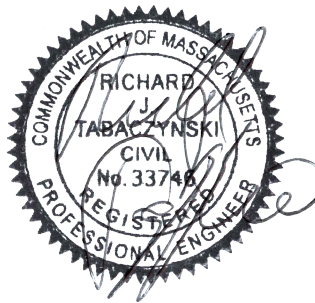# Atlantic
DESIGN ENGINEERS, INC.

Forebay Sizing Calculations
For:
Fearing Hill Road Solar Project
91 & 101 Fearing Hill Road
Wareham, Massachusetts 02576

Applicant:
Wareham MA 3, LLC
101 Summit Lake Drive
Valhalla, NY 10595

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July 26, 2022
Atlantic Project No. 3055.02

Introduction

In response to comments received on 7/19/22 from the Town's consulting engineer, Charles Rowley, sediment forebays are being provided in place of micropools at the outlet pipes of all stormwater basins. These calculations have been prepared to properly size the forebays.

Typically, forebay sizing, per the based upon DEP Stormwater Manual, is based upon a contributing area of "impervious" surface. As solar farms technically do not have any impervious surfaces, the forebays have been sized based upon sediment loading calculations using the Revised Universal Soil Loss Equation (RUSLE) from the USDA which calculates a yearly sediment load based upon the total contributing area. We conservatively assumed barren soil conditions in the calculations and assumed the forebays would be inspected every 2 years and cleaned out, if necessary, as outlined in the Stormwater Operation and Maintenance Plan.

SEDIMENT FOREBAY CALCULATIONS - AREA 1Sa

Fearing Hill Solar Array

Wareham, MA

Sediment Loss per Acre, A (tons/ac/yr) = R*K*LS*C*P (per Universal Soil Loss Equation)[1]		
Drainage Area, A_D, (ac)	7.639	Calculated
Rainfall Factor, R[2]	135.000	
Soil Erodibility Factor , K[3]	0.250	
Lengthen and Slope Factor, LS[4]	0.900	
Crop Management Factor, C[5]	0.450	
Erosion Control Practice Factor, P[6]	0.100	
Sediment Loss per Acre, A (ton/ac/yr)	1.367	R*k*LS*C*P
Sediment Loss, SL (tons/yr)	10.442	A*A_D
Sediment Removal		
Total Sediment Storage, SS (cf/yr)	229.485	SRx2000/91
Operation and Maintenance (every 2 years)	2	time between each cleaning in years
Total Sediment Storage, SS (cf)	458.970	

1. Universal Soil Loss Equation factors obtain from "Ponce, V.M., 1989, EngineeringHydrology, Principles and Practices, Prentice Hall", Pages 538-543

2. Per "Figure 15-2 Rainfall Factor R in the Universal Soil Loss Equation", 'Ponce, V.M., 1989, Engineering Hydrology, Principles and Practices, Prentice Hall", Page 540

3. Per "Table 15-4 Values of Soil Erodibility Facor K", 'Ponce, V.M., 1989, Engineering Hydrology, Principles and Practices, Prentice Hall", Page 541 Boswell Fine Sandy Loam K factor

4. Per "Figure 15-3 Topographic Factor LS in the Universal Soil Loss Equation", 'Ponce, V.M., 1989, Engineering Hydrology, Principles and Practices, Prentice Hall", Page 544, 246 feet length and 7% slopes used as conservative approach

5. Per Table 15-5 "Values of Crop-Management Factor C for Permanent, Pasture, Grazed Forest Land, Range and Idle Land", 'Ponce, V.M., 1989, Engineering Hydrology, Principles and Practices, Prentice Hall", Page 542, No appreciable canopy, 0% Ground Cover Type G factor used

6. Per "Table 15-7 Values of Erosion-Control Practice Factor P for contoured-Farmed Terraced Fields", 'Ponce, V.M., 1989, Engineering Hydrology, Principles and Practices, Prentice Hall", Page 543, 3-8% Land Slope, Graded Channels, Sod Outlets Used

Provided Mircropool Volume =   238 cf (16ftx28ftx1ft deep micropool)

Required Mircropool Volume=   459 cf

Micropool Volume> Required Volume - OK

SEDIMENT FOREBAY CALCULATIONS - AREA 1Sb

Fearing Hill Solar Array
Wareham, MA

Sediment Loss per Acre, A (tons/ac/yr) = R*K*LS*C*P (per Universal Soil Loss Equation)[1]		
Drainage Area, A_D, (ac)	4.098	Calculated
Rainfall Factor, R[2]	135.000	
Soil Erodibility Factor , K[3]	0.250	
Lengthen and Slope Factor, LS[4]	0.900	
Crop Management Factor, C[5]	0.450	
Erosion Control Practice Factor, P[6]	0.100	
Sediment Loss per Acre, A (ton/ac/yr)	1.367	R*k*LS*C*P
Sediment Loss, SL (tons/yr)	5.601	$A*A_D$
Sediment Removal		
Total Sediment Storage, SS (cf/yr)	123.109	SRx2000/91
Operation and Maintenance (every 2 years)	2	time between each cleaning in years
Total Sediment Storage, SS (cf)	246.218	

1. Universal Soil Loss Equation factors obtain from "Ponce, V.M., 1989, EngineeringHydrology, Principles and Practices, Prentice Hall", Pages 538-543

2. Per "Figure 15-2 Rainfall Factor R in the Universal Soil Loss Equation", 'Ponce, V.M., 1989, Engineering Hydrology, Principles and Practices, Prentice Hall", Page 540

3. Per "Table 15-4 Values of Soil Erodibility Facor K", 'Ponce, V.M., 1989, Engineering Hydrology, Principles and Practices, Prentice Hall", Page 541 Boswell Fine Sandy Loam K factor

4. Per "Figure 15-3 Topographic Factor LS in the Universal Soil Loss Equation", 'Ponce, V.M., 1989, Engineering Hydrology, Principles and Practices, Prentice Hall", Page 544, 380 feet length and 3% slopes used as conservative approach

5. Per Table 15-5 "Values of Crop-Management Factor C for Permanent, Pasture, Grazed Forest Land, Range and Idle Land", 'Ponce, V.M., 1989, Engineering Hydrology, Principles and Practices, Prentice Hall", Page 542, No appreciable canopy, 0% Ground Cover Type G factor used

6. Per "Table 15-7 Values of Erosion-Control Practice Factor P for contoured-Farmed Terraced Fields", 'Ponce, V.M., 1989, Engineering Hydrology, Principles and Practices, Prentice Hall", Page 543, 3-8% Land Slope, Graded Channels, Sod Outlets Used

Provided Mircpool Volume = 252 cf

Required Mircpool Volume= 246 cf

Micropool Volume> Required Volume - OK

SEDIMENT FOREBAY CALCULATIONS - AREA 2S
Fearing Hill Solar Array
Wareham, MA

Sediment Loss per Acre, A (tons/ac/yr) = R*K*LS*C*P (per Universal Soil Loss Equation)[1]		
Drainage Area, A_D, (ac)	2.700	Calculated
Rainfall Factor, R[2]	135.000	
Soil Erodibility Factor , K[3]	0.250	
Lengthen and Slope Factor, LS[4]	0.900	
Crop Management Factor, C[5]	0.450	
Erosion Control Practice Factor, P[6]	0.100	
Sediment Loss per Acre, A (ton/ac/yr)	1.367	R*k*LS*C*P
Sediment Loss, SL (tons/yr)	3.691	A*A_D
Sediment Removal		
Total Sediment Storage, SS (cf/yr)[8]	81.111	SRx2000/91
Operation and Maintenance (every 2 years)	2	time between each cleaning in years
Total Sediment Storage, SS (cf)	162.223	

1. Universal Soil Loss Equation factors obtain from "Ponce, V.M., 1989, EngineeringHydrology, Principles and Practices, Prentice Hall", Pages 538-543

2. Per "Figure 15-2 Rainfall Factor R in the Universal Soil Loss Equation", 'Ponce, V.M., 1989, Engineering Hydrology, Principles and Practices, Prentice Hall", Page 540

3. Per "Table 15-4 Values of Soil Erodibility Facor K", 'Ponce, V.M., 1989, Engineering Hydrology, Principles and Practices, Prentice Hall", Page 541 Boswell Fine Sandy Loam K factor

4. Per "Figure 15-3 Topographic Factor LS in the Universal Soil Loss Equation", 'Ponce, V.M., 1989, Engineering Hydrology, Principles and Practices, Prentice Hall", Page 544, 330 feet length and 6% slopes used as conservative approach

5. Per Table 15-5 "Values of Crop-Management Factor C for Permanent, Pasture, Grazed Forest Land, Range and Idle Land", 'Ponce, V.M., 1989, Engineering Hydrology, Principles and Practices, Prentice Hall", Page 542, No appreciable canopy, 0% Ground Cover Type G factor used

6. Per "Table 15-7 Values of Erosion-Control Practice Factor P for contoured-Farmed Terraced Fields", 'Ponce, V.M., 1989, Engineering Hydrology, Principles and Practices, Prentice Hall", Page 543, 3-8% Land Slope, Graded Channels, Sod Outlets Used

Provided Mircropool Volume =	168	cf
Required Mircropool Volume=	162	cf

Micropool Volume> Required Volume - OK