FINAL DRAINAGE REPORT
FOR
LOT 23 CLAREMONT BUSINESS PARK FILING NO. 2

July 7, 2017

Prepared for:

Golden Age Preservation and Restoration, LLC
310 Gold Claim Terrace
Colorado Springs, CO 80905

WestWorks Job #91703

El Paso County Project Number PPR-17-022

FINAL DRAINAGE REPORT FOR LOT 23 CLAREMONT BUSINESS PARK FILING NO. 2

Engineer's Statement:

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

35751

Chad D. Kuzbek, Colorado PE #35751
For and on behalf of WestWorks Engineering

10/18/17
Date

Developer's Statement:

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

Golden Age Preservation & Restoration, LLC
Business Name

By:

Title: Owner

Address: 310 Gold Claim Terrace
Colorado Springs, CO 80905

El Paso County, Colorado:

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

Approved
By:Jennifer Irvine, County Engineer
Date:11/28/2017
El Paso County Department of Public Works

Jennifer Irvine, PE
County Engineer/ECM Administrator

Date

Conditions:

FINAL DRAINAGE REPORT FOR LOT 23 CLAREMONT BUSINESS PARK FILING NO. 2

PURPOSE

The purpose of this drainage report is to identify specific solutions to drainage problems on site and off-site resulting from the development of this platted subdivision to be developed.

GENERAL LOCATION AND DESCRIPTION

Lot 23 Claremont Business Park Filing No. 2 (herein referred to as 'Site') is a 0.39 acre industrial site located within a portion of the northeast quarter of Section 8, Township 14 South, Range 65 West of the 6th P.M. in El Paso County, Colorado. More specifically, the site is located near the corner of Meadowbrook Parkway and Cole View. Development of the site includes an industrial use building with associated parking and landscaping.

The existing site is covered mostly with native grasses and slopes gently to moderately from northeast to southwest. Existing soils in the study area consist mostly of Ellicott loamy coarse sand (Map Unit #28) as determined by the USDA NRCS. For calculations purposes Hydrologic Soil Group ‘A’ is used.

The adjacent site to the northeast is currently under construction for a proposed industrial facility. The other adjacent sites are pad-site graded by remain undeveloped at this time.

The study area is in the Sand Creek (East Fork) Drainage Basin Planning Area.

DRAINAGE BASINS AND SUB-BASINS

This site was previously studied in the "Final Drainage Report for Claremont Business Park Filing No. 2," prepared by Matrix Design Group, dated November 2006. The impervious area and runoff patterns associated with the construction of this project are in substantial conformance with the industrial development anticipated in the approved drainage study.

The existing site is pad graded but undeveloped. Existing flows travel southwest into Cole View. No off-site flows will impact this site.

The main purpose of this report is to size a proposed stormwater quality facility. For this site a sand filter basin (SFB) was chosen.

Basin A1 represents the developed flows draining into SFB Pond A. Runoff of Q_5 = 1.2 cfs and Q_{100} = 2.4 cfs will drain into Pond A via curb with a riprap rundown. Roof drainage should bi into parking lot where it can drain into Pond A. The SFP Pond A calculations are included in the Appendix of this report. Here is a summary:

WQCV required	=	314 CF
WQCV provided	=	314 CF (pond elevation 6,330.6)
SFB Area required	=	135 SF
SFB Area provided	=	135 SF (pond elevation 6,329.5)

Discharge from Pond A will be via a 5'-wide riprap lined overflow weir. The overflow will drain directly into the curb & gutter of Cole View. The previous drainage study by Matrix confirms that the downstream facilities (curb & gutter, pipes, and inlets) are designed for developed flows. Pond A shall be privately owned and maintained.

Basin B1 represents a very small portion of the mostly landscaping at the front of the lot that does not drain into Pond A. Flows from Basin B1 of Q_5 = 0.1 cfs and Q_{100} = 0.2 cfs will drain directly into Cole View.

Future development on adjacent lots will need to route their own on-site flows to provide stormwater quality prior to discharging off-site into Cole View.

DRAINAGE DESIGN CRITERIA

This drainage report was prepared in accordance to the criteria established in the El Paso County Drainage Criteria Manual, updated in October 1994. This report has taken into the account the results and recommendations of the following previous drainage studies:

"Final Drainage Report for Claremont Business Park Filing No. 2," prepared by Matrix Design Group, dated November 2006.

WestWorks Engineering uses the rational method for drainage basin study areas of less than 100 acres. This methodology is implemented in accordance with the City/County Drainage Criteria Manual Guidelines.

For the Rational Method, flows are calculated for the 5-year and 100-year recurrence intervals. The average runoff coefficients, 'C' values, are taken from Table 5-1 and the Intensity-Duration-Frequency curves are taken from Figure 5-1 of the County Drainage Criteria Manual. Time of concentration for overland flow and storm drain or gutter flow are calculated per Section 5.2.3 of the County Drainage Criteria Manual. Calculations for the Rational Method are shown in the Appendix of this report. Detention volume in drainage basin areas less than 100 acres is calculated using the Modified Rational Method. The Modified Rational Method calculations are performed with the aid of HydroCAD version 7.00.

DRAINAGE FACILITY DESIGN

All inlets, storm drains, culverts, and open channels are sized using the procedures outlined in the City/County Drainage Criteria Manual Chapters 7, 8, 9, and 10 respectively. All of the drainage systems, including the streets, are designed to safely route the 5-year and 100-year storm flows.

FLOODPLAIN STATEMENT

Lot 23 Claremont Business Park Filing No. 2 is within Zone X (areas determined to be outside 500-year floodplain) according per Flood Insurance Rate Map Community Panel No. 08041C0752 F, effective March 17th, 1997.

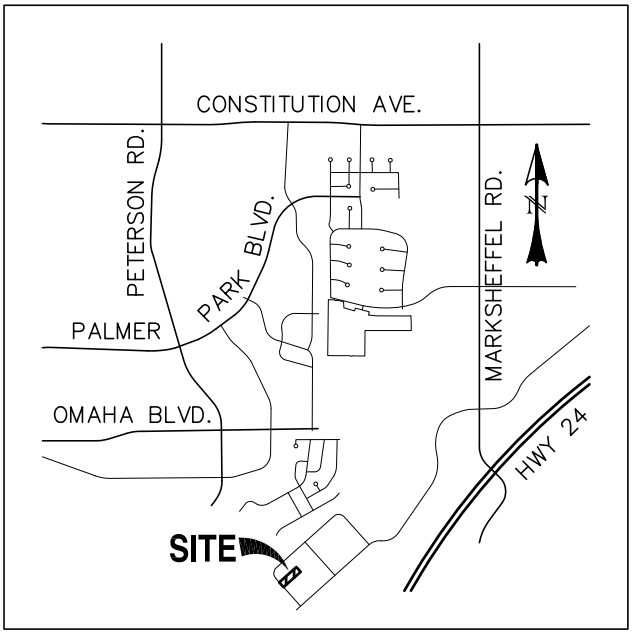
EROSION CONTROL PLAN

The El Paso County Drainage Criteria Manual specifies that an Erosion Control Plan and associated cost estimate be submitted in conjunction with the Final Drainage Report. The erosion control plan and associated cost estimate are to be submitted concurrently and are considered a portion of this final drainage report.

DRAINAGE AND BRIDGE FEES

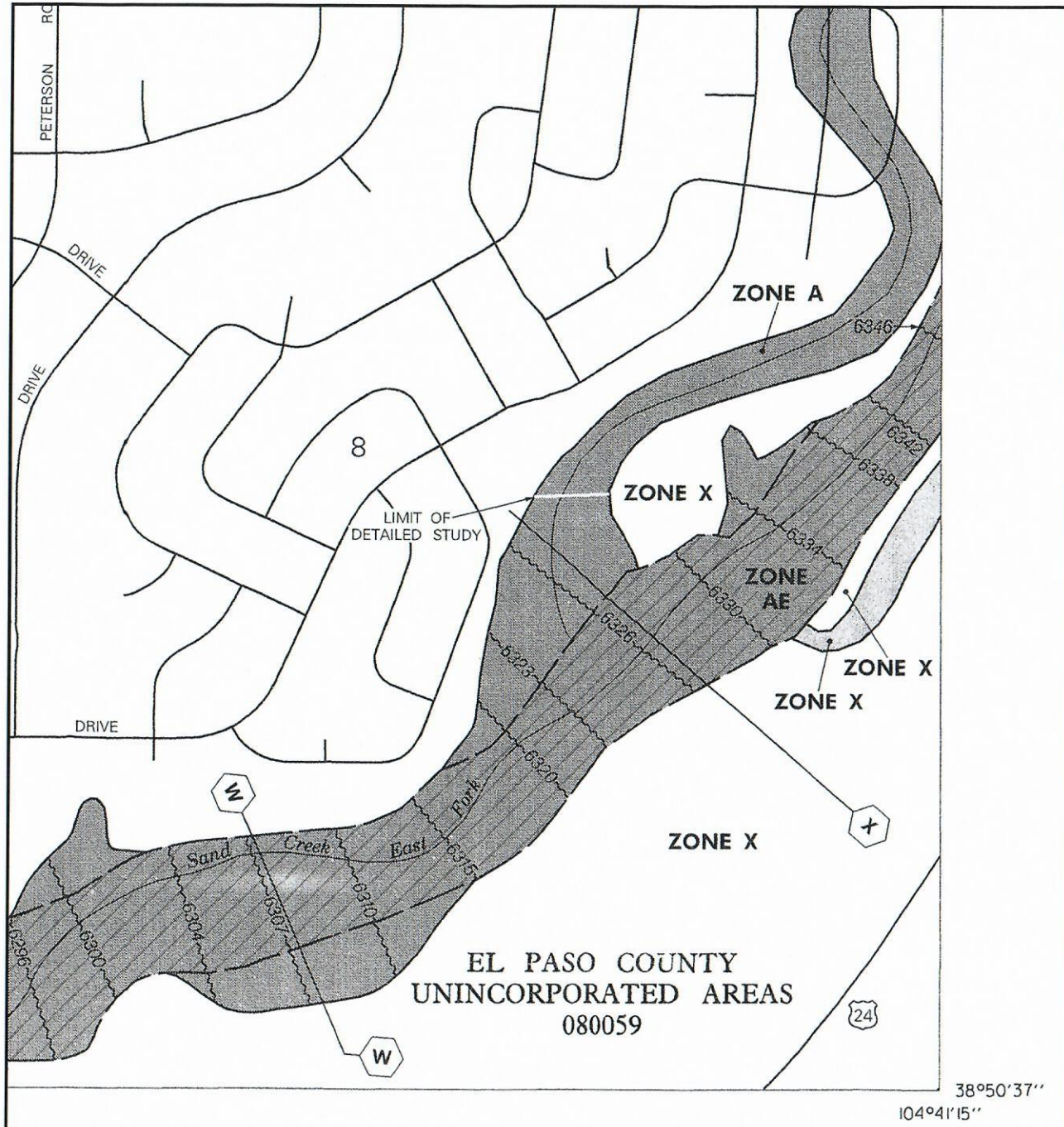
The study area is in the Sand Creek Drainage Basin. Drainage fees were paid at the time of original platting for this lot; therefore no new drainage fees are due.

APPENDIX



VICINITY MAP

SCALE: N.T.S.



APPROXIMATE SCALE IN FEET

500 0 500

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 752 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0752	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0752	F

MAP NUMBER
08041C0752 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Soil Map—El Paso County Area, Colorado
(7334 Cole View)

Map Scale: 1:360 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 15 30 60 90

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 14, Sep 23, 2016

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

Date(s) aerial images were photographed: Jun 3, 2014—Jun 17, 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

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	0.3	100.0%
Totals for Area of Interest		**0.3**	**100.0%**

CALCULATIONS

Subcatchment A1:

Runoff = 1.19 cfs @ 0.08 hrs, Volume= 0.008 af, Depth= 0.34"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.10 in/hr

Area (ac)	C	Description
0.300	0.80	INDUSTRIAL

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B1:

Runoff = 0.08 cfs @ 0.08 hrs, Volume= 0.001 af, Depth= 0.17"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.10 in/hr

Area (ac)	C	Description
0.040	0.40	PAVEMENT & LANDSCAPING

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Pond POND A:

Inflow Area = 0.300 ac, Inflow Depth = 0.34" for 5-Year event
Inflow = 1.19 cfs @ 0.08 hrs, Volume= 0.008 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 6,330.64' @ 0.17 hrs Surf.Area= 355 sf Storage= 370 cf
Plug-Flow detention time= (not calculated)
Center-of-Mass det. time= (not calculated)

#	Invert	Avail.Storage	Storage Description
1	6,329.50'	701 cf	**Custom Stage Data (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6,329.50	314	0	0
6,330.00	172	122	122
6,331.50	600	579	701

#	Routing	Invert	Outlet Devices
1	Primary	6,331.00'	**5.0' long x 3.0' breadth OVERFLOW WEIR** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6,329.50' (Free Discharge)
└─**1=OVERFLOW WEIR** (Controls 0.00 cfs)

Subcatchment A1:

Runoff = 2.39 cfs @ 0.08 hrs, Volume= 0.017 af, Depth= 0.68"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=9.09 in/hr

Area (ac)	C	Description
0.300	0.90	INDUSTRIAL

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B1:

Runoff = 0.18 cfs @ 0.08 hrs, Volume= 0.001 af, Depth= 0.38"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=9.09 in/hr

Area (ac)	C	Description
0.040	0.50	PAVEMENT & LANDSCAPING

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Pond POND A:

Inflow Area = 0.300 ac, Inflow Depth = 0.68" for 100-Year event
Inflow = 2.39 cfs @ 0.08 hrs, Volume= 0.017 af
Outflow = 1.17 cfs @ 0.13 hrs, Volume= 0.005 af, Atten= 51%, Lag= 2.8 min
Primary = 1.17 cfs @ 0.13 hrs, Volume= 0.005 af

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 6,331.21' @ 0.13 hrs Surf.Area= 517 sf Storage= 588 cf
Plug-Flow detention time= 6.1 min calculated for 0.005 af (31% of inflow)
Center-of-Mass det. time= 3.9 min (8.9 - 5.0)

#	Invert	Avail.Storage	Storage Description
1	6,329.50'	701 cf	**Custom Stage Data (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6,329.50	314	0	0
6,330.00	172	122	122
6,331.50	600	579	701

#	Routing	Invert	Outlet Devices
1	Primary	6,331.00'	**5.0' long x 3.0' breadth OVERFLOW WEIR** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=1.16 cfs @ 0.13 hrs HW=6,331.21' (Free Discharge)
└─**1=OVERFLOW WEIR** (Weir Controls 1.16 cfs @ 1.1 fps)

Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.06, November 2016)

Designer:	**Chad Kuzbek, PE**
Company:	**WestWorks Engineering**
Date:	**May 4, 2017**
Project:	**Lot 23 Claremont Business Park Filing No. 2**
Location:	**Pond A**

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 90.0 %
B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)	i = 0.900
C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time $WQCV = 0.8 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$	WQCV = 0.32 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 12,000 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume $V_{WQCV} = WQCV / 12 * Area$	V_{WQCV} = 321 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = 0.42 in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = 314 cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = _____ cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 1.0 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft **DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE**
C) Minimum Filter Area (Flat Surface Area)	A_{Min} = 135 sq ft
D) Actual Filter Area	A_{Actual} = 135 sq ft
E) Volume Provided	V_T = 314 cu ft
3. Filter Material	Choose One (●) 18" CDOT Class B or C Filter Material ( ) Other (Explain):
4. Underdrain System	
A) Are underdrains provided?	Choose One ( ) YES (●) NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = N/A ft
ii) Volume to Drain in 12 Hours	Vol_{12} = N/A cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = N/A in

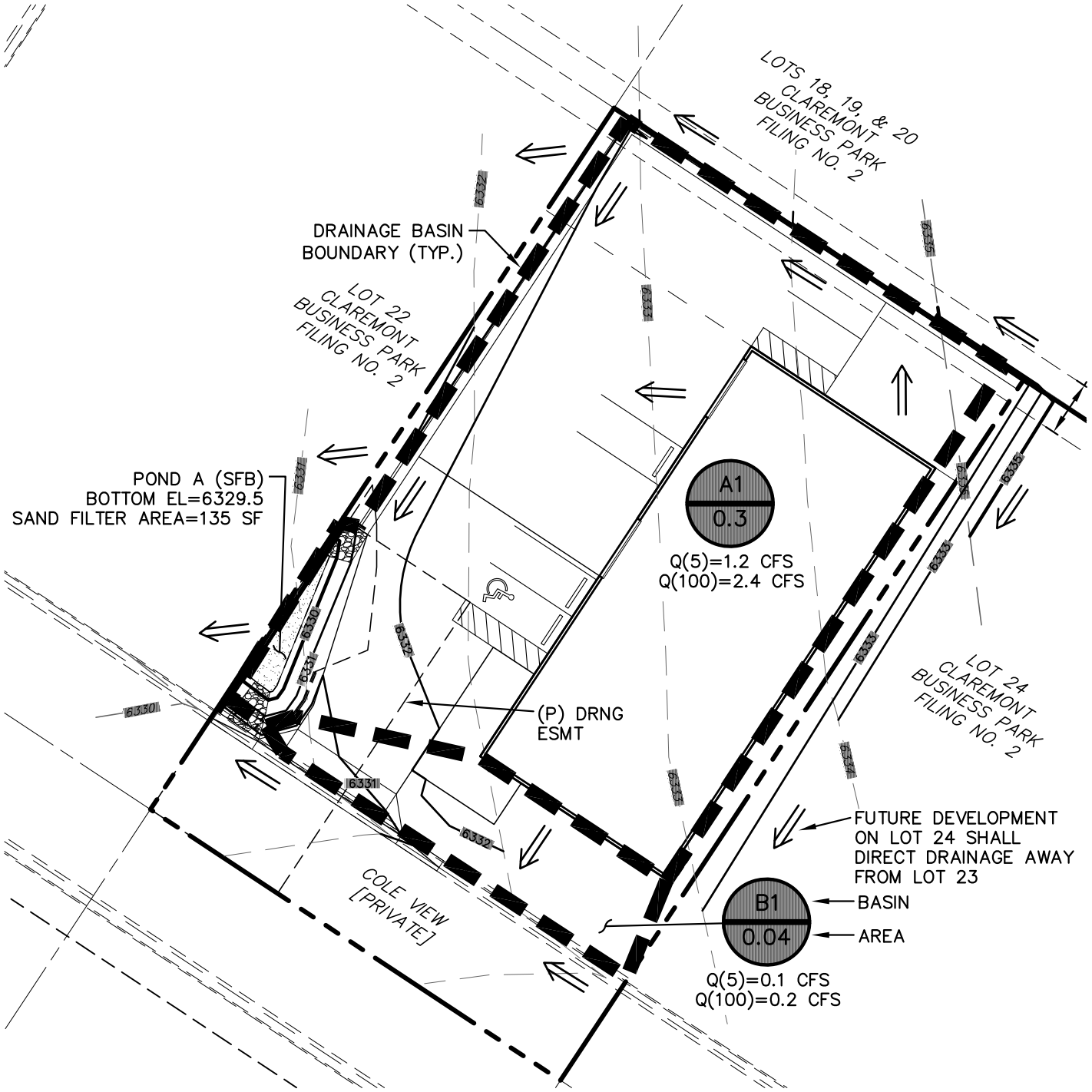
Design Procedure Form: Sand Filter (SF)

Designer:	**Chad Kuzbek, PE**
Company:	**WestWorks Engineering**
Date:	**May 4, 2017**
Project:	**Lot 23 Claremont Business Park Filing No. 2**
Location:	**Pond A**

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6-7. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	Riprap run downs for inflow. Riprap overflow weir for discharge.

Notes:

DRAINAGE MAP



SFB POND A

DESCRIPTION	5YR	100YR	UNITS
INFLOW	1.2	2.4	[CFS]
OVERFLOW	0.1	1.2	[CFS]
WATER SURFACE ELEV.	6,330.6	6,331.2	[FT]
STORAGE VOLUME	370	588	[CU-FT]

N

LEGEND

EXISTING (E)

PROPOSED (P)

WESTWORKS ENGINEERING

1023 W. COLORADO COLORADO SPRINGS, CO 80904 (719) 685-1670

LOT 23 CLAREMONT BUSINESS PARK FILING NO. 2

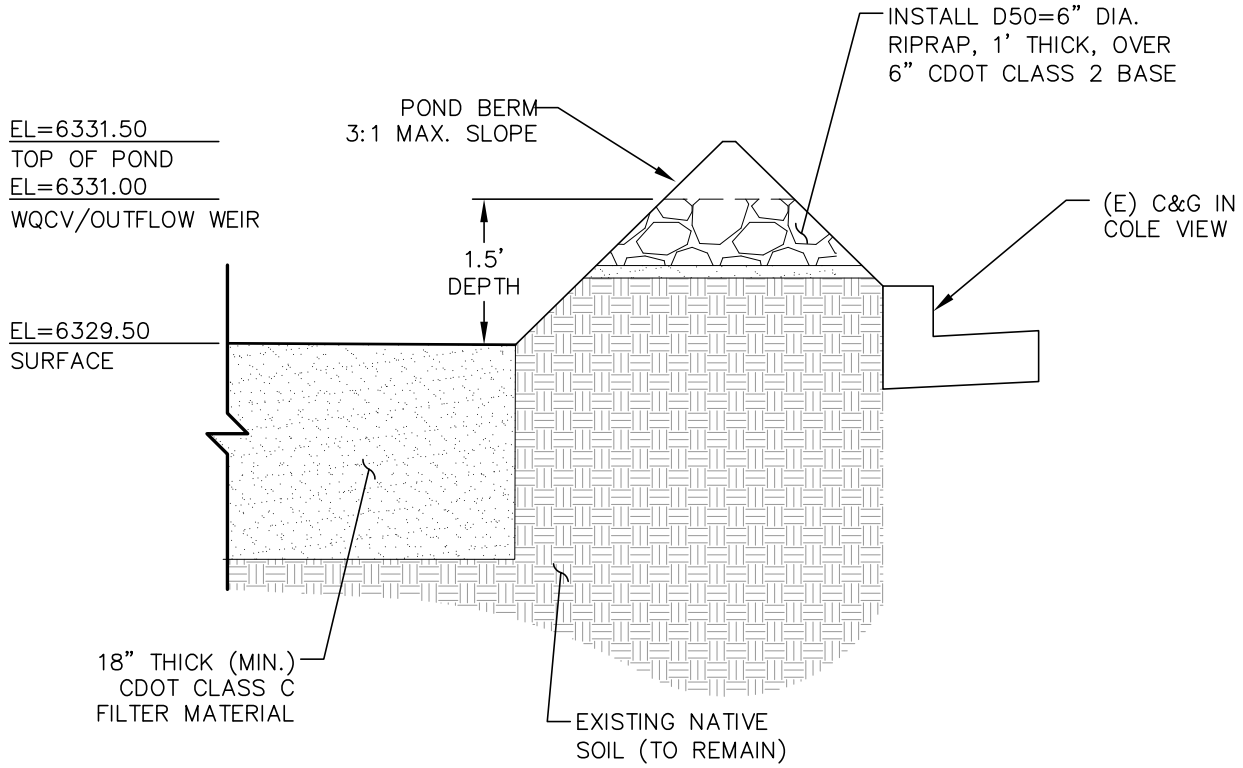
DRAINAGE MAP

SCALE:	DATE:
1"=30'	07/07/17
JOB NO.:	SHEET NO.:
91703	1 OF 1

W:\projects\91703 - Lot 23 Claremont BP\dwg_DR

SAND FILTER BASIN

PERMANENT STORMWATER QUALITY BMP



REQUIRED ACTION	MAINTENANCE OBJECTIVES	FREQUENCY
LAWN MOWING AND VEGETATIVE CARE	OCCASIONAL MOWING OF GRASSES AND WEED REMOVAL TO LIMIT UNWANTED VEGETATION. MAINTAIN IRRIGATE TURF GRASS AS 2 TO 4 INCHES TALL AND NON–IRRIGATED TURF GRASSES AT 4 TO 6 INCHES. RECOMMEND USING SMALLER MOWING EQUIPMENT & MACHINERY (<1,000 LB) TO LIMIT WEIGHT, PRESSURE, AND COMPACTION OF SAND MEDIA.	ROUTINE – DEPENDING ON AESTHETIC REQUIREMENTS.
DEBRIS AND LITTER REMOVAL	REMOVE DEBRIS AND LITTER FROM DETENTION AREA TO MINIMIZE CLOGGING OF THE SAND MEDIA.	ROUTINE – DEPENDING ON AESTHETIC REQUIREMENTS.
LANDSCAPING REMOVAL AND REPLACEMENT	THE SANDY LOAM TURF AND LANDSCAPING LAYER WILL CLOG WITH TIME. THIS LAYER WILL NEED TO BE REMOVED AND REPLACED, ALONG WITH ALL TURF AND VEGETATION GROWING ON THE SURFACE, TO REHABILITATE INFILTRATION RATES.	EVERY 5 TO 10 YEARS, DEPENDING ON INFILTRATION RATES NEEDED TO DRAIN THE WQCV IN 12–HOURS OR LESS.
INSPECTIONS	INSPECT DETENTION AREA TO DETERMINE IF SAND MEDIA IS ALLOWING ACCEPTABLE INFILTRATION.	ROUTINE – BI–ANNUAL INSPECTION OF HYDRAULIC PERFORMANCE.