Table XX-1
Stormwater Management Recommendations - Meeting Standards (Malletts Bay - West Lakeshore)

			Recommendation Details, Metrics, and Costs														Alternatives Evaluation Criteria and Scoring											
Sub-Basin ID	Street Name(s)	Recommendations - Meets Standards (MRGP, Town Public Works Standards, and SW Manual Public Transportation Projects Redevelopment-Major Maintenance)	Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Reconmentaions Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
MB-01	West Lakeshore Dr.	• Extend extent of existing MB-01 closed drainage system east to address ponding near 760 W. Lakeshore, capturing a portion of MB-02 • Install drop inlets or trench drain to capture run-on from Broadacres Drive • Create min. 7-ft. wide greenbelt on south side of roadway. • Construct 535 LF of 7 ft. wide infiltrating bioswale sized to capture WQv from south half of existing roadway (and from 10 ft. wide path if constructed). • Construct sediment forebays or equivalent pre-treatment at bioswale inlets • Construct 185 LF of 7 ft. wide grass swale on south side of roadway to capture runoff from remaining portions of south half of existing roadway (and from 10 ft. wide path if constructed). • Regrade south shoulder of roadway during construction of bioswale and grass swale to address ponding in to convey runoff and address ponding (for instance in front of Mazza's and at 760 W. Lakeshore (from MB-02). • Re-use outfall O_41 to route overflow from bioswale. Replace 15" CMP to outfall O_41 with 30" HDPE and lower the outfall to 125.5 ft. elevation. • Remove sediment below outfall O_41; extend ditch downstream to daylight	A	25.6	19,730	0.9	20.9	3,830	$270,000	$73,000	$343,000	$245,000	677,500	9.51	1.40	19	No	No	3	6	2	4	2	0	0	1	2	20	C	Y	H
MB-02	West Lakeshore Dr.	• Extend extent of existing MB-02 closed drainage system east to Shore Acres Dr., capturing a portion of MS-01 • Create min. 7-ft. wide greenbelt on south side of roadway. • Construct 300 LF of 7 ft. wide infiltrating bioswale sized to capture WQv from south half of existing roadway and from 10 ft. wide multi-use path if constructed). • Construct sediment forebays or equivalent pre-treatment at bioswale inlets • Add 125 ft. of curbing on N side of roadway, east of Harbor View Plaza Shopping Center • Re-use outfall O_40 to route overflow from bioswale • Replace existing 15" CM to outfall O_40 with 30" HDPE • Stabilize erosion at outfall O_40	A	8.7	17,360	0.5	0.6	2,160	$46,000	$41,000	$87,000	$59,000	277,800	15.79	1.49	12	No	No	4	6	2	4	2	0	0	1	2	21	C	Y	H
MS-01	West Lakeshore Dr.	• Add offline deep sump CBs and stormlines on Shore Acres Dr. to W. Lakeshore intersection to address run-on to W. Lakeshore and downslope private property; tie in to new bioswale • Create min. 7-ft. wide greenbelt on south side of roadway. • Construct 470 LF of 7 ft. wide bioswale sized to capture WQv from south half of existing roadway and from 10 ft. wide multi-use path if constructed. • Portions of bioswale shall be modified to linear gravel wetland design where infiltration is not feasible; cost estimate is for the more expensive bioswale. • Install stepped treatment cells as needed to accomodate moderate slopes near Moorings Marina. • Construct sediment forebays or equivalent pre-treatment at bioswale inlets. • Add curbing on N side of W. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property (1400 ft. on N side of roadway between Shore Acres Dr. and the Moorings; 360 ft. on N side of road east of the Moorings). • Overflow from new bioswales directed to existing outfalls O_59, O_47, and to the existing large pre-cast structure at Moorings Marina. • Repair minor erosion at outfall O_59.	D	13.3	19,340	0.8	1.5	3,360	$330,000	$63,000	$393,000	$170,000	517,900	17.60	2.32	17	No	No	4	6	2	4	2	0	0	1	2	21	C	N	H
MB-03	West Lakeshore Dr.	• Create min. 7-ft. wide greenbelt on south side of roadway. • Construct 370 LF of 7 ft. wide bioswale sized to capture WQv from south half of existing roadway and from 10 ft. wide multi-use path if constructed. • Portions of bioswale shall be modified to linear gravel wetland design where infiltration is not feasible; cost estimate is for the more expensive bioswale. • Construct sediment forebays or equivalent pre-treatment at bioswale inlets. • Add 360 LF of curbing on N side of W. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property. • Overflow from new bioswales for eastern half of MB-03 directed to bioswales and subsurface infiltration in MB-04. . • Stabilize erosion at outfall O_47.	D	6.4	7,400	0.6	1.7	2,670	$26,000	$50,000	$76,000	$42,000	245,200	6.73	1.85	36	No	No	1	6	1	4	2	0	0	1	2	17	C	N	H
MB-04	West Lakeshore Dr.	• Create min. 7-ft. wide greenbelt on south side of roadway. • Install deep sump CBs N side of W. Lakeshore Dr, routed to underdrain of new bioswale on S side of road capture runoff from entire existing roadway and new path. • Construct up to 200 LF of 7 ft wide bioswale sized to capture WQv from existing roadway and new 10 ft. bike path if constructed (at west end of MB-04 and near intersection). • Portions of bioswale shall be modified to linear gravel wetland design where infiltration is not feasible; cost estimate is for the more expensive bioswale. • Construct sediment forebays or equivalent pre-treatment at bioswale inlets. • Construct offline deep sump CBs for capture of runoff from intersection improvements (assumed Alternative 3 - Roundabout). Additional estimated impervious area = 33,200 SF, WQv = 2,770 CF. • Construct sand filter for water quality treatment of runoff from intersection improvements. • Construct new stabilized outfall at eastern end of intersection improvements to discharge overflow from stormwater treatment practices.	A	3.5	6,190	1.8	1.6	6,100	$107,000	$122,000	$229,000	$2,862,500	205,200	0.11	0.08	99	No	No	2	2	1	3	2	1	2	1	1	15	C	N	H
Malletts Bay - West Lakeshore Dr. Area Watershed Totals:				58	70,020	5	26	18,120	$779,000	$349,000	$1,128,000	$158,000	1,923,600	50	7	26	No	No												

% reduction in total P load: 14

Table XX-2
Stormwater Management Recommendations - Exceeding Standards (Malletts Bay - West Lakeshore)

			Recommendation Details, Metrics, and Costs														Alternatives Evaluation Criteria and Scoring											
Sub-Basin ID	Street Name(s)	Recommendations - Exceeds Standards (MRGP, Town Public Works Standards, and SW Manual)	Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Reconmentaions Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
MB-01	West Lakeshore Dr.	• Extend extent of existing MB-01 closed drainage system east to address ponding near 760 W. Lakeshore, capturing a portion of MB-02 • Install drop inlets or trench drain to capture run-on from Broadacres Drive • Create min. 7-ft. wide greenbelt on south side of roadway. • Construct off-line deep sump CBs on N side of road, routed to underdrain of bioswale on S side of road, allowing capture and treatment of runoff from entire roadway • Construct 720 LF of 7 ft. wide infiltrating bioswale sized to capture WQv from entire existing roadway (and from 10 ft. wide path if constructed). • Construct sediment forebays or equivalent pre-treatment at bioswale inlets • Regrade south shoulder of roadway during construction of bioswale and grass swale to address ponding in to convey runoff and address ponding (for instance in front of Mazza's and at 760 W. Lakeshore (from MB-02). • Construct subsurface infiltration chambers beneath boat launch parking area to treat and infiltrate remaining WQv from the reconfigured MB-01 sub-basin. • Relocate outfall O_41 to route overflow from bioswale and subsurface infiltration to N of boat launch	A	25.6	19,730	1.4	20.9	19,730	$270,000	$1,216,000	$1,486,000	$217,000	677,500	9.51	8.77	100	No	No	3	6	2	6	2	0	0	1	2	22	C	Y	H
MB-02	West Lakeshore Dr.	• Extend extent of existing MB-02 closed drainage system east to Shore Acres Dr., capturing a portion of MS-01 • Create min. 7-ft. wide greenbelt on south side of roadway. • Replace existing drainage system with deep sump CBs N side of road, routed to underdrain of new bioswale on S side of road capture/treat runoff from entire existing roadway and new path • Construct 430 LF of 7 ft. wide infiltrating bioswale sized to capture WQv from entire roadway and from 10 ft. wide multi-use path). • Construct sediment forebays or equivalent pre-treatment at bioswale inlets • Add 125 ft. of curbing on N side of roadway, east of Harbor View Plaza Shopping Center • Re-use outfall O_40 to route overflow from bioswale • Replace existing 15" CM to outfall O_40 with 30" HDPE • Stabilize erosion at outfall O_40	A	8.7	17,360	0.8	0.7	3,095	$46,000	$58,000	$104,000	$49,000	277,800	15.79	2.14	18	No	No	4	6	2	5	2	0	0	1	2	22	C	Y	H
MS-01	West Lakeshore Dr.	• Add offline deep sump CBs and stormlines on Shore Acres Dr. to W. Lakeshore intersection to address run-on to W. Lakeshore and downslope private property; tie in to new bioswale. • Create min. 7-ft. wide greenbelt on south side of roadway. • Install deep sump CBs N side of W. Lakeshore Dr, routed to underdrain of new bioswale on S side of road capture/treat runoff from entire existing roadway and new path. • Construct 690 LF of 7 ft. wide bioswale sized to capture WQv from south half of existing roadway and from 10 ft. wide multi-use path if constructed. • Portions of bioswale shall be modified to linear gravel wetland design where infiltration is not feasible; cost estimate is for the more expensive bioswale. • Install stepped treatment cells as needed to accomodate moderate slopes near Moorings Marina. • Construct sediment forebays or equivalent pre-treatment at bioswale inlets. • Add curbing on N side of W. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property (1400 ft. on N side of roadway between Shore Acres Dr. and the Moorings. • Overflow from new bioswales directed to existing outfall O_59, and to the existing large pre-cast structure at Moorings Marina. • Repair minor erosion at outfall O_59.	D	13.3	19,340	1.4	2.0	4,940	$442,000	$92,000	$534,000	$157,000	517,900	17.60	3.42	26	No	No	4	6	2	5	2	0	0	1	2	22	C	N	H
MB-03	West Lakeshore Dr.	• Create min. 7-ft. wide greenbelt on south side of roadway. • Install deep sump CBs N side of W. Lakeshore Dr, routed to underdrain of new bioswale on S side of road capture/treat runoff from entire existing roadway and new path. • Construct 370 LF of 7 ft. wide bioswale sized to capture WQv from south half of existing roadway and from 10 ft. wide multi-use path if constructed. • Portions of bioswale shall be modified to linear gravel wetland design where infiltration is not feasible; cost estimate is for the more expensive bioswale. • Construct sediment forebays or equivalent pre-treatment at bioswale inlets. • Add 360 LF of curbing on N side of W. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property. • Overflow from new bioswales for western half of MB-03 directed to existing outfall O_47. • Overflow from new bioswales for eastern half of MB-03 directed to bioswales and subsurface infiltration in MB-04. • Stabilize erosion at outfall O_47.	D	6.4	7,400	1.0	2.1	3,550	$107,000	$66,000	$173,000	$71,000	245,200	6.73	2.45	48	No	No	1	6	1	5	2	0	0	1	2	18	C	N	H
MB-04	West Lakeshore Dr.	• Create min. 7-ft. wide greenbelt on south side of roadway. • Construct up to 200 LF of 7 ft wide bioswale sized to capture WQv from existing roadway and new 10 ft. bike path if constructed (at west end of MB-04 and near intersection). • Portions of bioswale shall be modified to hybrid gravel wetland design where infiltration is not feasible; cost estimate is for the more expensive bioswale. • Replace existing CBs with offline deep sump CBs, direct to bioswale underdrains and subsurface infiltration described below. • Construct offline deep sump CBs for capture of runoff from intersection improvements (assumed Alternative 3 - Roundabout). • Overflow from new bioswales, and all runoff from intersection improvements, directed to subsurface infiltration located beneath Bayside Park parking lot • Subsurface infiltration chambers sized to contain the total WQv have a footprint of approximately 3,000 SF. Larger storage capacity or overflow to a Bayside Park water feature required for flows above WQv.	A	3.5	6,190	2.6	2.5	9,430	$107,000	$559,000	$773,000	$7,027,000	205,200	0.11	0.11	100	No	No	2	2	1	6	3	0	2	1	1	18	C	Y	H
		Malletts Bay - West Lakeshore Dr. Area Watershed Totals:		58	70,020	7	28	40,745	$972,000	$1,991,000	$3,070,000	$182,000	1,923,600	50	17	58	No	No												

% reduction in total P load: 34

Table XX-3
Stormwater Management Recommendations - Meeting Standards (Malletts Bay - East Lakeshore)

			Recommendation Details, Metrics, and Costs															Alternatives Evaluation Criteria and Scoring												
Sub-Basin ID	Street Name(s)	Recommendations - Meets Standards (MRGP, Town Public Works Standards, and SW Manual Public Transportation Projects Redevelopment-Major Maintenance)	Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Recomentaions Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
MB-05	East Lakeshore Dr.	• Add curbing on N side of E. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property (925 LF, of which 40 LF may impact abutting property owners). • Replace existing drainage system with deep sump CBs N side of road, routed to new bioswale on S side of road to capture/treat runoff from existing roadway. • Construct 300 LF of 7 ft wide bioswale sized to capture WQv from portions of existing roadway closest to outfall O_24. • Overflow from new bioswale directed to existing outfall O_24. • Stabilize exposed portions of outfall pipe at outfall O_24.	A	17.3	8,620	0.6	1.6	2400	$222,000	$45,000	$267,000	$204,000	285,700	6.20	1.31	28	No	No	3	4	1	4	1	2	1	2	2	20	C	Y	M
SC-01	East Lakeshore Dr., S. Bay Circle	• Localized flooding in this sub-basin, associated with surcharge of infiltration practices in MB-07 during intense storms, addressed in 2014; existing system meeds standards.	A	2.7	3,210	0.0	0.0	0	$0	$0	$0	N/A	106,500	2.92	0.00	0	No	No	0	2	1	1	1	1	2	3	3	14	C	N	L
MB-07	East Lakeshore Dr.	• Add curbing on N side of E. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property (940 LF, none of which appears to impact abutting property owners). • Extend drainage system to north, capturing a portion of MB-08/MB-09. • Replace existing drainage system with deep sump CBs N side of road, routed to new stormlines • Construct 170 LF of stormlines as infiltration trench on N. side of roadway (perforated HDPE in 4-ft. wide, 4-ft. deep gravel reservoir bed). Infiltration trench sized to capture WQv from existing roadway only. • Extend CBs and stormline south past end of existing system to new stabilized outfall near estimated OF3 outfall location. • Stabilize erosion on steep embankment downslope from existing structure 293	A	5.1	6,530	0.3	0.6	1,180	$302,000	$18,000	$320,000	$304,000	216,600	5.95	1.05	18	No	No	4	6	3	5	1	1	1	2	2	25	C	Y	H
MB-08	East Lakeshore Dr.	• Add curbing on N side of E. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property (920 LF for MB-08 and MB-09 combined), 565 LF of which appears to impact abutting property owners. • Connect existing CBs to MB-09 drainage system and abandon existing outfall O_32. • See MB-09 for recommendations regarding the combined MB-08 and MB-09 drainage areas.	A	0.0	0	0.0	0.0	0	$155,000	$0	$155,000	N/A	0	0.00	0.00	0	No	No	4	2	1	3	1	3	2	3	3	22	C	N	L
MB-09	East Lakeshore Dr., Williams Rd.	• Add curbing on N side of E. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property (920 LF for MB-08 and MB-09 combined), 565 LF of which appears to impact abutting property owners. • Add offline deep sump CBs on Williams Rd. to address insufficient runoff capture from roadway and impacts to downstream property on E. Lakeshore Dr.; add offline deep sump CBs on E. Lakeshore Dr. in MB-08 area to address ponding in roadway. • Construct 200 LF of stormlines as infiltration trench on N. side of E. Lakeshore Dr. (perforated HDPE in 4-ft. wide, 4-ft. deep gravel reservoir bed). Infiltration trench sized to infiltrate WQv from existing roadway only. • Construct 150 LF of stormlines as infiltration trench on W. side of Williams Rd. (perforated HDPE in 4-ft. wide, 4-ft. deep gravel reservoir bed). Infiltration trench sized to infiltrate WQv from existing roadway only. • Overflow from all proposed water quality practices directed to stormlines along N. side of E. Lakeshore and ultimately to existing outfall O_33. • Stormline sizing recommendations provided below may be reduced or eliminated based on final design calculations for new water quality treatment practices. • On Williams Rd., replace 12" CM stormlines with 15" HDPE on Williams Rd (stormlines 154, 156, 157, 158, and C8) . • On E. Lakeshore Dr., replace existing pipe ID 277 (15" CM stormline) with 18" HDPE. Replace existing pipe ID 275 (15" CM stormline) with 24" HDPE; replace existing pipe ID 258 (12" CM stormline) with 24" HDPE). • Consider replacement of existing pipe ID 155 (24" CM, on E. Lakeshore N. of Williams Rd.) with HDPE. .	A	20.7	21,680	0.6	1.4	2,100	$293,000	$32,000	$325,000	$259,000	896,500	13.26	1.26	10	No	No	5	4	2	4	1	1	0	1	2	20	C	Y	H
MB-10	Bayview Rd.	• Construct approximately 450 SF of bioretention along roadways, sized to capture and treat WQv from the existing roadways only . • Bioretention area footprint is sized based on 2 ft. media depth and 1 ft. ponding. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street is extremely narrow or not present, but much of sub-basin does not have sidewalks. • Overflow from bioretention directed to existing catch basins and discharge to O_25. • Remove sediment from mouth of outfall O_25. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	2.6	2,590	0.3	0.9	1,225	$1,500	$23,000	$25,000	$30,000	86,000	2.36	0.85	47	No	Yes	1	5	2	4	1	2	1	2	2	20	C	Y	M
MB-11	East Lakeshore Dr., Rea Janet Dr., Suncrest Terr.	• Add curbing on N side of E. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property (1,050 LF, 390 LF of which appears to impact abutting property owners). • Install offline deep sump CBs along E. Lakeshore Dr. between the southern edge of MB-11 (approx. 937 E. Lakeshore Dr.); and existing outfall O_36. Place CBs to intercept curbline flow, as well as surface runoff directed to street west of Suncrest Terr. • Construct 330 LF of stormlines as infiltration trench on N. side of E. Lakeshore Dr. (perforated HDPE in 4-ft. wide, 4-ft. deep gravel reservoir bed). Infiltration trench sized to infiltrate WQv from existing roadway only. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Overflow from infiltration trench directed to stormlines along N. side of E. Lakeshore and existing outfall O_36.	A	33.7	19,330	0.6	0.3	2,240	$140,000	$34,000	$174,000	$88,000	640,600	17.59	2.00	12	No	No	4	6	2	4	1	2	0	1	2	22	C	Y	H
MB-12	Jason Dr., Whispering Pines Condominium	• System meets draft MRGP standards and pre-2002 VSMM standards, and consists of infiltrating practices. • Remove sediment from outfall O_39, into infiltration basin. • MB-12 and MB-13 are under same common plan of development and State stormwater permit; may fall under Developed Lands General Permit and thus may require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Consider "road diet" for Jason Drive if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	10.5	10,700	2.7	7.8	0	$1,500	$0	$2,000	N/A	354,700	0.19	0.00	0	No	Yes	1	0	1	n/a	n/a	n/a	n/a	n/a	2	4	C	N	n/a

Table XX-3
Stormwater Management Recommendations - Meeting Standards (Malletts Bay - East Lakeshore)

			Recommendation Details, Metrics, and Costs															Alternatives Evaluation Criteria and Scoring											
Sub-Basin ID	Street Name(s)	Recommendations - Meets Standards (MRGP, Town Public Works Standards, and SW Manual Public Transportation Projects Redevelopment-Major Maintenance)	Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Reccomentaions Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
MB-13	Jason Dr., Whispering Pines Condominium	• System meets draft MRGP standards and pre-2002 VSMM standards, and consists of infiltrating practices. • MB-12 and MB-13 are under same common plan of development and State stormwater permit; may fall under Developed Lands General Permit and thus may require engineering feasibility assessment and retrofits to maximize phosphorus treatment.	D	5.8	2,910	0.6	5.2	0	$0	$0	$0	N/A	96,600	0.05	0.00	0	No	No	0	0	1	n/a	n/a	n/a	n/a	n/a	2	3	C	Y	n/a
MB-14	Joey Dr.	• Replace 12" CA stormlines and culverts with 18" HDPE to meet MRGP standards. Stormline sizing recommendations may be reduced based on final design calculations for water quality treatment practices. • Construct 1,700 SF of bioretention along roadways, sized to capture and treat WQv from the existing roadways only . • Bioretention area footprint is sized based on 2 ft. media depth and 1 ft. ponding. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design may be curb-cut or curb extension depending on position; greenbelt between sidewalk and street only 3-4 ft. wide. • Overflow from bioretention directed to existing catch basins and discharge to outfalls O_26 or O_28. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	13.6	11,950	1.4	4.4	5,120	$95,000	$95,000	$190,000	$54,000	395,900	10.87	3.54	43	No	No	1	4	2	4	1	3	1	2	2	20	C	Y	M
MB-15	East Lakeshore Dr.	• Connect existing CB to MB-16 drainage system and abandon existing outfall O_37. • See MB-16 for recommendations regarding the combined MB-15 and MB-16 drainage areas.	A	0.8	980	0.3	0.5	0	$0	$0	$0	N/A	32,400	0.89	0.00	0	No	No	2	2	1	n/a	n/a	n/a	n/a	n/a	3	8	C	N	n/a
MB-16	East Lakeshore Dr.	• Add curbing on N side of E. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property (390 LF, 195 LF of which appears to impact abutting property owners). • Install offline deep sump CBs along E. Lakeshore Dr. , extending between the southern edge of MB-15 and existing outfall O_36. Place CBs to intercept curbline flow; use perforated stormline with gravel sump for conveyance with infiltration. • Construct 170 LF of stormlines as infiltration trench on N. side of E. Lakeshore Dr. (perforated HDPE in 4-ft. wide, 4-ft. deep gravel reservoir bed). Infiltration trench sized to infiltrate WQv from existing roadway only. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Overflow from infiltration trench directed to existing outfall O_38. • Replace existing existing pipe from ID 151 (15" CM) to outfall with 18" or larger HDPE. Stormline diameter may be reduced based on final design calculations for water quality treatment practices.	A	23.0	10,670	0.3	2.2	1,160	$60,000	$18,000	$78,000	$84,000	332,800	8.81	0.94	11	No	No	2	2	1	4	1	2	0	1	2	15	C	Y	H
MB-17	East Lakeshore Dr.	• Add curbing on N side of E. Lakeshore Dr. to prevent runoff from damaging property (295 LF, 170 LF of which appears to impact abutting property owners). • Install offline deep sump CBs and stormlines along E. Lakeshore Dr. , extending between the northern edge of MB-17 and existing outfall O_35. Place CBs to intercept curbline flow; use perforated stormline with gravel sump for conveyance with infiltration. • Construct 160 LF of stormlines as infiltration trench on N. side of E. Lakeshore Dr. (perforated HDPE in 4-ft. wide, 4-ft. deep gravel reservoir bed). Infiltration trench sized to infiltrate WQv from existing roadway only. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Overflow from stormline and infiltration trench directed to existing outfall O_35. • Replace of existing pipe ID 30 (15" CP) with 18" or larger HDPE. Stormline diameter may be reduced based on final design calculations for water quality treatment practices.	A	16.3	6,250	0.3	2.6	1,130	$56,000	$17,000	$73,000	$73,000	207,100	5.68	1.01	18	No	No	3	2	1	4	1	2	0	1	2	16	C	Y	H
MB-18	East Lakeshore Dr.	• Construct 400 LF of 7 ft. wide bioswale in ROW to south of E. Lakeshore Dr. to capture and treat WQv from the roadway only. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Greenbelts are generally adequate for 7-ft. wide bioswales and open conveyance already exisis. • Overflow from bioswale directed to existing catch basins and discharge to outfall O_34. • Replace existing pipes ID 152 and 153 (12" SP) with 24" HDPE,and adjust inlet and outlet invert elevations (outlet invert of pipe 152 from 108.25 to 106.75; inlet invert of pipe 153 from 107.75 to 106.25).	A	11.4	9,850	0.4	2.9	2,880	$58,000	$54,000	$112,000	$57,000	326,600	8.97	1.99	29	No	No	1	2	1	4	1	1	1	1	2	14	C	Y	M
		Malletts Bay - East Lakeshore Dr. Area Watershed Totals:		163	115,270	8	30	19,435	$1,384,000	$336,000	$1,721,000	$124,000	3,978,000	84	14	17	No	No													

% reduction in total P load: 17

Table XX-4
Stormwater Management Recommendations - Exceeding Standards (Malletts Bay - East Lakeshore)

Sub-Basin ID	Street Name(s)	Recommendations - Exceeds Standards (MRGP, Town Public Works Standards, and SW Manual)	Recommendation Details, Metrics, and Costs															Alternatives Evaluation Criteria and Scoring												
			Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Recomentaions Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
MB-08	East Lakeshore Dr.	• Add curbing on N side of E. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property (920 LF for MB-08 and MB-09 combined), 565 LF of which appears to impact abutting property owners. • Connect existing CBs to MB-09 drainage system and abandon existing outfall O_32. • See MB-09 for recommendations regarding the combined MB-08 and MB-09 drainage areas.	A	0.0	0	0.0	0.0	0	$155,000	$0	$155,000	N/A	0	0.00	0.00	0	No	No	4	2	1	3	1	3	2	3	3	22	C	N	L
MB-14	Joey Dr.	• Replace 12" CA stormlines and culverts with 18" HDPE to meet MRGP standards. Stormline sizing recommendations may be reduced based on final design calculations for water quality treatment practices. • Construct 4,000 SF of bioretention area to capture and treat the WQv from roadways, driveways, and rooftops. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design may be curb-cut or curb extension depending on position; greenbelt between sidewalk and street only 3-4 ft. wide. • Overflow from bioretention directed to existing catch basins and discharge to outfalls O_26 or O_28. • Consider 'road diet' if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	13.6	11,950	2.9	10.7	11,950	$95,000	$222,000	$317,000	$39,000	395,900	10.87	8.26	100	No	No	1	4	2	6	1	3	1	2	2	22	D	Y	M
MB-07	East Lakeshore Dr.	• Add curbing on N side of E. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property (940 LF, none of which appears to impact abutting property owners). • Extend drainage system to north, capturing a portion of MB-08/MB-09. • Replace existing drainage system with deep sump CBs N side of road, routed to new stormlines • Construct 950 LF of stormlines as infiltration trench on N. side of roadway (perforated HDPE in gravel reservoir bed). Infiltration trench sized to capture WQv from entire sub-basin. • Overflow from infiltration trench directed to new stormline along N. side of E. Lakeshore and ultimately to new stabilized outfall to Smith Creek. • Stabilize erosion on steep embankment downslope from existing structure 293	A	5.1	6,530	1.7	3.3	6,530	$302,000	$98,000	$400,000	$69,000	216,600	5.95	5.83	100	No	No	4	6	3	6	1	1	0	2	2	25	D	Y	H
MB-18	East Lakeshore Dr.	• Construct 1,150 LF of 7 ft. wide bioswale in ROW to south of E. Lakeshore Dr. and Bay Rd. to capture and treat WQv from the roadways and a portion . • Bioswales are sized to maximize capture of WQv from existing roadway and other directly connected impervious areas. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Greenbelts are generally adequate for 7-ft. wide bioswales and open conveyance already exists.	A	11.4	9,850	2.0	7.6	8,280	$58,000	$154,000	$212,000	$38,000	326,600	8.97	5.73	84	No	No	1	2	1	5	1	1	1	1	2	15	C	Y	M
MB-11	East Lakeshore Dr., Rea Janet Dr., Suncrest Terr.	• Add curbing on N side of E. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property (1,050 LF, 390 LF of which appears to impact abutting property owners). • Install offline deep sump CBs along E. Lakeshore Dr. between the southern edge of MB-11 (approx. 937 E. Lakeshore Dr.); and existing outfall O_36. Place CBs to intercept curbline flow, as well as surface runoff directed to street west of Suncrest Terr. • Construct 900 LF of stormlines as infiltration trench on N. side of E. Lakeshore Dr. (perforated HDPE in 4-ft. wide, 4-ft. deep gravel reservoir bed). • Infiltration trenches sized to maximize capture of WQv from existing roadway and other directly connected impervious areas. Assumes that infiltration trench is sited continuously along the roadway without regard to curb cuts. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Overflow from infiltration trench directed to stormlines along N. side of E. Lakeshore and existing outfall O_36.	A	33.7	19,330	1.3	9.5	6,200	$140,000	$93,000	$233,000	$43,000	640,600	17.59	5.53	32	No	No	4	6	2	5	1	2	0	1	2	23	C	Y	H
MB-09	East Lakeshore Dr., Williams Rd.	• Add curbing on N side of E. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property (920 LF for MB-08 and MB-09 combined), 565 LF of which appears to impact abutting property owners. • Add offline deep sump CBs on Williams Rd. to address insufficient runoff capture from roadway and impacts to downstream property on E. Lakeshore Dr.; add offline deep sump CBs on E. Lakeshore Dr. in MB-08 area to address ponding in roadway. • Construct 600 LF of stormlines as infiltration trench on N. side of E. Lakeshore Dr. (perforated HDPE in 4-ft. wide, 4-ft. deep gravel reservoir bed). • Construct 550 LF of stormlines as infiltration trench on W. side of Williams Rd. (perforated HDPE in 4-ft. wide, 4-ft. deep gravel reservoir bed). • Infiltration trenches sized to maximize capture of WQv from existing roadway and other directly connected impervious areas. Assumes that infiltration trench is sited continuously along the roadway without regard to curb cuts. • Overflow from all proposed water quality practices directed to stormline along N. side of E. Lakeshore and ultimately to existing outfall O_33. • Stormline sizing recommendations provided below may be reduced or eliminated based on final design calculations for new water quality treatment practices.	A	20.7	21,680	1.2	6.4	8,000	$293,000	$120,000	$413,000	$87,000	896,500	13.26	4.79	37	No	No	5	4	2	5	1	1	0	1	2	21	C	Y	H
MB-05	East Lakeshore Dr.	• Add curbing on N side of E. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property (925 LF, of which 40 LF may impact abutting property owners). • Replace existing drainage system with deep sump CBs N side of road, routed to new bioswale on S side of road to capture/treat runoff from existing roadway • Maximize infiltrating bioswale length and direct to bioretention/ infiltration on northern edge of Hazelett property. Construct 400 LF of 7-ft. wide bioswale and 300 LF of 10-ft. wide bioretention for a total capture volume of 6,030 CF. • Overflow from new bioswale and bioretentin directed to existing outfall O_24. • Stabilize exposed portions of outfall pipe at outfall O_24.	A	17.3	8,620	1.7	10.4	6030	$222,000	$112,000	$334,000	$102,000	285,700	6.20	3.29	70	No	No	3	4	1	5	1	2	1	2	2	21	C	Y	M
SC-01	East Lakeshore Dr., S. Bay Circle	• Localized flooding in this sub-basin, associated with surcharge of infiltration practices in MB-07 during intense storms, addressed in 2014. • Construct 1,600 SF surface infiltration basin, 3 ft. deep, to provide offline water quality treatment for runoff from E. lakeshore Drive and for runoff reaching improvement constructed in 2014.	A	2.7	3,210	0.5	2.2	3,210	$20,000	$25,000	$45,000	$16,000	106,500	2.92	2.87	100	No	No	0	2	1	3	1	1	2	2	2	14	C	Y	M

Table XX-4
Stormwater Management Recommendations - Exceeding Standards (Malletts Bay - East Lakeshore)

			Recommendation Details, Metrics, and Costs															Alternatives Evaluation Criteria and Scoring											
Sub-Basin ID	Street Name(s)	Recommendations - Exceeds Standards (MRGP, Town Public Works Standards, and SW Manual)	Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Reconmentaions Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
MB-16	East Lakeshore Dr.	• Add curbing on N side of E. Lakeshore Dr. to prevent runoff from eroding steep embankments and damaging property (390 LF, 195 LF of which appears to impact abutting property owners). • Install offline deep sump CBs and stromrlines along E. Lakeshore Dr. , extending between the southern edge of MB-15 and existing outfall O_36. Place CBs to intercept curbline flow; use perforated stormline with gravel sump for conveyance with infiltration.	A	23.0	10,670	0.7	2.5	2,770	$60,000	$42,000	$102,000	$46,000	332,800	8.81	2.24	26	No	No	2	2	1	5	1	2	0	1	2	16	C	Y	H
MB-17	East Lakeshore Dr.	• Add curbing on N side of E. Lakeshore Dr. to prevent runoff from damaging property (295 LF, 170 LF of which appears to impact abutting property owners). • Install offline deep sump CBs and stromrlines along E. Lakeshore Dr. , extending between the northern edge of MB-17 and existing outfall O_35. Place CBs to intercept curbline flow; use perforated stormline with gravel sump for conveyance with infiltration. • Construct 290 LF of subsurface infiltration trenches to maximize runoff capture from E. Lakeshore Dr. • Infiltration trenches sized to maximize capture of WQv from existing roadway and other directly connected impervious areas. Assumes that infiltration trench is sited continuously along the roadway without regard to curb cuts. • Overflow from stormline and infiltration trench directed to existing outfall O_35. • Replace of existing pipe ID 30 (15" CP) with 18" or larger HDPE. Stormline diameter may be reduced based on final design calculations for water quality treatment practices.	A	16.3	6,250	0.5	5.1	2,140	$56,000	$33,000	$89,000	$47,000	207,100	5.68	1.91	34	No	No	3	2	1	6	1	2	0	1	2	18	C	Y	H
MB-10	Bayview Rd.	• Construct 930 SF of bioretention areas along roadways, sized to capture and "over-treat" the WQv from all of the existing impervious area . • Bioretention area footprint is sized based on 2 ft. media depth and 1 ft. ponding. • Further analysis recommended to optimize treatment practice sizing and capture	A	2.6	2,590	0.7	2.2	2,850	$1,500	$53,000	$55,000	$31,000	86,000	2.36	1.79	110	No	Yes	1	5	2	6	1	2	1	2	2	22	D	Y	M
MB-13	Jason Dr., Whispering Pines Condominium	• De-pave unused portions of the existing cul-de-sac (approximately 3,900 SF of total pavement may be removed). • Construct 1,500 SF of bioretention in place of a portion of the de-paved cul-de-sac area to provide additional water quality treatment for runoff from exsting roadways, drives, and structures. • Bioretention area sized based on 2 ft. media depth and 1 ft. ponding. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Overflow from bioretention directed to existing catch basins and discharge to existing infiltration basin at outfall O_27.	D	5.8	2,910	0.6	5.2	4,500	$0	$84,000	$84,000	$2,085,000	96,600	0.05	0.04	155	No	No	0	0	1	3	1	3	2	2	2	14	D	Y	M
MB-12	Jason Dr., Whispering Pines Condominium	• System meets pre-2002 VSMM standards and consists of infiltrating practices. • Remove sediment from outfall O_39, into infiltration basin. • MB-12 and MB-13 are under same common plan of development and State stormwater permit; may fall under Developed Lands General Permit and thus may require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Opportunity to exceed standards in this development is described in MB-13 recommendations. • Consider "road diet" for Jason Drive if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	10.5	10,700	2.7	7.8	0	$1,500	$0	$2,000	N/A	354,700	0.19	0.00	0	No	Yes	1	0	1	n/a	n/a	n/a	n/a	n/a	2	4	C	N	n/a
MB-15	East Lakeshore Dr.	• Connect existing CB to MB-16 drainage system and abandon existing outfall O_37. • See MB-16 for recommendations regarding the combined MB-15 and MB-16 drainage areas.	A	0.8	980	0.3	0.5	0	$0	$0	$0	N/A	32,400	0.89	0.00	0	No	No	2	2	1	n/a	n/a	n/a	n/a	n/a	3	8	C	N	n/a
Malletts Bay - East Lakeshore Dr. Area Watershed Totals:				163	115,270	17	73	62,460	$1,404,000	$1,036,000	$2,441,000	$58,000	3,978,000	84	42	54	No	No												

% reduction in total P load: 50

Table XX-5
Stormwater Management Recommendations - Meeting Standards (Crooked Hollow Creek)

			Recommendation Details, Metrics, and Costs															Alternatives Evaluation Criteria and Scoring											
Sub-Basin ID	Street Name(s)	Recommendations - Meets Standards (MRGP, Town Public Works Standards, and SW Manual Public Transportation Projects Redevelopment-Major Maintenance)	Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Reccomendations Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
CC-01	Bay Rd.	• Existing culvert meets applicable standards. No identified issues or recommendations.	D	23.2	17,460	4.1	19.1	0	$0	$0	$0	N/A	578,500	0.90	0.00	0	No	No	0	0	1	n/a	n/a	n/a	n/a	n/a	3	4	C	N	n/a
CC-02	Bay Rd.	• Existing system meets applicable stormwater standards. • Existing stormlines are 12" SP - less than 18" minimum in MRGP, but there are no existing issues, so no action required to meet standards. • Existing grass channel (600 LF) at east end of drainage system provides some water quality treatment for recreational path and southern half of roadway. • Overflow from grass channel and closed drainage system directed to existing outfall O_44.	A	7.2	7,360	1.9	5.4	0	$0	$0	$0	N/A	243,900	6.69	0.00	0	No	No	0	2	1	n/a	n/a	n/a	n/a	n/a	3	6	C	Y	n/a
CC-03	Stone Dr., Granite Cre	• Construct approximately 8,350 SF of bioretention areas with 12" ponding depth and 2 ft. of soil filter media along roadways, sized to capture and treat WQv from the existing impervious area . • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street generally adequate for 7-ft. wide practices. • Overflow from bioretention directed to existing catch basins and discharge to existing detentin basin and outfall O_8. • This sub-basin may fall under Developed Lands General Permit and thus require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	20.6	24,920	6.5	14.1	25,050	$0	$477,000	$477,000	$35,000	825,700	18.36	13.96	101	No	Yes	0	2	2	3	1	3	2	2	2	17	C	Y	M
CC-04	Windswept Dr.	• Existing system effectively consists of infiltrating practices and meets applicable standards. • If this sub-basin is considered part of the subdivision "common plan of development" it may fall under Developed Lands General Permit and thus require engineering feasibility assessment and retrofits to maximize phosphorus treatment. No operational stormwater permit found for this sub-basin; further investigation may be warranted. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	6.8	8,570	2.2	4.5	0	$0	$0	$0	N/A	284,000	0.16	0.00	0	No	Yes	0	0	1	n/a	n/a	n/a	n/a	n/a	2	3	C	Y	n/a
CC-05	Orchard Drive, Orchard Circle, Field Green Drive	• System does not meet draft MRGP standards, and no water quality treatment or volume control provided in this sub-basin. • Construct 6,500 SF of curb-cut infiltrating bioretention with 12-inch ponding and 2-ft. filter bed to provide water quality treatment for the existing impervious area. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street generally adequate for 7-10 ft. wide practices. • Overflow from bioretention directed to existing catch basins and ultimately to existing detention basin and outfall O_12. • Construct restoration practices to remediate gully erosion at outfall O_12 in coordination with or following upland retrofits for water quality treatment and infiltration. • This sub-basin may fall under Developed Lands General Permit and thus may require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	13.7	19,520	5.2	8.5	19,500	$100,000	$371,000	$471,000	$45,000	646,800	14.03	10.65	100	Yes	Yes	1	12	5	4	1	2	2	2	2	31	C	Y	M
CC-06	Orchard Drive - Lot 46 Extension	• Existing system effectively consists of infiltrating practices and meets applicable standards. • This sub-basin may fall under Developed Lands General Permit and thus may require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	D	7.2	9,480	2.5	4.6	0	$0	$0	$0	N/A	314,300	6.99	0.00	0	No	Yes	0	2	1	n/a	n/a	n/a	n/a	n/a	2	5	C	Y	n/a
Crooked Hollow Creek Watershed Totals:				79	87,310	22	56	44,550	100,000	848,000	948,000	$39,000	2,893,200	46	25	51	Yes	Yes												

% reduction in total P load: 53

Table XX-6
Stormwater Management Recommendations - Exceeding Standards (Crooked Hollow Creek)

			Recommendation Details, Metrics, and Costs															Alternatives Evaluation Criteria and Scoring										
Sub-Basin ID	Street Name(s)	Recommendations - Exceeds Standards (MRGP, Town Public Works Standards, and SW Manual)	Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Reccomendations Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
CC-01	Bay Rd.	• Existing culvert meets applicable standards. No identified issues or recommendations.	D	23.2	17,460	4.1	19.1	0	$0	$0	$0	N/A	578,500	0.90	0.00	0	No	No	0	0	1	n/a	n/a	n/a	n/a	n/a	3	4	C	N	n/a
CC-02	Bay Rd.	• Construct up to 600 LF of 7 ft. wide bioswale to maximize capture and treatment of runoff from roadway and recreation path. • Overflow from bioswale directed to existing catch basin and ultimately to existing outfall O_44.	A	7.2	7,360	1.9	5.4	1,510	$0	$29,000	$29,000	$28,000	243,900	6.69	1.04	21	No	No	0	2	1	3	0	4	2	3	2	17	C	Y	M
CC-03	Stone Dr., Granite Cre	• Construct approximately 15,500 SF of bioretention areas with 12" ponding depth and 2 ft. of soil filter media along roadways, sized to capture and "over-treat" the WQv from the existing impervious area. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street generally adequate for 7-10 ft. wide practices. • Overflow from bioswales directed to existing catch basins and ultimately to existing detention basin and outfall O_8. • This sub-basin may fall under Developed Lands General Permit and thus require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	20.6	24,920	6.5	14.1	46,500	$0	$885,000	$885,000	$64,000	825,700	18.36	13.96	187	No	Yes	0	2	2	3	1	3	2	2	2	17	C	Y	M
CC-04	Windswept Dr.	• Construct approximately 2,850 SF of bioretention areas with 12" ponding depth and 2 ft. of soil filter media along roadways, sized to maximize capture and "over-treat" the WQv from the existing impervious area. • Full WQv capture may require acquisition of land outside of ROW. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street generally adequate for 7-10 ft. wide practices. • Overflow from bioretention directed to existing catch basins and ultimately to existing detention basin and outfall O_9. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	6.8	8,570	2.2	4.5	8,570	$0	$164,000	$164,000	$1,384,000	284,000	0.16	0.12	100	No	Yes	0	0	1	3	1	3	1	2	2	13	D	Y	M
CC-05	Orchard Drive, Orchard Circle, Field Green Drive	• Construct approximately 13,000 SF of bioretention areas with 12" ponding depth and 2 ft. of soil filter media along roadways, sized to maximize capture and "over-treat" the WQv from the existing impervious area. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street generally adequate for 7-10 ft. wide practices. • Overflow from bioretention directed to existing catch basins and ultimately to existing outfall O_12. • Construct restoration practices to remediate gully erosion at outfall O_12 in coordination with or following upland retrofits for water quality treatment and infiltration. • This sub-basin may fall under Developed Lands General Permit and thus may require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	13.7	19,520	5.2	8.5	39,000	$100,000	$742,000	$842,000	$79,000	646,800	14.03	10.66	200	Yes	Yes	1	12	5	6	1	2	2	2	2	33	C	Y	M
CC-06	Orchard Drive - Lot 46 Extension	• Optimize existing dry detention basin to infiltrate at least the WQv from the existing impervious cover and to minimize overflows from outfall O_19 into the closed drainage system for CC-05. • Opportunities to infiltrate runoff along roadways in the majority of this sub-basin are limited (HSG D soils). • Further analysis recommended to optimize treatment practice sizing and capture volume. • This sub-basin may fall under Developed Lands General Permit and thus may require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	D	7.2	9,480	2.5	4.6	9,480	$0	$73,000	$73,000	$11,000	314,300	6.99	6.85	100	No	Yes	0	2	1	3	1	2	2	3	2	16	C	Y	M
		Crooked Hollow Creek Watershed Totals:		79	87,310	22	56	105,060	100,000	1,893,000	1,993,000	$62,000	2,893,200	46	33	120	Yes	Yes												

% reduction in total P load: 71

Table XX-7
Stormwater Management Recommendations - Meeting Standards (Smith Creek)

			Recommendation Details, Metrics, and Costs														Alternatives Evaluation Criteria and Scoring											
Sub-Basin ID	Street Name(s)	Recommendations - Meets Standards (MRGP, Town Public Works Standards, and SW Manual Public Transportation Projects Redevelopment-Major Maintenance)	Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Reccomendations Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
SC-02	S. Bay Circle	• System meets standards in its existing condition. • Existing infiltration practices do surcharge during intense precipitation events. Drainage improvements were constructed at the intersection of S. Bay Circle and E. Lakeshore in 2014 to address this localized flooding. • Renovation of the existing infiltration practices should be considered, especially if this work is coordinated with other roadway or subsurface utility upgrades. • This sub-basin may fall under Developed Lands General Permit and thus require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	17.5	19,020	4.9	12.6	0	$0	$0	$0	N/A	630,300	0.35	0.00	0	No	Yes	0	0	1	n/a	n/a	n/a	n/a	n/a	2	3	C	Y	n/a
SC-03	Laker Lane	• System generally meets standards, though at least one existing practice has reduced efficiency due to age and compaction. • This sub-basin may fall under Developed Lands General Permit and thus require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Retrofit practices are already in design to exceed standards "Animating Infrastructure" grant applied for, March 2017. • No further recommendations.	A	11.0	22,580	6.3	4.7	0	$0	$0	$0	N/A	748,200	0.41	0.00	0	No	No	0	2	1	n/a	n/a	n/a	n/a	n/a	2	5	C	Y	L
SC-04	Fox Run, Waterlefe W	• System meets 2002 VSMM standards - constructed in last 5 years and is in excellent condition. • Existing stormwater practices emphasize infiltration; dry detention basins function as infiltration basins, effectively maximizing infiltration. • No further recommendations.	A	10.7	13,580	3.6	7.2	0	$0	$0	$0	N/A	450,200	0.25	0.00	0	No	No	0	0	1	n/a	n/a	n/a	n/a	n/a	2	3	C	Y	n/a
SC-05	Fox Run, Blackberry C	• Existing system consists of infiltrating practices. Meets MRGP standards; not permitted, but meets applicable stormwater standards. • This sub-basin may fall under Developed Lands General Permit and thus require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Consider "road diet" if substantial reconstruction of roadway needed in future. Low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	11.4	14,120	3.7	7.7	0	$0	$0	$0	N/A	468,000	0.26	0.00	0	No	Yes	0	0	1	n/a	n/a	n/a	n/a	n/a	2	3	C	Y	n/a
SC-06	Laura Ln., Jeffrey Dr., Andrea Ln.	• Existing system consists of infiltrating practices. Meets MRGP standards; not permitted, but meets applicable stormwater standards. • Existing stormlines are in fair to poor condition; replace if other roadway projects planned. • Consider "road diet" if substantial reconstruction of roadway needed in future. Low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A (former gravel pit)	9.2	11,000	2.9	6.4	0	$117,000	$0	$117,000	N/A	364,700	0.20	0.00	0	No	Yes	1	0	1	3	1	2	2	3	3	16	C	Y	M
SC-07	Julie Dr.	• Existing system consists of infiltrating practices. Meets MRGP standards; not permitted, but meets applicable stormwater standards. • This sub-basin may fall under Developed Lands General Permit and thus require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Existing stormlines are in fair to poor condition; replace if other roadway projects planned. • Consider "road diet" if substantial reconstruction of roadway needed in future. Low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	11.3	16,230	4.3	7.0	0	$53,000	$0	$53,000	N/A	537,900	0.30	0.00	0	No	Yes	1	0	1	3	1	2	2	3	3	16	C	Y	M
SC-08	Williams Rd.	• Replace existing 18" cross culvert with min. 36" HDPE. • Stabilize outfall O_43 with stone-lined plunge pool. • Restore 370 LF of grass channel between I-89 culverts and Williams Rd. • Work with VTrans to reduce run-on from I-89 impervious cover and drainage network, followed by restoration/stabilization of major gully reaching from Williams Rd. to the creek. • Assume that gravel wetlands can be constructed in VTrans ROW to manage WQv. BMP construction costs are included at right but ultimately may not be borne solely by the Town. • Opportunities to meet standards by maximizing treatment and infiltration are primarily located in VTrans roadway and ROW and therefore must be developed in coordination with that agency.	D	39.2	20,710	4.2	35.1	20,710	$319,000	$224,000	$543,000	$48,000	686,400	18.84	11.50	100	Yes	No	3	10	5	4	1	3	1	3	2	32	C	Y	M
SC-09	Williams Rd., Tower Ridge Circle, Midnight Pass	• Construct 650 SF of 7 ft. wide bioswale (length of existing grass channels) along roadways. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Greenbelts are generally adequate for 7-ft. or wider bioswales and open conveyance already exisis. • Overflow from bioswales directed to existing catch basins and discharge to O_29. • Erosion at outfall was stabilized in 2016; if necessary, repair gully erosion between outfall and creek following construction of bioswales.	A	8.6	9,940	2.6	6.0	4,680	$95,000	$90,000	$185,000	$73,000	329,500	7.15	2.56	47	Yes	No	1	6	3	4	0	2	2	2	2	22	C	Y	M
SC-10	Everbreeze Dr.	• Repair stormline to outfall O_18; outfall is stable but water flows above pipe during wet conditions. • Locate and restore outfall O_17 (to SC-08). • Construct approximately 2,750 SF of bioretention along roadways, sized to capture and treat WQv from the existing impervious area . • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street generally adequate for 7-ft. wide practices. • Overflow from bioswales directed to existing catch basins and discharge to O_17 or O_18. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	7.7	8,190	2.1	5.6	8,250	$30,000	$157,000	$187,000	$34,000	271,600	7.46	5.67	101	No	Yes	1	4	2	5	1	2	2	2	2	21	C	Y	M

Table XX-7
Stormwater Management Recommendations - Meeting Standards (Smith Creek)

Sub-Basin ID	Street Name(s)	Recommendations - Meets Standards (MRGP, Town Public Works Standards, and SW Manual Public Transportation Projects Redevelopment-Major Maintenance)	Recommendation Details, Metrics, and Costs														Alternatives Evaluation Criteria and Scoring											
			Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Reccomendations Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
SC-11	Blakeley Rd.	• Municipal Offices and Rescue Building meet 2002 standards; no further recommendations. • Closed drainage serving Colchester PD/former Town Offices in good condiion but older and does not include WQ treatment. • Construct approximately 700 SF of bioretention in space between Police Dept. and Fletcher Allen buildings to treat up to 24% of WQv from this remaining untreated impervious area. • Overflow from bioretention directed to existing manhole and discharge to O_10. • Construct stone-lined plunge pool and stabilize erosion down-slope of outfall O_10. • Town Garage's overland flow, as permitted via a pre-2002 State stormwater operational permot, includes 3.24 acres of impervious area and thus may fall under the Developed Lands permit program and require engineering feasibility assesment and upgrades to maximize phosphorus removal.	A	10.9	13,240	1.3	2.5	2,100	$65,000	$40,000	$105,000	$104,000	438,900	8.41	1.01	16	No	No	2	6	2	4	1	3	2	2	2	24	C	Y	M
SC-12	Old Sawmill Rd.	• Existing system consists of infiltrating practices and meets applicable stormwater standards. • System is approximately 30 years old; condition of subsurface infiltration unknown. • Consider "road diet" if substantial reconstruction of roadway needed in future.	A	3.5	4,480	1.2	2.3	0	$0	$0	$0	N/A	148,500	0.29	0.00	0	No	Yes	0	0	1	n/a	n/a	n/a	n/a	n/a	3	4	C	Y	n/a
SC-13	Burnham Ln., Nice Way	• Construct approximately 6,400 SF bioretention areas along roadways, sized to capture and treat WQv from the existing impervious area . • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street generally adequate for 7-ft. wide practices. • Overflow from bioretention directed to existing catch basins and discharge to existing extended detention basin at outfall O_11. • This sub-basin may fall under Developed Lands General Permit and thus require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	15.3	19,130	5.0	10.3	19,200	$0	$366,000	$366,000	$35,000	633,900	14.10	10.71	100	No	Yes	0	2	2	3	1	2	2	2	2	16	C	Y	M
SC-14	Hummingbird Dr.	• Existing system consists of infiltrating practices and meets applicable stormwater standards. • System is approximately 30 years old; subsurface infiltration practices are in fair condition. Replace if other roadway projects planned. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	8.3	7,340	1.8	6.5	0	$0	$0	$0	N/A	243,300	0.13	0.00	0	No	Yes	1	0	1	n/a	n/a	n/a	n/a	n/a	3	5	C	Y	n/a
SC-15	Thomas Dr.	• Existing system consists of infiltrating practices and meets applicable stormwater standards. • System is over 35 years old; subsurface infiltration practices are in fair condition. Replace if other roadway projects planned. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	4.2	5,800	1.5	2.7	0	$0	$0	$0	N/A	192,300	0.11	0.00	0	No	Yes	1	0	1	n/a	n/a	n/a	n/a	n/a	3	5	C	Y	n/a
SC-16	Edgewood Dr.	• Construct approximately 5,800 SF bioretention areas along roadways, sized to capture and treat WQv from the existing impervious area . • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street generally adequate for 7-ft. wide practices. • Overflow from bioretention directed to existing catch basins and discharge to existing outfalls (O_15, O_20, or O_22). • This sub-basin may fall under Developed Lands General Permit and thus require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	11.2	17,320	4.7	6.5	17,400	$0	$331,000	$331,000	$54,000	574,000	8.19	6.23	100	No	Yes	0	4	2	4	1	2	2	2	2	19	C	Y	M
SC-17	Hawkes Way	• Existing system consists of infiltrating practices (grass channels with underdrains to drywells) and meets applicable stormwater standards. • Consider "road diet" if substantial reconstruction of roadway needed in future or as strategic de-paving. Roadway is not curbed, so pavement removal and shoulder restoration is relatively cost-effective. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	3.9	5,110	1.3	2.5	0	$0	$0	$0	N/A	169,400	0.07	0.00	0	No	Yes	1	0	1	n/a	n/a	n/a	n/a	n/a	3	5	C	Y	n/a
Smith Creek Watershed Totals:				184	207,790	51	125	72,340	$679,000	$1,208,000	$1,887,000	$51,000	6,887,100	67	38	35	Yes	Yes												

% reduction in total P load: 57

Table XX-8
Stormwater Management Recommendations - Exceeding Standards (Smith Creek)

Sub-Basin ID	Street Name(s)	Recommendations - Exceeds Standards (MRGP, Town Public Works Standards, and SW Manual)	Recommendation Details, Metrics, and Costs															Alternatives Evaluation Criteria and Scoring											
			Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Reccomendations Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
SC-02	S. Bay Circle	• Construct approximately 6,350 SF of curb-cut bioretention areas along roadways, sized to capture and "over-treat" WQv from the existing impervious area . • Some bioretention areas could require acquisition of land outside of ROW. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street generally adequate for 7-ft. wide practices. • Overflow from bioretention directed to existing catch basins and discharge to groundwater. • This sub-basin may fall under Developed Lands General Permit and thus require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	17.5	19,020	4.9	12.6	19050	$0	$363,000	$363,000	$1,381,000	630,300	0.35	0.26	100	No	Yes	0	0	1	3	1	2	1	2	2	12	D	Y	M
SC-03	Laker Lane	• System generally meets standards, though at least one existing practice has reduced efficiency due to age and compaction. • This sub-basin may fall under Developed Lands General Permit and thus require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Retrofit practices already designed to meet/exceed standards; "Animating Infrastructure" grant applied for, March 2017. • Construct proposed bioretention practices and other upgrades to existing practices according to final designs.	A	11.0	22,580	6.3	4.7	1,390	$0	$27,000	$27,000	$1,405,000	748,200	0.41	0.02	6	No	No	0	2	1	6	1	3	2	3	2	20	C	Y	L
SC-04	Fox Run, Waterlefe W	• System meets 2002 VSMM standards - constructed in last 5 years and is in excellent condition. • Existing stormwater practices emphasize infiltration; dry detention basins function as infiltration basins, effectively maximizing infiltration. • No further recommendations.	A	10.7	13,580	3.6	7.2	0	$0	$0	$0	N/A	450,200	0.25	0.00	0	No	No	0	0	1	n/a	n/a	n/a	n/a	n/a	2	3	C	Y	n/a
SC-05	Fox Run, Blackberry C	• Construct approximately 6,350 SF of bioretention areas along roadways, sized to capture and "over-treat" WQv from the existing impervious area . • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas; water and underground electric utility conflicts limit siting opportunities. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street generally adequate for 7-ft. wide practices. • Overflow from bioretention directed to existing catch basins and discharge to groundwater. • This sub-basin may fall under Developed Lands General Permit and thus require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	11.4	14,120	3.7	7.7	14,120	$0	$269,000	$269,000	$1,378,000	468,000	0.26	0.20	100	No	Yes	0	0	1	3	1	2	2	2	2	13	C	Y	H
SC-06	Laura Ln., Jeffrey Dr., Andrea Ln.	• Construct approximately 3,700 SF of bioretention areas along roadways, sized to capture and "over-treat" WQv from the existing impervious area . • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas; water and underground electric utility conflicts limit siting opportunities. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street generally adequate for 7-ft. wide practices. • Overflow from bioretention directed to existing catch basins and discharge to groundwater. • Existing stormlines are in fair to poor condition; consider replacement if other roadway projects planned. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A (former gravel pit)	9.2	11,000	2.9	6.4	11,000	$117,000	$210,000	$327,000	$2,149,000	364,700	0.20	0.15	100	No	Yes	1	0	1	6	1	2	2	2	2	17	C	Y	M
SC-07	Julie Dr.	• Construct approximately 5,400 SF of bioretention areas along roadways, sized to capture and "over-treat" WQv from the existing impervious area . • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas; water and underground electric utility conflicts limit siting opportunities. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street generally adequate for 7-ft. wide bioswales. • Overflow from bioswales directed to existing catch basins and discharge to groundwater. • This sub-basin may fall under Developed Lands General Permit and thus require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Existing stormlines are in fair to poor condition; consider replacement if other roadway projects planned. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	11.3	16,230	4.3	7.0	16,230	$53,000	$309,000	$362,000	$1,613,000	537,900	0.30	0.22	100	No	Yes	1	0	1	6	1	2	2	3	3	19	C	Y	M
SC-08	Williams Rd.	• Replace existing 18" cross culvert with min. 36" HDPE. • Stabilize outfall O_43 with stone-lined plunge pool. • Restore 370 LF of grass channel between I-89 culverts and Williams Rd. • Work with VTrans to reduce run-on from I-89 impervious cover and drainage network, followed by restoration/stabilization of major gully reaching from Williams Rd. to the creek. • Assume that gravel wetlands can be constructed in VTrans ROW to manage WQv. BMP construction costs are included at right but ultimately may not be borne solely by the Town. • Opportunities to meet standards by maximizing treatment and infiltration are primarily located in VTrans roadway and ROW and therefore must be developed in coordination with that agency.	D	39.2	20,710	4.2	35.1	20,710	$319,000	$224,000	$543,000	$48,000	686,400	18.84	11.50	100	Yes	No	3	10	5	6	1	3	1	3	2	34	C	Y	M
SC-09	Williams Rd., Tower Ridge Circle, Midnight Pass	• Construct 650 LF of 7 ft. wide bioswale (length of existing grass channels) along roadways to treat 47% of the WQv, as in the "Meets Standards" recommendation. • Construct 1,800 SF of bioretention with 2 ft. media depth and 1 ft. ponding at end of pipe to fully treat the remaining WQv of 5,420 CF. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Greenbelts are generally adequate for 7-ft. or wider bioswales and open conveyance already exisis. • Overflow from bioswales directed to existing catch basins and discharge to O_29. • Erosion at outfall was stabilized in 2016; if necessary, repair gully erosion between outfall and creek following construction of bioswales and bioretention.	A	8.6	9,940	2.6	6.0	9,940	$95,000	$190,000	$285,000	$53,000	329,500	7.15	5.43	100	Yes	No	1	6	3	6	0	2	1	2	2	23	C	Y	M

Table XX-8
Stormwater Management Recommendations - Exceeding Standards (Smith Creek)

Sub-Basin ID	Street Name(s)	Recommendations - Exceeds Standards (MRGP, Town Public Works Standards, and SW Manual)	Recommendation Details, Metrics, and Costs														Alternatives Evaluation Criteria and Scoring											
			Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Reccomendations Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
SC-10	Everbreeze Dr.	• Repair stormline to outfall O_18; outfall is stable but water flows above pipe during wet conditions. • Locate and restore outfall O_17 (to SC-08). • Construct approximately 6,000 SF of bioretention areas along roadways, sized to capture and "over-treat" WQv from the existing impervious area . • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street generally adequate for 7-ft. wide practices. • Overflow from bioswales directed to existing catch basins and discharge to O_17 or O_18. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	7.7	8,190	2.1	5.6	18,000	$30,000	$343,000	$373,000	$66,000	271,600	7.46	5.67	220	No	Yes	1	4	2	6	1	2	2	1	2	21	C	Y	M
SC-11	Blakeley Rd.	• Municipal Offices and Rescue Building meet 2002 standards; no further recommendations. • Closed drainage serving Colchester PD/former Town Offices in good condiion but older and does not include WQ treatment. • Construct subsurface infiltration chambers beneath parking area to treat and infiltrate 100% of the presently untreated WQv from the Police Dept. and Fletcher Allen buildings • Overflow from infiltration directed to existing manholes and discharge to O_10. • Construct stone-lined plunge pool and stabilize erosion down-slope of outfall O_10. • Town Garage's overland flow, as permitted via 9010, includes 3.24 acres of impervious area and thus may fall under the Developed Lands permit program and require engineering feasibility assesment and upgrades to maximize phosphorus removal.	A	10.9	13,240	1.3	2.5	5,070	$65,000	$424,000	$489,000	$155,000	438,900	8.41	3.16	38	No	No	2	6	2	6	1	3	2	2	2	26	C	Y	M
SC-12	Old Sawmill Rd.	• Construct approximately 6,000 SF of bioretention areas along roadways, sized to capture and "over-treat" WQv from the existing impervious area . • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas.	A	3.5	4,480	1.2	2.3	4,500	$0	$86,000	$86,000	$397,000	148,500	0.29	0.22	100	No	Yes	0	0	1	6	1	2	1	2	2	15	C	Y	M
SC-13	Burnham Ln., Nice Way	• Construct up to 14,000 SF of bioretention areas along roadways, sized to capture and "over-treat" runoff in excess of WQv from the existing impervious area . • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street generally adequate for 7-ft. wide practices. • Overflow from bioretention directed to existing catch basins and discharge to existing extended detention basin at outfall O_11. • This sub-basin may fall under Developed Lands General Permit and thus require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	15.3	19,130	5.0	10.3	42,000	$0	$799,000	$799,000	$75,000	633,900	14.10	10.71	220	No	Yes	0	2	2	3	1	2	2	2	2	16	C	Y	M
SC-14	Hummingbird Dr.	• Construct up to 2,360 SF of bioretention areas along roadways, sized to capture and "over-treat" runoff in excess of WQv from the existing impervious area . • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design can be a combination of curb-cut and curb extension; greenbelt between sidewalkand street on south side of roadway is not adequate for curb-cut practices. • System is approximately 30 years old; subsurface infiltration practices are in fair condition. Replace if other roadway projects planned. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	8.3	7,340	1.8	6.5	7,340	$0	$140,000	$140,000	$1,380,000	243,300	0.13	0.10	100	No	Yes	1	0	1	6	1	2	1	2	2	16	C	Y	M
SC-15	Thomas Dr.	• Construct up to 1,980 SF of bioretention areas along roadways, sized to capture and "over-treat" the WQv from the existing impervious area . • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas. • Bioretention design will be a combination of curb-cut and curb extension; greenbelt between sidewalkand street on south side of roadway is adequate for 7-ft. wide practices. • System is over 35 years old; subsurface infiltration practices are in fair condition. Replace if other roadway projects planned. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	4.2	5,800	1.5	2.7	5,800	$0	$111,000	$111,000	$1,384,000	192,300	0.11	0.08	100	No	Yes	1	0	1	6	1	2	1	2	2	16	C	Y	M
SC-16	Edgewood Dr.	• Construct up to 10,000 SF of bioretention areas along roadways, sized to capture and "over-treat" the WQv from the existing impervious area. • Further analysis recommended to optimize treatment practice sizing and capture volumes/drainage areas; water and underground electric utility conflicts limit siting opportunities. • Bioretention design may be curb-cut or curb extension; greenbelt between sidewalk and street generally adequate for 7-ft. wide practices. • Overflow from bioretention directed to existing catch basins and discharge to existing outfalls (O_14, O_15, O_20, O_21, or O_22). • This sub-basin may fall under Developed Lands General Permit and thus require engineering feasibility assessment and retrofits to maximize phosphorus treatment. • Consider "road diet" if substantial reconstruction of roadway needed in future. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	11.2	17,320	4.7	6.5	30,000	$0	$571,000	$571,000	$92,000	574,000	8.19	6.23	173	No	Yes	0	4	2	6	1	2	1	2	2	20	C	Y	M

Table XX-8
Stormwater Management Recommendations - Exceeding Standards (Smith Creek)

Sub-Basin ID	Street Name(s)	Recommendations - Exceeds Standards (MRGP, Town Public Works Standards, and SW Manual)	Recommendation Details, Metrics, and Costs															Alternatives Evaluation Criteria and Scoring												
			Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Reccomendations Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
SC-17	Hawkes Way	• Add check-dams and risers to catch basins at bottoms of exisitng swales to increase infiltration capacity, increasing the WQv "over-treated" by approximately 10%. • Consider 'road diet' if substantial reconstruction of roadway needed in future or as strategic de-paving. Roadway is not curbed, so pavement removal and shoulder restoration is relatively cost-effective. Current Town standard is 26 ft. width; low traffic volume roads (less than 50 homes or 500 daily trips) may potentially be be as narrow as 22 feet.	A	3.9	5,110	1.3	2.5	510	$0	$8,000	$8,000	$1,114,000	169,400	0.07	0.01	10	No	Yes	1	0	1	3	1	4	1	3	3	17	C	Y	L
Smith Creek Watershed Totals:				184	207,790	51	125	205,660	$679,000	$4,074,000	$4,753,000	$109,000	6,887,100	67	44	99	Yes	Yes												

% reduction in total P load: 66

Table XX-9
Stormwater Management Recommendations - Meeting Standards (Moorings Stream)

Sub-Basin ID	Street Name(s)	Recommendations - Meets Standards (MRGP, Town Public Works Standards, and SW Manual Public Transportation Projects Redevelopment-Major Maintenance)	Recommendation Details, Metrics, and Costs															Alternatives Evaluation Criteria and Scoring												
			Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Recomentaions Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
MS-02	Shore Acres Dr.	• Construct endwall for existing 15" CPP stormline at outfall O_48. • Construct stone-lined plunge pool at outfall O_48 to address erosion at culvert outlet. • Construct 175 LF of subsurface gravel treatment wetland on west side of roadway to replace existing CBs and stormlines, between driveways in the southern portion of the sub-basin closest to the existing cross culvert. • Use gravel diaphragm and filter strip at road shoulder and small sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard. • Overflow from subsurface gravel wetland directed to existing outfall O_48.	D	5.2	3,220	0.7	4.5	2,000	$9,000	$22,000	$31,000	$28,000	106,600	2.93	1.11	62	No	No	2	6	3	4	1	3	1	2	2	24	C	N	M
MS-03	Hillcrest Ln.	• Construct stone-lined plunge pool at 24" RCP outfall O_13 to address erosion at culvert outlet. • Replace existing CBs and stormlines with subsurface gravel treatment wetlands and connecting culverts. • Construct 385 LF of subsurface gravel treatment wetland on both sides of roadway to replace existing CBs and stormlines, using all available road frontage between driveways and concentrated in the northern/down-slope portion of the sub-basin. • Retain and replace driveway culverts where necessary to connect surface flows from treatment cells. • Use gravel diaphragm and filter strip at road shoulder and small sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard. • Overflow from subsurface gravel wetland directed to existing outfall O_13.	D	4.7	4,080	1.08	3.6	4,080	$5,000	$45,000	$50,000	$28,000	135,200	2.93	1.79	100	No	No	2	6	3	4	1	2	1	2	2	23	C	N	M
MS-04	Shore Acres Dr., Summit Ridge	• Replace existing grass channels, CBs, and stormlines with subsurface gravel treatment wetlands and connecting culverts. • Construct 590 LF of subsurface gravel treatment wetland on both sides of roadway on Shore Acres Dr., using all available road frontage between driveways and concentrated in the northern/down-slope portion of the sub-basin. • Retain and replace driveway culverts where necessary to connect surface flows from treatment cells. • Use gravel diaphragm and filter strip at road shoulder and sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard. • Overflow from subsurface gravel wetland directed to existing outfall O_23.	D	6.5	6,770	1.73	4.77	6,830	$0	$74,000	$74,000	$25,000	224,500	4.87	2.97	101	No	No	1	6	3	5	1	2	1	2	2	23	C	N	M
MS-05	Cedar Ridge Dr.	• Replace two existing 15" CMP culverts with 18" HDPE culverts, endwalls, and stone-lined plunge pools at outlets. • Replace existing grass channels with subsurface gravel treatment wetlands and connecting culverts. • Construct 585 LF of subsurface gravel treatment wetland on both sides of roadway on Shore Acres Dr., using available road frontage between driveways and concentrated in the down-slope portion of the sub-basin where practicable. • Retain and replace driveway culverts where necessary to connect surface flows from treatment cells. • Use gravel diaphragm and filter strip at road shoulder and sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard. • Overflow from subsurface gravel wetland directed to existing culvert outlet locations.	D	7.6	6,700	1.58	6.02	6,550	$65,000	$71,000	$136,000	$48,000	222,000	4.81	2.87	98	No	No	2	6	3	5	1	2	1	2	2	24	C	N	M
MS-06	Shore Acres Rd.	• Replace existing grass channels with subsurface gravel treatment wetlands and connecting culverts. • Construct 830 LF of subsurface gravel treatment wetland on both sides of roadway on Shore Acres Dr., using all available road frontage between driveways and concentrated in the down-slope portion of the sub-basin where practicable. • Use gravel diaphragm and filter strip at road shoulder and sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard. • Overflow from subsurface gravel wetland directed to the existing 18" CMP culvert.	D	12.6	9,450	2.2	10.4	9,470	$0	$103,000	$103,000	$25,000	313,300	6.79	4.14	100	No	No	1	6	3	5	1	2	1	2	2	23	C	N	M
MS-07	Shore Acres Rd.	• Replace existing grass channels with subsurface gravel treatment wetlands and connecting culverts. • Construct 830 LF of subsurface gravel treatment wetland on both sides of roadway on Shore Acres Dr., using all available road frontage between driveways and concentrated in the down-slope portion of the sub-basin where practicable. • Use gravel diaphragm and filter strip at road shoulder and sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard • Construct approximately 1000 LF of stone-lined ditching with check dams along the east and west sides of the road in the northern, steeper portion of the drainage area. Retain, replace, or install drive culverts where necessary to connect the conveyance system. • Overflow from subsurface gravel wetland and stone-lined ditches directed the existing 30" HDPE culvert and stone-gabion stabilized outlet. • Repair stabilized outlet structure by re-leveling existing stone gabion level spreaders to correct short-circuiting on the structure's south side during larger storm events.	D	16.1	9,510	2.01	14.1	9,510	$100,000	$103,000	$203,000	$49,000	315,100	6.83	4.17	100	No	No	3	8	3	5	1	2	1	2	2	27	C	N	M

Table XX-9
Stormwater Management Recommendations - Meeting Standards (Moorings Stream)

Sub-Basin ID	Street Name(s)	Recommendations - Meets Standards (MRGP, Town Public Works Standards, and SW Manual Public Transportation Projects Redevelopment-Major Maintenance)	Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Recomentaions Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
			Recommendation Details, Metrics, and Costs																Alternatives Evaluation Criteria and Scoring												
MS-08	Shore Acres Rd.	• Replace existing grass channels with subsurface gravel treatment wetlands and connecting culverts. • Construct 250 LF of subsurface gravel treatment wetland on both sides of roadway on Shore Acres Dr., using available road frontage between driveways and concentrated in the down-slope portion of the sub-basin where practicable. • Use gravel diaphragm and filter strip at road shoulder and sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard • Overflow from subsurface gravel wetland directed to the existing 15" CM culvert.	D	2.4	3,070	0.76	1.7	3,070	$0	$34,000	$34,000	$26,000	101,800	2.21	1.35	100	No	No	1	6	2	5	1	2	1	2	2	22	C	N	M
MS-09	Shore Acres Rd.	• Replace existing grass channels with subsurface gravel treatment wetlands and connecting culverts. • Construct 350 LF of subsurface gravel treatment wetland on both sides of roadway and around a portion of the cul-de-sac on Shore Acres Dr., using available road frontage between driveways. • Use gravel diaphragm and filter strip at road shoulder and sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard • Overflow from subsurface gravel wetland directed the existing 18" and 30" CMP culverts.	D	22.8	10,910	0.94	21.8	4,010	$0	$44,000	$44,000	$26,000	361,600	7.84	1.76	37	No	No	1	6	3	4	1	2	1	2	2	22	C	N	M
		Moorings Stream Watershed Totals:		78	53,710	11	67	45,520	$179,000	$496,000	$675,000	$34,000	1,780,100	39	20	85	No	No												

% reduction in total P load: 51

Table XX-10
Stormwater Management Recommendations - Exceeding Standards (Moorings Stream)

Sub-Basin ID	Street Name(s)	Recommendations - Exceeds Standards (MRGP, Town Public Works Standards, and SW Manual)	Recommendation Details, Metrics, and Costs															Alternatives Evaluation Criteria and Scoring												
			Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Recomentaions Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
MS-02	Shore Acres Dr.	• Construct endwall for existing 15" CPP stormline at outfall O_48. • Construct stone-lined plunge pool at outfall O_48 to address erosion at culvert outlet. • Construct 250 LF of subsurface gravel treatment wetland on west side of roadway to replace existing CBs and stormlines, using all available road frontage between driveways. • Use gravel diaphragm and filter strip at road shoulder and small sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard. • Overflow from subsurface gravel wetland directed to existing outfall O_48.	D	5.2	3,220	0.7	4.5	2,870	$9,000	$31,000	$40,000	$26,000	106,600	2.93	1.59	89	No	No	2	6	3	5	1	3	1	2	2	25	C	N	M
MS-03	Hillcrest Ln.	• Construct stone-lined plunge pool at 24" RCP outfall O_13 to address erosion at culvert outlet. • Replace existing CBs and stormlines with subsurface gravel treatment wetlands and connecting culverts. • Construct 820 LF of subsurface gravel treatment wetland on both sides of roadway to replace existing grass channels, CBs, and stormlines, using all available road frontage between driveways along Hillcrest Ln. and Shore Acres Dr. • Retain and replace driveway culverts where necessary to connect surface flows from treatment cells. • Use gravel diaphragm and filter strip at road shoulder and small sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard. • Overflow from subsurface gravel wetland directed to existing outfall O_13.	D	4.7	4,080	1.08	3.6	9,390	$5,000	$102,000	$107,000	$60,000	135,200	2.93	1.79	230	No	No	2	6	3	6	1	2	1	2	2	25	C	N	M
MS-04	Shore Acres Dr., Summit Ridge	• Replace existing grass channels, CBs, and stormlines with subsurface gravel treatment wetlands and connecting culverts. • Construct 1,930 LF of subsurface gravel treatment wetland on both sides of roadway on Shore Acres Dr. and Cedar Ridge Dr., using all available road frontage between driveways. • Retain and replace driveway culverts where necessary to connect surface flows from treatment cells. • Use gravel diaphragm and filter strip at road shoulder and sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard. • Overflow from subsurface gravel wetland directed to existing outfall O_23.	D	6.5	6,770	1.73	4.77	22,100	$0	$239,000	$239,000	$81,000	224,500	4.87	2.97	326	No	No	1	6	3	6	1	2	1	2	2	24	C	N	M
MS-05	Cedar Ridge Dr.	• Replace two existing 15" CMP culverts with 18" HDPE culverts, endwalls, and stone-lined plunge pools at outlets. • Replace existing grass channels with subsurface gravel treatment wetlands and connecting culverts. • Construct 1,910 LF of subsurface gravel treatment wetland on both sides of roadway on Cedar Ridge Dr., using all available road frontage between driveways where ledge outcrops not present within the ROW. • Retain and replace driveway culverts where necessary to connect surface flows from treatment cells. • Use gravel diaphragm and filter strip at road shoulder and sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard. • Overflow from subsurface gravel wetland directed to existing culvert outlet locations.	D	7.6	6,700	1.58	6.02	21,930	$65,000	$237,000	$302,000	$103,000	222,000	4.81	2.94	327			2	6	3	6	1	2	1	2	2	25	C	N	M
MS-06	Shore Acres Rd.	• Replace existing grass channels with subsurface gravel treatment wetlands and connecting culverts. • Construct 2,530 LF of subsurface gravel treatment wetland on both sides of roadway on Shore Acres Dr. and Cedar Ridge DR., using all available road frontage between driveways. • Retain and replace driveway culverts where necessary to connect surface flows from treatment cells. • Use gravel diaphragm and filter strip at road shoulder and sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard • Overflow from subsurface gravel wetland directed to the existing 18" CMP culvert.	D	12.6	9,450	2.2	10.4	29,030	$0	$314,000	$314,000	$76,000	313,300	6.79	4.14	307	No	No	1	6	3	6	1	2	1	2	2	24	C	N	M
MS-07	Shore Acres Rd.	• Replace existing grass channels with subsurface gravel treatment wetlands and connecting culverts. • Construct 1,160 LF of subsurface gravel treatment wetland on both sides of roadway on Shore Acres Dr., using all available road frontage between driveways and concentrated in the down-slope portion of the sub-basin where practicable. • Use gravel diaphragm and filter strip at road shoulder and sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard • Construct approximately 1000 LF of stone-lined ditching with check dams along the east and west sides of the road in the northern, steeper portion of the drainage area. Retain, replace, or install drive culverts where necessary to connect the conveyance system. • Overflow from subsurface gravel wetland and stone-lined ditches directed the existing 30" HDPE culvert and stone-gabion stabilized outlet. • Repair stabilized outlet structure by re-leveling existing stone gabion level spreaders to correct short-circuiting on the structure's south side during larger storm events.	D	16.1	9,510	2.01	14.1	13,280	$100,000	$144,000	$244,000	$59,000	315,100	6.83	4.17	140	No	No	3	8	3	6	1	2	1	2	2	28	C	N	M

Table XX-10
Stormwater Management Recommendations - Exceeding Standards (Moorings Stream)

			Recommendation Details, Metrics, and Costs														Alternatives Evaluation Criteria and Scoring												
Sub-Basin ID	Street Name(s)	Recommendations - Exceeds Standards (MRGP, Town Public Works Standards, and SW Manual)	Primary Soil HSG	Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMP	Additional P Credit for Addressing Major Localized Gully Erosion?	Road Diet Candidate?	Existing Roadway Drainage Concerns (scale 1-5)	Existing Volume, Sediment, Nutrient Concerns (scale 1-12)	Environmental Priority (scale 1-5)	Extent Recomentaions Address Existing Concerns (scale 1-6)	Integration with Other Infrastructure Improvements (scale 1-3)	Utility Conflicts (scale 4-0)	ROW and Adjacent Property Impacts (scale 2-0)	Constructability (scale 1-3)	Ease of Operation (scale 1-3)	Implementation Score	Project Type	Infiltration-Based Green Infrastructure Opportunity (Y or N)	Need for Additional Engineering
MS-08	Shore Acres Rd.	• Replace existing grass channels with subsurface gravel treatment wetlands and connecting culverts. • Construct 400 LF of subsurface gravel treatment wetland on both sides of roadway on Shore Acres Dr., using available road frontage between driveways and concentrated in the down-slope portion of the sub-basin where practicable. • Use gravel diaphragm and filter strip at road shoulder and sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard • Overflow from subsurface gravel wetland directed to the existing 15" CM culvert.	D	2.4	3,070	0.76	1.7	4,580	$0	$50,000	$50,000	$38,000	101,800	2.21	1.35	149	No	No	1	6	2	6	1	2	1	2	2	23	C	N	M
MS-09	Shore Acres Rd.	• The "meets standards" recommendations for this sub-basin represent the maximum water quality treatment possible in this sub-basin. Recommendations repeated below. • Replace existing grass channels with subsurface gravel treatment wetlands and connecting culverts. • Construct 350 LF of subsurface gravel treatment wetland on both sides of roadway and around a portion of the cul-de-sac on Shore Acres Dr., using available road frontage between driveways. • Use gravel diaphragm and filter strip at road shoulder and sediment forebays at driveway culverts as pre-treatment. • Gravel wetland cells are 5'wide, 3' deep gravel treatment area and 0.5 ft. of ponding above gravel in swale with 3:1 side slopes and 0.5 ft freeboard • Overflow from subsurface gravel wetland directed to the existing 18" and 30" CMP	D	22.8	10,910	0.94	21.8	4,010	$0	$44,000	$44,000	$26,000	361,600	7.84	1.76	37	No	No	1	6	3	4	1	2	1	2	2	22	C	N	M
		Moorings Stream Watershed Totals:		78	53,710	11	67	107,190	$179,000	$1,161,000	$1,340,000	$65,000	1,780,100	39	21	200	No	No												

% reduction in total P load: 53

Table XX-11
Stormwater Management Recommendations - Summary of Metrics and Costs

	Watershed Name	Recommendation Details, Metrics, and Costs												
		Sub-basin Area (ac)	Sub-basin WQv (CF)	Impervious Area Treated (ac)	Pervious Area Treated (ac)	Proposed Storage Volume (CF)	Curbing, Stabilization, and Drainage Upgrade Cost Estimate (2017 $)	BMP Cost Estimate (2017 $)	Total Implementation Cost Estimate (2017$)	Implementation Cost Per Pound P Load Removed (2017 $)	Est. annual avg runoff volume (CF)	Estimated Total Base P Load, Including Existing BMPs (lbs/year)	Estimated P Load Removed by New BMPs (lbs./yr)	% Sub-basin WQv Treated by New BMPs	% Reduction in Total P Load
Meeting Standards	Malletts Bay - West Lakeshore Dr. Area	57.6	70,020	5	26	18,120	$779,000	$349,000	$1,128,000	$158,000	1,923,600	50	7	26	14
	Malletts Bay - East Lakeshore Dr. Area	163.2	115,270	8	30	19,435	$1,384,000	$336,000	$1,721,000	$124,000	3,978,000	84	14	17	17
	Crooked Hollow Creek	78.7	87,310	22	56	44,550	$100,000	$848,000	$948,000	$39,000	2,893,200	46	25	51	53
	Smith Creek	183.8	207,790	51	125	72,340	$679,000	$1,208,000	$1,887,000	$51,000	6,887,100	67	38	35	57
	Moorings Stream	77.9	53,710	11	67	45,520	$179,000	$496,000	$675,000	$34,000	1,780,100	39	20	85	52
	TOTALS	561	534,100	98	305	199,965	$3,121,000	$3,237,000	$6,359,000	$62,000	17,462,000	285	104	37	36
Exceeding Standards	Malletts Bay - West Lakeshore Dr. Area	57.6	70,020	7	28	40,745	$972,000	$1,991,000	$3,070,000	$182,000	1,923,600	50	17	58	34
	Malletts Bay - East Lakeshore Dr. Area	163.2	115,270	17	73	62,460	$1,404,000	$1,036,000	$2,441,000	$58,000	3,978,000	84	42	54	50
	Crooked Hollow Creek	78.7	87,310	22	56	105,060	$100,000	$1,893,000	$1,993,000	$62,000	2,893,200	46	33	120	71
	Smith Creek	183.8	207,790	51	125	205,660	$679,000	$4,074,000	$4,753,000	$109,000	6,887,100	67	44	99	66
	Moorings Stream	77.9	53,710	11	67	107,190	$179,000	$1,161,000	$1,340,000	$65,000	1,780,100	39	21	200	53
	TOTALS	561	534,100	108	350	521,115	$3,334,000	$10,155,000	$13,597,000	$87,000	17,462,000	285	156	98	55