

**E&S WORKSHEET # 11**

**Channel Design Data**

PROJECT NAME: ATLANTIC SUNRISE PROJECT - NORTH DIAMOND REGULATOR STATION

LOCATION: LEHMAN TOWNSHIP, LUZERNE COUNTY, PENNSYLVANIA

PREPARED BY: HFT DATE: 07/26/2017

CHECKED BY: AJB DATE: 07/26/2017

CHANNEL OR CHANNEL SECTION	Ex. Concentrated Flowpath Downstream of Culvert 1/Rain Garden	Ex. Concentrated Flowpath Downstream of Swale 1		
TEMPORARY OR PERMANENT? (T OR P)	P	P		
DESIGN STORM (2, 5, OR 10 YR)	10	10		
ACRES (AC)	1.91	12.6		
MULTIPLIER <sup>1</sup> (1.6, 2.25, or 2.75) <sup>1</sup>	2.75	2.75		
Qr (REQUIRED CAPACITY) (CFS)	5.25	34.65		
Q (CALCULATED AT FLOW DEPTH d) (CFS)	5.00	34.95		
PROTECTIVE LINING <sup>2</sup>	Grass	Grass/SC250		
n (MANNING'S COEFFICIENT) <sup>2</sup>	0.035	0.055		
Va (ALLOWABLE VELOCITY) (FPS)	N/A	N/A		
V (CALCULATED AT FLOW DEPTH d) (FPS)	2.00	4.04		
ta (MAX ALLOWABLE SHEAR STRESS) (LB/FT <sup>2</sup> )	1.00	8.00		
td (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT <sup>2</sup> )	0.36	3.08		
CHANNEL BOTTOM WIDTH (FT)	0.5	0.5		
CHANNEL SIDE SLOPES (H:V)	4	4		
D (TOTAL DEPTH) (FT)	2.0	2.0		
CHANNEL TOP WIDTH @ D (FT)	16.5	16.5		
d (CALCULATED FLOW DEPTH) (FT)	0.73	1.41		
CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)	6.34	11.78		
BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)	0.68	0.35		
d50 STONE SIZE (IN)	N/A	N/A		
A (GROSS-SECTIONAL AREA) (SQ. FT.)	2.50	8.66		
R (HYDRAULIC RADIUS)	0.38	0.71		
S (BED SLOPE) <sup>3</sup> (FT/FT)	0.008	0.035		
Sc (CRITICAL SLOPE) (FT/FT)	0.025	0.051		
.7Sc (FT/FT)	0.018	0.036		
1.3Sc (FT/FT)	0.033	0.066		
STABLE FLOW? (Y/N)	Y	Y		
FREEBOARD BASED ON UNSTABLE FLOW (FT)	0.11	0.43		
FREEBOARD BASED ON STABLE FLOW (FT)	0.50	0.50		
MINIMUM REQUIRED FREEBOARD <sup>4</sup> (FT)	0.50	0.50		
DESIGN METHOD FOR PROTECTIVE LINING <sup>5</sup> PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)	S	S		

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.