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STORMWATER MANAGEMENT PLAN

Introduction

This plan is submitted in conjunction with the other items required to obtain an operation permit for the Hardee County Landfill. Pertinent design information is included which would be required for a stormwater permit from the Department of Environmental Regulation (DER). Plans showing the landfill site and drainage details are included as part of this submittal. The format of this report follows that of DER Form 17-1.215(1) to assist the reviewer of this plan.

General Information

The existing landfill area is served by a perimeter ditch located along the north and west sides of the site. Runoff from the landfill area is collected into the perimeter ditch and flows to a detention pond located east of the landfill area. After detention, the water flows out of the pond through a control structure and into a drainage ditch. This ditch discharges to a wooded wetlands area. This wetlands area eventually drains into the Peace River.

Based on results of meetings with DER, a littoral zone is proposed as being the most feasible means of bringing the site into compliance with stormwater regulations. The littoral zone will be created in the same vicinity as the existing detention area. A new control structure is proposed to keep the bleedown rate within compliance of latest DER regulations. The existing stormwater management concept was determined to be valid.

The stormwater detention area is designed to detain runoff from the first inch of rainfall over the 17.1-acre site shown in the drawings. Coverage of this area will be mostly natural ground with the exception of 800-feet of 20-foot wide shell access road. There is no impervious area which flows into the detention area. Our soil consultants (Ardaman & Associates) have indiated that the runoff characteristics for the site will be improved resulting in less runoff once the site is completed. For design purposes, however, a runoff coefficient of 0.3 was used as agreed upon in the meeting with DER staff.

Technical Information

The stormwater management plan drawing defines the drainage area boundaries of the stormwater management system. The area served by the detention pond covers 17.1-acres. The top of the landfill will be graded towards the existing north and west perimeter ditches. These ditches convey water to the detention area. Runoff from the existing shell entrance road in the vicinity of the landfill site is presently intercepted by a drainage swale on the west side of the road. Inlets are proposed at the south end of this swale to intercept runoff from the west side of the road and divert it to the swale on the east side of the road. A swale on the east side of the road will be constructed at 0.1% grade to convey runoff to the detention pond.

The existing detention pond serving the site will be modified to create a littoral zone and sediment sump. The sediment sump will be constructed by installing a berm in the existing detention pond in the location shown on the drawings. The area of the existing pond will be expanded by excavation of a 0.31-acre littoral zone along the south side of the pond. The total acreage of the detention pond, including the littoral zone, is 0.88-acres.

A control structure will be installed to replace the existing structure. A V-notch weir will control the discharge rate such that no more than one-half of the detained volume discharges in no less than 60-hours in accordance with the latest stormwater regulations.

The water from the detention area will be discharged to the existing drainage ditch which presently serves the present detention facility. This ditch discharges into a wooded wetlands area. Water from the wooded wetlands area eventually discharges into the Peace River through a series of ditches and tributaries. There is no direct discharge into state waters.

The landfill area will be covered by natural ground and vegetation. The access road to the landfill site is shell. There is presently an insignificant amount of impervious area on the site. No additional impervious area is planned for this site for which the operation permit is being sought.

Based on conversations with Ardaman and Associates (the hydrogeologists for the site) the average water table elevation during the wet season is generally one-foot below the ground surface at the site. Existing ground elevation in the vicinity of the detention area is 82.9. A wet season water table elevation of 81.9 was used for the design of the detention facilities.

Representative soil profiles on the site were derived from actual borings. These soil profiles are shown on the construction plans for the dewatering pump station, irrigation system and liner submitted as part of the package required for an operating permit.

For a littoral zone, the following conditions must be met by the control structure:

1. Bleed down no more than one-half of treatment volume in no less than 60-hours.

2. Detention of the treatment volume should not cause the pond level to rise more than 8-inches above the seasonal high water table elevation.

3. Invert of orifice should be at the elevation of the seasonal high water table. Details of the control structure are shown in the detail sheet for the stormwater management plan.

The following computations demonstrate how these three conditions are met by the proposed control structure.

The proposed control structure contains a 22-1/2° V-notch weir as the bleeder. The bottom of the weir is set at elevation 81.9 to meet condition 3 for a littoral zone.

The required detention pond volume is computed as follows:

$V = CiA$

where $V =$ pond volume
$C =$ runoff coefficient
$i =$ 1 inch of rainfall
$A =$ contributing area in acres

For this area a C value of 0.3 is used and the contributing area is 17.1-acres.

$$V = 0.3 \times 1 \text{ inch} \times 17.1 \text{ acres} \times \frac{43560 ft^2}{acre} \times \frac{ft.}{12 \text{ inches}}$$

$$V = 18622 ft.^3$$

The storage volume provided is computed. The pond area is 0.88-acres. To meet the latest stormwater regulations (Condition 2) a maximum storage depth of 8-inches is allowed. Pond storage volume is computed using the equation:

$V_p = Ad$

where $V_p =$ storage volume of pond
$A =$ surface area of pond
$d =$ depth (using 6 inches)
$V_p = 0.88 \times 43560 \times 0.5$

$$V_p = 19166 ft.^3$$

Pond storage is sufficient.

The following computations demonstrate that no more than one-half of the storage volume is drained within 60 hours.

Using Table 6-1A from the ISCO Open Channel Flow Measurement Handbook, the discharge rates through the 22-1/2° V-notch weir are tabulated. Table is attached.

water height =	6 inches;	head = 0.5 ft.;	Q = 0.088 cfs
water height =	5 inches;	head = 0.42 ft.;	Q = 0.057 cfs
water height =	4 inches;	head = 0.33 ft.;	Q = 0.031 cfs
water height =	3 inches;	head = 0.25 ft.;	Q = 0.016 cfs
water height =	2 inches;	head = 0.17 ft.;	Q = 0.006 cfs
water height =	1 inch;	head = 0.08 ft.;	Q = 0.0009 cfs
water height =	0 inch;	head = 0.0 ft.;	Q = 0 cfs

Average discharge rate of 0-1 inches = $\frac{0.0009 \text{ cfs} + 0 \text{ cfs}}{2}$ = 0.00045 cfs

Average discharge rate of 1-2 inches = $\frac{0.0009 \text{ cfs} + 0.006 \text{ cfs}}{2}$ = 0.003 cfs

Average discharge rate of 2-3 inches = $\frac{0.006 \text{ cfs} + 0.016 \text{ cfs}}{2}$ = 0.011 cfs

Average discharge rate of 3-4 inches = $\frac{0.016 \text{ cfs} + 0.031 \text{ cfs}}{2}$ = 0.024 cfs

Average discharge rate of 4-5 inches = $\frac{0.031 \text{ cfs} + 0.057 \text{ cfs}}{2}$ = 0.044 cfs

Average discharge rate of 5-6 inches = $\frac{0.057 \text{ cfs} + 0.088 \text{ cfs}}{2}$ = 0.073 cfs

Approximately 1/6 x 19166ft.^{3} = 3194ft.^{3} is stored within each inch of the pond.

From 6-5 inches draindown time (Td) = $\frac{3194 ft^3}{0.073 \text{ cfs}}$ = 43753 sec

From 5-4 inches Td = $\frac{3194 ft^3}{0.044 \text{ cfs}}$ = 72591 sec

From 4-3 inches Td = $\frac{3194 ft^3}{0.024 \text{ cfs}}$ = 133083 sec

Total time to discharge one-half of the storage volume = 43753 sec + 72591 sec + 133083 sec

$$\text{Total time} = \frac{249427 \text{ sec}}{3600 \text{ sec/hr}}$$

Total time = 69.3 hours (meets requirements)

A littoral zone planting is proposed for this site. The area of the proposed littoral zone is 0.31-acres. The plant types proposed are:

1. Maidencane from depths of 0 to 1-ft. submergence during the wet season.
2. Pickerelweed from depths of 1 to 2-ft. submergence during the wet season.
3. Yellow Pond Lily from depths of 2 to 3-ft. submergence during the wet season.

These plant types are readily available from local nursery stocks and will be planted in accordance with the details shown on the drawings. Water will flow through the littoral zone prior to being discharged through the bleeder structure. This littoral zone must be at least 35% of the surface area of the pond. The following computations demonstrate that this condition has been satisfied.

Area of pond = 0.88 acres

Area of littoral zone = 0.31 acres

$$\% = \frac{\text{Area of Littoral Zone}}{\text{Total Pond Area}} \times 100\%$$

$$\% = \frac{0.31}{0.88} \times 100\%$$

$$\% = 35\%$$

The time of concentration path is marked on the accompanying drawings. Average velocities used to compute the time of concentration were taken from the SCS Overland Flow Curves (copy attached). The following procedure was used:

Over landfill area, the coverage will be equivalent to pasture. The length of travel (L_T) = 720 ft. Using a slope of 1.0% for the cover over the landfill, a velocity of 0.7 feet per second is obtained from the chart. For the ditches, the curve for small upland gullies and paved areas was used.

Landfill L = 720 ft.
V = 0.7 fps

$$T = \frac{L}{V}$$

$$T = \frac{720 \text{ ft.}}{0.7 \text{ fps}}$$

T = 1030 seconds

Ditches L = 1685 ft.
Slope (S) = 0.1%
V = 1 fps

$$T = \frac{1685 \text{ ft.}}{1 \text{ fps}}$$

T = 1685 sec

Time of concentration (T_C) is computed by adding the travel time over the landfill and through the perimeter ditches to the pond.

$$T_C = 1030 \text{ seconds} + 1685 \text{ seconds}$$

$$T_C = 2715 \text{ seconds} \times \frac{\text{min.}}{60 \text{ sec.}}$$

$$T_C = 45 \text{ minutes}$$

The rational runoff coefficients used for the design were 0.3 for the site. This gives a higher runoff rate than the 0.15 for the site estimated by the hydrologists. The coefficient of 0.3 was discussed in our meeting with DER staff and was determined to be reasonable.

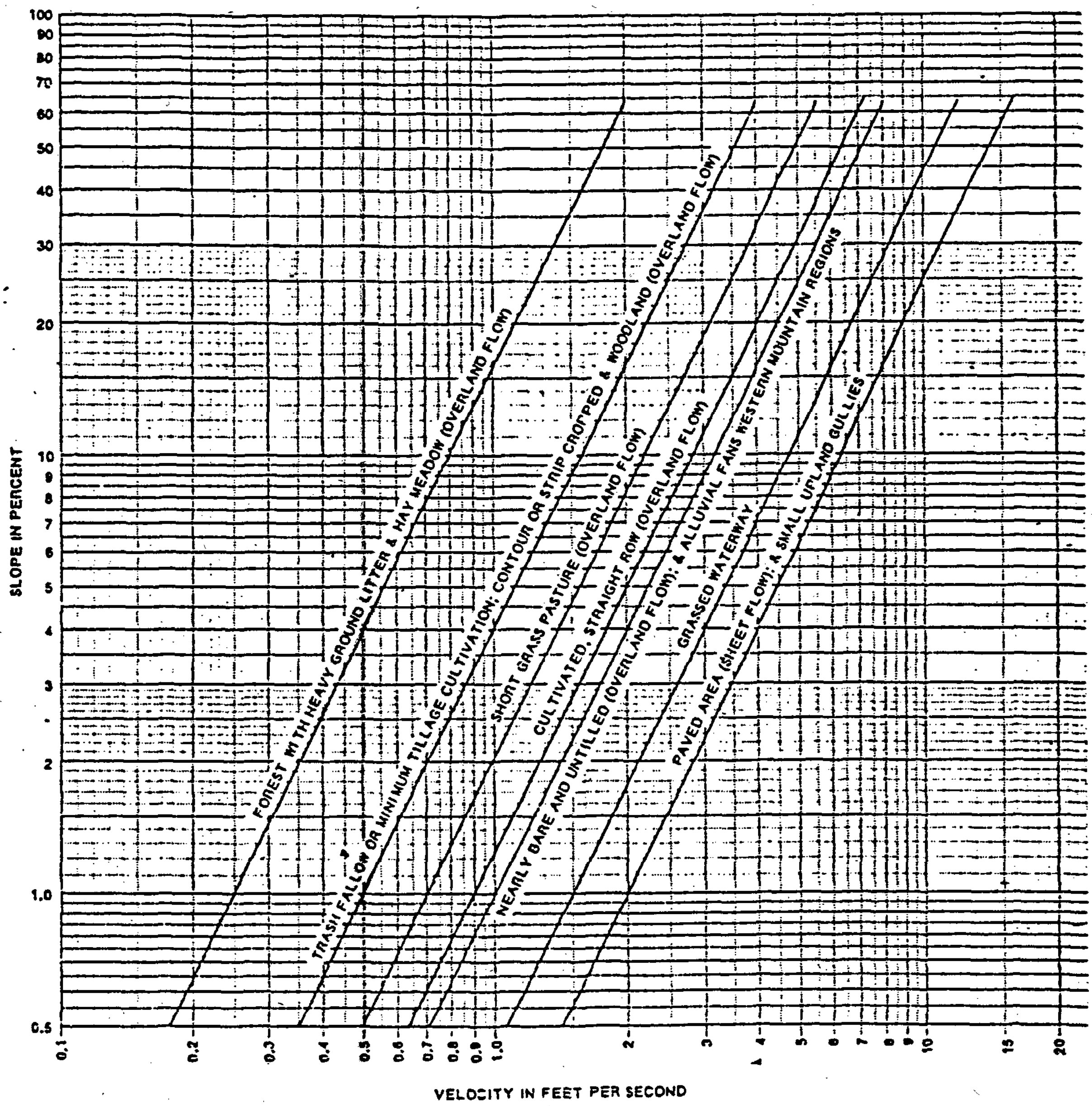
Staff will periodically check the drainage ditches for erosion and will reshape and resod them on an as needed basis. The plant types in the littoral zone will be checked and intruding vegetation removed if required. Drainage sumps will be cleaned out at least once per year and the storm sewer lines checked for plugging. The area in front of the bleeder structure will be checked at least quarterly to remove any excess plants or debris which could cause the structure to plug.

The sedimentation basin will be checked using a probe to determine the level of sediment in the sump. When the level of sediment becomes excessive, the accumulated debris will be cleaned out of the pond in order to restore operating efficiency.

DISCHARGE OF 22½° V-NOTCH WEIR

FORMULAS: $CFS = 0.497H^{2.5}$ $GS = CFS \times 7.481$ $MGD = CFS \times 0.6463$

HEAD FT.	CFS	GS	MGD	HEAD FT.	CFS	GS	MGD	HEAD FT.	CFS	GS	MGD	HEAD FT.	CFS	GS	MGD	HEAD FT.	CFS	GS	MGD
0.01	.0000	.0000	.0000	0.26	.0171	.1282	.0111	0.51	.0923	.6906	.0597	0.76	.2503	1.872	.1617	1.01	.5095	3.812	.3293
0.02	.0000	.0002	.0000	0.27	.0188	.1408	.0122	0.52	.0969	.7250	.0626	0.77	.2586	1.934	.1671	1.02	.5222	3.907	.3375
0.03	.0001	.0006	.0001	0.28	.0206	.1542	.0133	0.53	.1016	.7603	.0657	0.78	.2671	1.998	.1726	1.03	.5351	4.003	.3458
0.04	.0002	.0012	.0001	0.29	.0225	.1684	.0145	0.54	.1065	.7967	.0688	0.79	.2757	2.062	.1782	1.04	.5482	4.101	.3543
0.05	.0003	.0021	.0002	0.30	.0245	.1833	.0158	0.55	.1115	.8341	.0721	0.80	.2845	2.128	.1839	1.05	.5615	4.200	.3629
0.06	.0004	.0033	.0003	0.31	.0266	.1989	.0172	0.56	.1166	.8725	.0754	0.81	.2935	2.195	.1897	1.06	.5749	4.301	.3716
0.07	.0006	.0048	.0004	0.32	.0288	.2154	.0186	0.57	.1219	.9120	.0788	0.82	.3026	2.264	.1956	1.07	.5886	4.403	.3804
0.08	.0009	.0067	.0006	0.33	.0311	.2326	.0201	0.58	.1273	.9525	.0823	0.83	.3119	2.334	.2016	1.08	.6024	4.507	.3894
0.09	.0012	.0090	.0008	0.34	.0335	.2506	.0217	0.59	.1329	.9941	.0859	0.84	.3214	2.404	.2077	1.09	.6165	4.612	.3984
0.10	.0016	.0118	.0010	0.35	.0360	.2695	.0233	0.60	.1386	1.037	.0896	0.85	.3311	2.477	.2140	1.10	.6307	4.718	.4076
0.11	.0020	.0149	.0013	0.36	.0386	.2891	.0250	0.61	.1444	1.081	.0934	0.86	.3409	2.550	.2203	1.11	.6452	4.826	.4170
0.12	.0025	.0185	.0016	0.37	.0414	.3096	.0267	0.62	.1504	1.125	.0972	0.87	.3509	2.625	.2268	1.12	.6598	4.936	.4264
0.13	.0030	.0227	.0020	0.38	.0442	.3310	.0286	0.63	.1566	1.171	.1012	0.88	.3610	2.701	.2333	1.13	.6746	5.047	.4360
0.14	.0036	.0273	.0024	0.39	.0472	.3532	.0305	0.64	.1629	1.218	.1053	0.89	.3714	2.778	.2400	1.14	.6896	5.159	.4457
0.15	.0043	.0324	.0028	0.40	.0503	.3762	.0325	0.65	.1693	1.266	.1094	0.90	.3819	2.857	.2468	1.15	.7049	5.273	.4555
0.16	.0051	.0381	.0033	0.41	.0535	.4002	.0346	0.66	.1759	1.316	.1137	0.91	.3926	2.937	.2537	1.16	.7203	5.388	.4655
0.17	.0059	.0443	.0038	0.42	.0568	.4250	.0367	0.67	.1826	1.366	.1180	0.92	.4035	3.018	.2608	1.17	.7359	5.505	.4756
0.18	.0068	.0511	.0044	0.43	.0601	.4508	.0389	0.68	.1895	1.418	.1225	0.93	.4145	3.101	.2679	1.18	.7517	5.624	.4858
0.19	.0078	.0585	.0051	0.44	.0638	.4774	.0412	0.69	.1966	1.470	.1270	0.94	.4258	3.185	.2752	1.19	.7678	5.744	.4962
0.20	.0089	.0665	.0057	0.45	.0675	.5051	.0436	0.70	.2038	1.524	.1317	0.95	.4372	3.271	.2826	1.20	.7840	5.865	.5067
0.21	.0100	.0751	.0065	0.46	.0713	.5336	.0461	0.71	.2111	1.579	.1364	0.96	.4488	3.357	.2900	1.21	.8004	5.988	.5173
0.22	.0113	.0844	.0073	0.47	.0753	.5631	.0486	0.72	.2186	1.635	.1413	0.97	.4606	3.445	.2977	1.22	.8171	6.112	.5281
0.23	.0126	.0943	.0081	0.48	.0793	.5935	.0513	0.73	.2263	1.693	.1463	0.98	.4725	3.535	.3054	1.23	.8339	6.238	.5390
0.24	.0140	.1049	.0091	0.49	.0835	.6249	.0540	0.74	.2341	1.751	.1513	0.99	.4847	3.626	.3132	1.24	.8510	6.366	.5500
0.25	.0155	.1162	.0100	0.50	.0879	.6573	.0568	0.75	.2421	1.811	.1565	1.00	.4970	3.718	.3212	1.25	.8682	6.495	.5611



Average Velocities for Estimating Travel Time for Overland Flow (SCS, 1972).