

STP Selection Matrix

Version 5/8/2017

Project Name: Barre City/ Barre Town MEGC M 6000(11)

Discharge Point: 1

Step 1: Is the Water Quality Treatment Standard entirely managed with one or more of the following Tier 1 practices?

- | | |
|---|--|
| Infiltration Basins/ Trenches/ Chambers | Simple Disconnection |
| Drywells | Disconnection to Filter Strips and Vegetated Buffers |
| Bioretention (designed to infiltrate) | Dry Swales (designed to infiltrate) |
| Filters (designed to infiltrate) | Permeable Pavement ¹ |
| Reforestation ¹ | |

Yes No

Stop. No further justification needed.

1. These practices do not require specific justification due to feasibility limitations

Step 2: Assess the feasibility of using Tier 1 Practices

Complete the matrix below in its entirety for each drainage area.

Tier 1 Practices are available to meet the Water Quality Treatment Standard. If using one of these practices, stop here. If additional site constraints exist other than those listed here, proceed to Step 3.		Infiltration Basin/ Trench/ Chamber	Drywell	Bioretention (infiltrating)	Simple Disconnection	Disconnection to Filter Strips or Vegetated Buffer	Dry Swales (infiltrating)	Filters (infiltrating)
Practice Availability for Water Quality Treatment?		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Feasibility Restriction	Response	Practice Availability Based on Restrictions						
Do underlying soils have an infiltration rate of less than 0.2 inches per hour, as confirmed by field geotechnical tests or are classified as Hydrologic Soil Group D according to the NRCS Soil survey?	<input type="radio"/> Yes <input checked="" type="radio"/> No	Available	Available	Available	n/a	n/a	Available	Available
Will runoff to the practice include discharge from a hotspot landuse or activity?	<input type="radio"/> Yes <input checked="" type="radio"/> No	Available	Available	Available	Available	Available	Available	Available
Is the site a brownfield or contaminated site where infiltration is restricted or where infiltration would increase the threat of pollution migration, as confirmed in writing by the Department's Waste Management and Prevention Division?	<input type="radio"/> Yes <input checked="" type="radio"/> No	Available	Available	Available	Available	Available	Available	Available
Is the slope of the vegetated buffer greater than 15%	<input type="radio"/> Yes <input checked="" type="radio"/> No	n/a	n/a	n/a	Available	Available	n/a	n/a
Is the slope of the filter strip greater than 15%	<input type="radio"/> Yes <input checked="" type="radio"/> No	n/a	n/a	n/a	Available	n/a	n/a	n/a
Is the slope of the vegetated buffer greater than 8%	<input type="radio"/> Yes <input checked="" type="radio"/> No	n/a	n/a	n/a	n/a	Available	n/a	n/a
Are natural slopes where an infiltration trench or basin could be sited greater than 15%	<input type="radio"/> Yes <input checked="" type="radio"/> No	Available	n/a	Available	n/a	n/a	Available	Available
Bottom of practice would be below seasonal high water table	<input type="radio"/> Yes <input checked="" type="radio"/> No	Available	Available	Available	n/a	n/a	Available	Available
Seasonal high water table or bedrock would be less than 1 foot from the bottom of the practice.	<input type="radio"/> Yes <input checked="" type="radio"/> No	Available	Available	n/a	n/a	n/a	n/a	n/a
Seasonal high water table or bedrock would be less than 3 feet from the bottom of the practice.	<input type="radio"/> Yes <input checked="" type="radio"/> No	Available	n/a	n/a	n/a	n/a	n/a	n/a

Will the practice be located within 75 feet down-gradient of a wastewater disposal area system, within 35 feet up-gradient or 75 feet down-gradient of a wastewater disposal system?	<input type="radio"/> Yes <input checked="" type="radio"/> No	Available	Available	Available	n/a	n/a	Available	Available
Will the practice be located within 150 feet of a drinking water source located in an unconfined aquifer?	<input type="radio"/> Yes <input checked="" type="radio"/> No	Available	Available	Available	n/a	n/a	Available	Available
Will the practice be located within 100 feet of a drinking water source located in bedrock or a confined unconsolidated aquifer?	<input type="radio"/> Yes <input checked="" type="radio"/> No	Available	Available	Available	n/a	n/a	Available	Available
Will the practice be located within Zone 1 or Zone 2 of a public community groundwater source protection area?	<input type="radio"/> Yes <input checked="" type="radio"/> No	Available	Available	Available	n/a	n/a	Available	Available
Will the practice be located within 200 feet of non-transient non-community groundwater source?	<input type="radio"/> Yes <input checked="" type="radio"/> No	Available	Available	Available	n/a	n/a	Available	Available
Will the practice violate any restrictions of the Vermont Wastewater and Potable Water Supply Rules, or their replacement?	<input type="radio"/> Yes <input checked="" type="radio"/> No	Available	Available	Available	Available	Available	Available	Available

Step 3: Other feasibility constraints for remaining Tier 1 and Tier 2 practices

If, following completion of Step 2 of the STP Selection Tool there are no Tier 1 Practices available for use on the project site, designers shall consider the use of Tier 2 practices for treatment of the Water Quality Treatment Standard.

Is the Water Quality Treatment Standard entirely managed with Tier 2 Practices?

Yes No

Provide written site specific justification below. Tier 3 Practices may be used to meet the Water Quality Treatment Standard.

If the the use of a Tier 1 or Tier 2 Practice is infeasible for reasons beyond those listed in Step 2 of the STP Selection Matrix, a designer may submit site specific detailed feasibility justification that such practices are not feasible following the guidance in Section 2.2.4.1 of the 2017 VSMM. Only after completion of the STP Selection Matrix and determination that Tier and Tier 2 Practices are infeasible shall a designer consider Tier 3 Practices or existing stormwater infrastructure for meeting the Water Quality Treatment Standard (WQTS) on the project site.

Provide written feasibility justification below or list attachments

Public Transportation Project Classification Tool

Project Name: Barre City/Barre Town MEGC M 6000(11)
Designer Name: Andrew Mills, P.E.
Designer Company: VHB

Version: 6/13/2017

When to use this Tool: This tool is to be used for Public Transportation Projects only as defined in the manual. Complete this tool to determine the type of public transportation project. After completion of this tool, complete the appropriate Design Worksheet as instructed.

Instructions for Use: Input responses into cells filled blue. Instructions will appear in yellow box based on answers to questions. Complete instructions that appear in yellow box.

Step 1: Is the project a "public transportation project" as defined in the Vermont Stormwater Management Manual?

Yes No

Answer "Yes" or "No" using radio button.

"Public transportation project" means a state highway project, town highway project, or other public road project; or a linear public transportation project, such as a trail, bicycle path, or sidewalk project. New roadways in undeveloped rights-of-way or transportation related site development projects such as park-and-ride lots, maintenance facilities, or hangar facilities are not considered a "public transportation project" and are subject to the full suite of stormwater treatment standards in Subchapter 2.0.

Proceed to Step 2

Step 2: Will the project result in a net increase in impervious surface?

Fill in areas indicated in blue boxes below:

Pre-Developed Impervious Surface within Site Limits:	2.65 acres
Expanded Impervious Surface within Site Limits:	0.68 acres
Reconstructed Impervious Surface within Site Limits:	1.10 acres
Existing Impervious Surface to remain within Site Limits:	1.22 acres
Total Resulting Impervious Surface within Site Limits:	3.00 acres
Net Increase in Impervious Surface:	0.35 acres

Project is classified as **Redevelopment with Expansion (Subchapter 6.1.2)**. Complete **Redevelopment with Expansion Worksheet**.

Redevelopment with Expansion (6.1.2)

Project Name: Barre City/Barre Town MEGC M 6000(11)

Discharge Point: 1

When to use this Worksheet: This worksheet is to be used for Public Transportation Projects only as defined in Subchapter 6.0 in the manual. Before completing this worksheet, complete the Public Transportation Project Classification Tool to determine if this worksheet needs to be completed. **A worksheet must be completed for each discharge point that will be regulated under the permit.**

Note: This worksheet is intended to provide designers guidance for preparing designs and application materials that meet the intent of Section 6.1.2. While of this worksheet is a permit application requirement, it does not guarantee full compliance with the requirements of Section 6.1.2. The designer is ultimately responsible for preparing a design that meets the requirements included in Section 6.1.2.

Instructions for Use: Use drop down menus in "Response" column to indicate response to each question and follow directions when prompted in the "Directions" column. If "Directions" column requires a justification, provide justification in "Justifications (6.1.2)" tab. List references where required information can be found in the permit application in the "References" column. Complete one worksheet per regulated discharge point. Designer only needs to input answers or references in cells that are filled blue. All other cells (filled yellow or grey) do not require designer input, and are either calculated cells or provide instruction to the designer.

Net Expanded Impervious Area (from Project Classification Tool): 0.35 acres

Complete this Worksheet.

	Response	Directions	Reference
Applicable Standards			
1	No	Design STP to treat 100% of WQv for net increase in impervious surface. Move to Step 2.	
2	Yes	Provide applicable STP worksheet as an attachment. Move to Step 3.	Attachment A3
Site Balancing			
3	No	Skip steps 4-8. Move to Step 9.	
4	Yes	Document existing impervious area to be treated on plan. Provide location of plan within permit application in 'Reference' column to the right. Skip Steps 5 - 7. Move to Step 8.	
5			
6			
7			
8	Yes	Move to Step 9.	
Improving Outlet Conditions			
9	N/A		

	Response	Directions	Reference
10	Will existing swale, median, or pipe outlets be retrofitted with splash pads, energy dissipators, or plunge pools?	N/A	
Repairing Erosion			
11	Is there rill and gully erosion within the right-of-way?	No	Move to Step 12.
12	Is there significant erosion at inlets of existing culverts?	No	Move to Step 13.
13	Is curbing (treated timber, asphalt, granite, concrete or built-up berms along the shoulder causing erosion at concentrated points along roadway embankments?	N/A	
14	Will removal of curbing or built-up berms to allow distributed runoff cause additional erosion or safety issues for the transportation facility?	N/A	
Post-Construction Soil Depth and Quality Standard			
15	Are requirements in Section 6.3.1 included in the plans or specifications?	Yes	Include plans in the application detailing locations where soil depth and quality standard will be met. Move to Step 16.
16	Will disturbed areas be restored to meet the Post-Construction Soil Depth and Quality Standard, and to preserve permeable (HSG A and B) soils during site construction and restoration activities?	Yes	Show locations on the plans.

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Project Name Barre City/Barre Town MEGC M 6000(11)

The name above will appear on all the discharge point tabs

Site Summary

Do not fill this tab out, apart from the project name and notes. It will auto-populated based on the values on the discharge point tabs. Discharge points (SN) will only show on the summary if an area has been entered on that tab. Areas listed below are those seeking permit coverage.

		Total	SN1
Impervious	New	0.68	0.68
	Redeveloped	1.10	1.10
	Existing	0.00	0.00
	Previously Authorized	0.00	0.00
	Total	1.78	1.78
Site Area		4.80	4.80
Latitude		44.18416	
Longitude		-72.49630	
Receiving Water		1	

Recharge

	Total	SN1
Required	0.0291	0.0291
Provided	0.1000	0.1000
Standard met?	Yes	Yes

Notes: Not applicable to Redevelopment with Expansion projects.

Water Quality

	Total	SN1
Required	0.1222	0.1222
Provided	0.1000	0.1000
Standard met?	No	No

A minimum WQ_v of 0.2" ($P \cdot R_v$) is required for sites with low impervious (<16.67%). This calculation has not been incorporated into this workbook. Designers should check that the minimum WQ_v has been met for their site.

Notes: Project classified as Redevelopment with Expansion. Water quality treatment has been provided for impervious area exceeding the net new impervious area.

Channel Protection

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	Total	SN1
Standard Applies?		No
Waiver		n/a
Method		n/a
HC _v	0.0491	0.0491
T _v Provided	0.1000	0.1000

Notes: Not applicable to Redevelopment with Expansion projects.

Overbank Flood Protection

	SN1
Standard Applies?	No
Pre-Dev Q (cfs)	0
Routed, Post-Dev Q (cfs)	0
Waiver	n/a

Notes: Not applicable to Redevelopment with Expansion projects.

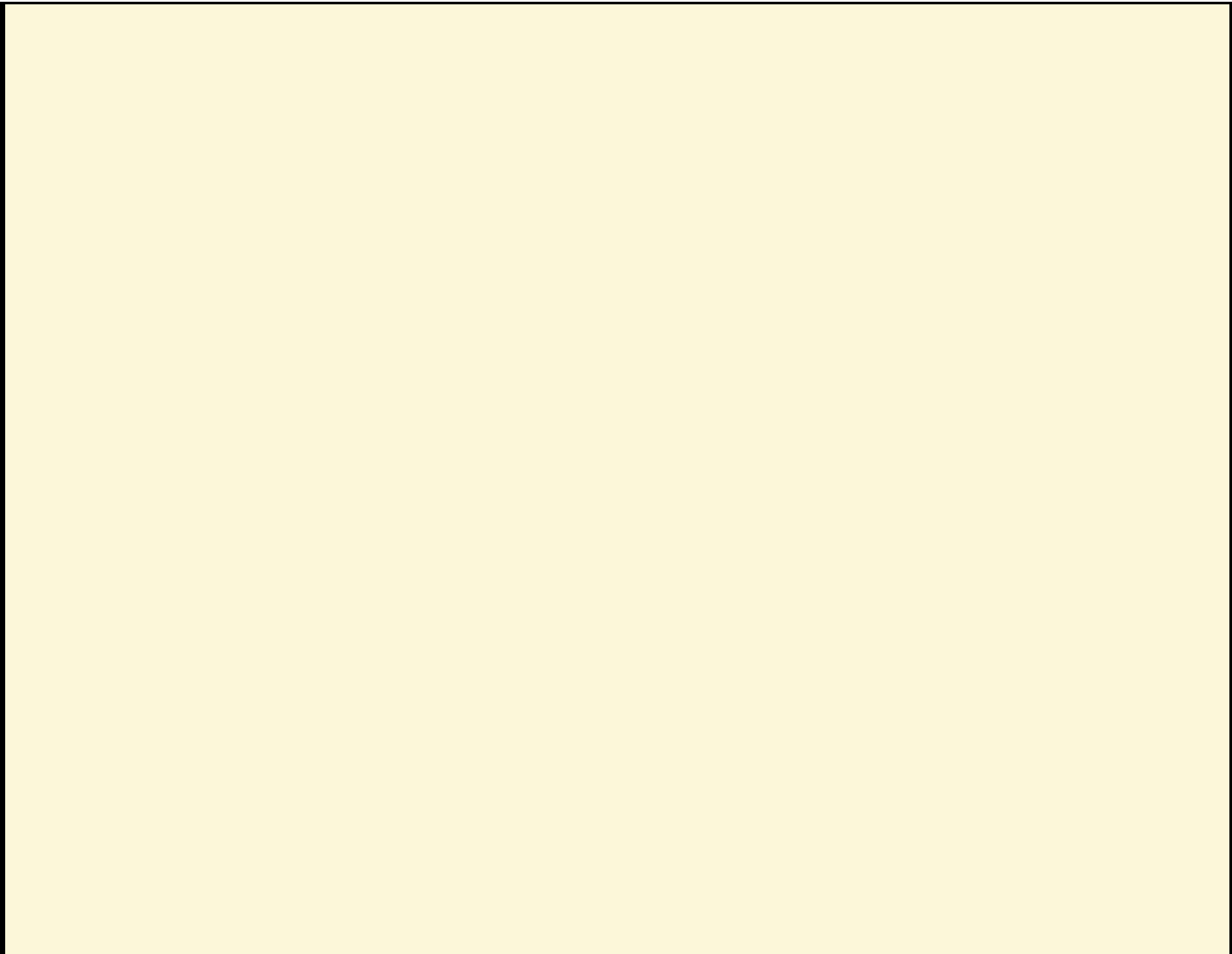
Extreme Flood Protection

	SN1
Standard Applies?	No
Pre-Dev Q (cfs)	0
Routed, Post-Dev Q (cfs)	0
Waiver	n/a

Notes: Not applicable to Redevelopment with Expansion projects.

General Notes

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General Discharge Point Information

Project name	Barre City/Barre Town MEGC M 6000(11)
Discharge point serial number (e.g. S/N 001)	1
Name of receiving water	1
Latitude (decimal degrees to five decimal places)	44.18416
Longitude (decimal degrees to five decimal places)	-72.49630

Precipitation Data

* Precipitation values shall be obtained from [NOAA Atlas 14](#)

Storm	WQ Storm	1 yr, 24 hr	10 yr, 24 hr	100 yr, 24 hr
Precipitation (inches)	1.00	1.92	3.47	5.30

Drainage Area Information

Pre Development Land Use (acres)

Landuse	A	B	C	D	Total
Grass	0.540	0.452	0.000	0.000	0.992
Meadow	0.000	0.000	0.000	0.000	0.000
Woods	0.482	0.591	0.000	0.000	1.073
Existing Impervious	0.795	1.855	0.000	0.000	2.650
Impervious previously authorized under 2002 VSMM (not included in calculations)					0.000
Total Pre Site Area					4.715

Post Development Land Use (acres)

Landuse	A	B	C	D	Total	%
Grass	0.523	0.450	0.000	0.000	0.973	
Meadow	0.000	0.000	0.000	0.000	0.000	
Woods	0.276	0.554	0.000	0.000	0.830	
New Impervious	0.445	0.235	0.000		0.680	14.2%
Existing for Permit Coverage (Treated to New Standards)	0.000	0.000	0.000	0.000	0.000	0.0%
Existing Impervious Not for Permit Coverage					1.220	25.4%
Redeveloped Impervious					1.098	22.9%
Impervious previously authorized under 2002 VSMM					0.000	0.0%
Total Site Area					4.801	
Total Impervious for Permit Coverage					1.778	
Net Reduced Impervious					0.000	0.0%
Reduced Existing Impervious (for redevelopment)					0.332	23.2%

WARNING: Pre development and post development areas don't match, so evaluation of the Hydrologic Condition Method is not appropriate within this drainage area. Designer may consider HCM across drainage

Information for Calculating T_c by the Watershed Lag Method

	Average Catchment Slope, Y (%)	Hydraulic Length, l (ft)
Pre Development		
Post Development		

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Runoff Calculations	1 yr, 24-hr	10 yr, 24-hr	100 yr, 24-hr
Predevelopment runoff volume (ac-ft)	0.3770	0.7573	1.2730
Pre-routed, post development runoff volume (ac-ft)	0.4261	0.8500	1.4153

Tier 1/Runoff Reduction Practices

List all Tier 1 practices below with the associated treatment volume (T_v). The T_v will be applied to all treatment standards, except for Green Roofs, which do not receive recharge or water quality credit. Please include the appropriate STP worksheet(s) with the application.

Practice	T _v (ac-ft)	Practice	T _v (ac-ft)
Dry Swales (infiltrating)	0.100		

Runoff Reduction Calculations

Standard	Re	WQ	CP	Q _{P10}	Q _{P100}
T _v Required (ac-ft)	0.0291	0.1222	0.0491	0.0927	0.1423
T _v Provided (ac-ft)	0.1000	0.1000	0.1000	0.1000	0.1000
T _v Remaining (ac-ft)	0.0000	0.0222	0.0000	0.0000	0.0423
Standard met with HCM?	Yes	No	Yes	Yes	No
Post-Development CN	n/a	90	91	87	84
CN _{adj}	n/a	78	86	84	81
Pre-Development CN	n/a	n/a	89	84	81

Groundwater Recharge Standard (Re)

Standard Applicable?	<input type="radio"/> Yes <input checked="" type="radio"/> No	Reason recharge not required (if No is selected):	
Re _v	0.0291		
Standard met with Tier 1 Practices?	Yes		
Recharge Notes:	Not applicable for Redevelopment with Expansion projects.		

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Water Quality Treatment Standard (WQ)

	(ac-ft)		Apply Reduction?
WQ _v - New & Existing	0.0710	% Net Reduction	0.0% <input checked="" type="radio"/> No <input type="radio"/> Yes
WQ _v - Redevelopment	0.0512	% Removed Existing Impervious (Redevelopment)	23.2% <input checked="" type="radio"/> No <input type="radio"/> Yes
Total WQ _v	0.1222		
WQ _v met with Tier 1 practices	0.1000	Is all impervious treated by disconnection?	<input checked="" type="radio"/> No <input type="radio"/> Yes (WQ _v met)
WQ _v to be met with Tier 2 and/or Tier 3 practices	0.0222		

Tier 2 & 3 Water Quality Practice	WQ _v Provided (ac-ft)	Tier
Total WQ _v Provided (ac-ft)	0.0000	ac-ft
Is the WQ _v Standard met?	No	

NOTE: Add more water quality practices unless site balancing is being used. (Check summary tab)

Water Quality Notes:

Project is classified as Redevelopment with Expansion. WQ_v only required for net increased impervious (0.35 acres required, 0.67 acres impervious provided.)

Channel Protection Standard (CP)

Standard Applicable?	<input type="radio"/> Yes <input checked="" type="radio"/> No	Waiver (if No is selected):	<div style="border: 1px solid black; height: 20px;"></div>
Standard Met with HCM?	Yes	<i>The channel protection standard has been fully met with hydrologic condition method. Additional treatment of the 1 year storm is not required.</i>	
Provide Extended Detention for:	n/a	ac-ft	
Warm or Cold Water Fishery?	<input checked="" type="radio"/> Cold <input type="radio"/> Warm	→	Provide: <div style="border: 1px solid black; padding: 5px; text-align: center;">12 hours of extended detention</div>
			OR
			<input type="checkbox"/> The Alternative Extended Detention Method (§2.2.5.4) is being used.
Extended Detention STP:	<div style="border: 1px solid black; height: 20px;"></div>		

[See the Vermont Water Quality Standards for warm and cold water designations](#)

Modeling Info: When demonstrating CP compliance with extended detention in a hydrologic model, use the CN and T_c below if the practice being modelled is not a Tier 1 practice. The CN_{Adj} takes into account the reduction in runoff volume achieved through Tier 1 practices. The T_c is calculated by the watershed lag method using CN_{Adj} as CN'.

CN _{Adj}	86	Post Development T _c (min)	0.0	(Watershed Lag Method)
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Channel Protection Notes:

Not applicable for Redevelopment with Expansion projects.

Vermont Operational Stormwater Permit - Standards Compliance Workbook

Overbank Flood Protection (Q_{P10})

Standard Applicable? Yes No

Waiver (if No is selected):

Standard Met with HCM? **Yes**

The Q_{P10} standard has been fully met. No additional STPs are required.

STP used:

Pre-development peak discharge rate (cfs)

Pre-routed, post-development peak discharge rate (cfs)

Routed, post-development peak discharge rate (cfs)

Modeling Info: When demonstrating Q_{P10} compliance in a hydrologic model, use the following CN and T_c below, if the practice used to meet Q_{P10} is not itself a Tier 1 practice. The CN_{Adj} takes into account the reduction in runoff volume achieved through Tier 1 practices. The T_c is calculated by the watershed lag method using CN_{Adj} as CN'.

Pre-Development CN (Flow-weighted composite)	84	Pre Development T_c (min)	0.0	(Watershed Lag Method)
CN_{Adj}	84	Post Development T_c (min)	0.0	

Overbank Flood Notes: Not applicable for Redevelopment with Expansion projects.

Extreme Flood Protection (Q_{P100})

Standard Applicable? Yes No

Waiver (if No is selected):

Standard Met with HCM? **No**

The extreme standard has not been fully met. Provide additional STPs to ensure post development peak runoff does not exceed pre development peak runoff for the 100 yr, 24 hour storm event.

STP used:

Pre-development peak discharge rate (cfs)

Pre-routed, post-development peak discharge rate (cfs)

Routed, post-development peak discharge rate (cfs)

Modeling Info: When demonstrating Q_{P100} compliance in a hydrologic model, use the following CN and T_c below, if the practice used to meet Q_{P100} is not a Tier 1 practice. The CN_{Adj} takes into account the reduction in runoff volume achieved through runoff reduction practices. The T_c is calculated by the watershed lag method using CN_{Adj} as CN'.

Pre-Development CN (Flow-weighted composite)	81	Pre Development T_c (min)	0.0	(Watershed Lag Method)
CN_{Adj}	81	Post Development T_c (min)	0.0	

Extreme Flood Notes: Not applicable for Redevelopment with Expansion projects.