

6.0 Evaluation of Benefits

Purpose

The purpose of the evaluation is to compare the relative benefits provided by each of the *Fanno Tryon Water Quality and TMDL CIP Pre-design #7622* (Pre-design) projects.

Alternatives were analyzed and evaluated throughout the Pre-design process at various levels, as appropriate for required project completion.

For the geographic clusters, alternatives were evaluated at both the project element and project pre-design level. For example, 38 culverts in the Beaverton Hillsdale Highway cluster were evaluated in detail. From this initial list, four culverts were selected, based on developed criteria, for specific project pre-designs. During engineering pre-design of each individual culvert, alternatives were evaluated to select the recommended design option.

A similar approach was used for programmatic elements. Design and implementation alternatives were analyzed for each programmatic element. Individual project sites were then evaluated and prioritized for implementation.

Project Goals and Indicators

For the evaluation, a set of Pre-design goals and indicators was compiled, using the watershed goals, objectives, key watershed attributes, indicators, and implementation measures established by the *Fanno Tryon Creek Watershed Management Plan* (FTCWMP). Results of the technical memorandums were also incorporated. The indicators are measurable attributes of projects. Table 6-1 shows the watershed goals, project indicators, and associated metrics. All goals are weighted equally.

Scoring Guidance

Based on the goals and indicators, the Pre-design project team developed scoring guidance (Table 6-2) to evaluate the pre-design projects and programmatic elements. Projects are scored from 1-10 for each goal category and then summed for an overall project score.

The scoring guidance was developed to help evaluate the project metrics in relation to the goals and to enable scoring of the multi-objective projects across different goals (e.g., comparison of stormwater retrofits with culvert repair/replacement). The scoring guidance lists key project indicators and metrics for each project category and each goal.

Table 6-1: Goals and Project Indicators

GOAL	PROJECT INDICATOR	METRICS
Hydrology	Impervious area managed for flow control	Acres
	Acres of natural area protected (fee purchase/conservation easement)	Acres
	Floodplain reconnected	Acres
	Stream daylighted	Ft
	Stream length added (e.g., increasing sinuosity)	Ft
Water Quality	Impervious area treated/managed	Acres
	Total suspended solids (TSS) removed	Lbs
	Riparian revegetation	Ft
	Bacteria loading reduced	
	Stream bank stabilized	Ft
	Sanitary pipe protected	Ft
Habitat	Stream enhancement	Ft
	Floodplain reconnected	Acres
	Riparian revegetation	Ft
	Revegetation	Acres
	Impervious area treated/managed	Acres
	TSS removed	Lbs
	Acres of natural area protected (fee purchase/conservation easement)	Acres
	Fish passage: Linear feet of stream made accessible during all seasons	Ft
Biological Communities	Improves distribution of native fish communities	Low, Medium, High
	Directly or indirectly (e.g., water quality facility) improves aquatic habitat	Low, Medium, High
Infrastructure	Fish passage: Linear feet of stream made accessible during all seasons	Ft
	Level of urgency (protect public health and safety)	Low, Medium, High
	Ditch enhanced	Ft
	Sanitary pipe protected (public health and safety)	Ft
	Reduced long-term maintenance costs	Low, Medium, High

Table 6-2: Scoring Guidance

Goal	Score	Scoring Guidance												
		Stormwater Retrofits		Water Quality Facilities		Ditch-to-Swale		Stream Enhancement	Sanitary Sewer Infrastructure Protection and Enhancement	Stormwater Outfall Rehabilitation and Replacement	Culvert Repair and/or Replacement	Revegetation	Land Acquisition	
Hydrology	8-10	IA Treated 80-100%	+Peak Flow Reduced +Volume Reduction	(+) Area Managed (-)	IA Treated 80-100%	+Peak Flow Reduced +Volume Reduction	(+) Area Managed (-)	IA Treated 80-100%	+Peak Flow Reduced +Volume Reduction	(+) Area Managed (-)	Floodplain reconnection (score based on magnitude)			Natural areas protected
	5-7	50-70%			50-70%			50-70%			Stream daylighting, floodplain reconnection (score based on magnitude)	Rehabilitates or replaces sanitary sewer (I&I, SSO reduction)		
	2-4	20-40%			20-40%			20-40%				Culvert Repair and/or Replacement (flood management)	Revegetation	
	0-1	0-10%			0-10%			0-10%			Stream bank stabilization	Streambank stabilization		
Water Quality	8-10	TSS Reduced 70%	+TMDL +MS4 +Other Pollutants	(+) Area Managed (-)	TSS Reduced 70%	+TMDL +MS4 +Other Pollutants	(+) Area Managed (-)	TSS Reduced 70%	+TMDL +MS4 +Other Pollutants	(+) Area Managed (-)				Natural areas protected
	5-7	50-70%			50-70%			50-70%			Protects exposed sanitary sewer pipe			
	2-4	20-40%			20-40%			20-40%			Streambank Stabilization	Reduces existing erosion/scour problems	Riparian revegetation	
	0-1	0-10%			0-10%			0-10%			Riparian Vegetation	Rehabilitates or replaces sanitary sewer (I&I, SSO reduction)	Streambank stabilization (prevents scour, erosion)	
Habitat	8-10													Natural areas protected
	5-7	Creates New Habitat			Creates New Habitat			Stream daylighting						
	2-4	Managing stormwater runoff provides indirect benefit			Managing stormwater runoff provides indirect benefit			Stream enhancement, floodplain reconnection			revegetation	Provides local habitat improvements and/or connection		
	0-1				Managing stormwater runoff provides indirect benefit			Stream bank stabilization			Streambank stabilization	Revegetation		
Biological Communities	8-10											Improves fish passage (T&E Species)		Natural areas protected
	5-7	Reduces Identified Limiting Pollutants			Reduces Identified Limiting Pollutants			Stream Enhancement and Daylighting where known presence of T and E species in system				Improves fish passage (Resident species)		
	2-4	Managing stormwater runoff provides indirect benefit (presence of T and E species score higher)			Managing stormwater runoff provides indirect benefit (presence of T and E species score higher)			Stream Enhancement and Daylighting					Revegetation (habitat connectivity)	
	0-1				Managing stormwater runoff provides indirect benefit (presence of T and E species score higher)				Protects exposed sanitary sewer pipe (indirect benefit)	Streambank stabilization	Streambank stabilization	Streambank stabilization		
Infrastructure	8-10								High level of urgency	High level of urgency	High level of urgency; Improves fish passage			Improves access to public sewer infrastructure
	5-7								Medium level of urgency	Medium level of urgency	Medium level of urgency			
	2-4	Enhances public stormwater infrastructure			Enhances public stormwater infrastructure				Low level of urgency	Low level of urgency	Low level of urgency			
	0-1	Enhances public stormwater infrastructure			Enhances public stormwater infrastructure			Stream daylighting (flow storage, reduction of peak flows and impact on storm system, natural system cheaper to maintain over long run)						

Scored Projects

Six Pre-design project team members scored the pre-design projects and programmatic elements, using the scoring matrix and guidance described above. Table 6-3 lists projects organized by cluster. The average score (1-10 point range) each project received for each goal category is provided. Total scores, rank within cluster, and overall rank are also listed for each project.

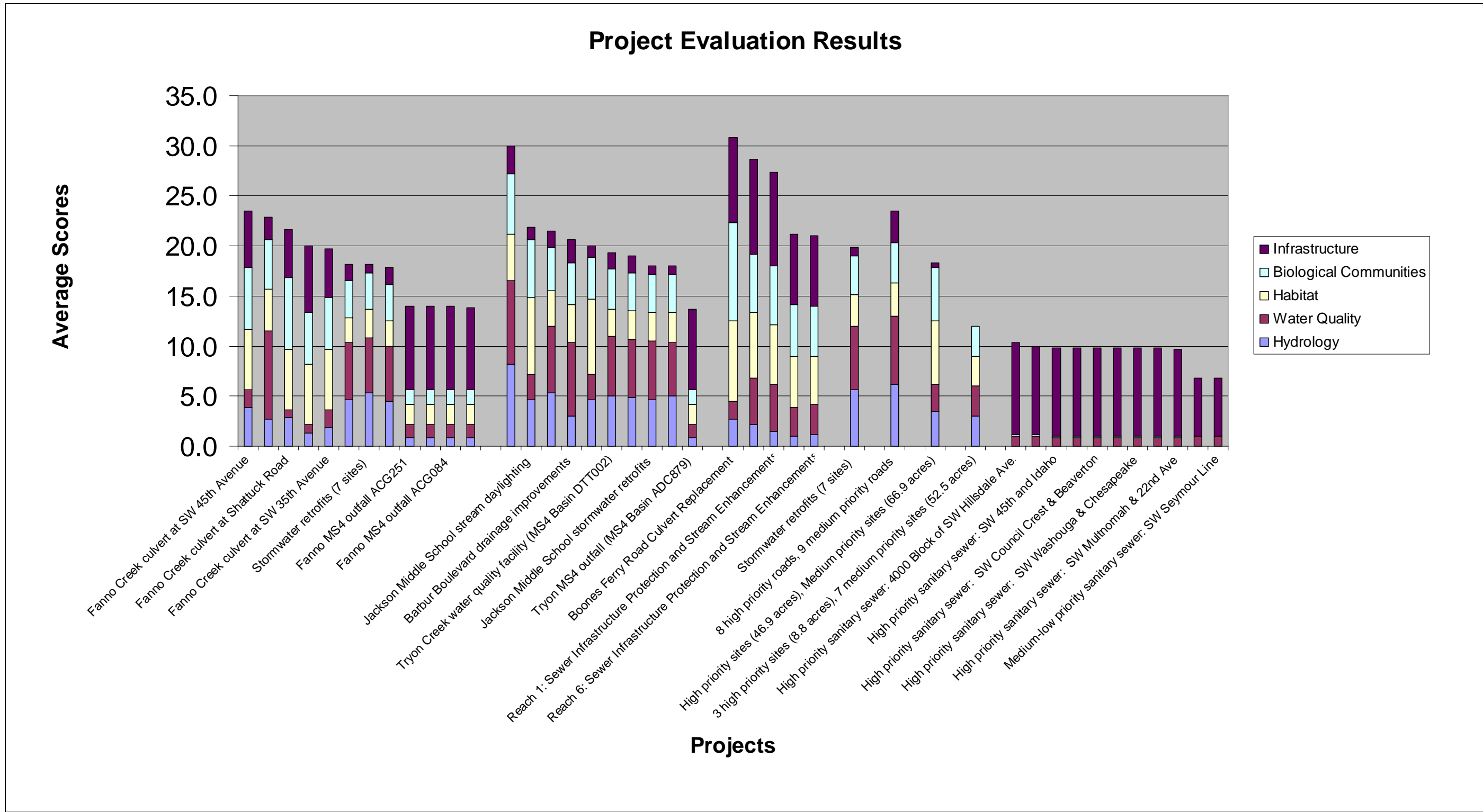
Figure 6-1 displays projects and scores graphically. Each project score is represented by one bar on the chart. Each bar depicts the total project score, subdivided into goals.

Table 6-3: Project Evaluation Results

Cluster or Element	Projects	Watershed Goals					Total Score	Group Rank	Overall Rank
		Hydrology	Water Quality	Habitat	Biological Communities	Infrastructure			
		Average Benefit Scores							
Beaverton Hillsdale Highway Cluster	Fanno Creek culvert at SW 45 th Avenue	3.8	1.8	6.0	6.2	5.7	23.5	1	5
	Beaverton Hillsdale Highway drainage improvements	2.7	8.8	4.2	5.0	2.2	22.8	2	7
	Fanno Creek culvert at Shattuck Road	2.8	0.8	6.0	7.2	4.8	21.7	3	9
	Fanno Creek culvert at SW 39 th Avenue	1.3	0.8	6.0	5.2	6.7	20.0	4	14
	Fanno Creek culvert at SW 35 th Avenue	1.8	1.8	6.0	5.2	4.8	19.7	5	17
	Fanno Creek water quality facility (MS4 basin ACM139)	4.7	5.7	2.5	3.7	1.7	18.2	6	22
	Stormwater retrofits (7 sites)	5.3	5.5	2.8	3.7	0.8	18.2	7	21
	Fanno Creek water quality facility (MS4 basin ACG084)	4.5	5.5	2.5	3.7	1.7	17.8	8	25
	Fanno MS4 outfall ACG251	0.8	1.3	2.0	1.5	8.3	14.0	9	26
	Fanno MS4 outfall DTF026/ANJ549	0.8	1.3	2.0	1.5	8.3	14.0	10	27
	Fanno MS4 outfall ACG084	0.8	1.3	2.0	1.5	8.3	14.0	11	28
	Fanno MS4 outfall ACM514	0.8	1.3	2.0	1.5	8.2	13.8	12	29
Upper Tryon Creek Cluster	I-5 at SW 26 th water quality facility	8.2	8.3	4.7	6.0	2.8	30.0	1	2
	Jackson Middle School stream daylighting	4.7	2.5	7.7	5.8	1.2	21.8	2	8
	Tryon Creek water quality facility (MS4 Basin ADC879)	5.3	6.7	3.5	4.3	1.7	21.5	3	10
	Barbur Boulevard drainage improvements	3.0	7.3	3.8	4.2	2.3	20.7	4	13
	Spring Garden Park stream daylighting	4.7	2.5	7.5	4.2	1.2	20.0	5	15
	Tryon Creek water quality facility (MS4 Basin DTT002)	5.0	6.0	2.7	4.0	1.7	19.3	6	18
	Stormwater retrofits (Multnomah Village)	4.8	5.8	2.8	3.8	1.7	19.0	7	19
	Jackson Middle School stormwater retrofits	4.7	5.8	2.8	3.8	0.8	18.0	8	24
	Stormwater retrofits (7 sites)	5.0	5.3	3.0	3.8	0.8	18.0	9	23
Tryon MS4 outfall (MS4 Basin ADC879)	0.8	1.3	2.0	1.5	8.0	13.7	10	30	
Lower and Middle Tryon Creek Cluster	Boones Ferry Road culvert replacement	2.7	1.8	8.0	9.8	8.5	30.8	1	1
	Reach 4: Sewer infrastructure protection and stream enhancements	2.2	4.7	6.5	5.8	9.5	28.7	2	3
	Reach 1: Sewer infrastructure protection and stream enhancements	1.5	4.7	6.0	5.8	9.3	27.3	3	4
	Reach 5: Stream bank gabion removal and enhancement	1.0	2.8	5.2	5.2	7.0	21.2	4	11
	Reach 6: Sewer infrastructure protection and stream enhancements	1.2	3.0	4.8	5.0	7.0	21.0	5	12

Cluster or Element	Projects	Watershed Goals					Total Score	Group Rank	Overall Rank
		Hydrology	Water Quality	Habitat	Biological Communities	Infrastructure			
Other Stormwater Retrofits	Stormwater retrofits (7 sites)	Average Benefit Scores					19.8	1	16
		5.7	6.3	3.2	3.8	0.8			
Ditch-to-Swale	8-high priority roads, 9-medium priority roads	6.2	6.8	3.3	4.0	3.2	23.5	1	6
Land Acquisition	High-priority sites (46.9 acres), medium-priority sites (66.9 acres)	3.5	2.7	6.3	5.3	0.5	18.3	1	20
Revegetation	3 high-priority sites (8.8 acres), 7 medium-priority sites (52.5 acres)	3.0	3.0	3.0	3.0	0.0	12.0	1	31
Operations and Maintenance	High-priority sanitary sewer: 4000 block of SW Hillsdale Ave.	0.0	1.0	0.0	0.2	9.2	10.3	1	32
	High-priority sanitary sewer: SW Multnomah & 30th Ave.	0.0	1.0	0.0	0.2	8.8	10.0	2	33
	High-priority sanitary sewer: SW 45 th and Idaho	0.0	0.8	0.0	0.2	8.8	9.8	3	34
	High-priority sanitary sewer: 3000 block of SW Fairmont Blvd.	0.0	0.8	0.0	0.2	8.8	9.8	4	35
	High-priority sanitary sewer: SW Council Crest & Beaverton	0.0	0.8	0.0	0.2	8.8	9.8	5	36
	High-priority sanitary sewer: SW Hillsdale & Fairmount	0.0	0.8	0.0	0.2	8.8	9.8	6	37
	High-priority sanitary sewer: SW Washouga & Chesapeake	0.0	0.8	0.0	0.2	8.8	9.8	7	38
	High-priority sanitary sewer: SW Hillsboro & Council Crest	0.0	0.8	0.0	0.2	8.8	9.8	8	39
	High-priority sanitary sewer: SW Multnomah & 22nd Ave.	0.0	0.8	0.0	0.2	8.7	9.7	9	40
	Medium/low-priority sanitary sewer: Cambridge Gravity Line	0.0	1.0	0.0	0.0	5.8	6.8	10	41
Medium/low-priority sanitary sewer: SW Seymour Line	0.0	1.0	0.0	0.0	5.8	6.8	11	42	

Figure 6-1: Project Evaluation Results



Project Considerations

Evaluation scores are based on project performance in relation to the five Pre-design goals. The scores do not, however, reflect other factors that should be considered when developing the final prioritized list of recommended projects. These factors include:

- Issues that affect implementation, such as need for BES policy guidance before CIP funds can be spent on private property.
- Community expectations.
- The level of urgency of individual projects.
- Time-limited opportunities, such as the availability of Metro bond funds to support land acquisition.
- Opportunities to expand partnerships with other City bureaus and public agencies.
- Projects that substantially fulfill other City or bureau objectives.

These considerations are described in more detail for specific projects in Chapter 7.0.

7.0 Recommendations and Implementation Plan

Purpose

This chapter provides a ranked list of recommended *Fanno Tryon Water Quality and TMDL CIP Pre-design #7622* (Pre-design) projects, based on the benefit scores described in Chapter 6.0 and an implementation schedule (Table 7-1). Projects are grouped by clusters/elements and listed according to rank. The estimated cost is provided for each project. Project implementation has four phases. Project costs are allocated into these phases, based on rank.

A more detailed discussion of the implementation plan follows Table 7-1. It is organized by phase and identifies implementation considerations for each project. These considerations could influence the project schedule, cost, and ease of implementation. Project implementation and scheduling will also depend on Bureau of Environmental Services (BES) CIP program procedures and criteria.

Implementation Plan

The implementation plan organizes projects into four phases, based on evaluation scores. Highest-ranked projects are in the early phases; lower-ranked projects are in later phases. It is expected that some projects, such as a water quality facility, will be completed within a single phase. Programmatic projects that require a sustained level of effort, such as land acquisition and conversion of roadside ditches to swales, are organized through several phases. Stormwater retrofits are also organized into several phases. Pilot projects would be implemented in early phases, laying the groundwork for a sustained level of effort over several phases.

The implementation plan reflects the project ranking and implementation considerations and provides a long-term framework for a consistent level of investment to improve the health of the Fanno and Tryon Creek watersheds.

Table 7-1 Ranked Pre-design Projects

Cluster or Element	Projects	Cluster Rank	Overall Rank	Project Cost	Implementation Plan			
					Phase 1	Phase 2	Phase 3	Phase 4
Beaverton Hillsdale Highway Cluster	Fanno Creek culvert at SW 45 th Avenue	1	5	\$1,370,749	\$1,370,749			
	Beaverton Hillsdale Highway drainage improvements	2	7	\$1,104,000	\$1,104,000			
	Fanno Creek culvert at Shattuck Road	3	9	\$987,118		\$987,118		
	Fanno Creek culvert at SW 39 th Avenue	4	14	\$12,024		\$12,024		
	Fanno Creek culvert at SW 35 th Avenue	5	17	\$907,823		\$907,823		
	Fanno Creek water quality facility (MS4 basin ACM139)	6	22	\$34,650		\$34,650		
	Stormwater retrofits (7 sites)	7	21	\$2,878,819	\$300,000	\$500,000	\$800,000	\$1,278,819
	Fanno Creek water quality facility (MS4 basin ACG084)	8	25	\$430,745			\$430,745	
	Fanno MS4 outfall ACG251	9	26	\$304,003			\$304,003	
	Fanno MS4 outfall DTF026/ANJ549	10	27	\$361,736			\$361,736	
	Fanno MS4 outfall ACG084 (see WQ facility ACG084 above)	11	28	Ref.		Ref.		
	Fanno MS4 outfall ACM514	12	29	\$118,187			\$118,187	
Upper Tryon Creek Cluster	I-5 at SW 26 th water quality facility	1	2	\$1,318,214	\$1,318,214			
	Jackson Middle School stream daylighting	2	8	\$759,941	\$759,941			
	Tryon Creek water quality facility (MS4 Basin ADC879)	3	10	\$202,800		\$202,800		
	Barbur Boulevard drainage improvements	4	13	\$690,000		\$690,000		
	Spring Garden Park stream daylighting	5	15	\$ 104,730		\$ 104,730		
	Tryon Creek water quality facility (MS4 Basin DTT002)	6	18	\$202,800		\$202,800		
	Stormwater retrofits (Multnomah Village)	7	19	\$552,037	\$230,000	\$322,037		
	Jackson Middle School stormwater retrofits	8	24	\$798,453			\$798,453	
	Stormwater retrofits (7 sites)	9	23	\$5,118,081	\$300,000	\$500,000	\$800,000	\$3,518,081
	Tryon MS4 outfall (MS4 Basin ADC879)	10	30	\$32,760			\$32,760	
Lower and Middle Tryon Creek Cluster	Boones Ferry Road culvert replacement	1	1	\$ 2,418,621	\$ 2,418,621			
	Reach 4: Sewer infrastructure protection and stream enhancements	2	3	\$533,000	\$533,000			
	Reach 1: Sewer infrastructure protection and stream enhancements	3	4	\$1,872,000	\$1,872,000			
	Reach 5: Streambank gabion removal and enhancement	4	11	\$312,000		\$312,000		
	Reach 6: Sewer infrastructure protection and stream enhancements	5	12	\$286,000		\$286,000		

Cluster or Element	Projects	Cluster Rank	Overall Rank	Project Cost	Implementation Plan			
					Phase 1	Phase 2	Phase 3	Phase 4
Other Stormwater Retrofits	Stormwater retrofits (7 sites)	1	16	\$1,487,753	\$500,000	\$500,000	\$487,753	
Ditch-to-Swale	8 high-priority roads, 9 medium-priority roads	1	6	\$2,702,000	\$305,000	\$300,000	\$300,000	\$1,597,000
Land Acquisition	High-priority sites (46.9 acres), medium-priority sites (66.9 acres)	1	20	\$23,547,567	\$385,000	\$500,000	\$500,000	\$22,162,567
Revegetation	3-high priority sites (8.8 acres), 7-medium priority sites (52.5 acres)	1	31	\$643,321		\$300,000	\$343,321	
Operations and Maintenance	High-priority sanitary sewer: 4000 block of SW Hillsdale Ave.	1	32	\$136,000			\$136,000	
	High-priority sanitary sewer: SW Multnomah & 30 th Ave.	2	33	\$310,000			\$310,000	
	High-priority sanitary sewer: SW 45 th and Idaho	3	34	\$72,000			\$72,000	
	High-priority sanitary sewer: 3000 Block of SW Fairmont Blvd.	4	35	\$167,000			\$167,000	
	High-priority sanitary sewer: SW Council Crest & Beaverton	5	36	\$224,000			\$224,000	
	High-priority sanitary sewer: SW Hillsdale & Fairmount	6	37	\$136,000			\$136,000	
	High-priority sanitary sewer: SW Washouga & Chesapeake	7	38	\$224,000			\$224,000	
	High-priority sanitary sewer: SW Hillsboro & Council Crest	8	39	\$136,000			\$136,000	
	High-priority sanitary sewer: SW Multnomah & 22nd Ave.	9	40	\$95,000			\$95,000	
	Medium/low-priority sanitary sewer: Cambridge Gravity Line	10	41	\$70,000			\$70,000	
	Medium/low-priority sanitary sewer: SW Seymour Line	11	42	\$217,000			\$217,000	
Total				\$53,879,932	\$11,396,525	\$6,661,982	\$7,063,958	\$28,556,467

Phase 1

The highest-ranked projects in each cluster/element are proposed for implementation in Phase 1.

Beaverton Hillsdale Highway Cluster

Fanno Creek Culvert at SW 45th Avenue

The Portland Office of Transportation (PDOT) owns this culvert. Issues that could affect cost and/or schedule include:

- Transportation requirements: SW 45th is designated in Portland's Transportation System Plan as a local service street and a city walkway, requiring a future cross-section of a 32-foot-wide street, two 14-foot sidewalk corridors (0.5-foot curb, 6-foot planter/swale, 6-foot sidewalk, 1.5-foot frontage zone), and two 4-foot buffers for guardrails. Total right-of-way needed is 68 feet. (Existing right-of-way is 70 feet.)
- Easement acquisition: The right-of-way along SW 45th Avenue in this location is 70 feet wide. The new street cross-section (designed to meet PDOT requirements) will use this entire width, so additional permanent easements are required for wing-walls as well as maintenance of grade control structures up and downstream. Temporary construction easements are required for access.
- Utilities: A sanitary sewer line runs underneath the culvert; the clearance between the top of the sewer line and the bottom of the culvert is 2.25 feet. The cover between the top of the culvert to the road is 3.5 feet. The location of utilities in the road crossing and crossing the creek could constrain the design, make construction more complicated, or create a need for additional stream work to protect utilities at or near the surface.
- Environmental assessments and geotechnical investigations: Results could influence design and could affect costs and/or schedule.
- The anticipated in-water work window along Fanno Creek is June 1 through September 30.
- Traffic control will be a significant concern at this location because of traffic volumes on this street and lack of convenient detours.
- City, state, and local permits will be required.

Beaverton Hillsdale Highway Drainage Improvements

This funding request will support the design and construction of stormwater retrofits located primarily within the existing street right-of-way for the Beaverton Hillsdale Highway. The City is responsible for maintenance of this section of highway, and the stormwater facilities are part of the City's NPDES municipal separate storm sewer system (MS4).

The choice of City-approved stormwater technologies that could be installed into the existing drainage system is extremely limited. The actual performance of these facilities and the ability to install them as a retrofit may be limited. Some sites may have geotechnical and/or environmental concerns that could be identified during design and construction and could affect project costs and/or schedule.

Stormwater Retrofits (7 sites)

This funding request will support pilot stormwater retrofit projects. Many of these retrofit projects are located on private property. Policies are not yet in place to spend BES capital funds to design and construct stormwater facilities on private property. Therefore, projects located on public property (e.g., Oregon Department of Transportation [ODOT], TriMet) would be pursued first. As supporting policies are developed and opportunities arise, projects located on private property may be pursued.

All stormwater retrofit projects will require agreements with property owners. Some stormwater retrofit sites may have geotechnical (soils/infiltration) and/or environmental concerns that could be identified during design and construction. These could affect project costs and/or schedules.

Upper Tryon Creek Cluster

I-5 at SW 26th Water Quality Facility

This project is located on ODOT right-of-way. ODOT has been involved in and reviewed all pre-designs. A draft memorandum of understanding between ODOT and BES that describes roles and responsibilities has been developed. This would need to be finalized and approved by both agencies as part of the project.

A preliminary environmental assessment revealed Pyrene onsite. The site will require disposal at a non-hazardous landfill. Environmental records research revealed a gas spill located 300 feet upgradient of the site, an active Oregon Department of Environmental Quality (DEQ) LUST site. Remediation activities are still occurring. Further environmental and geotechnical investigations and coordination with DEQ will be required. BES Maintenance Engineering had an onsite storm line TV'd for approximately 520 feet. Results indicate that there are hairline cracks, leaking joints, and flowing inflow and infiltration along the entire length. These issues could affect the design, costs, and/or schedule.

Jackson Middle School Stream Daylighting

This project is located at Jackson Middle School; the tennis courts are owned by the Portland Bureau of Parks & Recreation. Portland Public Schools (PPS) and Parks representatives have been involved in and reviewed all pre-designs. Both parties have agreed to allow the tennis court relocation.

A geotechnical survey of the project areas has been completed; no critical environmental issues have been identified. The project will require state, federal, and City permits. It is expected that permit can be acquired with relative ease and should not adversely affect the implementation schedule.

Stormwater Retrofits (Multnomah Village)

This funding request will support the design and construction of stormwater management facilities located in the public right-of-way or on public property. These projects should be relatively easy to implement; pre-designs have been presented to the Multnomah Village Business Association and have been reviewed by staff from the Bureau of Maintenance and PDOT.

Stormwater Retrofits (7 sites)

This funding request will support pilot stormwater retrofit projects. Many of these retrofit projects are located on private property. Policies are not yet in place to spend BES capital funds to design and construct stormwater facilities on private property. Therefore, projects located on public property (e.g., ODOT, TriMet) would be pursued first. As supporting policies are developed and opportunities arise, projects located on private property may be pursued.

All stormwater retrofit projects will require agreements with property owners. Some stormwater retrofit sites may have geotechnical (soils/infiltration) and/or that could be identified during design and construction. These could affect project costs and/or schedules.

Lower and Middle Tryon Creek Cluster

Boones Ferry Road Culvert Replacement

Replacement of the Boones Ferry culvert, currently a complete fish passage barrier, would extend fish passage upstream approximately 3,000 feet to Marshall Cascades, thought to be a natural passage barrier. Downstream of Boones Ferry Road near the Willamette River, Tryon Creek flows through the Highway 43 culvert, a partial fish passage barrier. ODOT will retrofit the Highway 43 culvert in summer 2008 to improve fish passage. That project, along with replacement of the Boones Ferry Road culvert, would enable fish passage on Tryon Creek from its confluence with the Willamette River upstream to the Marshall Cascades.

Issues that could affect the design, costs, and/or schedule include:

- Community groups have expressed an interest in the bridge alternative, which was also considered in the Pre-design. The bridge would provide space for a trail connection below Boones Ferry Road. This option should be considered further in the design phase and would influence costs.
- Environmental assessment and geotechnical investigations will be required to determine the load-bearing capabilities of the soil.
- PDOT street requirements, such as lane widths, sidewalks, and bike lanes, need to be determined.
- Detailed survey of topography, utilities, and other features for design will be needed.
- Construction access easements will be required.
- Federal, state, and City permits will be required.
- The in-water work window for Tryon Creek is July 15 through September 30.

Reach 4: Sewer Infrastructure Protection and Stream Enhancements

This request will support the design and construction of urgently needed repairs to the sanitary sewer. A portion of the 30-inch sanitary sewer trunk line is exposed in the active stream channel; the project is located in Tryon Creek State Natural Area. This project should proceed to design and construction as soon as possible.

City, state, and federal permits will be required. Construction easements will be needed for some project elements. Detailed flow modeling will be needed to support the design. The in-water work window for Tryon Creek is July 15 through September 30. These factors could influence the project costs and/or schedule.

Reach 1: Sewer Infrastructure Protection and Stream Enhancements

This request will support the design and construction of urgently needed repairs to the sanitary sewer located in Tryon Creek State Natural Area. Support structures for the elevated sanitary sewer are located in the active channel, and many of them are undermined. A number of sanitary sewer manholes are in need of rehabilitation/replacement. This project should proceed to design and construction as soon as possible.

City, state, and federal permits will be required. Construction easements will be needed for some project elements. Detailed flow modeling will be needed to support the design. The in-water work window for Tryon Creek is July 15 through September 30. These factors could influence the project costs and/or schedule.

Other Stormwater Retrofits

This funding request will support pilot stormwater retrofit projects. Many of these retrofit projects are located on private property. Policies are not yet in place to spend BES capital funds to design and construct stormwater facilities on private property. Therefore, projects located on public property (e.g., Portland Parks, Portland Community College) would be pursued first. As supporting policies are developed and opportunities arise, projects located on private property may be pursued.

All stormwater retrofit projects will require agreements with property owners. Some stormwater retrofit sites may have geotechnical (soils/infiltration) and/or environmental concerns that could be identified during design and construction. These could affect project costs and/or schedules.

Ditch-to-Swale

This funding request will support the initiation of a program to systemically convert high-priority City-maintained roadside ditches to swales. All projects are located in the public right-of-way. As part of the Pre-design, community interests arose about potential pedestrian improvements that could be made as part of ditch-to-swale conversions. PDOT, BES, and community representatives have and continue to work on pedestrian-related issues as part of ditch-to-swale conversions. These issues could influence the design, costs, and schedule.

Land Acquisition

This funding request will support the initiation of a willing seller land acquisition program. CIP funds will be leveraged with the City's local cost share (approximately \$15 million) and regional funds (approximately \$160 million) from Metro's bond measure, which must be spent by March 2012.

Phase 2

Beaverton Hillsdale Highway Cluster

Fanno Creek Culvert at Shattuck Road

Issues that could affect the design, cost and/or schedule include:

- Transportation requirements: SW Shattuck Road is designated in Portland's Transportation System Plan (TSP) as a neighborhood collector, community transit street, city bikeway, city walkway, and major emergency transit street. Future TSP project 90059 would provide bike lanes and sidewalks along this portion of Shattuck; that project is currently listed for years 6 to 10 in the TSP. The future cross-section is two 11-foot travel lanes, two 6-foot bike lanes, two 14-foot sidewalk corridors (0.5-foot curb, 6-foot planter/swale, 6-foot sidewalk, 1.5-foot frontage zone), and two 4-foot buffers for guardrails. Total right-of-way needed is 68 feet. (Existing right-of-way is 50 feet.)

- Easement acquisition: There is only 50 feet of right-of-way along this portion of Shattuck. Since 70 feet of right-of-way is needed to accommodate the design, an additional 20 feet of right-of-way for the new street width must be purchased. For this project, easements are required for temporary construction access and permanent access to the culvert and any grade control structures installed.
- Utilities: There are several relevant utility conflicts. An 18-inch storm pipe outfalls directly into the culvert and will have to be rerouted or reconnected to the new culvert. An 18-inch sanitary pipe is located within the right-of-way 4 feet below the bottom of the culvert, limiting the ability to lower the culvert.
- Environmental assessments and geotechnical investigations will be needed.
- The anticipated in-water work window along Fanno Creek is June 1 through September 30.
- Traffic control: Traffic control along Shattuck will be a significant concern during planning and construction. Recent road work in this neighborhood and lack of adequate alternate routes will make public involvement regarding the road closure critical.
- City, state, and local permits will be required.

Fanno Creek Culvert at SW 39th Avenue

Issues that could affect the design, cost and/or schedule include:

- Transportation requirements: SW 39th Drive is designated in the Transportation System Plan as a local service street. The existing pavement width is 32 feet, with curbs but no sidewalks. The future cross section is 32-foot-wide street, two 12-foot sidewalk corridors (0.5-foot curb, 6-foot planter/swale, 5-foot sidewalk, 0.5-foot frontage zone), and two 4-foot buffers for guardrails. Total right-of-way needed is 66 feet (Existing right-of-way is 50 feet.)
- Easement acquisition: The right-of-way is 50 feet wide at this location. PDOT will need to purchase an additional 16 feet of right-of-way to accommodate the required roadway width. The culvert is 122 feet long and extends beyond the right-of-way. The outlet is located in property owned by Portland Parks and Metro. The inlet is located on a private residential lot and is covered by an existing easement. Additional easements for the culvert may need to be purchased for maintenance access.
- Utilities: No conflicts were identified in the Pre-design.
- Environmental assessments and geotechnical investigations will be needed.
- The anticipated in-water work window along Fanno Creek is June 1 through September 30.

- Traffic control will be required.
- City, state, and local permits will be required.

Fanno Creek Culvert at SW 35th Avenue

Issues that could affect the design, cost and/or schedule include:

- **Transportation requirements:** The road crossing this culvert is a private driveway. The current pavement width is nearly 20 feet. This current width will be restored after construction. This driveway is the only access point for a large apartment complex and a few homes. This will necessitate staging to provide access during construction, possibly installing the culvert in sections.
- **Easement acquisition:** The culvert is completely located on BES property. The stream upstream and downstream is mostly located in the right-of-way along Beaverton Hillsdale Highway. Easements may be needed for small areas of stream if grade controls are installed. Research will be necessary to confirm property ownership and the location of any easements.
- **Utilities:** An 8-inch sanitary sewer line exists just above the crown of the culvert, limiting flexibility in culvert placement. A 15-inch storm sewer line outfalls directly into the culvert; this will be connected to the new structure. A concrete wall downstream of the culvert is catching debris, and the creek is flowing through the debris and under the wall. Along the bank upstream of the culvert is a concrete block of unknown utility; if it no longer has a function, it should be removed.
- Environmental assessments and geotechnical investigations will be needed.
- The anticipated in-water work window along Fanno Creek is June 1 through September 30.
- City, state, and local permits will be required.

Fanno Creek Water Quality Facility and Outfall Repair (MS4 basin ACM139)

This funding request will support the design and construction of this water quality facility. This project is located in the right-of-way and BES property.

Environmental and geotechnical investigations will be needed. City, state, and local permits will be required.

Stormwater Retrofits (7 sites)

This funding request will continue to support design and construction of stormwater retrofit projects. See the description in Phase 1 for more information.

Upper Tryon Creek Cluster

Tryon Creek Water Quality Facility (MS4 Basin ADC879)

This funding request will support the design and construction of this water quality facility. This project is located on private property and in the ODOT right-of-way along Interstate 5.

Facility designs were not developed as part of the Pre-design. Detailed modeling, environmental investigations, and geotechnical assessments will be required. Land ownership, facility size, and the exact location of the facility have not been determined. Based on those determinations, agreements with property owners and land acquisition and/or easements may be needed; those costs were not included in the cost estimate. City and state permits may also be required.

Barbur Boulevard Drainage Improvements

This funding request will support the design and construction of stormwater retrofits located primarily within the existing street right-of-way for Barbur Boulevard.

Three issues may effect implementation and performance. First, while these projects would be located in the public right-of-way, Barbur Boulevard is a state-owned and maintained highway. The design and installation of any facilities would need to be closely coordinated with ODOT. Second, the choice of City-approved stormwater technologies that could be installed into the existing drainage system is extremely limited. The actual performance of these facilities and the ability to install them as a may be limited. Third, some sites may have geotechnical and/or environmental concerns that could be identified during design and construction and could affect implementation.

Spring Garden Park Stream Daylighting

This project will support the design and construction of this stream daylighting project located on Portland Parks property.

Environmental assessment and geotechnical analysis needs to be conducted. A non-park use permit and a street opening permit will probably be required from the City. An easement over the drainage flow path will be needed. The design and construction must be coordinated with Portland Parks. These items could moderately affect implementation.

Tryon Creek Water Quality Facility (MS4 Basin DTT002)

This funding request will support the design and construction of this water quality facility. This project is located primarily in the ODOT right-of-way along Interstate 5 and partially on private property.

Facility designs were not developed as part of the Pre-design. Detailed modeling, environmental investigations, and geotechnical assessments will be required. Land ownership, facility size, and the exact location of the facility have not been determined. Based on those determinations, agreements with property owners and land acquisition and/or easements may be needed; those costs were not included in the cost estimate. City and state permits may also be required.

Stormwater Retrofits (Multnomah Village)

This funding request will continue to support the design and construction of stormwater retrofits in the public right-of-way and on public property. See the description in Phase 1 for more information.

Stormwater retrofits (7 sites)

This funding request will continue to support the design and construction of stormwater retrofits in upper Tryon Creek. See the description in Phase 1 for more information.

Lower and Middle Tryon Creek Cluster

Reach 5: Streambank Gabion Removal and Enhancement

This request will support the design and construction of the removal and replacement of stream bank gabions with large wood and other natural materials. This project is located in Tryon Creek State Natural Area.

City, state, and federal permits will be required. Construction easements will be needed for some project elements. Detailed flow modeling will be needed to support the design. The in-water work window for Tryon Creek is July 15 through September 30. These factors can influence the project costs and/or schedule.

Reach 6: Sewer Infrastructure Protection and Stream Enhancements

This request will support the design and construction of measures to protect two exposed segments of sanitary sewer. The project is located on Tryon Creek on private property upstream of Boones Ferry Road.

Access to the site is difficult. Construction easements will be needed for some project elements. Detailed flow modeling will be needed to support the design. City, state, and federal permits will be required. The in-water work window for Tryon Creek is July 15 through September 30. These factors may influence the project costs and/or schedule.

Other Stormwater Retrofits

This funding request will continue to support design and construction of stormwater retrofit projects. See the description in Phase 1 for more information.

Ditch-to-Swale

This funding request will continue to support the conversion of roadside ditches to swales. See the description in Phase 1 for more information.

Land Acquisition

This funding request will continue to support a willing seller acquisition program. See the description in Phase 1 for more information.

Revegetation

This funding request will support revegetation on high-priority sites. These sites are on private property. BES Revegetation Program staff will establish agreements with property owners for initial plantings and 5 years of project maintenance.

Phase 3

Beaverton Hillsdale Highway Cluster

Stormwater Retrofits (7 sites)

This funding request will continue to support design and construction of stormwater retrofit projects. See the description in Phase 1 for more information.

Fanno Creek Water Quality Facility (MS4 Basin ACG084)

This funding request will support the design and construction of this water quality facility located on Portland General Electric property.

Environmental and geotechnical investigations will be needed. Ownership of the onsite stormwater pipe needs to be determined. Property and easements must be acquired. Access to the site for construction and maintenance will be challenging. Additional easements and access road construction may be needed. City, state, and local permits will be needed. These items could affect implementation.

Fanno MS4 Outfall ACG251

This funding request will support the replacement of this storm pipe and stream bank repairs. The pipe is located on private property.

The entire pipe should be TV'd to determine pipe condition along the entire length and determine if lining is appropriate. Initial environmental and geotechnical investigations are needed. Ownership of the storm pipe needs to be determined; it appears to be a private pipe. Property and easements must be acquired. Access to the site for both construction and maintenance will be difficult. Additional easements and access road construction may be needed. These issues could affect implementation.

Fanno MS4 Outfall DTF026/ANJ549

This funding request will support the lining of this piped outfall and stream bank repairs. This pipe is located on private property.

The entire pipe should be TV'd to determine pipe condition along the entire length and determine if lining is appropriate. Initial environmental and geotechnical investigations are

needed. Ownership of the storm pipe needs to be determined; it appears to be a private pipe. Property and easements must be acquired. Access to the site for both construction and maintenance will be difficult. Additional easements and access road construction may be needed. These issues could affect implementation.

Fanno MS4 Outfall ACM514

This funding request will support the repair of this piped outfall and stream bank revegetation. The project is located in the right-of-way.

The entire pipe should be TV'd to determine if the entire pipe needs replacement. If the adjacent property owners are interested, opportunities to extend revegetation should be pursued. No other issues that could affect implementation were identified.

Upper Tryon Creek Cluster

Jackson Middle School Stormwater Retrofits

This funding request will support the design and construction of stormwater retrofits at Jackson Middle School. Pre-designs have been reviewed by Portland Public Schools representatives. The project will require City permits. It is expected that these permits can be acquired with relative ease and should not adversely affect the implementation schedule.

Stormwater Retrofits (7 sites)

This funding request will continue to support the design and construction of stormwater retrofits in upper Tryon Creek. See the description in Phase 1 for more information.

Tryon MS4 Outfall (MS4 Basin ADC879)

This funding request will support the rehabilitation of this stormwater outfall. The outfall appears to be located in the right-of-way. Additional investigations of pipe condition by BES Maintenance Engineering will be needed.

Other Stormwater Retrofits

This funding request will continue to support design and construction of stormwater retrofit projects. See the description in Phase 1 for more information.

Ditch-to-Swale

This funding request will continue to support the conversion of roadside ditches to swales. See the description in Phase 1 for more information.

Land Acquisition

This funding request will continue to support a willing seller acquisition program. See the description in Phase 1 for more information.