

Stormwater Management Plan for:

Gun Club Raw Water Expansion Project

Saddle Rock Golf Course

Located along Piney Creek from Saddle Rock Golf Course to Heritage Eagle Bend

City of Aurora, CO

219128ES1

1900-UTIL

24-25S,26-27T

Owner/Operator(s):

City of Aurora - Aurora Water

John Bruneau

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Aurora, CO 80012

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Engineer Contact(s):

Carollo Engineers

Jim Kriss

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Broomfield, CO 80021

(303) 404-6304

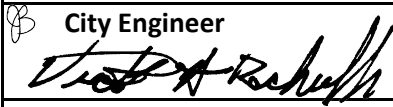
jkkriss@carollo.com

SWMP Preparation Date: 5/1/2019

Estimated Project Dates:

Project Start Date: June 2019

Project Completion Date: April 2020

APPROVED FOR ONE YEAR FROM THIS DATE	
06.05.19	
CGE	
	Date 06/05/2019
THT	
Aurora Water Department 	Date 05/23/2019

“THIS STORMWATER MANAGEMENT PLAN HAS BEEN PLACED IN THE CITY OF AURORA FILE FOR THIS PROJECT AND HAS BEEN DETERMINED TO COMPLY WITH THE APPLICABLE CITY OF AURORA STORMWATER MANAGEMENT CRITERIA. ADDITIONAL STORMWATER MANAGEMENT, EROSION AND SEDIMENT CONTROL MEASURES MAY BE REQUIRED OF THE OWNER OR HIS/HER AGENTS, DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT FUNCTION AS INTENDED.”

“REVIEW OF THIS PLAN BY THE CITY OF AURORA SHALL NOT IMPLY THAT IT HAS BEEN REVIEWED FOR COMPLIANCE WITH THE REQUIREMENTS SET FORTH BY THE STATE OF COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT GENERAL PERMIT FOR STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY.”

“SEE APPROVED STORMWATER MANAGEMENT PLAN DESIGN DRAWINGS (SITE PLAN) FOR SITE SPECIFIC BEST MANAGEMENT PRACTICES.”

Project Owner/Developer Signature Block

I have reviewed the information contained within the Stormwater Management Plan and accept responsibility for the requirements set forth.



5/1/2019

Permittee/Affiliation

Date

John Bruneau/ Aurora Water

Plan Preparer Signature Block

I acknowledge my responsibility for the preparation of the Stormwater Management Plan.



5/1/2019

CO Professional Engineer

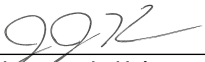
Date

James J. Kriss, P.E.

Reg. No. 33808

FACSIMILE

This electronic plan is a facsimile of the signed and sealed pdf set.



Date 5/1/2019

James J. Kriss

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SWMP APPENDIX F – Vertical and General Construction Matrix - To be prepared by the Contractor

"Pursuant to Sections 138-440 and 138-442 of the Aurora Municipal Code, the Permittee shall locate, install, and maintain all Best Management Practices, including, but not limited to, erosion controls, sediment controls, drainage controls, and water quality BMPs as indicated in the approved Stormwater Management Plan (SWMP). The following notes are a requirement and shall be included in the SWMP narrative developed for this project and submitted for approval by the City. BMP installations shall be installed per the COA Standard Detail in effect at the time of installation or per the approved SWMP design drawing, a COA approved variance, or a COA approved design drawing plan amendment."

COA Stormwater Management Standard Notes

1. A City of Aurora Stormwater Quality Discharge Permit for Construction Activities must be issued by the City and executed by a COA Erosion Control staff prior to any earthwork activities. An on-site inspection will be conducted to verify the correct installation and adequacy of initial BMPs for the site. No earthwork, including clearing and grubbing, or demolition activities are to begin until the project site has passed an inspection and the City of Aurora Stormwater Quality Discharge Permit for Construction Activities has been executed. The Permittee is required to present the project's CDPHE-WQCD Stormwater Discharges Associated with Construction Activity Permit to the Inspector during the initial inspection. The Permittee shall designate a Stormwater Management Plan (SWMP) Administrator on the application for the City of Aurora Stormwater Quality Discharge Permit for Construction Activities. The SWMP Administrator will act as the project representative for any concerns or issues regarding environmental controls and stormwater management.
2. These requirements shall be the obligation of the Permittee, until such time as the Permit is properly closed, or otherwise allowed by the City to be voided, modified, transferred, re-assigned or replaced.
3. This SWMP narrative, the SWMP design drawings, and the Permittee's inspection and maintenance records are all components of required record keeping and shall be kept on site at all times and updated as required. These and any other pertinent records shall be provided to the City when requested.
4. Any discrepancy between this SWMP and any other approved Stormwater Management Plan for this site shall require compliance with the more restrictive valid, approved plan.
5. Streets shall be constructed with Rough Cut Street Control measures, surface roughened or otherwise temporarily stabilized with rough cut street controls within seven (7) days of completion of grading in the appropriate phase. If paving is to occur within fourteen (14) days after final grading, rough cut street controls shall be waived.
6. Inspection and maintenance of erosion and sediment control Best Management Practices (BMPs) are the continuous obligations of the Permittee. BMPs shall be inspected at a minimum every seven (7) days and within 24-hours after the end of a precipitation event that produces run-off, and following snowmelt events. If a site is temporarily idle and no construction activities will occur during the 48 hours following a storm event, the post-precipitation event (including

snowmelt) inspection shall be conducted prior to commencing construction activities on the site, but no later than 72 hours following the storm event. All necessary maintenance and repairs shall be initiated and completed on an on-going basis, as features are required to operate continuously. Inspections may need to be conducted at a greater frequency than noted above, to ensure features and systems are operating adequately. Erosion and sediment control BMPs shall be maintained and functional for the entire duration of the project.

7. Ingress and egress vehicle access points onto disturbed areas shall be stabilized with Vehicle Tracking Control Pads (VTC) and shall be constructed with angular rock, 3" to 6" in size and to a depth of at least 9-inches. The use of recycled asphalt or concrete is not permitted. The VTC shall be installed over a liner of non-woven geotextile with a weight of at least 10 oz/yd² and a grab tensile strength of at least 250 pounds. No dirt or other materials shall be placed on paved surfaces or curb flow lines to act as curb ramps. Only metal ramps or rock wattles may be used in the curb flow line.

8. Fugitive dust emissions resulting from grading activities and/or wind shall be controlled using reasonably available control technology as defined by the Colorado Department of Public Health and Environment.

9. All potential pollution sources on-site shall be identified and control measures installed and practiced to minimize the likelihood of a release. Spill prevention controls shall be developed for the site with BMPs in place to respond to any spills, leaks or other releases.

10. Hydraulic mulching as a means to cover and protect seeding is not an acceptable means of applying mulch in the City of Aurora unless a previously installed irrigation system is used to aid germination and growth and where approved through variance. Hydraulic seeding is not permitted.

11. For all porous landscape detention facilities, in order to prevent clogging of filter medium, installation of the filtration system must be delayed until after the site is fully landscaped.

12. If stockpiles are located within 100 feet of a drainageway or a public storm sewer system, additional sediment controls such as temporary diversion dikes, silt fence, or sediment basin shall be required.

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SECTION 1 SITE DESCRIPTION

In this section, the preparer can gather some basic site information that will be helpful to the permittee later when you file for permit coverage.

- For more information, see *City of Aurora Rules and Regulations Regarding Stormwater Discharges Associated with Construction Activities, current revision* (also known as the *Rules and Regs*), Chapter 2
- Detailed information on determining your site's latitude and longitude can be found at www.epa.gov/npdes/stormwater/latlong

i Site Location

- Site location including, Section, township, range, and latitude/longitude to the nearest 15 seconds.
- Project street location or nearest major cross streets
- If applicable, specific acknowledgement that the land is currently, or will ultimately be owned or managed by the Parks, Recreation and Open Space Department.

Project/Site Name: Gun Club Raw Water Expansion Project

Project Street/Location: Piney Creek between Saddle Rock and Heritage Eagle Bend

City: Aurora

State: CO

ZIP Code: 80016

County or Similar Subdivision: Arapahoe County

Latitude/Longitude (Use **one** of three possible formats, and specify method)

Latitude:

Longitude:

1. 39° 35' 41" N (degrees, minutes, seconds)

1. 104° 43' 37" W (degrees, minutes, seconds)

2. . ' N (degrees, minutes, decimal)

2. . ° . ' W (degrees, minutes, decimal)

3. N (decimal)

3. W (decimal)

Method for determining latitude/longitude:

☐ USGS topographic map (specify scale:)

☐ EPA Web site

☐ GPS

☒ Other (please specify): Google Earth

Is this land currently or will it ultimately be owned or managed by COA Parks, Recreation, and Open Space Department? ☒ Yes ☐ No

CDPS Permit #*:

COA SWQ Permit #*:

**(This is the unique identifying number assigned to your project by your permitting authority after you have applied for coverage under the appropriate construction permit.)*

ii Description of Adjacent Areas

- Provide a description of adjacent areas such as residential areas, roads, streams, lakes, etc, which might be affected by the proposed project's land disturbing activity.

Provide adjacent area information

The Gun Club Raw Water Expansion Project is generally located along Piney Creek from the Saddle Rock Golf Course to a raw water connection near Aurora Parkway and Addition Court. Adjacent properties are generally residential with some commercial properties, along with the City owned Saddle Rock golf course. The segment along Piney Creek will be constructed in City of Aurora Parks, Recreation and Open Space.

a) Nature and Purpose of Construction Activity

Describe of the nature and purpose of the construction activity, note any vertical construction.

The project is required to expand the raw water system to serve Heritage Eagle Bend golf course.

☐ Residential ☐ Commercial ☐ Industrial ☐ Road Construction ☒ Linear
☐ Utility ☐ Overlot Grading ☐ Over-excavation ☐ Vertical Construction
☐ Other (please specify):

b) Construction Sequence

The proposed sequence for major activities should be described, including:

- An estimated project start
- An estimated project end date
- The sequence of major construction activities (Initial, interim, final or overlot grading, utilities, vertical, paving, over – excavation, etc.). This is expected to be a brief overview of the project as more detailed phasing information and specific BMPs will be addressed in later sections of the SWMP narrative report.

Estimated Project Start Date: Spring 2019

Estimated Project Completion Date: Winter 2019

Describe the major phases of construction:

The project includes a new 12-inch pipeline that will be connected to the existing 12-inch pipeline that currently serves the Saddle Rock golf course. A new flow control vault will be

constructed at this connection to divert flows to either Saddle Rock or to Heritage Eagle Bend golf courses. The pipeline will be located in portions of the Saddle Rock golf course, Arapahoe Road, Piney Creek drainage way, and E-470 multi-use easement. Phases are not anticipated for the project, and it is expected that the various elements of construction will occur concurrently.

c) Area

The areas for the site should be described including any grading phasing which will need all of the information by phase, as well as for the overall project. This also includes overlot grading in different phases to achieve the outcome of the project. This may be required to be modified by the contractor with a phasing plan submittal.

- Provide estimates of the total area of the site and the sub area within the site expected to undergo clearing, excavation or grading.
- Include an estimate of the excavation and fill volumes involved during the proposed construction.
- Include an estimate of how excavation and fill will be phased.
- Include an estimate of over-excavation areas and volumes (and type) and an estimate of offsite trucking volume (import and/or export).

Note: If exporting material to an area within the COA limits, the receiving site must have its own SWMP and may be required to have its own COA Stormwater Quality Discharge Permit. If the export site is outside of COA limits, then the requirements of that local jurisdiction must be met and proof of a valid permit for the site will be required.

Total project area:	4.5	acres
Construction site area to be disturbed:	4.5	acres
Construction site over excavation area to be disturbed:	0.00	acres
Export/Import Volume	0.00	
Phase Area	Cut/Fill	Net

Description of phasing for sites disturbing more than 40 acres.:

Areas presented above reflect anticipated limits of construction. Total project disturbed area will be less than 40 acres.

d) Topography, Soils, and Rainfall Data

- Provide a summary describing the soil, the soil type, and hydrologic soil group, permeability, texture, soil erosion potential, depth, soil structure, etc. and potential impacts of the soil type on the quality of any stormwater discharge from the site.
- A description of the topography of the site, existing site conditions, drainage patterns, and existing site slopes should also be included.

Note: A soils map showing the site limits and excerpts regarding the soils information shall be placed in the SWMP narrative report appendices.

Soil type(s):

NRCS soil designations and types to be encountered along the alignment include the follow:

BuD, BuE – Bresser-Stapelton sandy loams, hydrologic soil group B.

NIB – Nunn loam, hydrologic soil group C.

BoE – Blakeland loamy sand, hydrologic soil group A

Su – Sandy alluvial land, hydrologic soil group A

RtE – Renohill-Little-Thedalund complex, hydrologic soil group D.

Description	Result	Location of Occurrence
Highest Elevation:	5994	Connection to existing Heritage Eagle Bend line
Lowest Elevation:	5864	Piney Creek crossing
Steepest Slope:	10% ±	E-470 multi-use easement
Average Slope:	2% ±	

Slopes (describe current slopes and note any changes due to grading or fill activities):

Existing slopes vary along the alignment, and final grades will match existing existing grades.

Drainage Patterns (describe current drainage patterns and note any changes dues to grading or fill activities):

There will be no fill activities associated with the project, so surface drainage patterns will remain unchanged.

Normal Monthly Precipitation Table in Inches

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.51	0.49	1.28	1.93	2.32	1.56	2.16	1.82	1.14	0.99	0.98	0.63

Adapted from: <http://www.ncdc.noaa.gov/oa/climate/online/ccd/nrmlprcp.html>

Imperviousness and Runoff Coefficients:

- Calculate the percentage of impervious surface area before and after construction
- Calculate the runoff coefficients before and after construction.

Percentage impervious area before construction:		5.4%	%
Runoff coefficient before construction (100 Yr):		0.93	
Percentage impervious area after construction:		5.4%	%
Runoff coefficient after construction (100 Yr):		0.93	

e) Existing Vegetation

- Provide a description of the existing vegetation at the site and an estimate of the percent vegetative cover density prior to disturbance in an average square yard of the site. This requirement does not encompass hard surfaces or damaged areas. The consultant may have to evaluate vegetation from a nearby area if there has already been disturbance. There may also be drastically different vegetation in areas of the project or prairie dog issues, discuss as appropriate.
- A plan showing the existing major trees (4" diameter trunks and larger), tree masses, and shrub masses should be provided.

Existing Vegetation on the site:

Golf Course: Upland grass and scrub brush.

Piney Creek: Upland grass.

Pre-disturbance vegetation density:

Golf Course: 50%

Piney Creek: 75%

Discuss tree protections and removals (reference detail for protection):

All trees will be protected in place and designated for protection using construction fence.

f) Potential Sources of Pollution

- Identify and list the proposed location and description of any potential pollution sources anticipated to be used during the project, such as portable toilets, vehicle fueling, grout/cement mixers, storage of fertilizers, paints or chemicals and stockpiles, etc.
- Materials of concern may include, but are not limited to, raw materials, fuels, metallic products, hazardous substances designated under Section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), any chemical the facility

is required to report pursuant to Section 313 of title III of the Superfund Amendments and Reauthorization Act (SARA), fertilizers, pesticides, ash, slag, sludge concrete washout, paints, solvents, and waste piles.

Note: This is expected to be a brief list with detailed information being addressed in later sections of the SWMP narrative report.

Potential pollutants and sources to stormwater runoff:

See Table below:

Trade Name, Material, or Operation	Stormwater Pollutants	Potential Location
Bedding Stockpiles	Sediment	Adjacent to active trench.
Concrete Materials and Concrete Waste Management	Concrete	Various locations, progressing with trenching and pipeline installation
Dewatering	Ground Water containing various other pollutants	Various locations as required for construction.
Material Delivery	Other Materials	Entire site
Paving Operations	Asphalt, Tar, Road Base, Lime	Roads
Sanitary Waste Management	Sanitary Waste	Open Trench areas, Staging Areas
Trash	Debris, Bacteria, various chemicals, etc.	Staging Areas
Excavations	Sediment	Entire site
Vehicle and Equipment Maintenance, Cleaning, or Leaks	Fuel, Oil, Grease, Chemicals, Hydraulic Oil	Entire site

g) Non Stormwater Discharges

Identify and list the location and description of any anticipated non-stormwater components of the discharge, such as springs (State permit required), potable water for dust suppression, landscape irrigation return flow, pipeline dewatering (i.e. waterline flushing and testing) diverted stream flows, flows from wetlands, firefighting activities, hydrant blow-offs, building power-washing where detergents are not used, construction dewatering of groundwater (State permit required), uncontaminated air conditioning or compressor condensate, foundation or footing drains where flows are not contaminated with process materials such as solvents (State permit may be required), or other discharges specifically authorized by a separate National Pollutant

Discharge Elimination Systems (NPDES) permit or a separate Colorado Discharge Permit System (CDPS) permit etc. Discharges are those flows that are allowed to leave the site.

- Identify all allowable sources of non-stormwater discharges that are not identified. The allowable non-stormwater discharges identified might include those in the table below.
- Identify measures used to eliminate or reduce these discharges and the BMPs used to prevent those discharges from becoming contaminated.

Check if Applicable to Site	List of Potential Non-Stormwater Discharges	Management of Discharge
☐	Waters used to wash vehicles where detergents are not used	NA
X ☐	Water used to control dust	Water used for dust control will be applied at a rate that will not induce runoff
☐	Potable water including uncontaminated water line flushings	NA
☐	Routine external building wash down that does not use detergents	NA
☐	Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used	NA
☐	Uncontaminated air conditioning or compressor condensate	NA
☐	Uncontaminated ground water or spring water	NA
☐	Foundation or footing drains where flows are not contaminated with process materials such as solvents	NA
X ☐	Uncontaminated excavation dewatering	NPDES Permit will be obtained by the Contractor
☐	Landscape irrigation	NA
☐	Potable water for firefighting activities	NA
☐	Diverted channels or streams	NA
☐	Flows from wetlands	NA
☐	Sanitary sewer/plumbing line testing	NA
☐		

h) Receiving Waters

List the name of all potential receiving water (s) and the size, type and location of any outfall. If the discharge is to a municipal storm sewer system, then provide the name of that system, the location of the storm sewer discharge, and the ultimate receiving water(s). State whether or not there are wetlands, the 100-year floodplain status (i.e. if the site is within a floodway, near a flood plain or not within a flood zone), if the receiving water is impaired or not, and if there are any stream crossings proposed.

Note: Floodplain maps shall be provided in the SWMP narrative report appendices and shall show the site in relation to the floodplain.

- List the waterbody(s) that would receive stormwater from your site, including streams, rivers, lakes, and wetlands. Describe each as clearly as possible, such as *Murphy Creek, a tributary to the Sand Creek*, and so on. Indicate the location of all waters, including wetlands, on the site map.
- Note any stream crossings or stream diversions, if applicable.
- List the downstream storm inlets, storm sewer system or drainage system that stormwater from your site could discharge to and the waterbody(s) that it ultimately discharges to. It is preferred that the waterbodies are listed to a reservoir, Sand Creek, Cherry Creek or the South Platte.
- If any of the waterbodies above are impaired and/or subject to Total Maximum Daily Loads (TMDLs), please list the pollutants causing the impairment and any specific requirements in the TMDL(s) that are applicable to construction sites. Your SWMP should specifically include measures to prevent the discharge of these pollutants.

The site is within the Cherry Creek Drainage Basin: ☒ Yes ☐ No

The site is within the Aurora Reservoir Drainage Basin: ☐ Yes ☒ No

Description of receiving waters:

Piney Creek, Tributary to Cherry Creek.

Description of storm inlets and storm sewer systems:

- Storm inlets and sewer systems along Arapahoe Road and Peakview Drive collect and discharge to Piney Creek. The 2 inlets near Arapahoe Road and Peakview Drive will be protected.

Description of impaired waters or waters subject to TMDLs:

Piney Creek is listed as impaired for e coli and selenium; no TMDL available.

100- Year Floodplain Status:

The segment of pipeline along Piney Creek is located in the regulated floodplain, Zone AE, FEMA Map Nos. 08005C0503L and 08005C0504L.

Description of wetlands:

- The area includes Palustrine Emergent (PEM) and Palustrine Forested (PFO) wetlands (USFWS 2018a). Six wetlands have been delineated in the project area that are

predominately PEM and Paulustrine Scrub-Shrub (PSS) wetlands. Wetland vegetation included obligative species such as cattails and common threesquare, as well as a variety of facultative wetland and facultative species. Other wetland determinants that are present are hydric soils, surface water, a high water table, and near-surface saturation. BMPs to minimize sediment in stormwater will be implemented in portions of the project that may impact wetlands.

Other: None

i) **Site Features and Sensitive Areas to be Protected**

- Describe unique site features including streams, stream buffers, wetlands, specimen trees, natural vegetation, steep slopes, or highly erodible soils that are to be preserved.
- Describe measures to protect these features.
- Include these features and areas on your SWMP design drawings.

The pipeline along Piney Creek will be constructed within Parks, Recreation and Open Space, using open trench construction methods. Construction activities in this area will minimize the disturbance to the extent practicable. All existing trees will be protected in place. Silt fence will be installed on the downgradient side of the alignment to protect Piney Creek for the duration of construction. Restoration activities will include returning excavated areas to ground surface grade and reseedling.

j) **Other Applicable Federal, State or Local Programs, Regulations or Restrictions**

State any other regulations that are affecting the site (i.e. **State CDPHE**, Regulation 72, Consent Decrees, etc).

USACE Clean Water Act Section 404 Dradge and Fill Permit for construction of the new outfall structure

CDHPE Construction Dewatering Permit

CDHPE Stormwater Discharges Associated with Construction Activities

CDOT Utility/Special Use Permit

DWR/OSE Notice of Intent to install dewatering wells

Regional Transportation District Railroad Utility Agreement

1) *Endangered Species Certification*

State whether or not there are any endangered species or critical habitats on or near the site. If so, then describe the impacts and the measures being taken to address that impact and supply documentation in the SWMP narrative report appendices.

Are endangered or threatened species and critical habitats on or near the project area?

☐ Yes ☒ No

If yes, describe the species and/or critical habitat and provide reference to other documents as appropriate:

2) *Historic Preservation*

State whether or not there are any historic sites on or near the site. If so, then describe the impacts and the BMP measures being taken to address that impact

Are there any historic sites on or near the construction site?

☐ Yes ☒ No

If yes, describe or refer to documentation that determines the likelihood of an impact on this historic site and the steps taken to address that impact.

SECTION 2 DESIGN DRAWINGS

Approved design drawings shall be kept with the approved narrative report (this document) in the field and must be kept current. See COA Rules and Regs Chapter 3 for more information regarding Living Documents. For most projects, a series of site maps is recommended. The first should show the undeveloped site and its current features. An additional map or maps should be created to show the developed site or for more complicated sites show the major phases of development.

- SWMP design drawings are required to indicate the types, locations, and extents of BMPs proposed for installation on the project site.
- For more information and requirements, see *Rules and Regulations Regarding Stormwater Discharges Associated with Construction Activities, current revision* (also known as the *Rules and Regs*), Chapter 2

SECTION 3 STORMWATER MANAGEMENT CONTROLS

This section shall describe the stormwater management controls that will be used to control pollutants in stormwater discharge during construction activity.

a) SWMP Administrator and Important Contacts

- List Contact names and phone numbers for the SWMP Administrator, alternates, owner, developer, etc that are known
- Copy as needed

Owner/Operator(s):
Aurora Water
Sarah Young
15151 E. Alameda Parkway
Aurora, CO 80012
(303) 739-7279
syoung@auroragov.org
Area of Control (if more than 1 operator at site):

SWMP Administrator Contact(s):
Company or Organization Name:
Name:
Address:
City, State, Zip Code:
Telephone Number:
Fax/Email:
Area of Control (if more than 1 operator at site):

This SWMP was Prepared by (the Colorado Licensed Engineer):
Carollo Engineers
Jim Kriss
390 Interlocken Crescent, Suite 800
Broomfield, CO 80021
(303) 404-6304
jkriss@carollo.com

Emergency 24-Hour Contact (for site, not 911):
Area of Control (if more than 1 operator at site):

Contractor:
Area of Control (if more than 1 operator at site):

Other:
Company or Organization Name:
Name:
Address:
City, State, Zip Code:
Telephone Number:
Fax/Email:
Area of Control (if more than 1 operator at site):

b) Identification of Potential Pollutant Sources

All potential pollutant sources, including materials and activities, at a site must be evaluated for the potential to contribute pollutants to stormwater discharges.

- Identify and describe the sources of potential pollutants to stormwater discharges. At a minimum, each of the following sources and activities shall be evaluated for the potential to contribute pollutants to stormwater discharges.
- Numbers in [] brackets indicate the appropriate section to describe the BMPs to be used to address the potential pollutant source

Applicable to Site (Y, N, Maybe)	Sources of Potential Pollutants to Stormwater Discharges
Y	All disturbed and stored soils (including borrow areas, stockpiles, haul routes, and over-excavation) [Section 3 c) 1, 2, and 3]
M	Vehicle tracking controls and clean up [Section 3 c) 6]
M	Management of contaminated soils [Section 3 c) 4]

Applicable to Site (Y, N, Maybe)	Sources of Potential Pollutants to Stormwater Discharges
Y	Routine maintenance activities involving fertilizers, pesticides, detergents, fuels, solvents, oils, etc. [Section 3 c) 4]
Y	On-site waste management practices (waste piles, liquid wastes, dumpsters, etc.) [Section 3 c) 7]
Y	Concrete truck/equipment washing, including the concrete truck chute, pump truck primary and associated fixtures and equipment [Section 3 c) 7]

Applicable to Site (Y, N, Maybe)	Sources of Potential Pollutants to Stormwater Discharges
Y	Loading and unloading operations (including access points and protection of existing BMPs) [Section 3 c) 10]
M	Outdoor storage areas (building materials, fertilizers, chemicals, etc.) [Section 3 c) 4]
Y	Vehicle and equipment maintenance and fueling [Section 3 c) 4]
Y	Significant dust or particulate generating processes (including haul routes, masonry mixing, and silos) [Section 3 c) 2]
N	Power washing of building using detergents or other chemicals/solvents [Section 3c) 4]
N	Building/vertical construction (including paints, solvents, drywall, fire retardant, etc) [Section 3c) 4, 7, 10]

Applicable to Site (Y, N, Maybe)	Sources of Potential Pollutants to Stormwater Discharges
N	Dedicated asphalt and concrete batch plants [Section 3 c) 7]
Y	Non-industrial waste sources such as worker trash and portable toilets [Section 3 c) 7]
M	Other areas or procedures where potential spills can occur [Section 3 c) 4]
Y	Stormwater or groundwater dewatering [Section 3 c) 9]

c) BMPs for Stormwater Pollution Prevention

This section of the SWMP narrative report shall include a narrative description of the appropriate controls and measures that will be implemented before, during and after construction activities at the project site to manage and control the runoff of pollutants.

The SWMP narrative report shall clearly describe the relationship between the phases of construction, and the implementation and maintenance of BMP controls and measures. For example, the report must indicate which controls will be implemented during each of the following phases of construction: clearing and grubbing for perimeter controls, installation of initial BMPs, clearing and grubbing, overlot

grading, installation of interim BMPs, site construction, utility construction, vertical construction, other pertinent construction phases, final grading, stabilization, removal of BMPs, and Permit closeout.

1) Structural Practices

- Clearly describe the initial/interim, post-paving, and permanent structural site management practices to control erosion and sediment transport. Practices may include, but are not limited to: silt fences, diversion dikes, temporary slope drains, inlet protection, outlet protection, check dams, curb/rock socks, sediment control logs, compacted earthen berm, and terracing.

BMP Description: <i>Construction Fence (CF)</i>	
<i>Intended Use/Purpose:</i>	Temporary linear construction barrier to limit the area of construction and to restrict public access to the construction area.
<i>Appropriate Installation Timing:</i>	Initial
<i>Appropriate Removal Timing:</i>	When restoration is complete
BMP Description: <i>Small Site Concrete/ Liquid Waste Washout (CWS)</i>	
<i>Intended Use/Purpose:</i>	Concrete washout basin, either an excavated, lined earthen basin or a mobile at grade washout basin.
<i>Appropriate Installation Timing:</i>	Initial
<i>Appropriate Removal Timing:</i>	When restoration is complete
BMP Description: <i>Dewatering (DW)</i>	
<i>Intended Use/Purpose:</i>	Dewatering to manage the discharge of groundwater that must be removed for construction
<i>Appropriate Installation Timing:</i>	Initial
<i>Appropriate Removal Timing:</i>	When restoration is complete
BMP Description: <i>On-Grade Inlet Protection (IPO)</i>	
<i>Intended Use/Purpose:</i>	Temporary on-grade curb and gutter drain inlet barrier to intercept and slow the flow of sediment-laden sheet flow runoff.
<i>Appropriate Installation Timing:</i>	Initial
<i>Appropriate Removal Timing:</i>	When restoration is complete
BMP Description: <i>Silt Fence (SF)</i>	
<i>Intended Use/Purpose:</i>	Intercept and capture the flow of sediment-laden sheet flow runoff. Silt fence will be installed on all downgradient slopes along the area of construction.

<i>Appropriate Installation Timing:</i>	Initial
<i>Appropriate Removal Timing:</i>	When restoration is complete
<i>BMP Description: Vehicle Tracking Control (VTC)</i>	
<i>Intended Use/Purpose:</i>	Control sediment vehicle tracking onto paved surfaces.
<i>Appropriate Installation Timing:</i>	Initial
<i>Appropriate Removal Timing:</i>	When restoration is complete.

2) ***Non-Structural Practices***

- Clearly describe initial/interim, post-paving, and permanent stabilization practices, including site specific scheduling of the implementation of these practices. Site plans should ensure that existing vegetation is preserved where possible and that all disturbed areas are stabilized. Non-structural practices may include, but are not limited to: temporary seeding, mulching, temporary sod stabilization, vegetative buffer strips, temporary landscaping, temporary erosion control blankets/matting, temporary soil retention matting, surface roughening, dust suppression, seasonal schedule, and preservation of mature vegetation.

<i>BMP Description: Dust Suppression (DS)</i>	
<i>Intended Use/Purpose:</i>	Dust Suppression
<i>Appropriate Installation Timing:</i>	For duration of construction activities as deemed necessary for construction activities.
<i>Appropriate Removal Timing:</i>	After completion of all construction activities

3) ***Phase Construction Activity and BMP Implementation***

This section shall describe the relationship between the phases of construction, and the implementation and maintenance of BMP controls and measures. For example, indicate which controls will be implemented during each of the following phases of construction: prior to clearing and grubbing for perimeter controls (installation of initial BMPs),

clearing and grubbing, overlot grading, installation of interim BMPs, site construction, utility construction, vertical construction, other pertinent construction phases, final grading, stabilization, removal of BMPs, and Permit closeout.

- Clearly describe the various phases of construction and the implementation of BMPs to be used during each phase. Examples of project phases may include, but are not limited to, demolition, clearing and grubbing, overlot grading, over-excavation, road construction, utility installations, vertical construction, fine grading, and final stabilization. The description for a particular phase may have sub-phases. For example, the overlot grading of an 80 acre site may have to describe multiple sub-phases for the 40 acre disturbance limitation. Another example would be vertical construction phase may describe sub-phases of the construction such as grading, foundations, framing, finishing, and stabilization. For more information, see *Rules and Regs*, Chapter 2, Section 2.2.1)

Note: Some construction information may need to be added once a contractor(s) are involved. See the Manual and below for more information.

<i>Phase Description: Not Applicable – All project elements will be constructed concurrently</i>	
<i>Duration of phase (start/end dates):</i>	NA
<i>BMPs Associated with the Phase:</i>	NA
<i>Describe Temp/Final Stabilization for Phase:</i>	NA

a. Overlot Grading Specific Practices

Overlot grading specific practices should address items such as: surface roughening, blanketing, terracing, mulching, temporary seeding, permanent seeding, temporary sediment pond construction and removal, phasing, haul routes, disturbance limits, rough cut street controls, etc.

- Address haul routes may be designated on the SWMP updates and shall take into consideration drainage, erosion and sediment control BMPs, along with interim stabilization measures.

- Discuss interim stabilization may be provided via plan amendment by the contractor and the engineer at the Erosion Control Kick Off meeting. These measures shall be provided with timeframes and down gradient controls.

Temporary drainage BMPs (diversion ditches, sediment traps or sediment basins) shall be maintained at all times.

- Discuss timing and procedural requirements for implementation, maintenance and removal of these items during this period of construction.

BMP Description: *Not applicable. There will be no overlot grading associated with this project.*

Intended Use/Purpose:	NA
Appropriate Installation Timing:	NA
Appropriate Removal Timing:	NA

b. Vertical and General Construction Requirements – See Appendix for Table of Required Information

- Staging areas change during construction regularly. Therefore, if “con/conex” boxes are to be utilized and if they are to include liquid pollutants, then a redundant BMP measure must be provided
- Site drainage will need to be maintained during vertical construction. Review conditions to ensure that it will continue to work as shown during the grading/utility timeframes.
- Provide redundant BMPs for generators and mobile concrete washouts to protect from fuel/hydraulic leaks
- Continuously review the down gradient BMPs within the impervious and disturbed areas to ensure that conveyances, inlets and outlets are protected appropriately during this phase.
- Areas of disturbance outside of the building envelope shall still require BMPs.
- Continuously review the timing/phasing of the project to ensure the appropriate BMPs are implemented as construction continues. Deletion of BMPs shall require different measures to be implemented upon deletion.

- BMPs for keeping impervious surfaces clean may need to be enhanced or added to as construction continues.
- Review and implement BMP measures to control roof drainage. This becomes a point source and may cause extensive erosion on site.

BMP Description: *Not applicable. There is no vertical construction associated with this project.*

Intended Use/Purpose:	NA
Appropriate Installation Timing:	NA
Appropriate Removal Timing:	NA

Optional Section – To be included if the items in bullet points cannot be addressed elsewhere in this report.

A Plan Amendment from the contractor shall be required to be submitted to the engineer of record and City of Aurora Water Engineering Plans Reviewer three (3) business days prior to the Erosion Control Kick-Off Meeting. This submittal shall provide narrative information and the associated details required for vertical construction BMPs (structural and non-structural) that will be implemented during this phase of construction.

- Provide a mixing station detail/area for masonry/brick. If the site is going to bring in silos for masonry mixing, wind protection will be required to minimize the maximum extent practicable the dust from impacting adjacent buildings and streets.
- Saw cutting station detail/area
- Options for handling paints, solvents, glues (i.e. utilize the CWS or provide alternative)
- Provide physical and procedural BMPs for clean up along the building during the installation of brick, stone or stucco
- Access may be required around the building, defining a haul route may be necessary and denote stabilization needs on this proposed haul route
- Address waste handling procedures for drywall, painters, carpet layers etc.
- Stream Diversion Method
- Cranes when access is required around the building and may impact BMPs, relocation may be required

4) Material Handling and Spill Prevention

This section shall describe any procedures and locations for all practices implemented at the site that will be used to minimize impacts from identified potential pollutant sources. BMPs need to

address many different pollutant sources that include, but are not limited to exposed storage of construction materials, liquid contaminants, contaminated soils management, fueling procedures, redundant measures for any spill or leak sources, and equipment maintenance procedures. Activities involving potential for spills shall have spill prevention and spill response procedures identified.

- Identify and describe how the sources of potential pollutants to stormwater discharges identified in Section 3.2 will be controlled through BMP selection and implementation. The information provided may address frequency, seasonal considerations, characteristics of the area and surface type, primary and secondary containment, proximity to drainageways and stormwater facilities.

BMP Description: TBD – by Contractor

<i>Intended Use/Purpose:</i>	TBD
<i>Location(s)</i>	TBD

BMP Description: SPILL RESPONSE -Cleanup and Removal Procedures

<u>NOTE:</u> IN CASE OF FIRE, EVACUATE ALL PERSONNEL FROM THE IMMEDIATE AREA, RENDER FIRST AID TO ANYONE WHO IS INJURED, AND DIAL 911 IMMEDIATELY. TAKE APPROPRIATE STEPS TO PROTECT HUMAN LIFE AND TO CONTROL FIRES FIRST. SPILL CONTROL IS SECONDARY.

- Upon detection of any spill, the first action to be taken is to ensure personal safety. All possible ignition sources, including running engines, electrical equipment (including cellular telephones, etc.), or other hazards will be immediately turned off or removed from the area. The extent of the spill and the nature of the spilled material will be evaluated to determine if remedial actions could result in any health hazards, escalation of the spill, or further damage that would intensify the problem. If such conditions exist, a designated employee will oversee the area of the spill and the construction SWMP Administrator will be notified immediately.
- The source of the spill will be identified and if possible the flow of pollutants stopped if it can be done safely. However, no one should attend to the source or begin cleanup of the spill until **ALL** emergency priorities (fire, injuries, etc.) have been addressed.

Small Spills

Small spills (usually <5 gallons) consist of minor quantities of gasoline, oil, anti-freeze, or other materials that can be cleaned up by a single employee using readily available materials.

The following procedures should be used for clean-up of small spills:

- a. Ensure personal safety, evaluate the spill, and if possible, stop the flow of pollutants.
- b. Contain the spread of the spill using absorbents, portable berms, sandbags, or other available measures.
- c. Spread absorbent materials on the area to soak up as much of the liquid as possible and to prevent infiltration into the soil.
- d. Once the liquids have been absorbed, remove all absorbents from the spill and place the materials in a suitable storage container. On paved areas, wipe any remaining liquids from the surface and place the materials in a storage container. Do not spray or wash down the area using water. For open soil areas, excavate any contaminated soil as soon as possible and place the soil in a suitable storage container. All materials will then be transported off-site for disposal.
- e. If immediate transfer and storage of the contaminated soil is not practical, excavate and place the contaminated soil on a double thickness sheet of 3-mil or higher polyethylene film. In addition, a small berm should be formed around the outer edges of the soil stockpile, underneath the polyethylene film, to ensure that contaminants are not washed from the site during precipitation events and that materials do not seep through the berm.
- f. Record all significant facts and information about the spill, including the following:
 - Type of pollutant
 - Location
 - Apparent source
 - Estimated volume
 - Time of discovery
 - Actions taken to clean up spill
- g. Notify the SWMP Administrator of the spill and provide the information from Item f. The SWMP Administrator will then contact the City of Aurora Erosion Control Staff.

Medium to Large Spills

Medium to large spills consist of larger quantities of materials (usually >5 – 25 gallons) that are used on site that cannot be controlled by a single employee. Generally, a number of facility personnel will be needed to control the spill and a response may require the suspension of other facility activities.

The following procedure shall be used for the cleanup of medium to large spills:

- a. Ensure personal safety, evaluate the spill, and if possible, stop the flow of pollutants.
- b. Immediately dispatch a front-end loader or similar equipment to the spill and construct a berm or berms down gradient of the spill to minimize the spread of potential pollutants. On paved

surfaces, portable berms, sandbags, booms, or other measures will be used to control the lateral spread of the pollutants.

- c. When the spread of the spill has been laterally contained, contact the SWMP Administrator or designated facility employee and provide them information on the location, type, and amount of spilled material, and a briefing on the extent of the spread and measures undertaken to contain the contaminants.
- d. Depending on the nature of the spill, mobilize additional resources as needed to contain the contaminants.
- e. Cleanup will commence when the lateral spread has been contained and the notification to the SWMP Administrator has been made.
- f. Freestanding liquid will be bailed or pumped into 55-gallon storage drums, steel tanks, or other suitable storage containers. When all the liquid has been removed from the pavement or soil layer, absorbents will be applied to the surface and transferred to the storage containers when they have soaked up as much of the spill as possible.
- g. On paved surfaces, the remaining contaminants will be removed to the extent possible, with rags, sweeping, or similar measures. The area of the spill will not be sprayed or washed down using water. Any contaminant soaked materials will be placed into the storage containers with the other absorbents.
- h. The remaining contaminated soils will be excavated and loaded into a dump truck(s) for disposal off-site at a designated facility. If transport off-site is not immediately available, the remaining soils will be stockpiled on a double thickness sheet of 3-mil or higher polyethylene film. In addition, a small berm will be formed around the outer edges of the soil stockpile, underneath the polyethylene film, to ensure that contaminants are not washed from the site during precipitation and do not seep through the berm.
- i. Record all significant facts and information about the spill, including the following:
 - Type of pollutant
 - Location
 - Apparent source
 - Estimated volume
 - Time of discovery
 - Actions taken to clean up spill
- j. Provide the SWMP Administrator (or designated employee) with the information from Item i. The SWMP Administrator will then contact the City of Aurora Flow Control Center.

NOTIFICATION

Notification to the Colorado Department of Public Health & Environment (CDPHE) and the City of Aurora is required if there is any release or suspected release of any substance, including oil or other substances that

spill into or threaten State waters. Unless otherwise noted, notifications are to be made by the SWMP Administrator and only after emergency responses related to the release have been implemented. This will prevent misinformation and assures that notifications are properly conducted.

The notification requirements are as follows:

1. **Spills into/or Threatens State Waters:** Immediate notification is required for releases that occur beneath the surface of the land or impact or threaten waters of the State of threaten the public health and welfare. Notifications that will be made are:
 - a. For any substance, regardless of quantity, contact CDPHE at 1-877-518-5608. State as follows:
 - a) Give your name.
 - b) Give location of spill (name of city).
 - c) Describe the nature of the spill, type of products, and estimate size of spill.
 - d) Describe type of action taken thus far, type of assistance or equipment needed.
 - b. For any quantity of oil or other fluids, call the National Response Center at 1-800-424-8802. State as follows:
 - a) Give your name.
 - b) Give location of spill (name of city and state).
 - c) Describe the nature of the spill, type of product, and estimate size of spill.
 - d) Describe type of action taken thus far, type of assistance or equipment needed.
2. **Reportable Quantity Spill on Land Surface:** Immediate notification is required of a release upon the land surface of an oil in quantity that exceeds 25 gallons, or of a hazardous substance that equals or exceeds 10 pounds or its reportable quantity under Section 101(14) of the Comprehensive Environmental Response, Compensation Liability Act (CERCLA) of 1980 as amended (40 CFR Part 302) and Section 329 (3) of the Emergency Planning and Community Right to Know Act of 1986 (40 CFR Part 355) whichever is less. This requirement does apply at a minimum to the substances listed in Table A below.

TABLE A

Substances Requiring Notification

SUBSTANCE	REPORTABLE QUANTITY
Motor Oil	25 Gallons
Hydraulic Oil	25 Gallons
Gasoline/Diesel Fuel	25 Gallons

The notification procedures to be followed are:

- a) Give your name.
- b) Give location of spill (name of city and state).

- c) Describe nature of the spill, type of product, and estimate size of spill.
 - d) Describe type of action taken thus far, type of assistance or equipment needed.
3. Notification is not required for release of oil upon the land surface of 25 gallons or less that will not constitute a threat to public health and welfare, the environmental or a threat of entering the waters of the State.
 4. Notification, as required in paragraphs 1 and 2 above, will be made to the CDPHE using the 24-hour telephone number to report environmental spills. All information known about the release at the time of discovery is to be included, such as the time of occurrence, quantity and type of material, location and any corrective or clean-up actions presently being taken. Table B lists these phone numbers.

SPILL RESPONSE CONTACTS

TABLE B

Emergency Notification Contacts

Name/Agency	Number
City of Aurora Fire Department	911
City of Aurora Police Department	911
Ambulance	911
Hospital	911
National Response Center	1-800-424-8802
CDPHE – Report Environmental Spills (24 hrs/day)	1-877-518-5608
City of Aurora – Water Dept Erosion Control Staff	303-326-8645
Colorado Emergency Planning Committee	303-273-1622
Also contact SWMP Administrator and Owner	See Section 3 a) of this report

It is the responsibility of the SWMP Administrator to contact the City of Aurora, CDPHE, and/or the National Response Center.

- **The National Response Center** is to be contacted when a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR 110, 4- DFR 117, or 40 CFR 302 occurs during a 24-hour period.
- Notification to the **CDPHE** and **COA** is required if there is any release or suspected release of any material, including oil or hazardous substances that spill into or threaten state waters.

REPORTS

The CDPHE and COA require written notification of a spill or discharge of oil or other substance that may cause pollution of the waters of the State of Colorado. A written report must be submitted to the Water Quality Control District (WQCD) and the COA Erosion Control Staff within five days after becoming aware of the spill or discharge.

The CDPHE and COA require a written final report within 15 days for all releases of an oil or hazardous substance that require implementation of a contingency plan. The CDPHE and COA may also require additional reports on the status of the clean up until any required remedial action has been complete.

Written notification of reports must contain at a minimum:

1. Date, time, and duration of the release.
2. Location of the release.
3. Person or persons causing and responsible for the release.
4. Type and amount of oil or substance released.
5. Cause of the release.
6. Environmental damage caused by the release.
7. Actions taken to respond, contain, and clean up the release.
8. Location and method of ultimate disposal of the oil or other fluids.
9. Actions taken to prevent a reoccurrence of the release.
10. Any known or anticipated acute or chronic health risks associated with the release.
11. When appropriate advice regarding medical attention necessary for exposed individuals.

5) Dedicated Concrete or Asphalt Batch Plants

- Describe measures to control stormwater pollution from dedicated concrete batch plants or dedicated asphalt batch plants covered by the SWMP.

BMP Description: Not applicable. There will be no dedicated concrete or asphalt batch plants associated with this project.

<i>Intended Use/Purpose:</i>	NA
<i>Appropriate Installation Timing:</i>	NA
<i>Appropriate Removal Timing:</i>	NA

6) Vehicle Tracking Control

- Describe all practices implemented at the site to control potential sediment discharges from vehicle tracking. Practices must be implemented for all areas of potential vehicle tracking, and can include: minimizing site access; street sweeping or scraping; tracking pads; stabilized staging and parking areas; requiring that vehicles stay on paved areas on-site; wash racks; contractor education; and/or sediment control BMPs, etc

BMP Description: Mandatory sweeping of all internal and adjacent external paved areas is required on a weekly basis at a minimum. This

applies until Initial Close-Out acceptance. At that time it will be on an as needed basis.

BMP Description: *Street Sweeping*

<i>Location(s):</i>	Sweeping will occur weekly or as needed based on construction conditions.
<i>Intended Use/Purpose:</i>	Control sediment vehicle tracking onto paved surfaces
<i>Appropriate Installation Timing:</i>	For duration of construction activities
<i>Appropriate Removal Timing:</i>	At the completion of construction activities

7) Waste Management and Disposal, Including Concrete Washout

- Clearly describe the practices implemented at the site to control stormwater pollution from all construction site wastes (liquid and solid), including concrete washout activities and liquid waste washouts, dumpsters, worker trash, and portable toilets.

BMP Description: *Sanitary and Septic Waste Management*

<i>Locations</i>	Locations for portable toilets will be located near construction activities and will be relocated as needed to progress with pipeline construction.
<i>Appropriate Installation Timing:</i>	For duration of construction activities
<i>Appropriate Removal Timing:</i>	At the completion of construction activities

BMP Description: *Small Site Concrete/ Liquid Waste Washout (CWS)*

<i>Intended Use/Purpose:</i>	Concrete washout basin, either an excavated, lined earthen basin or a mobile at grade washout basin.
<i>Appropriate Installation Timing:</i>	Initial
<i>Appropriate Removal Timing:</i>	At the completion of construction activities

8) BMP Specifications

BMP Details for installation and maintenance shall be the City of Aurora Standard Details in Appendix D of the (*City of Aurora Rules and Regulations Regarding Stormwater Discharge Associated with Construction Activities (Rules and Regs)*), latest revision, an approved variance, or an approved plan amendment. All approved variances must be documented in the SWMP. It is understood that not all details in the COA Rules and Regs will be used on this project site, but that all details are available for implementation if unforeseen circumstances warrant their use. Proper procedures must be used to update the living document and get approval as documented in the COA Rules and Regs. All physical BMPs require a detail to show installation and maintenance information. If a detail is not available through the manufacturer, then one must be created by the preparer of this SWMP narrative report.

9) Groundwater and Stormwater Dewatering

- The SWMP shall clearly describe the practices to be implemented at the site to control stormwater pollution from the dewatering of groundwater or stormwater from excavations, wells, etc.
- For any construction dewatering of stormwater from construction areas, describe the BMPs to be used to control additional erosion and transport of sediment.

Note: This City of Aurora Stormwater permit does not authorize dewatering of groundwater. A separate State permit is required for this activity.

Permits for dewatering from the DWR OSE and CDHPE will be issued before dewatering operations are started.

BMP Description: *Dewatering (DW)*

<i>Intended Use/Purpose:</i>	Dewatering to manage the discharge of groundwater that must be removed for construction
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<i>Appropriate Installation Timing:</i>	Initial
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<i>Appropriate Removal Timing:</i>	At the completion of construction activities
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10) Developer/Builder Specific Practices

Include a description of standard practices of the company for whom this SWMP is being developed. At a minimum it shall include:

- Standard practices for construction operations during wet weather conditions and winter weather conditions
- Methods used to obtain compliance from sub-contractors (i.e. fines, education, etc)
- Stormwater education policies for educating personnel and subcontractors
- Company Standard Operating Procedures as they relate to stormwater management (as appropriate)
- Describe any standard construction practices that will be used on the site such as material loading and unloading practices, lot controls, lot access etc.

Note: Any practices requiring a variance that are discussed here must reference the variance section, and must be requested in the variance section, or they will be considered unapproved and not allowed.

<i>BMP Description: TBD.</i>	
<i>Intended Use/Purpose:</i>	NA
<i>Appropriate Installation Timing:</i>	NA
<i>Appropriate Removal Timing:</i>	NA

[Additional Developer/Builder practices not listed herein shall be submitted 3 days prior to the Erosion Control kick-off meeting for review and approval.](#)

SECTION 4 FINAL STABILIZATION AND LONG TERM STORMWATER MANAGEMENT

a) Final Stabilization Measures

Include a description of the proposed measures to be used to achieve final stabilization and long-term stormwater control. Revegetation with seeding and mulching, revegetation with seeding with erosion control blankets, landscaping, green roofs, permeable paving, permanent water quality ponds and permanent outlet protection are examples of final stabilization measures.

b) Seed Mix Information

Provide the name of the City of Aurora standard seed mix(es) that may be appropriate for the site and the soils anticipated for the site and the preferred method(s) for protecting the seed. If the site is not using a COA standard seed mix, then a variance request must be submitted and the preferred seed mix must be provided with the application rates.

c) Final Stabilization Notes

See Chapter 5 of the Rules and Regulations for more information.

- 1) *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.*
- 2) *Vegetative coverage density does not apply to paved areas, walks, buildings, or other hard surface impermeable areas.*
- 3) *Establishment of a vegetative cover capable of providing the erosion control equivalent to pre-existing conditions at the site can be considered final stabilization (i.e. landscape rocks, mulch, shrubs, etc). This determination will be made by the City of Aurora Water Department Erosion Control Program Staff prior to the close-out of the permit.*

BMP Description: *Seeding and Mulching (SM)*

<i>Intended Use/Purpose:</i>	Seeding and mulching for final stabilization utilizing approved City seed mixes and application rates. Standard mixes shall include Sand Loam and Clay Loam seed mix for most areas, and Damp or Low Areas, Ditches, Detention Ponds seed mix in areas of persistent water or wetlands.
<i>Appropriate Installation Timing:</i>	Final
<i>Appropriate Removal Timing:</i>	NA

SECTION 5 INSPECTIONS AND MAINTENANCE

This section shall describe procedures to inspect and maintain, in good effective operating condition, the vegetation, erosion, and sediment control measures and all other protective measures identified in the plan.

The following are the required frequencies of inspections:

- i. *Prior to Initial Closeout Acceptance:* Permittee shall self-inspect the site at least every 7 calendar days and within 24-hours after the end of any precipitation event or snowmelt event that results in runoff and causes surface erosion, except as allowed in Item iii below.
- ii. *Following Initial Closeout Acceptance and until permit closeout:* Permittee shall self-inspect the site at least every 30 calendar days, and within 24-hours after the end of any precipitation event or snowmelt event that results in runoff and causes surface erosion
- iii. *Post-Precipitation Event Inspections for Temporarily Idle Sites:* If a site is temporarily idle and no construction activities will occur during the 48 hours following a storm event, the post-precipitation event (including snowmelt) inspection shall be conducted prior to commencing construction activities on the site, but no later than 72 hours following the storm event.

— Describe all other procedures necessary to inspect and maintain all BMPs on this site.

Note: Do not duplicate information that is provided in the COA Standard Details for Maintenance and Inspection.

The City of Aurora has an established process for inspection of stormwater quality protection practices at construction sites. The Gun Club Raw Water Expansion Project will comply with the inspection requirements described in Chapter 4 of the City of Aurora Rules and Regulations Regarding Stormwater Discharges Associated with Construction Activities. Inspections shall consist of a review of the construction site perimeter, disturbed areas, and areas used for material storage that are exposed to precipitation. These areas will be reviewed for evidence of, or the potential for, sediment and other pollutants entering the drainage system. The specific site controls and BMPs identified in this SWMP will be inspected to ensure they are being implemented properly. An official record of inspections will be maintained by the SWMP Administrator.

SECTION 6 PROBABLE COST FOR INSTALLATION OF BMPs

The standardized probable cost form shall include costs for required maintenance during the construction phase and shall establish the required Fiscal Security amount.

*Notes: City of Aurora projects do not require Fiscal Security, unless otherwise required.
The Forms should be located in the Appendix of this SWMP narrative report.*

- List the total cost and the Fiscal Security amount, which is equal to the 25% Maintenance Cost amount of the higher of the two forms.

Initial BMP Total Cost:	\$	82184
Initial BMP Maintenance Cost:	\$	20546
Post-Paving BMP Total Cost:	\$	0
Post-Paving BMP Maintenance Cost:	\$	0
Fiscal Security amount:	\$	NA

SECTION 7 CALCULATIONS MADE FOR THE DESIGN

Include calculations made in the design of the SWMP, including calculations for sizing of sediment basins, design of erosion control matting, soil retention matting, sediment traps, diversion ditches, temporary stream crossings, weir sizing, or sizing of outlet protection riprap in the appendix with a summary of the results below.

- Address any required additional information below.

No calculations required.

SECTION 8 VARIANCE REQUESTS

As may be reasonably required by COA, additional information shall be included here. A listing of variances requested and/or requests for special consideration of innovative BMPs should be provided along with their justification.

Any variance from COA Rules and Regulations Regarding Stormwater Discharges Associated with Construction Activities shall be approved by the City of Aurora. If it is not specifically listed within this section of the narrative, then it shall not be considered an approved variance. There are provisions for Variance requests once construction has begun. See Chapter 3 Section 3.3.3 of the Rules and Regulations. In such cases the City of Aurora approved variance shall be added to the field maintained SWMP.

Note: Manufacturer documentation and specifications for requested variances shall be provided in the appendices. If no detail is provided for a physical BMP, the request for variance will automatically be denied.

- List all Variances being requested

Variance Description: <i>Stabilized Staging Area (SSA)</i>	
Intended Use/Purpose:	Construction Staging in Foodplain – Replace crushed rock with wood chips. All other provisions of the SSA apply.
Reason for Variance:	Limit disturbance to areas in the open space/ floodplain.
Maintenance Requirements:	Unchanged.
Appropriate Installation Timing:	July 2019
Appropriate Removal Timing:	December 2019

[Add additional sections here to meet requirements of other regulations]

REFERENCES

References should include the drainage report, the COA Rules and Regs, and the CDPHE permit at a minimum. Other relevant references may be included.

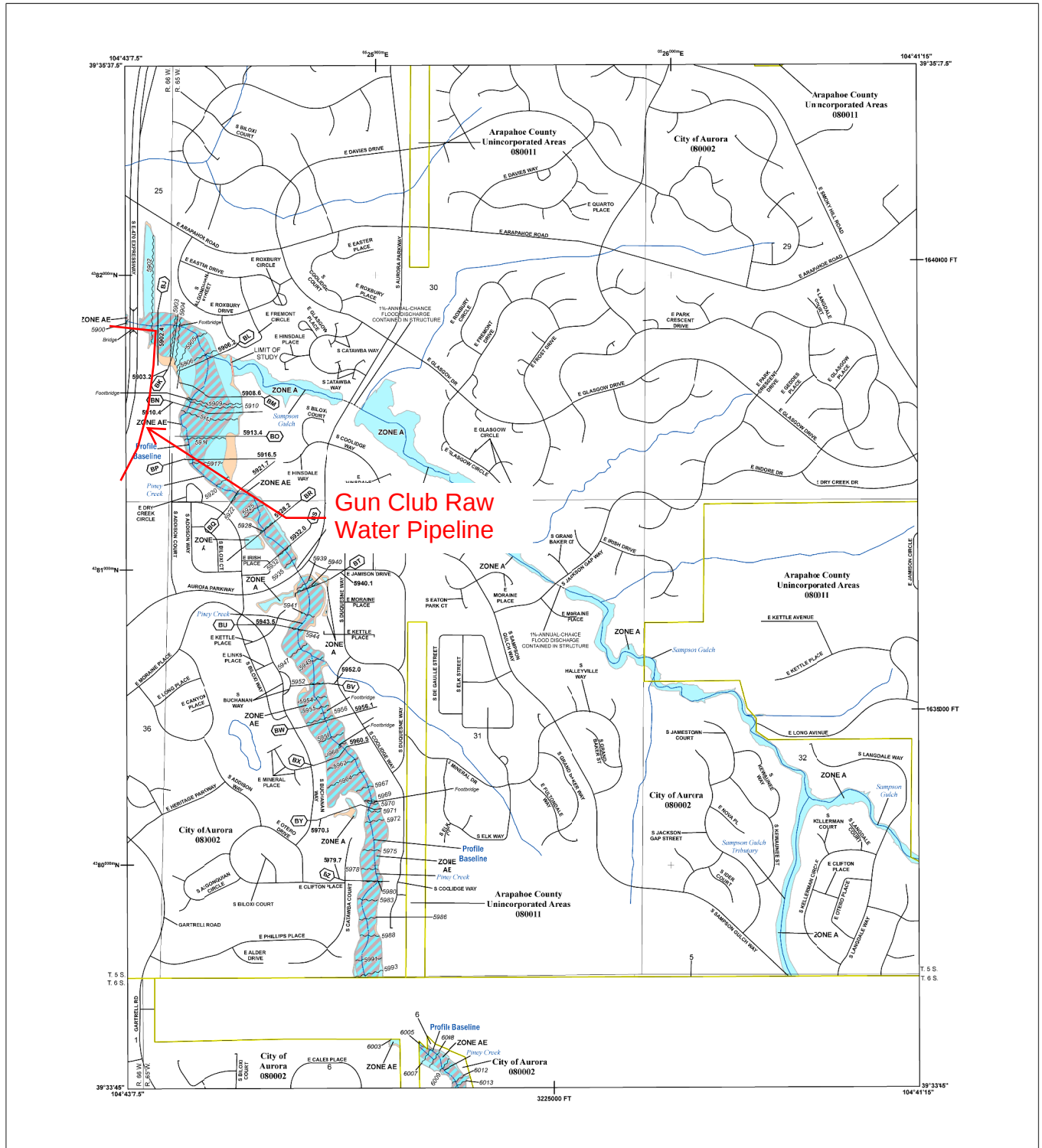
Rules and Regulations Regarding Stormwater Discharges Associated with Construction Activities, current revision

Colorado Department of Public Health and Environment CDPS General Permit – Stormwater Discharges Associated with Construction Activity, current revision to expire June 30, 2012.

[INSERT TEXT HERE](#)

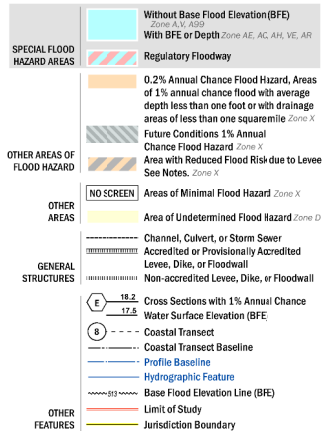
[INSERT TEXT HERE](#)

SWMP APPENDIX A – Floodplain Information



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR ZONE DESCRIPTIONS AND INDEX MAP
THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING
DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT
[HTTP://MSC.FEMA.GOV](http://MSC.FEMA.GOV)



NOTES TO USERS

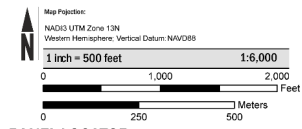
For information and questions about this map, available products associated with this FIRI including historic versions of this FIRI, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information Exchange at 1-877-FEMA-MAP (1-877-368-2971) or visit the FEMA Map Service Center website at <http://msc.fema.gov>. Available products may include previously issued editions of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be searched or obtained directly from the website. Users may determine the current map date for each FIRI panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information Exchange.

Communities receiving land or adjacent FIRI panels must obtain a current copy of the adjacent panel as well as the current FIRI index. These may be ordered directly from the Map Service Center at the number listed above.

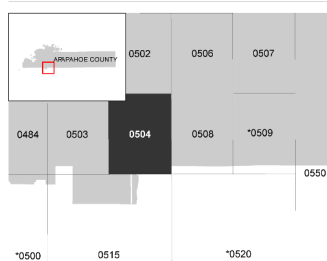
For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction. To determine if flood insurance is available in the community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Base map information shown on this FIRI was provided by the Arapahoe County and City of Aurora and Litchfield GIS departments. The coordinate system used for production of this digital FIRI is Universal Transverse Mercator, Zone 13N, referenced to the North American Datum of 1983 and the GRS 1990 spheroid, Western Hemisphere.

SCALE



PANEL LOCATOR



* PANEL NOT PRINTED



NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE RATE MAP

ARAPAHOE COUNTY, COLORADO
And Incorporated Areas

PANEL 504 OF 725



COMMUNITY	NUMBER	PANEL	SUFFIX
ARAPAHOE COUNTY	080011	0504	L
AURORA, CITY OF	080002	0504	L

Panel Contains

COMMUNITY NUMBER PANEL SUFFIX

ARAPAHOE COUNTY 080011 0504 L

AURORA, CITY OF 080002 0504 L

Panel Contains

COMMUNITY NUMBER PANEL SUFFIX

ARAPAHOE COUNTY 080011 0504 L

AURORA, CITY OF 080002 0504 L

Panel Contains

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ARAPAHOE COUNTY 080011 0504 L

AURORA, CITY OF 080002 0504 L

Panel Contains

COMMUNITY NUMBER PANEL SUFFIX

ARAPAHOE COUNTY 080011 0504 L

AURORA, CITY OF 080002 0504 L

VERSION NUMBER
2.3.3.2

MAP NUMBER
08005C0504L

MAP REVISED
FEBRUARY 17, 2017

SWMP 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 **Arapahoe County, Colorado**



December 14, 2018

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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

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How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

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

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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 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.

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: Arapahoe County, Colorado

Survey Area Data: Version 14, Sep 10, 2018

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

Date(s) aerial images were photographed: Mar 16, 2012—Aug 21, 2014

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
BoE	Blakeland loamy sand, 1 to 20 percent slopes	7.5	1.5%
BsB	Bresser sandy loam, terrace, 0 to 3 percent slopes	6.5	1.3%
BuD	Bresser-Stapleton sandy loams, 3 to 9 percent slopes	108.9	21.1%
BuE	Bresser-Stapleton sandy loams, 9 to 20 percent slopes	25.7	5.0%
FoC	Fondis-Colby silt loams, 3 to 5 percent slopes	6.7	1.3%
HIB	Heldt clay, 0 to 3 percent slopes	15.6	3.0%
Lv	Loamy alluvial land	30.6	5.9%
NIB	Nunn loam, 1 to 3 percent slopes	40.0	7.8%
ReE	Renohill loam,reddish variant, 5 to 20 percent slopes	38.0	7.4%
RhD	Renohill-Buick loams, 3 to 9 percent slopes	44.1	8.5%
RhE	Renohill-Buick loams, 9 to 20 percent slopes	24.6	4.8%
RtE	Renohill-Little-Thedalund complex, 9 to 30 percent slopes	43.5	8.4%
SIF	Samsil-Little stony clays, 20 to 50 percent slopes	23.9	4.6%
Ss	Samsil-Shale outcrop complex	18.7	3.6%
Su	Sandy alluvial land	44.4	8.6%
SwE	Stapleton sandy loam, 9 to 30 percent slopes	37.0	7.2%
Totals for Area of Interest		515.8	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

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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.

Arapahoe County, Colorado

BoE—Blakeland loamy sand, 1 to 20 percent slopes

Map Unit Setting

National map unit symbol: 34xz
Elevation: 4,600 to 5,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Blakeland and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: From the dawson formation eolian deposits

Typical profile

H1 - 0 to 14 inches: loamy sand
H2 - 14 to 60 inches: sand, loamy coarse sand, loamy sand
H2 - 14 to 60 inches:
H2 - 14 to 60 inches:

Properties and qualities

Slope: 1 to 20 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: High (about 10.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Deep Sand (R067BY015CO)
Hydric soil rating: No

Minor Components

Valent

Percent of map unit: 10 percent

Hydric soil rating: No

BsB—Bresser sandy loam, terrace, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 34y1

Elevation: 5,300 to 6,800 feet

Mean annual precipitation: 12 to 15 inches

Mean annual air temperature: 46 to 52 degrees F

Frost-free period: 135 to 155 days

Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Bresser, terrace, and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bresser, Terrace

Setting

Landform: Drainageways, stream terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Noncalcareous sandy alluvium and/or noncalcareous sandy eolian deposits

Typical profile

H1 - 0 to 6 inches: sandy loam

H2 - 6 to 21 inches: clay loam, sandy clay loam

H2 - 6 to 21 inches: gravelly sandy loam, coarse sandy loam, sandy loam

H3 - 21 to 28 inches: gravelly loamy sand, loamy coarse sand

H3 - 21 to 28 inches:

H3 - 21 to 28 inches:

H4 - 28 to 60 inches:

H4 - 28 to 60 inches:

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)

Depth to water table: More than 80 inches

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Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: Very high (about 12.8 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: Sandy Foothill (R049BY210CO)
Hydric soil rating: No

Minor Components

Bijou

Percent of map unit: 8 percent
Hydric soil rating: No

Olney

Percent of map unit: 7 percent
Hydric soil rating: No

Nunn

Percent of map unit: 5 percent
Hydric soil rating: No

BuD—Bresser-Stapleton sandy loams, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 34y3
Elevation: 4,700 to 6,800 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 135 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Bresser and similar soils: 60 percent
Stapleton and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bresser

Setting

Landform: Drainageways, stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Noncalcareous sandy alluvium and/or noncalcareous sandy eolian deposits

Typical profile

H1 - 0 to 10 inches: sandy loam
H2 - 10 to 34 inches: clay loam, sandy clay loam
H2 - 10 to 34 inches: gravelly sandy loam, coarse sandy loam, sandy loam
H3 - 34 to 44 inches: gravelly loamy sand, loamy coarse sand
H3 - 34 to 44 inches:
H3 - 34 to 44 inches:
H4 - 44 to 60 inches:
H4 - 44 to 60 inches:

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: Very high (about 15.1 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Sandy Foothill (R049BY210CO)
Hydric soil rating: No

Description of Stapleton

Setting

Landform: Knobs, hills
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic sandstone

Typical profile

H1 - 0 to 8 inches: sandy loam
H2 - 8 to 16 inches: sandy loam
H3 - 16 to 25 inches: sandy loam
H4 - 25 to 29 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
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

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Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: Sandy Foothill (R049BY210CO)

Hydric soil rating: No

Minor Components

Buick

Percent of map unit: 5 percent

Hydric soil rating: No

Renohill

Percent of map unit: 5 percent

Hydric soil rating: No

BuE—Bresser-Stapleton sandy loams, 9 to 20 percent slopes

Map Unit Setting

National map unit symbol: 34y4

Elevation: 5,300 to 6,800 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 46 to 52 degrees F

Frost-free period: 135 to 170 days

Farmland classification: Not prime farmland

Map Unit Composition

Bresser and similar soils: 40 percent

Stapleton and similar soils: 40 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bresser

Setting

Landform: Drainageways, stream terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Noncalcareous sandy alluvium and/or noncalcareous sandy eolian deposits

Typical profile

H1 - 0 to 7 inches: sandy loam

H2 - 7 to 18 inches: clay loam, sandy clay loam

H2 - 7 to 18 inches: gravelly sandy loam, coarse sandy loam, sandy loam

H3 - 18 to 28 inches: gravelly loamy sand, loamy coarse sand

H3 - 18 to 28 inches:

Custom Soil Resource Report

H3 - 18 to 28 inches:

H4 - 28 to 60 inches:

H4 - 28 to 60 inches:

Properties and qualities

Slope: 9 to 15 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 10 percent

Available water storage in profile: Very high (about 12.5 inches)

Interpretive groups

Land capability classification (irrigated): 6e

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Ecological site: Sandy Foothill (R049BY210CO)

Hydric soil rating: No

Description of Stapleton

Setting

Landform: Ridges, hills

Landform position (two-dimensional): Shoulder, summit

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Arkosic sandstone

Typical profile

H1 - 0 to 6 inches: sandy loam

H2 - 6 to 19 inches: gravelly sandy loam, sandy loam

H2 - 6 to 19 inches: weathered bedrock

H3 - 19 to 23 inches:

Properties and qualities

Slope: 9 to 20 percent

Depth to restrictive feature: 10 to 20 inches to paralithic bedrock

Natural drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Ecological site: Sandy Foothill (R049BY210CO)

Hydric soil rating: No

Minor Components

Buick

Percent of map unit: 10 percent

Hydric soil rating: No

Litle

Percent of map unit: 5 percent

Hydric soil rating: No

Renohill

Percent of map unit: 5 percent

Hydric soil rating: No

FoC—Fondis-Colby silt loams, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: 34yl

Elevation: 4,700 to 6,200 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 46 to 52 degrees F

Frost-free period: 150 to 170 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Fondis and similar soils: 65 percent

Colby and similar soils: 25 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fondis

Setting

Landform: Drainageways

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Silty and/or loamy

Typical profile

H1 - 0 to 5 inches: silt loam

H2 - 5 to 17 inches: clay

H3 - 17 to 60 inches: clay loam

Properties and qualities

Slope: 3 to 5 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Low

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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 in profile: 15 percent

Available water storage in profile: High (about 10.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3c

Hydrologic Soil Group: C

Ecological site: LOAMY FOOTHILL (R067XY202CO)

Hydric soil rating: No

Description of Colby

Setting

Landform: Ridges

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Fine-loamy eolian deposits and/or fine-silty eolian deposits

Typical profile

H1 - 0 to 4 inches: silt loam

H2 - 4 to 60 inches: loam, silt loam

H2 - 4 to 60 inches:

Properties and qualities

Slope: 3 to 5 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 20 percent

Available water storage in profile: Very high (about 19.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3c

Hydrologic Soil Group: B

Ecological site: LOAMY FOOTHILL (R067XY202CO)

Hydric soil rating: No

Minor Components

Weld

Percent of map unit: 6 percent

Hydric soil rating: No

Ft collins

Percent of map unit: 4 percent

Hydric soil rating: No

HIB—Heldt clay, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 34yp

Elevation: 4,000 to 6,200 feet

Mean annual precipitation: 11 to 15 inches

Mean annual air temperature: 46 to 59 degrees F

Frost-free period: 110 to 150 days

Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Heldt and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Heldt

Setting

Landform: Stream terraces, flood plains, drainageways

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Eolian deposits

Typical profile

H1 - 0 to 4 inches: clay

H2 - 4 to 60 inches: silty clay, clay

H2 - 4 to 60 inches:

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately 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 in profile: 10 percent

Gypsum, maximum in profile: 1 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 10.0

Available water storage in profile: Very high (about 17.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Custom Soil Resource Report

Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: C
Ecological site: Clayey Plains (R067BY042CO)
Hydric soil rating: No

Minor Components

Nunn

Percent of map unit: 7 percent
Hydric soil rating: No

Beckton

Percent of map unit: 3 percent
Hydric soil rating: No

Lv—Loamy alluvial land

Map Unit Setting

National map unit symbol: 34yt
Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 11 to 15 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Loamy alluvial land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Loamy Alluvial Land

Setting

Landform: Flood plains, drainageways, streams
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

H1 - 0 to 6 inches: loam
H2 - 6 to 60 inches: stratified loam to clay loam

Properties and qualities

Slope: 0 to 3 percent
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Frequency of flooding: Occasional
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 1 percent

Custom Soil Resource Report

Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)

Available water storage in profile: High (about 10.7 inches)

Interpretive groups

Land capability classification (irrigated): 2w

Land capability classification (nonirrigated): 6w

Hydrologic Soil Group: B

Ecological site: Overflow (R067BY036CO)

Hydric soil rating: No

Minor Components

Nunn

Percent of map unit: 10 percent

Hydric soil rating: No

Satanta

Percent of map unit: 5 percent

Landform: Paleoterraces

Hydric soil rating: No

NIB—Nunn loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tln2

Elevation: 3,900 to 6,250 feet

Mean annual precipitation: 13 to 16 inches

Mean annual air temperature: 46 to 54 degrees F

Frost-free period: 135 to 160 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Nunn and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nunn

Setting

Landform: Terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Pleistocene aged alluvium and/or eolian deposits

Typical profile

Ap - 0 to 6 inches: loam

Bt1 - 6 to 10 inches: clay loam

Bt2 - 10 to 26 inches: clay loam

Btk - 26 to 31 inches: clay loam

Bk1 - 31 to 47 inches: loam

Custom Soil Resource Report

Bk2 - 47 to 80 inches: loam

Properties and qualities

Slope: 1 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Medium

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 in profile: 7 percent

Salinity, maximum in profile: Nonsaline (0.1 to 1.0 mmhos/cm)

Sodium adsorption ratio, maximum in profile: 0.5

Available water storage in profile: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: Loamy Plains (R067BY002CO)

Hydric soil rating: No

Minor Components

Wages

Percent of map unit: 8 percent

Landform: Alluvial fans, terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Loamy Plains (R067BY002CO)

Hydric soil rating: No

Fort collins

Percent of map unit: 5 percent

Landform: Terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Loamy Plains (R067BY002CO)

Hydric soil rating: No

Haverson, very rarely flooded

Percent of map unit: 2 percent

Landform: Terraces, drainageways, alluvial fans

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear, concave

Ecological site: Overflow (R067BY036CO)

Hydric soil rating: No

ReE—Renohill loam,reddish variant, 5 to 20 percent slopes

Map Unit Setting

National map unit symbol: 34yz
Elevation: 3,600 to 6,200 feet
Mean annual precipitation: 11 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 100 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Renohill and similar soils: 87 percent
Minor components: 13 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Renohill

Setting

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loam clayey

Typical profile

H1 - 0 to 5 inches: loam
H2 - 5 to 19 inches: clay, clay loam
H2 - 5 to 19 inches: clay loam, loam
H3 - 19 to 26 inches: unweathered bedrock
H3 - 19 to 26 inches:
H4 - 26 to 30 inches:

Properties and qualities

Slope: 5 to 20 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
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 in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Loamy Foothill (R049BY202CO)

Custom Soil Resource Report

Hydric soil rating: No

Minor Components

Buick

Percent of map unit: 5 percent

Hydric soil rating: No

Thedalund

Percent of map unit: 5 percent

Hydric soil rating: No

Samsil

Percent of map unit: 3 percent

Hydric soil rating: No

RhD—Renohill-Buick loams, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 34z0

Elevation: 3,600 to 6,200 feet

Mean annual precipitation: 11 to 16 inches

Mean annual air temperature: 45 to 48 degrees F

Frost-free period: 100 to 170 days

Farmland classification: Not prime farmland

Map Unit Composition

Renohill and similar soils: 65 percent

Buick and similar soils: 25 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Renohill

Setting

Landform: Drainageways

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loam silty and clayey alluvium

Typical profile

H1 - 0 to 4 inches: loam

H2 - 4 to 18 inches: clay, clay loam

H2 - 4 to 18 inches: clay loam, loam

H3 - 18 to 30 inches: unweathered bedrock

H3 - 18 to 30 inches:

H4 - 30 to 34 inches:

Properties and qualities

Slope: 3 to 9 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Custom Soil Resource Report

Runoff class: Medium

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 in profile: 15 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: D

Ecological site: Loamy Plains (R067BY002CO)

Hydric soil rating: No

Description of Buick

Setting

Landform: Ridges

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium and/or eolian deposits

Typical profile

H1 - 0 to 4 inches: loam

H2 - 4 to 20 inches: clay loam

H3 - 20 to 60 inches: clay loam, sandy clay loam

H3 - 20 to 60 inches:

Properties and qualities

Slope: 3 to 8 percent

Depth to restrictive feature: More than 80 inches

Natural 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 in profile: 15 percent

Available water storage in profile: Very high (about 17.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4c

Hydrologic Soil Group: C

Ecological site: Loamy Plains (R067BY002CO)

Hydric soil rating: No

Minor Components

Fondis

Percent of map unit: 5 percent

Hydric soil rating: No

Little

Percent of map unit: 5 percent

Hydric soil rating: No

RhE—Renohill-Buick loams, 9 to 20 percent slopes

Map Unit Setting

National map unit symbol: 34z1

Elevation: 3,600 to 6,200 feet

Mean annual precipitation: 11 to 16 inches

Mean annual air temperature: 45 to 48 degrees F

Frost-free period: 100 to 170 days

Farmland classification: Not prime farmland

Map Unit Composition

Renohill and similar soils: 67 percent

Buick and similar soils: 20 percent

Minor components: 13 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Renohill

Setting

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Clay loamy alluvium

Typical profile

H1 - 0 to 4 inches: loam

H2 - 4 to 14 inches: clay, clay loam

H2 - 4 to 14 inches: clay loam, loam

H3 - 14 to 26 inches: unweathered bedrock

H3 - 14 to 26 inches:

H4 - 26 to 30 inches:

Properties and qualities

Slope: 9 to 20 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Natural drainage class: Well drained

Runoff class: Medium

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 in profile: 15 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Moderate (about 8.4 inches)

Custom Soil Resource Report

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Ecological site: Loamy Slopes (R067BY008CO)

Hydric soil rating: No

Description of Buick

Setting

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium and/or eolian deposits

Typical profile

H1 - 0 to 5 inches: loam

H2 - 5 to 22 inches: clay loam

H3 - 22 to 60 inches: clay loam, sandy clay loam

H3 - 22 to 60 inches:

Properties and qualities

Slope: 5 to 8 percent

Depth to restrictive feature: More than 80 inches

Natural 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 in profile: 15 percent

Available water storage in profile: Very high (about 16.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4c

Hydrologic Soil Group: C

Ecological site: Loamy Slopes (R067BY008CO)

Hydric soil rating: No

Minor Components

Litle

Percent of map unit: 10 percent

Hydric soil rating: No

Fondis

Percent of map unit: 3 percent

Hydric soil rating: No

RtE—Renohill-Litle-Thedalund complex, 9 to 30 percent slopes

Map Unit Setting

National map unit symbol: 34z4
Elevation: 3,600 to 6,200 feet
Mean annual precipitation: 11 to 16 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 100 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Renohill and similar soils: 40 percent
Litle and similar soils: 32 percent
Thedalund and similar soils: 20 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Renohill

Setting

Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loam clayey

Typical profile

H1 - 0 to 3 inches: loam
H2 - 3 to 15 inches: clay, clay loam
H2 - 3 to 15 inches: clay loam, loam
H3 - 15 to 24 inches: unweathered bedrock
H3 - 15 to 24 inches:
H4 - 24 to 28 inches:

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural 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 in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Clayey Foothill (R049BY208CO)
Hydric soil rating: No

Description of Litle

Setting

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits

Typical profile

H1 - 0 to 3 inches: silty clay loam
H2 - 3 to 30 inches: clay, silty clay
H2 - 3 to 30 inches: weathered bedrock
H3 - 30 to 34 inches:

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
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 in profile: 15 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: Clayey Foothill (R049BY208CO)
Hydric soil rating: No

Description of Thedalund

Setting

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Interbedded residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 5 inches: clay loam
H2 - 5 to 23 inches: clay loam, loam
H2 - 5 to 23 inches: weathered bedrock
H3 - 23 to 27 inches:

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural 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 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: Clayey Foothill (R049BY208CO)
Hydric soil rating: No

Minor Components

Buick

Percent of map unit: 5 percent
Hydric soil rating: No

Tassel

Percent of map unit: 3 percent
Hydric soil rating: No

SIF—Samsil-Litle stony clays, 20 to 50 percent slopes

Map Unit Setting

National map unit symbol: 34z7
Elevation: 4,700 to 6,200 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 150 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Samsil and similar soils: 45 percent
Litle and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Samsil

Setting

Landform: Knobs
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium

Typical profile

H1 - 0 to 3 inches: stony clay
H2 - 3 to 12 inches: clay, silty clay
H2 - 3 to 12 inches: weathered bedrock
H3 - 12 to 16 inches:

Properties and qualities

Slope: 20 to 50 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural 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 in profile: 10 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

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

Description of Litle

Setting

Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits

Typical profile

H1 - 0 to 3 inches: stony clay
H2 - 3 to 21 inches: silty clay, clay
H2 - 3 to 21 inches: weathered bedrock
H3 - 21 to 25 inches:

Properties and qualities

Slope: 20 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High

Custom Soil Resource Report

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 in profile: 15 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: Moderate (about 6.0 inches)

Interpretive groups

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

Minor Components

Renohill

Percent of map unit: 10 percent
Hydric soil rating: No

Thedalund

Percent of map unit: 10 percent
Hydric soil rating: No

Ss—Samsil-Shale outcrop complex

Map Unit Setting

National map unit symbol: 34z9
Elevation: 4,700 to 6,200 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 150 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Samsil and similar soils: 60 percent
Shale outcrop: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Samsil

Setting

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous loam clayey

Custom Soil Resource Report

Typical profile

H1 - 0 to 5 inches: clay loam
H2 - 5 to 12 inches: clay, silty clay
H2 - 5 to 12 inches: weathered bedrock
H3 - 12 to 16 inches:

Properties and qualities

Slope: 9 to 20 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
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 in profile: 10 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Shaly Plains (R067BY045CO)
Hydric soil rating: No

Description of Shale Outcrop

Setting

Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

H1 - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 9 to 20 percent
Depth to restrictive feature: 0 inches to paralithic bedrock
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

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

Minor Components

Renohill

Percent of map unit: 10 percent

Hydric soil rating: No

Su—Sandy alluvial land

Map Unit Setting

*National map unit symbol: 34zc
Elevation: 2,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 110 to 160 days
Farmland classification: Not prime farmland*

Map Unit Composition

*Sandy alluvial land: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.*

Description of Sandy Alluvial Land

Setting

*Landform: Streams, drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium and/or loamy alluvium*

Typical profile

*H1 - 0 to 10 inches: sand
H2 - 10 to 60 inches: fine sand, sand, loamy sand
H2 - 10 to 60 inches:
H2 - 10 to 60 inches:*

Properties and qualities

*Slope: 0 to 2 percent
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Frequency of flooding: Frequent
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: High (about 11.0 inches)*

Interpretive groups

*Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A
Hydric soil rating: No*

Minor Components

Bresser

Percent of map unit: 5 percent

Hydric soil rating: No

SwE—Stapleton sandy loam, 9 to 30 percent slopes

Map Unit Setting

National map unit symbol: 34zf

Elevation: 4,700 to 6,200 feet

Mean annual precipitation: 15 to 16 inches

Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 150 to 170 days

Farmland classification: Not prime farmland

Map Unit Composition

Stapleton and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Stapleton

Setting

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Arkosic sandstone

Typical profile

H1 - 0 to 8 inches: sandy loam

H2 - 8 to 16 inches: sandy loam

H3 - 16 to 25 inches: sandy loam, gravelly sandy loam

H3 - 16 to 25 inches: unweathered bedrock

H4 - 25 to 29 inches:

Properties and qualities

Slope: 9 to 30 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Natural 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

Available water storage in profile: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Custom Soil Resource Report

Hydrologic Soil Group: B

Hydric soil rating: No

Minor Components

Bresser

Percent of map unit: 5 percent

Hydric soil rating: No

Truckton

Percent of map unit: 3 percent

Hydric soil rating: No

Sandy alluvial land

Percent of map unit: 2 percent

Hydric soil rating: No

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SWMP APPENDIX C – Probable Cost Forms

PROBABLE BMP COST SHEETS

Standardized Probable Cost Spreadsheet for Initial BMPs

Project Name: Gun Club Raw Water Expansion Project

Date: 5/1/2019

No.	BMP	ID	Unit	Installation Unit Cost	Initial / Interim Quantity	Initial / Interim Cost
1	Check Dam	CD	LF	\$ 24.00		\$ -
2	Compost Blanket	CB	SF	\$ 0.50		\$ -
3	Compost Filter Berm	CFB	LF	\$ 4.00		\$ -
4	Concrete Washout Area	CWA	EA	\$ 1,000.00	5	\$ 5,000.00
5	Construction Fence	CF	LF	\$ 5.00	6724	\$ 33,620.00
6	Curb Socks	CS	EA	\$ 20.00		\$ -
7	Diversion Channel	DC	EA	\$ 2,000.00		\$ -
8	Diversion Dike	DD	LF	\$ 1.50		\$ -
9	Dewatering	DW	EA	\$ 600.00	10	\$ 6,000.00
10	Erosion Control Blanket	ECB	SY	\$ 5.00		\$ -
11	Inlet Protection - All types	IP	EA	\$ 300.00	2	\$ 600.00
12	Outlet Protection	OP	EA	\$ 250.00		\$ -
13	Reinforced Check Dam	RCD	LF	\$ 36.00		\$ -
14	Rock Socks	RS	LF	\$ 10.00		\$ -
15	Rough Cut Street Control	RCS	EA	\$ 50.00		\$ -
16	Sediment Basin	SB	CY	\$ 3.00		\$ -
17	Sediment Control Log	SCL	LF	\$ 3.00		\$ -
18	Sediment Trap	ST	EA	\$ 600.00		\$ -
19	Seeding & Mulching (Less than 10 Acres)	SM	AC	\$ 2,500.00	5	\$ 12,500.00
	(Greater than 10 Acres)	SM	AC	\$ 1,500.00		\$ -
20	Silt Fence	SF	LF	\$ 2.00	7170	\$ 14,340.00
21	Silt Fence - Reinforced	SF-R	LF	\$ 4.00		\$ -
22	Stabilized Staging Area	SSA	SY	\$ 2.00	2	\$ 4.00
23	Surface Roughening	SR	AC	\$ 600.00		\$ -
24	Temporary Slope Drain	TSD	LF	\$ 25.00		\$ -
25	Temporary Stream Crossing	TSC	EA	\$ 1,500.00		\$ -
26	Terracing	TER		\$ -		\$ -
27	Tree Protection Fencing	TP	LF	\$ 5.00		\$ -
28	Vehicle Tracking Control	VTC	EA	\$ 1,000.00	5	\$ 5,000.00
29	VTC with Wheel Wash	WW	EA	\$ 1,500.00		\$ -
30	Mobilization (required on all projects)	MB	LS	\$ 5,000.00	1	\$ 5,000.00
31	Pond Maintenance/Sediment Removal (Based on area tributary to the pond)	PM	AC	\$ 1,000.00		\$ -
32	Street Maintenance (Based on lane miles of streets within project and adjacent to project)	STM	LM	\$ 1,500.00	0.08	\$ 120.00
33	Other: _____			\$ -		\$ -
Subtotal Cost of Initial BMPs						\$ 82,184.00
34	Maintenance (required on all projects)		%	25% of Subtotal		\$ 20,546.00
Total Cost of Initial & Interim BMPs						\$ 102,730.00
Fiscal Security Amount						\$ 20,546.00

* For Temporary Batch Plant BMPs allow \$5000.00 in line 32.

** Fiscal Security required is the higher amount of either the Initial or the Post-Paving, not both.

SWMP APPENDIX D – Calculations

SWMP APPENDIX E – Variance Request Details

SWMP APPENDIX F – Vertical and General Construction Matrix

Vertical and General Construction Concern	BMP Measures	Information Provided by:	Approved by (COA Employee):
Provide a mixing station detail/area for masonry/brick. If the site is going to bring in silos for masonry mixing, wind protection will be required to minimize the maximum extent practicable the dust from impacting adjacent buildings and streets.			
Saw cutting station detail/area (must address slurry waste)			
Tool Cleanup BMPs and Practices			
Procedural BMPs for clean up in the above areas and clean up if spills should occur as traveling to the building area			
Options for handling paints, solvents, glues (i.e. utilize the CWS or provide alternative)			
Provide physical and procedural BMPs for clean up along the building during the installation of brick, stone or stucco (strike zone and scaffolding impacts to BMPs)			
Access may be required around the building, defining a haul route may be necessary and denote stabilization needs on this proposed haul route (cranes)			

Address access to the building as different stages of vertical construction occur. For example, a VTC may work for the duration of the infrastructure construction but as the grading is fine tuned, different measures may need to be implemented to limit access or be more mobile. Controlling access is important during vertical construction, especially when taking access from an impervious surface (i.e. pavement).			
Staging areas change during construction regularly. Therefore, if “con/conex” boxes are to be utilized and if they are to include liquid pollutants, then a redundant BMP measure must be provided			
Site drainage will need to be maintained during vertical construction. Review conditions to ensure that it will continue to work as shown during the grading/utility timeframes.			
Provide redundant BMPs for generators to protect from fuel/hydraulic leaks			
Utility Installation BMPs			
Waterproofing BMPs and procedures			

Review the down gradient BMPs within the impervious areas to ensure that conveyances, inlets and outlets are protected appropriately during each phase.			
Areas of disturbance outside of the building envelope shall still require BMPs review the timing/phasing of the project to ensure the appropriate BMPs are implemented as construction continues.			
BMPs for keeping impervious surfaces clean may need to be enhanced or added to as construction continues.			
Provide redundant BMPs for mobile concrete washouts and policies for cleanup of blobs of concrete by trades			
Review and implement BMP measures to control roof drainage. This becomes a point source and may cause extensive erosion on site.			
Address waste handling procedures for drywall, painters, carpet layers etc.			
Provide BMPs for delivery trucks – i.e. controlled access points, staging areas, delivery areas, parking area.			
Coordination Plan – required if different phases of work is to be done by different general contractors (i. e. road work vs. building façade)			

Details and BMP measures for form oil and form oil laydown area			
Run on modifications			
Interim lot stabilization techniques			
The methods to be used to address the following issues:			
▪ Irrigation testing			
▪ Water main/fire line testing			
▪ Sewer line testing			
▪ Building washing			

▪ Graffiti deterrent application			
▪ Fire retardant application			
▪ Fueling			
▪ Process water (paving rollers, boring equipment, wet saws, etc)			