



To: Sudbury Planning Board

Date: November 10, 2020  
Project #: 14009.00 Sudbury to Hudson

## Memorandum

From: Mark Costa, P.E.  
Kenneth Staffier, P.E.  
VHB

Re: Horsley Witten Group: Peer Review of the Stormwater Management  
for the Sudbury-Hudson Transmission Reliability and Mass Central  
Rail Trail Project

The following memorandum summarizes the updates that have been made to the Stormwater Management Plan for of the Sudbury-Hudson Transmission Reliability and Massachusetts Central Rail Trail Project between the July 30, 2020 submission (Revision 1) and the October 21, 2020 submission (Revision 2). Revision 2 of the Stormwater Management Plan was made in response to the August 31, 2020 "Sudbury-Hudson Transmission Reliability and Mass Central Rail Trail Project Conservation Commission Stormwater Peer Review Update" from BETA Group, Inc (BETA) and to the September 18, 2020 "Peer Review of the Stormwater Management for the Sudbury-Hudson Transmission Reliability and Mass Central Rail Trail Project" from Horsley Witten Group (HWG). This memorandum addresses the five areas noted in the Horsley Witten Group's Stormwater Comment (SW) 8 (i.e., watersheds 5.14, 8.5, 9.1, 10.4, 10.14). The changes made at these five areas are summarized below:

<b>Watershed</b>	<b>Stormwater BMP</b>	<b>Comment</b>
5.14	250-foot-long, one-foot deep area of increased infiltration	BMP was included in original submittal. Its storage volume was increased within Revision 1.
8.5	900-foot-long, one-foot deep area of increased infiltration	BMP was included in original submittal. Its storage volume was increased within Revision 1.
9.1	None	BMPs were not added to avoid impacts to wetland resource areas
10.4	Natural low-lying area was added into HydroCAD during Revision 2. Although not listed as a formal BMP, a proposed 100-foot long conveyance swale provides detention and infiltration; stone protection was added at the end of the conveyance swale	The low-lying area is not a formal BMP, but it provides detention and recharge without additional tree clearing and earthwork. Stone Protection was added at the end of the proposed 100-foot conveyance swale in watershed 10.4A per BETA Comment SW10.
10.14	Stormwater basin	The stormwater basin also addresses stormwater from the existing outfall at Landham Road

### **Design Point and Watershed 5.14**

The Revision 2 changes made to design point 5.14 include: (1) separating the existing conditions into watersheds 5.14A and 5.14B to create congruency from the existing condition watershed to the proposed condition watershed, (2) modifying delineation of the watershed to remove downgradient areas (based upon BETA Comment SW12), and (3) updating an area previously designated as Wood-Good cover type to Grass-Good cover type. Watershed 5.14B includes a proposed 250-foot-long, one-foot-deep, area of increased infiltration and its storage volume was increased within Revision 1.

### **Design Point and Watershed 8.5**

The Revision 2 changes made to design point 8.5 include: (1) separating the existing conditions into watersheds 8.5A and 8.5B to create congruency from the existing condition watershed to the proposed condition watershed, and (2) updating hydrologic soil groups (HSGs) from HSG D to HSG A for Revision 2 (based upon BETA Comment SW14). Watershed 8.5B includes a proposed 900-foot-long, one-foot-deep area of increased infiltration and its storage volume was increased within Revision 1.

### **Design Point and Watershed 9.1**

The Revision 2 changes made to design point 9.1 include: (1) updating HSGs from HSG D to HSG A for Revision 2 (based upon BETA Comment SW14), (2) revising portions of the existing rail bed cover type designation as Woods-Good within Revision 1 to Gravel for Revision 2. This change increased the peak rate of runoff and volume in the existing conditions for Revision 2. No BMPs have been proposed to be added for this watershed because much of the ROW is at or near the elevation of the wetland resource areas and any BMP would need to be constructed beyond the shoulder of the bike path, which would result in impacts to the wetland resource areas.

### **Design Point and Watershed 10.4**

The Revision 2 changes made to design point 10.4 include separating the existing conditions watershed into watersheds 10.4A and 10.4B to create congruency from the existing condition watershed to the proposed condition watershed. The HydroCAD model was updated to include a low area within the right-of-way. Although not a formal BMP, the low point provides detention and recharge potential without additional tree removal and earthwork. The addition of the low area reduces the peak rate of runoff in existing and proposed conditions in Revision 2. Although not listed as a formal BMP, a proposed 100-foot long conveyance swale provides detention and infiltration. Stone Protection was added at the end of the proposed 100-foot conveyance swale in watershed 10.4A per BETA Comment SW10.

### **Design Point and Watershed 10.14**

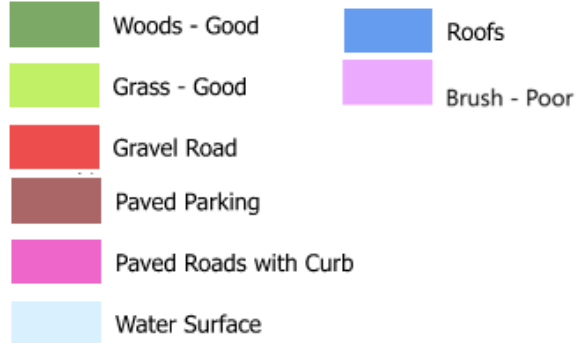
The Revision 2 changes made to design point 10.14 include separating the existing conditions watershed into watersheds 10.14A and 10.14B to create congruency from existing condition to proposed condition. This reduced TCs in the modified existing watersheds which increased peak runoff rates and volumes in the existing conditions. The existing cover type for the bike path was updated from Gravel to Brush-Poor (BETA Comment SW13). HSGs that were originally designated as Unknown were HSG D in Revision 1 and have been updated to HSG A for Revision 2 (BETA Comment SW14). Incorporating these two changes of updated cover type and HSGs reduced the peak rate of runoff and volume in existing and proposed conditions. The addition of Landham Road basin, BMP P-10.14B (BETA Comment SW 8), also reduced the peak rate and volumes in proposed conditions for Revision 2. This basin was also added to address stormwater from existing outfall at Landham Road.

**Legend**

**Hydrologic Soil Group (HSG)**



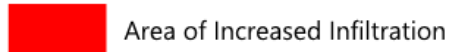
**Cover Type**



**Watersheds (WS)**



**Areas of increased infiltration**

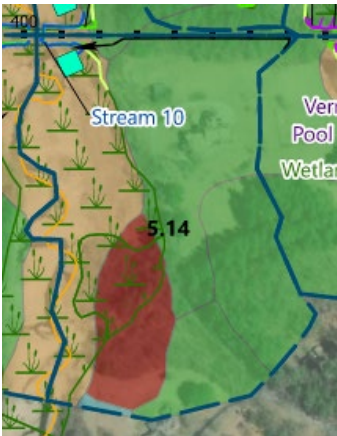


- TC Time of Concentration
- HSG Hydrologic Soil Group
- WS Watershed

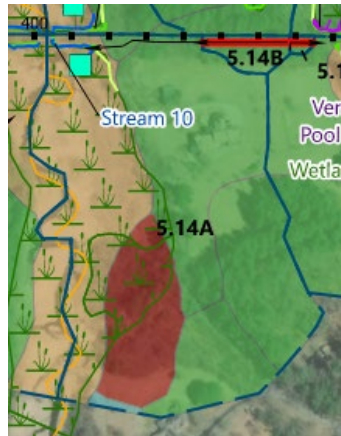
## Design Point and Watershed 5.14

### July 2020 Submission - Revision 1

Existing (HSG & WS)



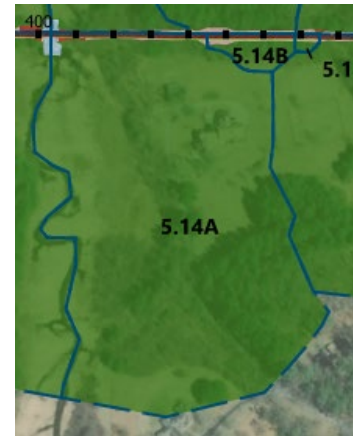
Proposed (HSG & WS)



Existing (Cover Type & WS)



Proposed (Cover Type & WS)



### October 2020 Submission - Revision 2

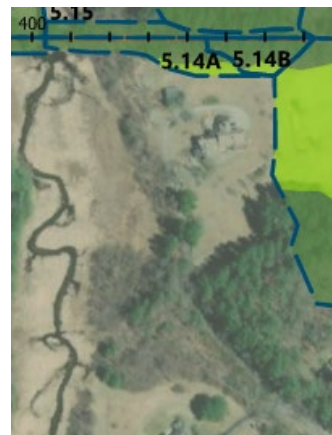
Existing (HSG & WS)



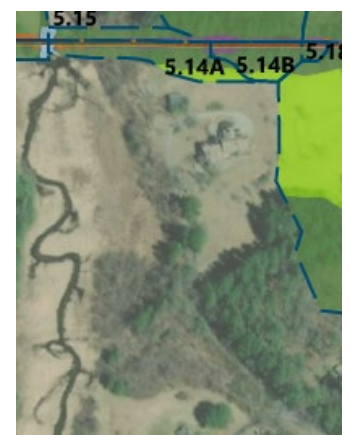
Proposed (HSG & WS)



Existing (Cover Type & WS)



Proposed (Cover Type & WS)



	Revision 1			Revision 2			
	EX	PR		EX	PR		
		A	B		A	B	A
Area (acre)	14.0	13.7	0.4	0.6	0.4	0.7	0.4
Curve Number	46	46	39	46	37	51	41
TC (minutes)	23.1	13.2	6.9	23.8	10.1	9.2	13.7
Peak Discharge Rate (Q100 cfs)*	20.1	25.2		1.1		1.6	
Runoff Volume (Q100 acre-ft)*	2.555	2.568		0.152		0.160	

\*Peak Discharge and Runoff Volume are in reference to the corresponding design point

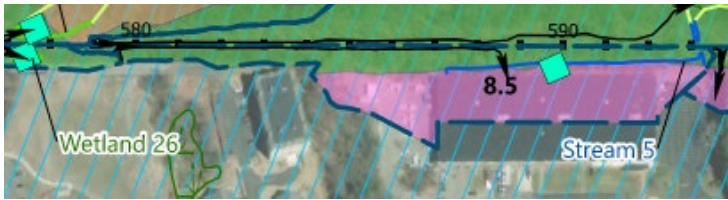
### Changes include:

- Existing conditions watershed separated into watersheds 5.14A and 5.14B to create congruency from existing condition watershed to proposed condition watershed. This reduced TCs in the modified existing watersheds which increased peak runoff rates and volumes in the existing conditions.
- Modified delineation of watershed to remove downgradient areas. This significantly reduced peak runoff rates and volumes in both existing and proposed conditions. *BETA Comment SW12.*
- Cover Type area previously designated as Wood - Good to Grass - Good was revised to more accurately reflect the existing cover type.

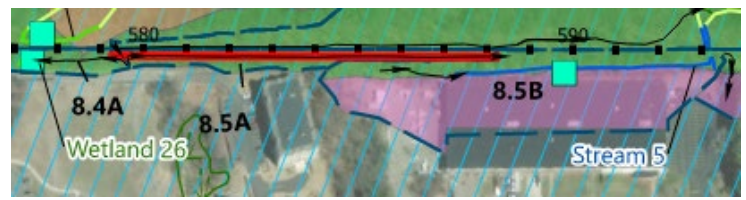
## Design Point and Watershed 8.5

### July 2020 Submission - Revision 1

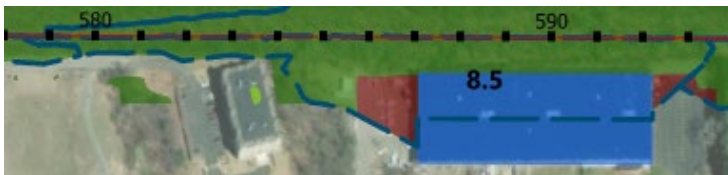
#### Existing (HSG & WS)



#### Proposed (HSG & WS)



#### Existing (Cover Type & WS)



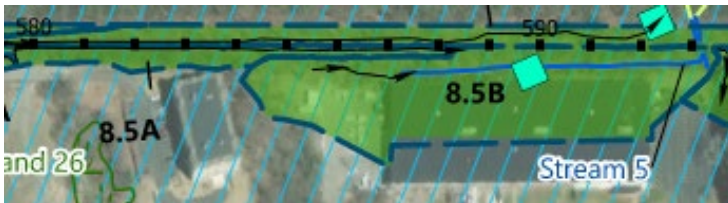
#### Proposed (Cover Type & WS)



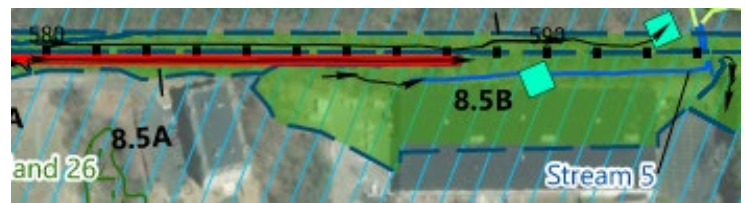
\* HydroCAD Cover Type calculations taken from watershed limits. Revision 2 Figures have been updated to not show Cover Type outside watershed limits.

### October 2020 Submission - Revision 2

#### Existing (HSG & WS)



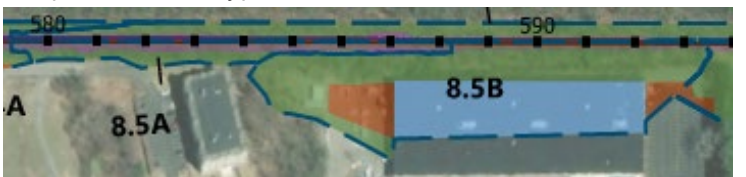
#### Proposed (HSG & WS)



#### Existing (Cover Type & WS)



#### Proposed (Cover Type & WS)



	Revision 1			Revision 2			
	EX	PR		EX	PR		EX
		A	B		A	B	
Area (acre)	4.0	0.7	3.5	0.7	3.4	0.7	3.5
Curve Number	68	50	77	34	65	50	65
TC (minutes)	24.9	19.4	15.3	37.8	15.3	19.4	15.3
Peak Discharge Rate (Q100 cfs)*	13.6	17.6		13.2		13.3	
Runoff Volume (Q100 acre-ft)*	1.571	1.803		1.305		1.295	

\*Peak Discharge and Runoff Volume are in reference to the corresponding design point

#### Changes include:

- Existing conditions watershed was separated into watersheds 8.5A and 8.5B to create congruency from existing condition watershed to proposed condition watershed. This reduced TCs in the modified existing watersheds which increased peak runoff rates and volumes in the existing conditions Rev 2.
  - HSGs originally designated as Unknown, were HSG D in Revision 1, and have been updated to HSG A for Revision 2. This reduced the peak rate of runoff and volume in existing and proposed conditions Rev 2.
- BETA Comment SW14*

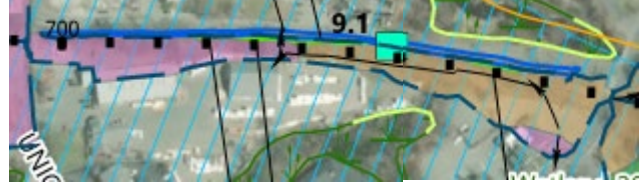
## Design Point and Watershed 9.1

### July 2020 Submission - Revision 1

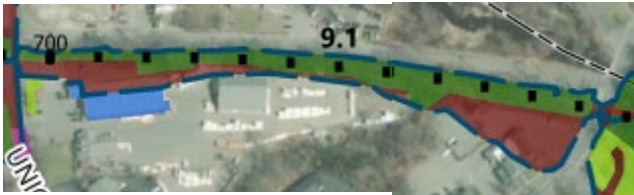
#### Existing (HSG & WS)



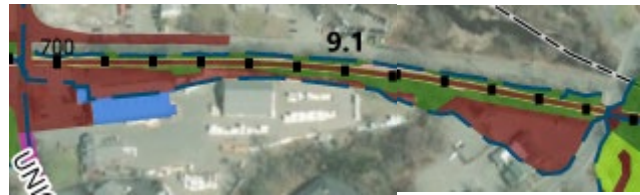
#### Proposed (HSG & WS)



#### Existing (Cover Type & WS)\*



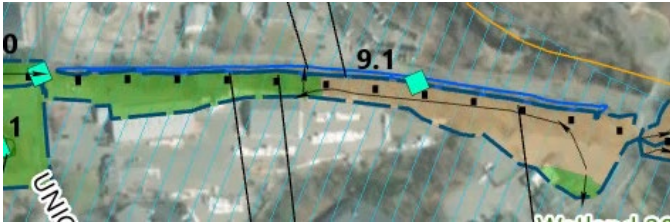
#### Proposed (Cover Type & WS)\*



\* HydroCAD Cover Type calculations taken from watershed limits. Revision 2 Figures have been updated to not show Cover Type outside watershed limits.

### October 2020 Submission - Revision 2

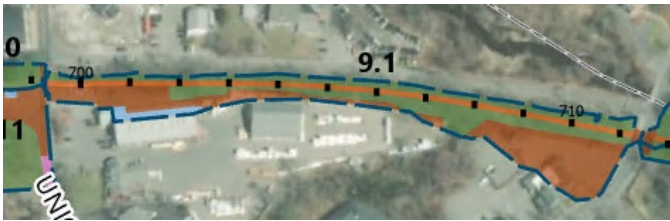
#### Existing (HSG & WS)



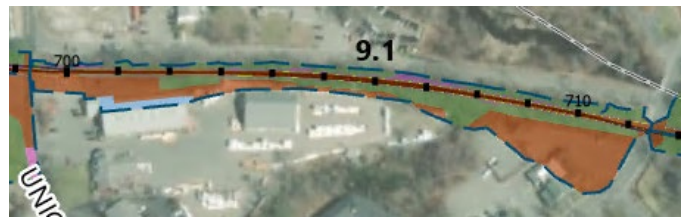
#### Proposed (HSG & WS)



#### Existing (Cover Type & WS)



#### Proposed (Cover Type & WS)



	Revision 1		Revision 2	
	EX	PR	EX	PR
Area (acre)	2.2	2.2	2.2	2.2
Curve Number	87	90	83	84
TC (minutes)	41.2	29.7	41.2	29.7
Peak Discharge Rate (Q100 cfs)*	8.5	10.3	8.0	9.5
Runoff Volume (Q100 acre-ft)*	1.296	1.363	1.207	1.230

\*Peak Discharge and Runoff Volume are in reference to the corresponding design point

#### Changes include:

- HSGs originally designated as Unknown were HSG D in Revision 1 and have been updated to HSG A for Revision 2. This reduced the peak rate of runoff and volume in existing and proposed conditions Revision 2. *BETA Comment SW14*
- Portions of the existing rail bed had been designated as Woods – Good cover type within Revision 1. This has been updated to Gravel for Revision 2. This increased the peak rate of runoff and volume in existing conditions Revision 2.

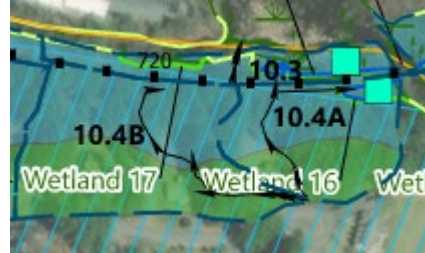
## Design Point and Watershed 10.4

### July 2020 Submission - Revision 1

Existing (HSG & WS)



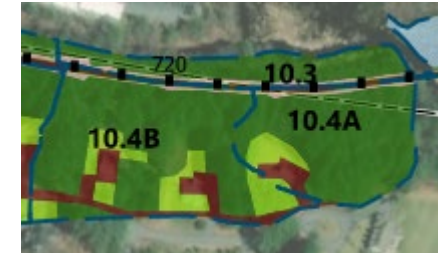
Proposed (HSG & WS)



Existing (Cover Type & WS)



Proposed (Cover Type & WS)



### October 2020 Submission - Revision 2

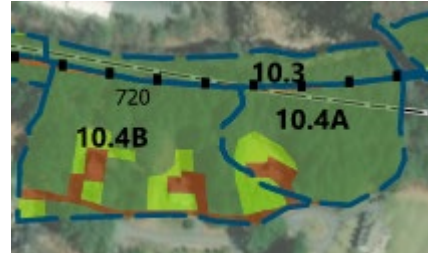
Existing (HSG & WS)



Proposed (HSG & WS)



Existing (Cover Type & WS)



Proposed (Cover Type & WS)



	Revision 1			Revision 2			
	EX	PR		EX	PR	EX	PR
		A	B				
Area (acre)	4.9	1.8	3.0	1.8	3.0	1.8	3.0
Curve Number	62	63	63	63	63	63	63
TC (minutes)	25.4	11.3	13.4	17.3	13.4	11.3	13.4
Peak Discharge Rate (Q100 cfs*)	13.8	18.8		6.3		7.4	
Runoff Volume (Q100 acre-ft)*	1.628	1.676		0.627		0.627	

Peak Discharge and Runoff Volume are in reference to the corresponding design point

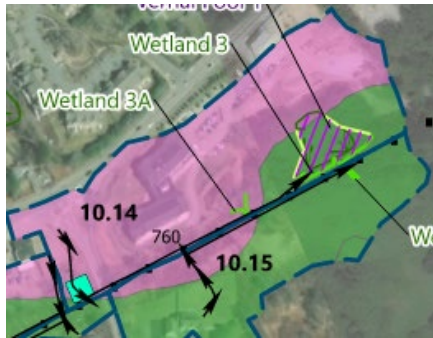
### Changes include:

- Existing conditions watershed was separated into watersheds 10.4A and 10.4B to create congruency from existing condition watershed to the proposed condition watershed. This reduced TCs in the modified existing watersheds which increased peak runoff rates and volumes in the existing conditions.
- Added low point in existing and proposed HydroCAD model. This reduced the peak rate of runoff in existing and proposed conditions in Rev 2.
- Added Stone Protection at the end of the conveyance swale in watershed 10.4A *BETA Comment SW10*

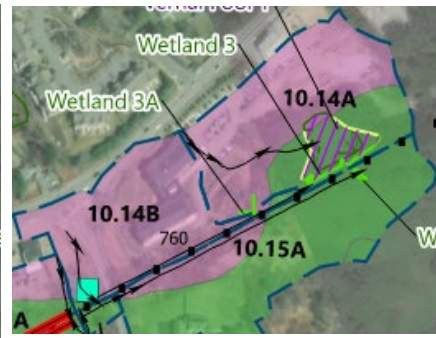
## Design Point and Watershed 10.14

### July 2020 Submission - Revision 1

Existing (HSG & WS)



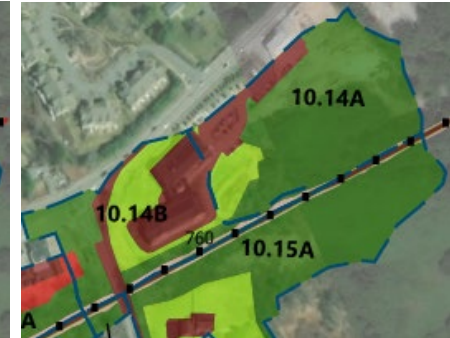
Proposed (HSG & WS)



Existing (Cover Type & WS)

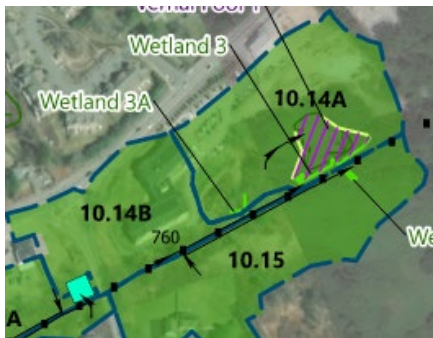


Proposed (Cover Type & WS)

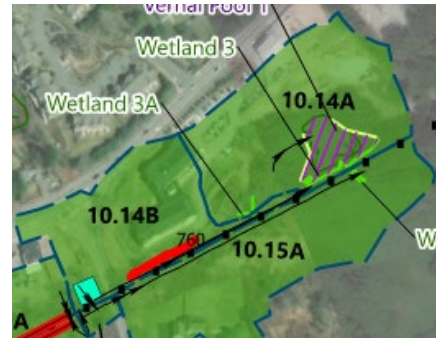


### October 2020 Submission - Revision 2

Existing (HSG & WS)



Proposed (HSG & WS)



Existing (Cover Type & WS)



Proposed (Cover Type & WS)



	Revision 1			Revision 2			
	EX	PR		EX		PR	
		A	B	A	B	A	B
Area (acre)	7.0	4.1	2.9	4.1	2.9	4.1	2.9
Curve Number	74	66	84	40	56	40	56
TC (minutes)	37.1	7.5	19.4	19.0	30.6	19.0	11.9
Peak Discharge Rate (Q100 cfs)*	22.9	31.2		9.7		11.7	
Runoff Volume (Q100 acre-ft)*	3.182	3.150		1.320		1.282	

\*Peak Discharge and Runoff Volume are in reference to the corresponding design point

#### Changes include:

- Addition of Landham Road basin, BMP: P-10.14B. *BETA Comment SW 8* This reduced the peak rate and volumes in proposed conditions Rev 2.
- Existing conditions watershed separated into watersheds 10.14A and 10.14B to create congruency from existing condition to proposed condition. This reduced TCs in the modified existing watersheds which increased peak runoff rates and volumes in the existing conditions.
- HSGs originally designated as Unknown were HSG D in Revision 1 and have been updated to HSG A for Revision 2. This reduced the peak rate of runoff and volume in existing and proposed conditions Rev 2. *BETA Comment SW14*.



- Existing cover type for bike path updated from Gravel to Brush – Poor. This decreased peak rate of runoff and volume in existing conditions Rev 2.  
*BETA Comment SW1*

