APPENDIX K
Intake Area Report

CALCULATION COVER SHEET

PROJECT	JOB NO.	CALC NO. 25493-000-K0C-7400-00001	SHEET
Bell Bend Nuclear Power Plant	25493		1 of 19

SUBJECT	DISCIPLINE
Intake Area Storm Water Management Analysis	G&HES

CALCULATION STATUS DESIGNATION	PRELIMINARY	CONFIRMED with PRELIMINARY INFORMATION	CONFIRMED	SUPERSEDED	VOIDED
		X			

COMPUTER PROGRAM/TYPE	SCP	PROGRAM NO.	VERSION/RELEASE NO.	OPERATING SYSTEM
	☐	NONE	--	–
NUCLEAR QUALITY CLASSIFICATION	SAFETY-RELATED ☐	AUGMENTED QUALITY ☐	NONSAFETY-RELATED ☒	

Preliminary Information:

Site grade at the intake area is based on preliminary data.

DIT 25493-000-30X-K01G-00001, Rev. 000

NO.	REASON FOR REVISION	TOTAL NO. OF SHEETS	LAST SHEET NO.	BY	CHECKED	APPROVED/ ACCEPTED	DATE
000	Issued for Use	19	Sht 19	YK	CMF	GB/MN	03 Nov. '10

RECORD OF REVISIONS

I. Objective and Methodology

The objective of this calculation is to determine the following for the intake area: 1) the pre- and post-development runoff volumes; 2) pre- and post-development peak discharges; and 3) guidelines on channel protection for points of discharge.

Applicable regulations and design criteria established by the Commonwealth of Pennsylvania were utilized in estimating the pre- and post-development runoff volumes and peak discharges; and also for the design of channel protection at discharge points. TR-55 methodology is used to determine peak discharges from sub-basins.

II. Site Description

The proposed Bell Bend Nuclear Power Plant (PPL Bell Bend, LLC / UniStar Nuclear Energy) is located in Salem Township, Luzerne County, Pennsylvania. The proposed site for this project is located north of S.R. 0011 and is bounded by Beachgrove Rd. The nearest intersection to the project is Market St. with Beachgrove Rd.

The proposed intake area is located on the west bank of Susquehanna River, east of the power block area and south of the existing intake for Susquehanna Units 1 & 2. Figure 1 shows the location of the intake area. Horizontal datum used in this calculation is the North American Datum, 1983 in conjunction with the State Plane coordinate system of Pennsylvania North FIPS 3701.

The land cover of the intake area is mostly grassland and wooded and covers approximately 14.9 acres. Currently there is no agricultural, industrial/commercial or residential facility at the site. All runoff from the area drains directly to the Susquehanna River, either through an unnamed stream that cuts across the site, or directly as overland flow to the river. There is a marsh area near the southwest corner of the site that potentially can retain precipitation and runoff.

For the post-development conditions, part of the unnamed stream will be filled to build the intake structure and the associated access road and parking area in addition to discontinuing overflow into the stream from the adjacent canal. The stream will be diverted from just upstream of the toe of the access road embankment to the river via a pipe. The area north of the proposed intake structure and south of the existing intake structure will be drained to the river via a pipe. In addition, the runoff from the southern embankment of the intake structure, access road and parking area will be intercepted by a swale and drain directly to the river. These three point discharges discussed above will be designed for scour and erosion protection stemming from peak runoff discharges. Figure 2 shows the location of these discharge points (Point of Interests (POIs) I-1, I-2 and I-5).

III. Analysis and Design Data

A. Soil Properties

As indicated in Figure 3, the soils within the intake area consist of Holly silt loam (Ho) and Pope Soils (Ps). The soil types of the area fall into hydrological soil group (HSG) Type B.

B. 24-Hour Rainfall Depths

The 24-hour rainfall depths are obtained from the Reference 3 and are presented in Table 1.

Table 1: 24-Hour Rainfall Depths (P) for the Bell Bend Site

ARI(1)	2-year	10-Year	25-year	100-Year
Depth (in)	3.02	4.38	5.41	7.49

Note: (1) Average Recurrence Interval.

A Type-II rainfall distribution is used for the TR-55 method to determine peak discharges based on the rainfall depth values presented in Table 1.

C. Preliminary Information: Site grade is preliminary data and was obtained from Civil Discipline. The site grade is shown in Figures 1 and 2.

IV. Pre-Development Runoff Peak Discharges

The pre-development peak discharges are determined for the intake area. The details are described in the following sections:

A. Drainage Areas

The pre-development drainage areas (sub-basins) of the intake area are shown in Figure 1. Those areas are summarized in Table 2.

Table 2: Pre-development Drainage Areas

Sub-basin	Area	
	(ft^2)	(ac)
I-3	115,158	2.64
I-4	14,010	0.32
I-5	367,213	8.43
I-6	153,532	3.52
Total	649,913	14.92

B. Runoff Curve Numbers

Runoff curve numbers (CNs) are a function of soil type and land use, as indicated by the NRCS hydrologic group rating, and were determined based on Tables 2-2a through 2-2d of TR-55. (Reference 2). As indicated in Figure 3, the HSG for the intake area is Type B. Table 3a details the CNs for the different types of land cover and Table 3b summarizes the composite CNs for the sub-basins. The composite CNs for the sub-basins were calculated based area-weighted averaging.

Table 3a. Pre-development Runoff Curve Number for Land Cover Types

Land Cover Type	HSG	Curve Number
Woods	B	60
Grass	B	58
Road/paved	B	98
Water	--	100

Table 3b. Pre-development Runoff Curve Number for Sub-basins

Sub-basin	Area (%)				Composite Curve Number
	Woods	Grass	Paved	Water	
I-3	10	90	0	0	58.2
I-4	50	50	0	0	59.0
I-5	20	75	2	3	60.4
I-6	40	50	0	10	63.0

C. Time of Concentrations

NRCS methodologies described in TR-55, Reference 2, are used to estimate the time of concentration for each sub-basin. The time of concentration flow paths are divided into three segments: sheet flow; shallow concentrated flow; and ditch (stream) flow. The equations used to determine the travel time through each segment are described as follows:

Sheet Flow:

$$T_1 = \frac{0.007(nL)^{0.8}}{P_2^{0.5} S^{0.4}}$$

Where:
n = surface roughness coefficient (based on shallow surface flows) (Reference 2)
L = flow path length, ft; P_2 = 2-yr, 24-hr rainfall = 3.02 inches (Table 1);
S = Flow path slope

Shallow Concentrated Flow:

From Reference 2, page 3-2, velocity for unpaved surfaces, $V = 16.1345S^{0.5}$, where S is the flow path slope.

$$T_2 = \frac{L}{3600V}$$

Stream Flow:

The average flow velocity in the natural stream is assumed to be about 1.5 ft/s.

The time of concentration (Tc) flow path for each sub-basin POI is shown in Figure 1. For sub-basin I-6, the runoff does not discharge directly to the river, but accumulates within the marsh area. For sub-basins I-3 and I-4, there are no defined point discharge locations, but runoff would enter the river after traveling as overland flow. For sub-basin I-5, the POI is at the mouth of the unnamed stream where it enters the river. For the portion of the flow path past the small marsh area northeast of the sub-basin, it is conservatively assumed that the travel time is negligible. As indicated in Figure 1, there is a small area by the northeast corner this sub-basin that the runoff enters as overland flow to the river without draining to the steam first. Because this area is small (about 1.1% of the sub-basin), it is not delineated separately but is included with within sub-basin I-6.

The Tc values for each sub-basin are calculated and summarized in Table 4.

Table 4 – Sub-Basin Outlet Time of Concentration Estimates for Pre-Development Conditions

	Sheet Flow (Segment A-B)				Shallow Concentrated Flow (Segment B-C)				Stream Flow (Segment C-D)			Calculated
Sub-Basin	Length L (ft)	Manning's *n*	Slope S	T_1 (hr)	Length L (ft)	Slope S	Calc. Velocity V (fps)	T_2 (hr)	Length L (ft)	Est. Vel. V (fps)	T_3 (hr)	Time of Conc. (min)
I-3	100	0.15	0.024	0.156	110	0.07	4.3	0.007	350	1.5	0.065	13.7
I-4	100	0.15	0.001	0.579	90	0.010	1.6	0.015	0	0	0.000	35.7
I-5	100	0.15	0.100	0.088	450	0.007	1.3	0.095	370	2.0	0.051	14.1
I-6	100	0.15	0.005	0.304	260	0.008	1.5	0.049	0	0	0.000	21.2

D. Peak Flows

The peak discharges are determined by the graphical method provided in Chapter 4 of TR-55 (Reference 2).

The formulation for the peak discharge is as follows:

$$q_p = q_u A_m Q F_p$$

where q_p is peak discharge (cfs); q_u is unit discharge (cms/in); A_m is drainage area (mile^2); Q is runoff depth (in) and F_p is pond and swamp adjustment factor. Because the effect of pond/swamp is directly accounted in this analysis, the adjustment factor is set to one.

Details of the peak flow calculations are provided in Tables 5a through 5d.

Table 5a. 2-Year; 24-Hour Rainfall Peak Flows for Pre-Development Conditions

Sub-basin	CN	Ia (in)	Ia /P	T_c (hours)	q_u (csm/in)	A_m (ac)	A_m (sq. mi.)	Q runoff (in.)	Peak Flow (cfs)
I-3	58.2	1.44	0.48	0.228	410	2.64	0.00413	0.29	0.5
I-4	59.0	1.39	0.46	0.594	280	0.32	0.00050	0.31	0.04
I-5	60.4	1.31	0.43	0.235	480	8.43	0.01317	0.35	2.2
I-6	63.0	1.17	0.39	0.353	460	3.52	0.00550	0.44	1.1

Table 5b. 10-Year; 24-Hour Rainfall Peak Flows for Pre-Development Conditions

Sub-basin	CN	Ia (in)	Ia /P	T_c (hours)	q_u (csm/in)	A_m (ac)	A_m (sq. mi.)	Q runoff (in.)	Peak Flow (cfs)
I-3	58.2	1.44	0.33	0.228	700	2.64	0.00413	0.86	2.5
I-4	59.0	1.39	0.32	0.594	420	0.32	0.00050	0.90	0.2
I-5	60.4	1.31	0.30	0.235	700	8.43	0.01317	0.98	9.0
I-6	63.0	1.17	0.27	0.353	610	3.52	0.00550	1.13	3.8

Table 5c. 25-Year; 24-Hour Rainfall Peak Flows for Pre-Development Conditions

Sub-basin	CN	Ia (in)	Ia /P	T_c (hours)	q_u (csm/in)	A_m (ac)	A_m (sq. mi.)	Q, runoff (in.)	Peak Flow (cfs)
I-3	58.2	1.44	0.27	0.228	710	2.64	0.00413	1.42	4.2
I-4	59.0	1.39	0.26	0.594	440	0.32	0.00050	1.47	0.3
I-5	60.4	1.31	0.24	0.235	710	8.43	0.01317	1.58	14.7
I-6	63.0	1.17	0.22	0.353	640	3.52	0.00550	1.77	6.3

Table 5d. 100-Year; 24-Hour Rainfall Peak Flows for Pre-Development Conditions

Sub-basin	CN	Ia (in)	Ia /P	T_c (hours)	q_u (csm/in)	A_m (ac)	A_m (sq. mi.)	Q runoff (in.)	Peak Flow (cfs)
I-3	58.2	1.44	0.19	0.228	760	2.64	0.00413	2.77	8.7
I-4	59.0	1.39	0.19	0.594	490	0.32	0.00050	2.85	0.7
I-5	60.4	1.31	0.18	0.235	720	8.43	0.01317	3.00	28.4
I-6	63.0	1.17	0.16	0.353	690	3.52	0.00550	3.27	12.4

V. Post-Development Runoff Peak Discharges

The post-development peak discharges are determined for the intake area. The details are described in the following sections.

A. Drainage Areas

The post-development drainage areas (sub-basins) of the intake area are shown in Figure 2. Those areas are summarized in Table 6. The sub-basin I-4 for post-development conditions is identical to sub-basin I-4 for the pre-development conditions, as no area will be disturbed within the sub-basin. Sub-basin I-5 in the pre-development conditions is represented by sub-basins I-5, I-1 and I-2 in the post-development conditions. Therefore, the summation of the peak discharges from sub-basins I-5, I-1 and I-2 for post-development conditions will be compared to the sub-basin I-5 peak discharge under pre-development conditions. The land cover type for the sub-basin changes because of the intake structure and the associated access road and parking lot, in addition to the dredging stockpile within the sub-basin. The major difference between pre- and post-development for the sub-basins I-3 and I-6 is land cover type change due to the dredging stockpile.

Table 6: Post-development Drainage Areas

Sub-basin	Area	
	(ft^2)	(ac)
I-1	23,788	0.55
I-2	62,351	1.43
I-3	115,305	2.65
I-4	14,010	0.32
I-5	280,135	6.43
I-6	154324	3.54
Total	649,913	14.92

B. Runoff Curve Numbers

Runoff curve numbers are a function of soil type and land use, as indicated by the NRCS hydrologic group rating, and were determined based on Tables 2-2a through 2-2d of TR-55. (Reference 2). The CN for dredging stockpile is determined to be 79 under HSG C, assuming that the dredging material comprises of sand, silt and clay, and also is covered with grass. The CN for side slopes of road way embankments is determined assuming grassed conditions.

As indicated in Figure 3, the HSG for the intake area is Type B. Table 7a details the CNs for the different types of land cover and Table 7b summarizes the composite CNs for the sub-basins. The composite CNs for the sub-basins were calculated based area-weighted averaging.

Table 7a. Post-development Runoff Curve Number for Land Cover Types

Land Cover Type	HSG	Curve Number
Woods	B	60
Grass	B	58
Road/paved/structure	--	98
Water	--	100
Dredge Stockpile	C	79
Side Slopes	B	61

Table 7b. Post-development Runoff Curve Number for Sub-basins

Sub-basin	Area (%)						Composite Curve Number
	Woods	Grass	Paved	Water	Dredge	Side Slopes	
I-1	0	35	30	0	10	25	72.9
I-2	5	0	40	0	0	55	75.8
I-3	10	25	0	0	65	0	71.9
I-4	50	50	0	0	0	0	59.0
I-5	35	40	1	2	10	12	62.4
I-6	30	40	0	8	22	0	66.6

C. Time of Concentration

The time of concentration for the post-development conditions are computed that same way as the pre-development condition as discussed in Section IV.C (NRCS methodologies described in Reference 2 are used to estimate the time of concentration for each of the sub-basin).

The time of concentration (Tc) flow path for each sub-basin POI is shown in Figure 2. For sub-basin I-6, the runoff does not discharge directly to the river, but is detained within the marsh area. For sub-basins I-3 and I-4, there are no defined point discharge locations, but the runoff would enter the river after traveling as overland flow. For sub-basin I-5, the POI is at the entrance of the stream diversion pipe, as indicated in Figure 2. For the portion of the flow path past the small marsh area northeast of the sub-basin, it is conservatively assumed that the travel time is negligible. As indicated in Figure 2, there is a small area by the northeast corner this sub-basin that the runoff enters as overland flow to the river without draining to the steam first. However, for this calculation this area is included within sub-basin I-1.

The Tc values for each sub-basin are calculated and summarized in Table 8.

Table 8 – Sub-Basin Outlet Time of Concentration Estimates for Post-Development Conditions

Sub-Basin	Sheet Flow (Segment A-B)				Shallow Concentrated Flow (Segment B-C)				Stream Flow (Segment C-D)			Calculated Time of Conc. (min)
	Length L (ft)	Manning's *n*	Slope S	T_1 (hr)	Length L (ft)	Slope S	Calc. Velocity V (fps)	T_2 (hr)	Length L (ft)	Est. Vel. V (fps)	T_3 (hr)	
I-1	100	0.011	0.060	0.013	150	0.042	3.29	0.013	90	3.00	0.008	6.0*
I-2	100	0.011	0.200	0.008	100	0.15	6.25	0.004	0	0	0.000	6.0*
I-3	100	0.011	0.050	0.014	20	0.075	4.42	0.001	350	1.50	0.065	6.0*
I-4	100	0.15	0.001	0.579	90	0.010	1.61	0.015	0	0	0.000	35.7
I-5	100	0.15	0.100	0.088	450	0.007	1.32	0.095	0	0	0.000	11.0
I-6	100	0.15	0.005	0.304	260	0.008	1.47	0.049	0	0	0.000	21.2

Note: * Time of concentration calculated for minimum of 6 min.

D. Peak Flows

The peak flows for the post-development conditions are computed that same way as the pre-development condition as discussed in Section IV.D (graphical method provided in Chapter 4 of TR-55 (Reference 2)).

Details of the peak flow calculations are provided in Tables 9a through 9d.

Table 9a. 2-Year; 24-Hour Rainfall Peak Flows for Post-Development Conditions

Sub-basin	CN	Ia (in)	Ia /P	Tc (hours)	q_u (csm/in)	A_m (ac)	A_m (sq. mi.)	Q, runoff (in.)	Peak Flow (cfs)
I-1	72.9	0.75	0.25	0.100	985	0.55	0.00085	0.86	0.7
I-2	75.8	0.64	0.21	0.100	990	1.43	0.00224	1.01	2.2
I-3	71.9	0.78	0.26	0.100	985	2.65	0.00414	0.81	3.3
I-4	59.0	1.39	0.46	0.594	280	0.32	0.00050	0.31	0.04
I-5	62.4	1.21	0.40	0.183	610	6.43	0.01005	0.42	2.6
I-6	66.6	1.00	0.33	0.353	560	3.54	0.00554	0.58	1.8

Table 9b. 10-Year; 24-Hour Rainfall Peak Flows for Post-Development Conditions

Sub-basin	CN	Ia (in)	Ia /P	Tc (hours)	q_u (csm/in)	A_m (ac)	A_m (sq. mi.)	Q, runoff (in.)	Peak Flow (cfs)
I-1	72.9	0.75	0.17	0.100	995	0.55	0.00085	1.79	1.5
I-2	75.8	0.64	0.15	0.100	997	1.43	0.00224	2.01	4.5
I-3	71.9	0.78	0.18	0.100	992	2.65	0.00414	1.72	7.1
I-4	59.0	1.39	0.32	0.594	420	0.32	0.00050	0.90	0.2
I-5	62.4	1.21	0.28	0.183	820	6.43	0.01005	1.10	9.0
I-6	66.6	1.00	0.23	0.353	600	3.54	0.00554	1.36	4.5

Table 9c. 25-Year; 24-Hour Rainfall Peak Flows for Post-Development Conditions

Sub-basin	CN	Ia (in)	Ia /P	Tc (hours)	q_u (csm/in)	A_m (ac)	A_m (sq. mi.)	Q, runoff (in.)	Peak Flow (cfs)
I-1	72.9	0.75	0.14	0.100	998	0.55	0.00085	2.59	2.2
I-2	75.8	0.64	0.12	0.100	1000	1.43	0.00224	2.85	6.4
I-3	71.9	0.78	0.14	0.100	998	2.65	0.00414	2.51	10.3
I-4	59.0	1.39	0.26	0.594	440	0.32	0.00050	1.47	0.3
I-5	62.4	1.21	0.22	0.183	830	6.43	0.01005	1.73	14.4
I-6	66.6	1.00	0.19	0.353	625	3.54	0.00554	2.06	7.1

Table 9d. 100-Year; 24-Hour Rainfall Peak Flows for Post-Development Conditions

Sub-basin	CN	Ia (in)	Ia /P	Tc (hours)	q_u (csm/in)	A_m (ac)	A_m (sq. mi.)	Q, runoff (in.)	q_p (cfs)
I-1	72.9	0.75	0.10	0.100	1000	0.55	0.00085	4.34	3.7
I-2*	75.8	0.64	0.09	0.100	1010	1.43	0.00224	4.67	10.5
I-3	71.9	0.78	0.10	0.100	1000	2.65	0.00414	4.23	17.5
I-4	59.0	1.39	0.19	0.594	490	0.32	0.00050	2.85	0.7
I-5	62.4	1.21	0.16	0.183	870	6.43	0.01005	3.21	28.1
I-6	66.6	1.00	0.13	0.353	650	3.54	0.00554	3.66	13.2

VI. Pre- and Post-Development Runoff Volumes

The pre- and post-development runoff volumes for the intake area were computed based on WORKSHEET 4 of PADEP's stormwater BMP manual, Reference 1, as shown in Table 10. Per the manual, the runoff volume change was based on 2-Year, 24-Hour rainfall event.

Table 10. 2-Year Pre- and Post-Development Runoff Volumes for the Intake Area

Existing Conditions:

Cover Type/Condition	Soil Type	Area		CN	S	Ia	Q Runoff(1)	Runoff Volume(2)
		(ft^2)	(ac)		(in)	(0.2*S)	(in)	(ft^3)
Woods	B	153376	3.52	60	6.67	1.33	0.34	4,353
Grass	B	463522	10.64	58	7.24	1.45	0.28	10,827
Road/paved	--	6645	0.15	98	0.20	0.04	2.79	1,544
Water	--	26370	0.61	100	0.00	0.00	3.02	6,636
TOTAL:			14.92					23,360

Developed Conditions:

Cover Type/Condition	Soil Type	Area		CN	S	Ia	Q Runoff(1)	Runoff Volume(2)
		(ft^2)	(ac)		(in)	(0.2*S)	(in)	(ft^3)
Woods	B	165998	3.81	60	6.67	1.33	0.34	4,711
Grass	B	217941	5.00	58	7.24	1.45	0.28	5,091
Dredge Pile	C	139292	3.20	79	2.66	0.53	1.20	13,965
Paved	--	34878	0.80	98	0.20	0.04	2.79	8,104
Side slopes	B	73856	1.70	61	6.39	1.28	0.37	2,294
Water	--	17949	0.41	100	0.00	0.00	3.02	4,517
TOTAL:			14.92					38,682

2-Year Runoff Volume Increase: 15,322 ft^3

(1) Runoff (in) = $Q = (P - 0.2S)^2 / (P + 0.8S)$ where
P = 2-Year, 24-Hour Rainfall (in)
S = (1000/CN) - 10
(2) Runoff Volume (ft^3) = Q x Area x 1/12
Q = Runoff (in)
Area = Land use area (ft^2)

VII. Points of Discharge

There are three discharge points where runoffs are directed towards Susquehanna River. The first one is from the diversion pipe of the unnamed stream (POI-5). The second is from the area between the existing and proposed intake structures and via a pipe (POI-1). The required pipe sizes will have to be determined based on the 25-year, 24-hour peak flow rates and pipe slopes. The third discharge point is where the toe of the southern embankment of the intake structures meets the bank of the river. A grassed swale has to be provided that parallels the toe of the embankment and directs the peak flow of 25-year, 24-hour rainfall event to the river.

Outlet protection riprap over geotextile will have to be provided for the three discharge points in order to reduce erosive discharge velocities. The peak discharges will be based on 25-year, 24-hour rainfall event.

VIII. Summary of Results

The comparison of peak discharges for the pre- and post-development is listed in Table 11, below.

Table 11. Comparison of Pre- and Post-Development Peak Flows

Sub-basin	Pre-Development				Post-Development			
	2-Year	10-Year	25-Year	100-Year	2-Year	10-Year	25-Year	100-Year
I-1,I-2, I-5	2.2	9.0	14.7	28.4	5.5	15.0	23.0	42.3
I-3	0.5	2.5	4.2	8.7	3.3	7.1	10.3	17.5
I-4	0.04	0.2	0.3	0.7	0.04	0.2	0.3	0.7
I-6	1.1	3.8	6.3	12.4	1.8	4.5	7.1	13.2

The 2-Year, 24-Hour runoff volumes for pre- and post-development conditions of the intake area are 23,360 ft^3 and 38,682 ft^3, respectively, with an increase of 15,322 ft^3.

Adequate pipe sizes and outlet protected will have to be provided for the runoff outlet to the river.

IX. References

1. Bureau of Watershed Management, Department of Environmental Protection, *Pennsylvania Stormwater Best Management Practices Manual*, December 30, 2006.

2. Conservation Engineering Division, Natural Resources Conservation Service, U.S. Department of Agriculture, *Technical Release 55, Urban Hydrology for Small Watersheds*, June 1986.

3. Sargent & Lundy, LLC, Report No. SL-009446, Revision 5, Project No. 12198-415, *Conceptual Design of Stormwater Management, Bell Bend Nuclear Power Plant* (UniStar Nuclear Energy), July 28, 2010.

4. Pennsylvania Spatial Data Access at URL: ftp://www.pasda.psu.edu/pub/pasda/soils/luzerne_soils.zip, published on September 22, 2004 and retrieved on October 06, 2010.

5. GoogleEarth satellite (land surface) map of the intake area, accessed on October 27, 2010.

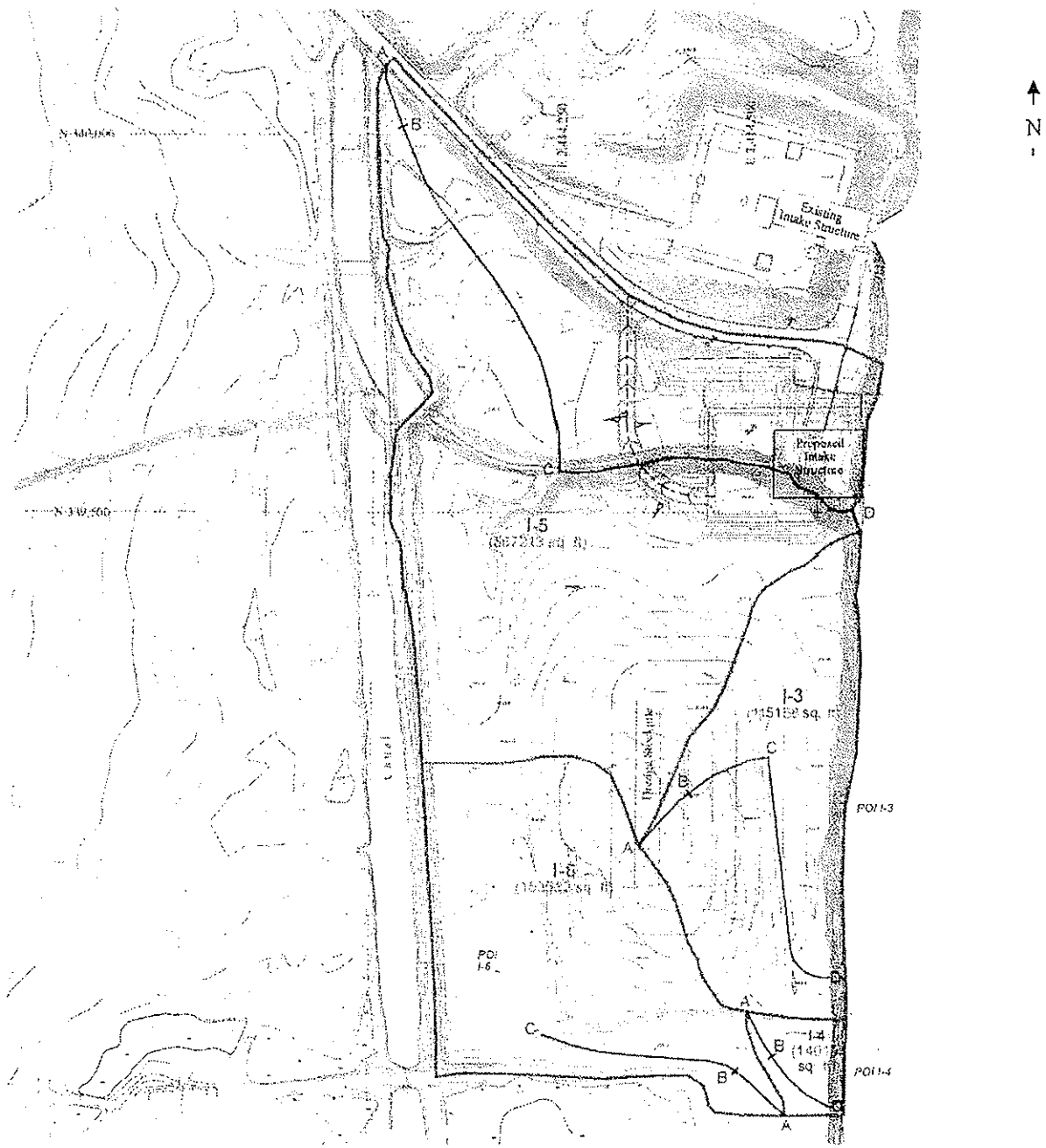

Figure 1. Intake Area Pre-Development Sub-basin Delineation and T_c Flow Paths (site grade is preliminary data)

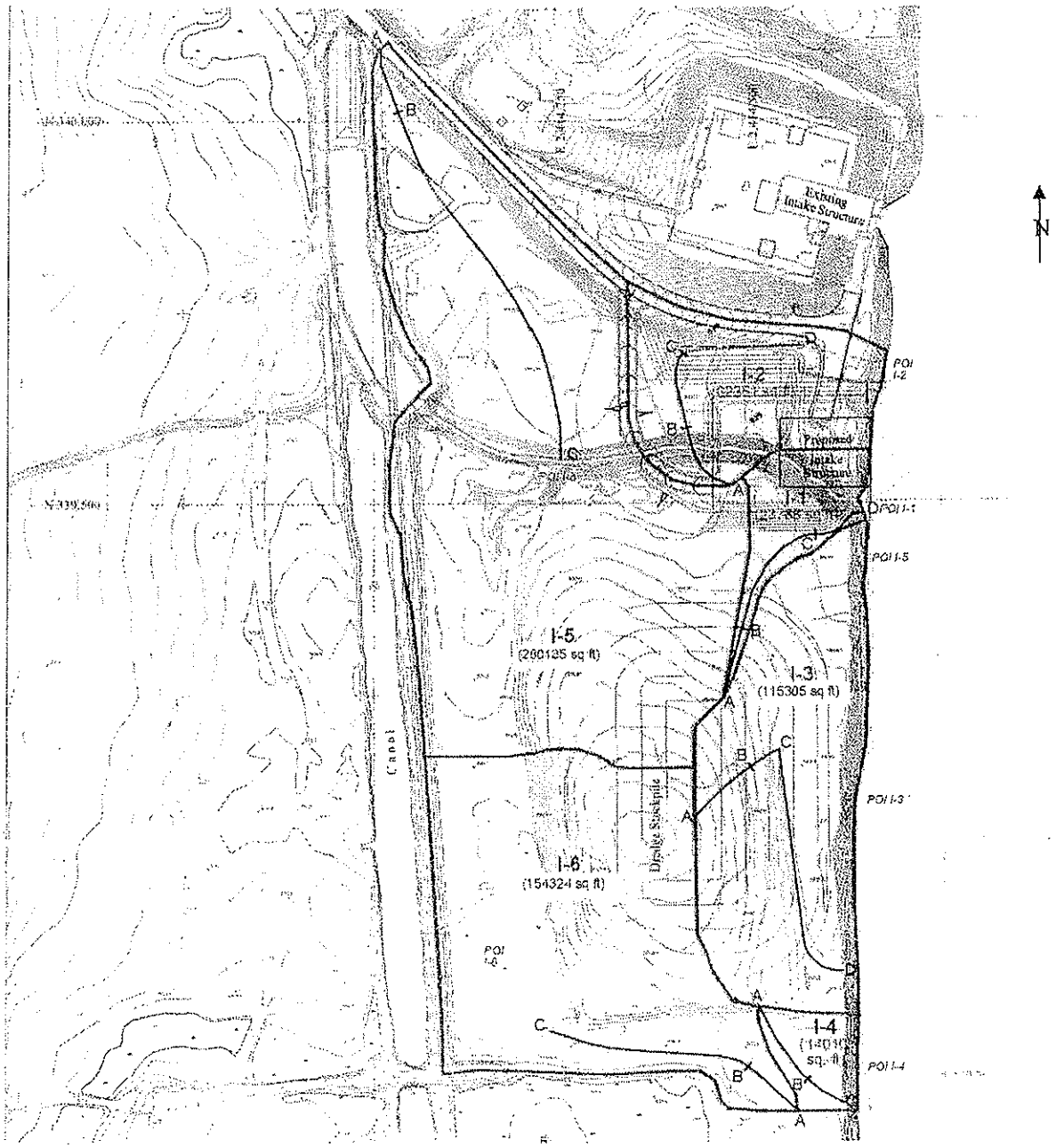

Figure 2. Intake Area Post-Development Sub-basin Delineation and T_c Flow Paths (site grade is preliminary data)

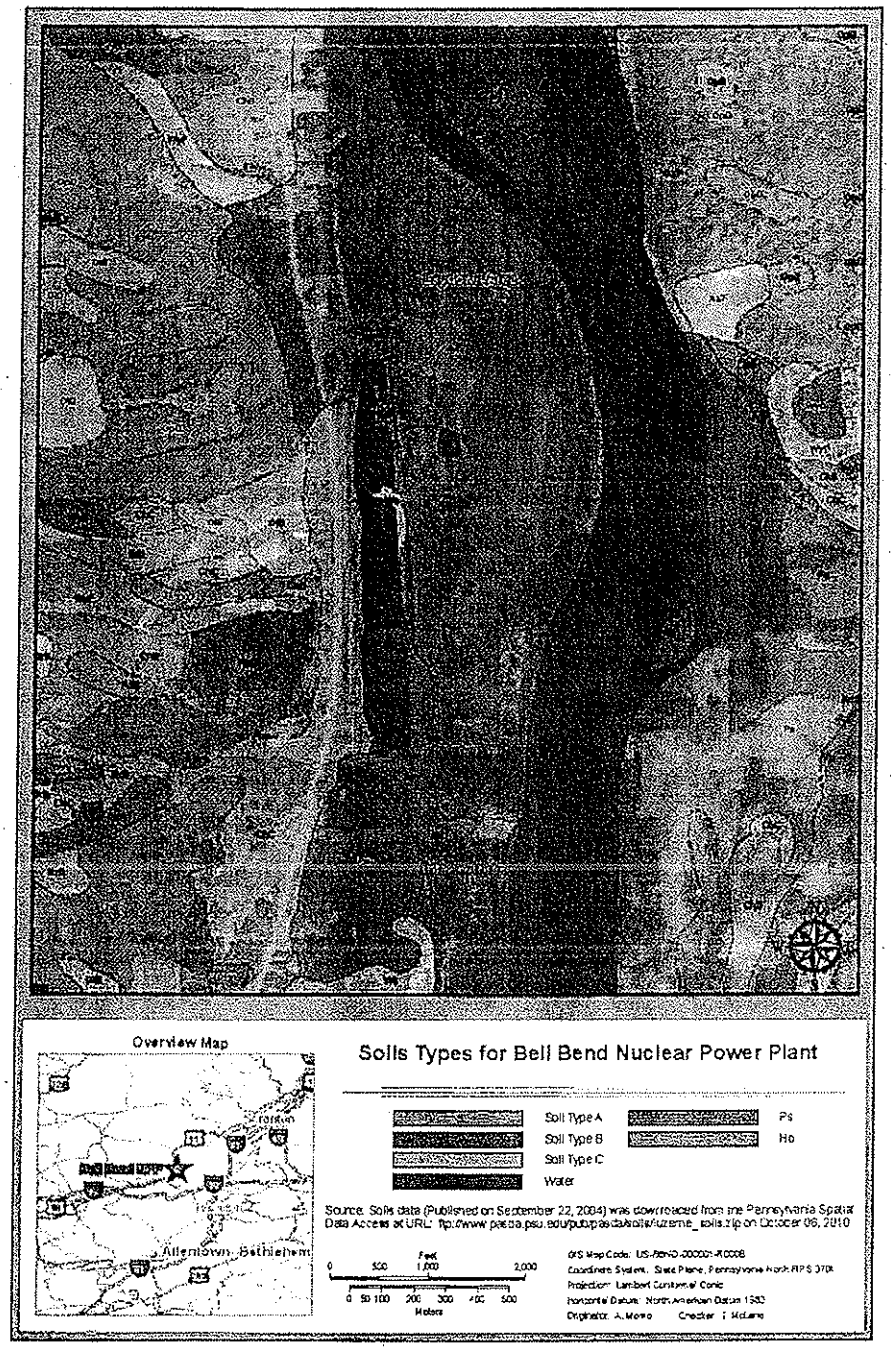

Figure 3. Soil Type at Intake and Surrounding Area (Reference 4)

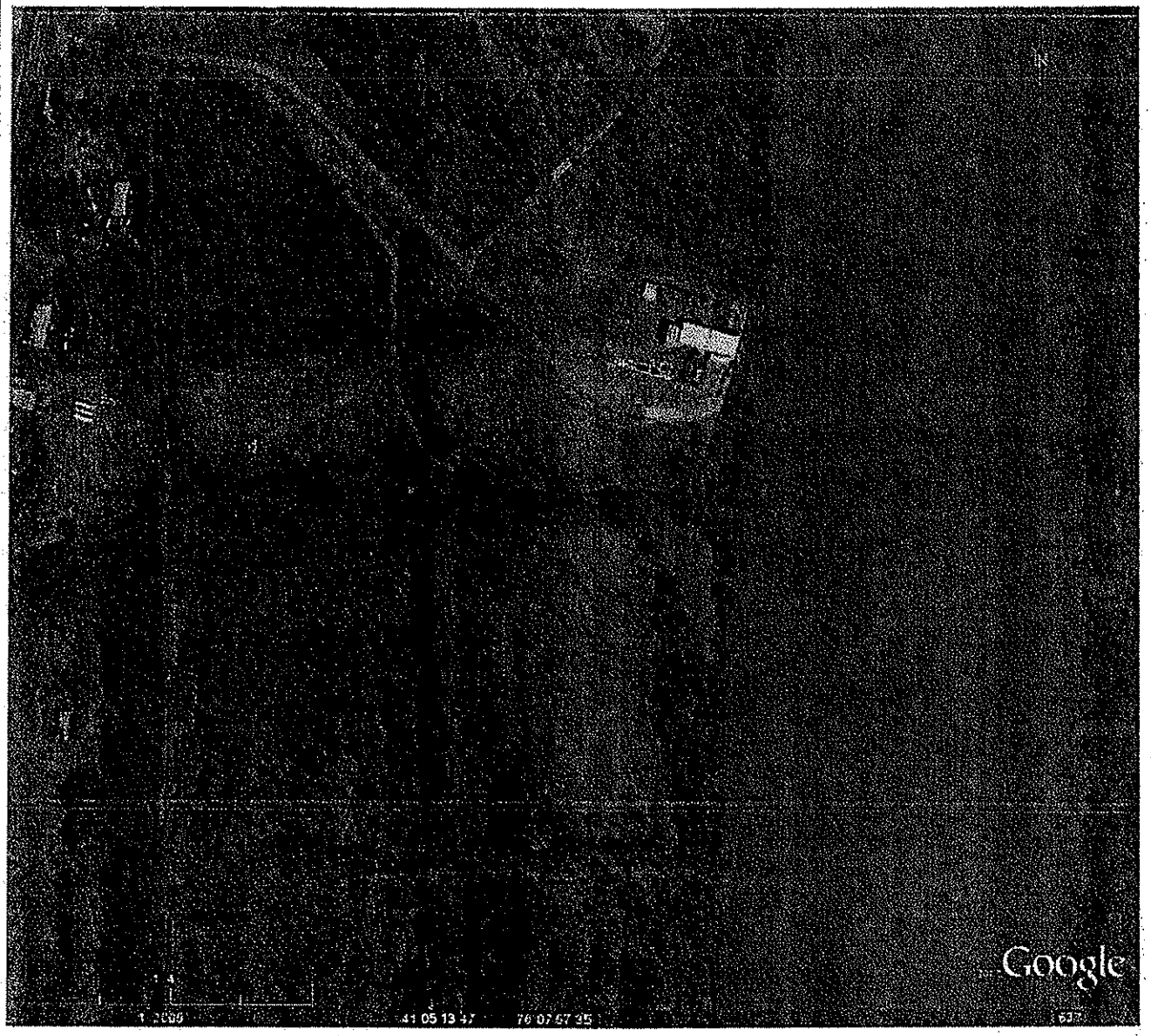

Figure 4. Land Cover at the Intake and Surrounding Area (Reference 5)

POI I-1

2. SUMMARY TABLE FOR SUPPORTING CALCULATION AND MEASUREMENT DATA

Please reference the Stormwater Methodology used (i.e. SCS Method) SCS Method

	Pre-construction	Post Construction	Net Change
Design storm frequency 2 years Rainfall amount 3.02 inches			
Impervious area (acres)	1 0*	2 0.16	3 0.16
Volume of stormwater runoff ☐ acre-feet or ☒ cubic feet without planned stormwater BMPs (check appropriate box)	4 0*	5 2276	6 2276
Volume of stormwater runoff ☐ acre-feet or ☒ cubic feet with planned stormwater BMPs (check appropriate box)		7 NA	8 NA
Stormwater peak discharge rate for the design frequency storm (cubic feet per second)	9 0*	10 0.7	11 0.7

*INCLUDED IN PRE POI I-5

Box 1. **Pre-construction impervious area**: The total acres of impervious area on the project site before construction activities begin, based on land use for five years preceding the planned project.

Box 2. **Post construction impervious area**: The total acres of impervious area on the project site after construction activities have been completed.

Box 3. **Net change of impervious area**: The difference between the acres of impervious area listed in Box 1 and Box 2. Zero or negative values are acceptable.

Box 4. **Pre-construction stormwater runoff volume without planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence before construction activities begin, based on land use for five years preceding the project.

Box 5. **Post construction stormwater runoff volume without planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence after construction activities have finished assuming that no stormwater infiltration or retention BMPs have been installed.

Box 6. **Net change in stormwater volume without planned BMPs**: The difference between the amounts of stormwater runoff volume listed in Box 4 and Box 5.

Box 7. **Post construction stormwater runoff volume with planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence after construction activities have finished and the planned stormwater infiltration or retention BMPs have been installed.

Box 8. **Net change in stormwater runoff volume with planned BMPs**: The difference between the amounts of stormwater runoff volume listed in Box 4 and Box 7.

Box 9. **Pre-construction stormwater discharge rate**: The stormwater runoff discharge rate for the design frequency storm as determined by the land use for the past five years.

Box 10. **Post construction stormwater discharge rate**: The stormwater runoff discharge rate for the design frequency storm event after all planned stormwater BMPs are installed.

Box 11. **Net change stormwater discharge rate**: The difference between the stormwater runoff discharge rates listed in Box 9 and Box 10.

3. **SUMMARY DESCRIPTION OF POST CONSTRUCTION STORMWATER BMPs (consistent with Worksheets 3 and 5 referenced in the Pa. Stormwater BMP Manual)**

Key: **RC = Rate Control** **VC = Volume Control** **WQ = Water Quality**

In the lists below, check the BMPs identified in the PCSM Plan, and their function(s) using the above Key. More than one function may be checked for a BMP. List the stormwater volume and area of runoff to be treated by each BMP type. If any BMP in the PCSM Plan is not listed below, describe it in the space provided after "Other".

BMP	Function(s)	Volume of stormwater treated	Acres treated
☐ Wet ponds	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Constructed wetlands	☐ VC ☐ RC ☐ WQ		
☐ Retention basins	☐ VC ☐ RC ☐ WQ		
☐ Detention basin	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Underground detention	☐ VC ☐ RC ☐ WQ		
☐ Dry Extended detention basin	☐ VC ☐ RC ☐ WQ		
☐ Sediment fore bay	☐ VC ☐ RC ☐ WQ		
☐ Infiltration trench	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Infiltration Berm/Retentive Grading	☐ VC ☐ RC ☐ WQ		
☐ Subsurface Infiltration bed	☐ VC ☐ RC ☐ WQ		
☐ Infiltration basin	☐ VC ☐ RC ☐ WQ		
☐ Pervious pavement	☐ VC ☐ RC ☐ WQ		
☐ Dry well/Seepage pit	☐ VC ☐ RC ☐ WQ		
☐ Bio-infiltration areas	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Rain gardens/Bio-retention	☐ VC ☐ RC ☐ WQ		
☐ Vegetated swales	☐ VC ☐ RC ☐ WQ		
☐ Constructed filters	☐ VC ☐ RC ☐ WQ		
☐ Protect Sensitive & Special Value Features	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Protect/Conserve/Enhance Riparian areas	☐ VC ☐ RC ☐ WQ		
☐ Restoration: Buffers/ Landscape/Floodplain	☐ VC ☐ RC ☐ WQ		
☐ Disconnection from storm sewers	☐ VC ☐ RC ☐ WQ		
☐ Rooftop disconnection	☐ VC ☐ RC ☐ WQ		
☐ Vegetated roofs	☐ VC ☐ RC ☐ WQ		
☐ Runoff capture/Reuse	☐ VC ☐ RC ☐ WQ		
☐ Oil/grit separators	☐ WQ	NA	NA
☐ Water quality inserts/inlets	☐ WQ		
☐ Street sweeping	☐ WQ		
☐ Other _____	☐ VC ☐ RC ☐ WQ		
☐ Other _____	☐ VC ☐ RC ☐ WQ		

4. **OFF SITE DISCHARGE ANALYSIS**

Does the project propose any off-site discharges to areas other than surface waters? ☐ **Yes** ☒ **No**

If yes, describe the type of easement that provides the legal authority for this discharge and a demonstration that the discharge will not cause erosion, damage, or a nuisance to off-site properties.

POI I-2

2. SUMMARY TABLE FOR SUPPORTING CALCULATION AND MEASUREMENT DATA

Please reference the Stormwater Methodology used (i.e. SCS Method) SCS Method

	Pre-construction	Post Construction	Net Change
Design storm frequency 2 years Rainfall amount 3.02 inches			
Impervious area (acres)	1 0*	2 0.57	3 0.57
Volume of stormwater runoff ☐ acre-feet or ☒ cubic feet without planned stormwater BMPs (check appropriate box)	4 0*	5 6949	6 6949
Volume of stormwater runoff ☐ acre-feet or ☒ cubic feet with planned stormwater BMPs (check appropriate box)		7 NA	8 NA
Stormwater peak discharge rate for the design frequency storm (cubic feet per second)	9 0*	10 2.2	11 2.2

*INCLUDED IN PRE POI I-5

Box 1. **Pre-construction impervious area**: The total acres of impervious area on the project site before construction activities begin, based on land use for five years preceding the planned project.

Box 2. **Post construction impervious area**: The total acres of impervious area on the project site after construction activities have been completed.

Box 3. **Net change of impervious area**: The difference between the acres of impervious area listed in Box 1 and Box 2. Zero or negative values are acceptable.

Box 4. **Pre-construction stormwater runoff volume without planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence before construction activities begin, based on land use for five years preceding the project.

Box 5. **Post construction stormwater runoff volume without planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence after construction activities have finished assuming that no stormwater infiltration or retention BMPs have been installed.

Box 6. **Net change in stormwater volume without planned BMPs**: The difference between the amounts of stormwater runoff volume listed in Box 4 and Box 5.

Box 7. **Post construction stormwater runoff volume with planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence after construction activities have finished and the planned stormwater infiltration or retention BMPs have been installed.

Box 8. **Net change in stormwater runoff volume with planned BMPs**: The difference between the amounts of stormwater runoff volume listed in Box 4 and Box 7.

Box 9. **Pre-construction stormwater discharge rate**: The stormwater runoff discharge rate for the design frequency storm as determined by the land use for the past five years.

Box 10. **Post construction stormwater discharge rate**: The stormwater runoff discharge rate for the design frequency storm event after all planned stormwater BMPs are installed.

Box 11. **Net change stormwater discharge rate**: The difference between the stormwater runoff discharge rates listed in Box 9 and Box 10.

3. **SUMMARY DESCRIPTION OF POST CONSTRUCTION STORMWATER BMPs (consistent with Worksheets 3 and 5 referenced in the Pa. Stormwater BMP Manual)**

Key: **RC = Rate Control** **VC = Volume Control** **WQ = Water Quality**

In the lists below, check the BMPs identified in the PCSM Plan, and their function(s) using the above Key. More than one function may be checked for a BMP. List the stormwater volume and area of runoff to be treated by each BMP type. If any BMP in the PCSM Plan is not listed below, describe it in the space provided after "Other".

BMP	Function(s)	Volume of stormwater treated	Acres treated
☐ Wet ponds	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Constructed wetlands	☐ VC ☐ RC ☐ WQ		
☐ Retention basins	☐ VC ☐ RC ☐ WQ		
☐ Detention basin	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Underground detention	☐ VC ☐ RC ☐ WQ		
☐ Dry Extended detention basin	☐ VC ☐ RC ☐ WQ		
☐ Sediment fore bay	☐ VC ☐ RC ☐ WQ		
☐ Infiltration trench	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Infiltration Berm/Retentive Grading	☐ VC ☐ RC ☐ WQ		
☐ Subsurface Infiltration bed	☐ VC ☐ RC ☐ WQ		
☐ Infiltration basin	☐ VC ☐ RC ☐ WQ		
☐ Pervious pavement	☐ VC ☐ RC ☐ WQ		
☐ Dry well/Seepage pit	☐ VC ☐ RC ☐ WQ		
☐ Bio-infiltration areas	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Rain gardens/Bio-retention	☐ VC ☐ RC ☐ WQ		
☐ Vegetated swales	☐ VC ☐ RC ☐ WQ		
☐ Constructed filters	☐ VC ☐ RC ☐ WQ		
☐ Protect Sensitive & Special Value Features	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Protect/Conserve/Enhance Riparian areas	☐ VC ☐ RC ☐ WQ		
☐ Restoration: Buffers/ Landscape/Floodplain	☐ VC ☐ RC ☐ WQ		
☐ Disconnection from storm sewers	☐ VC ☐ RC ☐ WQ		
☐ Rooftop disconnection	☐ VC ☐ RC ☐ WQ		
☐ Vegetated roofs	☐ VC ☐ RC ☐ WQ		
☐ Runoff capture/Reuse	☐ VC ☐ RC ☐ WQ		
☐ Oil/grit separators	☐ WQ	NA	NA
☐ Water quality inserts/inlets	☐ WQ		
☐ Street sweeping	☐ WQ		
☐ Other _____	☐ VC ☐ RC ☐ WQ		
☐ Other _____	☐ VC ☐ RC ☐ WQ		

4. **OFF SITE DISCHARGE ANALYSIS**

Does the project propose any off-site discharges to areas other than surface waters? ☐ **Yes** ☒ **No**

If yes, describe the type of easement that provides the legal authority for this discharge and a demonstration that the discharge will not cause erosion, damage, or a nuisance to off-site properties.

POI I-3

2. SUMMARY TABLE FOR SUPPORTING CALCULATION AND MEASUREMENT DATA

Please reference the Stormwater Methodology used (i.e. SCS Method) SCS Method

	Pre-construction	Post Construction	Net Change
Design storm frequency 2 years Rainfall amount 3.02 inches			
Impervious area (acres)	1 0.00	2 0.00	3 0.00
Volume of stormwater runoff ☐ acre-feet or ☒ cubic feet without planned stormwater BMPs (check appropriate box)	4 2748	5 8515	6 5767
Volume of stormwater runoff ☐ acre-feet or ☒ cubic feet with planned stormwater BMPs (check appropriate box)		7 NA	8 NA
Stormwater peak discharge rate for the design frequency storm (cubic feet per second)	9 0.5	10 3.3	11 2.8

Box 1. **Pre-construction impervious area**: The total acres of impervious area on the project site before construction activities begin, based on land use for five years preceding the planned project.

Box 2. **Post construction impervious area**: The total acres of impervious area on the project site after construction activities have been completed.

Box 3. **Net change of impervious area**: The difference between the acres of impervious area listed in Box 1 and Box 2. Zero or negative values are acceptable.

Box 4. **Pre-construction stormwater runoff volume without planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence before construction activities begin, based on land use for five years preceding the project.

Box 5. **Post construction stormwater runoff volume without planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence after construction activities have finished assuming that no stormwater infiltration or retention BMPs have been installed.

Box 6. **Net change in stormwater volume without planned BMPs**: The difference between the amounts of stormwater runoff volume listed in Box 4 and Box 5.

Box 7. **Post construction stormwater runoff volume with planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence after construction activities have finished and the planned stormwater infiltration or retention BMPs have been installed.

Box 8. **Net change in stormwater runoff volume with planned BMPs**: The difference between the amounts of stormwater runoff volume listed in Box 4 and Box 7.

Box 9. **Pre-construction stormwater discharge rate**: The stormwater runoff discharge rate for the design frequency storm as determined by the land use for the past five years.

Box 10. **Post construction stormwater discharge rate**: The stormwater runoff discharge rate for the design frequency storm event after all planned stormwater BMPs are installed.

Box 11. **Net change stormwater discharge rate**: The difference between the stormwater runoff discharge rates listed in Box 9 and Box 10.

3. **SUMMARY DESCRIPTION OF POST CONSTRUCTION STORMWATER BMPs (consistent with Worksheets 3 and 5 referenced in the Pa. Stormwater BMP Manual)**

Key: **RC = Rate Control** **VC = Volume Control** **WQ = Water Quality**

In the lists below, check the BMPs identified in the PCSM Plan, and their function(s) using the above Key. More than one function may be checked for a BMP. List the stormwater volume and area of runoff to be treated by each BMP type. If any BMP in the PCSM Plan is not listed below, describe it in the space provided after "Other".

BMP	Function(s)	Volume of stormwater treated	Acres treated
☐ Wet ponds	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Constructed wetlands	☐ VC ☐ RC ☐ WQ		
☐ Retention basins	☐ VC ☐ RC ☐ WQ		
☐ Detention basin	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Underground detention	☐ VC ☐ RC ☐ WQ		
☐ Dry Extended detention basin	☐ VC ☐ RC ☐ WQ		
☐ Sediment fore bay	☐ VC ☐ RC ☐ WQ		
☐ Infiltration trench	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Infiltration Berm/Retentive Grading	☐ VC ☐ RC ☐ WQ		
☐ Subsurface Infiltration bed	☐ VC ☐ RC ☐ WQ		
☐ Infiltration basin	☐ VC ☐ RC ☐ WQ		
☐ Pervious pavement	☐ VC ☐ RC ☐ WQ		
☐ Dry well/Seepage pit	☐ VC ☐ RC ☐ WQ		
☐ Bio-infiltration areas	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Rain gardens/Bio-retention	☐ VC ☐ RC ☐ WQ		
☐ Vegetated swales	☐ VC ☐ RC ☐ WQ		
☐ Constructed filters	☐ VC ☐ RC ☐ WQ		
☐ Protect Sensitive & Special Value Features	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Protect/Conserve/Enhance Riparian areas	☐ VC ☐ RC ☐ WQ		
☐ Restoration: Buffers/ Landscape/Floodplain	☐ VC ☐ RC ☐ WQ		
☐ Disconnection from storm sewers	☐ VC ☐ RC ☐ WQ		
☐ Rooftop disconnection	☐ VC ☐ RC ☐ WQ		
☐ Vegetated roofs	☐ VC ☐ RC ☐ WQ		
☐ Runoff capture/Reuse	☐ VC ☐ RC ☐ WQ		
☐ Oil/grit separators	☐ WQ	NA	NA
☐ Water quality inserts/inlets	☐ WQ		
☐ Street sweeping	☐ WQ		
☐ Other _____	☐ VC ☐ RC ☐ WQ		
☐ Other _____	☐ VC ☐ RC ☐ WQ		

4. **OFF SITE DISCHARGE ANALYSIS**

Does the project propose any off-site discharges to areas other than surface waters? ☐ **Yes** ☒ **No**

If yes, describe the type of easement that provides the legal authority for this discharge and a demonstration that the discharge will not cause erosion, damage, or a nuisance to off-site properties.

POI I-4

2. SUMMARY TABLE FOR SUPPORTING CALCULATION AND MEASUREMENT DATA

Please reference the Stormwater Methodology used (i.e. SCS Method) SCS Method

	Pre-construction	Post Construction	Net Change
Design storm frequency 2 years Rainfall amount 3.02 inches			
Impervious area (acres)	1 0	2 0	3 0
Volume of stormwater runoff ☐ acre-feet or ☒ cubic feet without planned stormwater BMPs (check appropriate box)	4 362	5 362	6 0
Volume of stormwater runoff ☐ acre-feet or ☒ cubic feet with planned stormwater BMPs (check appropriate box)		7 NA	8 NA
Stormwater peak discharge rate for the design frequency storm (cubic feet per second)	9 0.04	10 0.04	11 0.0

Box 1. **Pre-construction impervious area**: The total acres of impervious area on the project site before construction activities begin, based on land use for five years preceding the planned project.

Box 2. **Post construction impervious area**: The total acres of impervious area on the project site after construction activities have been completed.

Box 3. **Net change of impervious area**: The difference between the acres of impervious area listed in Box 1 and Box 2. Zero or negative values are acceptable.

Box 4. **Pre-construction stormwater runoff volume without planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence before construction activities begin, based on land use for five years preceding the project.

Box 5. **Post construction stormwater runoff volume without planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence after construction activities have finished assuming that no stormwater infiltration or retention BMPs have been installed.

Box 6. **Net change in stormwater volume without planned BMPs**: The difference between the amounts of stormwater runoff volume listed in Box 4 and Box 5.

Box 7. **Post construction stormwater runoff volume with planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence after construction activities have finished and the planned stormwater infiltration or retention BMPs have been installed.

Box 8. **Net change in stormwater runoff volume with planned BMPs**: The difference between the amounts of stormwater runoff volume listed in Box 4 and Box 7.

Box 9. **Pre-construction stormwater discharge rate**: The stormwater runoff discharge rate for the design frequency storm as determined by the land use for the past five years.

Box 10. **Post construction stormwater discharge rate**: The stormwater runoff discharge rate for the design frequency storm event after all planned stormwater BMPs are installed.

Box 11. **Net change stormwater discharge rate**: The difference between the stormwater runoff discharge rates listed in Box 9 and Box 10.

3. **SUMMARY DESCRIPTION OF POST CONSTRUCTION STORMWATER BMPs (consistent with Worksheets 3 and 5 referenced in the Pa. Stormwater BMP Manual)**

Key: **RC = Rate Control** **VC = Volume Control** **WQ = Water Quality**

In the lists below, check the BMPs identified in the PCSM Plan, and their function(s) using the above Key. More than one function may be checked for a BMP. List the stormwater volume and area of runoff to be treated by each BMP type. If any BMP in the PCSM Plan is not listed below, describe it in the space provided after "Other".

BMP	Function(s)	Volume of stormwater treated	Acres treated
☐ Wet ponds	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Constructed wetlands	☐ VC ☐ RC ☐ WQ		
☐ Retention basins	☐ VC ☐ RC ☐ WQ		
☐ Detention basin	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Underground detention	☐ VC ☐ RC ☐ WQ		
☐ Dry Extended detention basin	☐ VC ☐ RC ☐ WQ		
☐ Sediment fore bay	☐ VC ☐ RC ☐ WQ		
☐ Infiltration trench	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Infiltration Berm/Retentive Grading	☐ VC ☐ RC ☐ WQ		
☐ Subsurface Infiltration bed	☐ VC ☐ RC ☐ WQ		
☐ Infiltration basin	☐ VC ☐ RC ☐ WQ		
☐ Pervious pavement	☐ VC ☐ RC ☐ WQ		
☐ Dry well/Seepage pit	☐ VC ☐ RC ☐ WQ		
☐ Bio-infiltration areas	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Rain gardens/Bio-retention	☐ VC ☐ RC ☐ WQ		
☐ Vegetated swales	☐ VC ☐ RC ☐ WQ		
☐ Constructed filters	☐ VC ☐ RC ☐ WQ		
☐ Protect Sensitive & Special Value Features	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Protect/Conserve/Enhance Riparian areas	☐ VC ☐ RC ☐ WQ		
☐ Restoration: Buffers/ Landscape/Floodplain	☐ VC ☐ RC ☐ WQ		
☐ Disconnection from storm sewers	☐ VC ☐ RC ☐ WQ		
☐ Rooftop disconnection	☐ VC ☐ RC ☐ WQ		
☐ Vegetated roofs	☐ VC ☐ RC ☐ WQ		
☐ Runoff capture/Reuse	☐ VC ☐ RC ☐ WQ		
☐ Oil/grit separators	☐ WQ	NA	NA
☐ Water quality inserts/inlets	☐ WQ		
☐ Street sweeping	☐ WQ		
☐ Other _____	☐ VC ☐ RC ☐ WQ		
☐ Other _____	☐ VC ☐ RC ☐ WQ		

4. **OFF SITE DISCHARGE ANALYSIS**

Does the project propose any off-site discharges to areas other than surface waters? ☐ **Yes** ☒ **No**

If yes, describe the type of easement that provides the legal authority for this discharge and a demonstration that the discharge will not cause erosion, damage, or a nuisance to off-site properties.

POI I-5

2. SUMMARY TABLE FOR SUPPORTING CALCULATION AND MEASUREMENT DATA

Please reference the Stormwater Methodology used (i.e. SCS Method) SCS Method

	Pre-construction	Post Construction	Net Change
Design storm frequency 2 years Rainfall amount 3.02 inches			
Impervious area (acres)	1 0.15	2 0.06	3 -0.9
Volume of stormwater runoff ☐ acre-feet or ☒ cubic feet without planned stormwater BMPs (check appropriate box)	4 12850	5 11314	6 -1537
Volume of stormwater runoff ☐ acre-feet or ☒ cubic feet with planned stormwater BMPs (check appropriate box)		7 NA	8 NA
Stormwater peak discharge rate for the design frequency storm (cubic feet per second)	9 2.2	10 2.6	11 0.4

Box 1. **Pre-construction impervious area**: The total acres of impervious area on the project site before construction activities begin, based on land use for five years preceding the planned project.

Box 2. **Post construction impervious area**: The total acres of impervious area on the project site after construction activities have been completed.

Box 3. **Net change of impervious area**: The difference between the acres of impervious area listed in Box 1 and Box 2. Zero or negative values are acceptable.

Box 4. **Pre-construction stormwater runoff volume without planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence before construction activities begin, based on land use for five years preceding the project.

Box 5. **Post construction stormwater runoff volume without planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence after construction activities have finished assuming that no stormwater infiltration or retention BMPs have been installed.

Box 6. **Net change in stormwater volume without planned BMPs**: The difference between the amounts of stormwater runoff volume listed in Box 4 and Box 5.

Box 7. **Post construction stormwater runoff volume with planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence after construction activities have finished and the planned stormwater infiltration or retention BMPs have been installed.

Box 8. **Net change in stormwater runoff volume with planned BMPs**: The difference between the amounts of stormwater runoff volume listed in Box 4 and Box 7.

Box 9. **Pre-construction stormwater discharge rate**: The stormwater runoff discharge rate for the design frequency storm as determined by the land use for the past five years.

Box 10. **Post construction stormwater discharge rate**: The stormwater runoff discharge rate for the design frequency storm event after all planned stormwater BMPs are installed.

Box 11. **Net change stormwater discharge rate**: The difference between the stormwater runoff discharge rates listed in Box 9 and Box 10.

3. **SUMMARY DESCRIPTION OF POST CONSTRUCTION STORMWATER BMPs (consistent with Worksheets 3 and 5 referenced in the Pa. Stormwater BMP Manual)**

Key: **RC = Rate Control** **VC = Volume Control** **WQ = Water Quality**

In the lists below, check the BMPs identified in the PCSM Plan, and their function(s) using the above Key. More than one function may be checked for a BMP. List the stormwater volume and area of runoff to be treated by each BMP type. If any BMP in the PCSM Plan is not listed below, describe it in the space provided after "Other".

BMP	Function(s)	Volume of stormwater treated	Acres treated
☐ Wet ponds	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Constructed wetlands	☐ VC ☐ RC ☐ WQ		
☐ Retention basins	☐ VC ☐ RC ☐ WQ		
☐ Detention basin	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Underground detention	☐ VC ☐ RC ☐ WQ		
☐ Dry Extended detention basin	☐ VC ☐ RC ☐ WQ		
☐ Sediment fore bay	☐ VC ☐ RC ☐ WQ		
☐ Infiltration trench	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Infiltration Berm/Retentive Grading	☐ VC ☐ RC ☐ WQ		
☐ Subsurface Infiltration bed	☐ VC ☐ RC ☐ WQ		
☐ Infiltration basin	☐ VC ☐ RC ☐ WQ		
☐ Pervious pavement	☐ VC ☐ RC ☐ WQ		
☐ Dry well/Seepage pit	☐ VC ☐ RC ☐ WQ		
☐ Bio-infiltration areas	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Rain gardens/Bio-retention	☐ VC ☐ RC ☐ WQ		
☐ Vegetated swales	☐ VC ☐ RC ☐ WQ		
☐ Constructed filters	☐ VC ☐ RC ☐ WQ		
☐ Protect Sensitive & Special Value Features	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Protect/Conserve/Enhance Riparian areas	☐ VC ☐ RC ☐ WQ		
☐ Restoration: Buffers/ Landscape/Floodplain	☐ VC ☐ RC ☐ WQ		
☐ Disconnection from storm sewers	☐ VC ☐ RC ☐ WQ		
☐ Rooftop disconnection	☐ VC ☐ RC ☐ WQ		
☐ Vegetated roofs	☐ VC ☐ RC ☐ WQ		
☐ Runoff capture/Reuse	☐ VC ☐ RC ☐ WQ		
☐ Oil/grit separators	☐ WQ	NA	NA
☐ Water quality inserts/inlets	☐ WQ		
☐ Street sweeping	☐ WQ		
☐ Other _____	☐ VC ☐ RC ☐ WQ		
☐ Other _____	☐ VC ☐ RC ☐ WQ		

4. **OFF SITE DISCHARGE ANALYSIS**

Does the project propose any off-site discharges to areas other than surface waters? ☐ **Yes** ☒ **No**

If yes, describe the type of easement that provides the legal authority for this discharge and a demonstration that the discharge will not cause erosion, damage, or a nuisance to off-site properties.

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2. SUMMARY TABLE FOR SUPPORTING CALCULATION AND MEASUREMENT DATA

Please reference the Stormwater Methodology used (i.e. SCS Method) SCS Method

	Pre-construction	Post Construction	Net Change
Design storm frequency 2 years Rainfall amount 3.02 inches			
Impervious area (acres)	1 0	2 0	3 0
Volume of stormwater runoff ☐ acre-feet or ☒ cubic feet without planned stormwater BMPs (check appropriate box)	4 7400	5 9267	6 1867
Volume of stormwater runoff ☐ acre-feet or ☒ cubic feet with planned stormwater BMPs (check appropriate box)		7 NA	8 NA
Stormwater peak discharge rate for the design frequency storm (cubic feet per second)	9 1.1	10 1.8	11 0.7

Box 1. **Pre-construction impervious area**: The total acres of impervious area on the project site before construction activities begin, based on land use for five years preceding the planned project.

Box 2. **Post construction impervious area**: The total acres of impervious area on the project site after construction activities have been completed.

Box 3. **Net change of impervious area**: The difference between the acres of impervious area listed in Box 1 and Box 2. Zero or negative values are acceptable.

Box 4. **Pre-construction stormwater runoff volume without planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence before construction activities begin, based on land use for five years preceding the project.

Box 5. **Post construction stormwater runoff volume without planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence after construction activities have finished assuming that no stormwater infiltration or retention BMPs have been installed.

Box 6. **Net change in stormwater volume without planned BMPs**: The difference between the amounts of stormwater runoff volume listed in Box 4 and Box 5.

Box 7. **Post construction stormwater runoff volume with planned BMPs**: The amount of stormwater runoff volume from the project site that would result from the design storm occurrence after construction activities have finished and the planned stormwater infiltration or retention BMPs have been installed.

Box 8. **Net change in stormwater runoff volume with planned BMPs**: The difference between the amounts of stormwater runoff volume listed in Box 4 and Box 7.

Box 9. **Pre-construction stormwater discharge rate**: The stormwater runoff discharge rate for the design frequency storm as determined by the land use for the past five years.

Box 10. **Post construction stormwater discharge rate**: The stormwater runoff discharge rate for the design frequency storm event after all planned stormwater BMPs are installed.

Box 11. **Net change stormwater discharge rate**: The difference between the stormwater runoff discharge rates listed in Box 9 and Box 10.

3. **SUMMARY DESCRIPTION OF POST CONSTRUCTION STORMWATER BMPs (consistent with Worksheets 3 and 5 referenced in the Pa. Stormwater BMP Manual)**

Key: **RC = Rate Control** **VC = Volume Control** **WQ = Water Quality**

In the lists below, check the BMPs identified in the PCSM Plan, and their function(s) using the above Key. More than one function may be checked for a BMP. List the stormwater volume and area of runoff to be treated by each BMP type. If any BMP in the PCSM Plan is not listed below, describe it in the space provided after "Other".

BMP	Function(s)	Volume of stormwater treated	Acres treated
☐ Wet ponds	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Constructed wetlands	☐ VC ☐ RC ☐ WQ		
☐ Retention basins	☐ VC ☐ RC ☐ WQ		
☐ Detention basin	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Underground detention	☐ VC ☐ RC ☐ WQ		
☐ Dry Extended detention basin	☐ VC ☐ RC ☐ WQ		
☐ Sediment fore bay	☐ VC ☐ RC ☐ WQ		
☐ Infiltration trench	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Infiltration Berm/Retentive Grading	☐ VC ☐ RC ☐ WQ		
☐ Subsurface Infiltration bed	☐ VC ☐ RC ☐ WQ		
☐ Infiltration basin	☐ VC ☐ RC ☐ WQ		
☐ Pervious pavement	☐ VC ☐ RC ☐ WQ		
☐ Dry well/Seepage pit	☐ VC ☐ RC ☐ WQ		
☐ Bio-infiltration areas	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Rain gardens/Bio-retention	☐ VC ☐ RC ☐ WQ		
☐ Vegetated swales	☐ VC ☐ RC ☐ WQ		
☐ Constructed filters	☐ VC ☐ RC ☐ WQ		
☐ Protect Sensitive & Special Value Features	☐ VC ☐ RC ☐ WQ	NA	NA
☐ Protect/Conserve/Enhance Riparian areas	☐ VC ☐ RC ☐ WQ		
☐ Restoration: Buffers/ Landscape/Floodplain	☐ VC ☐ RC ☐ WQ		
☐ Disconnection from storm sewers	☐ VC ☐ RC ☐ WQ		
☐ Rooftop disconnection	☐ VC ☐ RC ☐ WQ		
☐ Vegetated roofs	☐ VC ☐ RC ☐ WQ		
☐ Runoff capture/Reuse	☐ VC ☐ RC ☐ WQ		
☐ Oil/grit separators	☐ WQ	NA	NA
☐ Water quality inserts/inlets	☐ WQ		
☐ Street sweeping	☐ WQ		
☐ Other _____	☐ VC ☐ RC ☐ WQ		
☐ Other _____	☐ VC ☐ RC ☐ WQ		

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