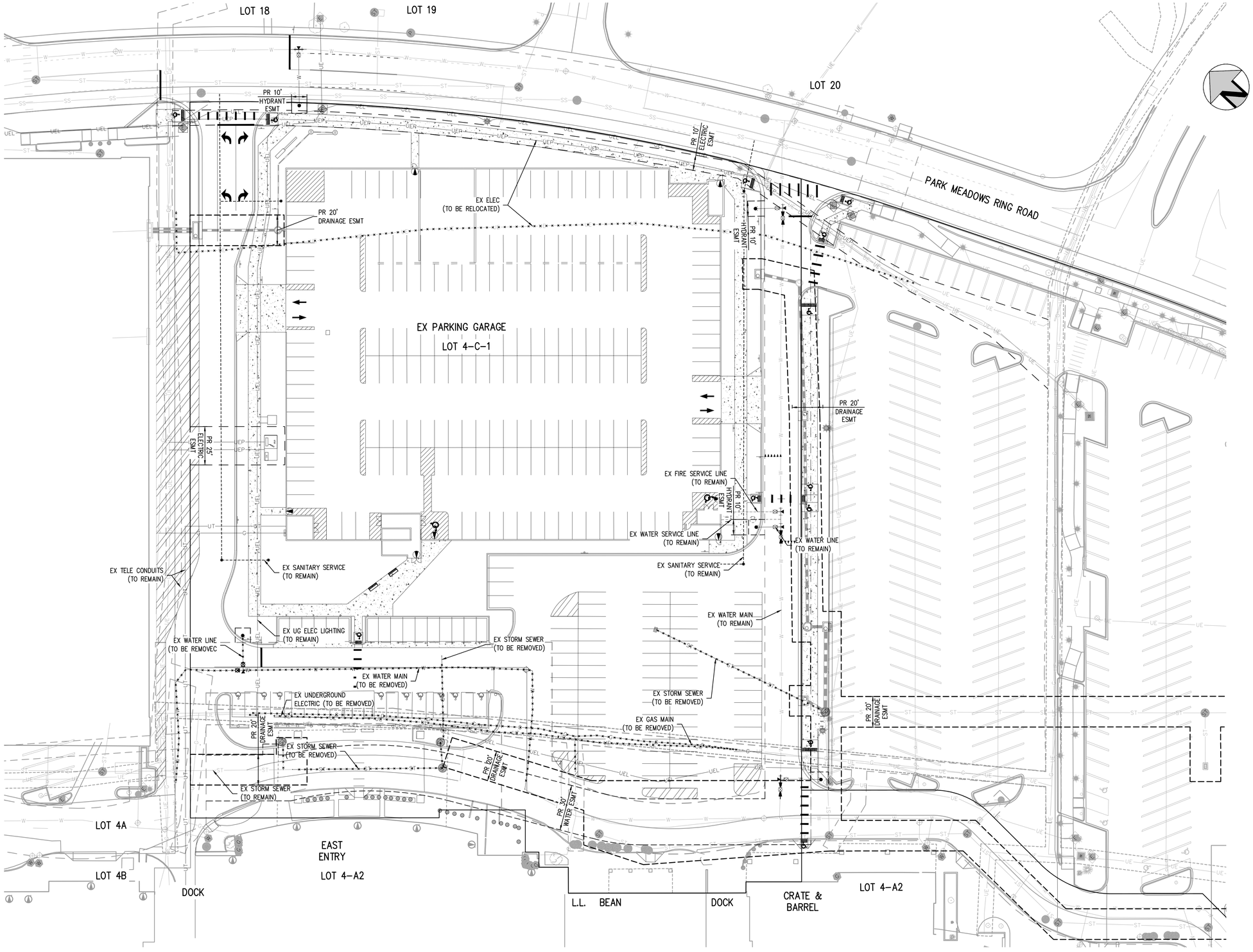
PLOTTED: TUE 05/07/24 1:59:05P BY: JT ROBBINS



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2. EXISTING UTILITY MANHOLES/RIMS/BOXES/STRUCTURES/ETC. CALLED OUT TO REMAIN SHALL BE ADJUSTED TO FINAL GRADE. CONTRACTOR SHALL COORDINATE WITH UTILITY PROVIDERS TO DETERMINE THE REQUIREMENTS FOR ADJUSTING EXISTING PULL BOXES/MANHOLES/STRUCTURES/ETC.
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7. EXISTING ELECTRICAL UTILITIES TO BE REMOVED SHALL BE REMOVED IN ACCORDANCE WITH CURRENT XCEL ENERGY SPECIFICATIONS. ALL REQUIRED PERMITS SHALL BE OBTAINED FROM XCEL ENERGY PRIOR TO MODIFICATION TO THESE UTILITIES. IN SOME CASES XCEL ENERGY, NOT THE CONTRACTOR, WILL BE RESPONSIBLE FOR REMOVAL OF CERTAIN INFRASTRUCTURE. THE CONTRACTOR SHALL COORDINATE REMOVAL OF ALL INFRASTRUCTURE WITH THE UTILITY PROVIDER.
8. EXISTING TELECOMMUNICATION, CABLE TV, PHONE LINES TO BE REMOVED SHALL BE REMOVED IN ACCORDANCE WITH THE CURRENT APPLICABLE UTILITY PROVIDERS SPECIFICATIONS. ALL REQUIRED PERMITS SHALL BE OBTAINED FROM APPLICABLE INFRASTRUCTURE OWNERS PRIOR TO MODIFICATION. THE CONTRACTOR SHALL COORDINATE REMOVAL OF ALL INFRASTRUCTURE WITH THE UTILITY PROVIDER.
9. EXISTING WASTEWATER (STORM SEWER AND SANITARY SEWER) INFRASTRUCTURE TO BE REMOVED SHALL BE REMOVED IN ACCORDANCE WITH CURRENT SOUTH GATE WATER & SANITATION DISTRICT, CITY OF LONE TREE, AND STATE SPECIFICATIONS. SEE APPROVED UTILITY PLANS FOR MORE DETAILS.
10. THE EXISTING STRUCTURES, INCLUDING THE FOUNDATIONS, SHOULD BE COMPLETELY REMOVED FROM THE SITE. ANY OTHER BELOW GRADE APPURTENANCES ASSOCIATED WITH THE STRUCTURE SHOULD ALSO BE REMOVED. ANY WELLS ENCOUNTERED SHOULD BE ABANDONED IN ACCORDANCE WITH THE REGULATIONS OF THE COLORADO STATE ENGINEER. ALL CONCRETE PADS SHOULD BE REMOVED FROM THE SITE.
11. CONTRACTOR SHALL REFER TO THE GEOTECHNICAL SITE DEVELOPMENT STUDY FOR ADDITIONAL SITE DEVELOPMENT RECOMMENDATIONS.
12. THIS PLAN DOES NOT SHOW LIMITS OF EXISTING PAVEMENT REMOVAL REQUIRED FOR UTILITY TRENCHES AND INSTALLATION.

LEGEND:

- PROPERTY BOUNDARY
- EX UNDERGROUND TELECOM (UT)
- EX STORM SEWER LINE (ST)
- EX SANITARY SEWER LINE (SS)
- EX GAS LINE (G)
- PHASE 1A STORM
- LIMITS OF CONSTRUCTION / LIMITS OF DISTURBANCE (LOC)
- DEMO LANDSCAPE ISLAND
- DEMO ASPHALT / CONCRETE

BENCHMARK:

BENCHMARK IS DOUGLAS COUNTY CONTROL POINT 2113021 STAMPED" 2.113021 DC GIS" WITH A PUBLISHED ELEVATION OF 5914.49 FT (NAVD88).

CITY OF LONE TREE

DATE

THESE CONSTRUCTION PLANS HAVE BEEN REVIEWED BY THE CITY OF LONE TREE FOR GRADING AND EROSION CONTROL IMPROVEMENTS ONLY.

ENGINEERING DIVISION ACCEPTANCE BLOCK

Know what's below. Call before you dig.

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SCALE: 1" = 30'

DESIGNED BY: EE
CHECKED BY: JDO
DRAWN BY: JTKR

ISSUE DATE: 03-29-2024	
DATE	REVISION COMMENTS
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HARRIS KOCHER SMITH
1120 Lincoln Street, Suite 1000
Denver, Colorado 80203
P: 303.623.6300 F: 303.623.6311
HarrisKocherSmith.com

PARK MEADOWS MALL, LLC/
PARK MEADOWS ANCHOR ACQUISITION, LLC

PARK MEADOWS - GARAGE AND RETAIL
DEMOLITION PLAN - BELOW GRADE - PHASE 1B

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 231016
SHEET NUMBER
EC8
8 OF 17

FILEPATH: P:\2023\231016\ENGINEERING\CD\PHASE 1B\CD_ DEMO PLAN BELOW GRADE PH01B.DWG LAYOUT: LAYOUT1
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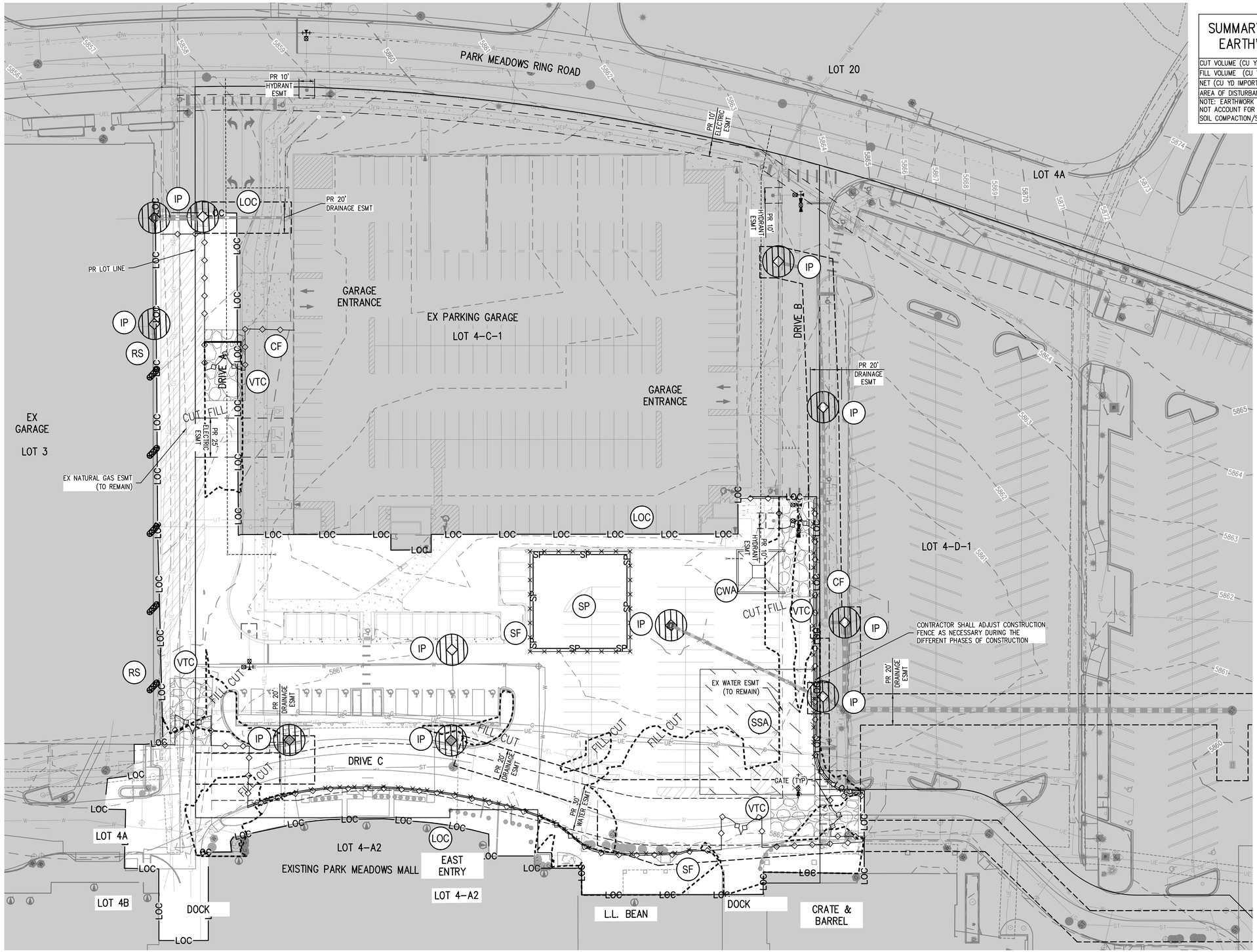

SUMMARY OF APPROXIMATE EARTHWORK QUANTITIES

CUT VOLUME (CU YD)	287
FILL VOLUME (CU YD)	2,460
NET (CU YD IMPORT)	2,173
AREA OF DISTURBANCE	**2.38** ACRES

NOTE: EARTHWORK VOLUMES ARE UNADJUSTED AND DO NOT ACCOUNT FOR UTILITY SPOILS, PAVEMENT SECTION, SOIL COMPACTION/SWELL, ETC.

BMP LEGEND:

- LIMITS OF CONSTRUCTION / LIMITS OF DISTURBANCE (LOC)
- CONSTRUCTION FENCE (CF)
- SILT FENCE (SF)
- STABILIZED STAGING AREA (SSA)
- STOCKPILE PROTECTION (SP)
- VEHICLE TRACKING CONTROL (VTC)
- INLET PROTECTION (IP)
- CONCRETE WASHOUT AREA (CWA)
- SEDIMENT CONTROL LOG (SCL)
- ROCK SOCK (RS)

LEGEND

EXISTING

- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- UTILITY EASEMENT
- AREA NOT TO BE DISTURBED
- CUT/FILL BOUNDARY
- SANITARY SEWER W/ MANHOLE
- SANITARY SERVICE W/CLEANOUT
- WATER LINE AND GATE VALVE
- WATER SERVICE
- STORM SEWER W/ MANHOLE & INLETS
- FIRE HYDRANT
- STREET LIGHT
- GAS MAIN
- ELECTRIC PULL BOX
- PED/BIKE CROSSING

INITIAL PLAN

1. SEE COVER SHEET OF LONE TREE STANDARD NOTES AND DETAILS (SHEET 1 OF 3) FOR LEGEND OF BMP NAMES AND SYMBOLS.
2. SHADED BEST MANAGEMENT PRACTICES (BMPS) WERE INSTALLED IN AN EARLIER PHASE, AND UNLESS OTHERWISE INDICATED SHALL BE LEFT IN PLACE UNTIL REVEGETATION ESTABLISHMENT IS APPROVED BY THE CITY OF LONE TREE. CONTRACTOR SHALL VERIFY THE CONDITION OF ALL EXISTING BMPS AND REMOVE AND REPLACE THEM AS NECESSARY.
3. ALL EXISTING BMPS WILL NEED TO BE PROPERLY REFRESHED OR REINSTALLED BY THE CONTRACTOR TO FUNCTION AS ORIGINALLY DESIGNED.
4. SEE CONSTRUCTION PLANS FOR DETAILS OF PERMANENT DRAINAGE FACILITIES SUCH AS DETENTION FACILITIES, CULVERTS, STORM DRAINS, AND INLET AND OUTLET PROTECTION.
5. SEE DETAIL SHEET EC12-EC14 FOR EROSION CONTROL MEASURE CONSTRUCTION DETAILS.
6. CONTRACTOR SHALL SEED AND MULCH ALL DISTURBED AREAS NOT FORMALLY LANDSCAPED PER THE APPROVED LANDSCAPE PLAN SEED MIX OR THE CITY OF LONE TREE STANDARD SEED MIX.
7. ROCK SOCKS MAY BE SUBSTITUTED FOR SILT FENCE AS PERIMETER CONTROL ON HARDSCAPE SURFACE AREAS.
8. ALL EROSION AND SEDIMENT CONTROL PRACTICES AND OTHER PROTECTIVE MEASURES IDENTIFIED IN THE STORMWATER MANAGEMENT PLAN (SWMP) MUST BE MAINTAINED IN PROPER FUNCTIONING CONDITION. CONTRACTOR SHALL MONITOR ALL BMPS AND IMMEDIATELY CORRECT OR REAPPLY ANY THAT ARE NO LONGER FUNCTIONING EFFECTIVELY.
9. THE CONTRACTOR SHALL PROVIDE SURFACE ROUGHENING AND SEEDING & MULCHING DURING THE DEMOLITION AND EARTHWORK PHASES AS REQUIRED BY THE SWMP AND COUNTY/CITY INSPECTOR.
10. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING INLET PROTECTION ON ALL EXISTING STORM SEWER INLETS IMMEDIATELY ADJACENT TO AND DOWNSTREAM OF THE PROJECT SITE.
11. REMOVAL OF CONTROL MEASURES SHALL NOT OCCUR WITHOUT THE APPROVAL OF STORMWATER INSPECTOR.
12. ALL PAVED SURFACES MUST REMAIN FREE OF SEDIMENT AND REQUIRE CLEANING, INCLUDING STREET SWEEPING, AS NEEDED.
13. PORTABLE TOILETS SHALL BE PLACED ON A PERVIOUS SURFACE AND STAKED DOWN ON ALL FOUR SIDES.

BENCHMARK:

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CITY OF LONE TREE

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PARK MEADOWS MALL, LLC /
PARK MEADOWS ANCHOR ACQUISITION, LLC

PARK MEADOWS - GARAGE AND RETAIL
INITIAL GESC PLAN - PHASE 1B

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 231016
SHEET NUMBER
EC9
9 OF 17

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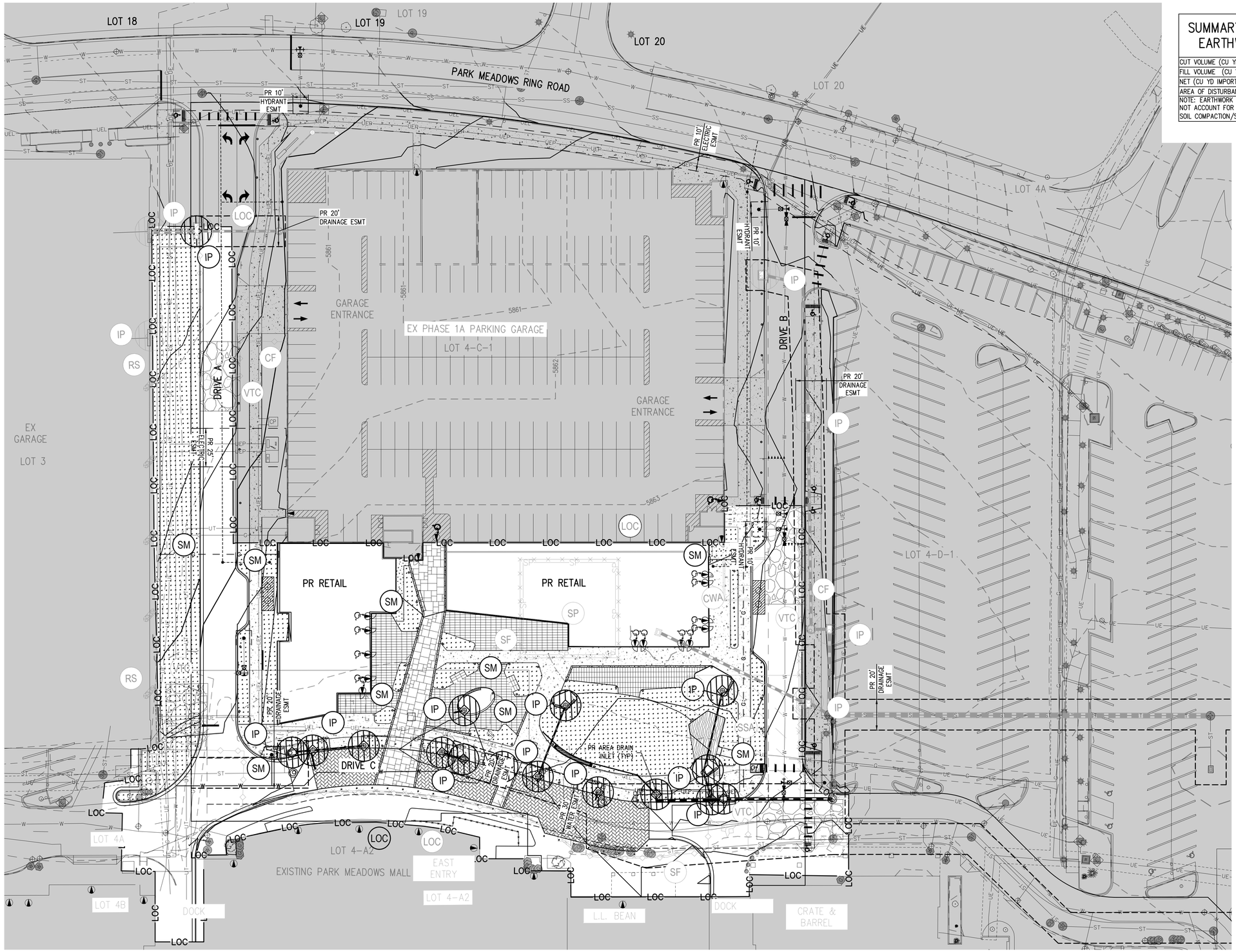

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- SILT FENCE (SF)
- STABILIZED STAGING AREA (SSA)
- STOCKPILE PROTECTION (SP)
- VEHICLE TRACKING CONTROL (VTC)
- INLET PROTECTION (IP)
- CONCRETE WASHOUT AREA (CWA)
- SEDIMENT CONTROL LOG (SCL)
- ROCK SOCK (RS)
- EROSION CONTROL BLANKET (ECB)
- SEEDING & MULCHING (SM)

LEGEND

EXISTING

- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- UTILITY EASEMENT
- AREA NOT TO BE DISTURBED
- CUT AREA
- SANITARY SEWER W/ MANHOLE
- SANITARY SERVICE W/CLEANOUT
- WATER LINE AND GATE VALVE
- WATER SERVICE
- STORM SEWER W/ MANHOLE & INLETS
- FIRE HYDRANT
- STREET LIGHT
- GAS MAIN
- ELECTRIC PULL BOX
- PED/BIKE CROSSING

INTERIM PLAN

1. SEE COVER SHEET OF LONE TREE STANDARD NOTES AND DETAILS (SHEET 1 OF 3) FOR LEGEND OF BMP NAMES AND SYMBOLS.
2. ALL LANDSCAPE DRAIN AREA INLETS SHALL HAVE INLET PROTECTION UNTIL THE UPSTREAM AREA HAS BEEN FORMALLY LANDSCAPED AND ESTABLISHED. REFER TO THE PRIVATE STORM SEWER PLANS FOR EXACT LOCATIONS OF ALL AREA INLETS.
3. SHADED BMPS INSTALLED IN THE INITIAL STAGE SHALL BE LEFT IN PLACE IN THE INTERIM STAGE.
4. ALL INTERIM BMPS, INCLUDING SEEDING AND MULCHING OF DISTURBED AREAS, MUST BE COMPLETED PRIOR TO ISSUANCE OF ANY CURB AND GUTTER PERMITS.
5. SEE CONSTRUCTION PLANS FOR DETAILS OF PERMANENT DRAINAGE FACILITIES SUCH AS DETENTION FACILITIES, CULVERTS, STORM DRAINS, AND INLET AND OUTLET PROTECTION.
6. PORTABLE TOILETS SHALL BE PLACED ON A PERVIOUS SURFACE AND STAKED DOWN ON ALL FOUR SIDES.

BENCHMARK:

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PARK MEADOWS MALL, LLC /
PARK MEADOWS ANCHOR ACQUISITION, LLC

PARK MEADOWS - GARAGE AND RETAIL
INTERIM GESC PLAN - PHASE 1B

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 231016
SHEET NUMBER
EC10
10 OF 17

FILEPATH: P:\2023\231016\ENGINEERING\EROSION\EC - INTERIM GESC PLAN-PH01B.DWG, LAYOUT: LAYOUT1
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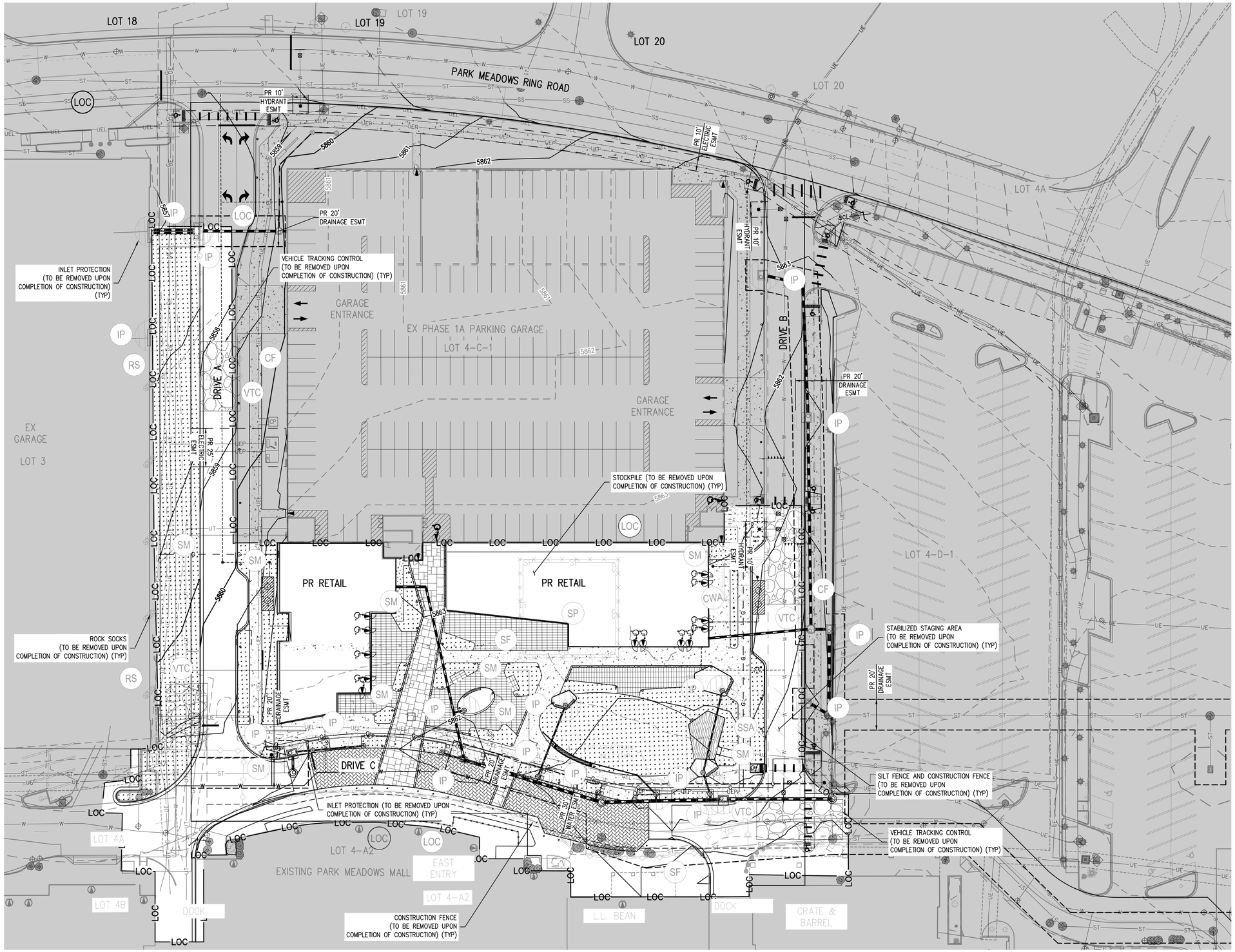

BMP LEGEND:

LIMITS OF CONSTRUCTION / LIMITS OF DISTURBANCE	LOC
CONSTRUCTION FENCE	CF
SILT FENCE	SF
STABILIZED STAGING AREA	SSA
STOCKPILE PROTECTION	SP
VEHICLE TRACKING CONTROL	VTC
INLET PROTECTION	IP
CONCRETE WASHOUT AREA	CWA
SEDIMENT CONTROL LOG	SCL
ROCK SOCK	RS
EROSION CONTROL BLANKET	ECB
SEEDING & MULCHING	SM

LEGEND

EXISTING

- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- UTILITY EASEMENT
- AREA NOT TO BE DISTURBED
- SANITARY SEWER W/ MANHOLE
- SANITARY SERVICE W/CLEANOUT
- WATER LINE AND GATE VALVE
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- FIRE HYDRANT
- STREET LIGHT
- GAS MAIN
- ELECTRIC PULL BOX
- FLOW ARROW
- PED/BIKE CROSSING

NOTES:

1. SEE COVER SHEET OF LONE TREE STANDARD NOTES AND DETAILS (SHEET 1 OF 3) FOR LEGEND OF BMP NAMES AND SYMBOLS.
2. SHADED BMPS INSTALLED IN THE INITIAL AND INTERIM GESC PLANS, UNLESS OTHERWISE INDICATED, SHALL BE LEFT IN PLACE UNTIL REVEGETATION ESTABLISHMENT IS APPROVED BY THE CITY.
3. SEE CONSTRUCTION PLANS FOR DETAILS OF PERMANENT DRAINAGE FACILITIES SUCH AS DETENTION FACILITIES, CULVERTS, STORM DRAINS, AND INLET AND OUTLET PROTECTION.
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PARK MEADOWS ANCHOR ACQUISITION, LLC

PARK MEADOWS - GARAGE AND RETAIL
FINAL GESC PLAN - PHASE 1B

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT #: 231016
SHEET NUMBER
EC11
11 OF 17

FILEPATH: P:\2023\231016\ENGINEERING\EROSION\EC - FINAL GESC PLAN-PHASE 1B.DWG, LAYOUT: LAYOUT1
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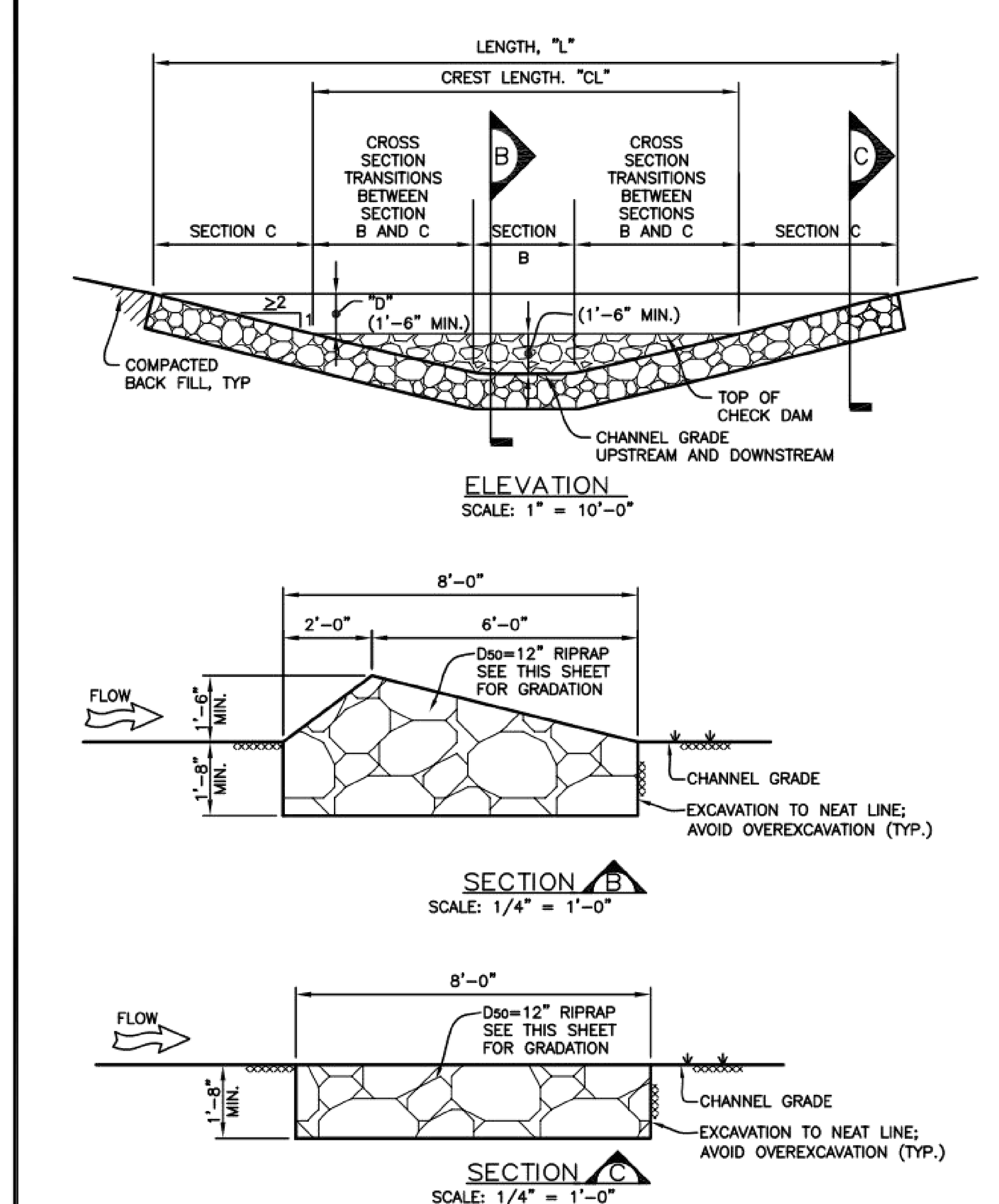
PLOTTED: TUE 05/07/24 2:00:01P BY: JT ROBBINS

GRADING, EROSION, AND SEDIMENT CONTROL (GESC) GENERAL NOTES [A]

1. THE CITY OF LONE TREE ENGINEER'S SIGNATURE AFFIXED TO THIS DOCUMENT INDICATES THE CITY OF LONE TREE PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION, HAS REVIEWED THE DOCUMENT AND FOUND IT IN GENERAL COMPLIANCE WITH THE CITY OF LONE TREE SUBDIVISION REGULATIONS AND/OR THE GRADING, EROSION AND SEDIMENT CONTROL (GESC) CRITERIA MANUAL. THE CITY OF LONE TREE ENGINEER, THROUGH ACCEPTANCE OF THIS DOCUMENT, ASSUMES NO RESPONSIBILITY (OTHER THAN AS STATED ABOVE) FOR THE COMPLETENESS AND/OR ACCURACY OF THESE DOCUMENTS.
2. THE ADEQUACY OF THIS GESC PLAN LIES WITH THE ORIGINAL DESIGN ENGINEER.
3. THE GESC PLAN SHALL BE CONSIDERED VALID FOR TWO (2) YEARS FROM THE DATE OF ACCEPTANCE BY THE CITY OF LONE TREE, AFTER WHICH TIME THE PLAN SHALL BE VOID AND WILL BE SUBJECT TO RE-REVIEW AND RE-ACCEPTANCE BY THE CITY OF LONE TREE.
4. ALL MATERIALS AND WORKMANSHIP SHALL BE SUBJECT TO INSPECTION BY THE CITY OF LONE TREE ENGINEERING DIVISION. THE CITY OF LONE TREE RESERVES THE RIGHT TO ACCEPT OR REJECT ANY SUCH MATERIALS AND WORKMANSHIP THAT DOES NOT CONFORM TO THE GESC MANUAL, GESC PLAN OR GESC PERMIT.
5. THE PLACEMENT OF EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES (BMPs) SHALL BE IN ACCORDANCE WITH THE CITY OF LONE TREE – ACCEPTED GESC PLAN AND THE CITY OF LONE TREE GESC MANUAL.
6. ANY VARIATION IN MATERIAL, TYPE OR LOCATION OF EROSION AND SEDIMENT CONTROL BMPs FROM THE CITY OF LONE TREE – ACCEPTED GESC PLAN WILL REQUIRE APPROVAL FROM AN ACCOUNTABLE REPRESENTATIVE OF THE CITY OF LONE TREE ENGINEERING DIVISION.
7. AFTER THE GESC PLAN HAS BEEN ACCEPTED, THE GESC PERMIT APPLIED FOR, FEES AND FISCAL SECURITY SUBMITTED TO THE CITY, AND THE GESC FIELD MANUAL OBTAINED AND REVIEWED, THE CONTRACTOR MAY INSTALL THE INITIAL-STAGE EROSION AND SEDIMENT CONTROL BMPs INDICATED ON THE ACCEPTED GESC PLAN.
8. THE FIRST BMP TO BE INSTALLED ON THE SITE SHALL BE CONSTRUCTION FENCE, MARKERS, OR OTHER APPROVED MEANS OF DEFINING THE LIMITS OF CONSTRUCTION, INCLUDING CONSTRUCTION LIMITS ADJACENT TO STREAM CORRIDORS AND OTHER AREAS TO BE PRESERVED.
9. AFTER INSTALLATION OF THE INITIAL-STAGE EROSION AND SEDIMENT CONTROL BMPs, THE PERMITTEE SHALL CALL THE CITY OF LONE TREE CONSTRUCTION INSPECTOR AT (303) 662-8112 TO SCHEDULE A PRECONSTRUCTION MEETING AT THE PROJECT SITE. THE REQUEST SHALL BE MADE A MINIMUM OF THREE BUSINESS DAYS PRIOR TO THE REQUESTED MEETING TIME. NO CONSTRUCTION ACTIVITIES SHALL BE PLANNED WITHIN 24 HOURS AFTER THE PRECONSTRUCTION MEETING.
10. THE OWNER OR OWNER'S REPRESENTATIVE, THE GESC MANAGER, THE GENERAL CONTRACTOR, AND THE GRADING SUBCONTRACTOR, IF DIFFERENT FROM THE GENERAL CONTRACTOR, MUST ATTEND THE PRECONSTRUCTION MEETING. IF ANY OF THE REQUIRED PARTICIPANTS FAIL TO ATTEND THE PRECONSTRUCTION MEETING, OR IF THE GESC FIELD MANUAL IS NOT ON SITE, OR IF THE INSTALLATION OF THE INITIAL BMPs ARE NOT APPROVED BY THE CITY OF LONE TREE GESC INSPECTOR, THE APPLICANT WILL HAVE TO PAY A REINSPECTION FEE, ADDRESS ANY PROBLEMS WITH BMP INSTALLATION, AND CALL TO RESCHEDULE THE MEETING, WITH A CORRESPONDING DELAY IN THE START OF CONSTRUCTION. THE CITY OF LONE TREE STRONGLY ENCOURAGES THE APPLICANT TO HAVE THE ENGINEER OF RECORD AT THE PRECONSTRUCTION MEETING. FAILURE OF THE ENGINEER OF RECORD TO ATTEND MAY RESULT IN A DELAY OF THE START OF CONSTRUCTION.
11. CONSTRUCTION SHALL NOT BEGIN UNTIL THE CITY OF LONE TREE GESC INSPECTOR APPROVES THE INSTALLATION OF THE INITIAL BMPs AND THE APPROVED GESC PERMIT IS PICKED UP FROM THE CITY AND IS IN-HAND ON THE SITE. THE COMPLETED PERMIT WILL BE AVAILABLE WITHIN 24-HOURS AFTER THE INSTALLATION OF THE INITIAL BMPs ARE APPROVED.
12. THE GESC MANAGER SHALL STRICTLY ADHERE TO THE CITY OF LONE TREE-APPROVED LIMITS OF CONSTRUCTION AT ALL TIMES. THE CITY OF LONE TREE ENGINEERING DIVISION MUST APPROVE ANY CHANGES TO THE LIMITS OF CONSTRUCTION AND, AT THE DISCRETION OF THE ENGINEERING DIVISION, ADDITIONAL EROSION/SEDIMENT CONTROLS MAY BE REQUIRED IN ANY ADDITIONAL AREAS OF CONSTRUCTION.
13. THE MAXIMUM AREA OF CONSTRUCTION SHALL BE LIMITED TO 40 ACRES (70 ACRES IF APPROVED FOR SOIL MITIGATION OPERATIONS) TO REDUCE THE AMOUNT OF LAND DISTURBED AT ANY ONE TIME. LARGER SITES SHALL BE DIVIDED INTO PHASES THAT ARE EACH 40 (OR 70) ACRES OR LESS IN SIZE. THESE PROJECTS SHALL CONDUCT GRADING ACTIVITIES IN ACCORDANCE WITH THE ACCEPTED GESC PLAN. BMP INSTALLATION AND APPROVAL BY THE CITY OF LONE TREE AT THE START AND COMPLETION OF EACH PHASE SHALL BE CONDUCTED IN ACCORDANCE WITH THE PROCEDURES OUTLINED IN THE GESC MANUAL AND/OR GESC FIELD MANUAL.
14. PRIOR TO ACTUAL CONSTRUCTION, THE PERMITTEE SHALL VERIFY THE LOCATION OF EXISTING UTILITIES. FOR INFORMATION, CONTACT THE DENVER INTER-UTILITY GROUP AT 1-800-922-1987 OR FAX AT (303) 534-6700.
15. NATURAL VEGETATION SHALL BE RETAINED AND PROTECTED WHEREVER POSSIBLE. EXPOSURE OF SOIL TO EROSION BY REMOVAL OR DISTURBANCE OF VEGETATION SHALL BE LIMITED TO THE AREA REQUIRED FOR IMMEDIATE CONSTRUCTION OPERATIONS.
16. THE GESC PERMIT SHALL BE VALID FOR A PERIOD OF ONE (1) YEAR, UNLESS EXTENDED.
17. A COPY OF THE GESC PERMIT, ACCEPTED GESC PLANS AND THE GESC FIELD MANUAL SHALL BE ON SITE AT ALL TIMES.
18. THE GESC MANAGER SHALL BE RESPONSIBLE FOR ENSURING THAT THE SITE REMAINS IN COMPLIANCE WITH THE GESC PERMIT AND SHALL BE THE PERMITTEE'S CONTACT PERSON WITH THE CITY FOR ALL MATTERS PERTAINING TO THE GESC PERMIT. THE GESC MANAGER SHALL BE PRESENT AT THE SITE THE MAJORITY OF THE TIME AND SHALL BE AVAILABLE THROUGH A 24-HOUR CONTACT NUMBER. IN THE EVENT THAT THE CONTRACTOR'S GESC MANAGER IS NOT ON SITE AND CANNOT BE REACHED DURING A VIOLATION, THE ALTERNATE GESC MANAGER SHALL BE CONTACTED. IF NEITHER THE GESC MANAGER NOR ALTERNATE GESC MANAGER CAN BE CONTACTED DURING ANY VIOLATION, A STOP WORK ORDER SHALL BE ISSUED.
19. ALL CONSTRUCTION TRAFFIC MUST ENTER/EXIT THE SITE THROUGH THE CITY OF LONE TREE-APPROVED ACCESS POINT. A VEHICLE TRACKING CONTROL PAD IS REQUIRED AT ALL ACCESS POINTS ON THE SITE. ADDITIONAL STABILIZED CONSTRUCTION ENTRANCES MAY BE ADDED WITH AUTHORIZATION FROM THE CITY OF LONE TREE ENGINEERING DIVISION.
20. THE GESC MANAGER IS RESPONSIBLE FOR CLEANUP OF SEDIMENT OR CONSTRUCTION DEBRIS TRACKED ONTO ADJACENT PAVED AREAS. PAVED AREAS INCLUDING STREETS ARE TO BE KEPT CLEAN THROUGHOUT BUILD-OUT AND SHALL BE CLEANED, WITH A STREET SWEEPER OR SIMILAR DEVICE, AT FIRST NOTICE OF ACCIDENTAL TRACKING OR AT THE DISCRETION OF THE CITY OF LONE TREE GESC INSPECTOR. STREET WASHING IS NOT ALLOWED. THE CITY OF LONE TREE RESERVES THE RIGHT TO REQUIRE ADDITIONAL MEASURES TO ENSURE AREA STREETS ARE KEPT FREE OF SEDIMENT AND/OR CONSTRUCTION DEBRIS.
21. APPROVED EROSION AND SEDIMENT CONTROL BMPS SHALL BE MAINTAINED AND KEPT IN GOOD REPAIR FOR THE DURATION OF THIS PROJECT. AT A MINIMUM, THE GESC MANAGER SHALL INSPECT ALL BMPS IN ACCORDANCE WITH THE ACCEPTED GESC PLAN AND GESC MANUAL. ALL NECESSARY MAINTENANCE AND REPAIR ACTIVITIES SHALL BE COMPLETED WITHIN 48 HOURS FOR LEVEL III VIOLATIONS, AND IMMEDIATELY FOR LEVEL II VIOLATIONS, OR AS DIRECTED BY A CITY OF LONE TREE GESC INSPECTOR. ACCUMULATED SEDIMENT AND CONSTRUCTION DEBRIS SHALL BE REMOVED AND PROPERLY DISPOSED.
22. STRAW BALES ARE NOT A GESC-ACCEPTED SEDIMENT CONTROL BMP.
23. TOPSOIL SHALL BE STRIPPED AND STOCKPILED IN THE LOCATION SHOWN ON THE ACCEPTED GESC PLAN. THE GESC MANAGER SHALL SCHEDULE AN INSPECTION WITH THE CITY OF LONE TREE GESC INSPECTOR AS SOON AS TOPSOIL STRIPPING IS COMPLETED. FAILURE TO SCHEDULE SUCH INSPECTION OR FAILURE TO STOCKPILE TOPSOIL SHALL RESULT IN ISSUANCE OF A STOP WORK ORDER. THE STOP WORK ORDER SHALL REMAIN IN PLACE UNTIL TOPSOIL IS STOCKPILED ON SITE OR APPROPRIATE SOIL AMENDMENTS ARE STOCKPILED ON SITE.
24. THE ACCEPTED GESC PLAN MAY REQUIRE CHANGES OR ALTERATIONS AFTER APPROVAL TO MEET CHANGING SITE OR PROJECT CONDITIONS OR TO ADDRESS INEFFICIENCIES IN DESIGN OR INSTALLATION. THE GESC MANAGER SHALL OBTAIN PRIOR APPROVAL FROM THE DESIGN ENGINEER AND THE CITY OF LONE TREE ENGINEERING FOR ANY PROPOSED CHANGES.
25. LINING OF TEMPORARY SWALES AND DITCHES SHALL BE IN ACCORDANCE WITH THE GESC CRITERIA MANUAL.
26. NO PERMANENT EARTH SLOPES GREATER THAN 3:1 SHALL BE ALLOWED.
27. ANY SETTLEMENT OR SOIL ACCUMULATIONS BEYOND THE LIMITS OF CONSTRUCTION DUE TO GRADING OR EROSION SHALL BE REPAIRED IMMEDIATELY BY THE GESC MANAGER, THE GESC MANAGER SHALL BE HELD RESPONSIBLE FOR OBTAINING ACCESS RIGHTS TO ADJACENT PROPERTY, IF NEEDED, AND REMEDIATING ANY ADVERSE IMPACTS TO ADJACENT WATERWAYS, WETLANDS, PROPERTIES, ETC. RESULTING FROM WORK DONE AS PART OF THIS PROJECT.
28. A WATER SOURCE SHALL BE AVAILABLE ON SITE DURING EARTHWORK OPERATIONS AND UTILIZED AS REQUIRED TO MINIMIZE DUST FROM EARTHWORK EQUIPMENT AND WIND.
29. SOILS THAT WILL BE STOCKPILED FOR MORE THAN THIRTY (30) DAYS SHALL BE SEEDED AND MULCHED WITHIN FOURTEEN (14) DAYS OF STOCKPILE CONSTRUCTION, NO STOCKPILES SHALL BE PLACED WITHIN ONE HUNDRED (100) FEET OF A DRAINAGE WAY UNLESS APPROVED BY THE CITY OF LONE TREE ENGINEERING DIVISION.
30. ALL CHEMICAL OR HAZARDOUS MATERIAL SPILLS WHICH MAY ENTER WATERS OF THE STATE OF COLORADO, WHICH INCLUDE BUT ARE NOT LIMITED TO, SURFACE WATER, GROUND WATER AND DRY GULLIES OR STORM SEWER LEADING TO SURFACE WATER, SHALL BE IMMEDIATELY REPORTED TO THE CDPHE PER CRS 25-8-601, AND THE CITY OF LONE TREE. RELEASES OF PETROLEUM PRODUCTS AND CERTAIN HAZARDOUS SUBSTANCES LISTED UNDER THE FEDERAL CLEAN WATER ACT (40 CFR PART 116) MUST BE REPORTED TO THE NATIONAL RESPONSE CENTER AS WELL AS THE CDPHE. THE APPLICABLE CONTACT INFORMATION (SEE APPENDIX A, DOUGLAS COUNTY GESC MANUAL – SUBJECT TO CHANGE) IS: COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT TOLL-FREE 24-HOUR ENVIRONMENTAL EMERGENCY SPILL REPORTING LINE 1-877-518-5608; NATIONAL RESPONSE CENTER (24-HOUR NATIONAL SPILL RESPONSE) 1-800-424-8802; CITY OF LONE TREE PUBLIC WORKS (303) 662-8112. SPILLS THAT POSE AN IMMEDIATE RISK TO HUMAN LIFE SHALL BE REPORTED TO 911. FAILURE TO REPORT AND CLEAN UP ANY SPILL SHALL RESULT IN ISSUANCE OF A STOP WORK ORDER.
31. ALL WORK ON SITE SHALL STAY A MINIMUM OF ONE HUNDRED (100) FEET AWAY FROM ANY DRAINAGE WAY, WETLAND, ETC. UNLESS OTHERWISE NOTED ON AN ACCEPTED CITY OF LONE TREE GESC PLAN.
32. ALL PROJECTS SHALL BALANCE EARTHWORK QUANTITIES ON SITE. IN THE EVENT A VARIANCE IS GRANTED BY THE CITY ENGINEER TO ALLOW IMPORT OR EXPORT OF MATERIAL, THE PERMITEE SHALL HAVE A GESC PERMIT IN HAND FOR THE IMPORT OR EXPORT SITE PRIOR TO ANY TRANSPORTING OF EARTHEN MATERIAL. THE GESC MANAGER SHALL NOTIFY THE CITY OF LONE TREE GESC INSPECTOR OF THE LOCATION AND GESC PERMIT NUMBERS OF BOTH THE EXPORTING AND IMPORTING SITES PRIOR TO ANY IMPORT/EXPORT OPERATIONS.
33. THE USE OF REBAR, STEEL STAKES OR STEEL FENCE POSTS FOR STAKING OR SUPPORT OF ANY EROSION OR SEDIMENT CONTROL BMP IS PROHIBITED (EXCEPT STEEL TEE-POSTS FOR USE IN SUPPORTING CONSTRUCTION FENCE).
34. THE CLEANING OF CONCRETE DELIVERY TRUCK CHUTES IS RESTRICTED TO APPROVED CONCRETE WASH OUT LOCATIONS ON THE JOB SITE. THE DISCHARGE OF WATER CONTAINING WASTE CONCRETE TO THE STORM SEWER SYSTEM IS PROHIBITED. ALL CONCRETE WASTE SHALL BE PROPERLY CLEANED UP AND DISPOSED AT AN APPROPRIATE LOCATION.
35. ALL DEWATERING ON SITE SHALL BE COORDINATED WITH A CITY OF LONE TREE GESC INSPECTOR AND BE FREE OF SEDIMENT IN ACCORDANCE WITH THE GESC CRITERIA MANUAL.
36. ALL PERMANENT INSTALLATIONS OF PIPES FOR STORM SEWERS, SLOPE DRAINS, AND CULVERTS, TOGETHER WITH RIPRAP APRONS OR OTHER INLET AND OUTLET PROTECTION, REQUIRE INSPECTION BY THE CITY OF LONE TREE ENGINEERING (SEPARATE FROM GESC INSPECTIONS).
37. ALL DISTURBED AREAS SHALL BE DRILL SEEDED AND CRIMP MULCHED IN ACCORDANCE WITH THE DOUGLAS COUNTY GESC MANUAL CRITERIA AND THE CITY OF LONE TREE SEEDING AND MULCHING DETAIL (#17) INCLUDED HEREIN WITHIN THIRTY DAYS OF INITIAL EXPOSURE OR WITHIN SEVEN DAYS OF SUBSTANTIAL COMPLETION (AS DEFINED BY THE CITY OF LONE TREE) OF AN AREA, WHICHEVER IS LESS. THIS MAY REQUIRE MULTIPLE MOBILIZATIONS FOR SEEDING AND MULCHING.
38. HYDRAULIC SEEDING AND HYDRAULIC MULCHING ARE NOT AN ACCEPTABLE METHOD OF SEEDING OR MULCHING IN THE CITY OF LONE TREE.
39. NO CURB AND GUTTER PERMITS SHALL BE ISSUED UNTIL ALL DISTURBED AREAS ARE DRILL SEEDED AND CRIMP MULCHED.
40. NO PAVING PERMITS SHALL BE ISSUED UNTIL ALL INTERIM INLET PROTECTION IS INSTALLED AND APPROVED BY THE GESC INSPECTOR.
41. A FINAL GESC INSPECTION SHALL BE CONDUCTED A MINIMUM OF TWO WEEKS PRIOR TO THE ANTICIPATED REQUEST FOR CERTIFICATE OR TEMPORARY CERTIFICATE OF OCCUPANCY OR INITIAL ACCEPTANCE.

BMP LEGEND

DETAIL NO.	SHEET NO.	SYMBOL	BMP LEGEND
1	1	CD	CHECK DAM
2	1	CB	COMPOST BLANKET
3	1	CFB	COMPOST FILTER BERM
4	1	CWA	CONCRETE WASHOUT AREA
5	1	CF	CONSTRUCTION FENCE
6	1	CM	CONSTRUCTION MARKERS
7	1	DW	DEWATERING
8	1	DD	DIVERSION DITCH
9	2	ECB	EROSION CONTROL BLANKET
10	2	IP	INLET PROTECTION
11	2	RCD	REINFORCED CHECK DAM
12	2	RRB	REINFORCED ROCK BERM
13	2	RRC	RRB FOR CULVERT PROTECTION
14	2	SB	SEDIMENT BASIN
15	3	SCL	SEDIMENT CONTROL LOG
16	3	ST	SEDIMENT TRAP
17	3	SM	SEEDING AND MULCHING
18	3	SF	SILT FENCE
19	3	SSA	STABILIZED STAGING AREA
20	3	SR	SURFACE ROUGHENING
21	3	TSD	TEMPORARY SLOPE DRAIN
22	3	TSC	TEMPORARY STREAM CROSSING
23	3	TER	TERRACING
24	3	VTC	VEHICLE TRACKING CONTROL
25	3	WW	VTC WITH WHEEL WASH
[B] 26	3	CS	CURB SOCK
	1		ROCK AND RIPRAP GRADATIONS
		LOC	LIMITS OF CONSTRUCTION



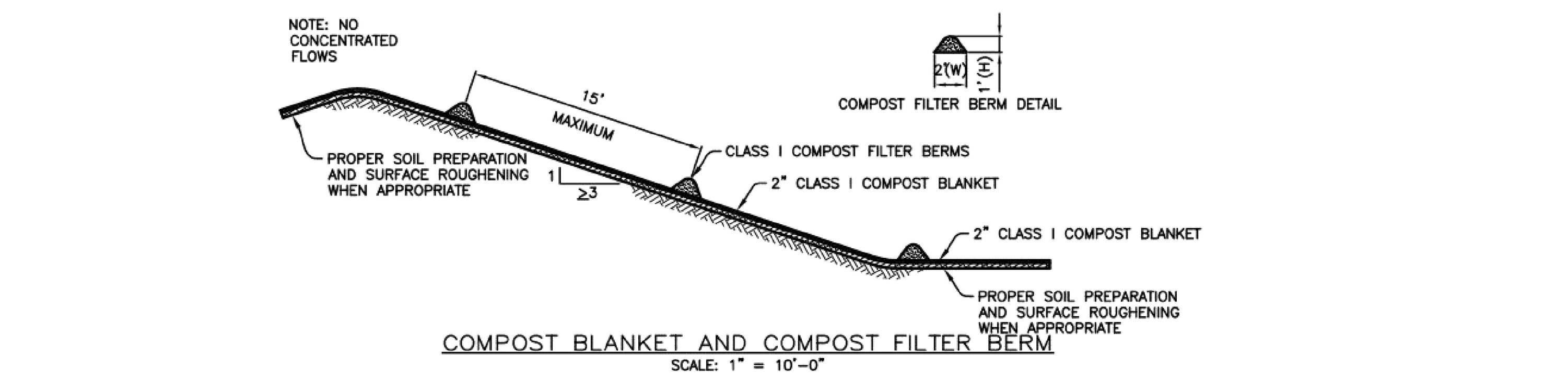
CHECK DAM INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATIONS OF CHECK DAMS.
   - CHECK DAM TYPE (CHECK DAM OR REINFORCED CHECK DAM).
   - LENGTH, "L", CREST LENGTH, "CL", AND DEPTH, "D".
2. CHECK DAMS INDICATED ON INITIAL GESC PLAN SHALL BE INSTALLED AFTER CONSTRUCTION FENCE, BUT PRIOR TO ANY UPSTREAM LAND-DISTURBING ACTIVITIES.
3. RIPRAP UTILIZED FOR CHECK DAMS SHALL HAVE A D_{50} MEDIAN STONE SIZE OF 12".
4. RIPRAP PAD SHALL BE TRENCHED INTO THE GROUND A MINIMUM OF 1'-8".
5. THE ENDS OF THE CHECK DAM SHALL BE A MINIMUM OF 1'-6" HIGHER THAN THE CENTER OF THE CHECK DAM.

CHECK DAM MAINTENANCE NOTES

1. THE GESC MANAGER SHALL INSPECT CHECK DAMS WEEKLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT AS NECESSARY.
2. SEDIMENT ACCUMULATED UPSTREAM OF CHECK DAMS SHALL BE REMOVED WHEN THE SEDIMENT DEPTH UPSTREAM OF CHECK DAM IS WITHIN ½ OF THE HEIGHT OF THE CREST.
3. CHECK DAMS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND GRASS COVER IS APPROVED BY THE CITY.
4. WHEN CHECK DAMS ARE REMOVED, EXCAVATIONS SHALL BE FILLED WITH SUITABLE COMPACTED BACK FILL. ANY DISTURBED AREA SHALL BE SEEDED AND MULCHED AND COVERED WITH EROSION CONTROL BLANKET OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE CITY.

(CD) CHECK DAM (1) [A]



COMPOST BLANKET AND COMPOST FILTER BERM
SCALE: 1" = 10'-0"

COMPOST BLANKET NOTES:

1. SEE PLAN VIEW FOR AREA OF COMPOST BLANKET.
2. MAY BE USED IN PLACE OF STRAW MULCH OR EROSION CONTROL BLANKET IN AREAS WHERE ACCESS IS DIFFICULT DUE TO LANDSCAPING OR OTHER OBJECTS OR IN AREAS WHERE A SMOOTH TURF GRASS FINISH IS DESIRED.
3. SHALL ONLY BE UTILIZED IN AREAS WHERE SHEET FLOW CONDITIONS PREVAIL; SHALL BE PROHIBITED IN AREAS OF POSSIBLE CONCENTRATED FLOW.
4. SOIL PREPARATION SHALL BE COMPLETE PER THE SPECIFICATIONS OUTLINED IN THESE CRITERIA PRIOR TO APPLICATION.
5. WHEN TURF GRASS FINISH IS NOT DESIRED, SURFACE ROUGHENING ON SLOPES SHALL TAKE PLACE PRIOR TO APPLICATION.
6. SHALL BE EVENLY APPLIED AT A DEPTH OF 2 INCH.
7. MAYBE APPLIED UTILIZING PNEUMATIC BLOWER, OR BY HAND.
8. SEEDING SHALL BE DRILLED PRIOR TO THE APPLICATION OF COMPOST OR SEED MAY BE COMBINED AND BLOWN WITH THE PNEUMATIC BLOWER.
9. COMPOST FILTER BERM SHALL BE UTILIZED ON SLOPES WITH A MAXIMUM SPACING OF 15 FEET PER THE REQUIREMENTS FOUND IN THE COMPOST FILTER BERM SECTION.
10. THE GESC MANAGER SHALL INSPECT WEEKLY, DURING AND AFTER ANY STORM EVENT.
11. COMPOST USED IN THE APPLICATION OF THE COMPOST BLANKET SHALL BE A CLASS I COMPOST AS DEFINED BY THE FOLLOWING PHYSICAL, CHEMICAL, AND BIOLOGICAL PARAMETERS:

PARAMETERS	CLASS I COMPOST FOR COMPOST BLANKET
MINIMUM STABILITY INDICATOR	STABLE TO VERY STABLE
SOLUBLE SALTS	MAXIMUM 5mmhos/cm
PH	6.0 – 8.0
AG INDEX	> 10
MATURITY INDICATOR EXPRESSED AS PERCENTAGE OF GERMINATION/VIGOR	80+/80+
MATURITY INDICATOR EXPRESSED AS AMMONIA N/ NITRATE N RATIO	< 4
MATURITY INDICATOR EXPRESSED AS CARBON TO NITROGEN RATIO	20:1
TESTED FOR CLOPYRALID	YES/NEGATIVE RESULT
MOISTURE CONTENT	30–60 %
ORGANIC MATTER CONTENT	25–45 % OF DRY WEIGHT
PARTICLE SIZE DISTRIBUTION	3" (75mm) 100% PASSING 1" (25mm) 95% TO 100% PASSING 3/4" (19mm) 85% TO 90% PASSING 3/8" (9.5mm) 50% TO 60% PASSING #4 20 TO 35% PASSING
PRIMARY, SECONDARY NUTRIENTS; TRACE ELEMENT	MUST BE REPORTED
TESTING AND TEST REPORT SUBMITTAL REQUIREMENTS	STA + CLOPYRALID
ORGANIC MATTER PER CUBIC YARD	MUST REPORT
CHEMICAL CONTAMINANTS	MEET OR EXCEED US EPA CLASS A STANDARD, 40 CFR 503.1 TABLES 1 & 3 LEVELS
MINIMUM MANUFACTURING/PRODUCTION REQUIREMENT	FULLY PERMITTED UNDER COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION
RISK FACTOR RELATING TO PLANT GERMINATION AND HEALTH	LOW

NOTE: CLOPYRALID IS THE COMMON NAME OF A HERBICIDE THAT KILLS BROAD-LEAVED WEEDS SUCH AS DANDELIONS, CLOVER AND THISTLE.

(CB) COMPOST BLANKET (2)

COMPOST FILTER BERM NOTES:

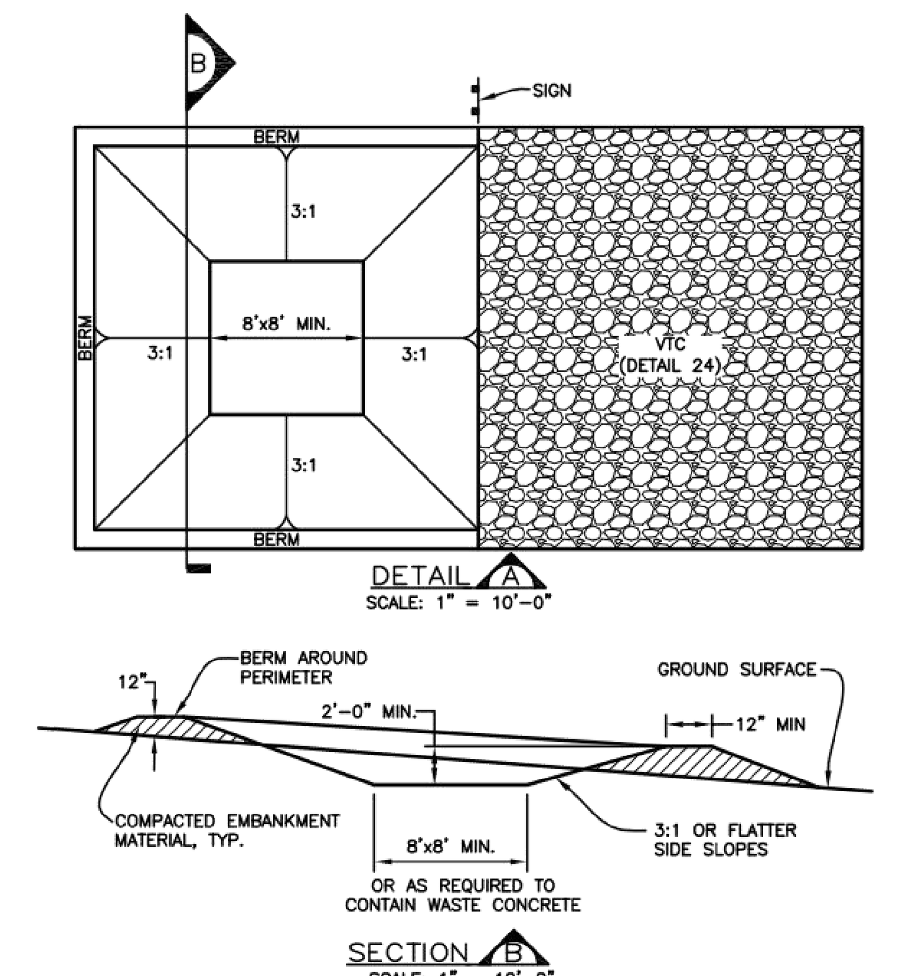
1. SEE PLAN VEW FOR LENGTH OF COMPOST FILTER BERM.
2. SHALL BE APPLIED TO ALL SLOPES RECEIVING A COMPOST BLANKET AT 15' INCREMENTS.
3. FILTER BERMS SHALL RUN PARALLEL TO THE CONTOUR.
4. FILTER BERMS SHALL BE A MINIMUM OF 1' H x 2' W.
5. FILTER BERMS SHALL BE APPLIED UTILIZING PNEUMATIC BLOWER, OR BY HAND.
6. SHALL ONLY BE UTILIZED IN AREAS WHERE SHEET FLOW CONDITIONS PREVAIL; SHALL BE PROHIBITED IN AREAS OF POSSIBLE CONCENTRATED FLOW.
7. SOIL PREPARATION SHALL BE COMPLETE PER THE SPECIFICATIONS OUTLINED IN THESE CRITERIA PRIOR TO APPLICATION.
8. WHEN TURF GRASS FINISH IS NOT DESIRED, SURFACE ROUGHENING ON SLOPES SHALL TAKE PLACE PRIOR TO APPLICATION.
9. SEEDING SHALL BE DRILLED BEFORE THE APPLICATION OF COMPOST OR SEED MAY BE COMBINED AND BLOWN WITH THE PNEUMATIC BLOWER.
10. THE GESC MANAGER SHALL INSPECT WEEKLY, DURING AND AFTER ANY STORM EVENT.
11. COMPOST USED IN THE APPLICATION OF THE COMPOST FILTER BERM SHALL BE A CLASS I COMPOST AS DEFINED BY THE FOLLOWING PHYSICAL, CHEMICAL, AND BIOLOGICAL PARAMETERS:

PARAMETERS	CLASS I COMPOST FOR COMPOST FILTER BERM
MINIMUM STABILITY INDICATOR	STABLE TO VERY STABLE
SOLUBLE SALTS	MAXIMUM 5mmhos/cm
PH	6.0 – 8.0
AG INDEX	> 10
MATURITY INDICATOR EXPRESSED AS PERCENTAGE OF GERMINATION/VIGOR	80+/80+
MATURITY INDICATOR EXPRESSED AS AMMONIA N/ NITRATE N RATIO	< 4
MATURITY INDICATOR EXPRESSED AS CARBON TO NITROGEN RATIO	20:1
TESTED FOR CLOPYRALID	YES/NEGATIVE RESULT
MOISTURE CONTENT	30–60 %
ORGANIC MATTER CONTENT	25–45 % OF DRY WEIGHT
PARTICLE SIZE DISTRIBUTION	3" (75mm) 100% PASSING 1" (25mm) 95% TO 100% PASSING 3/4" (19mm) 85% TO 90% PASSING 3/8" (9.5mm) 50% TO 60% PASSING #4 20 TO 35% PASSING
PRIMARY, SECONDARY NUTRIENTS; TRACE ELEMENT	MUST BE REPORTED
TESTING AND TEST REPORT SUBMITTAL REQUIREMENTS	STA + CLOPYRALID
ORGANIC MATTER PER CUBIC YARD	MUST REPORT
CHEMICAL CONTAMINANTS	MEET OR EXCEED US EPA CLASS A STANDARD, 40 CFR 503.1 TABLES 1 & 3 LEVELS
MINIMUM MANUFACTURING/PRODUCTION REQUIREMENT	FULLY PERMITTED UNDER COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION
RISK FACTOR RELATING TO PLANT GERMINATION AND HEALTH	LOW

NOTE: IF A BIOSOLID COMPOST IS TO BE UTILIZED IT SHALL BE PRODUCED BY A FACILITY IN POSSESSION OF A VALID NOTICE OF AUTHORIZATION (NOA) FOR THE UNRESTRICTED USE AND DISTRIBUTION BY THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT. THE NOA SHALL BE PROVIDED UPON REQUEST TO CITY OF LONE TREE.

NOTE: A LAB TEST DETAILING THE CHEMICAL, PHYSICAL, AND BIOLOGICAL PARAMETERS SHALL BE PROVIDED UPON REQUEST BY CITY OF LONE TREE.

(CFB) COMPOST FILTER BERM (3) [A]



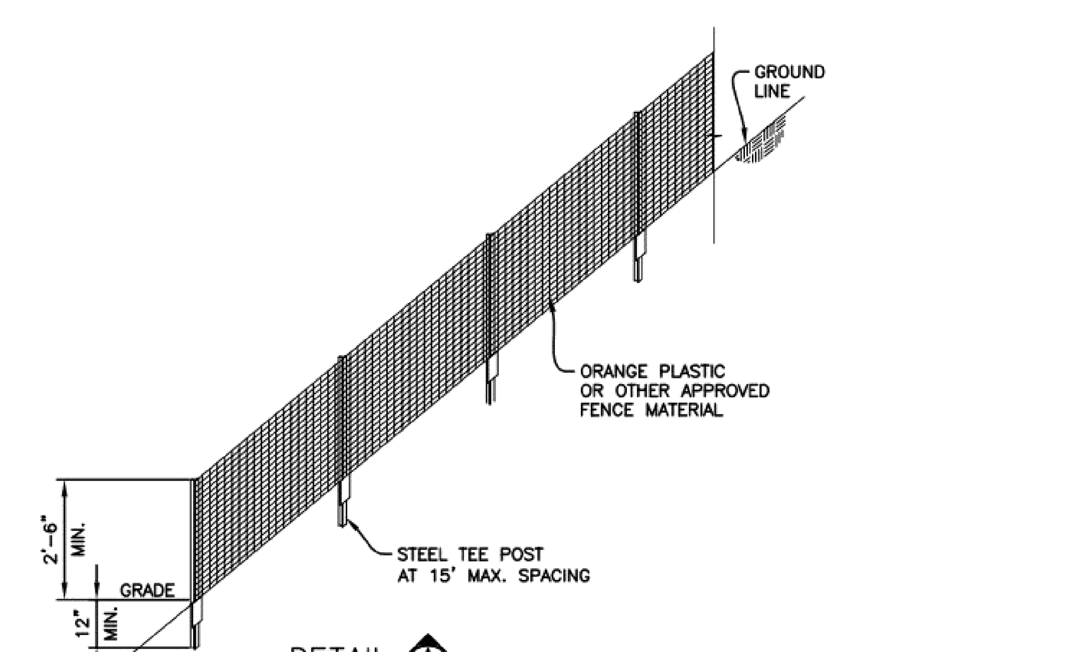
CONCRETE WASHOUT AREA INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATIONS OF CONCRETE WASHOUT AREA.
2. THE CONCRETE WASHOUT AREA SHALL BE INSTALLED PRIOR TO ANY CONCRETE PLACEMENT ON SITE.
3. VEHICLE TRACKING CONTROL (DETAIL 24) IS REQUIRED AT THE ACCESS POINT.
4. SIGNS SHALL BE PLACED AT THE CONSTRUCTION ENTRANCE, AT THE WASHOUT AREA, AND ELSEWHERE AS NECESSARY TO CLEARLY INDICATE THE LOCATION OF THE CONCRETE WASHOUT AREA TO OPERATORS OF CONCRETE TRUCKS AND PUMP RIGS.
5. EXCAVATED MATERIAL SHALL BE UTILIZED IN PERIMETER BERM CONSTRUCTION.

CONCRETE WASHOUT AREA MAINTENANCE NOTES

1. THE CONCRETE WASHOUT AREA SHALL BE REPAIRED AND ENLARGED OR CLEANED OUT AS NECESSARY TO MAINTAIN CAPACITY FOR WASTED CONCRETE.
2. AT THE END OF CONSTRUCTION, ALL CONCRETE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF AT AN APPROVED WASTE SITE.
3. WHEN THE CONCRETE WASHOUT AREA IS REMOVED, THE DISTURBED AREA SHALL BE DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE CITY.
4. INSPECT WEEKLY, DURING AND AFTER ANY STORM EVENT.

(CWA) CONCRETE WASHOUT AREA (4)



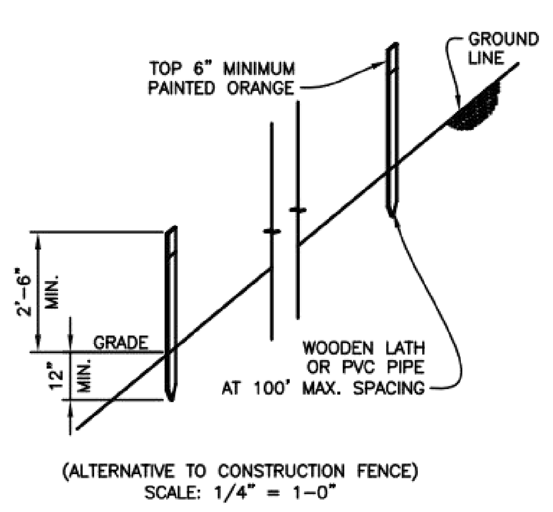
CONSTRUCTION FENCE INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - TYPE OF CONSTRUCTION LIMIT INDICATOR (FENCE OR MARKERS).
   - LOCATION AND LENGTH OF FENCE OR LINE OF MARKERS.
2. CONSTRUCTION FENCE OR MARKERS INDICATED ON INITIAL GESC PLAN SHALL BE INSTALLED PRIOR TO OTHER BMPS AND ANY LAND-DISTURBING ACTIVITIES.
3. STEEL TEE POSTS SHALL BE UTILIZED FOR SUPPORT OF CONSTRUCTION FENCE. MAXIMUM SPACING FOR TEE POSTS SHALL BE 15'.

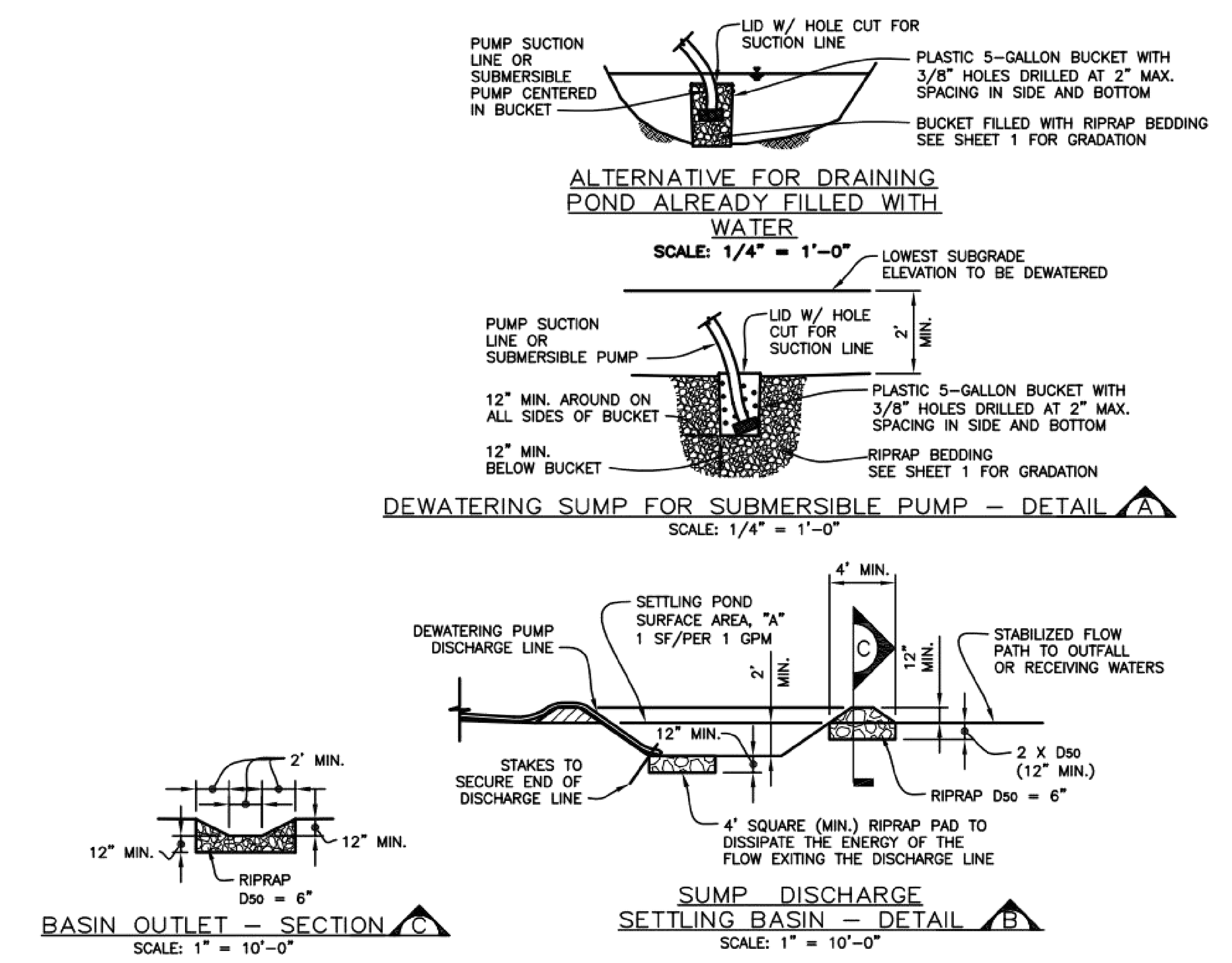
CONSTRUCTION FENCE MAINTENANCE NOTES

1. ANY DAMAGED FENCE OR MARKERS SHALL BE REPAIRED ON A DAILY BASIS.
2. FENCE OR MARKERS SHALL BE REMOVED AT THE END OF CONSTRUCTION. IF ANY DISTURBED AREA EXISTS AFTER FENCE REMOVAL, IT SHALL BE DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE CITY.

(CF) CONSTRUCTION FENCE (5)



(CM) CONSTRUCTION MARKERS (6)



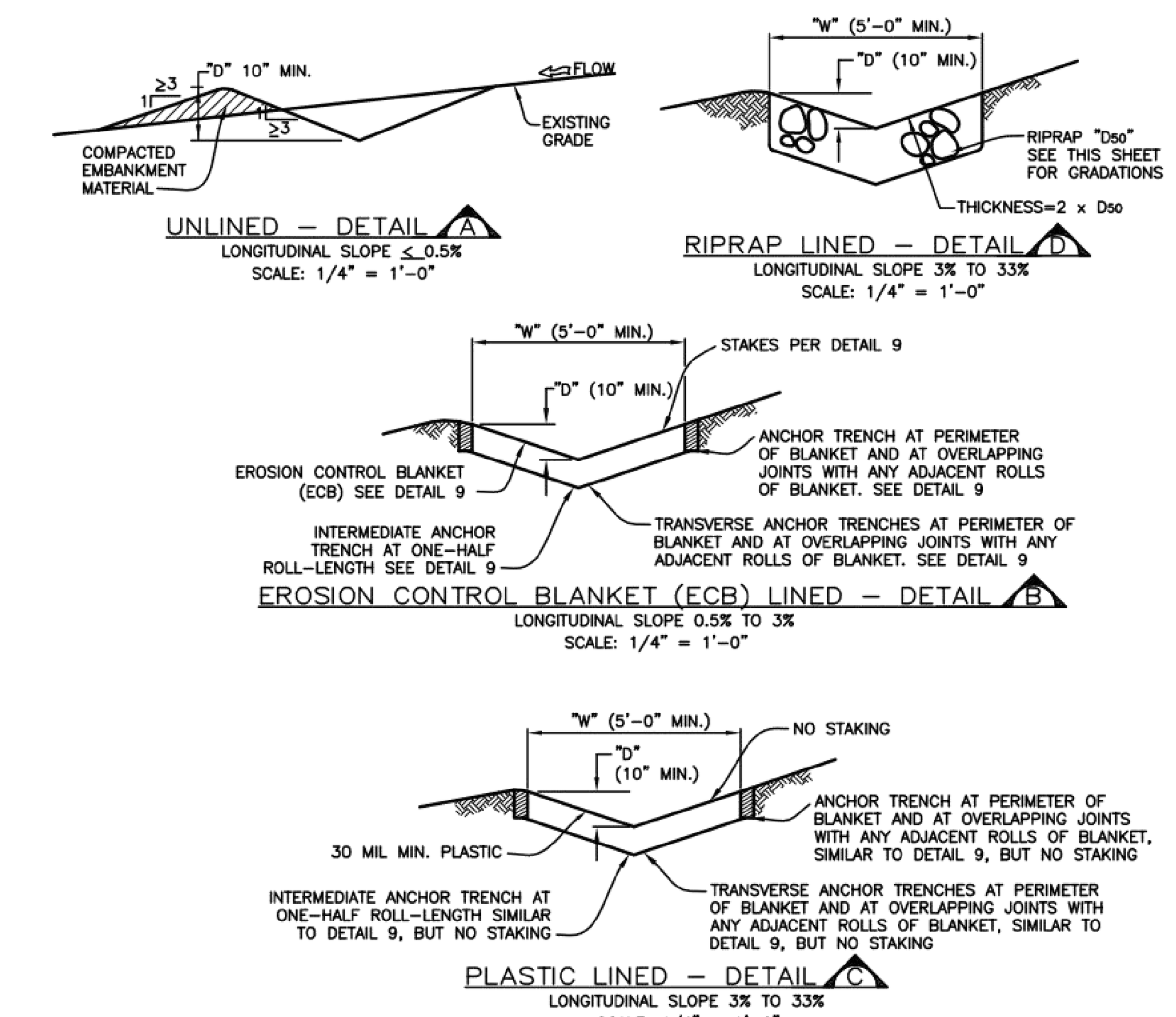
DEWATERING INSTALLATION NOTES

1. THE GESC MANAGER SHALL OBTAIN A CONSTRUCTION DISCHARGE (DEWATERING) PERMIT FROM THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT PRIOR TO ANY DEWATERING OPERATIONS. ALL DEWATERING SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE DISCHARGE PERMIT AND SHALL BE COORDINATED WITH THE CITY OF LONE TREE GESC INSPECTOR.
2. THE GESC MANAGER 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 BACKFILLED TO FINAL GRADE.
3. DEWATERING OPERATIONS SHALL USE ONE OR MORE OF THE DEWATERING SUMPS SHOWN ABOVE OR OTHER MEANS APPROVED BY THE CITY TO REDUCE THE PUMPING OF SEDIMENT, AND SHALL PROVIDE A TEMPORARY BASIN FOR SETTLING PUMPED DISCHARGES PRIOR TO RELEASE OFF SITE OR TO A RECEIVING WATER. SEDIMENT BASIN PER DETAIL 14 MAY BE USED IN LIEU OF SUMP DISCHARGE SETTLING BASIN SHOWN ABOVE.
4. A 4' SQUARE (MIN) RIPRAP PAD SHALL BE PLACED AT DISCHARGE POINT.
5. THE DISCHARGE END OF THE LINE SHALL BE STAKED IN PLACES TO PREVENT MOVEMENT OF RIPRAP PAD.

DEWATERING MAINTENANCE NOTES

1. THE GESC MANAGER SHALL INSPECT DEWATERING SYSTEMS AND PERFORM ANY NECESSARY REPAIRS OR MAINTENANCE ON A HOURLY BASIS.
2. TEMPORARY SETTLING BASINS SHALL BE REMOVED WHEN NO LONGER NEEDED FOR DEWATERING OPERATIONS. ANY DISTURBED AREA SHALL BE DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE CITY.

(DW) DEWATERING (7) [A]



DIVERSION DITCH INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATION OF DIVERSION DITCH.
   - TYPE OF DITCH (UNLINED, ECB LINED, PLASTIC LINED OR RIPRAP LINED).
   - LENGTH OF EACH TYPE OF DITCH.
   - DEPTH, "D", AND WIDTH, "W" DIMENSIONS.
   - FOR ECB LINED DITCH, EROSION CONTROL BLANKET TYPE (SEE DETAIL 9).
   - FOR RIPRAP LINED DITCH, SIZE OF RIPRAP, "D50".
2. SEE DRAINAGE PLANS FOR DETAILS OF ANY PERMANENT CONVEYANCE FACILITIES OR DIVERSION DITCHES EXCEEDING A 2-YEAR FLOW RATE OF 10 CFS.
3. DIVERSION DITCHES INDICATED ON INITIAL GESC PLAN SHALL BE INSTALLED PRIOR TO ANY LAND-DISTURBING ACTIVITIES.
4. FOR ECB LINED DITCHES, INSTALLATION OF EROSION CONTROL BLANKET SHALL CONFORM TO THE REQUIREMENTS OF DETAIL 9.
5. IN LOCATIONS WHERE CONSTRUCTION TRAFFIC MUST CROSS A DIVERSION DITCH, THE PERMITTEES SHALL INSTALL A TEMPORARY CULVERT WITH A MINIMUM DIAMETER OF 12-INCHES.

DIVERSION DITCH MAINTENANCE NOTES

1. THE GESC MANAGER SHALL INSPECT DIVERSION DITCHES WEEKLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT AS NECESSARY.
2. DIVERSION DITCHES ARE TO REMAIN IN PLACE UNTIL THE END OF CONSTRUCTION, OR, IF APPROVED BY THE CITY, LEFT IN PLACE.
3. IF DIVERSION DITCHES ARE REMOVED, THE DISTURBED AREA SHALL BE DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE CITY.

(DD) DIVERSION DITCH (8) [A]

TABLE 1. RIPRAP GRADATIONS

D50 MEDIAN STONE SIZE (INCHES)	% OF MATERIAL SMALLER THAN TYPICAL STONE	TYPICAL STONE EQUIVALENT DIAMETER (INCHES)	TYPICAL STONE WEIGHT (POUNDS)
6	70 – 100 50 – 70 35 – 50 2 – 10	12 9 6 2	85 35 10 0.4
9	70 – 100 50 – 70 35 – 50 2 – 10	15 12 9 3	160 85 35 1.3
12	70 – 100 50 – 70 35 – 50 2 – 10	21 18 12 4	440 275 85 3
18	100 50 – 70 35 – 50 2 – 10	30 24 18 6	1280 650 275 10
24	100 50 – 70 35 – 50 2 – 10	42 33 24 9	3500 1700 650 35

TABLE 2. RIPRAP BEDDING

SIEVE SIZE	MASS PERCENT PASSING SQUARE MESH SIEVES
	CLASS A
3"	100
1 1/2"	20 – 90
NO. 4	0 – 20
NO. 200	0 – 3
MATCHES SPECIFICATIONS FOR CDOT CLASS A FILTER MATERIAL AND UDFCD TYPE 1 BEDDING. ALL ROCK SHALL BE FRACTURED FACE, ALL SIDES.	

TABLE 3. 1 1/2" CRUSHED ROCK

SIEVE SIZE	MASS PERCENT PASSING SQUARE MESH SIEVES
	NO. 4
2"	100
1 1/2"	90 – 100
1"	20 – 55
3/4"	0 – 15
3/8"	0 – 5
MATCHES SPECIFICATIONS FOR NO. 4 COARSE AGGREGATE FOR CONCRETE PER AASHTO M43. ALL ROCK SHALL BE FRACTURED FACE, ALL SIDES.	

ROCK AND RIPRAP GRADATIONS

Sheet Revisions

6/30/05	ADOPTED FROM DOUGLAS COUNTY GESC PLANS	MLP
5/ /08	EDIT UPDATES [A]	GAW
11/ /08	ADD CURB SOCK DETAIL [B] (REF UDFCD, V3 FIGURE C5-23), MISC. NOTE EDITS	GAW

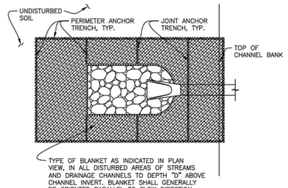
NOTE: SCALES SHOWN ARE FOR 24"x36" SHEETS; ADJUST ACCORDINGLY FOR 11"x17" SHEETS.

CITY OF LONE TREE
DEPARTMENT OF PUBLIC WORKS
Engineering Division

GESC GRADING, EROSION, AND SEDIMENT CONTROL

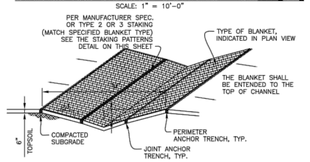
GESC PLAN STANDARD NOTES AND DETAILS

SHEET 1 OF 3



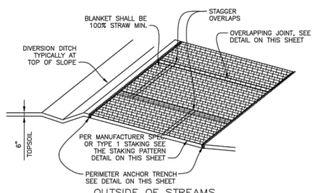
IN DISTURBED AREAS OF STREAMS AND DRAINAGE CHANNELS — DETAIL A

SCALE: 1" = 10'-0"



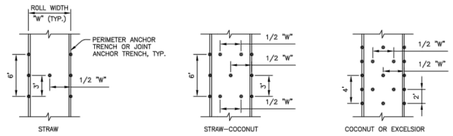
IN DIVERSION DITCH OR SMALL DITCH DRAINAGEWAY — DETAIL B

SCALE: 1" = 10'-0"



OUTSIDE OF STREAMS AND DRAINAGE CHANNELS — DETAIL C

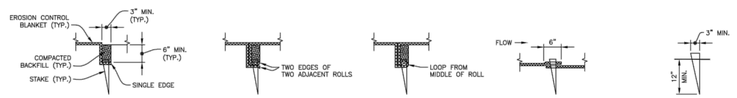
SCALE: 1" = 10'-0"



STAKING PATTERNS

SCALE: 1" = 10'-0"

SHALL BE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATION. IF NO MANUFACTURER'S SPECIFICATION IS AVAILABLE USE THE ACCEPTABLE STAKING PATTERN (AS SHOWN ABOVE).



PERIMETER ANCHOR TRENCH — SCALE: 1/2" = 1'-0"

JOINT ANCHOR TRENCH — SCALE: 1/2" = 1'-0"

INTERMEDIATE ANCHOR TRENCH — SCALE: 1/2" = 1'-0"

OVERLAPPING JOINT — SCALE: 1/2" = 1'-0"

WOOD STAKE DETAIL — SCALE: 1/2" = 1'-0" MINIMUM THICKNESS 1/2"

EROSION CONTROL BLANKET INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATION OF PERIMETER OF EROSION CONTROL BLANKET.
   - TYPE OF BLANKET (STRAW, STRAW-COCONUT, COCONUT, OR EXCELSIOR).
   - AREA "A" IN SQUARE YARDS OF EACH TYPE OF BLANKET.
2. ALL EROSION CONTROL BLANKETS AND NETTING SHALL BE MADE OF 100% NATURAL AND BIODEGRADABLE MATERIAL; NO PLASTIC OR OTHER SYNTHETIC MATERIAL, EVEN IF PHOTO DEGRADABLE, SHALL BE ALLOWED.
3. IN AREAS WHERE EROSION CONTROL BLANKET IS SHOWN ON THE PLANS, THE PERMITTEE SHALL PLACE TOPSOIL AND PERFORM FINAL GRADING, SURFACE PREPARATION, AND SEEDING BELOW THE BLANKET IN ACCORDANCE WITH THE REQUIREMENTS OF DETAIL 17. SEEDING AND MULCHING. SUBGRADE SHALL BE SMOOTH AND MOIST PRIOR TO BLANKET INSTALLATION AND THE BLANKET SHALL BE IN FULL CONTACT WITH SUBGRADE, NO GAPS OR VOIDS SHALL EXIST UNDER THE BLANKET.
4. PERIMETER ANCHOR TRENCH SHALL BE USED AT OUTSIDE PERIMETER OF ALL BLANKET AREAS.
5. JOINT ANCHOR TRENCH SHALL BE USED TO JOIN ROLLS OF BLANKETS TOGETHER (LONGITUDINALLY AND TRANSVERSELY) FOR ALL BLANKETS EXCEPT STRAW, WHICH MAY USE AN OVERLAPPING JOINT.
6. INTERMEDIATE ANCHOR TRENCH SHALL BE USED AT SPACING OF ONE-HALF THE ROLL LENGTH FOR COCONUT AND EXCELSIOR BLANKETS.
7. THE OVERLAPPING JOINT DETAIL SHALL BE USED TO JOIN ROLLS OF BLANKETS TOGETHER FOR BLANKETS ON SLOPES.
8. MATERIAL SPECIFICATIONS OF EROSION CONTROL BLANKET SHALL CONFORM TO TABLE 7.1.

EROSION CONTROL BLANKET INSTALLATION NOTES — CONTINUED

9. ANY AREAS OF SEEDING AND MULCHING DISTURBED IN THE PROCESS OF INSTALLING EROSION CONTROL BLANKET SHALL BE RESEEDED AND MULCHED IN ACCORDANCE WITH DETAIL 17.
10. SEE DRAINAGE DESIGN PLANS FOR MAJOR DRAINAGEWAY STABILIZATION MEASURES THAT MAY EXCEED THE DESIGN CONDITIONS ASSOCIATED WITH THE DETAILS ABOVE.

TABLE 7.1 — EROSION CONTROL BLANKET TYPE

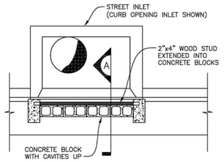
TYPE	COCONUT CONTENT	STRAW CONTENT	EXCELSIOR CONTENT	NETTING MIN.
STRAW*	–	100%	–	DOUBLE/NATURAL
STRAW-COCONUT	30% MIN.	70% MAX.	–	DOUBLE/NATURAL
COCONUT	100%	–	–	DOUBLE/NATURAL
EXCELSIOR	–	–	100%	DOUBLE/NATURAL

* FOR OUTSIDE OF STREAMS AND DRAINAGE CHANNELS

EROSION CONTROL BLANKET MAINTENANCE NOTES

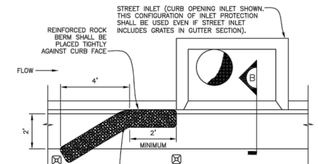
1. THE GESC MANAGER SHALL INSPECT EROSION CONTROL BLANKETS WEEKLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS AS NECESSARY.
2. EROSION CONTROL BLANKET IS TO BE LEFT IN PLACE UNLESS REQUESTED TO BE REMOVED BY THE CITY.
3. ANY EROSION CONTROL BLANKET PULLED OUT, TORN, OR OTHERWISE DAMAGED SHALL BE RE-INSTALLED. ANY SUBGRADE AREAS BELOW THE BLANKET 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.

ECB EROSION CONTROL BLANKET 9



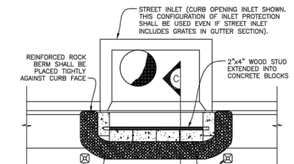
INTERIM CONFIGURATION (BEFORE PAVING) STREET INLET — PLAN

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



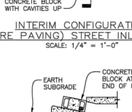
STREET INLET ON CONTINUOUS GRADE (AFTER PAVING) — PLAN

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



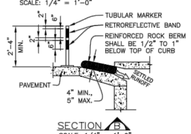
STREET INLET IN SUMP (AFTER PAVING) — PLAN

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



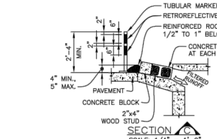
SECTION A

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



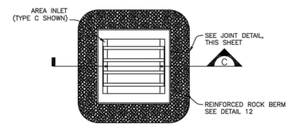
SECTION B

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



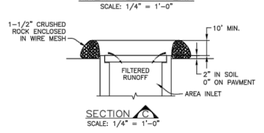
SECTION C

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



AREA INLET — PLAN

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



SECTION A

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

JOINT DETAIL

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

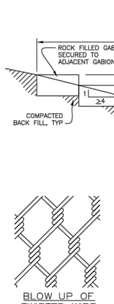
INLET PROTECTION INSTALLATION NOTES

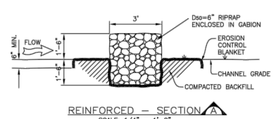
1. INTERIM CONFIGURATION OF INLET PROTECTION IN STREETS SHALL BE INSTALLED WITHIN 48-HOURS OF POURING INLET. INLET PROTECTION (AFTER PAVEMENT) SHALL BE INSTALLED WITHIN 48 HOURS AFTER PAVING IS PLACED.
2. INLET PROTECTION AT AREA INLETS SHALL BE INSTALLED WITHIN 48-HOURS OF POURING INLET.
3. CRUSHED ROCK SHALL BE FRACTURED FACE (ALL SIDES) AND SHALL COMPLY WITH GRADATION SHOWN ON SHEET 1 (1-1/2" MINUS). RECYCLED CONCRETE MEETING THIS GRADATION MAY BE USED.
4. WIRE MESH SHALL BE FABRICATED OF 10 GAUGE WIRE TWISTED INTO A MESH WITH A MAXIMUM OPENING OF 1.0 INCH (COMMONLY TERMED "CHICKEN WIRE"). ROLL WIDTH SHALL BE 48-INCHES.
5. WIRE MESH SHALL BE SECURED USING "HOG RINGS" OR WIRE TIES AT 6-INCH CENTERS ALONG ALL JOINTS AND AT 2-INCH CENTERS ON ENDS OF BERM.
6. REINFORCED ROCK BERM SHALL BE CONSTRUCTED IN ONE PIECE OR SHALL BE CONSTRUCTED USING JOINT DETAIL.
7. TUBULAR MARKERS SHALL MEET REQUIREMENTS OF MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), AS AMENDED.
8. THE TOP OF REINFORCED ROCK BERM SHALL BE 1/2"-1" BELOW TOP OF CURB.

INLET PROTECTION MAINTENANCE NOTES

1. THE GESC MANAGER SHALL INSPECT INLET PROTECTION WEEKLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT AS NECESSARY. MORE FREQUENT INSPECTIONS AND REPAIRS SHALL BE REQUIRED DURING WINTER CONDITIONS DUE TO FREEZE/THAW PROBLEMS.
2. SEDIMENT ACCUMULATED IN SEDIMENT BASIN SHALL BE REMOVED WHEN THE SEDIMENT DEPTH UPSTREAM OF ROCK BERM IS WITHIN 2-1/2 INCHES OF THE CREST.
3. INLET PROTECTION IS TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND GRASS COVER IS APPROVED, UNLESS THE CITY APPROVES EARLIER REMOVAL OF INLET PROTECTION IN STREETS.
4. WHEN INLET PROTECTION AT AREA INLETS ARE REMOVED, THE DISTURBED AREA SHALL BE DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE CITY.

IP INLET PROTECTION 10





REINFORCED — SECTION A

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

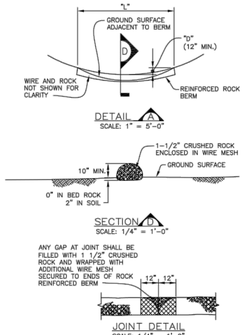
REINFORCED CHECK DAM INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATIONS OF CHECK DAMS.
   - CHECK DAM TYPE (CHECK DAM OR REINFORCED CHECK DAM).
   - LENGTH, "L", CREST LENGTH, "CL", AND DEPTH, "D".
2. CHECK DAMS INDICATED ON INITIAL GESC PLAN SHALL BE INSTALLED AFTER CONSTRUCTION FENCE, BUT PRIOR TO ANY UPSTREAM LAND-DISTURBING ACTIVITIES.
3. REINFORCED CHECK DAMS, GABIONS SHALL HAVE GALVANIZED TWISTED WIRE NETTING WITH A MAXIMUM OPENING DIMENSION OF 4-1/2" AND A MINIMUM WIRE THICKNESS OF 0.10". WIRE "HOG RINGS" AT 4" SPACING OR OTHER APPROVED MEANS SHALL BE USED AT ALL GABION SEAMS AND TO SECURE THE GABION TO THE ADJACENT GABION.
4. RIPRAP UTILIZED FOR CHECK DAMS SHALL HAVE A D_{50} MEDIAN STONE SIZE OF 6".
5. THE CHECK DAM SHALL BE TRENCHED INTO THE GROUND A MINIMUM OF 1'-6".
6. EROSION BLANKET SHALL BE PLACED IN THE REINFORCED CHECK DAM TRENCH EXTENDING A MINIMUM OF 1'-6" ON BOTH THE UPSTREAM AND DOWNSTREAM SIDES OF THE REINFORCED CHECK DAM.

REINFORCED CHECK DAM MAINTENANCE NOTES

1. THE GESC MANAGER SHALL INSPECT CHECK DAMS WEEKLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT AS NECESSARY.
2. SEDIMENT ACCUMULATED UPSTREAM OF CHECK DAMS SHALL BE REMOVED WHEN THE SEDIMENT DEPTH UPSTREAM OF CHECK DAM IS WITHIN ½ OF THE HEIGHT OF THE CREST.
3. CHECK DAMS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND GRASS COVER IS APPROVED BY THE CITY.
4. WHEN CHECK DAMS ARE REMOVED, EXCAVATIONS SHALL BE FILLED WITH SUITABLE COMPACTED BACK FILL. ANY DISTURBED AREA SHALL BE DRILL SEEDED AND CRIMP MULCHED AND COVERED WITH EROSION CONTROL BLANKET OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE CITY.

RCD REINFORCED CHECK DAM 11

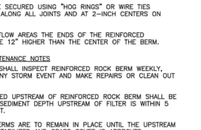


DETAIL A

SCALE: 1" = 5'-0"

SECTION A

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



JOINT DETAIL

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

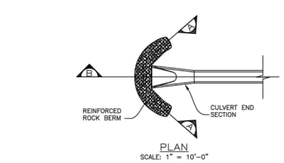
REINFORCED ROCK BERM INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATIONS OF REINFORCED ROCK BERMS.
   - LENGTH, "L", AND DEPTH, "D" DIMENSIONS.
2. REINFORCED ROCK BERM SECTION APPLIES TO CULVERT INLET FILTER AND INLET PROTECTION.
3. CRUSHED ROCK SHALL BE FRACTURED FACE (ALL SIDES) AND SHALL COMPLY WITH GRADATION SHOWN ON SHEET 1 (1-1/2" MINUS). RECYCLED CONCRETE MEETING THIS GRADATION MAY BE USED.
4. WIRE MESH SHALL BE FABRICATED OF 10 GAUGE WIRE TWISTED INTO A MESH WITH A MAXIMUM OPENING OF 1.0 INCH (COMMONLY TERMED "CHICKEN WIRE"). ROLL WIDTH SHALL BE 48-INCHES.
5. WIRE MESH SHALL BE SECURED USING "HOG RINGS" OR WIRE TIES AT 6-INCH CENTERS ALONG ALL JOINTS AND AT 2-INCH CENTERS ON ENDS OF BERM.
6. FOR CONCENTRATED FLOW AREAS THE ENDS OF THE REINFORCED ROCK BERM SHALL BE 12" HIGHER THAN THE CENTER OF THE BERM.

REINFORCED ROCK BERM MAINTENANCE NOTES

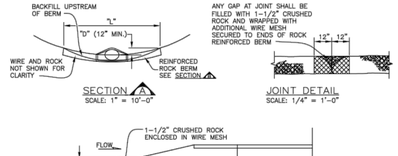
1. THE GESC MANAGER SHALL INSPECT REINFORCED ROCK BERM WEEKLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT AS NECESSARY.
2. SEDIMENT ACCUMULATED UPSTREAM OF REINFORCED ROCK BERM SHALL BE REMOVED WHEN THE SEDIMENT DEPTH UPSTREAM OF FILTER IS WITHIN 5 INCHES OF THE CREST.
3. REINFORCED ROCK BERMS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND GRASS COVER IS APPROVED.
4. WHEN REINFORCED ROCK BERMS ARE REMOVED, ANY DISTURBED AREA SHALL BE DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE CITY.

RRB REINFORCED ROCK BERM 12



PLAN

SCALE: 1" = 10'-0"

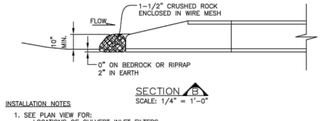


SECTION A

SCALE: 1" = 10'-0"

JOINT DETAIL

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



SECTION B

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

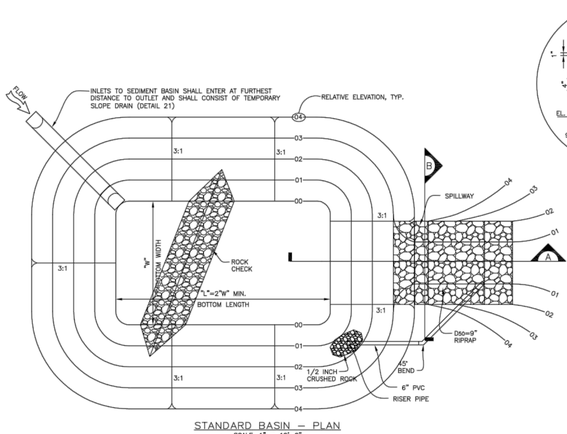
INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATIONS OF CULVERT INLET FILTERS.
   - LENGTH, "L", AND DEPTH, "D".
2. CRUSHED ROCK SHALL BE FRACTURED FACE (ALL SIDES) AND SHALL COMPLY WITH GRADATION SHOWN ON SHEET 1 (1-1/2" MINUS). RECYCLED CONCRETE MEETING THIS GRADATION MAY BE USED.
3. WIRE MESH SHALL BE FABRICATED OF 10 GAUGE WIRE TWISTED INTO A MESH WITH A MAXIMUM OPENING OF 1.0 INCH (COMMONLY TERMED "CHICKEN WIRE").
4. WIRE MESH SHALL BE SECURED USING "HOG RINGS" OR WIRE TIES AT 6-INCH CENTERS ALONG ALL JOINTS AND AT 2-INCH CENTERS ON ENDS OF BERM.
5. THE ENDS OF THE REINFORCED ROCK BERM SHALL BE 12" HIGHER THAN THE CENTER OF THE BERM.

MAINTENANCE NOTES

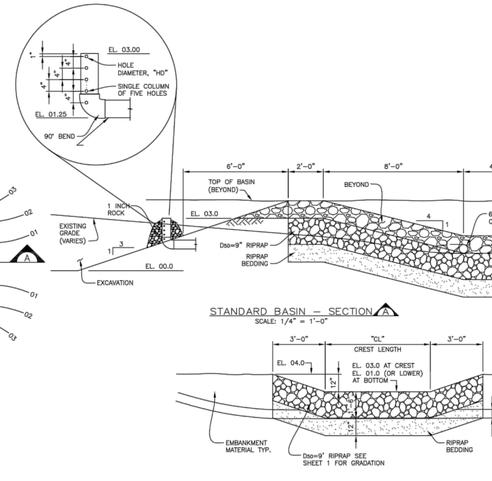
1. THE GESC MANAGER SHALL INSPECT CULVERT INLET FILTER WEEKLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT AS NECESSARY.
2. SEDIMENT ACCUMULATED UPSTREAM OF CULVERT INLET FILTER SHALL BE REMOVED WHEN THE SEDIMENT DEPTH UPSTREAM OF FILTER IS ½ THE HEIGHT OF THE REINFORCED ROCK BERM.
3. RRB FOR CULVERT PROTECTION ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND GRASS COVER IS APPROVED BY THE CITY.
4. WHEN CULVERT INLET FILTERS ARE REMOVED, ANY DISTURBED AREA SHALL BE DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE CITY.

RRC RRB FOR CULVERT PROTECTION 13



STANDARD BASIN — PLAN

SCALE: 1" = 10'-0"



STANDARD BASIN — SECTION A

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

STANDARD BASIN — SECTION B

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

SEDIMENT BASIN INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATION OF SEDIMENT BASIN.
   - TYPE OF BASIN (STANDARD BASIN OR NON-STANDARD BASIN).
   - FOR STANDARD BASIN, CREST LENGTH, "CL", BOTTOM WIDTH, "W", AND HOLE DIAMETER, "HD".
   - FOR NON-STANDARD BASIN, SEE CONSTRUCTION DRAWINGS FOR DESIGN OF BASIN INCLUDING RISER HEIGHT, "H", NUMBER OF COLUMNS, "N", HOLE DIAMETER, "HD", AND PIPE DIAMETER "D".
2. FOR STANDARD BASIN, BOTTOM DIMENSION MAY BE MODIFIED AS LONG AS BOTTOM AREA IS NOT REDUCED.
3. SEDIMENT BASINS INDICATED ON INITIAL GESC PLAN SHALL BE INSTALLED PRIOR TO ANY OTHER LAND-DISTURBING ACTIVITY.
4. EMBANKMENT MATERIAL SHALL CONSIST OF SOIL FREE OF DEBRIS, ORGANIC MATERIAL, AND ROCKS OR CONCRETE GREATER THAN 3 INCHES AND SHALL HAVE A MINIMUM OF 15 PERCENT BY WEIGHT PASSING THE NO. 200 SIEVE.
5. EMBANKMENT MATERIAL SHALL BE COMPACTED TO AT LEAST 95 PERCENT OF MAXIMUM DENSITY WITHIN 2 PERCENTAGE POINTS OF OPTIMUM DENSITY IN ACCORDANCE WITH ASTM D698.
6. PIPE SCH 40 OR GREATER SHALL BE USED.
7. THE DETAILS SHOWN ON THIS SHEET PERTAIN TO STANDARD SEDIMENT BASIN(S) IDENTIFIED ON THE GESC PLAN VIEW DRAWINGS USED FOR DRAINAGE AREAS LESS THAN 15 ACRES. SEE CONSTRUCTION DRAWINGS FOR EMBANKMENT, STORAGE VOLUME, SPILLWAY, OUTLET, AND OUTLET PROTECTION DETAILS FOR ANY SEDIMENT BASIN(S) THAT HAVE BEEN INDIVIDUALLY DESIGNED FOR DRAINAGE AREAS LARGER THAN 15 ACRES.

SEDIMENT BASIN MAINTENANCE NOTES

1. THE GESC MANAGER SHALL INSPECT SEDIMENT BASIN WEEKLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT AS NECESSARY.
2. SEDIMENT ACCUMULATED IN SEDIMENT BASIN SHALL BE REMOVED WHEN THE SEDIMENT DEPTH IS WITHIN 2.0 FEET OF THE CREST OF THE SPILLWAY.
3. SEDIMENT BASINS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND GRASS COVER IS APPROVED BY THE CITY.
4. IF SEDIMENT BASINS ARE REMOVED, THE DISTURBED AREA SHALL BE SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE CITY.

SB SEDIMENT BASIN 14

Sheet Revisions		
6/30/05	ADOPTED FROM DOUGLAS COUNTY GESC PLANS	MLP
5/ /08	EDIT UPDATES A	GAW
11/ /08	ADD CURB SOCK DETAIL A (REF UDFCD, V3 FIGURE C5-23), MISC. NOTE EDITS	GAW

NOTE: SCALES SHOWN ARE FOR 24"x36" SHEETS; ADJUST ACCORDINGLY FOR 11"x17" SHEETS.

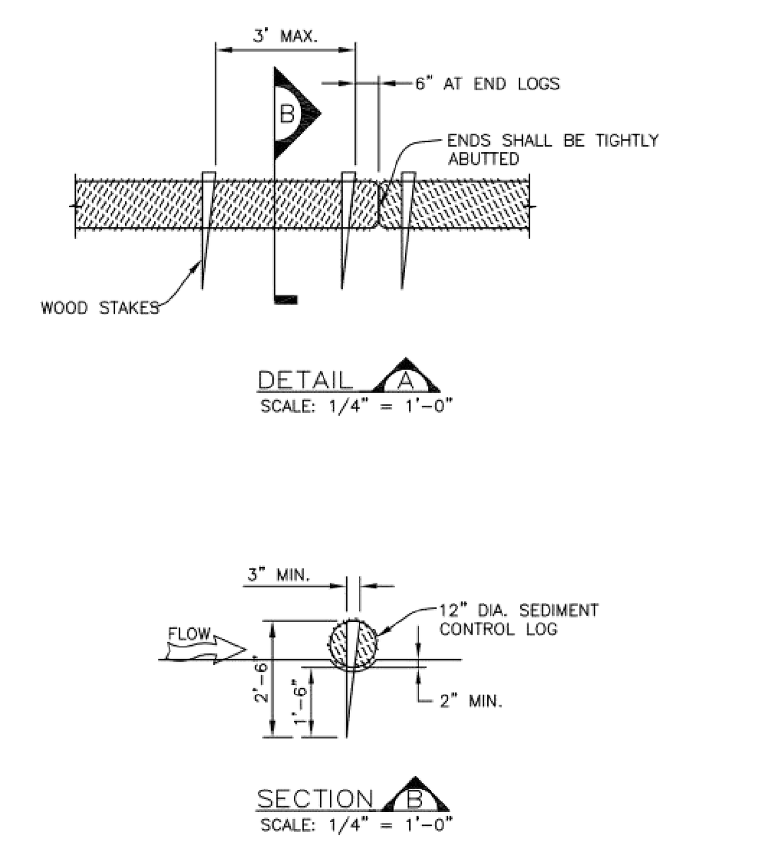
CITY OF LONE TREE

DEPARTMENT OF PUBLIC WORKS
Engineering Division

GESC GRADING, EROSION, AND SEDIMENT CONTROL

GESC PLAN STANDARD NOTES AND DETAILS

SHEET 2 OF 3



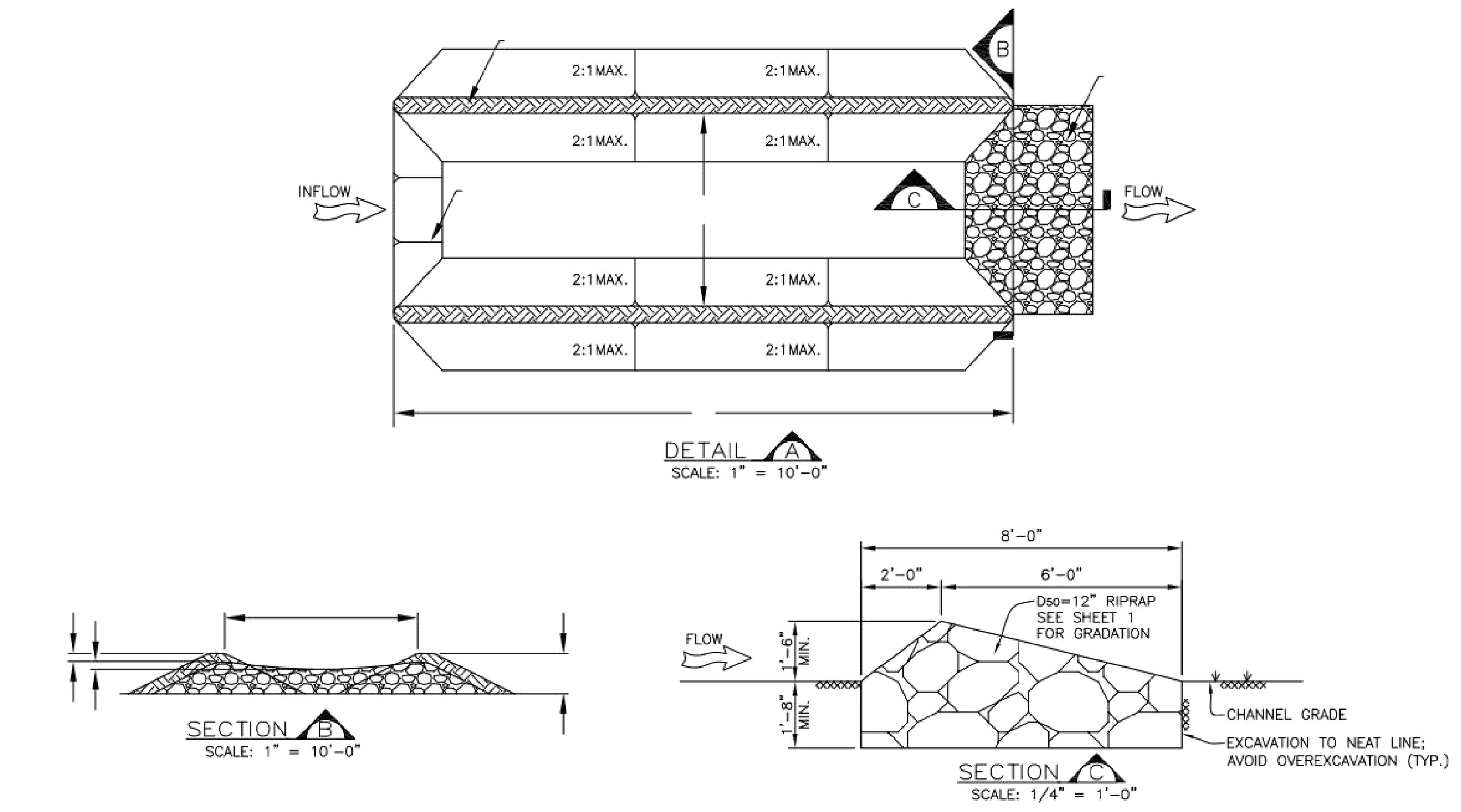
SEDIMENT CONTROL LOG INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATION AND LENGTH OF SEDIMENT CONTROL LOG.
2. SEDIMENT CONTROL LOGS INDICATED ON INITIAL GESC PLAN SHALL BE INSTALLED PRIOR TO ANY LAND-DISTURBING ACTIVITIES.
3. SEDIMENT CONTROL LOGS SHALL CONSIST OF STRAW, COMPOST, EXCELSIOR, OR COCONUT FIBER.
4. NOT FOR USE IN CONCENTRATED FLOW AREAS.
5. THE SEDIMENT CONTROL LOG SHALL BE TRENCHED INTO THE GROUND A MINIMUM OF 2".

SEDIMENT CONTROL LOG MAINTENANCE NOTES

1. THE GESC MANAGER SHALL INSPECT SEDIMENT CONTROL LOGS DAILY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT UPSTREAM SEDIMENT AS NECESSARY.
2. SEDIMENT ACCUMULATED UPSTREAM OF SEDIMENT CONTROL LOGS SHALL BE REMOVED WHEN THE UPSTREAM SEDIMENT DEPTH IS WITHIN ½ THE HEIGHT OF THE CREST OF LOG.
3. SEDIMENT CONTROL LOG SHALL BE REMOVED AT THE END OF CONSTRUCTION. IF ANY DISTURBED AREA EXISTS AFTER REMOVAL, IT SHALL BE DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE CITY.

SCL SEDIMENT CONTROL LOG 15



SEDIMENT TRAP INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATION, LENGTH AND WIDTH OF SEDIMENT TRAP.
2. SEDIMENT TRAPS INDICATED ON INITIAL GESC PLAN SHALL BE INSTALLED PRIOR TO ANY LAND-DISTURBING ACTIVITIES.
3. 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.
4. RIPRAP OUTLET SHALL BE CONSTRUCTED WITH D =12" RIPRAP WITH A MINIMUM OVERFLOW OF 6".
5. THE TOP OF THE EARTHEN BERM SHALL BE A MINIMUM OF 6" HIGHER THAN THE TOP OF THE RIPRAP OUTLET STRUCTURE.
6. THE ENDS OF THE RIPRAP OUTLET STRUCTURE SHALL BE MINIMUM OF 6" HIGHER THAN THE CENTER OF THE OUTLET STRUCTURE.

SEDIMENT TRAP MAINTENANCE NOTES

1. THE GESC MANAGER SHALL INSPECT SEDIMENT TRAPS WEEKLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT UPSTREAM SEDIMENT AS NECESSARY.
2. SEDIMENT ACCUMULATED UPSTREAM OF RIPRAP SHALL BE REMOVED WHEN THE UPSTREAM SEDIMENT DEPTH IS WITHIN ½ THE HEIGHT OF THE RIPRAP OUTLET STRUCTURE.
3. SEDIMENT TRAPS SHALL REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND GRASS COVERAGE IS APPROVED BY THE CITY.
4. WHEN SEDIMENT TRAPS ARE REMOVED THE DISTURBED AREA SHALL BE DRILLED SEEDED AND CRIMP MULCHED OR STABILIZED IN A MANNER APPROVED BY THE CITY.

ST SEDIMENT TRAP 16

SEEDING AND MULCHING INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - AREA OF SEEDING AND MULCHING.
   - TYPE OF SEED MIX (PERMANENT, TEMPORARY, OR LOW-GROWTH).
2. ALL BRANDS FURNISHED SHALL BE FREE FROM SUCH NOXIOUS SEEDS AS RUSSIAN OR CANADIAN THISTLE, COARSE FESCUE, EUROPEAN BINDWEED, JOHNSON GRASS, KNAP WEED AND LEAFY SPURGE.
3. THE SEEDER SHALL FURNISH TO THE CONTRACTOR A SIGNED STATEMENT CERTIFYING THAT THE SEED FURNISHED IS FROM A LOT THAT HAS BEEN TESTED BY A RECOGNIZED LABORATORY. SEED WHICH HAS BECOME WET, MOLDY, OR OTHERWISE DAMAGED IN TRANSIT OR IN STORAGE WILL NOT BE ACCEPTABLE. SEED TICKETS SHALL BE PROVIDED TO CITY OF LONE TREE UPON REQUEST.
4. DRILL SEEDING MIX SHALL CONFORM TO THE TABLE ON THE RIGHT:
5. IF THE SEED AVAILABLE ON THE MARKET DOES NOT MEET THE MINIMUM PURITY AND GERMINATION PERCENTAGES SPECIFIED, THE SUBCONTRACTOR MUST COMPENSATE FOR A LESSER PERCENTAGE OF PURITY OR GERMINATION BY FURNISHING SUFFICIENT ADDITIONAL SEED TO EQUAL THE SPECIFIED PRODUCT. THE TAGS FROM THE SEED MIXES MUST BE SUPPLIED TO CONTRACTOR AND FORWARDED TO THE CITY OF LONE TREE GESC INSPECTOR.
6. THE FORMULA USED FOR DETERMINING THE QUANTITY OF PURE LIVE SEED (PLS) SHALL BE (POUNDS OF SEED) X (PURITY) X (GERMINATION) = POUNDS OF PURE LIVE SEED (PLS).
7. PERMANENT SEED MIX SHALL BE USED UNLESS OTHERWISE APPROVED BY THE CITY.
8. ALL AREAS TO BE SEEDED AND MULCHED SHALL HAVE NATIVE TOPSOIL OR APPROVED SOIL AMENDMENTS SPREAD TO A DEPTH OF AT LEAST 6 INCHES (LOOSE DEPTH). HAUL ROADS AND OTHER COMPACTED AREAS SHALL BE LOOSENED TO A DEPTH OF 6 INCHES PRIOR TO SPREADING TOPSOIL.
9. SOIL IS TO BE THOROUGHLY LOOSENED (TILLED) TO A DEPTH OF AT LEAST 6 INCHES PRIOR TO SEEDING. THE TOP 6 INCHES OF THE SEED BED SHALL BE FREE OF ROCKS GREATER THAN 4 INCHES AND SOIL CLODS GREATER THAN 2 INCHES. SEEDING OVER ANY COMPACTED AREAS THAT HAVEN'T BEEN THOROUGHLY LOOSENED SHALL BE REJECTED.
10. SEED IS TO BE APPLIED USING A MECHANICAL DRILL TO A DEPTH OF 1/4 INCH. ROW SPACING SHALL BE NO MORE THAN 6 INCHES. MATERIAL USED FOR MULCH SHALL CONSIST OF LONG-STEMMED STRAW. AT LEAST 50 PERCENT OF THE MULCH, BY WEIGHT, SHALL BE 10 INCHES OR MORE IN LENGTH. MULCH SHALL BE APPLIED AND MECHANICALLY ANCHORED TO A DEPTH OF AT LEAST 2 INCHES. MULCH SHALL BE APPLIED AT A RATE OF 4000 LB. OF STRAW PER ACRE.
11. IF THE PERMITTEE DEMONSTRATES TO THE CITY THAT IT IS NOT POSSIBLE TO DRILL SEED, SEED IS TO BE UNIFORMLY BROADCAST AT TWO TIMES THE DRILLED RATE, THEN LIGHTLY HARROWED TO PROVIDE A SEED DEPTH OF APPROXIMATELY 1/4 INCH, THEN ROLLED TO COMPACT, THEN MULCHED AS SPECIFIED ABOVE.
12. SEEDING AND MULCHING SHALL BE COMPLETED WITHIN 30 DAYS OF INITIAL EXPOSURE OR 7 DAYS AFTER GRADING IS SUBSTANTIALLY COMPLETE IN A GIVEN AREA (AS DEFINED BY THE CITY). THIS MAY REQUIRE MULTIPLE MOBILIZATIONS FOR SEEDING AND MULCHING.
13. MULCH SHALL BE APPLIED WITHIN 24-HOURS OF SEEDING.
14. TACKIFIER SHOULD BE UTILIZED TO HELP WITH STRAW DISPLACEMENT.

SEEDING AND MULCHING MAINTENANCE NOTES

1. SEEDED AND MULCHED AREAS SHALL BE INSPECTED FOR REQUIRED COVERAGE MONTHLY FOR A PERIOD OF TWO YEARS FOLLOWING INITIAL SEEDING. REPAIRS AND RE-SEEDING AND MULCHING SHALL BE UNDERTAKEN AFTER THE FIRST GROWING SEASON FOR ANY AREAS FAILING TO MEET THE REQUIRED COVERAGE.
2. REQUIRED COVERAGE FOR STANDARD, OPEN SPACE AND LOW GROWTH SEED MIXES SHALL BE DEFINED AS FOLLOWS:
   1. THREE (3) PLANTS PER SQUARE FOOT WITH A MINIMUM HEIGHT OF 3 INCHES. THE 3 PLANTS PER SQUARE FOOT SHALL BE OF THE VARIETY AND SPECIES FOUND IN THE CITY OF LONE TREE-APPROVED MIX.
   2. NO BARE AREAS LARGER THAN 4 SQUARE FEET (TWO-FEET BY TWO-FEET OR EQUIVALENT).
   3. FREE OF ERODED AREAS.
   4. FREE FROM INFESTATION OF NOXIOUS WEEDS IN ACCORDANCE WITH SECTION 6.4 OF THE GESC CRITERIA MANUAL.
3. REQUIRED COVERAGE FOR TURF GRASS AREAS SHALL BE DEFINED AS FOLLOWS:
   1. AT LEAST 80% VEGETATIVE COVER OF GRASS SPECIES PLANTED.
   2. NO BARE AREAS LARGER THAN 4 SQUARE FEET (TWO-FEET BY TWO-FEET OR EQUIVALENT).
   3. FREE OF ERODED AREAS.
   4. FREE FROM INFESTATION OF NOXIOUS WEEDS IN ACCORDANCE WITH SECTION 6.4 OF THE GESC CRITERIA MANUAL.
4. RILL AND GULLY EROSION SHALL BE FILLED WITH TOPSOIL PRIOR TO RESEEDING. THE RESEEDING METHOD SHALL BE APPROVED BY THE CITY.

CITY OF LONE TREE PERMANENT DRILL SEEDING MIX

SPECIES	VARIETY	NOTES	% IN MIX	POUNDS OF PLS PER ACRE
BIG BLUESTEM	KAW	PNWS	10	1.1
YELLOW INDIANGRASS	CHEYENNE	PNWS	10	1
SWITCHGRASS	BLACKWELL	PNWS	10	0.4
SIDEOATS GRAMA	VAUGHN	PNWB	10	0.9
WESTERN WHEATGRASS	ARRIBA	PNCS	10	1.6
BLUE GRAMA	HACHITA	PNWB	10	0.3
THICKSPIKE WHEATGRASS	CRITANA	PNCS	10	1
PRAIRIE SANDREED	GOSHEN	PNWS	10	0.7
GREEN NEEDLEGRASS	LODORM	PNCB	10	1
SLENDER WHEATGRASS	PRYOR	PNCB	5	0.6
STREAMBANK WHEATGRASS	SODAR	PNCS	5	0.6
			TOTAL	9.2

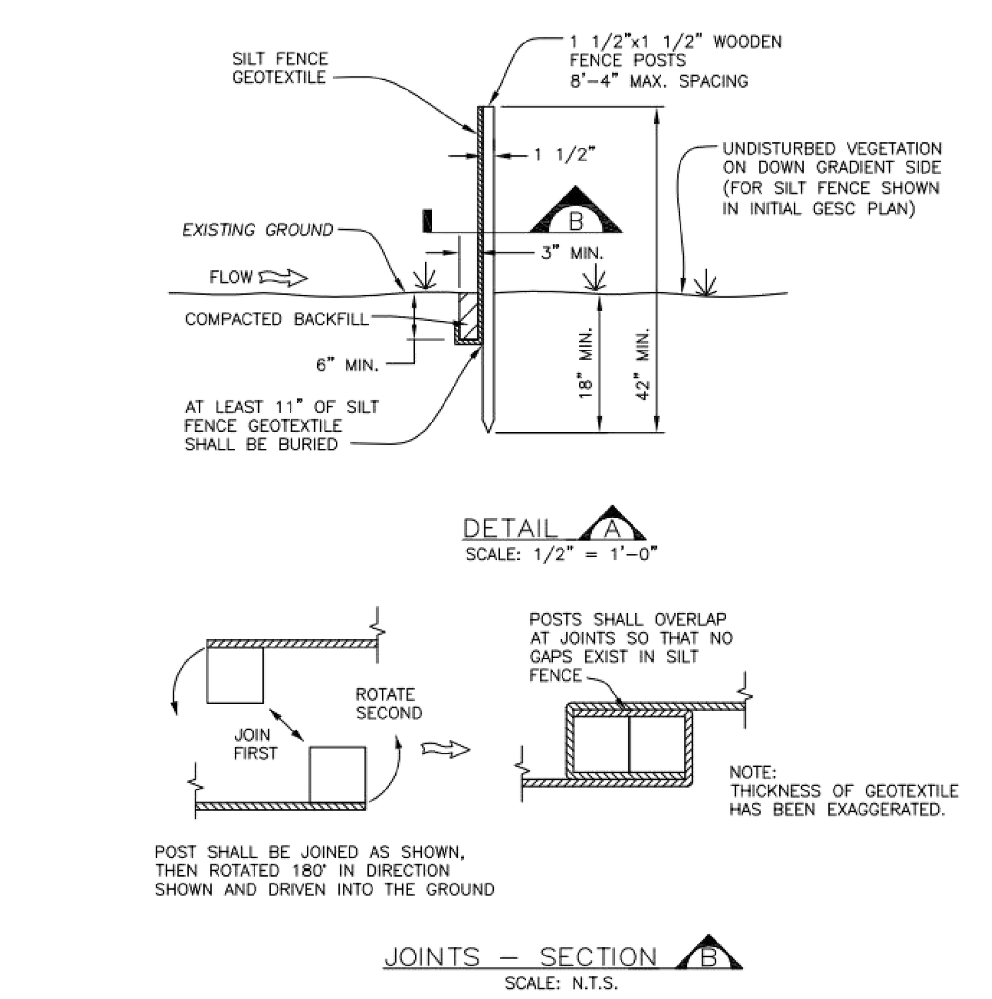
CITY OF LONE TREE TEMPORARY DRILL SEEDING MIX

SPECIES	VARIETY	NOTES	% IN MIX	POUNDS OF PLS PER ACRE
SMOOTH BROMEGRASS	LINCOLN	PICS	30	3.9
INTERMEDIATE WHEATGRASS	OAHE	PICS	30	4.5
PUBESCENT WHEATGRASS	LUNA	PICS	30	4.2
ANNUAL RYEGRASS	N/A	AICB	10	0.8
			TOTAL	13.4

CITY OF LONE TREE LOW-GROWTH DRILL SEEDING MIX

SPECIES	VARIETY	NOTES	% IN MIX	POUNDS OF PLS PER ACRE
BUFFALOGRASS	TEXOKA	PNWS	20	3.2
BLUE GRAMA	HACHITA	PNWB	20	0.6
WESTERN WHEATGRASS	ARRIBA	PNCS	20	3.2
SIDEOATS GRAMA	VAUGHN	PNWB	20	1.8
THICKSPIKE WHEATGRASS	CRITANA	PNCS	10	1
STREAMBANK WHEATGRASS	SODAR	PNCS	10	1.2
			TOTAL	11.0

SM SEEDING AND MULCHING 17 A



SILT FENCE INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATION AND LENGTH OF FENCE.
2. ANCHOR TRENCH SHALL BE EXCAVATED WITH TRENCHER, OR WITH SILT FENCE INSTALLATION MACHINE; NO ROAD GRADERS, BACKHOES, ETC. SHALL BE USED. TRENCH SHALL BE COMPACTED BY HAND, WITH "JUMPING JACK", OR BY WHEEL ROLLING. COMPACTION SHALL BE SUCH THAT SILT FENCE RESISTS BEING PULLED OUT OF ANCHOR TRENCH BY HAND.
3. SILT FENCE GEOTEXTILE SHALL MEET THE FOLLOWING REQUIREMENTS:
   - 6-TO 12-GALLONS PER MINUTE PER SQUARE FOOT FLOW CAPACITY.
   - 90 LB. TENSILE STRENGTH PER ASTM D4622.
   - UV DESIGN AT 500 HRS MIN. 70% STRENGTH RETAINED PER ASTM D 4355.
4. SILT FENCE INDICATED ON INITIAL GESC PLAN SHALL BE INSTALLED PRIOR TO ANY LAND-DISTURBING ACTIVITIES.

SILT FENCE MAINTENANCE NOTES

1. THE GESC MANAGER SHALL INSPECT SILT FENCE DAILY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT UPSTREAM SEDIMENT AS NECESSARY.
2. SEDIMENT ACCUMULATED UPSTREAM OF SILT FENCE SHALL BE REMOVED WHEN THE UPSTREAM SEDIMENT REACHES A DEPTH OF 6-INCHES.
3. SILT FENCE SHALL BE REMOVED WHEN THE UPSTREAM DISTURBED AREA IS STABILIZED AND GRASS COVER IS APPROVED BY THE CITY. IF ANY DISTURBED AREA EXISTS AFTER REMOVAL, IT SHALL BE SEEDED AND MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE CITY.

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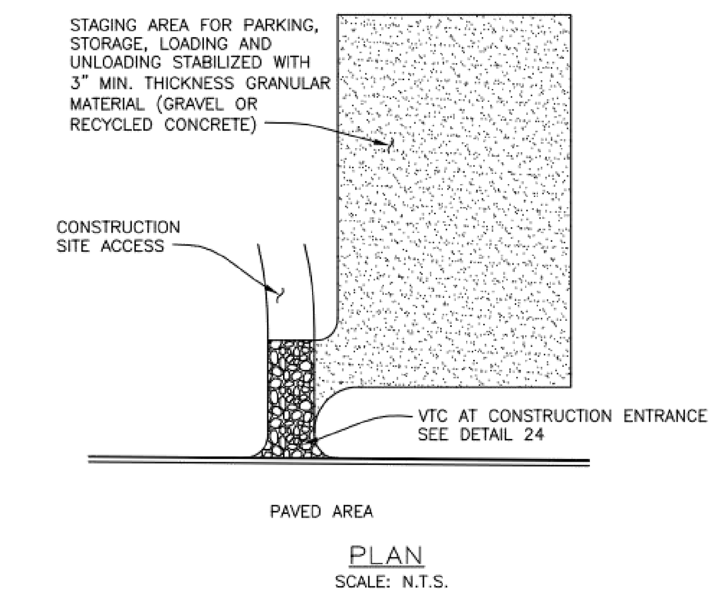


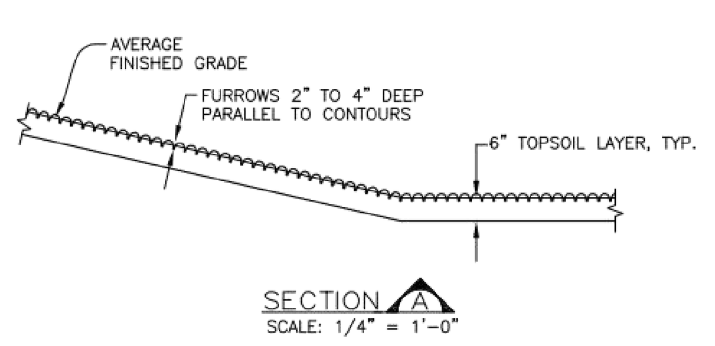
STABILIZED STAGING AREA INSTALLATION NOTES

1. SEE PLAN VIEW FOR GENERAL LOCATION OF STAGING AREA. CONTRACTOR MAY MODIFY LOCATION AND SIZE OF STABILIZED STAGING AREA WITH CITY APPROVAL.
2. STABILIZED STAGING AREA SHALL BE LARGE ENOUGH TO FULLY CONTAIN PARKING, STORAGE, AND UNLOADING AND LOADING OPERATIONS.
3. IF REQUIRED BY THE CITY, SITE ACCESS ROADS SHALL BE STABILIZED IN THE SAME MANNER AS THE STAGING AREA.
4. STAGING AREA SHALL BE STABILIZED PRIOR TO ANY OTHER OPERATIONS ON THE SITE.
5. THE STABILIZED STAGING AREA SHALL CONSIST OF A MINIMUM OF 3" OF GRANULAR MATERIAL (GRAVEL OR RECYCLED CONCRETE).

STABILIZED STAGING AREA MAINTENANCE NOTES

1. THE GESC MANAGER SHALL INSPECT THE STABILIZED STAGING AREA WEEKLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT UPSTREAM SEDIMENT AS NECESSARY.
2. GESC MANAGER SHALL PROVIDE ADDITIONAL THICKNESS OF GRANULAR MATERIAL IF ANY RUTTING OCCURS OR UNDERLYING SUBGRADE BECOMES EXPOSED.
3. STABILIZED STAGING AREA SHALL BE ENLARGED IF NECESSARY TO CONTAIN PARKING, STORAGE, AND UNLOADING AND LOADING OPERATIONS.
4. ANY ACCUMULATED DIRT OR MUD SHALL BE REMOVED FROM THE SURFACE OF THE STABILIZED STAGING AREA.
5. THE STABILIZED STAGING AREA SHALL BE REMOVED AT THE END OF CONSTRUCTION. THE GRANULAR MATERIAL SHALL BE REMOVED OR, IF APPROVED BY THE CITY, USED ON SITE, AND THE AREA TOPSOILED, DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE STABILIZED.

SSA STABILIZED STAGING AREA 19 A



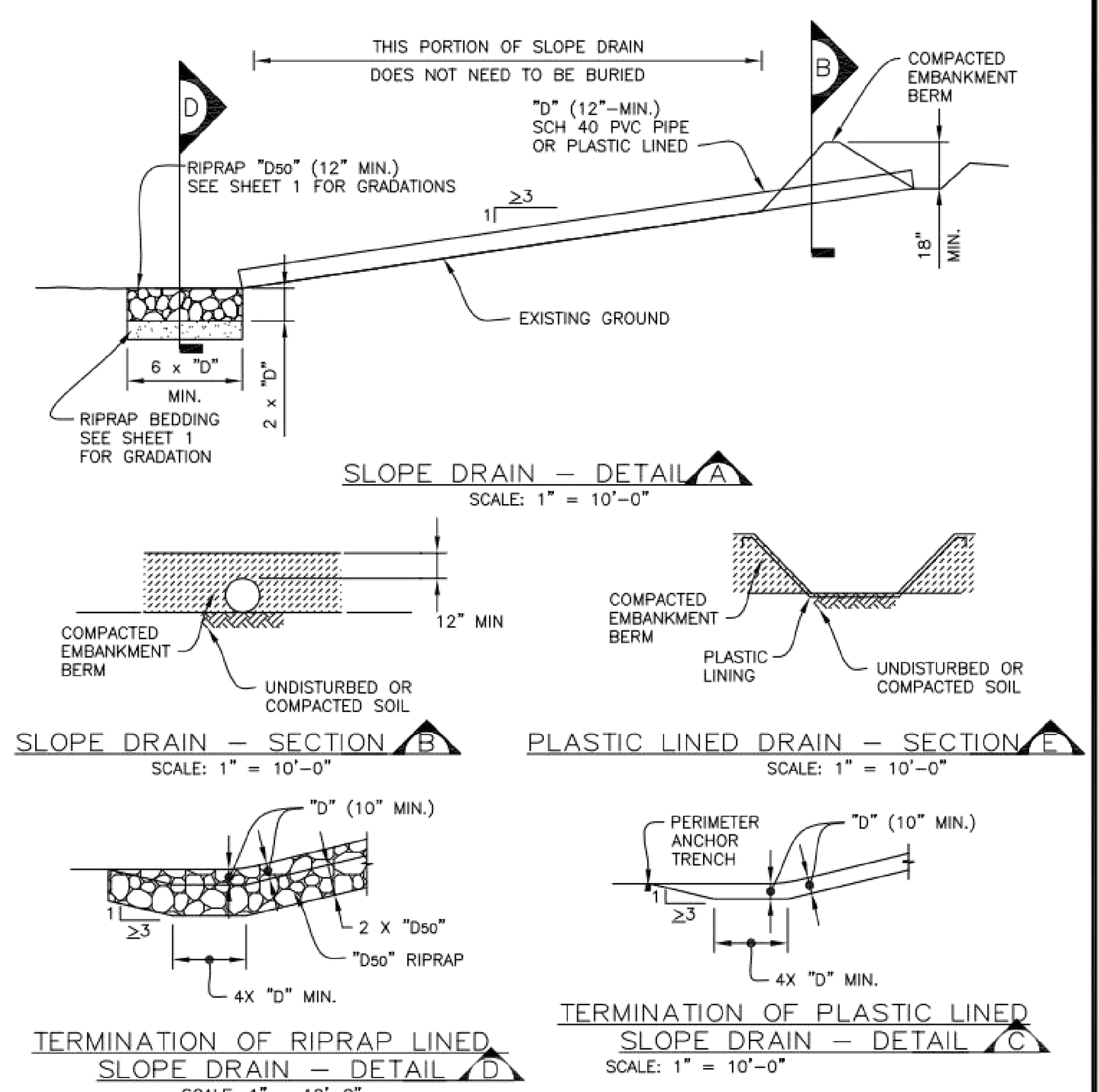
SURFACE ROUGHENING INSTALLATION NOTES

1. SURFACE ROUGHENING SHALL BE PROVIDED ON ALL FINISHED GRADES (SLOPES AND "FLAT" AREAS) WITHIN 2 DAYS OF COMPLETION OF FINISHED GRADE (FOR AREAS NOT RECEIVING TOPSOIL) OR WITHIN 2 DAYS OF TOPSOIL PLACEMENT.
2. AREAS WHERE BUILDING FOUNDATIONS, PAVEMENT, OR SOD IS TO BE PLACED WITHIN 7-DAYS OF FINISHED GRADING DO NOT NEED TO BE SURFACE ROUGHENED.
3. DISTURBED SURFACES SHALL BE ROUGHENED USING RIPPING OR TILLING EQUIPMENT ON THE CONTOUR OR TRACKING UP AND DOWN A SLOPE USING EQUIPMENT TREADS.

SURFACE ROUGHENING MAINTENANCE NOTES

1. THE GESC MANAGER SHALL INSPECT THE SURFACE ROUGHENING WEEKLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT UPSTREAM SEDIMENT AS NECESSARY.
2. VEHICLES AND EQUIPMENT SHALL GENERALLY BE CONFINED TO ACCESS DRIVES AND SHALL NOT BE DRIVEN OVER AREAS THAT HAVE BEEN SURFACE ROUGHENED.
3. IN NON-TURF GRASS FINISHED AREAS, SEEDING AND MULCHING SHALL TAKE PLACE DIRECTLY OVER SURFACE ROUGHENED AREAS WITHOUT FIRST SMOOTHING OUT THE SURFACE.
4. IN AREAS NOT SEEDED AND MULCHED AFTER SURFACE ROUGHENING, SURFACES SHALL BE RE-ROUGHENED AS NECESSARY TO MAINTAIN GROOVE DEPTH AND SMOOTH OVER ANY RILL EROSION.

SR SURFACE ROUGHENING 20



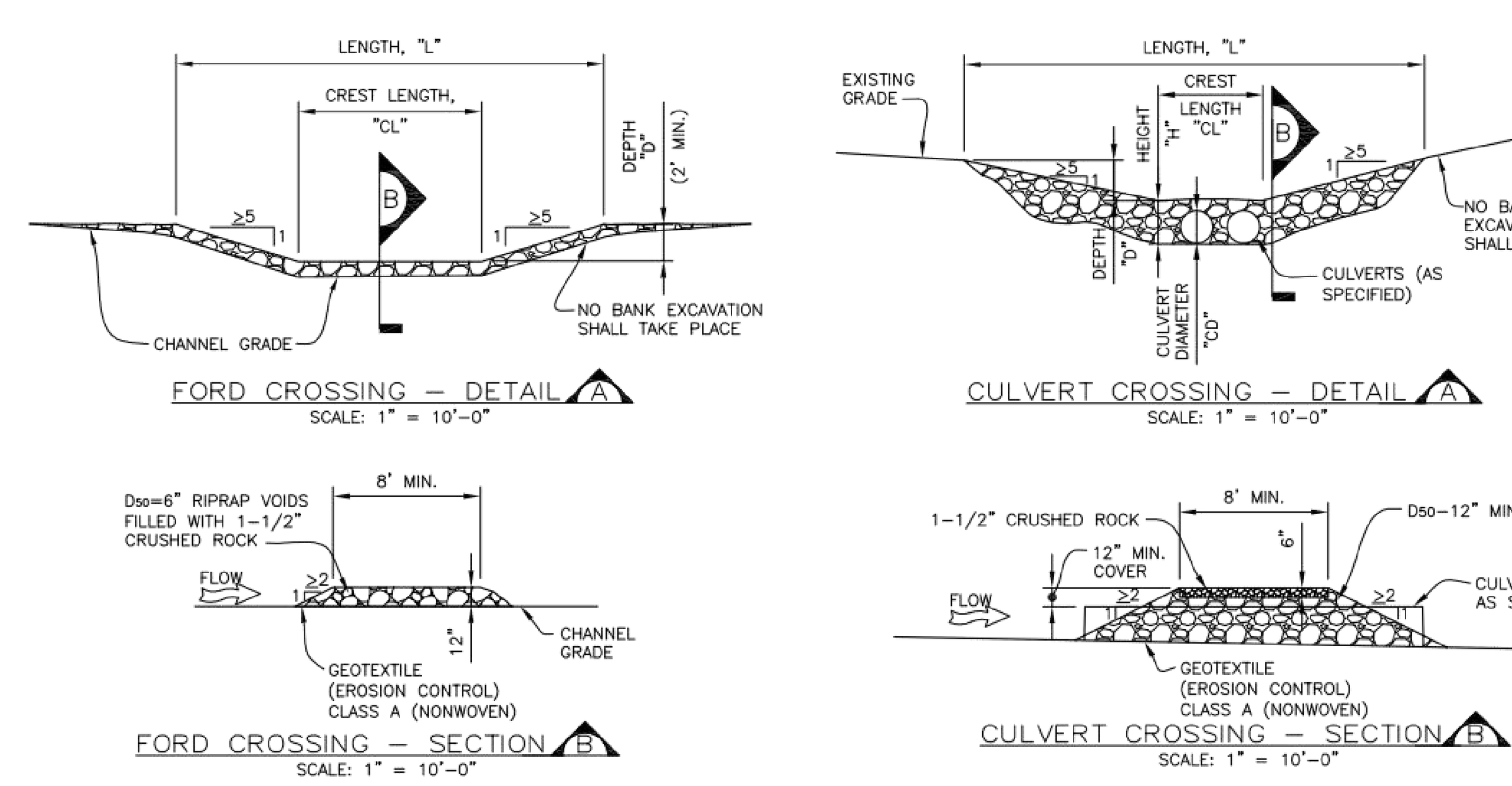
SLOPE DRAIN INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATION AND LENGTH OF SLOPE DRAIN.
   - PIPE DIAMETER, "D", AND RIPRAP SIZE, "D50".
2. SLOPE DRAIN DIMENSIONS SHALL BE CONSIDERED MINIMUM DIMENSIONS; CONTRACTOR MAY ELECT TO INSTALL LARGER FACILITIES. ANY DAMAGE TO SLOPE OR SLOPE DRAIN DURING RUNOFF EVENTS SHALL BE THE CONTRACTOR'S RESPONSIBILITY.
3. SLOPE DRAINS INDICATED ON INITIAL GESC PLAN SHALL BE INSTALLED PRIOR TO ANY UPSTREAM LAND-DISTURBING ACTIVITIES.
4. FOR TEMPORARY SLOPE DRAINS, PIPE MAY BE INSTALLED ON TOP OF SLOPE; HOWEVER, 12" MIN. COVER AT TOP OF SLOPE SHALL BE PROVIDED.
5. A RIPRAP PAD SHALL BE PLACED AT THE OUTFALL OF THE SLOPE DRAIN.

SLOPE DRAIN MAINTENANCE NOTES

1. THE GESC MANAGER SHALL INSPECT SLOPE DRAINS WEEKLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS AS NECESSARY.
2. TEMPORARY SLOPE DRAINS ARE TO REMAIN IN PLACE UNTIL NO LONGER NEEDED, BUT SHALL BE REMOVED PRIOR TO THE END OF CONSTRUCTION. WHEN SLOPE DRAINS ARE REMOVED, THE DISTURBED AREA SHALL BE DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE CITY.

TSD TEMPORARY SLOPE DRAIN 21 A



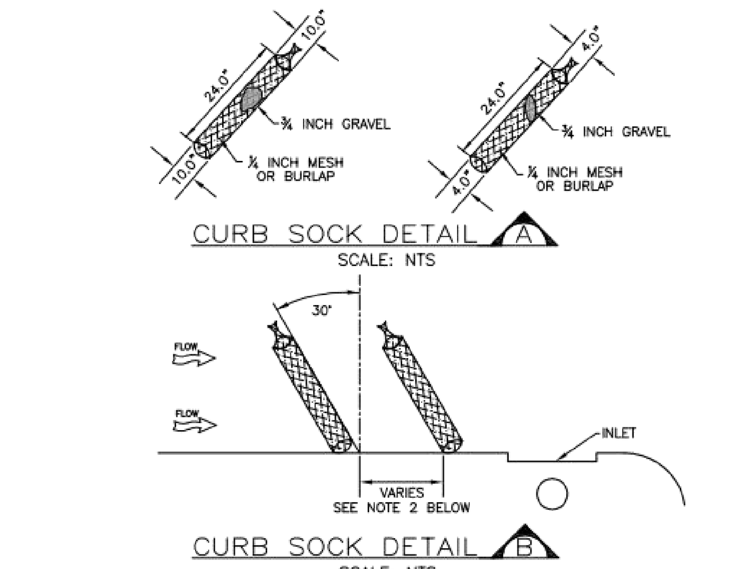
TEMPORARY STREAM CROSSING INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - LOCATIONS OF TEMPORARY STREAM CROSSING.
   - STREAM CROSSING TYPE (FORD OR CULVERT).
   - FOR FORD CROSSING: LENGTH, "L", CREST LENGTH, "CL", AND DEPTH, "D".
   - FOR CULVERT CROSSING : LENGTH, "L", CREST LENGTH, "CL", CROSSING HEIGHT, "H", DEPTH, "D", CULVERT DIAMETER, "CD", AND NUMBER, TYPE AND CLASS OR GAUGE OF CULVERTS.
2. TEMPORARY STREAM CROSSING DIMENSIONS, D50, AND NUMBER OF CULVERTS INDICATED (FOR CULVERT CROSSING) SHALL BE CONSIDERED MINIMUM DIMENSIONS; ENGINEER MAY ELECT TO INSTALL LARGER FACILITIES. ANY DAMAGE TO STREAM CROSSING OR EXISTING STREAM CHANNEL DURING BASEFLOW OR FLOOD EVENTS SHALL BE THE CONTRACTOR'S RESPONSIBILITY.
3. SEE SHEET 1 FOR RIPRAP AND 1-1/2" CRUSHED ROCK GRADATIONS.
4. FOR A TEMPORARY STREAM CROSSING THAT WILL CARRY LOADS, THE TEMPORARY STREAM CROSSING MUST BE DESIGNED BY THE DESIGN ENGINEER.

TEMPORARY STREAM CROSSING MAINTENANCE NOTES

1. THE GESC MANAGER SHALL INSPECT STREAM CROSSINGS WEEKLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT UPSTREAM SEDIMENT AS NECESSARY.
2. SEDIMENT ACCUMULATED UPSTREAM OF STREAM CROSSINGS SHALL BE REMOVED WHEN THE SEDIMENT DEPTH UPSTREAM OF CROSSING IS WITHIN 6-INCHES OF THE CREST (FORD CROSSING) OR GREATER THAN AN AVERAGE DEPTH OF 12-INCHES (CULVERT CROSSING).
3. STREAM CROSSINGS ARE TO REMAIN IN PLACE UNTIL NO LONGER NEEDED, BUT SHALL BE REMOVED PRIOR TO THE END OF CONSTRUCTION.
4. WHEN STREAM CROSSINGS ARE REMOVED, THE DISTURBED AREA SHALL BE DRILL SEEDED AND CRIMP MULCHED AND COVERED WITH EROSION CONTROL BLANKET OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE CITY.

TSC TEMPORARY STREAM CROSSING 22



CURB SOCK INSTALLATION NOTES

1. SOCKS WILL BE USED UPGRADIENT OF INLET PERPENDICULAR TO AND FLUSH WITH CURB.
2. NO LESS THAN TWO 10" DIAMETER SOCKS MUST BE USED IN SEQUENCE, SPACED NO MORE THAN 5 FEET APART.
   NO LESS THAN SIX SOCKS SHALL BE USED IF THE 4" SOCK IS USED, ALSO SPACED AT NO MORE THAN 5 FEET APART.
3. INCLINE AT 30 DEGREES FROM PERPENDICULAR, OPPOSITE THE DIRECTION OF FLOW (SEE DETAIL B).

CURB SOCK MAINTENANCE NOTES

1. THE GESC MANAGER SHALL INSPECT THE CURB SOCKS WEEKLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT UPGRADIENT SEDIMENT AS NECESSARY.

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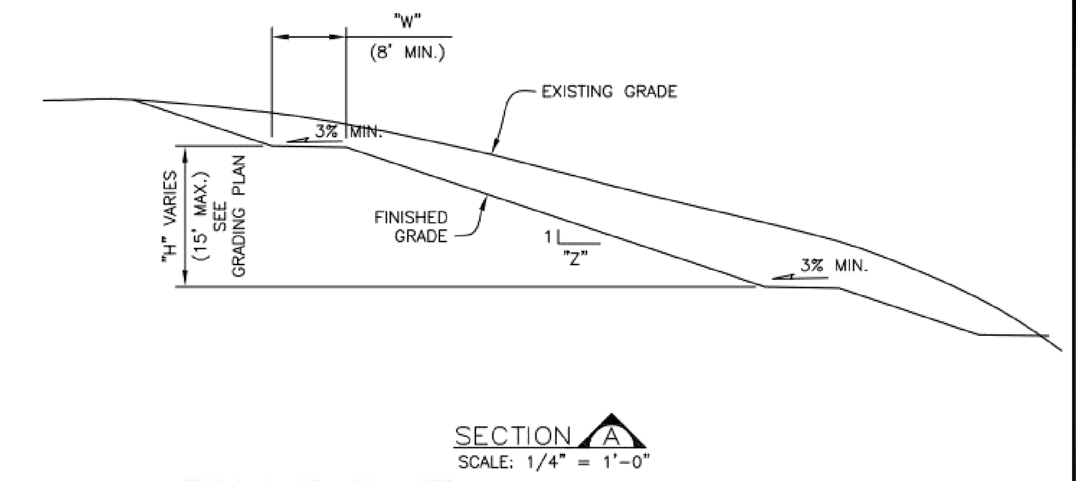


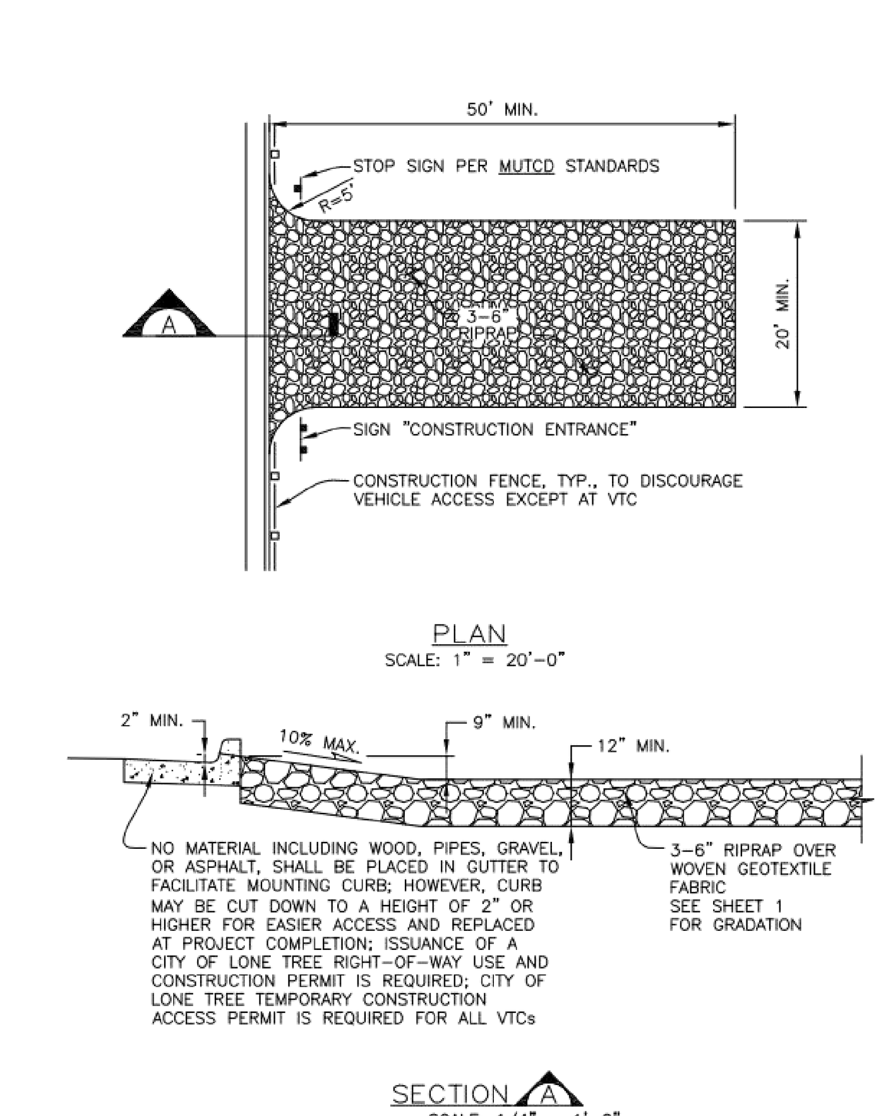
TERRACING INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - WIDTH, "W", AND SLOPE, "Z".
2. TERRACING IS NOT REQUIRED FOR SLOPES OF 4 TO 1 OR FLATTER.
3. EARTH (VEGETATED) SLOPES STEEPER THAN 3 TO 1 ARE NOT ALLOWED ON THE SITE.

TERRACING MAINTENANCE NOTES

1. THE GESC MANAGER SHALL INSPECT THE SURFACE ROUGHENING WEEKLY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT UPSTREAM SEDIMENT AS NECESSARY.
2. ANY RILL EROSION OCCURRING ON SLOPES SHALL BE REPAIRED AND RESEEDED AND MULCHED IN ACCORDANCE WITH DETAIL 17.

TER TERRACING 23



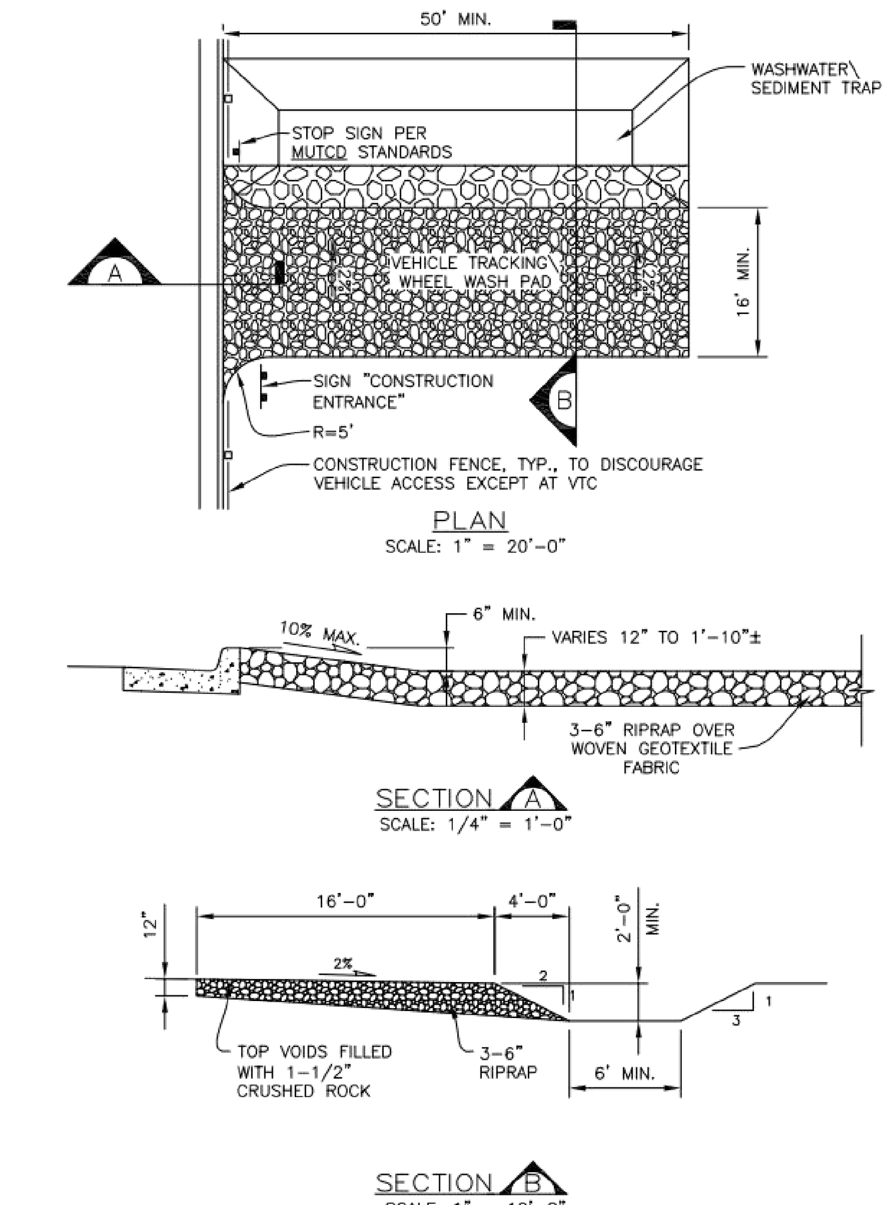
VEHICLE TRACKING CONTROL INSTALLATION NOTES

1. VEHICLE TRACKING CONTROL PADS SHALL BE INSTALLED AT EVERY ACCESS POINT TO SITE.
2. VEHICLE TRACKING CONTROL PADS SHALL CONSIST OF HARD, DENSE, DURABLE STONE, ANGULAR IN SHAPE AND RESISTANT TO WEATHERING. ROUNDED STONE OR BOULDERS WILL NOT BE ACCEPTABLE. THE STONES SHALL BE 3" WITH A MAXIMUM SIZE OF 6". THE STONE SHALL HAVE A SPECIFIC GRAVITY OF AT LEAST 2.6. CONTROL OF GRADATION WILL BE BY VISUAL INSPECTIONS.
3. WOVEN GEOTEXTILE FABRIC SHALL BE PLACED UNDER THE VTC STONE TO HELP MINIMIZE MIGRATION OF THE STONE INTO THE UNDERLYING MATERIAL.
4. ANY CRACKED OR DAMAGED CURB AND GUTTER AND SIDEWALK SHALL BE REPLACED BY PERMITTEE.
5. A CITY OF LONE TREE TEMPORARY CONSTRUCTION ACCESS PERMIT IS REQUIRED FOR EACH ACCESS/EXIT POINT FROM THE SITE.
6. A STOP SIGN INSTALLED IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), AS AMENDED, SHALL BE INSTALLED FOR EXITING TRAFFIC AT THE VTC.

VEHICLE TRACKING CONTROL MAINTENANCE NOTES

1. GESC MANAGER SHALL INSPECT VEHICLE TRACKING CONTROL PADS DAILY. ACCUMULATED SEDIMENTS SHALL BE REMOVED FROM PAD SURFACE. STONE SURFACE SHALL BE CLEAN AND LOOSE ENOUGH TO RUT SLIGHTLY UNDER WHEEL LOADS SUFFICIENTLY TO CAUSE LOOSE GRAVEL TO DISLODGE MUD/SEDIMENT FROM VEHICLE TIRES. WHEN STONE BECOMES COMPACTED AND/OR FILLED WITH SEDIMENT SO THAT THE EFFECTIVENESS OF THE PAD IS DIMINISHED, CONTRACTOR SHALL RIP, TURN OVER, OR OTHERWISE LOOSEN THE STONE, PLACE ADDITIONAL NEW STONE, OR REPLACE STONE AS NECESSARY TO RESTORE EFFECTIVENESS.
2. VEHICLE TRACKING CONTROL SHALL BE REMOVED AT THE END OF CONSTRUCTION, THE STONE MATERIAL AND GEOTEXTILE REMOVED OR, IF APPROVED BY THE CITY, USED ON SITE, AND THE AREA TOPSOILED, DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE STABILIZED IN CONFORMANCE WITH CITY APPROVED PLANS FOR SITE AND THE APPLICABLE GESC PERMIT.

VTC VEHICLE TRACKING CONTROL 24 C



VEHICLE TRACKING CONTROL WITH WHEEL WASH INSTALLATION NOTES

1. ALTHOUGH NOT NORMALLY USED, THE CITY RESERVES THE RIGHT TO REQUIRE VEHICLE TRACKING CONTROL WITH WHEEL WASH FACILITIES AT SITES WHERE TRACKING ONTO PAVED AREAS BECOMES A SIGNIFICANT PROBLEM.
2. IF VEHICLE TRACKING CONTROL WITH WHEEL WASH FACILITIES ARE REQUIRED, ALL WHEELS ON EVERY VEHICLE LEAVING THE SITE SHALL BE CLEANED OF MUD USING A PRESSURE-WASHER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING A WATER SOURCE.
3. VEHICLE TRACKING CONTROL PADS SHALL CONSIST OF HARD, DENSE, DURABLE STONE, ANGULAR IN SHAPE AND RESISTANT TO WEATHERING. ROUNDED STONE OR BOULDERS WILL NOT BE ACCEPTABLE. THE STONES SHALL BE 3" WITH A MAXIMUM SIZE OF 6". THE STONE SHALL HAVE A SPECIFIC GRAVITY OF AT LEAST 2.6. CONTROL OF GRADATION WILL BE BY VISUAL INSPECTION.
4. WOVEN GEOTEXTILE FABRIC SHALL BE PLACED UNDER THE VTC STONE TO HELP MINIMIZE MIGRATION OF THE STONE INTO THE UNDERLYING BASE MATERIAL.
5. ANY CRACKED OR DAMAGED CURB AND GUTTER AND SIDEWALK SHALL BE REPLACED BY PERMITEE.
6. A CITY OF LONE TREE TEMPORARY CONSTRUCTION ACCESS PERMIT IS REQUIRED FOR EACH ACCESS/EXIT POINT FROM THE SITE.
7. A STOP SIGN INSTALLED IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), AS AMENDED, SHALL BE INSTALLED FOR EXITING TRAFFIC AT THE VTC.

VEHICLE TRACKING CONTROL WITH WHEEL WASH MAINTENANCE NOTES

1. GESC MANAGER SHALL INSPECT VEHICLE TRACKING CONTROL PADS DAILY. ACCUMULATED SEDIMENTS SHALL BE REMOVED FROM PAD SURFACE. STONE SURFACE SHALL BE CLEAN AND LOOSE ENOUGH TO RUT SLIGHTLY UNDER WHEEL LOADS SUFFICIENTLY TO CAUSE LOOSE GRAVEL TO DISLODGE MUD/SEDIMENT FROM VEHICLE TIRES. WHEN STONE BECOMES COMPACTED AND/OR FILLED WITH SEDIMENT SO THAT THE EFFECTIVENESS OF THE PAD IS DIMINISHED, CONTRACTOR SHALL RIP, TURN OVER, OR OTHERWISE LOOSEN THE STONE, PLACE ADDITIONAL NEW STONE, OR REPLACE STONE AS NECESSARY TO RESTORE EFFECTIVENESS.
2. ACCUMULATED SEDIMENT IN THE WASHWATER/SEDIMENT TRAP SHALL BE REMOVED WHEN THE SEDIMENT DEPTH REACHES AN AVERAGE OF 12-INCHES.
3. VEHICLE TRACKING CONTROL SHALL BE REMOVED AT THE END OF CONSTRUCTION, THE STONE MATERIAL AND GEOTEXTILE REMOVED OR, IF APPROVED BY THE CITY, USED ON SITE, AND THE AREA TOPSOILED, DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE STABILIZED IN CONFORMANCE WITH CITY APPROVED PLANS FOR SITE AND THE APPLICABLE GESC PERMIT.

WW VTC WITH WHEEL WASH 25 C

Sheet Revisions

6/30/05	ADOPTED FROM DOUGLAS COUNTY GESC PLANS	MLP
5/ /08	EDIT UPDATES A	GAW
11/ /08	ADD CURB SOCK DETAIL B (REF UDFCD, V3 FIGURE C5-23), MISC. NOTE EDITS	GAW
12/ /09	UPDATE VTC & WW C	GAW

NOTE: SCALES SHOWN ARE FOR 24"x36" SHEETS; ADJUST ACCORDINGLY FOR 11"x17" SHEETS.

CITY OF LONE TREE
DEPARTMENT OF PUBLIC WORKS
Engineering Division

GESC GRADING, EROSION, AND SEDIMENT CONTROL

GESC PLAN STANDARD NOTES AND DETAILS

Appendix E

City of Lone Tree GESC Plan and Report Checklist

CITY OF LONE TREE

CITY OF LONE TREE
GESC PLAN AND REPORT CHECKLIST

Project: Park Meadows - Garage and Retail	**Date:** 03-08-2024

All Plan Sheets

Yes ☒	No ☐	N/A ☐	1.	Title Block (consistent on all sheets)
Yes ☒	No ☐	N/A ☐	2.	Legal Name (Subdivision Name and Filing Number)
Yes ☒	No ☐	N/A ☐	3.	Sheet Number
Yes ☒	No ☐	N/A ☐	4.	Graphic and Written Scale
Yes ☒	No ☐	N/A ☐	5.	North Arrow
Yes ☒	No ☐	N/A ☐	6.	Current Date of Plan Preparation
Yes ☒	No ☐	N/A ☐	7.	City Acceptance Block (available upon request)

Cover Sheet

Yes ☒	No ☐	N/A ☐	1.	Project name
Yes ☒	No ☐	N/A ☐	2.	Project address
Yes ☒	No ☐	N/A ☐	3.	Owner (and Applicant's if different) name and address
Yes ☒	No ☐	N/A ☐	4.	Design firm's name and address
Yes ☒	No ☐	N/A ☐	5.	Plan sheet index
Yes ☒	No ☐	N/A ☐	6.	Original date of preparation and subsequent revisions
Yes ☒	No ☐	N/A ☐	7.	The following note:

THE ***GRADING, EROSION AND SEDIMENT CONTROL PLAN*** INCLUDED HEREIN HAS BEEN PLACED IN THE CITY OF LONE TREE FILE FOR THIS PROJECT AND APPEARS TO FULFILL APPLICABLE LONE TREE GRADING, EROSION AND SEDIMENT CONTROL CRITERIA, AS AMENDED. ADDITIONAL GRADING, EROSION AND SEDIMENT CONTROL MEASURES MAY BE REQUIRED OF THE PERMITTEES DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT FUNCTION AS INTENDED. THE REQUIREMENTS OF THIS PLAN SHALL RUN WITH THE LAND AND BE THE OBLIGATION OF THE PERMITTEES, UNTIL SUCH TIME AS THE PLAN IS PROPERLY COMPLETED, MODIFIED OR VOIDED.

Yes ☒	No ☐	N/A ☐	8.	GESC Plan Designer's signature block with name, date, and Professional Engineer registration number. Signature block shall include the following note:

THE ***GRADING, EROSION AND SEDIMENT CONTROL PLAN*** INCLUDED HEREIN HAS BEEN PREPARED UNDER MY DIRECT SUPERVISION IN ACCORDANCE WITH THE REQUIREMENTS OF THE *GRADING, EROSION, AND SEDIMENT CONTROL (GESC) CRITERIA MANUAL* OF DOUGLAS COUNTY AS AMENDED.

Yes ☒	No ☐	N/A ☐	9.	General Location Map (at a reasonable scale) indicating:

a. general vicinity of the site location
b. major roadway names
c. north arrow and scale

GESC Drawing Index Sheet (if applicable) None Applicable

For projects that require multiple plan-view sheets to adequately show the project area (based on the specified scale ranges), a single plan-view sheet shall be provided at a scale appropriate to show the entire site on one sheet. Areas of coverage of the multiple blow-up sheets are to be indicated as rectangles on the index sheet.

Initial GESC Plan

Yes ☒	No ☐	N/A ☐	1.	Property Lines
Yes ☒	No ☐	N/A ☐	2.	Existing and proposed easements
Yes ☒	No ☐	N/A ☐	3.	Existing topography at one- or two-foot contour intervals, extending a minimum of 100 feet beyond the property line
Yes ☒	No ☐	N/A ☐	4.	Location of any existing structures or hydrologic features within the mapping limits
Yes ☒	No ☐	N/A ☐	5.	USGS Benchmark used for project
Yes ☒	No ☐	N/A ☐	6.	Limits of construction encompassing all areas of work, including: • Access points, storage and staging areas, borrow areas, stockpiles, and utility tie-in locations in on-site and off-site locations • Stream corridors and other resource areas to be preserved and all other areas outside the limits of construction shall be lightly shaded to clearly show area not to be disturbed.
Yes ☒	No ☐	N/A ☐	7.	Location of stockpiles, including topsoil, imported aggregates, and excess material
Yes ☒	No ☐	N/A ☐	8.	Location of storage and staging areas for equipment, fuel, lubricant, chemical (and other materials) and waste storage
Yes ☐	No ☐	N/A ☒	9.	Location of borrow or disposal areas Dirt to be imported offsite
Yes ☐	No ☐	N/A ☒	10.	Location of temporary roads Temporary roads not needed
Yes ☒	No ☐	N/A ☐	11.	Location, map symbol, and letter callouts of all initial erosion and sediment control BMPs
Yes ☒	No ☐	N/A ☐	12.	Information to be specified for each BMP, such as type and dimensions, as called for in the Standard Notes and Details
Yes ☒	No ☐	N/A ☐	13.	The following note: • SEE COVER SHEET OF LONE TREE STANDARD NOTES AND DETAILS (SHEET 1 OF 3) FOR LEGEND OF BMP NAMES AND SYMBOLS.
Yes ☐	No ☐	N/A ☒	14.	Other information as may be reasonably required by Lone Tree

Interim GESC Plan

Yes ☒	No ☐	N/A ☐	1.	Items 1, 2, and 4 through 10 from the Initial GESC Plan
Yes ☒	No ☐	N/A ☐	2.	Existing topography at one- or two-foot contour intervals extending a minimum of 100 feet beyond the property line, as shown on Initial GESC Plan. **These contours shall be screened.**
Yes ☒	No ☐	N/A ☐	2.	Location of all existing erosion and sediment control measures on site, as shown on the Initial GESC Plan Sheet. **These control measures shall be screened. Dimension information for initial stage BMPs shall not be shown.**
Yes ☒	No ☐	N/A ☐	3.	Proposed topography at one- or two-foot contour intervals, showing elevations, dimensions, locations, and slope of all proposed grading
Yes ☒	No ☐	N/A ☐	4.	Outlines of cut and fill areas
Yes ☒	No ☐	N/A ☐	5.	Location of all interim erosion and sediment controls, designed in conjunction with the proposed site topography, but also considering the controls designed for the existing topography.
Yes ☒	No ☐	N/A ☐	6.	Locations of all buildings, drainage features and facilities, paved areas, retaining walls, cribbing, water quality facilities, or other permanent features to be constructed in connection with, or as a part of, the proposed work, per approved plat, SIP, RSP, or other improvement plan.
Yes ☒	No ☐	N/A ☐	7.	The following notes: • SEE COVER SHEET OF LONE TREE STANDARD NOTES AND DETAILS (SHEET 1 OF 3) FOR LEGEND OF BMP NAMES AND SYMBOLS. • SHADED BMPS INSTALLED IN THE INITIAL STAGE SHALL BE LEFT IN PLACE IN THE INTERIM STAGE. • ALL INTERIM BMPS, INCLUDING SEEDING AND MULCHING OF DISTURBED AREAS, MUST BE COMPLETED PRIOR TO ISSUANCE OF ANY CURB AND GUTTER PERMITS. • SEE CONSTRUCTION PLANS FOR DETAILS OF PERMANENT DRAINAGE FACILITIES SUCH AS DETENTION FACILITIES, CULVERTS, STORM DRAINS, AND INLET AND OUTLET PROTECTION.
Yes ☒	No ☐	N/A ☐	8.	Summary of cut and fill volumes
Yes ☐	No ☐	N/A ☒	9.	Other information as may be reasonably required by Lone Tree

Final GESC Plan

Yes ☒	No ☐	N/A ☐	1.	Items 1, 2, and 5 from the Initial GESC Plan
Yes ☒	No ☐	N/A ☐	2.	Existing topography in areas of proposed contours shall not be shown.
Yes ☒	No ☐	N/A ☐	3.	Existing Initial and Interim BMPs shall be shown (screened). Dimension information shall not be shown.
Yes ☒	No ☐	N/A ☐	4.	Directional flow arrows on all drainage features
Yes ☒	No ☐	N/A ☐	5.	Any Initial or Interim BMPs that are to be removed and any resulting disturbed area to be stabilized
Yes ☒	No ☐	N/A ☐	6.	Location of all Final erosion and sediment control BMPs (including seeding and mulching of any areas not stabilized in the Interim Plan), permanent landscaping, and measures necessary to minimize the movement of sediment off site until permanent vegetation can be established.
Yes ☒	No ☐	N/A ☐	7.	Show area of buildings, pavement, sod, and permanent landscaping (define types) per accepted improvement plan.
Yes ☒	No ☐	N/A ☐	8.	Show seeding and mulching (SM) everywhere except within the limits of buildings and pavement areas.
Yes ☐	No ☐	N/A ☒	9.	Show other BMPs considered by the designer to be appropriate.
Yes ☒	No ☐	N/A ☐	10.	Show the following BMPs to be removed prior to end of construction: • Indicate dewatering (DW) to be removed. • Indicate temporary stream crossings (TSC) to be removed. • Indicate stabilized staging area (SSA) to be removed. • Indicate street inlet protection (IP) to be removed. • Indicate vehicle tracking control (VTC) to be removed. • Indicate construction fence (CF) to be removed.
Yes ☒	No ☐	N/A ☐	11.	Include the following notes: • SEE COVER SHEET OF LONE TREE STANDARD NOTES AND DETAILS (SHEET 1 OF 3) FOR LEGEND OF BMP NAMES AND SYMBOLS. • SHADED BMPS INSTALLED IN THE INITIAL AND INTERIM GESC PLANS, UNLESS OTHERWISE INDICATED, SHALL BE LEFT IN PLACE UNTIL REVEGETATION ESTABLISHMENT IS APPROVED BY THE CITY. • SEE CONSTRUCTION PLANS FOR DETAILS OF PERMANENT DRAINAGE FACILITIES SUCH AS DETENTION FACILITIES, CULVERTS, STORM DRAINS, AND INLET AND OUTLET PROTECTION.
Yes ☐	No ☐	N/A ☒	12.	Other information as may be reasonably required by Lone Tree

GESC Report

Yes ☒	No ☐	N/A ☐	1.	Name, Address, and Telephone Number of Applicant(s) – The name, address, and telephone number of the Professional Engineer preparing (or supervising the preparation of) the GESC Plan shall also be included, if different from the Applicant's.
Yes ☒	No ☐	N/A ☐	2.	Project Description – A brief description of the nature and purpose of the land-disturbing activity, the total area of the site, the area of disturbance involved, and project location including township, range, section and quarter section, or the latitude and longitude, of the approximate center of the project.
Yes ☒	No ☐	N/A ☐	3.	Existing Site Conditions – A description of the existing topography, vegetation, and drainage; a description of any wetlands on the site; and any other unique features of the property.
Yes ☒	No ☐	N/A ☐	4.	Adjacent Areas – A description of neighboring areas such as streams, lakes, residential areas, roads, etc., which might be affected by the land disturbance.
Yes ☒	No ☐	N/A ☐	5.	Soils – A brief description of the soils on the site including information on soil type and names, mapping unit, erodibility, permeability, hydrologic soil group, depth, texture, and soil structure (this information may be obtained from the soil report for the site, for adjacent sites if acceptable to the County, or the applicable Soil Survey prepared by the Natural Resources Conservation Service).
Yes ☒	No ☐	N/A ☐	6.	Areas and Volumes – An estimate of the quantity (in cubic yards) of excavation and fill involved (indicating a balance onsite), and the surface area (in acres) of the proposed disturbance.
Yes ☒	No ☐	N/A ☐	7.	Erosion and Sediment Control Measures – A description of the methods presented in the GESC Criteria Manual that will be used to control erosion and sediment on the site.
Yes ☒	No ☐	N/A ☐	8.	Timing/Phasing Schedule – A schedule indicating the anticipated starting and completion time periods of the site grading and/or construction sequence, including the installation and removal of erosion and sediment control BMPs. Indicate the anticipated starting and completion time periods of individual project phases.
Yes ☒	No ☐	N/A ☐	9.	Permanent Stabilization – A brief description, including applicable specifications, of how the site will be stabilized after construction is completed.
Yes ☒	No ☐	N/A ☐	10.	Stormwater Management Considerations – Explain how stormwater runoff from and through the site will be handled during construction.
Yes ☒	No ☐	N/A ☐	11.	Maintenance – Any special maintenance requirements over and above what is identified in the standard notes and details.
Yes ☒	No ☐	N/A ☐	12.	Opinion of Probable Cost (City Format) – An opinion of probable costs for erosion and sediment control, including anticipated maintenance during the construction phase, shall be submitted with the GESC Plan. This will be reviewed by City staff and used as a basis for fiscal security. Electronic or paper copies of the spreadsheet to be used for preparing the opinion of probable costs for erosion and sediment control are available upon request. Unit costs used to develop probable erosion and sediment control costs shall be those shown in the spreadsheet.

Yes ☒	No ☐	N/A ☐	13.	Calculations – Any calculations made for the design of such items as sediment basins or erosion control blanket selection.
Yes ☐	No ☐	N/A ☒	14.	Other Information – As may be reasonably required by Lone Tree.
Yes ☒	No ☐	N/A ☐	15.	The Following Note – "This Grading, Erosion and Sediment Control Plan has been placed in the Lone Tree file for this project and appears to fulfill the applicable Douglas County Grading, Erosion and Sediment Control Criteria, as amended. I understand that additional grading, erosion and sediment control measures may be required of the Permittees, due to unforeseen erosion problems or if the submitted plan does not function as intended. The requirements of this plan shall run with the land and be the obligation of the Permittees until such time as the plan is properly completed, modified or voided."
Yes ☒	No ☐	N/A ☐	16.	Signature Page for Permittees - Acknowledging the review and acceptance of responsibility, and a statement by the Professional Engineer acknowledging responsibility for the preparation of the GESC Plan (available upon request).

Libbey Endersbe
Preparer's Signature

03-08-2024
Date

Appendix F

Submittal Form

CITY OF LONE TREE

Public Works Department
9220 Kimmer Drive
Suite 100
Lone Tree, Colorado 80124
(303) 662-8112 Email: rowpermits@cityoflonetree.com

SUBMITTAL FORM

DATE RECEIVED: 3/8/2024

PROJECT OWNER

Name Park Meadows Mall, LLC/Park Meadows Anchor Aquisition, LLC
Address 8401 Park Meadows Center Drive
Lone Tree, CO 80124
Telephone 303-595-7000
Contact Adam Benner

OWNER REPRESENTATIVE

Name ELS Architecture
Address 2040 Addison, Berkeley, CA 94704
Telephone 303-623-6300
Contact 510-734-6143

PROJECT NAME

Park Meadows - Garage and Retail

LEGAL DESCRIPTION

Lots 4-C, 4-D, 4-E, and 21-A, Park Meadows Town Center Filing No. 1-A, 7th Amendment recorded at reception no. 2024_____, County of Douglas, State of Colorado

LOCATION

8401 Park Meadows Center Drive
Lone Tree, CO 80124

DRAWINGS/PLANS/REPORTS SUBMITTED:

- [x] Preliminary Construction Plans
- [ ] Plat or Development Plan Documents
- [ ] Changes to Approved Const. Plans
- [ ] Drainage Report (Phase I, II or III)
- [x] Cost Estimate of Public Improvements
- [ ] Traffic Report
- [ ] Pavement Design
- [ ] Access Request for Public Road
- [ ] Street Cut Request
- [ ] Signing & Striping Plan
- [x] Soils Report

FINAL CONSTRUCTION PLANS FOR:

- [ ] Plat or Development Plan
- [ ] Metro District
- [ ] Other Special Purpose District
- [ ] County Special Improvement District
- [ ] Utility Company
- [ ] Other (explain)

Drawings Submitted:
Erosion Control Plans

THIS APPLICATION IS (CHECK ONE): [x] AN INITIAL SUBMITTAL [ ] A RESUBMITTAL

IF RESUBMITTAL, WHAT WAS DISPOSITION OF PREVIOUS SUBMITTAL:

[ ] CONDITIONAL APPROVAL [ ] DENIAL [ ] REVISIONS REQUESTED

SPECIFY ONE OF THE FOLLOWING FOR THIS APPLICATION:

Plat or Development Plan Area (acres) 23.61 acres

Roadway Plans, Roadway Length (ft) N/A

Drainage Master Plan or Storm Sewer Basin Service Area (acres) 4.92

ACTION REQUESTED: [x] Review & Comment [ ] Information Only [ ] Approval [ ] Other (explain)

Submitted By David Masenten Date 3/8/2024

ENGINEERING REVIEW & ACCEPTANCE FEE:

Fee Amount $_____ Date Paid _____ Verified _____