Attachment 1

Alternatives Analysis Calculations

Economic Analysis
Option 3

Waste Volume Airspace	3,543,438	cy
C&D Waste Density	1,500	lb/cy
Waste Receipt Rate	286,000	tons/year
1 Ton	2,000	lbs
Site Life	9.3	yrs

Baseliner Construction	
Cell 1	$5,068,508
Cell 3	$11,160,162
Cell 4	$6,044,432
Total	$22,273,102

Design Permitting	$2,000,000
Baseliner Construction Cost	$22,280,972
Final Cover Construction Cost	$3,230,217
Annual Operating Cost	$3,546,149
Waste Relocation Cost	$700,000
Post Closure Fund	$8,933,147
Tipping Rate, per ton	$27
Waste Revenue, per year	$7,722,000
Wetland Mitigation Cost	$121,200

Partial Final Cover Construction Cost		
Phase	Cell	
5	1	$216,425
7	3a	$329,482
8	3b	$1,243,634
	Remaining	$1,440,677

Present Worth			
Factor Table Values	i		i
Percent (%)	1		2
P/F,i,1	0.9901		0.9804
P/F,i,2	0.9803		0.9612
P/F,i,3	0.9706		0.9423
P/F,i,4	0.9610		0.9238
P/A,i,2	1.9704		1.9416
P/F,i,7	0.9327		0.8706
P/F,i,8	0.9235		0.8535
P/F,i,9	0.9143		0.8368
P/F,i,10	0.9053		0.8203
P/F,i,10.3	0.9116		0.8155
P/F,i,11	0.8963		0.8043
	524,643		-456,255
Rate of Return		2%	

Economic Analysis
Option 4

Waste Volume Airspace	5,345,936	cy
C&D Waste Density	1,500.00	lb/cy
Waste Receipt Rate	286,000	tons/year
1 Ton	2,000	lbs
Site Life	14.0	yrs

Baseliner Construction	
Cell 1	$5,737,029
Cell 2	$3,689,895
Cell 3	$10,260,942
Cell 4	$5,560,116
Final	$25,247,982

Design Permitting	$2,000,000
Baseliner Construction Cost	$25,273,255
Final Cover Construction Cost	$3,972,746
Annual Operating Cost	$3,599,414
Waste Relocation Cost	$700,000
Post Closure Fund	$10,126,872
Tipping Rate, per year	$27
Waste Revenue, per ton	$7,722,000
Wetland Mitigation Cost	$343,400

Partial Final Cover Construction Cost		
Phase	Cell	
5	1	$266,174
6	2	$345,629
7	3a	$405,220
8	3b	$1,529,507
	Remaining	$1,426,216

Present Worth			
Factor Table Values	i		i
Percent (%)	8		9
P/F,i,1	0.9259		0.9174
P/A,I,2	1.7833		1.7591
P/F,i,4	0.7350		0.7084
P/F,i,5	0.6881		0.6499
P/F,i,6	0.6302		0.5963
P/F,i,7	0.5835		0.5470
P/F,i,8	0.5403		0.5019
P/F,i,9	0.5002		0.4604
P/A,I,2	1.7833		1.7591
P/F,i,12	0.3971		0.3555
P/F,i,13	0.3677		0.3262
P/A,I,2	1.7833		1.7591
P/F,i,16	0.2919		0.2519
	893,318		-178,625
Rate of Return		9%	

BY JPR DATE 6/11/15

CHKD. BY DL DATE 9/4/15

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JOB NO. 02-0104

SHEET NO. 1 OF 1

SUBJECT Option 3 Soil Volumes

Find: Volume of Soil in Liner System + Cover

Given: 3D Subgrade Surface Area 1,300,368 ft² – FIGURE 1
Bottom of Subgrade = 669,175 ft² – FIGURE 1
3D Area of Subgrade sideslope = 631,193 ft²
3D Top of waste = 1,300,306 ft² FIGURE 1
Flat top 1,202 ft² FIGURE 1 93,510
Airspace = 4,019,403 cy − 4(631,193 ft²)/27 ft³ − 5(669,175 ft²)/27 ft³ = 3,801,972 cy
Total Cut = 828954 cy
Embankment Fill = 237,570 cy
3D Top of waste without flat top = (1,300,306 ft² − 1202 ft²) = 1,299,104 ft²
Final cover slope soil thickness = (0.5 top soil + 2' BPL) = 2.5'
Final cover top soil thickness = (0.5 top soil + 1.5' SL + 2' BPL) = 4'
Baseliner soil thickness = (2' SSL + 1' SL), 2' PDL = 3'
Sideliner soil thickness = (2' SSL), 2' PDL = 2'
Intermediate soil thickness = 1 ft

TOTAL EXCAVATION = INCLUDING 10 ft OVEREXCAVATION 1,056,958.97 cy
RECOMPACTION VOLUME
123921 = 1056,958 − 828,954 cy = 228,005 cy

Assumptions: For tolerance: • Add 0.2 ft to SSL and Final cover SL thickness
Add 0.1 ft to SF thickness
Add 0.1 ft to BPL thickness

6.8% Discretionary Cover (Option 4 + Soil Bal in Eng. Report)

Baseliner:
SSL = (1,300,368 ft²)(2 + 0.2 ft) = 2,860,810 ft³/27 ft³ = 105,956 cy
SF = (669,175 ft²)(1 + 0.1 ft) = 736,093 ft³/27 ft³ = 27,263 cy
PDL = (1,300,368 ft²)(2 ft) = 2,600,736 ft³/27 ft³ = 96,324 cy

Final Cover
Intermediate Cover = (1,300,306 ft²)(1 ft) = 1,300,306 ft³/27 ft³ = 48,159 cy
Barrier Protection Layer = 1,300,306 ft²(2 + 0.1 ft) = 2,730643 ft³/27 ft³ = 101,135 cy
Soil Liner = (1,202 ft²)(1.5 + 0.2 ft) = 2043 ft³/27 ft³ = 76 cy
Top Soil = (1,300,306 ft²)(0.5 ft) = 650,153 ft³/27 ft³ = 24080 cy

Soil Volumes
Baseliner: 105,956 cy (SSL) + 27,263 cy (SF) = 133,219 cy
Final cover: 48,159 (IC) + 101,135 (BPL) + 76 (SL) + 24080 (T.S.) = = 173,450 cy
Discretionary cover (cover soil) = 0.068(3,801,972 cy) = 258,534 cy
W.V. = 3,801,972 cy − 258,534 cy = 3,543,438 cy
Soil Required = 258,534 + 173,450 (F.C.) + 133,219 (B.C.) + 237,570 = 802,773 cy

BY JPR DATE 6/5/15
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JOB NO. 02-0104
SHEET NO. 1 OF 2

SUBJECT Rate of Return For Option 3

Find: Rate of Return for option 3

Method: Present worth Analysis - Interpolate value for i that gives a zero present worth

Single Payment Present worth From Future worth: $(P/F, i, n) = (1+i)^{-n}$

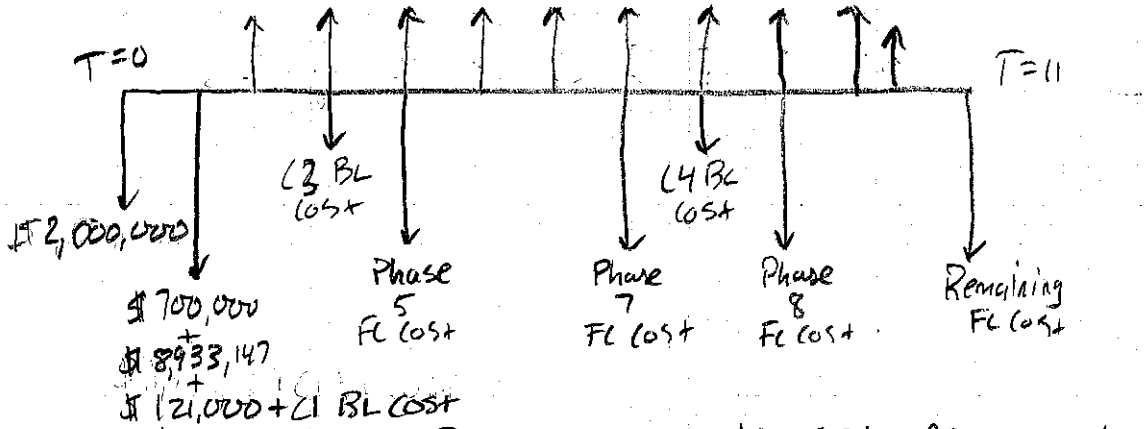
P = Present Worth F = Future Worth
i = Interest Rate n = Annual Amount

Present worth From annual amount: $(P/A, i, n) = \frac{(1+i)^n - 1}{i(1+i)^n}$ A = Annual Amount

Given/Assumptions:

Site Life = 9.3 years, Design/Permit = $2,000,000
Baseliner Construction = $23,280,972
Final Cover Construction = $3,239,217, Wetland Mitigation Cost = $121,200
Post-Closure Fund: $8,933,147, Annual Revenue = $7,722,000
Waste Relocation Cost: $700,000, Operational Cost = $3,546,149

$7,722,000 - $3,546,149 (WR-OC)



When to implement each cell Baseliner construction cost. Assume only three cells. Cell 3 and 4 are same size as option 4 and cell one is the remaining difference. Cell 2 doesn't exist due to wetland avoidance.

Cell 4 Area = 7.68 ac / 28.3 = 27.1% (9.3 years) = 2.5 years
Cell 3 Area = 14.18 ac / 28.3 = 50.1% (9.3 years) = 4.7 years ≈ 5
Cell 1 Area = 28.3 - (7.68 + 14.18) = 6.44 / 28.3 = 22.8% (9.3 years) = 2.1 years ≈ 2
C1 BL Cost = (6.44/28.31)($23,280,972) = $5,068,508
C3 BL Cost = (14.18/28.31)($23,280,972) = $11,660,162
C4 BL Cost = (7.68/28.31)($23,280,972) = $6,044,432

BY JPR DATE 6/5/15
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JOB NO. 02-0104
SHEET NO. 2 OF 2

SUBJECT Rate of Return For Option 3

Partial Final Cover Scaled off option 4 Phasing plan → Percentage of Opt. 4 final cover. See: "Rate of Return for Option 4"

Area of option 4 = 34.9 Ac
Area of option 3 = 28.3
> Scale = $\frac{28.3}{34.9} = 0.811$

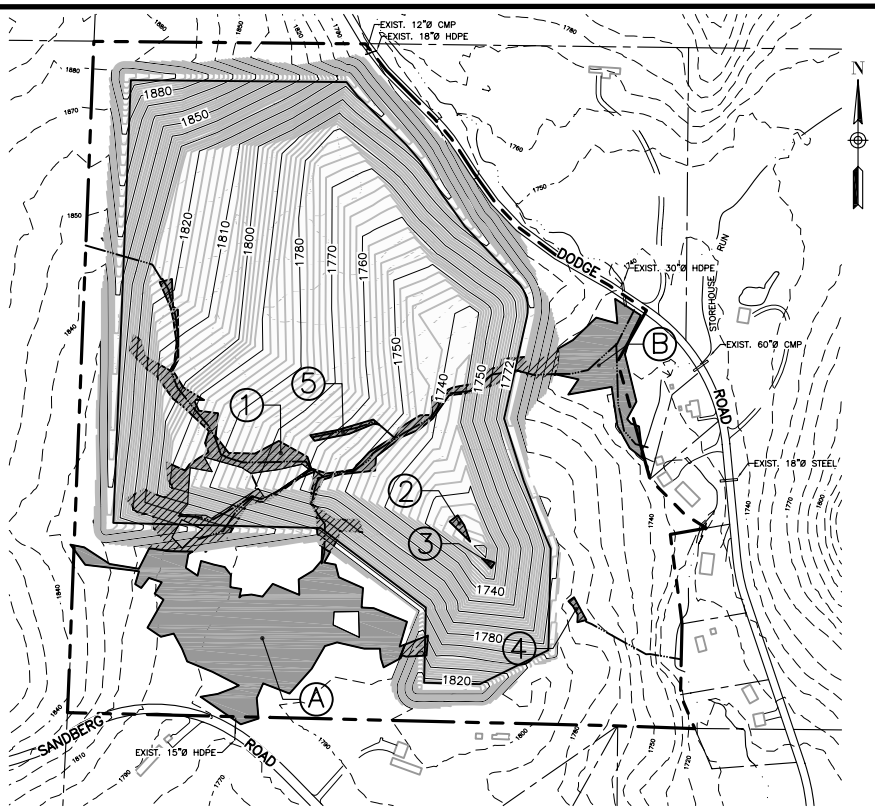
C1 Partial Final Cover (Phase 5) = (0.067)($3,230,217) = $216,425 year 4
C3a Partial Final Cover (Phase 7) = (0.102)($3,230,217) = $329,482 year 7
C3b Partial Final Cover (Phase 8) = (0.385)($3,230,217) = $1,243,634 year 9
+
$1,789,541

C2 Partial Final Cover N.A.

Remaining FC cost = $3,230,217 − $1,789,541 = $1,440,670

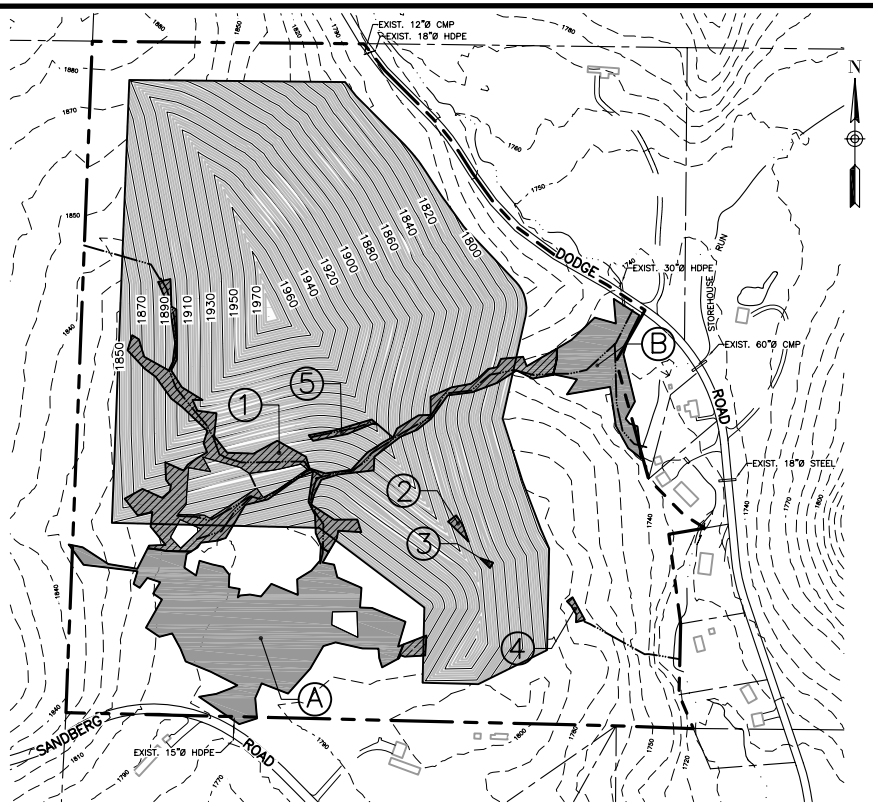
P = −$2,000,000 − ($700,000 + $8,933,147 + $121,200 + C1 BL cost + 5,661,870)(P/F, i, 1) + (WR − OC)(P/F, i, 2) + (WR − OC − C3 BL cost)(P/F, i, 3) + (WR − OC − C1 FC cost)(P/F, i, 4) + (WR − OC)(P/A, i, 2)(P/F, i, 4) + (WR − OC − C3a FC cost)(P/F, i, 7) + (WR − OC − C4 BL cost)(P/F, i, 8) + (WR − OC − C3b FC cost)(P/F, i, 9) + (WR − OC)(P/F, i, 10) + 0.3(WR − OC)(P/F, i, 10.3) − (Remaining FC cost)(P/F, i, 11) → Input into excel

Return on Investment (ROI) = 2%



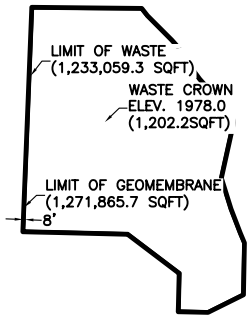
SUBGRADE

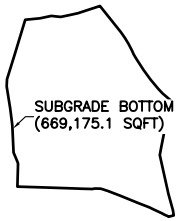
SCALE: 1"=500'



TOP OF WASTE

SCALE: 1"=500'





Base Surface	Comparison Surface	Cut	Fill	Net
X-TOPO	TSG-OPTION 3	828,954.30 Cu. Yd.	237,569.57 Cu. Yd.	591,384.73 Cu. Yd.<Cut>
TSG-OPTION 3	TOW-OPTION 3	0.00 Cu. Yd.	4,019,402.64 Cu. Yd.	4,019,402.64 Cu. Yd.<Fill>

SUBGRADE 3D SURFACE AREA 1,300,368 SQFT (VOLUME TO INSIDE SUBGRADE BERM)
TOP OF WASTE 3D SURFACE AREA 1,300,306.3 SQFT

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SEALAND WASTE, LLC		OPTION 3-ENGINEERING DOCUMENTATION		FIGURE 1
SCALE: NTS	REVISION # 0	CARROLL LANDFILL EXPANSION APPLICATION-ALTERNATIVES ANALYSIS		
June 2015		TOWN OF CARROLL	CHAUTAUQUA COUNTY	NEW YORK

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CARROLL LANDFILL
OPTION 3 FACILITY CONSTRUCTION - COST ESTIMATE

OPTION 3 TASK / ITEM		QTY.	UNIT	UNIT COST	RS MEANS PAGE	RS MEANS LINE	OTHER PRICE REFERENCE	TOTAL COST	VALUE REFERENCE / ASSUMPTIONS / NOTES
Erosion And Sediment Control		**$365,931**							
	Clear and Grub	36.90	ac.	$7,175.00	285	160		$264,733	Reference Fig. 1-2
	Silt fence	730	lf.	$0.83	329	1000		$606	Reference Fig. 3
Grass lined channels		4,940	lf.						Reference Fig. 3, Assume 15 ft. Drainage area for all channels (Varies)
	Grading, fertilizer, seed and mulch	26,034	sy.	$3.77	394	1000		$98,147	Assume 5 ft. channel width (Varies)
	Place and remove straw bales	3	ton.	$815.00	329	1200		$2,445	Assume 3 Tons
Sediment Basin 1 (Same as Option 4)		**$79,895**							
12" Subgrade Preparation		29,000	sf.						Reference Pond Report Sediment Basin 1, Top Contour Surface area (App. G)*1.054
	Hauling, loading, waiting,dumping, return	1,074	lcy.	$3.93	319	5000		$4,221	
	Finish Grading (Steep Slopes)	3,222	sy.	$0.26	288	3310		$838	
Geosynthetic Liner System									
	10-oz. Non Woven Geotextile Cushion	29,000	sf.	$0.09			Modern Landfill Bid	$2,737	Reference Sheet PD-29, Cost of 16-oz.* (10/16)
	36-Mil CSPE Geomembrane Layer	29,000	sf.	$0.14			Modern Landfill Bid	$4,111	Reference Sheet PD-29, Cost of 80-MIL*(36/80)
	24" Bank Run Gravel Protective Cover	3,222	sy.	$21.10	364	400		$67,988	Reference Sheet PD-29, Doubled 12" Value
Sediment Basin 2 (Same as Option 4)		**$56,310**							
12" Subgrade Preparation		20,439	sf.						Reference Pond Report, Sediment Basin 2, Top Contour Surface area (App G.)*1.054
	Hauling, loading, waiting,dumping, return	757	lcy.	$3.93	319	5000		$2,975	
	Finish Grading (Steep Slopes)	2,271	sy.	$0.26	288	3310		$590	
Geosynthetic Liner System									
	10-oz. Non Woven Geotextile Cushion	20,439	sf.	$0.09			Modern Landfill Bid	$1,929	Reference Sheet PD-29, Cost of 16-oz.* (10/16)
	36-Mil CSPE Geomembrane Layer	20,439	sf.	$0.14			Modern Landfill Bid	$2,897	Reference Sheet PD-29, Cost of 80-MIL*(36/80)
	24" Bank Run Gravel Protective Cover	2,271	sy.	$21.10	364	400		$47,918	Reference Sheet PD-29, Doubled 12" Value
Graded filters (Same as Option 4)		**$53,680**							
Graded Filter 1		2,348	sf.						Reference End Area Method Volume Calculations Graded Filter 1
	18" No. 2 Stone	130	cy.	$24.44			Tri-James (NO. 1 Stone)	$3,188	Reference Sheet PD-26
	20" No. 1 Stone	145	cy.	$24.44			Tri-James (NO. 2 Stone)	$3,549	Reference Sheet PD-26
	24" Filter Media	174	cy.	$16.30			Tri-James (Filter Sand)	$2,835	Reference Sheet PD-26
	6" Sandy Loam Topsoil Backfill	261	sy	$6.40	394	800		$1,670	Reference Sheet PD-26
	Tri-James Material Hauling, loading, waiting,dumping, return	450	lcy.	$3.93	319	5000		$1,767	
	Tri James Material Finish Grading (Steep Slopes)	261	sy.	$0.21	288	3300		$55	
	Separation Geotextile	2,348	sf.	$0.10			Modern Landfill Bid	$240	Reference Sheet PD-26
Graded Filter 2		2,126	sf.						Reference End Area Method Volume Calculations Graded Filter 2
	18" No. 2 Stone	118	cy.	$24.44			Tri-James (NO. 1 Stone)	$2,887	Reference Sheet PD-26
	20" No. 1 Stone	131	cy.	$24.44			Tri-James (NO. 2 Stone)	$3,214	Reference Sheet PD-26
	24" Filter Media	157	cy.	$16.30			Tri-James (Filter Sand)	$2,567	Reference Sheet PD-26
	6" Sandy Loam Topsoil Backfill	236	sy	$6.40	394	800		$1,512	Reference Sheet PD-26
	Tri-James Material Hauling, loading, waiting,dumping, return	407	lcy.	$3.93	319	5000		$1,600	
	Tri James Material Finish Grading (Steep Slopes)	236	sy.	$0.21	288	3300		$50	
	Separation Geotextile	2,126	sf.	$0.10			Modern Landfill Bid	$217	Reference Sheet PD-26
Graded Filter 3		4,118	sf.						Reference End Area Method Volume Calculations Graded Filter 3
	18" No. 2 Stone	229	cy.	$24.44			Tri-James (NO. 1 Stone)	$5,591	Reference Sheet PD-26
	20" No. 1 Stone	255	cy.	$24.44			Tri-James (NO. 2 Stone)	$6,225	Reference Sheet PD-26
	24" Filter Media	305	cy.	$16.30			Tri-James (Filter Sand)	$4,972	Reference Sheet PD-26
	6" Sandy Loam Topsoil Backfill	458	sy	$6.40	394	800		$2,928	Reference Sheet PD-26
	Tri-James Material Hauling, loading, waiting,dumping, return	789	lcy.	$3.93	319	5000		$3,099	
	Tri James Material Finish Grading (Steep Slopes)	458	sy.	$0.21	288	3300		$96	
	Separation Geotextile	4,118	sf.	$0.10			Modern Landfill Bid	$421	Reference Sheet PD-26
Graded Filter 4		882	sf.						Reference End Area Method Volume Calculations Graded Filter 4
	18" No. 2 Stone	49	cy.	$24.44			Tri-James (NO. 1 Stone)	$1,198	Reference Sheet PD-26
	20" No. 1 Stone	55	cy.	$24.44			Tri-James (NO. 2 Stone)	$1,333	Reference Sheet PD-26
	24" Filter Media	65	cy.	$16.30			Tri-James (Filter Sand)	$1,065	Reference Sheet PD-26
	6" Sandy Loam Topsoil Backfill	98	sy	$6.40	394	800		$627	Reference Sheet PD-26
	Tri-James Material Hauling, loading, waiting,dumping, return	169	lcy.	$3.93	319	5000		$664	
	Tri James Material Finish Grading (Steep Slopes)	98	sy.	$0.21	288	3300		$21	
	Separation Geotextile	882	sf.	$0.10			Modern Landfill Bid	$90	Reference Sheet PD-26

OPTION 3 TASK / ITEM	QTY.	UNIT	UNIT COST	RS MEANS PAGE	RS MEANS LINE	OTHER PRICE REFERENCE	TOTAL COST	VALUE REFERENCE / ASSUMPTIONS / NOTES
Site Miscellaneous (Same as Option 4)	**$1,293,377**							
Sound Barrier								
4.5 Feet High	1,335	lf.	$101.81			Interpolated Means	$135,920	Reference Noise Barrier Plan, Assume composite panels (4.5/8)*eight foot cost
8 Feet High	1,509	lf.	$181.00	389	400		$273,129	Reference Noise Barrier Plan, Assume composite panels
13 Feet High	1,133	lf.	$294.13			Interpolated Means	$333,244	Reference Noise Barrier Plan, Assume composite panels (13/8)*eight foot cost
Access Roads	3,610	lf.	$125.00	623	1200		$451,250	Reference Fig. 3
Asphault Lot (Entrance)	1,944	sy.	$27.00	365	550		$52,500	Reference Fig. 3
Grading, fertilizer, seed and mulch	12,556	sy.	$3.77	394	1000		$47,334	Reference Fig. 3, Rough Estimate, Conservative, Most area not in landfill
Baseliner System	**$7,762,233**							
Engineering Certification	28.3	ac	$25,000.00			Modern Landfill Bid	$707,500	
Mass excavation/truck loading (Cut)	1,056,956	bcy	$1.11	299	5620		$1,173,221	
Hauling, loading, waiting,dumping, return	1,215,499	lcy.	$3.93	319	5000		$4,776,913	Bulk Factor=1.15
Grading dumped material	320,719	ea 100,000 sf	$5,050.00	288	0280		$16,196	Assume Average Embankment Height of 20'
Compaction of Embankment	237,570	ecy	$1.66	328	0300		$394,366	Cut-Embankment Fill
Embankment QC	7.36	ac	$25,000.00			Modern Landfill Bid	$184,068	Assume Average Embankment Height of 20'
Compaction of Overexcavated Material	228,005	cy	$1.66				$378,488	
Liner subgrade grading	144,485	sy	$0.91	288	0100		$131,482	Soil Balance Appendix A of Engineering Report
Geosynthetic Liner System	**$6,795,304**							
Type P Geocomposite Drain	1,300,368	sf.	$0.38			Modern Landfill Bid	$491,539	Option 3 Volume Calculation, Fig 5-1, Subgrade Surface Area
Type L Geocomposite Drain	1,300,368	sf.	$0.57			Modern Landfill Bid	$745,111	Option 3 Volume Calculation, Fig 5-1, Subgrade Surface Area
Two Layers of 60-MIL Textured HDPE Geomembrane Liner	1,300,368	sf.	$0.32			Modern Landfill Bid, Cost 60/80	$819,232	Option 3 Volume Calculation, Fig 5-1, Subgrade Surface Area, two layers
Geosynthetic Clay Liner	669,175	sf.	$0.32			Modern Landfill Bid	$214,136	Option 3 Volume Calculation, Fig 5-1, Subgrade Surface Area, not on slopes
16-oz. Type C Cushion Geotextile	1,300,368	sf.	$0.15			Modern Landfill Bid	$196,356	Option 3 Volume Calculation, Fig 5-1, Subgrade Surface Area
10-oz. Type S Separation Geotextile	81,805	sf.	$0.10			Modern Landfill Bid	$8,361	Assume 6 foot width over PLCRS and SLCRS (Rererence Sheet PD-6), 7,770*6*2
24" Secondary Soil Liner (From Onsite)	2,860,810	cf.						Option 3 Volume Calculation, Subgrade Surface Area
Hauling, loading, waiting,dumping, return	105,956	lcy.	$3.93	319	5000		$416,407	Option 3 Volume Calculation, Subgrade Surface Area
Compaction	105,956	ecy	$1.66	328	0300		$175,887	
Finish Grading (Gentle to No Slope)	74,353	sy.	$0.21	288	3300		$600,770	Option 4 Volume Calculation, Bottom of Subgrade Area
Finish Grading (Steep Slopes)	70,133	sy.	$0.26	288	3310		$191,384	Option 4 Volume Calculation, Subgrade Sideslope Area
12" Structural Fill (From Onsite)	736,093	cf.						Option 4 Volume Calculation, Bottom of Subgrade Area
Hauling, loading, waiting,dumping, return	27,263	lcy.	$3.93	319	5000		$107,142	Option 4 Volume Calculation, Bottom of Subgrade Area
Compaction	27,263	ecy	$1.66	328	0300		$45,256	
Finish Grading (Gentle to No Slope)	81,788	sy.	$0.21	288	3300		$17,175	Option 4 Volume Calculation, Bottom of Subgrade Area
24" Leachate Drainage Layer (NO2. 3/4" DIA Rounded Stone)	2,600,736	cf.						Option 4 Volume Calculation, Subgrade Surface Area
24" No. 2 Stone	96,324	cy	$24.44			Tri-James (NO. 2 Stone)	$2,354,148	Option 4 Volume Calculation, Subgrade Surface Area
Tri-James Material Hauling, loading, waiting,dumping, return	96,324	lcy.	$3.93	319	5000		$378,552	
Tri James Material Finish Grading (Gentle to no Slope)	74,353	sy.	$0.21	288	3300		$15,614	Option 4 Volume Calculation, Subgrade Sideslope Surface Area
Tri James Material Finish Grading (Steep Slopes)	70,133	sy.	$0.26	288	3310		$18,234	Option 4 Volume Calculation, Subgrade Surface Area
Soil Required	133,219							
Leachate Pumping / Piping (Same as Option 4, collection pipe diff.)	**$1,165,400**							
Primary Leachate Collection System)								
Primary Sump	1	ea.	$6,525.00	247	2060		$6,525	Assume 300 GPM Discharge, Sump Pump, Single Stage
24" DIA HDPE Sideriser	415	lf.	$116.00	473	900		$48,140	Reference Sheet PD-6, Values from AUTOCAD
8" DIA HDPE Leachate Collection Pipe	6,817	lf.	$22.00	472	300		$149,976	Reference Sheet PD-6, Values from AUTOCAD
Secondary Leachate Collection System								
Secondary Sump	1	ea.	$6,525.00	247	2060		$6,525	Assume 300 GPM Discharge, Sump Pump, Single Stage
24" DIA HDPE Sideriser	398	lf.	$116.00	473	900		$46,168	Reference Sheet PD-6, Values from AUTOCAD
4" DIA HDPE Leachate Collection Pipe	6,817	lf.	$12.80	472	100		$87,259	Reference Sheet PD-6, Values from AUTOCAD
Porewater / Trench Drain System								
Porewater Sump	1	ea.	$6,525.00	247	2060		$6,525	Assume 300 GPM Discharge, Sump Pump, Single Stage
36" DIA HDPE Sideriser	426	lf.	$174.00			Interpolated RS Means	$74,124	Reference Sheet PD-6, Values from AUTOCAD, (36"/24")*116 (116 = Value for 24" Pipe
4" DIA HDPE Drain Pipe	6,817	lf.	$12.80	472	100		$87,259	Reference Sheet PD-6, Values from AUTOCAD
Trench Drain 6" HDPE Pipe	670	lf.	$17.70	472	200		$11,859	Reference Sheet PD-5, Values from AUTOCAD
Leachate Collection and Storage System								
Storage tank/foundation (initial)	1	ea.	$290,000.00			Lockwood Pricing	$290,000	
Storage tank/foundation (final)	1	ea.	$145,000.00			Lockwood Pricing	$145,000	Assume foundation is one-half the tank/foundation total
Loadout pad	2	ea.	$59,000.00			Lockwood Pricing	$118,000	
3"/6" DIA HDPE Leachate Forcemain								
Initial (6" DIA)	1,307	lf.	$17.70	472	200		$23,134	Reference Sheet PD-20
Initial (3" DIA)	1,307	lf.	$8.85	472		Interpolated RS Means	$11,567	Reference Sheet PD-20, Price for 3" half of 6"
Final (6"DIA)	912	lf.	$17.70	472	200		$16,142	Reference Sheet PD-20
Final (3"DIA)	912	lf.	$8.85	472		Interpolated RS Means	$8,071	Reference Sheet PD-20, Price for 3" half of 6"
Transfer Pump	1	ea.	$6,525.00	247	2060		$6,525	Assume 300 GPM Discharge, Sump Pump, Single Stage
Air Relief Valve	2	ea.	$10,000.00				$20,000	Reference Sheet PD-20, Price Assumption

Carroll Landfill Recycling and Landfill Management
Solid Waste Management Facilities Operating Cost Estimate for Option 3

Cost Calculated below is based on 307,000 tpy waste
30,700 tpy ADC (10%)

Operating Cost Summary

Equipment		Annual Lease Payment	Initial Purchase Payment	Life	Salvage Value	Straight Line Annual Depreciation	Fuel Consumption	Fuel Cost 4	Oil Consumption	Oil Cost 3	Maint. Contract
Cat 826 Landfill Compactor		$220,000					32,000	$128,000	425	$1,275	
D6 Bulldozer		$85,000					20,000	$80,000	185	$555	
D6 Bulldozer		$65,000					7,500	$30,000	90	$270	
D25 Off-Road Dump		$100,000					21,000	$84,000	510	$1,530	
D25 Off-Road Dump		$100,000					16,000	$64,000	510	$1,530	
962 Loader		$70,000					11,200	$44,800	310	$930	
336D Excavator		$55,000					22,000	$88,000	1,150	$3,450	
416E Backhoe		$100,000					1,400	$5,600	25	$75	
IR SD-100 Soil Compactor		$45,000					1,700	$6,800	80	$240	
Tractor/Trailer-Tanker		$27,000					5,700	$22,800	200	$600	
2,000 Gallon Water Truck		$20,000					3,400	$13,600	50	$150	
Equipment Maintenance Truck		$7,000					2,200	$8,800	50	$150	
Tool Truck		$6,000					2,700	$10,800	50	$150	
Fuel/Lube Truck		$10,000					3,500	$14,000	50	$150	
Vacuum Sweeper		$10,000					1,800	$7,200	50	$150	
Tub Grinder		$65,000					8,100	$32,400	180	$540	
Impact Crusher		$75,000					11,000	$44,000	350	$1,050	
Shaker Screen		$45,000					1,700	$6,800	200	$600	
Stacking Conveyor		$35,000					1,300	$5,200	50	$150	
One ton Dump Truck		$10,000					2,000	$8,000	50	$150	
Four Wheel Drive Pickup Trucks (3)		$18,000					6,000	$24,000	150	$450	
		$20,000									
Scales			$70,000	15	$3,000	$4,467					$2,500
Trash Pumps (2)			$5,000	7	$200	$686					
Air Compressor			$2,000	10	$200	$180					
Steam Cleaner			$2,000	10	$200	$180					
Generator			$3,000	10	$100	$290					
Portable Welder			$6,000	15	$500	$367					
Litter Vacuum			$15,000	10	$1,000	$1,400					
SulfaTreat			$250,000	20	$500	$12,475					
Mower Tractor			$45,000	10	$1,000	$4,400					
Slope Mower			$45,000	10	$1,000	$4,400					
Miscellaneous Tools			$40,000	10	$500	$3,950					
Subtotal Equipment cost		$1,188,000	$483,000			$32,794		$728,800		$14,145	$2,500
Total Annual Equipment Cost	**$1,966,239**										

OPTION 3 TASK / ITEM		QTY.	UNIT	UNIT COST	RS MEANS PAGE	RS MEANS LINE	OTHER PRICE REFERENCE	TOTAL COST	VALUE REFERENCE / ASSUMPTIONS / NOTES
Manhole									
	Concrete Placement	1	ea.	$2,600.00	495	1130		$2,600	Reference Sheet PD-20, 10 ft. deep
Landfill Leachate and Gas Collection and Treatment System		$4,708,842							
Horizontal Collectors			lf.						
	8" DIA HDPE Subheader	8,525	lf.	$22.00	472	300		$187,560	Reference Sheet PD-23, (28.31/34.9)*Option 4
	6" DIA HDPE LFG Collection Pipe	11,384	lf.	$17.70	472	200		$201,497	Reference Sheet PD-23, (28.31/34.9)*Option 4
24" DIA HDPE Header		4,068	lf.	$116.00	473	900		$471,893	Reference Sheet PD-23, (28.31/34.9)*Option 4
Leachate Treatment System (Structure)		1	ea.	$3,000,000.00			Average Cost.	$3,000,000	
	SulfaTreat Initial Capital Cost	1	ea.	$452,892.00			SulfaTreat Cost Estimate	$452,892	
	Flare	1						$395,000	John Zink Company, LLC Estimate
Final Cover System		**$3,230,217**							
Engineering Certification		28.3	ac	$15,000.00			Modern Landfill Bid	$424,500	
	Composite Landfill Gas Venting Layer	1,300,306	sf.	$0.38			Modern Landfill Bid	$491,516	Option 4 Volume Calculation, Fig 5-1, Final Cover Surface Area, Assume Type P Geocor
	40-MIL Textured LLDPE Geomembrane	1,300,306	sf.	$0.21			Modern Landfill Bid	$273,064	Option 4 Volume Calculation, Fig 5-1, Final Cover Surface Area
	Type C Geotextile Cushion	1,202	sf.	$0.15			Modern Landfill Bid	$182	Option 4 Volume Calculation, Fig 5-1, Final Cover Flat Top
	Composite Infiltration Drain	1,300,306	sf.	$0.38			Modern Landfill Bid	$491,516	Option 4 Volume Calculation, Fig 5-1, Final Cover Surface Area
		1,300,306	sf.					$0	Option 4 Volume Calculation, Final Cover Surface Area
12" Intermediate Cover								$189,267	Option 4 Volume Calculation, Final Cover Surface Area
	Hauling, loading, waiting,dumping, return	48,159	lcy.	$3.93	319	5000		$79,945	
	Compaction	48,159	ecy	$1.66	328	0300		$28	
	Finish Grading (Gentle to No Slope)	134	sy.	$0.21	288	3300		$37,530	
	Finish Grading (Steep Slopes)	144,345	sy.	$0.26	288	3310		$0	Option 4 Volume Calculation, Final Cover Flat Top
		1,202	sf.					$297	Option 4 Volume Calculation, Final Cover Flat Top
18" Soil Liner								$126	
	Hauling, loading, waiting,dumping, return	76	lcy.	$3.93	319	5000		$28	
	Compaction	76	ecy	$1.66	328	0300		$0	Option 4 Volume Calculation, Final Cover Surface Area
	Finish Grading (Gentle to No Slope)	134	sy.	$0.21	288	3300		$397,460	Option 4 Volume Calculation, Final Cover Surface Area
		1,300,306	sf.					$167,884	
24" Barrier Protection Layer								$28	
	Hauling, loading, waiting,dumping, return	101,135	lcy.	$3.93	319	5000		$37,530	
	Compaction	101,135	ecy	$1.66	328	0300		$0	Option 4 Volume Calculation, Final Cover Surface Area
	Finish Grading (Gentle to No Slope)	134	sy.	$0.21	288	3300		$94,633	Option 4 Volume Calculation, Final Cover Surface Area
	Finish Grading (Steep Slopes)	144,345	sy.	$0.26	288	3310		$544,684	
		1,300,306	sf.						
6" Topsoil									
	Hauling, loading, waiting,dumping, return	24,080	lcy.	$3.93	319	5000			
	Grading, fertilizer, seed and mulch	144,478	sy.	$3.77	394	1000			
	Soil Required	173,450							

Total Cost Estimate	**$25,511,189**
Final Cover Cost	**$3,230,217**
Baseliner Construction Cost	**$22,280,972**

Personnel	qty	Unit Salary	Total Salaries	Total Benefits		Total Expenses
Chief Operating Officer/Part Time from Sealand	1	$80,000	$80,000	$32,000		$4,000.00
General Manager	1	$80,000	$80,000	$32,000		$4,000.00
Site Manager	1	$70,000	$70,000	$28,000		$3,500.00
Waste Approval Coordinator	1	$50,000	$50,000	$20,000		$2,500.00
MEO IV	2	$40,000	$80,000	$32,000		$4,000.00
MEO III	1	$35,000	$35,000	$14,000		$1,750.00
MEO II	1	$30,000	$30,000	$12,000		$1,500.00
Laborers	2	$30,000	$60,000	$24,000		$3,000.00
Scale Operator	1	$28,000	$28,000	$11,200		$1,400.00
Paper Pickers	2	$25,000	$50,000	$20,000		$2,500.00
Totals	**13**	**$468,000**	**$563,000**	**$225,200**	**$728,800**	**$28,150**
Total Personnel Cost	**$1,284,350**					

Insurance	
General Liability	$5,000
Workers Compensation	$7,500
Automobile/Equipment	$15,000
Total Insurance Cost	**$27,500**

Leachate Management	Annual Rate	Amount
Average Operating Leachate Rate (gallons)	662,159	
Hauling, Treatment, Pumping Cost		$171,209
Leachate Pipe Cleaning		$20,000
Pumps and Maintenance		$20,000
Total Leachate Management		**$211,209**

Environmental Monitoring	
(See "Post-Closure Costs Itemized")	$56,851
Total Environmental Monitoring	**$56,851**

Total Annual Operating Cost	**$3,546,149**

BY JPR DATE 6/11/15
CHKD. BY DC DATE 9/14/15

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JOB NO. 02-0104
SHEET NO. 1 OF 1

SUBJECT Option 4 Soil Volumes

Find: Volume of Soil in Liner System + Cover

Given: Top of Subgrade area = 1,551,485 ft² – Fig A
Bottom of Subgrade area = 868,871 ft² – Fig A
Flat top of Final Cover = 51,556 ft² – Fig B
Airspace = 5,735,100 cy
Total Cut = 1,140,066 cy
Embankment Fill = 365,173 cy

TOTAL EXCAVATION INCLUDING 10ft OVEREXCAVATION = 1,437,122 CY

RECOMPACTION VOLUME = 296,400 CY

Limit of Cell

Subgrade Sideslope Area = (1,551,485 ft² − 868,871 ft²) 1.054 = 719,475 ft²
Subgrade Surface Area = (868,871 ft² + 719,475 ft²) = 1,588,346 ft²
Final Cover Sloped Surface Area (without Flat top)
= (1,551,485 ft² − 51,556 ft²) 1.054 = 1,580,925 ft²
Final Cover Surface Area (with flat top)
= (1,580,925 ft² + 51,556 ft²) = 1,632,481 ft²
Final Cover Slope Soil Thickness = (.5 Top Soil + 2' BPL) = 2.5'
Final Cover top Soil Thickness = (.5 Top Soil + 1.5' SL + 2' BPL) = 4'
Baseliner Soil thickness = (2' SSL + 1' SF), 2' PDL = 3'
Sideliner Soil thickness = (2' SSL) = 2', 2' PDL
Intermediate Soil thickness = 1 ft

Assumptions: For tolerance:
- Add 0.2 ft to SSL and Final Cover SL Thickness
- Add 0.1 ft to SF thickness
- Add 0.1 ft to BPL thickness

Baseliner:
SSL = (1,588,346 ft²)(2 + 0.2 ft) = 3,494,361 ft³ / 27 ft³ = 129,421 cy
SF = (868,871 ft²)(1 + 0.1 ft) = 955,758 ft³ / 27 ft³ = 35,398 cy
PDL = (1,588,346 ft²)(2 ft) = 3,176,692 ft³ / 27 ft³ = 117,655 cy

Final Cover:
Intermediate Cover = (1,632,481 ft²)(1 ft) = 1,632,481 ft³ / 27 ft³ = 60,462 cy
Barrier Protection Layer (1,632,481 ft²)(2 + 0.1 ft) = 3,428,210 ft³ / 27 ft³ = 126,971 cy
Soil Liner = (51,556 ft²)(1.5 + 0.2) = 87,645 ft³ / 27 ft³ = 3,246 cy
topsoil = (1,632,481 ft²)(0.5) = 816,241 ft³ / 27 ft³ = 30,231 cy

Soil Volumes
Baseliner Soil Volume = 35,398 cy + 129,421 cy = 164,819 cy
Final Cover Soil Volume = (126,971 cy + 60,462 cy + 3,246 cy + 30,231 cy) = 220,910 cy

Discretionary Cover (cover soil)
= (1,140,066 cy) − (164,819 + 220,910 + 365,173) = 389,164 cy → 389,164 cy / 5,735,100 cy = 6.8%

WV = 5,735,100 cy − 389,164 cy = 5,345,936 cy

BY JPR DATE 6/5/15
CHKD. BY DL DATE 9/4/15

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JOB NO. 02-0104
SHEET NO. 1 OF 2

SUBJECT Rate of Return For option 4

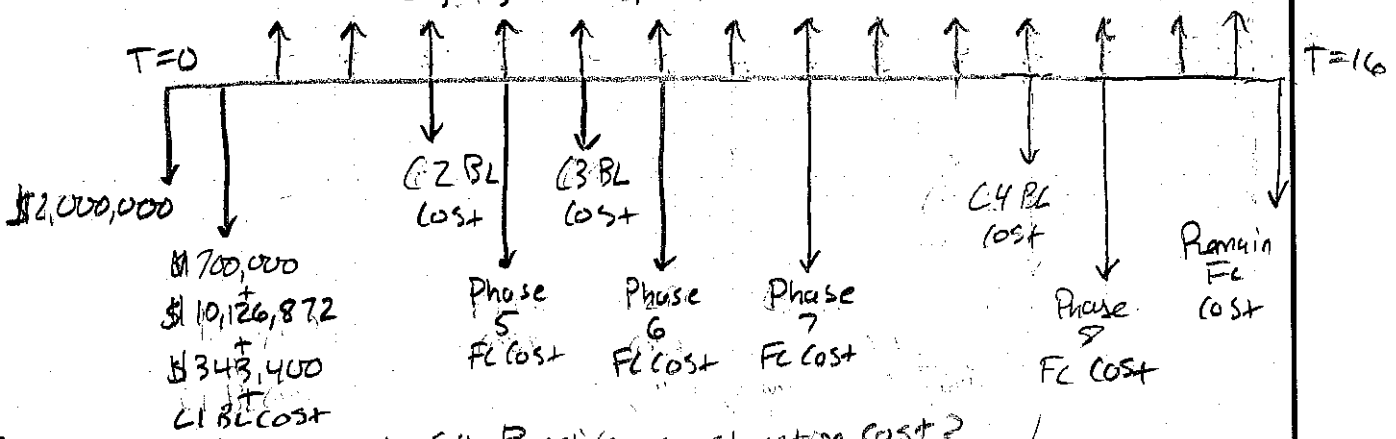
Find: Rate of Return for option 4
Method: Present worth analysis - Interpolate value of i that gives a zero present worth

Single payment present worth from future worth: $(P/F, i, n) = (1+i)^{-n}$

P = Present worth F = Future worth
i = Interest Rate n = life of asset (years)

Present Worth From annual Amount: $(P/A, i, n) = \frac{(1+i)^n - 1}{i(1+i)^n}$, A = annual amount.

Given: Site Life: 13.1 years, Design/Permit = $2,000,000
Baseliner Construction = $25,273,255
Final Cover Construction = $3,972,774.6, Wetland Mitigation Cost = $343,400 → Ref.
Post-Closure Fund = $10,126,872, Annual Revenue = $7,722,000
Waste Relocation = $700,000, Operational Cost = $3,599,414
$7,722,000 - $3,599,414



When to impliment each Cell Baseliner construction cost?

Attached PD-9

Cell 1 Area = 7.92 ac → % = 7.92/34.9 = 22.7% (14.0 y) = 3.18 ≈ 3 year life
Cell 2 Area = 5.11 ac → % = 5.11/34.9 = 14.6% (14.0 y) = 2.04 ≈ 2 year life
Cell 3 Area = 14.18 ac → % = 14.18/34.9 = 40.6% (14.0 y) = 5.68 ≈ 6 year life
Cell 4 Area = 7.68 ac → % = 7.68/34.9 = 22.0% (14.0 y) = 3.08 ≈ 3 year life

C1 BL cost = 0.227 ($25,273,255) = $ 5,737,029
C2 BL cost = 0.146 ($25,273,255) = $ 3,688,895
C3 BL cost = 0.406 ($25,273,255) = $ 10,260,941
C4 BL cost = 0.220 ($25,273,255) = $ 5,560,116

BY SPR DATE 6/5/15
CHKD. BY DL DATE 9/4/15

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JOB NO. 02-0104
SHEET NO. 2 OF 2

SUBJECT Rate of Return For Option 4

Partial Final Cover from Phasing Plan:

From ACAD: Phase 5 Fc (C1) = 2.40ac
Phase 6 Fc (C2) = 3.09ac
Phase 7 Fc (C3a) = 3.62 ac
Phase 8 Fc (C3b) = 13.7 ac
Total Fc Area = 35.6ac

Phase 5 Fc cost = 2.4/35.6 = 6.7% ($3,972,746) = $ 266,174
Phase 6 Fc cost = 3.09/35.6 = 8.7% ($3,972,746) = $ 345,679
Phase 7 Fc cost = 3.62/35.6 = 10.2% ($3,972,746) = $ 405,120
Phase 8 Fc cost = 13.7/35.6 = 38.5% ($3,972,746) = $1,529,507
$2,546,530

+

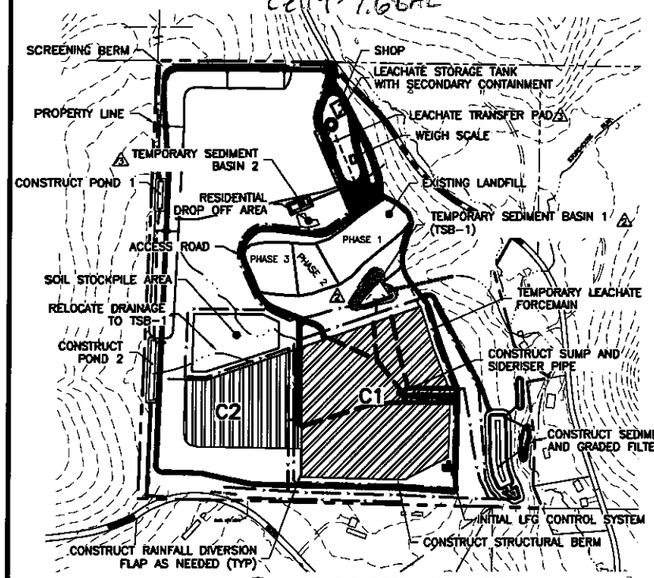
100% 64% = 36% Remaining Fc at end

($3,972,746 − $2,546,530) = $1,426,216

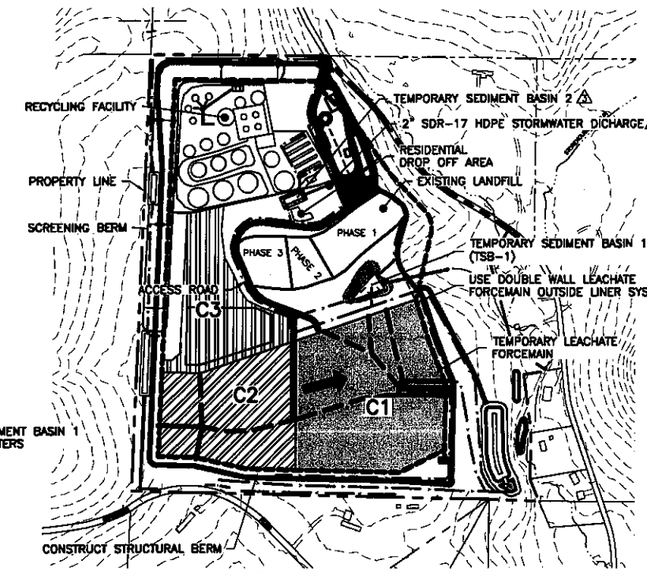
P = $12,000,000 − ($343,400 + $700,000 + $10,126,872 + (1 BL cost)(P/F,i,1) + (WR-OC)(P/A,i,2)(P/F,i,1) + (WR-OC − (2 BL cost)(P/F,i,4) + (WR-OC − Phase 5 Fc cost)(P/F,i,5) + (WR-OC − (3 BL cost)(P/F,i,6) + (WR-OC − Phase 6 Fc cost)(P/F,i,7) + (WR-OC)(P/F,i,8) + (WR-OC − Phase 7 Fc cost)(P/F,i,9) + (WR-OC)(P/A,i,2)(P/F,i,9) + (WR-OC − (4 BL cost)(P/F,i,12) + (WR-OC − Phase 8 Fc cost)(P/F,i,13) + (WR-OC)(P/A,i,2)(P/F,i,13) + (Remaining Fc cost)(P/F,i,16) → Input into excel

Return on Investment (ROI) = 9%

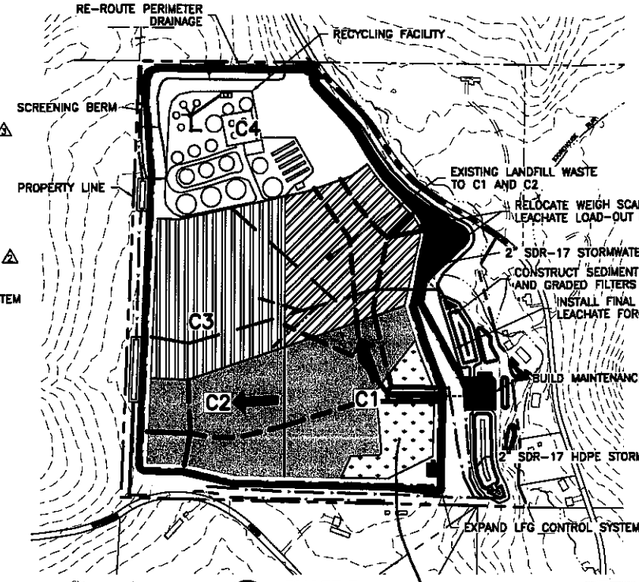
Cell Areas = Cell 1 : 7.92 Ac
Cell 2 : 5.11 Ac
Cell 3 : 14.18 Ac
Cell 4 : 7.66 Ac



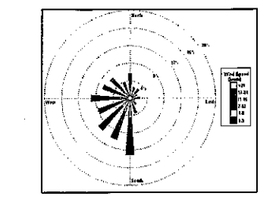
1 INITIAL CONSTRUCTION
Scale: 1"=300'



2 PHASE 4
Scale: 1"=300'



3 PHASE 5
Scale: 1"=300'



WIND ROSE

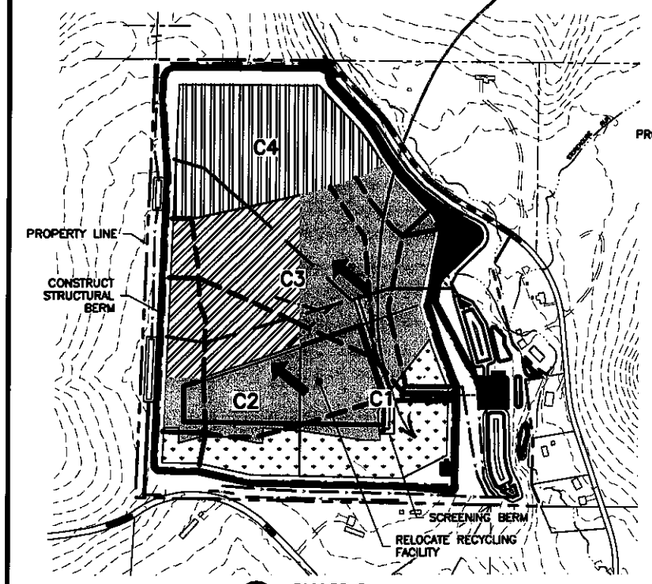
NOTE:
WIND ROSE REPRESENTS THE AVERAGE ANNUAL WIND DIRECTION AND SPEED DATA COLLECTED BY NOAA, JAMESTOWN, NEW YORK
SOURCE DATES: 1973 TO 2003

Total FC Area
35.6 Ac

LEGEND:

- BORROW AREA
- LINER CONSTRUCTION
- ACTIVE LANDFILLING
- FINAL COVER
- DIRECTION OF INITIAL FILL PLACEMENT
- DRAINAGE CHANNEL FLOW DIRECTION
- LEACHATE FORCEMAIN
- ACCESS ROAD
- LD1 LEAK DETECTION POINT
- PRIMARY LEACHATE COLLECTION PIPE
- PRIMARY LEACHATE CLEAN OUT PIPE
- SUBGRADE SURFACE STONE FILLED SURFACE GROUNDWATER DRAIN (W/PIPE)
- SUBGRADE SURFACE STONE FILLED GROUNDWATER DRAIN (NO PIPE)

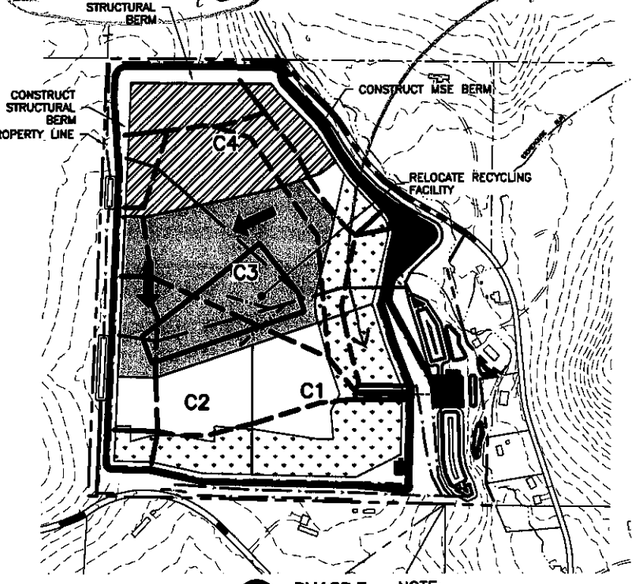
Total Phase 6 - Phase 5
5.49 - 2.40 = 3.09 = Ph 6 Partial FC



4 PHASE 6
Scale: 1"=300'

NOTE:
RECYCLING FACILITY TO BE RELOCATED SEQUENTIALLY DURING PHASE 6 TO ACCOMMODATE PROGRESS OF LANDFILLING IN CELL 1 AND 3, AND BORROW AREA IN CELL 4.

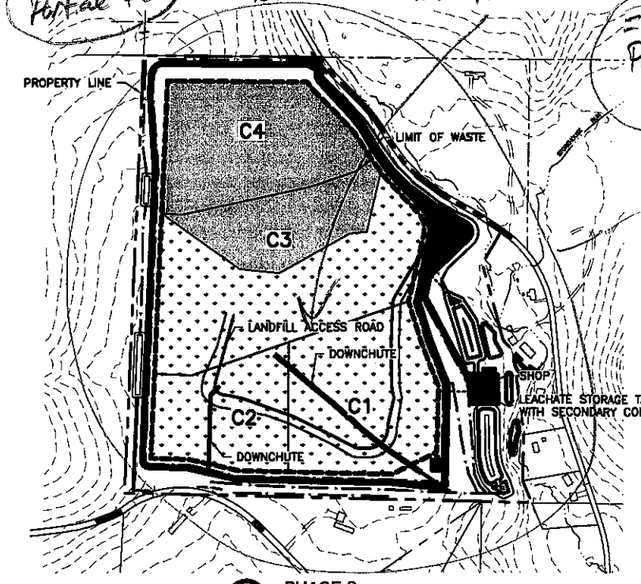
Total Phase 7 - Total Phase 6
9.11 - 5.49 = 3.62 = Ph 7 Partial FC



5 PHASE 7
Scale: 1"=300'

NOTE:
RECYCLING FACILITY TO BE RELOCATED SEQUENTIALLY DURING PHASE 7 TO ACCOMMODATE PROGRESS OF LANDFILLING IN CELL 3 AND CELL 4.

Total Phase 8 - Total Phase 7 = 22.61 - 9.11 = 13.7 Ph 8 Partial FC
A = 2.40 Ac = Ph 5 Partial FC



6 PHASE 8
Scale: 1"=300'

NOTE:
1. THE SIZE OF THE LANDFILL CELLS SHOWN HEREON ARE FOR ILLUSTRATION PURPOSES TO SHOW FILL SEQUENCING. THE ACTUAL SIZE AND NUMBER OF CELLS WILL BE DEPENDENT ON WEATHER AND MARKET CONDITIONS.
2. SEE PD-8 FOR FINAL GRADING AND DRAINAGE PLAN

ALTERATION OF ANY SURVEY, DRAWING, DESIGN, SPECIFICATION OR REPORT MUST BE COMPLETED IN ACCORDANCE WITH SECTION 7209 PROVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

NO.	REVISION	BY	DATE
7	REVISED FINAL COVER PLACEMENT PROGRESSION	TPP	5/14/15
6	ADDED DRAINAGE PHASE 5 TANK AND TRANSFER PAD TO FOREBAY SB 1 AND 2	TPP	3/06/15
5	ADDED DRAINAGE TO INITIAL PHASE TANK AND TRANSFER PAD TO TEMPORARY SEDIMENT BASIN 2	TPP	3/02/15
4	ADDED INITIAL CONSTRUCTION RETENTION BASIN	TPP	6/06/14
3	ADDED PLCRS PIPING AND SUBGRADE DRAIN IN PHASES	TPP	7/01/14

DAIGLER ENGINEERING, P.C.
CIVIL & GEO-ENVIRONMENTAL ENGINEERING
2620 GRAND ISLAND BLVD. GRAND ISLAND, NEW YORK 14072
(716) 773-5872 (716) 773-5873 FAX
JAMES A. DAIGLER, P.E.
NYSPE NO. 061689

DATE: March 2014
SCALE: 1"=300'

PREPARED FOR:	SEALAND WASTE, LLC.		PHASING PLAN
DES. BY:	DRW. BY:	CHK. BY:	CARROLL LANDFILL EXPANSION APPLICATION
DWG.	PD-9 CARROLL-PHASING.dwg		TOWN OF CARROLL / CHAUTAUQUA COUNTY / STATE OF NEW YORK

SHEET PD-9

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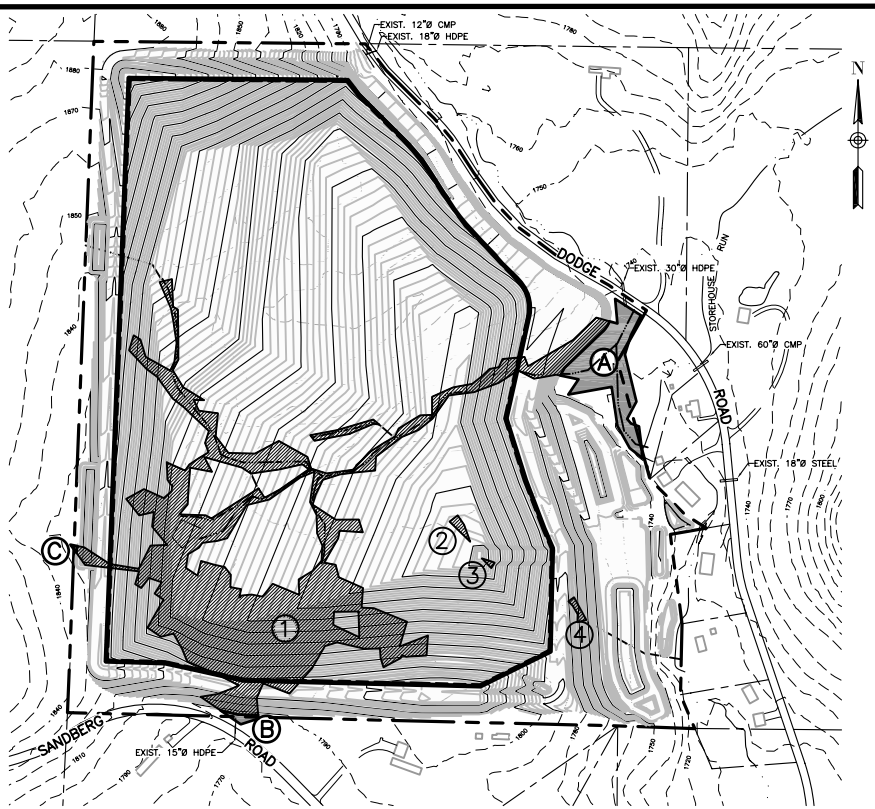
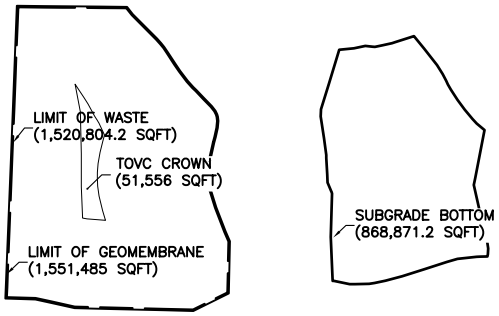


SUBGRADE

SCALE: 1"=500'

TOP OF WASTE

SCALE: 1"=500'



Base Surface	Comparison Surface	Cut	Fill	Net
PRIMARY DRAINAGE LAYER	TOP OF WASTE	0.00 Cu. Yd.	5,735,484.7 Cu. Yd.	5,735,484.7 Cu. Yd.<Fill>
X-TOPO	TSG WITH SAND FILTERS	1,140,066.88 Cu. Yd.	365,173.66 Cu. Yd.	774,893.52 Cu. Yd.<Cut>

SUBGRADE 3D SURFACE AREA	1,588,346 SQFT
TOP OF WASTE 3D SURFACE AREA	1,632,418 SQSFT

DAIGLER ENGINEERING, P.C.
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SEALAND WASTE, LLC		OPTION 4-ENGINEERING DOCUMENTATION	FIGURE 1
SCALE: NTS	REVISION # 0	CARROLL LANDFILL EXPANSION APPLICATION-ALTERNATIVES ANALYSIS	
June 2015	TOWN OF CARROLL	CHAUTAUQUA COUNTY	NEW YORK

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CARROLL LANDFILL
OPTION 4 FACILITY CONSTRUCTION - COST ESTIMATE

OPTION 4 TASK / ITEM		QTY.	UNIT	UNIT COST	RS MEANS PAGE	RS MEANS LINE	OTHER PRICE REFERENCE	TOTAL COST	VALUE REFERENCE / ASSUMPTIONS / NOTES
Erosion And Sediment Control		**$440,171**							
	Clear and Grub	47.13	ac.	$7,175.00	285	160		$338,158	Reference Fig. 1-2
	Silt fence	730	lf.	$0.83	329	1000		$606	Reference Fig. 3
Grass lined channels		4,940	lf.						Reference Fig. 3, Assume 15 ft. Drainage area for all channels (Varies)
	Grading, fertilizer, seed and mulch	26,034	sy.	$3.77	394	1000		$98,147	Assume 5 ft. channel width (Varies)
	Place and remove straw bales	4	ton.	$815.00	329	1200		$3,260	Assume 4 Tons
Sediment Basin 1		**$79,895**							Reference Pond Report Sediment Basin 1, Top Contour Surface area (App. G)*1.054
12" Subgrade Preparation		29,000	sf.						
	Hauling, loading, waiting,dumping, return	1,074	lcy.	$3.93	319	5000		$4,221	
	Finish Grading (Steep Slopes)	3,222	sy.	$0.26	288	3310		$838	
Geosynthetic Liner System									
	10-oz. Non Woven Geotextile Cushion	29,000	sf.	$0.09			Modern Landfill Bid	$2,737	Reference Sheet PD-29, Cost of 16-oz.* (10/16)
	36-Mil CSPE Geomembrane Layer	29,000	sf.	$0.14			Modern Landfill Bid	$4,111	Reference Sheet PD-29, Cost of 80-MIL*(36/80)
	24" Bank Run Gravel Protective Cover	3,222	sy.	$21.10	364	400		$67,988	Reference Sheet PD-29, Doubled 12" Value
Sediment Basin 2		**$56,310**							Reference Pond Report, Sediment Basin 2, Top Contour Surface area (App G.)*1.054
12" Subgrade Preparation		20,439	sf.						
	Hauling, loading, waiting,dumping, return	757	lcy.	$3.93	319	5000		$2,975	
	Finish Grading (Steep Slopes)	2,271	sy.	$0.26	288	3310		$590	
Geosynthetic Liner System									
	10-oz. Non Woven Geotextile Cushion	20,439	sf.	$0.09			Modern Landfill Bid	$1,929	Reference Sheet PD-29, Cost of 16-oz.* (10/16)
	36-Mil CSPE Geomembrane Layer	20,439	sf.	$0.14			Modern Landfill Bid	$2,897	Reference Sheet PD-29, Cost of 80-MIL*(36/80)
	24" Bank Run Gravel Protective Cover	2,271	sy.	$21.10	364	400		$47,918	Reference Sheet PD-29, Doubled 12" Value
Graded filters		**$53,680**							Reference End Area Method Volume Calculations Graded Filter 1
Graded Filter 1		2,348	sf.						
	18" No. 2 Stone	130	cy.	$24.44			Tri-James (NO. 1 Stone)	$3,188	Reference Sheet PD-26
	20" No. 1 Stone	145	cy.	$24.44			Tri-James (NO. 2 Stone)	$3,549	Reference Sheet PD-26
	24" Filter Media	174	cy.	$16.30			Tri-James (Filter Sand)	$2,835	Reference Sheet PD-26
	6" Sandy Loam Topsoil Backfill	261	sy	$6.40	394	800		$1,670	Reference Sheet PD-26
	Tri-James Material Hauling, loading, waiting,dumping, return	450	lcy.	$3.93	319	5000		$1,767	
	Tri James Material Finish Grading (Steep Slopes)	261	sy.	$0.21	288	3300		$55	
	Separation Geotextile	2,348	sf.	$0.10			Modern Landfill Bid	$240	
		2,126	sf.						Reference End Area Method Volume Calculations Graded Filter 2
Graded Filter 2									
	18" No. 2 Stone	118	cy.	$24.44			Tri-James (NO. 1 Stone)	$2,887	Reference Sheet PD-26
	20" No. 1 Stone	131	cy.	$24.44			Tri-James (NO. 2 Stone)	$3,214	Reference Sheet PD-26
	24" Filter Media	157	cy.	$16.30			Tri-James (Filter Sand)	$2,567	Reference Sheet PD-26
	6" Sandy Loam Topsoil Backfill	236	sy	$6.40	394	800		$1,512	Reference Sheet PD-26
	Tri-James Material Hauling, loading, waiting,dumping, return	407	lcy.	$3.93	319	5000		$1,600	
	Tri James Material Finish Grading (Steep Slopes)	236	sy.	$0.21	288	3300		$50	
	Separation Geotextile	2,126	sf.	$0.10			Modern Landfill Bid	$217	
		4,118	sf.						Reference End Area Method Volume Calculations Graded Filter 3
Graded Filter 3									
	18" No. 2 Stone	229	cy.	$24.44			Tri-James (NO. 1 Stone)	$5,591	Reference Sheet PD-26
	20" No. 1 Stone	255	cy.	$24.44			Tri-James (NO. 2 Stone)	$6,225	Reference Sheet PD-26
	24" Filter Media	305	cy.	$16.30			Tri-James (Filter Sand)	$4,972	Reference Sheet PD-26
	6" Sandy Loam Topsoil Backfill	458	sy	$6.40	394	800		$2,928	Reference Sheet PD-26
	Tri-James Material Hauling, loading, waiting,dumping, return	789	lcy.	$3.93	319	5000		$3,099	
	Tri James Material Finish Grading (Steep Slopes)	458	sy.	$0.21	288	3300		$96	
	Separation Geotextile	4,118	sf.	$0.10			Modern Landfill Bid	$421	
		882	sf.						Reference End Area Method Volume Calculations Graded Filter 4
Graded Filter 4									
	18" No. 2 Stone	49	cy.	$24.44			Tri-James (NO. 1 Stone)	$1,198	Reference Sheet PD-26
	20" No. 1 Stone	55	cy.	$24.44			Tri-James (NO. 2 Stone)	$1,333	Reference Sheet PD-26
	24" Filter Media	65	cy.	$16.30			Tri-James (Filter Sand)	$1,065	Reference Sheet PD-26
	6" Sandy Loam Topsoil Backfill	98	sy	$6.40	394	800		$627	Reference Sheet PD-26
	Tri-James Material Hauling, loading, waiting,dumping, return	169	lcy.	$3.93	319	5000		$664	
	Tri James Material Finish Grading (Steep Slopes)	98	sy.	$0.21	288	3300		$21	
	Separation Geotextile	882	sf.	$0.10			Modern Landfill Bid	$90	

OPTION 4 TASK / ITEM	QTY.	UNIT	UNIT COST	RS MEANS PAGE	RS MEANS LINE	OTHER PRICE REFERENCE	TOTAL COST	VALUE REFERENCE / ASSUMPTIONS / NOTES
Site Miscellaneous	**$1,293,377**							
Sound Barrier								
4.5 Feet High	1,335	lf.	$101.81			Interpolated Means	$135,920	Reference Noise Barrier Plan, Assume composite panels (4.5/8)*eight foot cost
8 Feet High	1,509	lf.	$181.00	389	400		$273,129	Reference Noise Barrier Plan, Assume composite panels
13 Feet High	1,133	lf.	$294.13			Interpolated Means	$333,244	Reference Noise Barrier Plan, Assume composite panels (13/8)*eight foot cost
Access Roads	3,610	lf.	$125.00	623	1200		$451,250	Reference Fig. 3
Asphault Lot (Entrance)	1,944	sy.	$27.00	365	550		$52,500	Reference Fig. 3
Grading, fertilizer, seed and mulch	12,556	sy.	$3.77	394	1000		$47,334	Reference Fig. 3, Rough Estimate, Conservative, Most area not in landfill
Baseliner System	**$8,942,900**							
Engineering Certification	34.9	ac	$25,000.00			Modern Landfill Bid	$872,500	Limit Of Waste
Mass excavation/truck loading (Cut)	1,437,122	bcy	$1.11	299	5620		$1,595,205	Reference Sheet PD-5
Hauling, loading, waiting,dumping, return	1,652,690	lcy	$2.97	320	6000		$4,908,490	Bulk Factor=1.15
Grading dumped material	492,984	ea 100,000 sf	$5,050.00	288	0280		$24,896	Assume Average Embankment Height of 20'
Compaction of Embankment	365,206	ecy	$1.66	328	0300		$606,242	Embankment Fill
Compaction of Overexcavated Material	296,406	cy	$1.66	328	0300		$492,034	
Embankment QC	11.32	ac	$25,000.00				$282,934	Assume Average Embankment Height of 20'
Liner subgrade grading	176,483	sy	$0.91	288	0100		$160,599	Soil Balance Appendix A of Engineering Report
Geosynthetic Liner System	**$8,342,225**							
Type P Geocomposite Drain	1,588,346	sf.	$0.38			Modern Landfill Bid	$600,395	Option 4 Volume Calculation, Fig 5-1, (868,871+719,475), Subgrade Surface Area
Type L Geocomposite Drain	1,588,346	sf.	$0.57			Modern Landfill Bid	$910,122	Option 4 Volume Calculation, Fig 5-1, (868,871+719,475), Subgrade Surface Area
Two Layers of 60-MIL Textured HDPE Geomembrane Liner	1,588,346	sf.	$0.32			Modern Landfill Bid, Cost 60/80	$1,000,658	Option 4 Volume Calculation, Fig 5-1, (868,871+719,475), Subgrade Surface Area, two layers
Geosynthetic Clay Liner	868,871	sf.	$0.32			Modern Landfill Bid	$278,039	Option 4 Volume Calculation, Fig 5-1, (868,871+719,475), Subgrade Surface Area, not on slopes
16-oz. Type C Cushion Geotextile	1,588,346	sf.	$0.15			Modern Landfill Bid	$239,840	Option 4 Volume Calculation, Fig 5-1, (868,871+719,475), Subgrade Surface Area
10-oz. Type S Separation Geotextile	100,848	sf.	$0.10			Modern Landfill Bid	$10,307	Assume 6 foot width over PLCRS and SLCRS (Rererence Sheet PD-6), 7,770*6*2
24" Secondary Soil Liner (From Onsite)	3,494,361	cf.						Option 4 Volume Calculation, Subgrade Surface Area (Fig. A), ((868871*2.2)+(719475*2.2))
Hauling, loading, waiting,dumping, return	129,421	lcy.	$3.93	319	5000		$508,624	Option 4 Volume Calculation, Subgrade Surface Area (Fig. A), ((868871*2.2)+(719475*2.2))/27
Compaction	129,421	ecy	$1.66	328	0300		$214,839	
Finish Grading (Gentle to No Slope)	96,541	sy.	$0.21	288	3300		$733,816	Option 4 Volume Calculation, Bottom of Subgrade Area
Finish Grading (Steep Slopes)	79,942	sy.	$0.26	288	3310		$248,497	Option 4 Volume Calculation, Sideslope Area
12" Structural Fill (From Onsite)	955,758	cf.						Option 4 Volume Calculation, Bottom of Subgrade Area (Fig. A), (868871*1.1)
Hauling, loading, waiting,dumping, return	35,398	lcy.	$3.93	319	5000		$139,116	Option 4 Volume Calculation, Bottom of Subgrade Area (Fig. A), (868871*1.1)/27
Compaction	35,398	ecy	$1.66	328	0300		$58,761	
Finish Grading (Gentle to No Slope)	96,541	sy.	$0.21	288	3300		$20,274	Option 4 Volume Calculation, Bottom of Subgrade Area
24" Leachate Drainage Layer (NO2. 3/4" DIA Rounded Stone)	3,176,692	cf.						Option 4 Volume Calculation, Subgrade Surface Area ,((868871+719475)*2)
24" No. 2 Stone	117,655	cy	$24.44			Tri-James (NO. 2 Stone)	$2,875,495	Option 4 Volume Calculation, Subgrade Surface Area ,((868871+719475)*2)/27
Tri-James Material Hauling, loading, waiting,dumping, return	117,655	lcy.	$3.93	319	5000		$462,385	
Tri James Material Finish Grading (Gentle to no Slope)	96,541	sy.	$0.21	288	3300		$20,274	Option 4 Volume Calculation, Subgrade Sideslope Surface Area
Tri James Material Finish Grading (Steep Slopes)	79,942	sy.	$0.26	288	3310		$20,785	Option 4 Volume Calculation, Subgrade Surface Area
Soil Required	164,819							
Leachate Pumping / Piping	**$1,155,444**							
Primary Leachate Collection System								
Primary Sump	1	ea.	$6,525.00	247	2060		$6,525	Assume 300 GPM Discharge, Sump Pump, Single Stage
24" DIA HDPE Sideriser	204	lf.	$116.00	473	900		$23,664	Reference Sheet PD-6, Values from AUTOCAD
8" DIA HDPE Leachate Collection Pipe	8,404	lf.	$22.00	472	300		$184,888	Reference Sheet PD-6, Values from AUTOCAD
Secondary Leachate Collection System								
Secondary Sump	1	ea.	$6,525.00	247	2060		$6,525	Assume 300 GPM Discharge, Sump Pump, Single Stage
24" DIA HDPE Sideriser	196	lf.	$116.00	473	900		$22,736	Reference Sheet PD-6, Values from AUTOCAD
4" DIA HDPE Leachate Collection Pipe	8,404	lf.	$12.80	472	100		$107,571	Reference Sheet PD-6, Values from AUTOCAD
Porewater / Trench Drain System								
Porewater Sump	1	ea.	$6,525.00	247	2060		$6,525	Assume 300 GPM Discharge, Sump Pump, Single Stage
36" DIA HDPE Sideriser	210	lf.	$174.00			Interpolated RS Means	$36,540	Reference Sheet PD-6, Values from AUTOCAD, (36"/24")*116 (116 = Value for 24" Pipe)
4" DIA HDPE Drain Pipe	8,404	lf.	$12.80	472	100		$107,571	Reference Sheet PD-6, Values from AUTOCAD
Trench Drain 6" HDPE Pipe	670	lf.	$17.70	472	200		$11,859	Reference Sheet PD-5, Values from AUTOCAD
Leachate Collection and Storage System								
Storage tank/foundation (initial)	1	ea.	$290,000.00			Lockwood Pricing	$290,000	
Storage tank/foundation (final)	1	ea.	$145,000.00			Lockwood Pricing	$145,000	Assume foundation is one-half the tank/foundation total
Loadout pad	2	ea.	$59,000.00			Lockwood Pricing	$118,000	
3"/6" DIA HDPE Leachate Forcemain								
Initial (6" DIA)	1,307	lf.	$17.70	472	200		$23,134	Reference Sheet PD-20
Initial (3" DIA)	1,307	lf.	$8.85	472		Interpolated RS Means	$11,567	Reference Sheet PD-20, Price for 3" half of 6"
Final (6"DIA)	912	lf.	$17.70	472	200		$16,142	Reference Sheet PD-20
Final (3"DIA)	912	lf.	$8.85	472		Interpolated RS Means	$8,071	Reference Sheet PD-20, Price for 3" half of 6"
Transfer Pump	1	ea.	$6,525.00	247	2060		$6,525	Assume 300 GPM Discharge, Sump Pump, Single Stage
Air Relief Valve	2	ea.	$10,000.00				$20,000	Reference Sheet PD-20, Price Assumption
Manhole								
Concrete Placement	1	ea.	$2,600.00	495	1130		$2,600	Reference Sheet PD-20, 10 ft. deep

OPTION 4 TASK / ITEM	QTY.	UNIT	UNIT COST	RS MEANS PAGE	RS MEANS LINE	OTHER PRICE REFERENCE	TOTAL COST	VALUE REFERENCE / ASSUMPTIONS / NOTES
Landfill Leachate and Gas Collection and Treatment System	**$4,909,254**							
Horizontal Collectors		lf.						
8" DIA HDPE Subheader	10,510	lf.	$22.00	472	300		$231,220	Reference Sheet PD-23
6" DIA HDPE LFG Collection Pipe	14,034	lf.	$17.70	472	200		$248,402	Reference Sheet PD-23
24" DIA HDPE Header	5,015	lf.	$116.00	473	900		$581,740	Reference Sheet PD-23
Leachate Treatment System (Structure, Blower, Flare)	1	ea.	$3,000,000.00			Average Cost.	$3,000,000	
SulfaTreat								
Initial Capital Cost	1	ea.	$452,892.00			SulfaTreat Cost Estimate	$452,892	
Flare							$395,000	John Zink Company, LLC Estimate

Final Cover System	**$3,972,746**							
Engineering Certification	28.3	ac	$15,000.00			Modern Landfill Bid	$424,500	
Composite Landfill Gas Venting Layer	1,632,481	sf.	$0.38			Modern Landfill Bid	$617,078	Option 4 Volume Calculation, Fig 5-1, (1580925+51556), Final Cover Surface Area, Assume Type P Geocomposite Drain
40-MIL Textured LLDPE Geomembrane	1,632,481	sf.	$0.21			Modern Landfill Bid, Cost (40/80)	$342,821	Option 4 Volume Calculation, Fig 5-1, (1580925+51556), Final Cover Surface Area
Type C Geotextile Cushion	51,556	sf.	$0.15			Modern Landfill Bid	$7,785	Option 4 Volume Calculation, Fig 5-1, (51556), Final Cover Flat Top
Composite Infiltration Drain	1,632,481	sf.	$0.38			Modern Landfill Bid	$617,078	Option 4 Volume Calculation, Fig 5-1, (1580925+51556), Final Cover Surface Area
12" Intermediate Cover	1,632,481	sf.						Option 4 Volume Calculation, (1580925+51556), Final Cover Surface Area
Hauling, loading, waiting,dumping, return	60,462	lcy.	$3.93	319	5000		$237,617	Option 4 Volume Calculation, ((1580925+51556)*1)/27, Final Cover Surface Area
Compaction	60,462	ecy	$1.66	328	0300		$100,367	
Finish Grading (Gentle to No Slope)	5,728	sy.	$0.21	288	3300		$1,203	
Finish Grading (Steep Slopes)	175,658	sy.	$0.26	288	3310		$45,671	
18" Soil Liner	51,556	sf.						Option 4 Volume Calculation, (51556), Final Cover Flat Top
Hauling, loading, waiting,dumping, return	3,246	lcy.	$3.93	319	5000		$12,757	Option 4 Volume Calculation, ((51556)*1.7)/27, Final Cover Flat Top
Compaction	3,246	ecy	$1.66	328	0300		$5,389	
Finish Grading (Gentle to No Slope)	5,728	sy.	$0.21	288	3300		$1,203	
24" Barrier Protection Layer	1,632,481	sf.						Option 4 Volume Calculation, (1580925+51556) Final Cover Surface Area
Hauling, loading, waiting,dumping, return	126,971	lcy.	$3.93	319	5000		$498,995	Option 4 Volume Calculation, ((1580925+51556)*2.1)/27, Final Cover Surface Area
Compaction	126,971	ecy	$1.66	328	0300		$210,771	
Finish Grading (Gentle to No Slope)	5,728	sy.	$0.21	288	3300		$1,203	
Finish Grading (Steep Slopes)	175,658	sy.	$0.26	288	3310		$45,671	
6" Topsoil	1,632,481	sf.						Option 4 Volume Calculation, (1580925+51556) Final Cover Surface Area
Hauling, loading, waiting,dumping, return	30,231	lcy.	$3.93	319	5000		$118,808	Option 4 Volume Calculation, ((1580925+51556)*.5)/27, Final Cover Surface Area
Grading, fertilizer, seed and mulch	181,387	sy.	$3.77	394	1000		$683,828	
Soil Required	220,910							

Total Cost Estimate	**$29,246,001**
Final Cover Cost	**$3,972,746**
Baseliner Construction Cost	**$25,273,255**

Carroll Landfill Recycling and Landfill Management
Solid Waste Management Facilities Operating Cost Estimate for Option 4

Cost Calculated below is based on 307,000 tpy waste
30,700 tpy ADC (10%)

Operating Cost Summary

Equipment		Annual Lease Payment	Initial Purchase Payment	Life	Salvage Value	Straight Line Annual Depreciation	Fuel Consumption	Fuel Cost 4	Oil Consumption	Oil Cost 3	Maint. Contract
Cat 826 Landfill Compactor		$220,000					32,000	$128,000	425	$1,275	
D6 Bulldozer		$85,000					20,000	$80,000	185	$555	
D6 Bulldozer		$65,000					7,500	$30,000	90	$270	
D25 Off-Road Dump		$100,000					21,000	$84,000	510	$1,530	
D25 Off-Road Dump		$100,000					16,000	$64,000	510	$1,530	
962 Loader		$70,000					11,200	$44,800	310	$930	
336D Excavator		$55,000					22,000	$88,000	1,150	$3,450	
416E Backhoe		$100,000					1,400	$5,600	25	$75	
IR SD-100 Soil Compactor		$45,000					1,700	$6,800	80	$240	
Tractor/Trailer-Tanker		$27,000					5,700	$22,800	200	$600	
2,000 Gallon Water Truck		$20,000					3,400	$13,600	50	$150	
Equipment Maintenance Truck		$7,000					2,200	$8,800	50	$150	
Tool Truck		$6,000					2,700	$10,800	50	$150	
Fuel/Lube Truck		$10,000					3,500	$14,000	50	$150	
Vacuum Sweeper		$10,000					1,800	$7,200	50	$150	
Tub Grinder		$65,000					8,100	$32,400	180	$540	
Impact Crusher		$75,000					11,000	$44,000	350	$1,050	
Shaker Screen		$45,000					1,700	$6,800	200	$600	
Stacking Conveyor		$35,000					1,300	$5,200	50	$150	
One ton Dump Truck		$10,000					2,000	$8,000	50	$150	
Four Wheel Drive Pickup Trucks (3)		$18,000					6,000	$24,000	150	$450	
		$20,000									
Scales			$70,000	15	$3,000	$4;467					$2,500
Trash Pumps (2)			$5,000	7	$200	$686					
Air Compressor			$2,000	10	$200	$180					
Steam Cleaner			$2,000	10	$200	$180					
Generator			$3,000	10	$100	$290					
Portable Welder			$6,000	15	$500	$367					
Litter Vacuum			$15,000	10	$1,000	$1,400					
SulfaTreat			$250,000	20	$500	$12,475					
Mower Tractor			$45,000	10	$1,000	$4,400					
Slope Mower			$45,000	10	$1,000	$4,400					
Miscellaneous Tools			$40,000	10	$500	$3,950					
Subtotal Equipment cost		$1,188,000	$483,000			$32,794		$728,800		$14,145	$2,500
Total Annual Equipment Cost	**$1,966,239**										

Personnel	qty	Unit Salary	Total Salaries	Total Benefits		Total Expenses
Chief Operating Officer/Part Time from Sealand	1	$80,000	$80,000	$32,000		$4,000.00
General Manager	1	$80,000	$80,000	$32,000		$4,000.00
Site Manager	1	$70,000	$70,000	$28,000		$3,500.00
Waste Approval Coordinator	1	$50,000	$50,000	$20,000		$2,500.00
MEO IV	2	$40,000	$80,000	$32,000		$4,000.00
MEO III	1	$35,000	$35,000	$14,000		$1,750.00
MEO II	1	$30,000	$30,000	$12,000		$1,500.00
Laborers	2	$30,000	$60,000	$24,000		$3,000.00
Scale Operator	1	$28,000	$28,000	$11,200		$1,400.00
Paper Pickers	2	$25,000	$50,000	$20,000		$2,500.00
Totals	**13**	**$468,000**	**$563,000**	**$225,200**	**$728,800**	**$28,150**
Total Personnel Cost	**$1,284,350**					

Insurance	
General Liability	$5,000
Workers Compensation	$7,500
Automobile/Equipment	$15,000
Total Insurance Cost	**$27,500**

Leachate Management	Annual Rate	Amount
Average Operating Leachate Rate (gallons)	816,585	
Hauling, Treatment, Pumping Cost		$211,138
Leachate Pipe Cleaning		$20,000
Pumps and Maintenance		$20,000
Total Leachate Management		**$251,138**

Environmental Monitoring	
(See "Post-Closure Costs Itemized")	$70,186
Total Environmental Monitoring	**$70,186**

Total Annual Operating Cost	**$3,599,414**

Sealand Waste, LLC
Carroll Landfill
Post-Closure Cost Estimate

Option 3 Post-Closure

Year	Time (years)	Environmental Monitoring	Repair and Maintenance	Leachate Management	Monthly Inspection	Total Annual Cost	End of Year Fund Balance
2029	0	$56,851.01	$290,451.15	$307,162.60	$19,080.74	$0.00	$8,933,147.26
2030	1	$58,556.54	$299,164.68	$276,835.20	$19,653.16	$654,209.59	$8,692,884.55
2031	2	$60,313.24	$308,139.62	$218,318.26	$20,242.76	$607,013.88	$8,490,164.21
2032	3	$62,122.63	$317,383.81	$150,651.88	$20,850.04	$551,008.37	$8,336,113.64
2033	4	$63,986.31	$326,905.33	$90,965.10	$21,475.54	$503,332.28	$8,224,420.42
2034	5	$65,905.90	$336,712.49	$48,060.78	$22,119.81	$472,798.98	$8,139,202.52
2035	6	$32,974.85	$346,813.86	$22,218.90	$22,783.40	$424,791.01	$8,100,132.08
2036	7	$34,959.79	$357,218.28	$8,988.15	$23,466.90	$424,633.11	$8,059,273.91
2037	8	$36,008.58	$367,934.83	$3,181.51	$24,170.91	$431,295.82	$8,009,376.99
2038	9	$37,088.84	$378,972.87	$985.40	$24,896.04	$441,943.14	$7,945,805.54
2039	10	$38,201.50	$390,342.06	$1,324.30	$25,642.92	$455,510.77	$7,864,809.51
2040	11	$39,347.55	$402,052.32	$1,364.02	$26,412.20	$469,176.09	$7,765,415.09
2041	12	$40,527.97	$414,113.89	$1,404.94	$27,204.57	$483,251.38	$7,646,271.90
2042	13	$41,743.81	$426,537.30	$1,447.09	$28,020.71	$497,748.92	$7,505,949.13
2043	14	$42,996.13	$439,333.42	$1,490.51	$28,861.33	$512,681.39	$7,342,931.13
2044	15	$44,286.01	$452,513.43	$1,535.22	$29,727.17	$528,061.83	$7,155,612.77
2045	16	$45,614.59	$466,088.83	$1,581.28	$30,618.98	$543,903.68	$6,942,294.54
2046	17	$46,983.03	$480,071.49	$1,628.72	$31,537.55	$560,220.79	$6,701,177.44
2047	18	$48,392.52	$494,473.64	$1,677.58	$32,483.68	$577,027.42	$6,430,357.53
2048	19	$49,844.30	$509,307.85	$1,727.90	$33,458.19	$594,338.24	$6,127,820.25
2049	20	$51,339.62	$524,587.08	$1,779.74	$34,461.94	$612,168.39	$5,791,434.46
2050	21	$52,879.81	$540,324.70	$1,833.13	$35,495.79	$630,533.44	$5,418,946.07
2051	22	$54,466.21	$556,534.44	$1,888.13	$36,560.67	$649,449.44	$5,007,971.47
2052	23	$56,100.19	$573,230.47	$1,944.77	$37,657.49	$668,932.92	$4,555,990.47
2053	24	$57,783.20	$590,427.38	$2,003.12	$38,787.21	$689,000.91	$4,060,339.04
2054	25	$59,516.70	$608,140.21	$2,063.21	$39,950.83	$709,670.94	$3,518,201.50
2055	26	$61,302.20	$626,384.41	$2,125.10	$41,149.35	$730,961.07	$2,926,602.46
2056	27	$63,141.26	$645,175.94	$2,188.86	$42,383.83	$752,889.90	$2,282,398.19
2057	28	$65,035.50	$664,531.22	$2,254.52	$43,655.35	$775,476.60	$1,582,267.67
2058	29	$66,986.56	$684,467.16	$2,322.16	$44,965.01	$798,740.89	$822,703.12
2059	30	$68,996.16	$705,001.17	$2,391.82	$46,313.96	$822,703.12	$0.00

$$A_{t_2} = A_{t_1}(1+d)^n$$

A_{t_2} = Cost at Time 2

A_{t_1} = Cost at Time 1

d = Annual Inflation Rate

n = Years

$$P_{t_2} = (P_{t_1} - A_{t_2})(1+i)$$

P_{t_2} = Fund Balance at Time 2

P_{t_1} = Fund Balance at Time 1

i = Annual Interest Rate

Assumptions:

d= 0.03

i= 0.05

- Total Annual Cost = Monitoring Cost + Monthly Inspections + Leachate Management + Repair and Maintenance
- Initial Environmental Monitoring Cost = $74,860
- Monitoring Cost after five years of closure = $432,975
- Initial Monthly Inspections Cost = $1,963 per Month, $23,556 per year
- Initial Repair and Maintenance Cost = $290,451
- Initial Leachate Management Cost = $307,163
- Assumes Landfill Post-Closure Period Begins in 2029

Sealand Waste, LLC
Carroll Landfill
Post-Closure Cost Estimate

Option 4 Post-closure

Year	Time (years)	Environmental Monitoring	Repair and Maintenance	Leachate Management	Monthly Inspection	Total Annual Cost	End of Year Fund Balance
2029	0	$70,186.43	$320,544.26	$379,213.09	$23,556.47	$0.00	$10,126,872.17
2030	1	$72,292.03	$330,160.58	$341,771.86	$24,263.16	$768,487.63	$9,826,303.77
2031	2	$74,460.79	$340,065.40	$269,528.72	$24,991.06	$709,045.96	$9,573,120.70
2032	3	$76,694.61	$350,267.36	$185,989.98	$25,740.79	$638,692.74	$9,381,149.36
2033	4	$78,995.45	$360,775.38	$112,302.60	$26,513.01	$578,586.44	$9,242,691.06
2034	5	$81,365.31	$371,598.65	$59,334.30	$27,308.40	$539,606.66	$9,138,238.62
2035	6	$40,709.69	$382,746.61	$27,430.75	$28,127.65	$479,014.69	$9,092,185.12
2036	7	$43,160.23	$394,229.00	$11,096.48	$28,971.48	$477,457.19	$9,045,464.33
2037	8	$44,455.04	$406,055.87	$3,927.79	$29,840.63	$484,279.33	$8,989,244.25
2038	9	$45,788.69	$418,237.55	$1,216.54	$30,735.85	$495,978.63	$8,917,928.90
2039	10	$47,162.35	$430,784.68	$1,634.93	$31,657.92	$511,239.88	$8,827,023.47
2040	11	$48,577.22	$443,708.22	$1,683.98	$32,607.66	$526,577.08	$8,715,468.72
2041	12	$50,034.53	$457,019.46	$1,734.50	$33,585.89	$542,374.39	$8,581,749.05
2042	13	$51,535.57	$470,730.05	$1,786.53	$34,593.47	$558,645.62	$8,424,258.60
2043	14	$53,081.64	$484,851.95	$1,840.13	$35,631.27	$575,404.99	$8,241,296.29
2044	15	$54,674.09	$499,397.51	$1,895.33	$36,700.21	$592,667.14	$8,031,060.61
2045	16	$56,314.31	$514,379.43	$1,952.19	$37,801.21	$610,447.15	$7,791,644.13
2046	17	$58,003.74	$529,810.82	$2,010.76	$38,935.25	$628,760.57	$7,521,027.74
2047	18	$59,743.85	$545,705.14	$2,071.08	$40,103.31	$647,623.38	$7,217,074.58
2048	19	$61,536.17	$562,076.29	$2,133.22	$41,306.41	$667,052.08	$6,877,523.62
2049	20	$63,382.25	$578,938.58	$2,197.21	$42,545.60	$687,063.65	$6,499,982.97
2050	21	$65,283.72	$596,306.74	$2,263.13	$43,821.97	$707,675.56	$6,081,922.79
2051	22	$67,242.23	$614,195.94	$2,331.02	$45,136.63	$728,905.82	$5,620,667.81
2052	23	$69,259.50	$632,621.82	$2,400.95	$46,490.73	$750,773.00	$5,113,389.56
2053	24	$71,337.28	$651,600.48	$2,472.98	$47,885.45	$773,296.19	$4,557,098.04
2054	25	$73,477.40	$671,148.49	$2,547.17	$49,322.01	$796,495.07	$3,948,633.11
2055	26	$75,681.72	$691,282.94	$2,623.59	$50,801.67	$820,389.93	$3,284,655.35
2056	27	$77,952.18	$712,021.43	$2,702.29	$52,325.72	$845,001.62	$2,561,636.41
2057	28	$80,290.74	$733,382.08	$2,783.36	$53,895.49	$870,351.67	$1,775,848.97
2058	29	$82,699.46	$755,383.54	$2,866.86	$55,512.36	$896,462.22	$923,356.09
2059	30	$85,180.45	$778,045.04	$2,952.87	$57,177.73	$923,356.09	$0.00

$$A_{t_2} = A_{t_1}(1+d)^n$$

$A_{t_2} = Cost \ at \ Time \ 2$

$A_{t_1} = Cost \ at \ Time \ 1$

$d = Annual \ Inflation \ Rate$

$n = Years$

$$P_{t_2} = (P_{t_1} - A_{t_2})(1+i)$$

$P_{t_2} = Fund \ Balance \ at \ Time \ 2$

$P_{t_1} = Fund \ Balance \ at \ Time \ 1$

$i = Annual \ Interest \ Rate$

Assumptions:

d= 0.03

i= 0.05

- Total Annual Cost = Monitoring Cost + Monthly Inspections + Leachate Management + Repair and Maintenance
- Initial Environmental Monitoring Cost = $74,860
- Monitoring Cost after five years of closura = $40,710
- Initial Monthly Inspections Cost = $1,963 per Month, $23,556 per year
- Initial Repair and Maintenance Cost = $320,544
- Initial Leachate Management Cost = $940,915
- Assumes Landfill Post-Closure Period Begins in 2029

CARROLL LANDFILL
CONCEPTUAL POST-CLOSURE PLAN - COST ESTIMATE

f= 0.03

	ITEM	ANNUAL COST 2014 DOLLARS	ANNUAL COST 2029 DOLLARS	Option Number 2	Option Number 3	Option Number 4
	Environmental Monitoring					
	First 5 Years			**$28,706**	**$56,851**	**$70,186**
1	Laboratory Analysis (Including Sampling)	$35,050	$54,607	$22,334.16	$44,231.47	$54,606.76
2	Reporting	$5,000	$7,790	$3,186.04	$6,309.77	$7,789.84
3	Data validation	$5,000	$7,790	$3,186.04	$6,309.77	$7,789.84
	After First 5 Years			**$16,650**	**$32,975**	**$40,710**
1	Laboratory Analysis (Including Sampling)	$18,130	$28,246	$11,552.59	$22,879.22	$28,245.95
2	Reporting	$3,000	$4,674	$1,911.63	$3,785.86	$4,673.90
3	Data validation	$5,000	$7,790	$3,186.04	$6,309.77	$7,789.84
	Monthly Inspection			**$9,635**	**$19,081**	**$23,556**
4	Inspection by qualified individual (2 days per month)	$15,120	$23,556	$9,634.60	$19,080.74	$23,556.47
5	**Leachate Management**					
6	See spreadsheet titled "Post-Closure Leachate Management Cost Estimate"					
7	**Repair & Maintenance**			**$226,939**	**$290,451**	**$320,544**
8	Personnel	$48,750	$75,951	$75,951	$75,951	$75,951
9	Equipment	$55,334	$86,209	$86,209	$86,209	$86,209
10	Stormwater drainage and collection system	$13,154	$20,494	$8,382	$16,600	$20,494
11	Leachate disposal and collection system	$12,000	$18,696	$7,647	$15,143	$18,696
12	Gas collection and control system	$39,076	$60,879	$24,900	$49,312	$60,879
13	Mowing of the landfill cap	$1,906	$2,969	$1,215	$2,405	$2,969
14	Clearing snow	$945	$1,472	$602	$1,193	$1,472
15	Vegetation replacement & erosion repair of the cap	$34,580	$53,875	$22,035	$43,638	$53,875

WETLAND AND DRAINAGEWAY MITIGATION PLAN

By: Daigler Engineering, P.C.

August 2016

WETLAND AND DRAINAGEWAY MITIGATION PLAN

CARROLL LANDFILL EXPANSION

CARROLL, NEW YORK

SEALAND WASTE, LLC

Prepared on behalf of:

Sealand Waste, L.L.C
85 High Tech Drive
Rush, New York 14543

Prepared by:

DAIGLER ENGINEERING P.C.
2620 Grand Island Blvd.
Grand Island, New York 14072-2131

August 2016

WETLAND AND DRAINAGEWAY MITIGATION PLAN

CARROLL LANDFILL EXPANSION
CARROLL, NEW YORK

Prepared on behalf of:

Sealand Waste, LLC
85 High Tech Drive
Rush, New York 14543

Prepared by:

DAIGLER ENGINEERING P.C.
2620 Grand Island Blvd.
Grand Island, New York 14072-2131

August 2016

WETLAND AND DRAINAGEWAY MITIGATION PLAN
CARROLL LANDFILL EXPANSION

Sealand Waste, LLC

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1 INTRODUCTION

Sealand Waste, LLC (Sealand), a private enterprise headquartered in Rush, New York, is proposing to purchase a 54.1-acre site containing the existing Jones Carroll Landfill (Carroll Landfill), a Construction and Demolition Debris (C&D) landfill on Dodge Road in the Town of Carroll, Chautauqua County, New York. The southeast corner of the property is approximately 2,000 feet northwest of the intersection of Dodge Road and Sandberg Road in the southeastern corner of the Town, approximately one mile north of the New York/Pennsylvania border.

Sealand plans to continue the development of the facility with the expansion of the existing landfill beyond the three acre limit allowed by the New York State Department of Environmental Conservation (NYSDEC) Permit (#9-0624-00025/00002-0), which expired in October 2007.

The September 2015 Supplemental Alternatives Analysis, included in Appendix D of the Draft Environmental Impact Statement (DEIS), demonstrated to the satisfaction of the U.S. Army Corps of Engineers (USACE) that the most practicable landfill development option will impact 5.76 acres of jurisdictional wetland and 2,844 linear feet of jurisdictional intermittent drainageway.

Sealand will compensate for the unavoidable loss of the jurisdictional wetlands and drainageways and their functions in a number of ways. To compensate for the loss of the jurisdictional wetlands, Sealand proposes the offsite restoration and creation of 13.18 acres of forested, shrub swamp and emergent wetland. To compensate for the loss of the jurisdictional drainageways, Sealand proposes onsite and offsite stream improvements. As shown in the permit drawings and as described in this report, Sealand's onsite mitigation includes the creation of a 900 foot long, high value stream/riparian area ecosystem and will restore and enhance 160 linear feet of Storehouse Run and 200 linear feet of its tributary. Offsite, Sealand will enhance and preserve 1,233 linear feet of intermittent drainageway at the wetland mitigation site. The location of the project and the mitigation sites are shown on the Title Sheet of the Permit Drawings in Appendix A.

This report presents baseline information for the impact site and the mitigation sites, mitigation goals and objectives, design specifics, construction methods, mitigation monitoring plan,

performance standards, mitigation site maintenance, and the long term preservation/protection plan.

2 BASELINE INFORMATION

2.1 IMPACT SITE

The 54.1-acre impact site history and characteristics are described in great detail in the Engineering Report and the DEIS for the facility expansion application, and the reader is directed to those companion documents for additional information. The impact site wetland and drainageway characteristics and the offsite wetland and drainageway characteristics are of particular interest and relevance to this report.

2.1.1 Wetlands

Sealand retained Earth Dimensions, Inc. (EDI) of Elma, New York to complete the most recent delineation of the onsite wetlands under the guidelines specified by the *1987 Corps of Engineers Wetlands Delineation Manual*, and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region*.

EDI identified five wetland areas and their associated drainageways, including two jurisdictional wetlands totaling 6.03 acres. In general, the wetland areas are described as forested wetland, emergent wetland and shrub swamp communities. Wetland hydrology is generated at this site via ponding of overland flow of surface water from upland areas to the west, and groundwater seepage. More detailed and comprehensive information is presented in the wetland delineation report in Appendix B. The jurisdictional determination is included in Appendix C.

2.1.2 Drainageways

The Standard Visual Assessment Protocol Version 2 (SVAP2) is a national protocol developed by the U.S. Department of Agriculture Natural Resource Conservation Service (NRCS 2009) that provides a method to qualitatively assess the condition of wadeable permanent and intermittent streams, their riparian zones, and their instream habitats. Mr. Kurt Jirka of EcoLogic, LLC employed this protocol to score the existing physical and biological conditions of 3,040 feet of on-site intermittent drainageway, a 220 foot reach of Storehouse Run and an unnamed tributary of Storehouse Run, and about 1,050 feet of the unnamed intermittent drainageway at the 28th Creek Road mitigation site.

Existing conditions were determined using 15 of the 16 stream elements outlined by the SVAP2. Element 16 regarding salinity, was not considered because all of the assessed streams are freshwater systems. EcoLogic's report, which describes in detail the physical and biological characteristics of the jurisdictional drainageways, is included in Appendix D.

2.2 28TH CREEK ROAD MITIGATION SITE

2.2.1 Site Selection

Sealand completed an exhaustive search to identify and purchase a parcel of land specifically for wetland and drainageway mitigation. Unlisted and listed properties located within the Conewango Creek watershed were identified based on their suitability for wetland and drainageway mitigation. The first phase of the search took into account the following criteria:

- Proximity to impacted wetlands and drainageways;
- Area required for mitigation wetlands and drainageways;
- Adequate hydrology onsite to support the mitigation wetland. The site should contain or be adjacent to existing wetlands, hydric soils, streams, lake or river;
- Availability of permanent site access for construction, monitoring, site management, and loading and unloading of equipment and materials;
- Proximity to highways or major roads and not within a right of way;
- The property should not contain restrictive land uses detrimental to wetland or drainageway mitigation;
- The property should not be downstream from or adjacent to any land use that could be harmful to the mitigation site;
- The site should not require the removal of mature upland vegetation to provide the appropriate mitigation;
- Adjacent land uses; and,
- Availability and financial feasibility.

Listed properties were identified using the Chautauqua County Board of Realtors website and through a realtor under a Buyers Broker Agreement. The properties were initially analyzed based on the above criteria through the Chautauqua County GIS parcel viewer. Environmental geographical information including the locations of wetlands, water courses, property classification and use, soil types and aerial photography was reviewed, and a short list of four properties emerged based on the screening criteria.

After reconnaissance and final application of the above criteria, the 28th Creek Road property was available and determined to best fit the mitigation site needs. The mitigation site lies within the Conewango Creek Watershed (hydrologic unit code 05010002), the same watershed and hydrologic unit as the impact site. The 28th Creek Road property contains a significant area of existing wetlands and is large enough to accommodate the mitigation wetland, upland buffer, and drainageway. A large mown hay field in the center of the property will allow the creation of mitigation wetland without the removal of mature or high quality upland habitat. The mitigation site wetlands and streams, as well as ponds on surrounding properties, confirm sufficient hydrology to sustain wetland and stream habitat.

2.2.2 Site Characteristics

The 35.8-acre 28th Creek Road mitigation site is located in the Town of Ellington, Chautauqua County, New York about nine miles northeast of the City of Jamestown, as shown in the Drawings. The Northwest corner of the property is approximately 0.3 miles west of the intersection of 28th Creek Road and Dean School Road, southwest of the Town of Ellington center.

The 28th Creek Road mitigation site has most recently been used for hay production. Gas well development has occurred on the adjacent properties, with two gas pipelines traversing the site. The Oil and Gas lease was signed on July 21, 1982, and was modified to allow for the ecological development of the site.

The 28th Creek Road mitigation site topography slopes gently from a central ridge down to the north and south, with elevations ranging from about 1,690 feet above sea level towards the center of the site to about 1,620 feet above sea level at the northeast corner and 1,660 feet above sea level at the southwest corner. About 17 acres of the center of the property is a mown hay field.

The southern extent of the site contains about 10 acres of wooded land, and the north and south areas of the site include jurisdictional wetlands. One gas pipeline traverses the center of the site connecting two gas wells on adjacent properties and another passes through the southern area.

2.2.3 Surficial Soil Types

According to the National Resources Conservation Service soil resource report for the site, the wetland mitigation site surficial soils consist of Ashville, Busti, and Chautauqua silt loam. Fluvaquents-Udifluvents are also present in the intermittent drainageways. The silt loams generally have 40 to 80 percent by weight passing the No. 200 sieve. Ashville silt loam is classified as a hydric soil and represents 8.8 percent of the mitigation site area surrounding the intermittent drainageway. The Fluvaquents-Udifluvents complex is also rated as a hydric soil. All of the soils except the Fluvaquents-Udifluvents are classified as being in the C/D hydrologic soil group, meaning they have a slow infiltration rate in drained areas and a very slow infiltration rate in undrained areas. The Fluvaquents-Udifluvents complex is classified as A/D, meaning they have a high infiltration rate in drained areas and a very slow infiltration rate in undrained areas.

2.2.4 Vegetation and Wildlife

The site vegetative communities are presented in EDI's wetland delineation report in Appendix B. The site includes maple beech forest, forested wetland drain, shrub swamp and successional shrubland communities in the southern portion of the property. The central area of the property is a mown hay field with non-jurisdictional shallow emergent marsh inclusions. The northern area of the property contains shrub swamp and successional shrubland communities. The area surrounding the site is characterized by undeveloped deciduous forest and scattered rural residential properties with gas well development. The site is about 1.3 miles east of the Harris Hill State Forest which encompasses 2,271 acres of managed hardwood and conifer forest.

The upland buffer south of the southern jurisdictional wetland is a maple beech mesic forest. To the east and west of the site lies deciduous forest, and along the north lies the mown hay field and successional shrubland. The northern jurisdictional wetland area is as close as ten feet from 28th Creek Road, with an upland buffer consisting of successional shrubland.

2.2.5 Wetlands

The wetland areas are described in detail in the EDI's wetland delineation report for 28th Street Creek Road in Appendix B. In general, the wetland areas are described as forested wetland drain and shallow emergent marsh in the southern portion of the site, and shrub swamp in the northern portion.

Wetland areas at this site receive their water supply primarily from surface water and groundwater seepage. The jurisdictional determination from the USACE is included as Appendix C. Two jurisdictional wetland areas, identified as Wetland 1 and Wetland 4, total 6.9 acres.

2.2.6 Drainageways

An approximate 1,230 linear foot long intermittent drainageway traverses the southern portion of the property, flowing from west to east and discharging to a tributary of 28th Creek; which in turn, discharges to Conewango Creek at a point about 6.8 miles northeast of the site. EcoLogic applied the SVAP2 scoring methodology to qualitatively assess the physical and biological condition of this non-jurisdictional unnamed intermittent stream, and a detailed summary of EcoLogic's findings is presented in their report, included in Appendix D.

3 MITIGATION GOALS AND OBJECTIVES

3.1 WETLANDS

The solid waste management facility expansion project will result in permanent direct impacts to 5.76 acres of federally jurisdictional wetlands. To mitigate for the unavoidable wetland impacts associated with the project, 13.18 acres of in-kind wetland will be created. Table 3-1 lists the impacted wetland community types and area, the corresponding mitigation wetland area and the resulting mitigation ratio.

Table 3-1 Wetland Community Impacts and the Mitigation Ratio

Wetland Community Type	Impact Area (acres)	Mitigation Area (acres)	Mitigation Ratio
Forested Wetland	3.38	10.56	3.1:1
Shrub Swamp	0.47	0.52	1.1:1
Emergent Marsh	1.91	2.10	1.1:1
Totals	5.76	13.18	2.3:1

The goal of the wetland mitigation design is to create a wetland ecosystem that will replace the functions and values of the wetland areas impacted at the landfill expansion site, with the objectives as listed below:

- Develop the mitigation wetland to be hydraulically and ecologically sustainable after the project has been deemed acceptable by the USACE and performance monitoring has ended;

- Replace the functions and values lost due to the impacts on the 5.76 acres of jurisdictional wetland; and,

- Protect existing jurisdictional and isolated wetlands on the mitigation site.

The mitigation wetland consists of 10.56 acres of forested wetland, 0.52 acres of shrub swamp, and 2.10 acres of shallow emergent marsh. In addition the existing jurisdictional 4.4 acre forested wetland/shallow emergent wetland complex, the 2.6 acre shrub swamp/seepage wetland and the isolated 0.09 and 0.02 acre wetlands will be protected and preserved. Approximately 7.11 acres of existing wetland and 13.18 acres of created and restored wetland will be protected for a total of 20.29 acres of freshwater wetland.

The mitigation wetlands are to provide the Conewango Creek watershed with adequate compensation of the functions of the wetlands lost through creating and restoring the same wetland community types. The functions provided by the impacted wetlands include wildlife habitat, groundwater recharge and discharge, and sediment, toxicant and pathogen retention. Wetland values gained will include all of these functions as well as improved visual aesthetics and larger acreage of wetlands. The mitigation wetland areas will be contiguous with existing wetlands, creating a more diverse and larger ecosystem with enhanced functions. Enhancement of existing wetlands through removal of invasive species and replacement with native plants will also add to the value of the mitigation wetland.

According to the Conewango Creek Watershed Association, watershed concerns include the effect of agricultural practices on water quality and the proliferation of invasive species. As described, the mitigation wetlands will address those concerns.

3.2 DRAINAGEWAYS

The objective of the drainageway mitigation plan is to restore and enhance the streambeds and banks of the existing and proposed drainageways. The mitigation plan will provide a functioning riparian ecosystem that will create diverse transition/buffer zones between the upland areas and the drainageways. Restoration elements include biological, mechanical, and ecological engineering solutions to limit erosion, control sedimentation, and stabilize the surface grades while improving habitat diversity, water quality, and aesthetics over the long term.

4 MITIGATION DESIGN

4.1 WETLANDS

4.1.1 Hydrology

Wetland mitigation will be completed at the 28th Creek Road property. The mitigation wetland hydrologic sources include direct rainfall, overland flow of surface water from upland areas, the groundwater table, and groundwater seepage. Rainfall is a reliable source for the hydrology needed to develop a viable wetland. Groundwater is found at shallow depth at the site as is evidenced by the groundwater fed pond excavated into the hillside on the adjacent property, east of the mitigation site. Groundwater seepage has been observed at the site both in the mown hay field and in the lower elevations to the south and the north, and currently feeds the seepage shrub swamp delineated in the field by EDI. Site observations and the presence of existing seepage wetlands demonstrate that sufficient hydrology is available to sustain the planned wetland ecosystem.

4.1.2 Site Grading

The mitigation wetland site grading plan will provide a balance between the cut and fill volumes generated in grading the project area. Topsoil stripped from the excavation and fill areas will be stockpiled for use in restoring an organic rich surface treatment in the disturbed areas. Subsoil removed from the shallow emergent marsh excavation will be placed in the adjacent native grassland buffer area in a way that blends with the surrounding topography.

The intent of the grading is to create a depression for the shallow emergent marsh such that the base of the marsh lies below the groundwater table. The water surface in the marsh will be controlled by a vegetated weir that will limit the depth of water in the marsh to no greater than 0.5 feet. Flow across the weir will in turn be conveyed through a vegetated flow diffuser. The purpose of the diffuser is to distribute the overflow water across the upper edge of the forested wetland, as shown on Sheet PD-1.

4.1.3 Vegetation

The mitigation wetland will include three wetland community types, including forested wetland, shallow emergent marsh and shrub swamp. The mitigation wetland planting plan and details are as shown in the Permit Drawings in Appendix A. The mitigation wetland will rely on natural colonization, the use of seed mixtures, and tree and shrub plantings. Disturbed upland areas will be seeded with an erosion-control seed mixture.

4.1.3.1 Forested Wetland

The forested wetland will be created using the shrub and tree plantings listed in Table 4-1. Tree species plant spacing shall be 40 feet on center and shrub species plant spacing shall be 15 to 20 feet on center.

Table 4-1 Forested Wetland Tree and Shrub Plantings

Botanical Name	Common Name	Wetland Indicator Status
Acer rubrum	Red Maple	FAC
Betula popvufolia	Gray Birch	FAC
Cornus racemosa	Gray Dogwood	FAC
Cornus amomum	Silky Dogwood	FACW

The forested wetland area shall be seeded with Southern Tier Consulting, Inc. Northeast Wetland Forest Herb Mix at three pounds per acre with the seed mix listed in Table 4-2.

Table 4-2 Forested Wetland Seed Mix

Quantity (Percentage by No. of Seeds)	**Botanical Name**	**Common Name**	**Wetland Indicator Status**
25.96%	Scirpus atrovirens	Green Bulrush	OBL
25.41%	Scirpus cyperinus	Wool Grass	OBL
8.33%	Carex vulpinoidea	Fox Sedge	OBL
7.68%	Glyceria canadensis	Canada Mannagrass	OBL
7.63%	Verbena hastata	Blue Vervain	FACW
6.02%	Glyceria grandis	Reed Meadowgrass	OBL
5.70%	Glyceria striata	Fowl Mannagrass	OBL
2.12%	Panicum clandestinum	Deertongue	FACW
1.53%	Verbena urticifolia	White Vervain	FAC
1.51%	Glyceria melicaria	Melic Mannagrass	OBL
0.94%	Boehmeria cylindrica	False Nettle	OBL
0.94%	Urtica dioica	Stinging Nettle	FAC
0.85%	Solidago gigantea	Giant Goldenrod	FACW
0.85%	Solidago rugosa	Wrinkled Goldenrod	FAC
0.75%	Cinna arundinacea	Wood Reed	FACW
0.62%	Leersia virginica	Whitegrass	FACW
0.57%	Cephalanthus occidentalis	Buttonbush	OBL
0.45%	Elymus canadensis	Wild Rye	FACU
0.38%	Sium suave	Water Parsnip	OBL

Quantity (Percentage by No. of Seeds)	**Botanical Name**	**Common Name**	**Wetland Indicator Status**
0.32%	Elymus virginicus	Virginia Wild Rye	FACW
0.29%	Polygonum pensylvanicum	Pennsylvania Smartweed	FACW
0.24%	Geum macrophyllum	Large-Leaf Avens	FACW
0.22%	Elymus riparius	Riverbank Wild Rye	FACW
0.19%	Rumex verticillatus	Water Dock	OBL
0.16%	Asclepias incarnata	Swamp Milkweed	OBL
0.09%	Carex lurida	Shallow Sedge	OBL
0.09%	Lilium superbum	Turk's Cap Lily	FACW
0.09%	Rubus allegheniensis	Blackberry	FACU
0.07%	Carex lupulina	Hop Sedge	OBL

4.1.3.2 Emergent Marsh

The emergent marsh will be created using the herb plantings listed in Table 4-3. Southern Tier Consulting, Inc. Wetland Native Pack cones shall be placed in random groups of five of the same species at three feet on center.

Table 4-3 Emergent Marsh Planting Pack

Quantity (Per Pack)	**Botanical Name**	**Common Name**	**Wetland Indicator Status**
12	*Asclepias incarnata*	Common Milkweed	UPL
12	*Aster novae angliae*	New England Aster	FACW
12	*Bidens cernua*	Beggar's Tick	OBL
6	*Eupatorium maculatum*	Joe Pye Weed	FAC
6	*Eupatorium perfoliaturn*	Boneset	FACW
12	*Iris versicolor*	Blue Iris	OBL
12	*Verbena hastate*	Blue Vervain	FACW

The emergent marsh area shall be seeded with Southern Tier Consulting, Inc. Northeast Wetland Hummock Pack Mix at three pounds per acre with the mix listed in Table 4-4.

Table 4-4 Emergent Marsh Seed Mix

Quantity (Percentage by No. of Seeds)	**Botanical Name**	**Common Name**	**Wetland Indicator Status**
43.6%	*Scirpus atrovirens*	Green Bulrush	OBL
19.0%	*Juncus effusus*	Soft Rush	OBL
33.5%	*Carex vulpinoidea*	Fox Sedge	OBL
1.3%	*Leersia oryzoides*	Rice Cut Grass	OBL
1.3%	*Carex comosa*	Bearded Sedge	OBL
0.9%	*Carex crinita*	Fringed Sedge	OBL
0.2%	*Carex lurida*	Shallow Sedge	OBL
0.2%	*Carex lupulina*	Hop Sedge	OBL

4.1.3.3 Shrub Swamp

The shrub swamp wetland will consist of the shrub pack plantings listed in Table 4-5. Southern Tier Consulting, Inc. Shrub Pack cones shall be planted in random groups of five of the same species at 10 feet on center spacing.

Table 4-5 Shrub Swamp Shrub Planting Pack

Quantity (Per Pack)	**Botanical Name**	**Common Name**	**Wetland Status Indicator**
5	*Aronia arbutifolia*	Red Choke berry	FACW
5	*Aronia melanocarpa*	Black Chokeberry	FAC
5	*Cephalanthus occidentalis*	Button Bush	OBL
5	*Cornum amomum*	Silky Dogwood	FACW
5	*Cornus sericea*	Red-Osier Dogwood	FACW
5	*Hamamelis virginiana*	Common Witch Hazel	FACU
5	*Salix sericea*	Silky Willow	OBL
5	*Ilex verticillata*	Winterberry	FACW

The shrub swamp wetland areas will be seeded with with Southern Tier Consulting, Inc. Shrub/Herb Mix at two pounds per acre the seed mix summarized in Table 4-6.

Table 4-6 Shrub Swamp Seed Mix

Quantity (Percentage by No. of Seeds)	**Botanical Name**	**Common Name**	**Wetland Indicator Status**
6%	*Cephalanthus occidentalis*	Button Bush	OBL
2.5%	*Viburnum dentatum*	Arrow Wood	FAC
2.5%	*Sambucus canadensis*	Elderberry	FACW
0.8%	*Cornum amomum*	Silky Dogwood	FACW
40%	*Verbena hastata*	Blue Vervain	FACW
17%	*Eupatroium maculatum*	Joe Pye Weed	FAC
17%	*Scirpus polyphyllus*	Many-Leaved Bulrush	OBL
8%	*Carex crinita*	Fringed Sedge	OBL
2.5%	*Bidens cermua*	Nodding Bur-Marigold	OBL
1.8%	*Ascelpias incarnate*	Swamp Milkweed	OBL
0.7%	*Iris versicolor*	Blue Iris	OBL
0.7%	*Aster umbellatus*	Flat-top White Aster	FACW
0.5%	*Carex intumescens*	Bladder Sedge	FACW

4.1.3.4 Upland Buffer Areas

The upland buffer areas will be seeded with with Southern Tier Consulting, Inc. Northeast Upland Wildlife Seed Mix at three pounds per acre the seed mix identified in Table 4-7.

Table 4-7 Upland and Berm Seed Mix

Quantity (Percentage by No. of Seeds)	**Botanical Name**	**Common Name**	**Wetland Indicator Status**
42.5%	*Phleum pretense*	Timothy	FACU
24.9%	*Trifolium hybridum*	Alsike Clover	FACU
15.6%	*Dactylis glomerata*	Orchard Grass	FACU
3.9%	*Lespedeza bicolor*	Bicolor Lespedeza	FACU
3.5%	*Panicum virgatum*	Switchgrass	FAC
.9%	*Andropogon virginicus*	Broom-Sedge	FACU
5.3%	*Setaria italica*	Fox-Tail Bristle Grass	FACU
1.9%	*Helianthus annuus*	Common Sunflower	FACU
0.8%	*Polygonum pensylvanicum*	Pennslyvania Smartweed	FACW
0.7%	*Avena sativa*	Oats	UPL

4.2 DRAINAGEWAYS

Nominally, 2,844 linear feet of intermittent drainageway under the jurisdiction of the USACE will be filled in or removed during the development of the solid waste management facility. Sealand's onsite mitigation includes the creation of a 900 foot long, high value stream/riparian area ecosystem and will restore and enhance 160 linear feet of Storehouse Run and 200 linear feet of its tributary. Offsite, Sealand will enhance and preserve 1,233 linear feet of intermittent drainageway at the 28th Creek Road mitigation site.

4.2.1 Design Methodology

Essentially, if protected waters are unavoidably disrupted or destroyed, compensation for those impacts is required to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. EcoLogic's investigation evaluated each of the intermittent drainageways to determine their current ecological condition as a baseline against which to compare the value of the proposed, mitigated drainageways. The condition of the stream systems evaluated was assessed using SVAP2, as described in Section 2.1.2.

Sealand has followed the requirements of the U.S. Environmental Protection Agency (USEPA) and the USACE, who have jointly publicized regulations that lay out the requirements for compensatory mitigation under Section 404 of the Clean Water Act. In addition, the USACE Buffalo District has developed standard procedures for determining compensatory mitigation credits for drainageways, and this protocol is presented in the March 2014 Compensatory Stream Mitigation Evaluation Method. This method has been applied to the specifics of the proposed facility expansion to compute the compensatory mitigation credits required, incorporating SVAP2 scores established by EcoLogic and other criteria, to quantify stream functionality of the impacted drainageways. The method is also applied to the mitigation drainageway design presented herein to compute the total restoration credits generated on implementing the mitigation plan.

Seven elements from SVAP2 are considered in the USACE Buffalo District mitigation scoring method. As summarized in the USACE worksheets, the total mitigation credits required for filling or removing the jurisdictional intermittent drainageways at the impact site total 8,824.15. The credits generated by the mitigation drainageways total 9,150.50. All of the criteria, design

elements and credit computations are identified on the Compensatory Stream Mitigation Evaluation worksheets and Fact Sheets included in Appendix E.

4.2.2 Seeding and Planting

Seeding and planting will best be completed in the late fall or early spring, when weather, soil and hydrologic conditions are most favorable. One rule of thumb is that all seeding and planting should be completed before June 15 or after September 15. Planting and seeding during these timeframes is expected to allow the new vegetation to sprout roots and stems and obtain a quick foothold. Plantings made outside the preferred period should be expected to experience a higher mortality rate and slower growth; and in turn, require a more intensive corrective measures program. New vegetation will be well watered immediately after planting. The planting plan is shown in the Drawings in Appendix A.

4.2.2.1 Native Riparian Seed Mix

The native riparian seed mix shall consist of the Ernst Conservation Seed's PA Northern Allegheny Plateau Province Riparian Mix which is summarized in Table 4-8. The riparian seed mix seed rate will be 20 lbs per acre with a cover crop such as grain oats at 30 lb per acre.

Table 4-8 Riparian Seed Mix

Quantity (Percentage by Weight)	**Botanical Name**	**Common Name**
20%	*Panicum clandestinum*	Deertongue
16%	*Schizachyrium scoparium*	Little Bluestem
14%	*Andropogon gerardii*	Big Bluestem
10%	*Elymus virginicus*	Virginia Wildrye
10%	*Poa palustris*	Fowl Bluegrass
10%	*Elymus riparius*	Riverbank Wildrye
2%	*Juncus effusus*	Soft Rush
2%	*Agrostis perennans*	Autumn Bentgrass
2%	*Panicum virgatum*	Switchgrass
2%	*Heliopsis helianthoides*	Oxeye Sunflower
1%	*Scirpus polyphyllus*	Many Leaved Bulrush
1%	*Monarda fistulosa*	Wild Bergamot
1%	*Eupatorium perfoliatum*	Boneset
1%	*Eupatorium perfoliatum*	Joe Pye Weed
1%	*Aster umbellatus*	Flat Topped White Aster
1%	*Aster Puniceus*	Purple Stem Aster
1%	*Aster prenanthoides*	Zigzag Aster
1%	*Aster novae-angliae*	New England Aster
1%	*Asclepias incarnata*	Swamp Milkweed
1%	*Eupatorium maculatum*	Spotted Joe Pye Weed

4.2.2.2 Riparian Shrubs

The riparian shrub plantings are listed in Table 4-9 and shall be planted randomly.

Table 4-9 Riparian Shrub Plantings

Botanical Name	Common Name
Aronia arbutifolia	Red Chokeberry
Aronia melanocarpa	Black Chokeberry
Cephalanthus occidentalis	Button Bush
Cornum amomum	Silky Dogwood
Cornus sericea	Red-Osier Dogwood
Hamamelis virginiana	Common Witch Hazel
Salix sericea	Silky Willow
Ilex verticillata	Winterberry

4.2.2.3 Live Stakes

Live stake cuttings will be planted along the streambanks. Live stake species are listed in Table 4-10 and will be planted on approximately two foot centers, except at the normal waterline, where they will be planted on one foot centers.

Table 4-10 Live Stake Plantings

Botanical Name	Common Name
Salix exigua ssp. Interior	Sandbar Willow
Salix sericea	Silky Willow
Sombucus canadensis	Elderberry

4.2.2.4 Emergent Vegetation

Emergent vegetation to be planted on the surface of the graded filters is listed in Table 4-11.

Table 4-11 Emergent Plantings

Botanical Name	Common Name
Juncus effusus	Soft Rush
Scirpus atrovirens	Green Bulrush
Scirpus cyperinus	Wool Grass
Scirpus microcarpus	Small-Fruit Bulrush
Scirpus pungens	Common Three Square
Scirpus validus	Soft Stem Bulrush

4.2.2.5 Upland Shrubs

The upland shrub plantings are listed in Table 4-12 and shall be planted randomly in upland areas as shown in the drawings.

Table 4-12 Upland Shrub Plantings

Botanical Name	Common Name
Corylus Americana	American Hazelnut
Physocarpus opulifolius	Ninebark
Viburnum trilobum	American Highbush Cranberry
Viburnum lentago	Nannyberry

4.2.2.6 Joint Plantings and Live Stakes

Joint planting and live stake planting will be used in the areas shown in the Drawings. Live stake species are listed in Table 4-13 and will be planted on approximately four foot centers or where randomly planted in the joints of rock armoring protection.

Table 4-13 Joint Planting Species

Botanical Name	Common Name
Cornus sericea	Red-Osier Dogwood
Viburnum alnifolium	Hobblebush
Cornus amomum	Silky Dogwood
Physocarpus opulifolius	Common Ninebark

4.2.2.7 Brush Mattress and Live Fascine

Brush mattress and live fascine bundles both utilize live cuttings that have good rooting ability. Live cutting species are listed in Table 4-14 and will be used in both bank stabilization techniques.

Table 4-14 Live Cuttings

Botanical Name	Common Name
Cornus sericea	Red-Osier Dogwood
Cornus amomum	Silky Dogwood
Viburnum lentago	Nannyberry
Viburnum dentatum	Arrowwood

4.2.2.8 Trees

Tree species to be planted are listed in Table 4-15.

Table 4-15 Tree Plantings

Botanical Name	Common Name
Gleditsia triacanthos	Thornless Honeylocust

5 MITIGATION WORK PLAN

5.1 ACCESS

Construction activities in the wetlands, streambanks and riparian areas will be planned for the July and August timeframes to allow for the intrusive work to be done under relatively dry ground and low streamflow conditions. Access to the wetland, streambank and riparian areas will be afforded by gravel access roads the uppermost/wearing surface of which will be composed of a coarse aggregate. This rough and porous surface will help maintain as clean and dry a working access way as is practicable. Strategically located, flat lying, native gravel pathways inside the riparian areas will accommodate site restoration, routine maintenance, and long term site inspection activities.

5.2 EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES

Implementing the wetland and drainageway mitigation plan will result in the temporary disturbance of soil resources, vegetated areas and streambanks. Appropriate measures protective of wetlands, soil resources, surface water, and stream water quality must be implemented prior to initial ground disturbance activity.

Mitigation and restoration typically begins as an earthmoving effort, and once all stormwater BMPs and staging areas are in-place, earthmoving will begin. Heavy equipment expected to be used in the project includes medium and large tracked excavators, off road dump trucks, rubber tire wheel loaders, bulldozers, compactors and hydroseeders. Implements needed to complete the work will likely include chain saws, portable trash pumps, submersible dewatering pumps, a generator and other small tools.

A number of stormwater control Best Management Practices (BMPs) will be employed to limit erosion and control sedimentation. The two most important practices to control erosion will be to minimize ground disturbance by protecting vegetation in areas not required for the construction, and ground stabilization by seeding and mulching of disturbed areas as soon as is practicable after the design grades are obtained. Erosion and sediment control BMPs will be consistent with New York State Standards and Specifications for Erosion and Sediment Control.

5.3 SITE PREPARATION

First, a survey control network of benchmarks and baselines will be established to support the construction of the mitigation features. To assure that the final design elevations are obtained, a professional land surveyor will stake out the footprint of the mitigation areas. The perimeter of the work areas to be preserved and the property boundaries will also be laid out using semi-permanent high visibility poles or stakes. Haul roads with stabilized stone entranceways to help remove soil from vehicles and construction equipment will then be constructed. The work area will be cleaned of any debris that may be present on the site. Any debris removed from the site will be hauled to a permitted solid waste management facility for proper recycling or disposal. Silt fencing will be installed where necessary per NYS Standards and Specifications for Erosion and Sediment Control to control and limit sedimentation. A Stormwater Pollution Prevention Plan will be prepared and the necessary steps and procedures implemented according NYSDEC State Pollutant Discharge Elimination System (SPDES) standards.

5.4 CONSTRUCTION

To prevent the unintentional introduction or spread of invasive species, the contractor must clear all construction equipment of mud, seeds, vegetation and other debris before entering the mitigation sites. The project specifications will require that all equipment and vehicles are cleaned prior to mobilization. Loose plant and soil material shall be removed from clothing and boots of any persons entering the mitigation sites. It is recommended that the mitigation wetland and drainageways be constructed during a dry period to limit ground disturbance and runoff, which in turn will ease the construction effort.

Topsoil will be stockpiled in separate staging areas for re-use once the design grades are reached. Stockpiling will not occur in any existing wetland areas. Soils associated with significant invasive species growth will be buried deeply in the fill materials. Areas proposed for excavation will be over-excavated to allow for the placement of topsoil to final grade.

Once topsoil has been placed, the mitigation wetland and drainageway areas will be seeded and planted. The disturbed upland areas will be seeded and mulched with straw to reduce soil erosion and to keep the soil moist for germination. The preferred seeding time is before June 15th or after September 15th.

5.5 INVASIVE SPECIES CONTROL

Before construction begins, the mitigation areas will be scouted by a qualified ecologist to identify colonies of invasive species. Appropriate action will be taken to remove any colonies found including excavation, mowing and herbicide application by a certified applicator. Any plant or soil material removed as a result of the identification of an invasive species colony will be disposed at an approved landfill. Coordination with the USACE and the NYSDEC will be conducted prior to implementing management techniques. Straw (not hay) will be used as mulch. Hay commonly contains many seeds of potential invasive species that may spread and impact the successful development of the mitigation wetland area and will not be used.

6 PERFORMANCE STANDARDS AND MONITORING

6.1 POST-CONSTRUCTION REPORT

A post construction report will be prepared and submitted to the NYSDEC and USACE by December 31st of the year construction is completed. The report will include the following:

- A record drawing depicting the final contour intervals (one foot intervals), the permanent photographic and data sampling stations to be used during the monitoring period, and seeding and planting locations;
- Cross-section record drawings;
- A description of any notable design changes made in the field during construction; and,
- A description of wetland seeding and planting activities including the landscape contractor used, the plant materials inventory and vendors, the seeding and planting times and methodology.

6.2 MONITORING REPORTS

As per the standard USACE requirements, Sealand will retain a professional consultant to monitor the wetland mitigation elements for a minimum period of 10 years and drainageway mitigation elements for a minimum period of 7 years. Monitoring reports will be prepared annually for the minimum monitoring periods, each growing season after construction. Monitoring reports will be submitted to the USACE and the NYSDEC no later than December 31st of each monitoring year. The monitoring report should include the following:

- Evaluation of the aerial coverage of the desired and invasive vegetative species during the annual monitoring activities;
- Evaluation of the hydrology, including water depths, from fixed locations within the mitigation area and determine if the hydrology is sufficient to establish hydrophobic vegetation in wetland areas and beneficial habitat (pools, riffles, etc.) in drainageway mitigation areas; and,

- Photographs taken from fixed locations and indicated on a vegetative cover map.

Monthly site visits will take place during the first growing season to carefully monitor for invasive species, establishment of beneficial species and hydrology. From year two on following construction, two site inspections per year, in spring and summer, will take place to monitor for the spread of invasive species and confirm the viability of the wetland and drainageway areas. Data and photographs will be collected during the site inspections and will be included in the annual monitoring reports. More frequent visits may be warranted if non-compliance issues arise. Photographic benchmarks will be established which will be used to record the progress of the mitigation elements during the 7-10 year monitoring periods.

During the site inspections, the applicant or his contractor will manually remove any invasive vegetative species such as reed canary grass, purple loosestrife and common reed to the extent practicable. If further control measures are needed recommendations are to be included in the monitoring reports. The monitoring reports shall conform to the published USACE guidelines for wetland mitigation monitoring (RGL 06-03) issued October 2006, or the most current version.

6.2.1 Performance Standards

6.2.1.1 Wetland Mitigation Site

The following performance standards will signal a successful implementation of the wetland mitigation project:

Hydrology

- A functioning mixed forested wetland, emergent marsh wetland, and shrub swamp totaling 13.18 acres per the record survey will be established and adequate in accordance with the approved design plans.

Vegetation

- Completion of wetland plantings in accordance with the approved planting schedule;

- The mitigation wetland consists of 85 percent or greater facultative, facultative wet, and obligate species; and,

- Less than 10 percent of the wetlands vegetative composition includes invasive species such as common reed, reed canary grass and purple loosestrife.

Habitat

- Microtopography features are attained through rough finish grading and undulating surfaces;

- Completion of upland buffers, which will provide adequate habitat for birds and other wildlife as well as habitat for life cycles of amphibians; and,

- Stabilization of all disturbed soils within the mitigation site.

6.2.1.2 Drainageway Mitigation Sites

After the 7 year period, a stream mitigation score will be determined based on the SVAP2 stream assessment parameters to verify whether the estimated mitigation score was met. The following performance standards will signal a successful implementation of drainageway mitigation:

Vegetation

- At least 80% of the live stakes, shrubs, and trees specified in the plans will be established and providing the planned services, such as providing habitat, shading, and plant diversity;

- Less than 5% of the riarian vegetative composition will include invasive species such as common reed, reed canary grass and purple loosestrife; and,

- Vegetation is established over 95% of the disturbed area.

Habitat

- All of the intended fish and aquatic invertebrate habitat features are present and in place.

Streambanks

- Eroded banks are stabilized with established vegetation covering 90% of the disturbed area after 7 years; and,

- Streambank stabilization structures are intact and functioning properly.

7 SITE MAINTENANCE AND PROTECTION

7.1 MAINTENANCE AND ADAPTIVE MANAGEMENT PLAN

The wetland mitigation site will be monitored for a minimum of 10 years and the drainageway mitigation site will be monitored for a minimum of 7 years, as described in Section 6.2. All inspections shall be conducted on foot by a professional who is experienced in this type of work. The sites will be maintained according to the performance standards listed in Section 6.2.1.

If the performance standards are not met or if the mitigation elements appear to be failing, a remediation plan will be created to achieve the mitigation goals. The remediation plan shall outline the proposed actions that will be taken to replace or enhance the existing mitigation elements.

7.2 LEGAL PROTECTION

A perpetual deed restriction will be placed on the 28th Creek Road mitigation site to guarantee its preservation. The restrictions shall specifically state that the mitigation area is not to be adversely impacted. The Deed Restrictive covenant shall contain a legal description of mitigation area and a signed surveyor's map. A conservation easement with a third party grantee will be placed on the drainageway mitigation areas, as required by the USACE compensatory stream mitigation evaluation method. A copy of the deed restrictive covenant is included in Appendix F and a copy of the Chautauqua Watershed Conservancy (CWC) conservation easement for the drainageways is included in Appendix G.

The mitigation property is under an oil and gas lease signed on July 21, 1982. The current lessee is Empire Energy E&P, LLC. Gas wells are located on the adjacent properties to the east and west. The gas wells are connected through a gas line which traverses the center of the property; while another gas line passes through the southern portion of the property. The gas lease has been amended to be compatible with mitigation site creation and protection. The amendment includes a waiver of the right to perform any exploration, drilling or mining on the surface of the premises and stipulation not to disturb the ground surface in the mitigation areas. The amendment also allows the lessor to remove and relocate gas pipelines from the wetland mitigation area. The Oil and Gas Lease and the Amendment are included in Appendix H.

7.3 FINANCIAL ASSURANCES

Sealand will put forth the financial assurance instrument to include costs for construction, monitoring, and long term stewardship. The financial assurance instrument will be in the form of a performance bond, as required under 332.3 (n) (2) [230.93(n) (2)]. The district engineer will determine if the instrument is sufficient for the mitigation wetland. The final document will be in place prior to commencing the permitted activity.

7.4 LONG-TERM MANAGEMENT PLAN

As previously described, Sealand will ensure that the wetland and drainageway mitigation sites are in compliance with the performance standards outlined in Section 6.2.1 for 7-10 years after the mitigation construction is complete. Beyond that time period, the CWC will monitor and maintain the condition of the sites. The deed restrictive covenant for the wetlands, included in Appendix F, and a deed conservation easement for the drainageways, included in Appendix G, will protect the mitigation areas and adjacent uplands and guarantee their preservation.

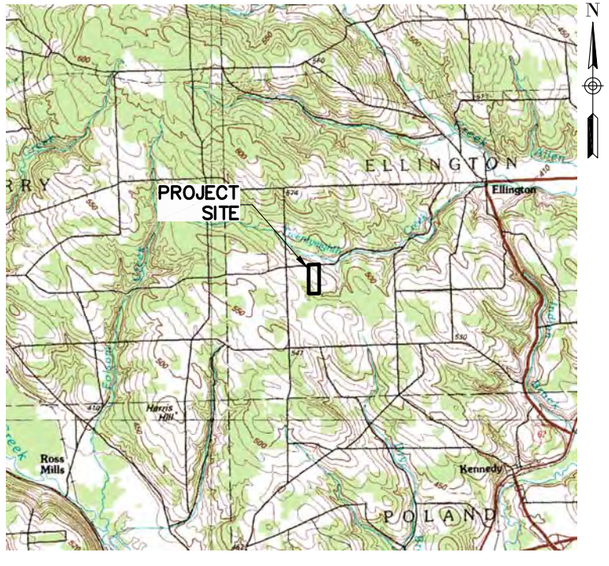
APPENDIX A

Permit Drawings

SEALAND WASTE, L.L.C.

CARROLL LANDFILL EXPANSION
WETLAND AND DRAINAGEWAY MITIGATION

(NOT FOR CONSTRUCTION)
TOWNS OF KENNEDY AND CARROLL, CHAUTAUQUA COUNTY, NEW YORK
August 2016

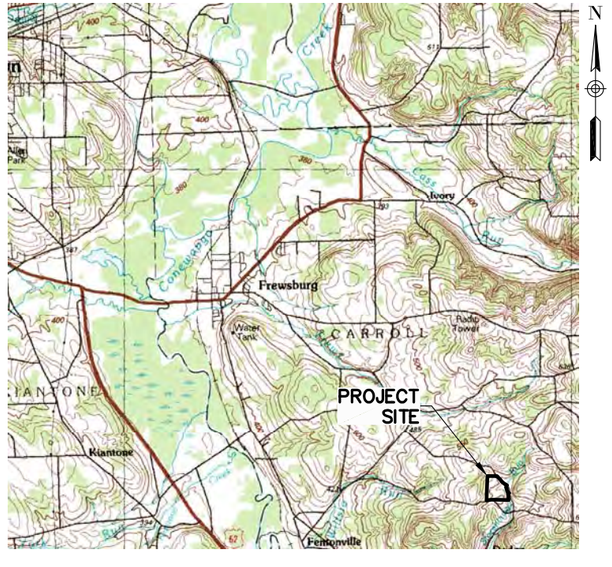


SOURCE: UNITED STATES GEOLOGICAL SURVEY

28TH CREEK ROAD LOCATION MAP
NTS

INDEX OF DRAWINGS

SHEET NO.	TITLE
PD-1	28TH CREEK ROAD MITIGATION PLAN AND PROFILES
PD-2	STOREHOUSE RUN DRAINAGEWAY MITIGATION PLAN
PD-3	MITIGATION DRAINAGEWAY PLAN AND PROFILES
PD-4	MITIGATION PLAN DETAILS
PD-5	MITIGATION PLAN DETAILS



SOURCE: UNITED STATES GEOLOGICAL SURVEY

LANDFILL EXPANSION SITE LOCATION MAP
NTS

PREPARED BY:

DAIGLER ENGINEERING, P.C.
CIVIL & GEO-ENVIRONMENTAL ENGINEERING

2620 GRAND ISLAND BLVD. GRAND ISLAND, NEW YORK 14072
(716) 773-6872 (716) 773-6873 FAX

PREPARED FOR:
SEALAND WASTE, L.L.C
85 HIGH TECH DRIVE
RUSH, NEW YORK 14543

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DATE:	DWG:	CHECKED BY:
August 2016	TITLE SHEET.DWG	

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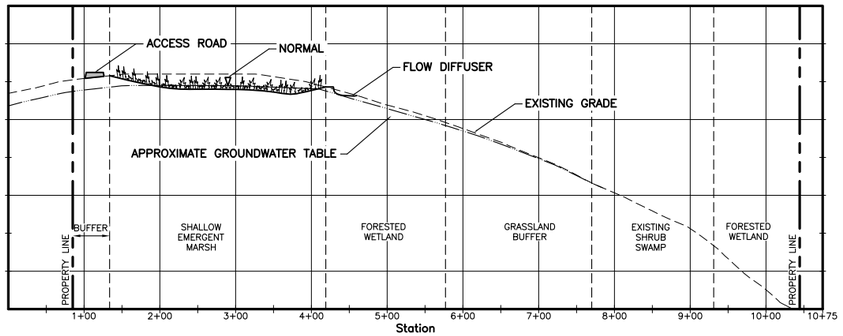
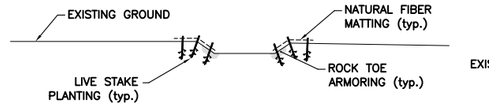


PROFILE VIEW A–A

SCALE: 1"=100' HORIZONTAL
1"=20' VERTICAL



SCHEMATIC PROFILE B–B

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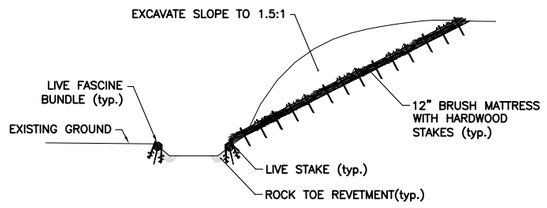

SCHEMATIC PROFILE C–C

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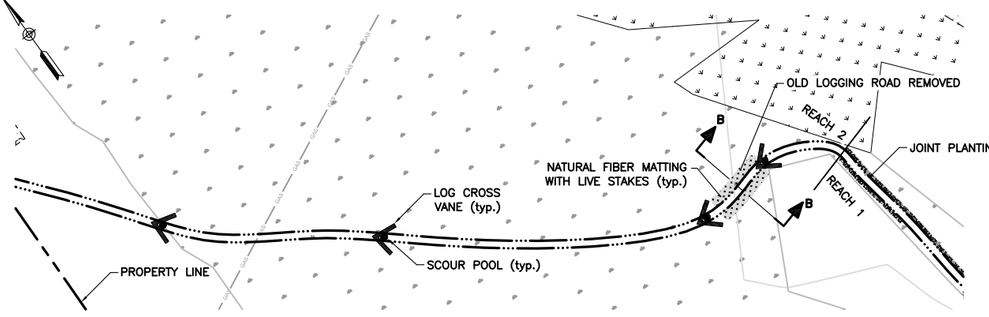
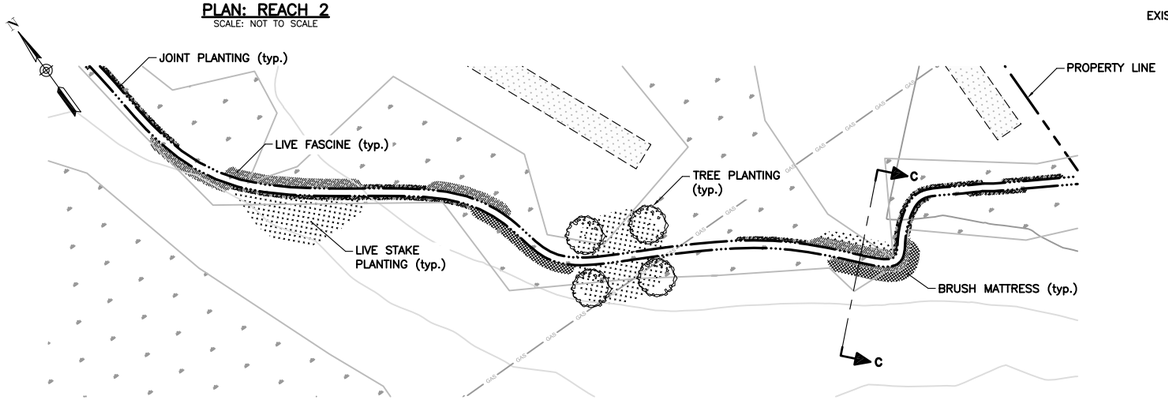


PLAN: REACH 2

SCALE: NOT TO SCALE



PLAN: REACH 1

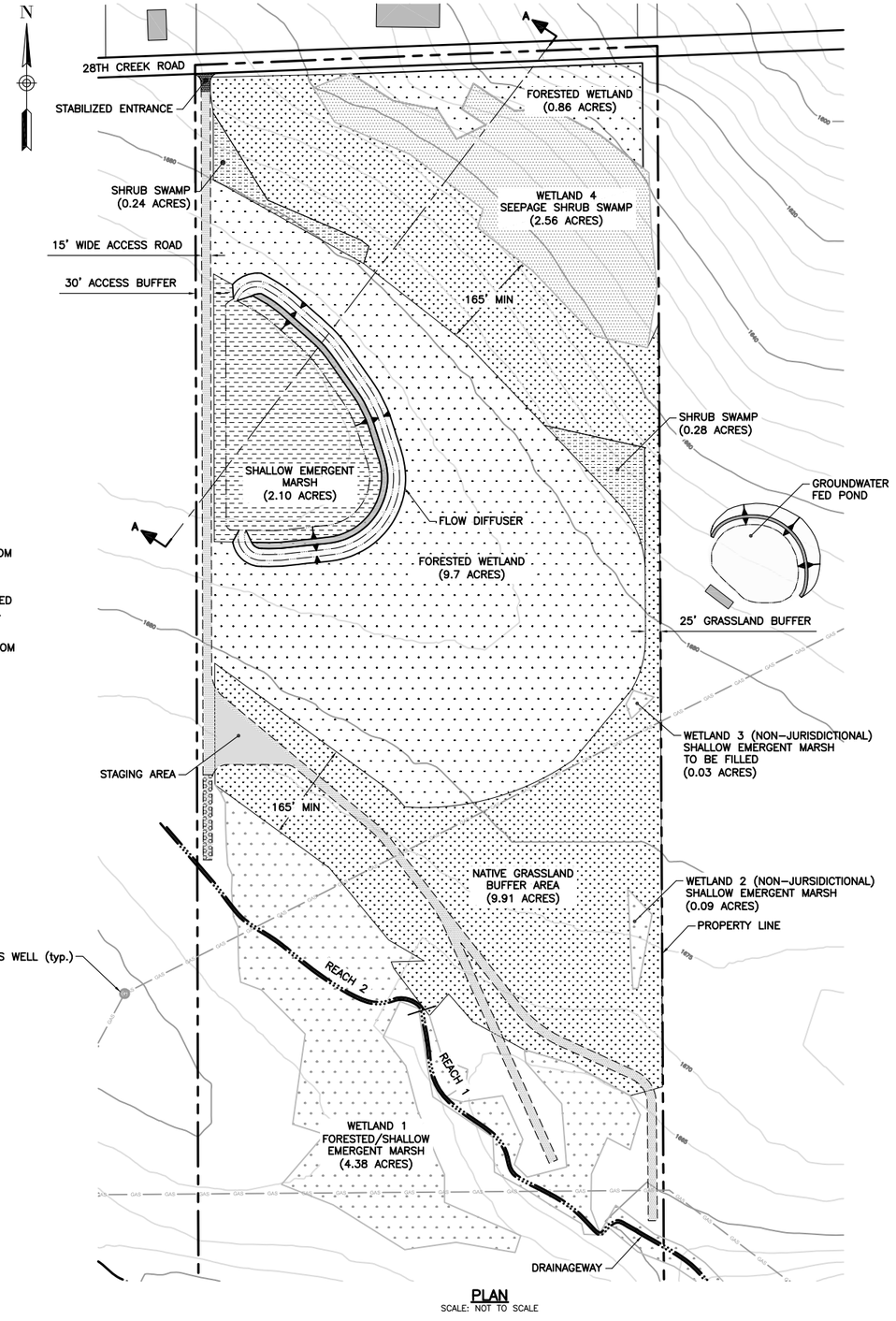
SCALE: NOT TO SCALE

LEGEND:

- EXISTING FORESTED/SHALLOW EMERGENT MARSH
- EXISTING SEEPAGE/SHRUB SWAMP
- FOREST WETLAND RESTORATION
- SHALLOW EMERGENT MARSH CREATION
- SHRUB SWAMP CREATION
- GRASSLAND BUFFER
- EXISTING WATER COURSE
- 1680 CONTOUR LINE
- GRAVEL ACCESS ROAD
- BRUSH MAT ROAD
- GAS NATURAL GAS PIPE
- JOINT PLANTING AREA
- LIVE STAKE PLANTING AREA
- LIVE FASCINE PLANTING AREA
- BRUSH MATTRESS AREA
- NATURAL FIBER MATTING
- LOG CROSS VANE
- TREE PLANTING

GENERAL NOTES:

1. CONTOURS AND TOPOGRAPHIC INFORMATION OBTAINED FROM GERRY, NEW YORK USGS QUADRANGLE, DATED 1979. ACTUAL ELEVATIONS SHOULD BE CONFIRMED IN–FIELD.
2. PROPERTY LINE AND RIGHT–OF–WAY INFORMATION OBTAINED FROM PROPERTY BOUNDS SURVEY PREPARED BY MICHAEL J. RODGERS OF JAMESTOWN, NEW YORK.
3. TREE LINE, FIELD LINE, AND CHANNEL DATA OBTAINED FROM GOOGLE EARTH OVERLAY.
4. NUMBERED WETLAND AREAS ARE EXISTING.



PLAN

SCALE: NOT TO SCALE

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NO.	REVISION	BY	DATE

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(716) 773-6872 (716) 773-6873 FAX

JAMES A. DAIGLER, P.E.
NYSPE NO. 061689

DATE: August 2016

PRELIMINARY NOT FOR CONSTRUCTION

SCALE: NOTED

PREPARED FOR: SEALAND WASTE, LLC			28TH CREEK ROAD MITIGATION PLAN AND PROFILES
DES. BY:	DRW. BY:	CHK. BY:	CARROLL LANDFILL EXPANSION WETLAND AND DRAINAGEWAY MITIGATION
DWG. Revised Wetland MITIGATION PLAN 040716.dwg	TOWN OF KENNEDY	CHAUTAUQUA COUNTY	STATE OF NEW YORK

SHEET PD-1

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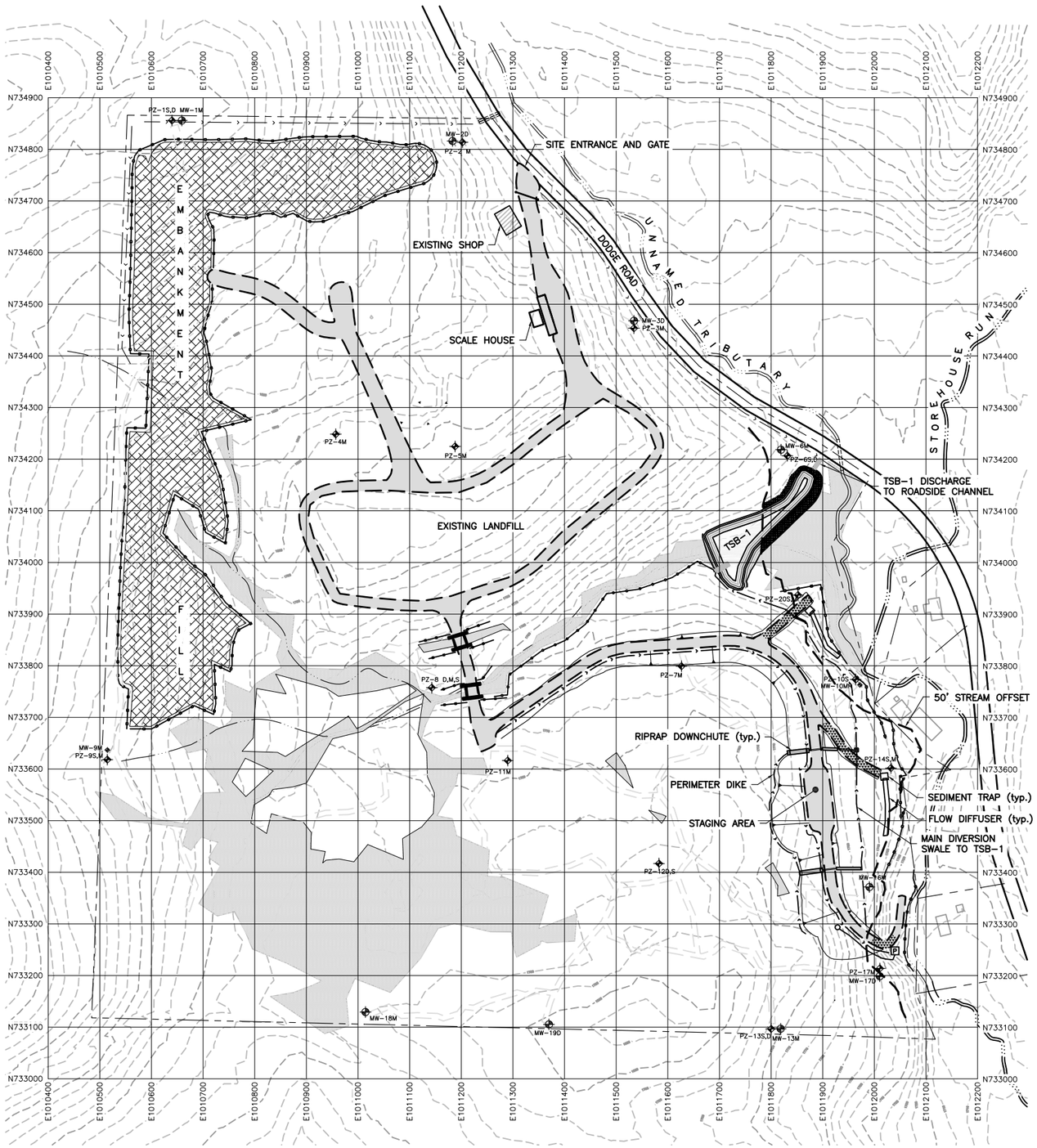
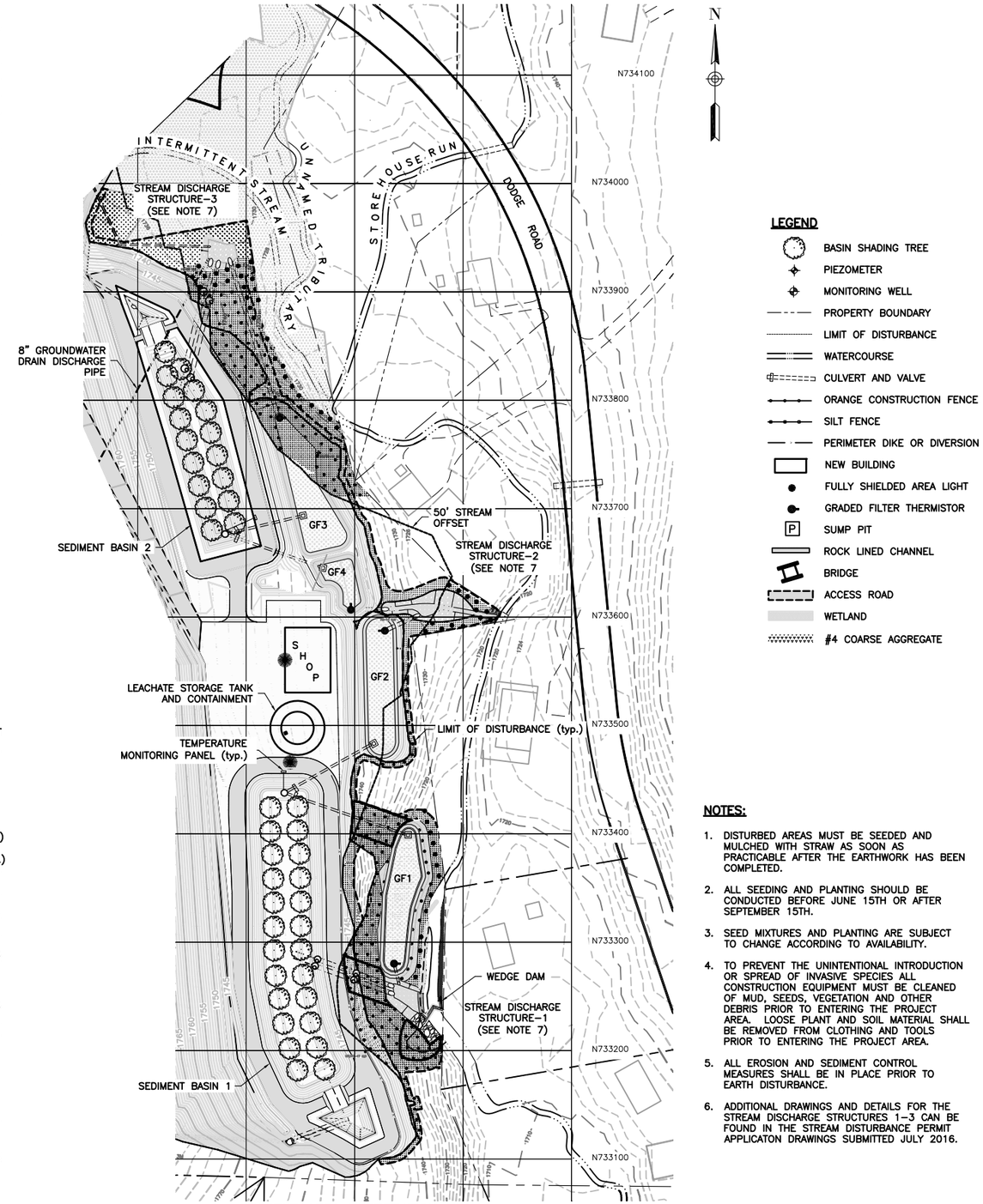


PROJECT AREA PREPARATION PLAN

SCALE: 1"=120'



PROJECT AREA RESTORATION PLAN

SCALE: 1"=60'

LEGEND

- BASIN SHADING TREE
- PIEZOMETER
- MONITORING WELL
- PROPERTY BOUNDARY
- LIMIT OF DISTURBANCE
- WATERCOURSE
- CULVERT AND VALVE
- ORANGE CONSTRUCTION FENCE
- SILT FENCE
- PERIMETER DIKE OR DIVERSION
- NEW BUILDING
- FULLY SHIELDED AREA LIGHT
- GRADED FILTER THERMISTOR
- SUMP PIT
- ROCK LINED CHANNEL
- BRIDGE
- ACCESS ROAD
- WETLAND
- #4 COARSE AGGREGATE

NOTES:

1. DISTURBED AREAS MUST BE SEEDED AND MULCHED WITH STRAW AS SOON AS PRACTICABLE AFTER THE EARTHWORK HAS BEEN COMPLETED.
2. ALL SEEDING AND PLANTING SHOULD BE CONDUCTED BEFORE JUNE 15TH OR AFTER SEPTEMBER 15TH.
3. SEED MIXTURES AND PLANTING ARE SUBJECT TO CHANGE ACCORDING TO AVAILABILITY.
4. TO PREVENT THE UNINTENTIONAL INTRODUCTION OR SPREAD OF INVASIVE SPECIES ALL CONSTRUCTION EQUIPMENT MUST BE CLEANED OF MUD, SEEDS, VEGETATION AND OTHER DEBRIS PRIOR TO ENTERING THE PROJECT AREA. LOOSE PLANT AND SOIL MATERIAL SHALL BE REMOVED FROM CLOTHING AND TOOLS PRIOR TO ENTERING THE PROJECT AREA.
5. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IN PLACE PRIOR TO EARTH DISTURBANCE.
6. ADDITIONAL DRAWINGS AND DETAILS FOR THE STREAM DISCHARGE STRUCTURES 1–3 CAN BE FOUND IN THE STREAM DISTURBANCE PERMIT APPLICATON DRAWINGS SUBMITTED JULY 2016.

ALTERATION OF ANY SURVEY, DRAWING, DESIGN, SPECIFICATION OR REPORT MUST BE COMPLETED IN ACCORDANCE WITH SECTION 7209 PROVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

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JAMES A. DAIGLER, P.E.
NYSPE NO. 061689

DATE: August 2016

SCALE: NOTED

PREPARED FOR: SEALAND WASTE, LLC			STOREHOUSE RUN DRAINAGEWAY MITIGATION PLAN
DES. BY:	DRW. BY:	CHK. BY:	CARROLL LANDFILL EXPANSION WETLAND AND DRAINAGEWAY MITIGATION
DWG. PD3.dwg			TOWN OF CARROLL / CHAUTAUQUA COUNTY / STATE OF NEW YORK

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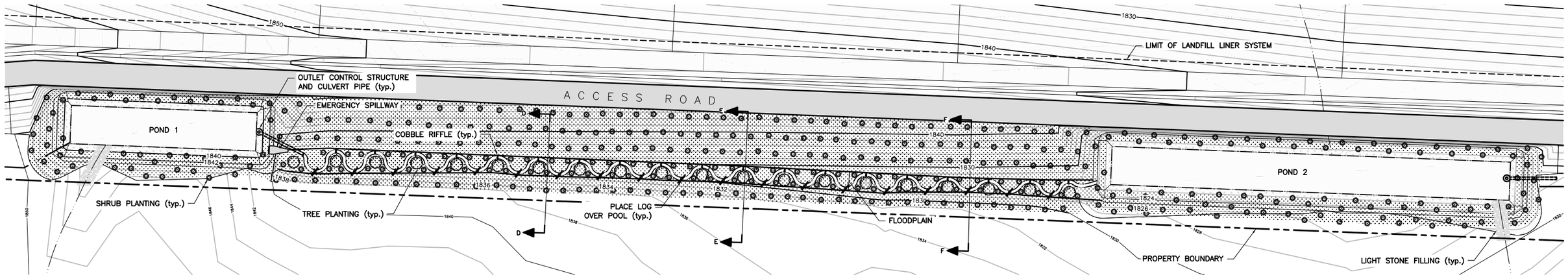

PLAN
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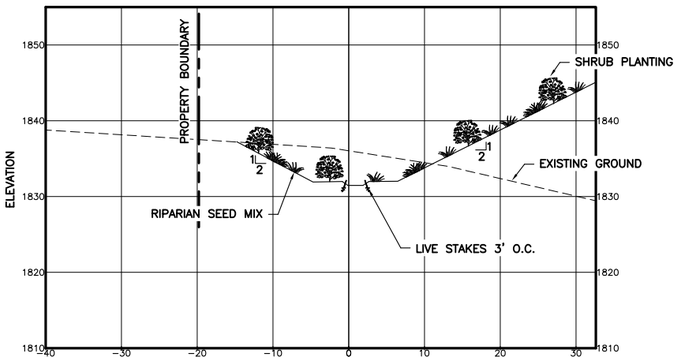
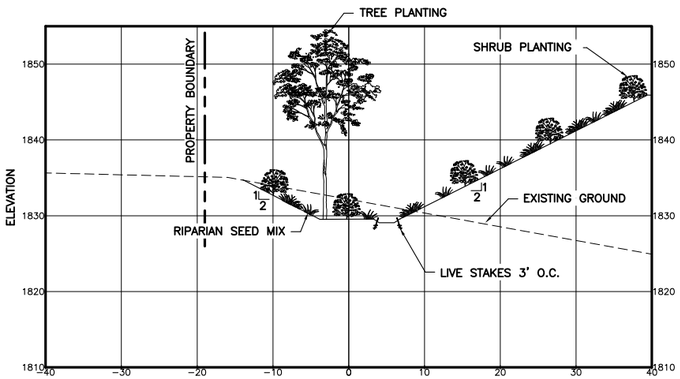


PROFILE D–D
SCALE: 1"=10'



PROFILE E–E
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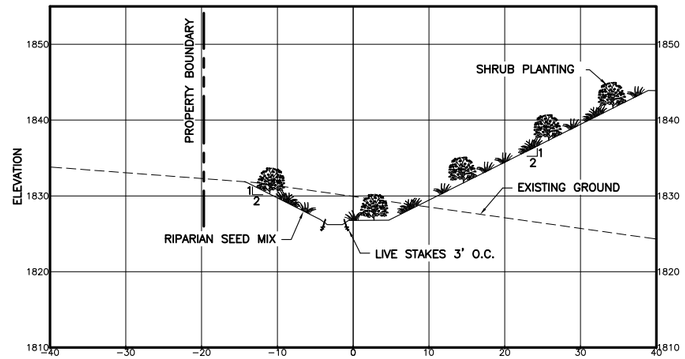

PROFILE F–F
SCALE: 1"=10'

NOTES:

1. DISTURBED AREAS MUST BE SEEDED AND MULCHED WITH STRAW AS SOON AS PRACTICABLE AFTER THE EARTHWORK HAS BEEN COMPLETED.
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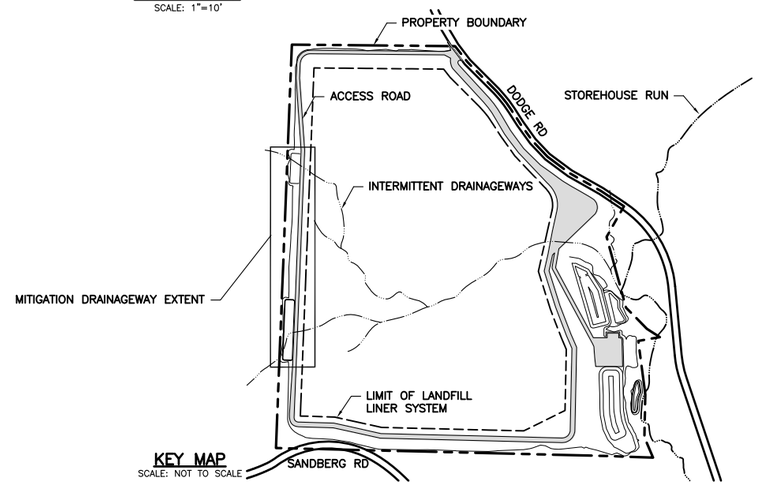
6. ADDITIONAL DRAWINGS AND DETAILS FOR THE STREAM DISCHARGE STRUCTURES 1–3 CAN BE FOUND IN THE STREAM DISTURBANCE PERMIT APPLICATON DRAWINGS SUBMITTED JULY 2016.

LEGEND:

- PROPERTY BOUNDARY
- EXISTING WATER COURSE
- SHRUB PLANTING
- TREE PLANTING
- RIPARIAN SEED PLANTING AREA
- EMERGENT PLANTING AREA



KEY MAP
SCALE: NOT TO SCALE

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(716) 773-6872 (716) 773-6873 FAX

JAMES A. DAIGLER, P.E.
NYSPE NO. 061689

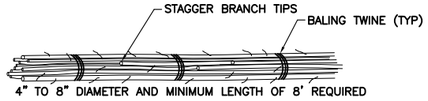
DATE: August 2016

PRELIMINARY NOT FOR CONSTRUCTION

SCALE: NOTED

PREPARED FOR: SEALAND WASTE, LLC			MITIGATION DRAINAGEWAY PLAN AND PROFILES CARROLL LANDFILL EXPANSION WETLAND AND DRAINAGEWAY MITIGATION
DES. BY:	DRW. BY:	CHK. BY:	
DWG. ON SITE MITIGATION.dwg	TOWN OF CARROLL	CHAUTAUQUA COUNTY	STATE OF NEW YORK

SHEET PD-3



FASCINE BUNDLE DETAIL
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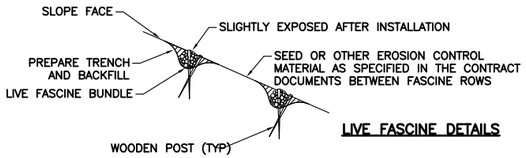
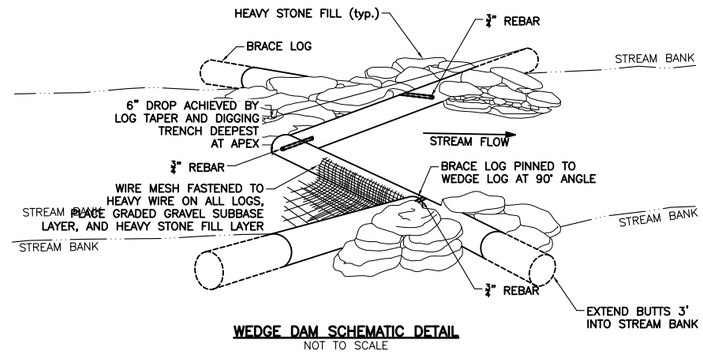


LIVE FASCINE DETAILS

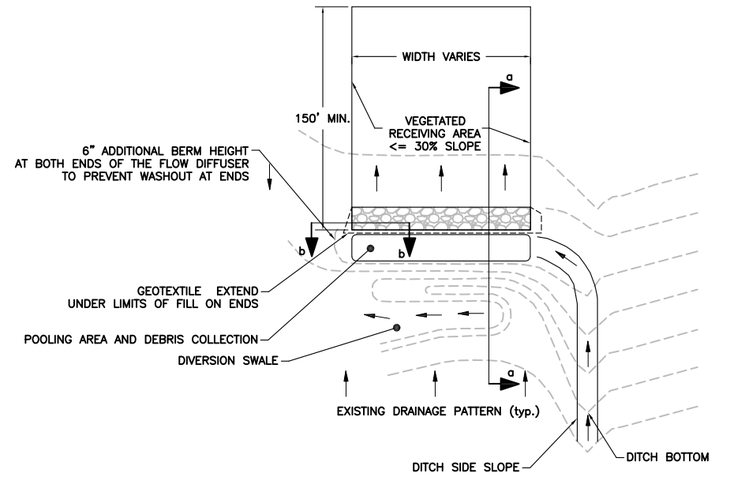
CROSS SECTION
NOT TO SCALE

LIVE FASCINE NOTES:

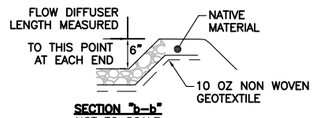
1. LIVE FASCINES SHALL BE PREPARED FROM FRESHLY CUT DORMANT PLANTS AND INSTALLED WITHIN 8 HOURS OF THE TIME THE MATERIAL IS HARVESTED, UNLESS PROPERLY STORED.
2. LIVE FASCINE SHALL BE OBTAINED FROM SOURCES APPROVED BY THE ENGINEER.
3. LIVE FASCINES SHALL BE 4" TO 8" IN DIAMETER. LENGTHS MAY VARY TO SUIT CONDITIONS. A MINIMUM LENGTH OF 8' IS REQUIRED.
4. THE TIPS OF THE BRANCHES WITHIN THE LIVE FASCINE SHALL BE STAGGERED.
5. LIVE FASCINES SHALL BE PLACED AS INDICATED IN THE CONTRACT DOCUMENTS.
6. BEGINNING AT THE BASE OF THE SLOPE, A TRENCH SHALL BE DUG LARGE ENOUGH TO CONTAIN THE LIVE FASCINES. THE LIVE FASCINES SHALL BE PLACED IN THE TRENCH. WHERE ENDS MEET IN THE TRENCH, THE FASCINES SHALL OVERLAP BY 18".
7. WOOD POSTS SHALL BE INSTALLED FLUSH TO THE TOP OF THE FASCINE EVERY 18" ALONG THE LENGTH OF THE BUNDLES AS SHOWN ON THE CROSS SECTION. WHERE SPECIFIED LIVE STAKES MAY BE USED IN PLACE OF POSTS.
8. THE TRENCH SHALL BE BACKFILLED WITH MOIST SOIL AND HAND TAMPED. THE TOP OF THE FASCINE SHALL BE SLIGHTLY EXPOSED WHEN THE INSTALLATION IS COMPLETE AS SHOWN ON THE CROSS SECTION.
9. SEED OR OTHER EROSION CONTROL MATERIAL SHALL BE USED BETWEEN THE FASCINE ROWS, AS SPECIFIED IN THE CONTRACT DOCUMENTS.
10. LIVE FASCINE TRENCHES SHALL BE FROM 3' TO 8' APART, ACCORDING TO SLOPE AND/OR THE CONTRACT DOCUMENTS.



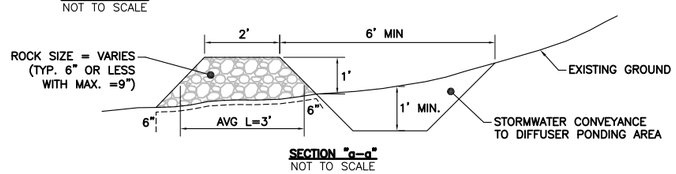
WEDGE DAM SCHEMATIC DETAIL
NOT TO SCALE



TYPICAL PLAN VIEW
NOT TO SCALE

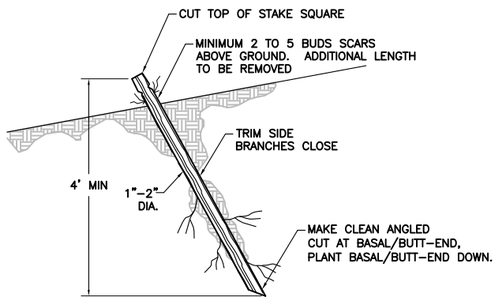


SECTION "b–b"
NOT TO SCALE



SECTION "a–a"
NOT TO SCALE

FLOW DIFFUSER SCHEMATIC DETAIL
NOT TO SCALE



LIVE STAKE DETAIL
NOT TO SCALE

LIVE STAKE NOTES:

1. LIVE STAKES SHALL BE 1–2 INCHES IN DIAMETER AND 2–6 FEET LONG (SEE NOTE 5)
2. NO LEAF BUDS SHALL HAVE INITIATED GROWTH BEYOND 1/4" AND THE CAMBIUM LAYER SHALL BE MOIST, GREEN AND HEALTHY.
3. ALL MATERIAL SHALL BE MAINTAINED IN A CONTINUOUSLY COOL, COVERED, AND MOIST STATE PRIOR TO USE AND BE IN GOOD CONDITION WHEN INSTALLED.
4. MATERIALS HARVESTED ON SITE SHALL BE INSTALLED THE SAME DAY THEY ARE PREPARED. NURSERY GROWN MATERIAL SHALL BE MAINTAINED IN A MOIST CONDITION FOR INSTALLATION.
5. INSTALLATION DETAILS;

5.a. THE LENGTHS OF LIVE CUTTINGS/LIVE STAKES DEPENDS ON THE APPLICATION. IF THROUGH RIPRAP, THE LENGTH SHALL EXTEND THROUGH THE SURFACE OF THE STONE FILL. AT LEAST HALF THE LENGTH SHALL BE INSERTED INTO THE SOIL, BELOW THE STONE FILL. SPACING ALONG THE WATERLINE IS 1 FOOT.

5.b. MINIMUM 2 TO 4 INCHES AND 2–5 LIVE BUDS OF THE LIVE STAKE SHALL BE EXPOSED ABOVE THE STONE FILLING.

5.c. LIVE STAKES SHALL BE CUT TO A POINT ON THE BASAL END FOR INSERTION IN THE GROUND.

5.d. USE A DEAD BLOW HAMMER TO DRIVE STAKES INTO THE GROUND. THE HAMMER HEAD SHOULD BE FILLED WITH SHOT OR SAND. A DIBBLE, IRON BAR, OR SIMILAR TOOL SHALL BE USED TO MAKE A PILOT HOLE TO PREVENT DAMAGING THE MATERIAL DURING INSTALLATION.

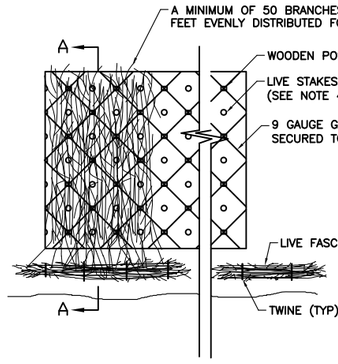
5.e. LIVE CUTTINGS SHALL BE INSERTED BY HAND INTO PILOT HOLES.

5.f. WHERE PRACTICAL, TAMP SOIL AROUND LIVE STAKES.

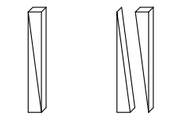
5.g. CARE SHALL BE TAKEN NOT TO DAMAGE THE LIVE STAKES DURING INSTALLATION. THOSE DAMAGED AT THE TOP DURING INSTALLATION SHALL BE TRIMMED BACK TO UNDAMAGED CONDITION.

BRUSH MATTRESS NOTES

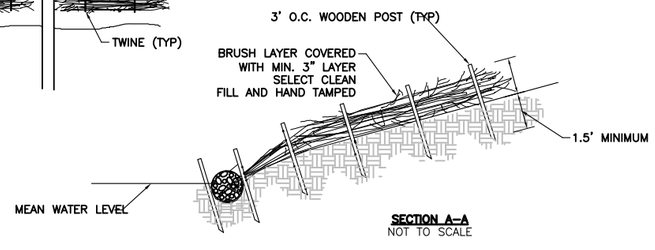
1. LAYERS SHALL BE COMPRISED OF LIVE QUICK–ROOTING SPECIES. SEE CONTRACT DOCUMENTS.
2. FILL MATTRESS WITH SOIL AND EVENLY DISTRIBUTE TO APPROXIMATELY 4" IN DEPTH AND HAND TAMP.
3. PLACE POSTS EVENLY OVER THE GRADED FACE USING 3' SQUARE SPACING. IF LIVE STAKES ARE SPECIFIED, ALTERNATE EVERY OTHER ON WITH THE POSTS.
4. STRETCH 9 GAUGE GALVANIZED WIRE DIAGONALLY FROM ONE POST TO ANOTHER BY TIGHTLY WRAPPING WIRE AROUND POSTS, NO CLOSER THAN 6" FROM THE TOP OF POST. WIRE SHALL NOT BE ATTACHED TO LIVE STAKES, IF THEY ARE SPECIFIED. POUND STAKES TO COMPRESS MATTRESS.
5. LIVE FASCINES AND LIVE STAKES ARE INSTALLED WHEN AND WHERE DIRECTED ON THE PLAN SHEET.



PLAN
NOT TO SCALE



WOODEN POST DETAIL
NOT TO SCALE



SECTION A–A
NOT TO SCALE

BRUSH MATTRESS DETAILS

ALTERATION OF ANY SURVEY, DRAWING, DESIGN, SPECIFICATION OR REPORT MUST BE COMPLETED IN ACCORDANCE WITH SECTION 7209 PROVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

NO.	REVISION	BY	DATE

2620 GRAND ISLAND BLVD. GRAND ISLAND, NEW YORK 14072

JAMES A. DAIGLER, P.E.
NYSPE NO. 061689

DATE: August 2016

SCALE: NOTED

PREPARED FOR: SEALAND WASTE, LLC			SHEET PD-4
DES. BY:	DRW. BY:	CHK. BY:	MITIGATION PLAN DETAILS CARROLL LANDFILL EXPANSION WETLAND AND DRAINAGEWAY MITIGATION
DWG. DETAIL SHEET.dwg	TOWNS OF KENNEDY & CARROLL	CHATAUQUA COUNTY	STATE OF NEW YORK

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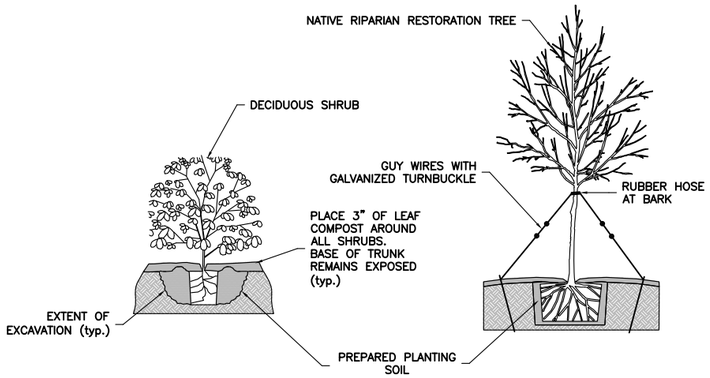
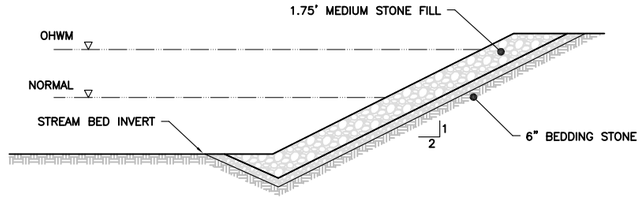


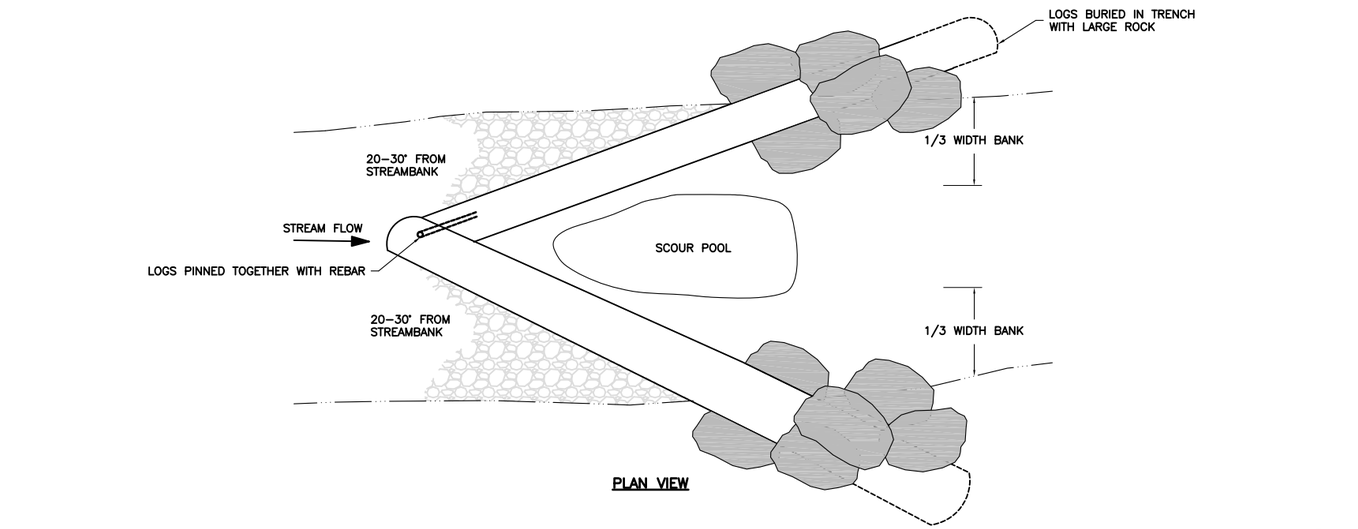
NOTE:
1. SEE ENGINEERING REPORT FOR PLANTING SCHEDULE

PLANTING DETAILS
NOT TO SCALE

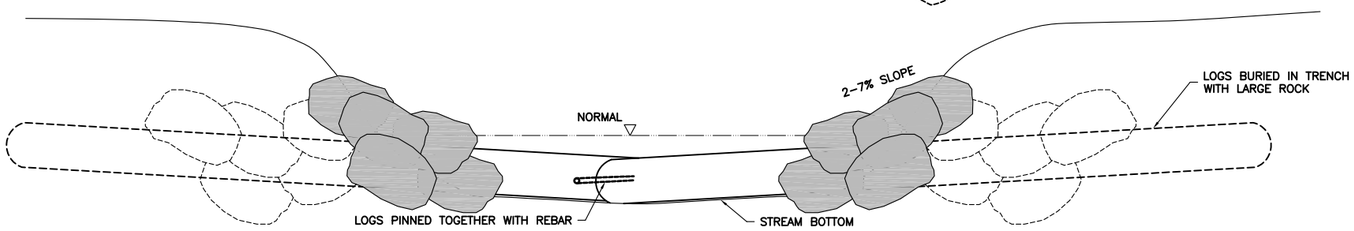


ROCK TOE REVETMENT SCHEMATIC DETAIL
NOT TO SCALE

GENERAL NOTES:
1. DISTURBED AREAS ASSOCIATED WITH THE CONSTRUCTION OF THE PROPOSED OUTFALL CULVERTS, OUTLET PROTECTION, AND GRADED FILTERS MUST BE SEEDED AND MULCHED WITH STRAW IMMEDIATELY AFTER THE EARTHWORK HAS BEEN COMPLETED IN ORDER TO REDUCE SOIL EROSION AND TO KEEP SOIL MOIST FOR GERMINATION.
2. ALL PERMANENT SEEDING AND PLANTING SHOULD BE CONDUCTED BETWEEN APRIL 1 TO JUNE 15 OR OCTOBER 15 TO DECEMBER 15.
3. SEED MIXTURES AND PLANTING ARE SUBJECT TO CHANGE ACCORDING TO AVAILABILITY.
4. TO PREVENT THE UNINTENTIONAL INTRODUCTION OR SPREAD OF INVASIVE SPECIES, ALL CONSTRUCTION EQUIPMENT AND MACHINERY MUST BE CLEANED OF ALL MUD, SEEDS VEGETATION, AND OTHER DEBRIS PRIOR TO ENTERING THE PROJECT AREA. LOOSE PLANT AND SOIL MATERIAL SHALL BE REMOVED FROM CLOTHING AND HAND TOOLS PRIOR TO ENTERING THE PROJECT AREA.
5. A MINIMUM OF SIX INCHES OF TOPSOIL SHALL BE PLACED WITHIN THE SEEDING AND PLANTING AREA.
6. ALL EROSION AND SEDIMENT CONTROL MEASURES WILL BE IN PLACE PRIOR TO ANY EARTH DISTURBANCE.



PLAN VIEW



SECTION VIEW

LOG CROSS VANE SCHEMATIC DETAIL
NOT TO SCALE

ROCK FILLING NOTES:
1. IF DRAINAGE CHANNELS ARE PLACED INSIDE THE LIMIT OF WASTE BEFORE FINAL COVER PLACEMENT, A MINIMUM OF 24–INCHES OF CLAYEY INTERMEDIATE COVER SHALL BE PLACED BETWEEN WASTE MATERIALS AND ANY CHANNEL BEDDING. FOR CHANNELS ABOVE FINAL COVER GEOSYNTHETICS, THE 24–INCH THICK BARRIER PROTECTION LAYER MUST BE A LOW PERMEABILITY CLAYEY SOIL.
2. A MINIMUM OF SIX–INCHES OF BEDDING MATERIAL MEETING THE REQUIREMENTS OF NYSDOT ITEM 620–2.05 SHALL BE PLACED ABOVE THE CLAYEY INTERMEDIATE COVER SOIL, PRIOR TO PLACEMENT OF THE CHANNEL LINING TO PREVENT PIPING AND EROSION OF THE INTERMEDIATE COVER SOIL. BEDDING MATERIAL SHALL BE PLACED USING METHODS THAT WILL NOT RESULT IN SEGREGATION OF PARTICLE SIZES.
3. ALL STONE FILLING TO BE USED FOR THE CHANNEL LINING SHALL BE ACCEPTED OR REJECTED FOR USE BASED ON A VISUAL EXAMINATION OF THE MATERIAL BY THE ENGINEER.
4. STONE FILLING MEETING THE REQUIREMENTS OF NYSDOT ITEM 620–1.01 SHALL BE PLACED AND CONSOLIDATED IN–PLACE IN THE CHANNEL TO ITS FULL COURSE THICKNESS IN ONE OPERATION. STONE FILLING SHALL BE PLACED IN A MANNER THAT PRODUCES A REASONABLY WELL–GRADED MASS WITH THE SMALLER STONE FRAGMENTS FILLING THE VOIDS BETWEEN THE LARGER PARTICLES WITH A MINIMUM PRACTICABLE VOID RATIO IN THE COMPLETED CHANNEL LINING. THE MATERIAL SHALL BE PLACED SUCH THAT THERE ARE NO POCKETS OF UNIFORM SIZE MATERIAL. PLACEMENT OF THE CHANNEL LINING SHALL BE COMPLETED IN A MANNER THAT AVOIDS DISTRUPTION AND DAMAGE TO THE UNDERLYING BEDDING MATERIAL.
5. IT IS RECOMMENDED THAT THE DESIRED DISTRIBUTION OF THE VARIOUS SIZES OF STONE THROUGHOUT THE CHANNEL LINING BE OBTAINED BY SELECTIVE LOADING AT THE SOURCE, BY CONTROLLED DUMPING OF SUCCESSIVE LOADS DURING FINAL PLACEMENT, BY REARRANGING OF INDIVIDUAL STONES BY MECHANICAL EQUIPMENT OR BY HAND, OR BY OTHER WELL CONSIDERED METHODS THAT WILL PRODUCE THE SPECIFIED RESULTS.

ROCK GRADATION REQUIREMENTS:

LIGHT STONE FILLING TYPE I

STONE SIZE	PERCENT TOTAL BY WEIGHT
LIGHTER THAN 110 LBS	90–100
LARGER THAN 6 INCHES	50–100
SMALLER THAN ½ INCH	0–10

LIGHT STONE FILLING TYPE II

STONE SIZE	PERCENT TOTAL BY WEIGHT
HEAVIER THAN 110 LBS	90–100
LARGER THAN 12 INCHES	50–100
SMALLER THAN 6 INCH	0–10

MEDIUM STONE FILLING TYPE III

STONE SIZE	PERCENT TOTAL BY WEIGHT
HEAVIER THAN 110 LBS	50–100
SMALLER THAN 6 INCHES	0–10

HEAVY STONE FILLING TYPE IV

STONE SIZE	PERCENT TOTAL BY WEIGHT
HEAVIER THAN 660 LBS	50–100
SMALLER THAN 6 INCHES	0–10

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NO.	REVISION	BY	DATE

DAIGLER ENGINEERING, P.C.
CIVIL & GEO-ENVIRONMENTAL ENGINEERING
2620 GRAND ISLAND BLVD, GRAND ISLAND, NEW YORK 14072
(716) 773-6872 (716) 773-6873 FAX
JAMES A. DAIGLER, P.E.
NYSPE NO. 061689

DATE: August 2016

SCALE: NOTED

PREPARED FOR: SEALAND WASTE, LLC			MITIGATION PLAN DETAILS
DES. BY:	DRW. BY:	CHK. BY:	CARROLL LANDFILL EXPANSION WETLAND AND DRAINAGEWAY MITIGATION
DWG. DETAIL SHEET.dwg	TOWNS OF KENNEDY & CARROLL	CHATAUQUA COUNTY	STATE OF NEW YORK

SHEET PD-5

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