

STORMWATER MANAGEMENT EVALUATION REPORT
FOR
BRIDGETON LANDFILL
LOCATED AT
13570 SAINT CHARLES ROCK ROAD, BRIDGETON, MISSOURI 63044

Prepared For:

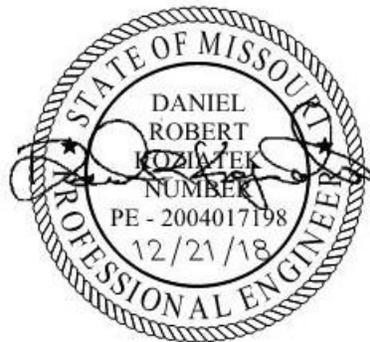
BRIDGETON LANDFILL, LLC

Prepared By:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
4848 PARK 370, SUITE F
HAZELWOOD, MISSOURI 63042

CEC Project No. 180-128
Task 1809

Date: DECEMBER 2018



Civil & Environmental Consultants, Inc.

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1.0 INTRODUCTION

1.1 INTRODUCTION AND FACILITY DESCRIPTION

The Bridgeton Landfill (Landfill) is a capped former sanitary landfill, located at 13570 Saint Charles Rock Road, Bridgeton, Missouri. The Landfill is within the West Lake Landfill Superfund Site which has been divided into two operable units – West Lake Landfill Operable Unit 1 (OU-1) and West Lake Operable Unit 2 (OU-2). The current Missouri Department of Natural Resources National Pollutant Discharge Elimination System (NPDES) permit (#MO-0112771) covers the two applicable portions of OU-2 – the Former Active (Bridgeton) Sanitary Landfill and the Closed Demolition Landfill. This permit authorizes stormwater discharges at six permitted outfalls (#003, 004, 005, 007, 008 and 009). These outfall locations are shown on the enclosed *Figure 1*. Receiving streams to these outfalls are known as Tributary to the Missouri River and Tributary to Old Fee Fee Creek.

CEC, Inc. performed an overall stormwater management evaluation of these permitted outfalls. This report provides a summary of the sampling data reviewed, the stormwater outfalls evaluated, the site conditions found, and suggestions to implement additional stormwater controls in an effort to obtain compliance with permitted effluent limitations.

1.2 STORMWATER SAMPLING RESULTS SUMMARY

To satisfy the NPDES permit conditions, monthly, quarterly and annual stormwater sampling is required to be performed. Stormwater sampling reports provided by the Landfill included 2017 (Quarters 1-4) and 2018 (Quarters 1-2). The results of the sampling were compared to determine whether there were any annual or seasonal trends. Upon review of the sampling results by quarter, no direct correlation between rain events and exceedances was recognized.

Precipitation values were tabulated and a summary comparison included in *Appendix A*. A brief summary of exceedances at each outfall is shown in the table below:

Outfall	Description
#003	Generally compliant, but had periodic aluminum benchmark exceedances during south quarry fill project.
#004	Periodic aluminum and TSS exceedances. Exceedance spike in 2017Q3 appears related to the work at the earthen borrow area and north quarry cap project.
#005	Periodic TSS and iron exceedances, but none since the outfall has been impounded with sand bags.
#007	BOD, COD and TSS are often exceeded with periodic chlorides and sulfates. Flows from the transfer station are included in this drainage area.
#008	TSS, iron and aluminum were exceeded during north quarry cap project.
#009	No discharges occurred during the sampling period, therefore no analytical results are available.

2.0 OUTFALL EVALUATION AND RECOMMENDATIONS

2.1 STORMWATER OUTFALL #003

This outfall receives discharges from a retention pond on the southwest side of the landfill. Stormwater runoff inflow to the pond is from an approximate 71.7 acre drainage area comprised of a leachate pretreatment facility, the holding area for a 97,000 gallon permeate tank, the heat removal system, a maintenance building, fuel storage tanks, auxiliary utility flare, the western portion of Bridgeton Landfill and the eastern portion of the Inactive Sanitary Landfill. Outfall #003 also receives flows periodically from Outfall #005 through a pumped system. Flow in a 10 year, 24 hour rain event is 7.7 million gallons per day (MGD) and is received by a Tributary to Old Fee Fee Creek.

Some routine maintenance is needed including sediment removal in the upstream lined channels and swales. The berms require periodic inspection to confirm no new animal dams or burrows are being constructed by muskrats or beavers. Maintenance should be coordinated with Outfall #005 as the pumped stormwater can also contain sediment contributing to potential exceedances.

2.2 STORMWATER OUTFALL #004

This outfall receives discharges from a sediment pond to the East of the landfill footprint. Stormwater runoff inflow to this pond drains from the soil borrow area and northeast portion of the Bridgeton Landfill. The Bridgeton Hauling Fleet management parking lot also discharges runoff to this sediment pond comprising a total of 72.5 acres. Flow in a 10 year, 24 hour rain event is 7.8 MGD and is received by a Tributary to Missouri River.

Periodic aluminum and total suspended solids (TSS) exceedances have occurred recently. An exceedance spike in 2017Q3 appears related to the work at the earthen borrow area and north quarry cap project when the ground was bare and not lined or vegetated during the ongoing construction process. CEC, Inc. recommends stabilizing work areas when not in operation and during construction efforts to prevent further silt loading in the pond and downstream channel.

In addition, we propose an emphasis on routine housekeeping with the downstream offsite channel. This channel allows some stormwater to pool and sediment to gather due to a very flat longitudinal slope. Recommend clearing this sediment annually to prevent backwater conditions and stagnant pooling.

2.3 STORMWATER OUTFALL #005

This outfall is permitted to receive discharges from the lined ditches located on the southeast corner of the landfill property. Stormwater runoff inflow to this basin drains from the eastern

portion of the Bridgeton Landfill comprising a total of 37.9 acres. Flow in a 10 year, 24 hour rain event is 4.1 MGD and is received by a Tributary to Old Fee Fee Creek.

However, sand bags were placed in the inlet and outlet of the pipe in 20173Q to close the outfall. Since this time, rain events are being managed by a pumping system, diverting flow to Outfall #003 to allow sediment to drop out during the longer residence time within the facility's stormwater management system, and no discharges or exceedances have occurred. The normal operating procedures are to pump from the lined inner east ditch to a lined swale along the south quarry landfill cap to drain to Outfall #003. When the lined inner east ditch fills and gets to the invert of a passive interconnected pipe, this pipe allows flow to travel to the lined outer east ditch. This lined outer east ditch has a knife gate that prevents flow to Outfall #005.

Currently, a south quarry fill project is ongoing and should be completed within the next few months. Straw wattles have been installed around areas of exposed fill, and final seeding will be done when warmer weather allows. Most of the earthen fill being used is being imported from offsite locations or the borrow area. CEC, Inc. recommends minimizing the areas of the cap being exposed and filled to limit the potential of TSS in the lined swales. Also recommend an annual cleanup of sediment in the lined swales and ditches.

2.4 STORMWATER OUTFALL #006

This former outfall receives discharges from a portion of the lined OU-2 North Quarry Landfill. Flows from this area are internal to the site and discharge to a lined retention pond which then provides a gravity outfall tributary to Outfall #004. This outfall was eliminated in the current NPDES stormwater permit.

2.5 STORMWATER OUTFALL #007

This outfall receives discharges from various closed landfills on the property (including West Lake Landfill OU-1, OU-2 Demolition Landfill, and OU-2 Inactive Sanitary Landfill), the asphalt plant and the container storage area west of the office building. The outfall also collects stormwater runoff from the transfer station located onsite. Tributary drainage area is 46.6 acres. Flow in a 10 year, 24 hour rain event is 5.0 MGD and is received by a Tributary to Old Fee Fee Creek.

This outfall is experiencing several recurring NPDES exceedances including biochemical oxygen demand (BOD), chemical oxygen demand (COD), TSS, Chlorides and Sulfates. The two main contributing factors to these exceedances are the transfer station pad runoff and some eroded non-vegetated tributary areas. To bring this outfall into compliance, we recommend four ways to improve the effectiveness of the existing BMPs:

1. Housekeeping – improved housekeeping and maintenance protocol at the transfer station is imperative to reducing the loading of trash and organics in the swales and outfall. To accomplish this, we suggest the following actions:
 - a. Implement a daily manual trash pickup – Once per day (minimum), someone walks the entire 6.6-acre area to pick up debris and trash. This 6.6-acre area is shown on the enclosed *Figure 2* and extends from the transfer station to the entrance at St Charles Rock Road.
 - b. Purchase a new sweeper with a pressurized water sprayer and vacuum system to better clean the concrete pad area in front of the transfer station. This sweeper should be used several times per day to regularly clean the concrete pad of debris. This new sweeper could be outfitted on existing equipment to replace the current brush sweeper that does not appear to collect and remove debris from the pad or drainage area. For details see *Appendix B*.
 - c. Contract with a sweeping company to weekly use an industrial sized vacuum sweeper on the entire 6.6-acre area from the transfer station and along the outbound lane for transfer trucks. See *Appendix B* for details.
2. Addition of Downstream Concrete Swale Improvements – the overall tributary area to Outfall #007 needs to be addressed to reduce the amount of TSS in the system. To accomplish this, we suggest the following actions:
 - a. Routine repair and maintenance of the rock check dams shall be done quarterly. The check dams should be constructed with the spillway in the center of the check dam to prevent flows from channeling around the outside edges of the rock and scouring and eroding the earthen hillside – see detail in *Appendix B*. In addition, sediment shall be cleared from the check dams during routine maintenance intervals. Filter socks shall also continue to be implemented to capture sediment and reduce sediment loading into the swales.
 - b. Pave an approximate 0.5-acre triangle shaped area of gravel lot between the main road and the access road to the asphalt plant and storage yard. By paving this area, dust and TSS should be reduced in the system. Pavement could be asphalt or concrete.
 - c. Regrade area of the outbound lane near the existing storm inlet. Some small areas surrounding the inlet do not have positive drainage to the sill which is causing ponding of stormwater runoff in the outbound drive lane.
 - d. The Roll-off Storage Yard has a lot of non-vegetated areas that allow eroded sediment to enter the concrete swale. This area should be stabilized or vegetated to reduce erodible land. Disturbance of the yard should be limited as much as possible. In addition, a diversion berm should be constructed at the top of the slope above the swale to divert runoff longitudinally to controlled let-downs using rip rap to the concrete swale.
 - e. The North Quarry Road has non-vegetated areas that are susceptible to erosion during rain events. The equipment storage yard north of the road should be relocated to eliminate the constant disturbance of the hillside and reduce sediment loading on the downstream swales. Also, an armored or lined swale

shall be constructed along the north side of the road to prohibit flows across the road and control the runoff discharging down the hillside to the swales.

2.6 STORMWATER OUTFALL #008

This outfall receives discharges from the northern portion of the Bridgeton Landfill and OU-1, Area 1. Total acreage tributary is approximately 8 acres. Flow in a 10 year, 24 hour rain event is 0.2 MGD and is received by a Tributary to Missouri River.

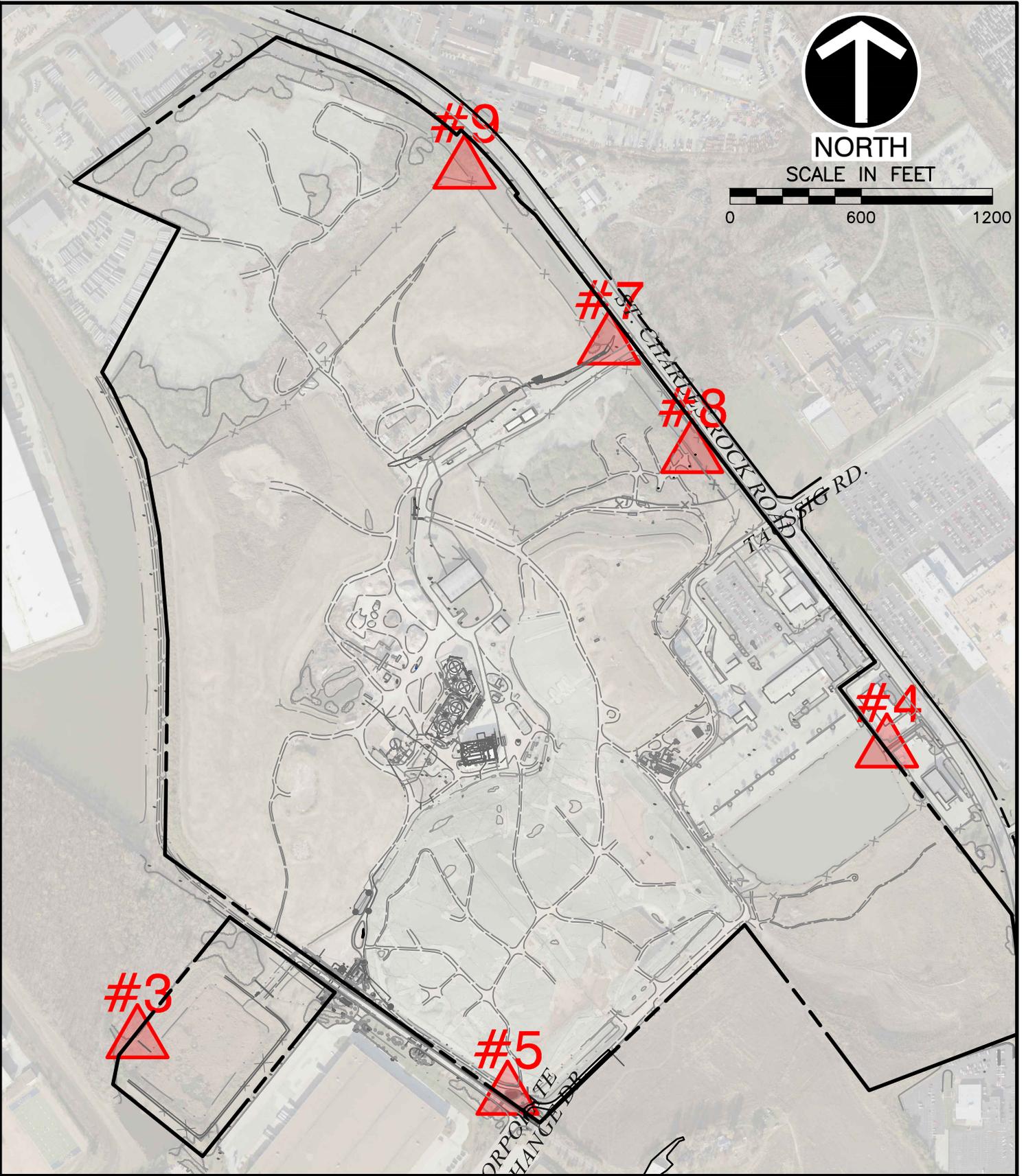
Currently, there is a low area upstream of the outfall that is collecting runoff and allowing it to temporarily store. A pump and conveyance pipe are set adjacent to this low area to convey flows back uphill to a lined storage basin which then gravity drains to Outfall #004. In extreme rain events, the pump has not kept up and has periodically (2015 and 2017) allowed a discharge of stormwater through the fence restricting access to Area 1 and along the St Charles Rock Road right-of-way. These rain events were when Outfall #008 was proposed and had not been formalized in the permit, but did lead to flows high in TSS, iron and aluminum. Subsequent to these two significant rain events, the site has set up an additional stormwater pump and conveyance pipe to collect stormwater internal to the North Quarry perimeter access road to increase pumping capacity to manage high-flow and high-intensity storm events. We suggest constructing an enlarged stormwater settling basin to allow greater storage of the high-flow and high-intensity storm events. An enlarged basin will help to eliminate or reduce frequency of discharges to the newly permitted Outfall #008.

A recent north quarry liner project has recently been completed which has helped to limit sediment loading to this outfall. We suggest routine housekeeping to ensure the cap is maintained and continues to provide positive drainage to the constructed low area.

2.7 STORMWATER OUTFALL #009

This outfall receives discharges from the northern portion of the Demolition Landfill and the east portion of West Lake Landfill OU-1, Area 2. Total acreage tributary is approximately 10.7 acres. Flow in a 10 year, 24 hour rain event is 0.9 MGD and is received by a Tributary to Old Fee Fee Creek. The drainage area is completely pervious. The Outfall #009 did not flow during the time period evaluated.

\\SVR-STLOUIS\Projects\2018\180-128\CADD\DWG\CV04 Storm Water Permit Compliance\180128-CV04-C200.dwg; FIGURE 1; LS:(12/19/2018 - sbriggs) - LP: 12/19/2018 7:03 PM



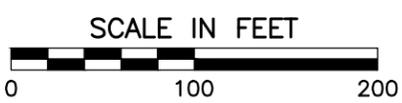
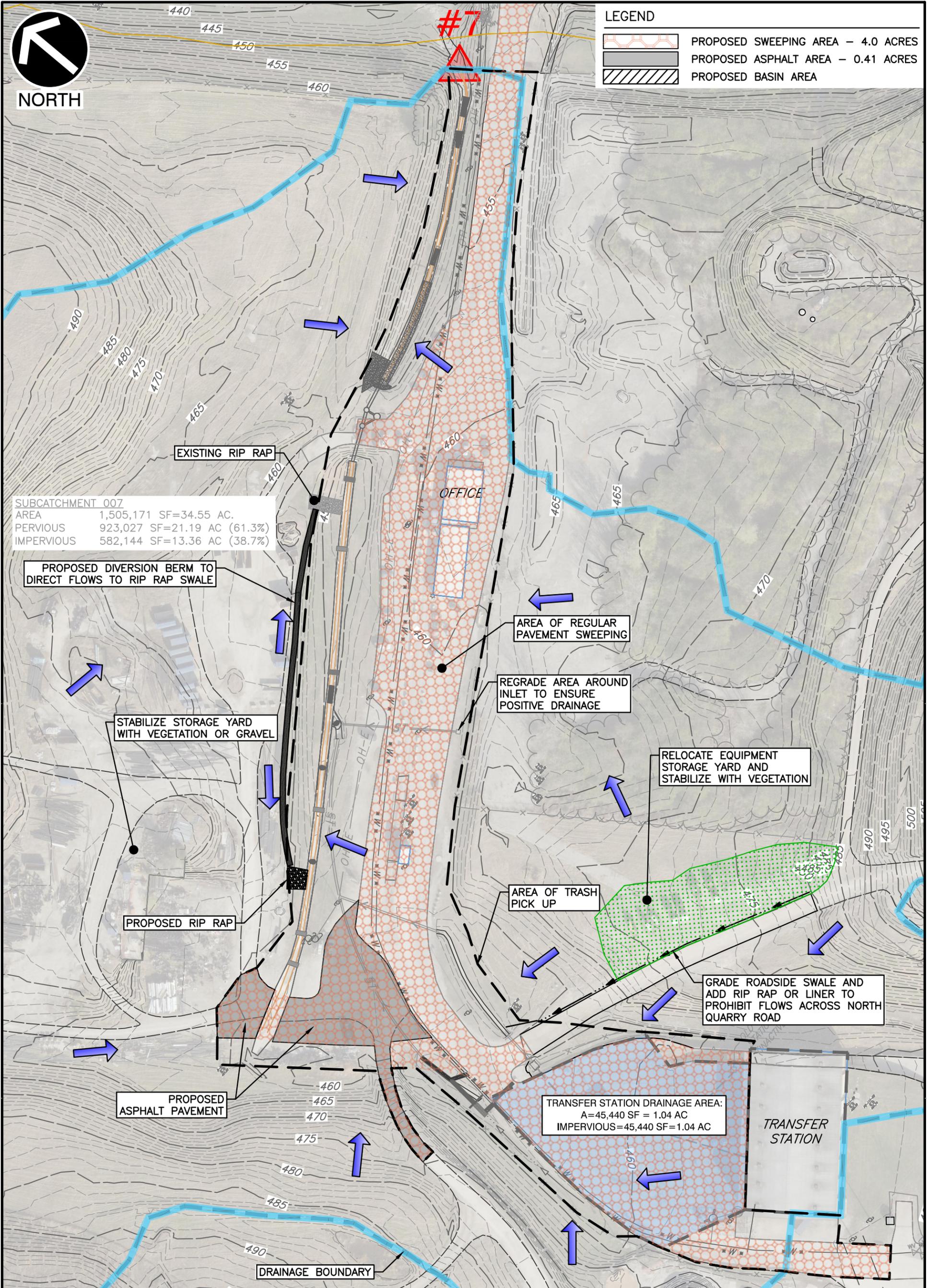
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 BRIDGETON, MO 63044

FACILITY OUTFALL MAP

DRAWN BY:	SGB	CHECKED BY:	DRAFT	APPROVED BY:	DRAFT	FIGURE NO.:	1
DATE:	DEC. 2018	DWG SCALE:	1"=600'	PROJECT NO.:	180-128		



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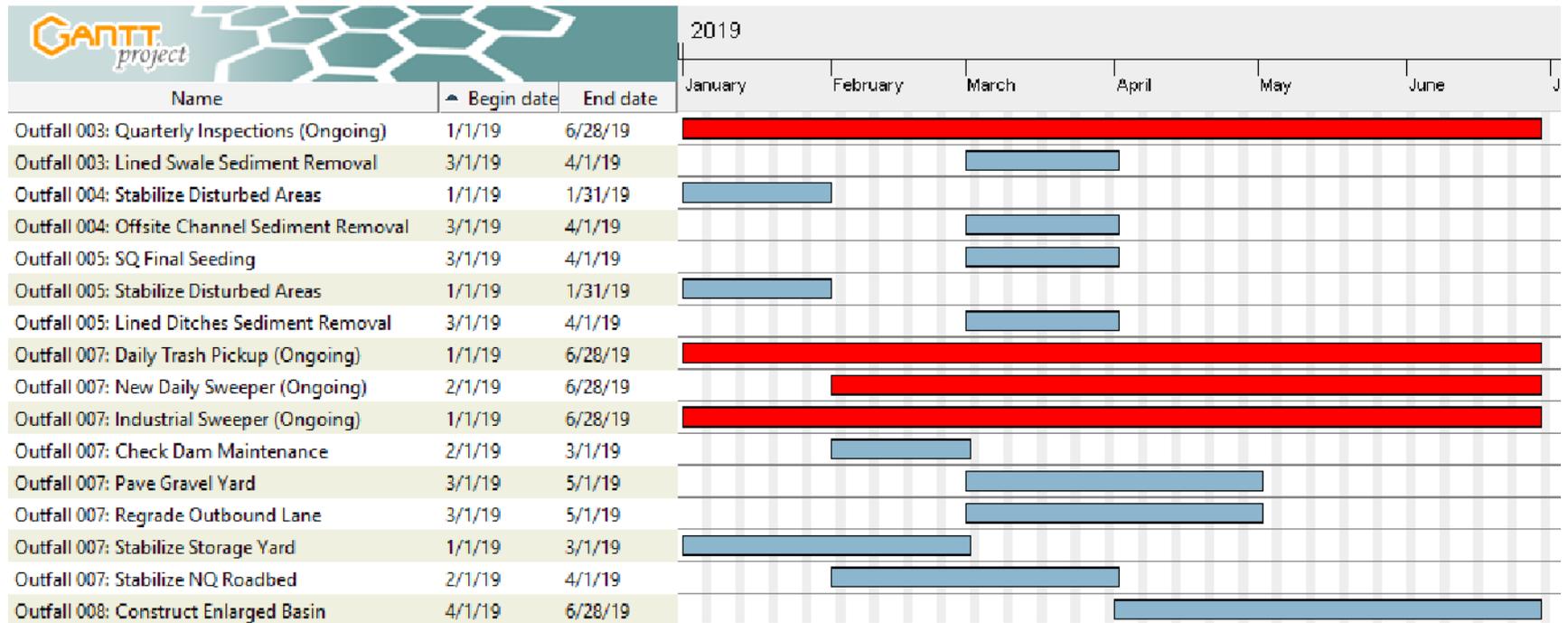
REPUBLIC SERVICES, INC.
 BRIDGETON LANDFILL
 13570 ST. CHARLES ROCK ROAD
 BRIDGETON, MO 63044

**STORMWATER OUTFALL #7
 PROPOSED IMPROVEMENTS**

DRAWN BY: SGB	CHECKED BY: DRK	APPROVED BY: DRK*	FIGURE NO.:
DATE: DEC. 2018	DWG SCALE: 1"=100'	PROJECT NO: 180-128	2

*HAND SIGNATURE ON FILE

Figure 3 - Implementation Schedule for BMP Installation



= Task is ongoing or routine
 = Task is a one-time improvement

APPENDIX A

SAMPLING RESULTS SUMMARY

APPENDIX A - STORMWATER OUTFALL SAMPLING

OUTFALL RESULTS SUMMARY

Q1 2017	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Q2 2018
#003	#003	#003	#003	#003	#003
#004	#004	#004	#004	#004	#004
#005	#005	#005	#005	#005	#005
#007	#007	#007	#007	#007	#007
N/A	Proposed #008	N/A	N/A	#008	#008
N/A	N/A	N/A	N/A	#009	#009
Precipitation (in.)					
2.3	19.09	4.95	2.99	3.92	9.67

LEGEND

No exceedance
Final limitation exceedance
Benchmark exceedance
No Discharge
No data provided

Outfall #003 Results								
Effluent Limitations		Units	2017 Q1	2017 Q2	2017 Q3	2017 Q4	2018 Q1	2018 Q2
PH	6.5-9.0	S.U.	7.35	7.44	7.58	7.75	7.51	7.52
BOD	45	mg/L	< 5	5	6	5	14	< 5
COD	120	mg/L	< 50	27	43	45	44	15
TSS	80	mg/L	20	7	24	43	17	6
Settable Solids	1.5	mL/L	< 0.1	0.1	0.1	< 0.1	< 0.1	0.1
Oil & Grease	15	mg/L	< 5	2	3	7	< 6	< 5
Chlorides + Sulfates	1000	mg/L	116	64	169	88	90	75
Aluminum, TR	750	µg/L	496	187	623	1480	2300	300
Arsenic, TR	33	µg/L	< 25	< 25	< 25	< 25	< 25	1.1
Copper, TR	22	µg/L	< 5	< 5	2.8	3	3.1	< 5
Iron, TR	4000	µg/L	760	496	761	1550	2860	393

Percipitation	inches	2.3	19.09	4.95	2.99	3.92	9.67
Flow	MGD	0.00108	1.084216	0.034196	1.516879	0.308979	1.633506

Outfall #004 Results								
Effluent Limitations		Units	2017 Q1	2017 Q2	2017 Q3	2017 Q4	2018 Q1	2018 Q2
PH	6.5-9.0	S.U.	8.38	8.75	7.63		7.61	8.90
BOD	45	mg/L	< 5	< 5	9		< 5	< 5
COD	120	mg/L	< 50	< 50	90		26	< 50
TSS	80	mg/L	< 6	16	98		13	8
Settable Solids	1.5	mL/L	< 0.1	< 0.1	0.3		< 0.1	< 0.1
Oil & Grease	15	mg/L	< 5	2	2		2	< 5
Chlorides + Sulfates	1000	mg/L	48	52	46		73	68
Aluminum, TR	750	µg/L	201	947	993		666	383
Arsenic, TR	33	µg/L	< 25	< 25	11		< 25	1.2
Copper, TR	22	µg/L	< 5	2.7	4.3		2.2	< 5
Iron, TR	4000	µg/L	201	1090	2620		704	410

Percipitation	inches	2.3	19.09	4.95	2.99	3.92	9.67
Flow	MGD	0.155116	1.08581	0.025853	0	0.180969	0.568759

Outfall #005 Results								
Effluent Limitations		Units	2017 Q1	2017 Q2	2017 Q3	2017 Q4	2018 Q1	2018 Q2
PH	6.5-9.0	S.U.	8.25	8.45			7.93	
BOD	45	mg/L	11	< 5			< 5	
COD	120	mg/L	< 50	25			65	
TSS	80	mg/L	41	55			203	
Settable Solids	1.5	mL/L	0.2	< 0.1			0.2	
Oil & Grease	15	mg/L	3	4			< 5	
Chlorides + Sulfates	1000	mg/L	107	53			47	
Aluminum, TR	750	µg/L	1320	3190			4820	
Arsenic, TR	33	µg/L	< 25	< 25			< 25	
Copper, TR	22	µg/L	2.4	4.2			7.9	
Iron, TR	4000	µg/L	1200	3220			5770	

Percipitation	inches	2.3	19.09	4.95	2.99	3.92	9.67
Flow	MGD	0.188724	0.10851	0	0	0.089192	0

Outfall #007 Results								
Effluent Limitations		Units	2017 Q1	2017 Q2	2017 Q3	2017 Q4	2018 Q1	2018 Q2
PH	6.5-9.0	S.U.	7.99	8.18	7.89	7.53	7.66	7.83
BOD	45	mg/L	70	5	80	127	51	133
COD	120	mg/L	150	49	209	264	294	59
TSS	80	mg/L	98	69	152	104	168	25
Settable Solids	1.5	mL/L	0.1	0.1	< 0.1	< 0.1	0.1	0.1
Oil & Grease	15	mg/L	2	3	7	7	< 5	< 5
Chlorides + Sulfates	1000	mg/L	352	105	144	164	1364	193
Aluminum, TR	750	µg/L	2000	2180	2460	2320	2340	351
Arsenic, TR	33	µg/L	< 25	< 25	< 25	< 25	< 25	1.9
Copper, TR	22	µg/L	13.3	10.1	27.5	24.2	21.8	5.7
Iron, TR	4000	µg/L	2620	2490	3420	3130	3010	411

Percipitation	inches	2.3	19.09	4.95	2.99	3.92	9.67
Flow	MGD	0.016158	0.325743	0.096947	0.052352	0.010099	0.096948

Outfall #008 Results								
Effluent Limitations		Units	2017 Q1	2017 Q2	2017 Q3	2017 Q4	2018 Q1	2018 Q2
PH	6.5-9.0	S.U.	N/A	7.93	N/A	N/A		
BOD	45	mg/L	N/A	< 5	N/A	N/A		
COD	120	mg/L	N/A	30	N/A	N/A		
TSS	80	mg/L	N/A	110	N/A	N/A		
Settable Solids	1.5	mL/L	N/A	20	N/A	N/A		
Oil & Grease	15	mg/L	N/A	6	N/A	N/A		
Chlorides + Sulfates	1000	mg/L	N/A	31	N/A	N/A		
Aluminum, TR	750	µg/L	N/A	27400	N/A	N/A		
Arsenic, TR	33	µg/L	N/A	16	N/A	N/A		
Copper, TR	22	µg/L	N/A	22.6	N/A	N/A		
Iron, TR	4000	µg/L	N/A	29700	N/A	N/A		

Percipitation	inches		19.09			3.92	9.67
Flow	MGD		0.310231			0	0

Outfall #009 Results								
Effluent Limitations		Units	2017 Q1	2017 Q2	2017 Q3	2017 Q4	2018 Q1	2018 Q2
PH	6.5-9.0	S.U.	N/A	N/A	N/A	N/A		
BOD	45	mg/L	N/A	N/A	N/A	N/A		
COD	120	mg/L	N/A	N/A	N/A	N/A		
TSS	80	mg/L	N/A	N/A	N/A	N/A		
Settable Solids	1.5	mL/L	N/A	N/A	N/A	N/A		
Oil & Grease	15	mg/L	N/A	N/A	N/A	N/A		
Chlorides + Sulfates	1000	mg/L	N/A	N/A	N/A	N/A		
Aluminum, TR	750	µg/L	N/A	N/A	N/A	N/A		
Arsenic, TR	33	µg/L	N/A	N/A	N/A	N/A		
Copper, TR	22	µg/L	N/A	N/A	N/A	N/A		
Iron, TR	4000	µg/L	N/A	N/A	N/A	N/A		

Percipitation	inches					3.92	9.67
Flow	MGD					0	0

APPENDIX B

STORMWATER DEVICE DETAILS

APPENDIX B STORMWATER OUTFALL #007 – BMPs AND DEVICE DETAILS

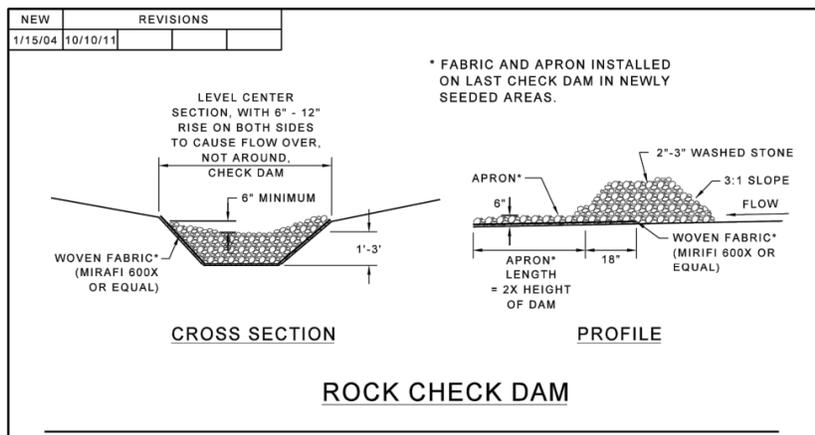
- 1.b Blue Diamond – skid steer pickup sweeper w/ pressurized water system (Or Equal)
<https://www.bluediamondattachments.com/pickup-broom/>



- 1.c TYMCO – Regenerative Air Sweeper (Or Equal)
<https://www.tymco.com/sweepers/regenerative-air-system/>



- 4.a Rock Check Dam



APPENDIX C
EVALUATION PHOTO LOG



Photograph Number: 1
Description: Outfall 003:
Retention Pond with
vegetation



Photograph Number: 2
Description: Outfall 003:
Sediment and vegetation
within upstream lined
drainage channel



Civil & Environmental Consultants, Inc.

Stormwater Evaluation Report

13570 St Charles Rock Road, Bridgeton, Missouri

Client Name:	Bridgeton Landfill, LLC
CEC Project:	180-128
Author:	Dan Koziatek
Photographs Taken On:	September 5, 2018



Photograph Number: 3
Description: Outfall 004:
Retention Pond



Photograph Number: 4
Description: Outfall 005:
Sand bags in outfall piping
system.



Civil & Environmental Consultants, Inc.

Stormwater Evaluation Report
13570 St Charles Rock Road, Bridgeton, Missouri

Client Name:	Bridgeton Landfill, LLC
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Author:	Dan Koziatek
Photographs Taken On:	September 5, 2018



Photograph Number: 5
Description: Outfall 007:
Outfall swale at property
fence line



Photograph Number: 6
Description: Outfall 007:
Concrete weir upstream of
the property fence line.



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CEC Project:	180-128
Author:	Dan Koziatek
Photographs Taken On:	September 5, 2018



Photograph Number: 7

Description: Outfall 007: Check dam in concrete swale with sediment. Recommend reshaping the rock check dams to allow runoff to spill through the center rather than near the ends of the dam – see detail in Appendix B.



Photograph Number: 8

Description: Outfall 007: Concrete swale with silt sock and minor sediment.



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Stormwater Evaluation Report

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Author:	Dan Koziatek
Photographs Taken On:	September 5, 2018



Photograph Number: 9
Description: Outfall 007:
Transfer station and
concrete pad.



Photograph Number 9
Description: Outfall 008:
Low area with pump and
force main to send flows to
a lined storage basin
tributary to Outfall 004.



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Stormwater Evaluation Report

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