QUALITY ASSURANCE PROJECT PLAN (QAPP)

Siuslaw Estuary Partnership

An Integrated Multiple Objective Approach To Watershed Protection and Restoration

Work Element III: Surface and Groundwater Assessment and Monitoring Program

Prepared by:

City of Florence, Oregon
250 Highway 101
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For:

USEPA Region 10
1200 6th Ave Seattle WA 98101

February 16, 2010

Title and Approval Sheet

Title: Siuslaw River Estuary Partnership: An Integrated, Multiple Objective Approach to Watershed Protection and Restoration, Work Plan Element III, Surface and Groundwater Assessment and Monitoring Program

Approving Officials:

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2/26/2010
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Acronyms and Abbreviations

DEQ	Oregon Department of Environmental Quality
DO	dissolved oxygen
DQOs	data quality objectives
IOC	inorganic chemical
OBMP	Oregon Beach Monitoring Program
ORP	oxidation-reduction potential
SOCs	synthetic organic chemicals, e.g., pesticides
TOC	total organic carbon
UGB	Urban Growth Boundary
USGS	U.S. Geological Survey
VOCs	volatile organic chemicals, e.g., fuels, solvents

List of Tables

This project has been funded wholly or in part by the United States Environmental Protection Agency under assistance agreement WC-00J04801-0 to City of Florence. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

A. Project Management

1. Project/Task Organization

The project team shall be comprised of a consortium of experts and stakeholders needed to shepherd the creation of a Surface- and Groundwater Assessment and Monitoring Program; Source Water Protection Plan and implementation; Estuary Interpretive Trail; Stormwater Design Manual and Demonstration Project; Wetland, Riparian, and Upland Protection and Restoration Plan; Tidal Wetlands Restoration Projects; and Comprehensive Plan and Code amendments. Personnel responsible for project implementation are:

Florence Community Development Director/Project Manager

Sandra Belson, Florence Community Development Director, is the Project Manager (PM) for the Siuslaw Estuary Partnership Project. The PM shall be responsible for overall project coordination, including the production of all project deliverables, collection and submittal of environmental samples to the designated laboratories for the chemical and physical analyses, and data reporting and management as specified in this QAPP. The Project Manager is responsible for coordinating these tasks with the other interested and involved parties associated with this monitoring effort, and ensuring that the monitoring plan is implemented as specified.

Carol Heinkel, Planning Consultant, is responsible for Project Coordination. She will provide project coordination, grant administration support, facilitate the Interdisciplinary Team and Stakeholder Group, and support policy and public involvement.

Project QA/QC Manager

Mike Miller, or Water Quality Monitoring Designee, will serve as the Project QA/QC Manager, responsible for coordinating with the analytical laboratories, ensuring conformance with data quality objectives, overseeing data validation, and managing project quality assurance and quality control.

Contract Laboratory Project Manager

To Be Determined. Selection of a contract laboratory(ies) has not been conducted to date. Once the appropriate laboratory is selected to analyze the water samples discussed in this monitoring plan, a representative of that laboratory will serve as the laboratory project manager. The laboratory project manager will provide analytical support to this project and is responsible for ensuring that laboratory analyses are performed in accordance with the protocols, quality control criteria, and other specifications detailed in this QAPP.

PARTNERS: Partners that have committed to participate on the team are listed below with an *. Additional agencies listed below will be invited to participate on the Interdisciplinary Team or the Stakeholder Group, as appropriate.

Table 1. Project Partners		
Local Government, Tribes & Non-Profits	**State Agencies**	**Federal Agencies**
*Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians	*Oregon Department of Environmental Quality	*U.S. Environmental Protection Agency
*Lane County	*Oregon Department of Fish and Wildlife	*U.S. Geological Survey
*Heceta Water District	*Oregon Department of Human Services, Drinking Water Program	*U.S. Bureau of Land Management
*Siuslaw Watershed Council	*Oregon Department of Land Conservation and Development	*U.S. Army Corps of Engineers
*Siuslaw Water and Soil Conservation District	*Oregon Department of State Lands	National Oceanic and Atmospheric Administration, Marine Fisheries Service
Port of Siuslaw	*Oregon Department of Water Resources	*USFS, Siuslaw National Forest
Port of Coos Bay	*Oregon Department of Transportation	

2. Problem Definition/Background

Florence, Oregon, a city of 9,400 people covering 5 square miles of land and 0.6 square miles of water along the Siuslaw River estuary and Pacific Ocean, is Lane County's major coastal town and the largest city in the watershed. The urban growth boundary (UGB) population is projected to grow to 17,200 by 2030, almost double the UGB population in 2000. This growth is expected to occur primarily through urbanization of "urbanizable" land within the UGB.

Land cover includes urban development within city limits and vacant and rural land uses outside. The Siuslaw River estuary, designated a Shallow Draft Development estuary under the Oregon Estuary Classification System, is managed for navigation and other public needs with jetties and a main channel maintained by dredging at 22 feet or less. The geomorphology of the area is that of a Drowned River Mouth estuary. The estuary's broad floodplain, numerous wetlands, and tidal islands, lead to the dunes along the coastal plain at Florence. Here the land is characterized by barren sand dunes interspersed with pine woodlands and deflation plain lakes or wetlands. Since the decline of the forest industry, most of the revenue generated in the area is from tourism, recreation, and commercial fishing. Local community members, both tribal and nontribal, engage in subsistence fishing for marine and stream resources. The area is an important recreational area providing opportunities for fishing, boating, beach walking, shopping, dining, bird watching, and many other active and passive recreational activities.

The Siuslaw Watershed is a significant natural area that provides critical habitat for endangered and threatened animal species, contains sensitive plant species, and provides valuable habitat for sensitive animal species (U.S. Natural Resources Conservation Service; Oregon Natural Heritage Program). Under the federal Endangered Species Act, the brown pelican is listed as endangered; the bald eagle, western snowy plover, marbled murrelet, Aleutian Canada Goose, northern spotted owl, Nelson's checker mallow, Oregon silverspot butterfly and Oregon Coast coho salmon are listed as threatened; and the estuary is proposed for critical habitat for the threatened Southern District Population segment of green sturgeon. The purple martin is listed as critical, and American marten as vulnerable, by Oregon. Twelve plant species in the area are listed as threatened, endangered, or possibly extirpated from Oregon. The estuary also supports shellfish resources, including clams, crab, mussels, and shrimp. Large animals include black bear, black-tailed deer, and mountain lion. In all, about 23 species of fish, almost 200 species of birds, and 40 species of marine mammals use the estuary and the surrounding wetlands, lakes, riparian and upland areas. The watershed supports spawning runs of fall Chinook, chum, winter steelhead, coho, and sea-run cutthroat; and receives significant waterfowl use. The estuary has retained a relatively large proportion of its tidal marshes (764 acres) and contains large eel grass beds, and very productive intertidal (sand and mud flats) and subtidal habitats, emergent marsh, scrub-shrub, and forested wetlands. The estuary has been designated an Important Bird Area by the National Audubon Society. There has been at least one winter count of more than 1,000 shorebirds. In addition, the South Jetty wetlands adjacent to the lower river are one of the two most important wintering areas for tundra swans on the Oregon coast.

The 1996 "Florence Local Wetlands and Riparian Area Inventory" identified 270 wetlands, totaling 572 acres, and about 315 acres of riparian area. The majority of the wetlands are of high quality, due to the proximity of a number of freshwater lakes, and the large areas of undeveloped land in the northern portion of the UGB. Plant communities with a high priority for conservation include three palustrine scrub-shrub assemblages and one palustrine forested assemblage. The majority of the riparian areas were found to have high or moderate functional values for thermal regulation, erosion control, flood control/water quality, and wildlife habitat function. In the northern part of the UGB, there are large wetlands, bogs, and flooded forests; if left undeveloped, they would help regulate stream flows and reduce flood waters.

The North Florence Dunal Aquifer, designated a sole source aquifer by the EPA in 1987, is the only sole source aquifer in the State of Oregon. It encompasses the entire continuous body of sand north of the Siuslaw River and east of the Pacific Ocean, the primary discharge points for the aquifer. About 85 percent of the rain percolates into the water table. Groundwater moves rapidly and almost uniformly toward a discharge point. Multiple seeps and springs occur along the coastline and riverbank, although the aquifer discharges mostly as underflow. Few streams cross the dunal area since most rainfall quickly infiltrates to the water table which is at the surface most of the year. Where streams flow across the sand, they are hydrologically connected with the groundwater system, as are Munsel Lake and Clear Lake, which is the only surface source of drinking water. When the last comprehensive testing of the aquifer was done 23 years ago, the groundwater was of good quality "from a human health standpoint." The 1987 EPA Sole Source Aquifer Resource Document states, "Possible sources of aquifer contamination include fuel storage tank failure, accidental spills of hazardous material, septic tank effluent, storm runoff, pesticides, and chemical fertilizers." Discharge of pharmaceutical by-products is also an environmental threat.

Historically, the Siuslaw Basin was one of the most abundant anadromous fish producers in the Pacific Northwest. Once the Oregon Coast's largest Coho-producing system next to the Columbia, the Siuslaw River is estimated to be at 1% of historic salmon production levels. The lower Siuslaw River watershed health is degraded and a significant amount of restoration action is needed to improve watershed conditions (Oregon Watershed Enhancement Board, 2007). The watershed is limited by all factors in aquatic/instream areas, tideland, riparian, freshwater wetlands, and upland areas. The Siuslaw River and a number of nearby waterways and lakes are classified as Water Quality Limited under the Clean Water Act and are included on the state's 303(d) list of Impaired Waterbodies by the Oregon Department of Environmental Quality. The River is failing in all these parameters: Dissolved Oxygen, Fecal Coliform, Habitat Modification, and Temperature, and potentially Alkalinity. Beneficial Uses impaired by these listed parameters include resident fish and aquatic life; salmonid fish spawning and rearing; anadromous fish passage; trout rearing and migration; and shellfish growing. In 1992, DEQ developed Total Maximum Daily Loads for Clear Creek/Clear Lake, and Collard Lake due to year-round phosphorus impairments. In addition, Mercer Creek and Mercer Lake are impaired due to chlorophyll a and aquatic weeds/algae, and there is a potential concern of impairment from nitrate. DEQ is currently developing the Total Maximum Daily Load for the Mid-Coast Basin with a target completion date of 2012.

Urbanization of the UGB, development of rural areas along stream corridors for housing, and climate change will exacerbate long-term watershed changes caused by established land use patterns, including altered sediment and detritus deposition patterns, changed peak flows, water circulation patterns, flooding regimes, and surface and groundwater contamination from septic systems and non-point source pollution. The presence and increased discharge of nitrates and other pollutants into the ecosystem through urban groundwater and surface water activities, and the loss of riparian and floodplain function, can be expected to further degrade the system. Another deleterious effect is increased erosion, which is already a problem in developed portions of the estuary and along Munsel Creek. Existing contamination will likely increase recovery time for these impacted waterways.

The Project Partners are favorably positioned to document and, as resources allow, restore identified natural resources that are impaired in an effort to protect functions and values of these resources in the future. The City has upgraded its sewage treatment plant; extended lines into the UGB; adopted a wetland and riparian inventory; and requires stormwater BMPs. The City has updated the Comprehensive Plan for compliance with Statewide Planning Goals for Estuarine, Shoreland, and Ocean Resources. The City, Lane County, and Heceta Water District have begun to cooperate on water quality assessment and monitoring, and the City has set aside funds for an on-going monitoring program. A Source Water Protection Plan and monitoring program were top City Council goals for 2009. The Siuslaw Watershed Council Partners (WC) will be project lead for the Tidal Wetlands Restoration Project. These Partners have a ten-year relationship and work together on an EPA-funded Targeted Watershed Initiative (since 2005).

PROJECT COMPONENTS

The Project Components are laid out in detail below. The proposal is effective and innovative because it links environmental protection and restoration with growth management in a collaborative, multi-faceted manner; and the project partners will explore non-traditional methods and activities, including low impact development, and design specifications and demonstration project for on-site water management systems that can adapt to sea level rise as well as changes in temperature and precipitation. The project will also include incentives to implement integrated environmental management strategies that will provide environmental benefits that cannot be achieved through regulations.

WORK PLAN

Milestones/Outcomes	Work Elements and Tasks
Phase I: Form Siuslaw River Estuary Partnership and Integrated Approach October 2009 through September 2010	
Agenda Packets and meeting notes; web site; Guiding Principles Report; Baseline Monitoring Protocols Report; Research Reports; Quality Management Plan and	**I. <u>Inter-disciplinary Team</u>** a. Form/convene Team; agree on meeting, review, and consultation process b. Submit Quality Management Plan and Quality Assurance Project Plans to EPA Project Officer for approval by November 1, 2009. c. Design and create web page and links for project. d. Establish Guiding Principles e. Establish baseline monitoring protocols f. Study climate change and its effects relative to project area

Milestones/Outcomes	Work Elements and Tasks
Quality Assurance Project Plans; Reports to EPA.	g. Conduct literature search for range of issues, policies and measures h. Provide semi-annual reports to EPA on progress and seek technical assistance from EPA as needed.
Agenda packets, staff reports, meeting notes; Newsletter #1; Open House Report #1	**II. <u>Stakeholder Group/Local Official Check-ins</u>** a. Form Group; create e-mail and hard copy mail list b. Create and mail newsletter #1 c. Hold initial interactive meeting/open house to obtain input on goals, guiding principles, project design d. Provide monthly updates to Planning Commission (PC), City Council (CC), and Heceta Water District Board (Board)
Technical Memoranda on Standards, Methods, Base Line Data, Sources of Contamination, and any Remedial Actions	**III. <u>Surface and Groundwater Assessment and Monitoring Program</u>** a. Develop scientific-based standards b. Develop methods for assessment and monitoring program c. Install groundwater monitoring wells, stream flow gauges at inflow to Munsel Lake and Ackerly Creek; data loggers in estuary d. Collect base line data and identify sources of contamination e. Take immediate remedial action for any identified contamination
Report on Protection Areas, Potential Risks, and Alternative Measures	**IV. <u>Source Water Protection Plan and Implementation</u>** a. Identify/refine source water protection areas b. Identify potential risks to the aquifer c. Develop alternative policies and implementation measures
Report on Trail Location and Design Options	**V. <u>Estuary Interpretive Trail</u>** a. Identify alternative sites for potential acquisition of missing linkages in estuary trail b. Develop alternative design options
Stormwater Policy and BMP Options Report	**VI. <u>Stormwater Best Management Practices Manual</u>** a. Identify policies to support guiding principles (connectivity, flood plain restoration and preservation, low impact development) b. Develop design BMPs for typical subdivision and infill development, tailored to Florence area climate, soils, topography, aquifer sensitivity (this portion of the project is funded by a DLCD Grant with local match).
Stormwater Demonstration Project Acquisition Report	**VII.<u>Stormwater Demonstration Project</u>** a. Identify demonstration project area and acquire site (preliminary site identification work has begun for Interpretive Center/ stormwater BMP demonstration project east of Siuslaw River Bridge)
Draft Inventory Report; Existing policies and measures: gaps and conflicts analysis	**VIII.<u>Wetland, Riparian, and Upland Protection and Restoration Plan</u>** a. Update wetland and riparian area inventory, assess floodplain capacity and connectivity, and conduct upland inventory b. Analyze existing policies and measures for gaps and conflicts with guiding principles
Prelim. site assess. for high priority wetlands, acquisition of highest priority conservation areas in estuary from willing landowners	**IX. <u>Estuary Acquisition and Restoration (Watershed Council)</u>** a. Secure landowner commitments for restoration projects b. Conduct site characterizations, limited baseline monitoring, conceptual design c. Raise sufficient matching funds for acquisition.
Preliminary List of Needed Plan and Code Amendments	**X. <u>City Comprehensive Plan and Code Amendments</u>** a. Describe needed amendments.
Phase 2: Alternatives Analysis, October 2010 through September 2011	
Agenda Packets and	**I. <u>Inter-disciplinary Team</u>**

Milestones/Outcomes	Work Elements and Tasks
Meeting Notes; Guiding Principles Evaluation and Alternatives Report; Reports to EPA.	a. Convene Team (assumes monthly meetings) b. Evaluate all milestones for consistency with Guiding Principles c. Propose alternatives d. Review and comment on all Draft Reports e. Provide semi-annual reports to EPA on progress and seek technical assistance from EPA as needed.
Agenda Packets and Meeting Notes; Newsletter #2; Open House Report #2	**II. <u>Stakeholder Group/Local Official Check-ins</u>** a. Convene Stakeholder Group to plan public outreach b. Create and send newsletter and maintain web page c. Hold second meeting/open house for input/feedback on milestones d. Update PC, CC and Board monthly
Report on Current Conditions and Alternative Solutions	**III. <u>Surface and Groundwater Assessment and Monitoring Program</u>** a. Problem-solve and remedy existing contamination incidents b. Develop and analyze alternative solutions to contamination threats
Draft Source Water Protection Plan; new Munsel Creek culvert; signs installed informing of lake water importance and risks	**IV. <u>Source Water Protection Plan and Implementation</u>** a. Continue to identify sources of contamination b. Test alternatives and monitor c. Develop protection strategies d. Prepare Draft Plan and implementation measures e. Implement identified measures (culvert; 5 signs around Clear Lake)
Estuary Interpretive Trail Report on Site and Design Options Preliminary Report	**V. <u>Estuary Interpretive Trail</u>** a. Analyze site and design options' environmental and cost impacts b. Identify and analyze strategies to retain trail as permanent open space c. Prepare draft report on site and design options
Draft Stormwater Best Management Practices Manual	**VI. <u>Stormwater Best Management Practices Manual</u>** a. Apply and evaluate design BMPs b. Analyze alternative policies and approaches based on lessons learned and refine BMPs
Demonstration Project Report on BMP design, installation, and estuary base line data	**VII. <u>Stormwater Demonstration Project</u>** a. Prepare stormwater BMP design specifications b. Install stormwater system c. Obtain baseline data on water quality in estuary
Draft Wetland, Riparian, and Upland Protection and Restoration Plan	**VIII. <u>Wetland, Riparian, and Upland Protection and Restoration Plan</u>** a. Evaluate biological soundness and feasibility of restoration goals using baseline data and follow-up monitoring program. b. Analyze policy and implementation alternatives c. Prepare Draft Plan
Lands in the highest priority zones of estuary permanently protected	**IX. <u>Estuary Acquisition and Restoration (Watershed Council)</u>** a. Implement restoration activities b. Purchase fee title and/or conservation easements
Draft Plan and code amendments	**X. <u>City Comprehensive Plan and code amendments</u>** a. Prepare draft City Plan and Code amendments; review and revise.
Phase 3: Propose Policies and Measures and Submit for Adoption, Oct. 2011 thru Sept. 2012	
Agenda Packets, meeting notes; Revised Draft and Final Report on Project, including On-going evaluation process; Reports to EPA.	**I. <u>Inter-disciplinary Team</u>** a. Convene Team (assumes monthly) b. Continue to evaluate milestone consistency with Guiding Principles c. Review and revise proposed plans and reports d. Develop on-going evaluation process for all milestones e. Review/revise final reports f. Provide semi-annual reports to EPA on progress and seek technical assistance from EPA as needed.

Milestones/Outcomes	Work Elements and Tasks
Agenda Packets and Meeting Notes; News-letter #3; Open House Report #3; Stake-holder Focus Group Report on Outcomes	**II. <u>Stakeholder Group/Local Elected Official Check-ins</u>** a. Convene Stakeholder Group to plan public outreach b. Create and mail newsletter; maintain web page c. Hold third meeting/open house to obtain feedback on milestones d. Provide monthly updates to PC, CC and Board; e. Conduct 9-week focus group with Stakeholders to fully explain all outcomes and obtain feedback.
On-going Groundwa-ter and Surface Water Assessment and Monitoring Program Adopted and Imple-mented.	**III. <u>Surface and Groundwater Assessment and Monitoring Program</u>** a. Adjust monitoring program as needed b. Collect updated data and analyze results c. Continue to problem-solve and remedy contamination incidents d. Establish on-going monitoring program for periodic surface and groundwater and stream flow monitoring to characterize natural conditions and ensure that unacceptable contaminants are not affecting water quality
Proposed Source Wa-ter Protection Plan and Implementation Strategies are adopted and implemented.	**IV. <u>Source Water Protection Plan and Implementation</u>** a. Propose Plan and Strategies (planning, zoning, education, technical assistance) to help prevent releases that could degrade water quality b. Submit to local officials for adoption and to ODHS and DEQ; begin imple-mentation
Estuary Interpretive Trail Final Report	**V. <u>Estuary Interpretive Trail</u>** a. Prepare final Report: "Recommended Trail Design and Location Options" b. Present report to local officials for approval.
Proposed Stormwater Design Manual and Informational Hand-outs are adopted and implemented.	**VI. <u>Stormwater Best Management Practices Manual</u>** a. Propose policies to support goals and guiding principles b. Propose alternative design BMPs for typical subdivision and infill develop-ment, as needed c. Evaluate effectiveness of BMPs where applied d. Develop hand-outs with design specification sheets and illustrations
Stormwater Demon-stration Project Final Report and BMP De-sign Modifications are adopted and imple-mented.	**VII. <u>Stormwater Demonstration Project</u>** a. Modify stormwater system to address water quantity/quality problems b. Revise stormwater BMP design specifications c. Continue to monitor water quality and quantity impacts on estuary
Proposed Wetland, Riparian, and Upland Protection and Resto-ration Plan is adopted.	**VIII. <u>Wetland, Riparian, and Upland Protection and Restoration Plan</u>** a. Prepare Proposed Wetland, Riparian, and Upland Protection and Restoration Plan with proposed implementation measures. b. Submit to local officials for adoption and DLCD for Goal compliance.
	IX. <u>Estuary Acquisition and Restoration (Watershed Council)</u> The Work Element is expected to be completed in Phase II.
Comprehensive Plan and Code Amend-ments are adopted to protect natural re-sources and water quality.	**X. <u>City Comprehensive Plan and Code Amendments</u>** a. Draft all proposed Comprehensive Plan and Code amendments b. Submit to local officials for adoption and DLCD for compliance with all ap-plicable Statewide Planning Goals c. Begin public hearing process.

3. Project/Task Description

Project Objectives

Multiple objectives of the project and expected outcomes are:

a. **Collaboration and Scientific Investigation:** An Inter-disciplinary Team will guide all work elements; shepherd the creation of "Guiding Principles" to tie each task together to meet multiple objectives; provide technical expertise on all products; and consider the latest scientific findings and research on climate change in the development of all plans, standards, policy, code, and monitoring programs. The Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians will be an active member of this team. The Guiding Principles will be the formally recognized vision for environmental protection in these watersheds. They will set environmental targets and measurable outcomes that will be used in the evaluation of each work element. Examples of expected environmental targets are: a return of the native fish population by x%; water quality maintained at current quality standards or improved by x%; wetland interconnectivity and habitat migration channels maintained and/or improved by x%; outreach to x% of the UGB population and 100% of key interest groups. The environmental database for these watersheds is not sufficiently detailed or comprehensive to establish these targets and measures at this time. In addition, consensus among key partners is critical if the standards are to be accepted and administered effectively. For these reasons, it is important that the process, including the public education component of the project, be used to obtain this level of information, comprehension, and commitment.

b **Public Education and Stewardship**: The project will include an outreach/public education program, including newsletters, signage around Clear Lake, development of an interested parties list (including organized interest and business groups and homeowners associations, among others) and targeted outreach to these groups; and a vision for an Estuary Interpretive Trail system. The Stakeholder Group will ensure long-term commitment to multiple objectives. The stakeholder group will be a key element of the outreach program. The group will consist of representatives of interests that will be affected by, or potentially affected by, the outcomes of the project. The specific composition of this group will help assure that the group will represent their respective interests, and that they will provide effective liaisons to their groups.

c. **Water Quality and Quantity Protection**: The project will develop and implement a Surface- and Groundwater Monitoring Program and Source Water Protection Plan. The Monitoring Program will develop scientifically-based standards; conduct an on-going monitoring program; identify sources of contamination; take appropriate corrective action where problems exist; quantify groundwater flow and water table fluctuation within the aquifer; water table fluctuation; and determine and monitor flow patterns (hydrographs) in the surface streams. The Source Water Protection Plan will include: an enhanced inventory of potential contaminant sources within the dunal aquifer area; refined delineations of drinking water source areas; and strategies for addressing contamination threats. In addition, a failing culvert at the outfall into Munsel Creek will be appropriately addressed.

The project will develop effective, innovative non-point source pollution controls: Stormwater Design Manual; and a Demonstration Project adjacent to the estuary in Old Town that uses state-of-the-art BMPs tailored to Florence. Current DEQ-approved BMPs, i.e, the Portland Manual, now used by the City, have not achieved desired environmental results in on-the-ground installations in Florence. BMPs are needed that work with the area's specific soil, topography, hydrology, and climate. This work is not required under a stormwater discharge permit.

d. **Wetland, Riparian, and Upland Area Protection and Restoration:** A "Wetland, Riparian, and Upland Protection and Restoration Plan" will use the Oregon Rapid Wetland Assessment Protocol (ORWAP) and will exceed State Goal 5 requirements: update 1996 biological and functional assessment; assess omitted tidal and non-tidal wetlands; include delineations made since 1996; include upland habitat; and adopt policies and measures to protect the resources (none adopted at present) and to reduce barriers that restrict floodwaters from dispersing in floodplains. The City will do preliminary work to assess the potential for restoration of riparian areas, wetlands, and uplands on City-owned property. The revised, updated Plan will provide a comprehensive functional assessment. This is especially important in this watershed. For example, the capacity of existing natural wetland systems, and potential future constructed wetlands, to store and slow the velocity of, stormwater prior to discharge to area creeks and the estuary, is not currently established; and it is not known whether the carrying capacity is sufficient for the environment to fully address the anticipated impacts from planned urbanization. The functional assessment of the wetlands within this urban growth area will provide critical information to help guide future urbanization policy and stormwater management policy and capital programs.

e. **Protection and Restoration of Key Estuary Wetlands:** The Watershed Council will protect/restore, through easement or acquisition, over 200 acres of wetland in the Siuslaw Estuary. The SWC, McKenzie River Trust, ODFW, and other partners are working with state, federal, and private funding sources to achieve protection and restoration of high priority tidally influenced wetlands. Two sites have been identified. The Waite Ranch Restoration Site Project will include: preliminary site assessment; site characteristic and limited baseline monitoring; and potential hazards assessment and project development. A Management Plan will be prepared for the North Fork Marsh site. Project to include coordination of tasks, partners, and landowners for both sites.

f. **Ecological Growth Planning**: Updates to the Comprehensive Plan and Land Use Code will be adopted and implemented that will protect water quality and quantity and ecology. Protection measures will include low impact development requirements, revised stormwater management BMPs, green spaces and riparian buffer Plan designations and zoning, requirements to protect unique wetland features, such as flooded forests and blueberry bogs, and other measures to address environmental impacts of growth. The base line data and monitoring regimes established through this project will set the stage for the City to perform scenario analyses of environmental impacts of UGB build-out.

Environmental targets and measurable outcomes will be established in the Guiding Principles that will guide all products and processes, as discussed above. Long-term outcomes are land use and water management policies and practices that maintain and protect rearing, migrating, and spawning habitat for resident and anadromous fish, and habitat for birds, mammals, amphibians and reptiles; conversion of rural lands to urban densities that do not impair water quality or result in dysfunctional stream conditions; enhanced floodplain functions and inter-connected wetlands and floodplain; and on-going surface and groundwater quality monitoring and remedial action to prevent contamination. Ultimately, the natural resource economy will be re-invigorated. People will be drawn to the area with a renewed appreciation for its rich and complex ecosystem; and the area will be a model for other small coastal cities faced with growth pressures.

The project will commence on October 1, 2009 and will be conducted in three phases, each resulting in deliverables for ten Work Elements. Elements I and II, Inter-disciplinary Team and Stakeholder Group/Local Official Check-in, ensure each Element is coordinated and meets common objectives of natural resource and water quality protection and enhancement. Specific outputs of these Elements, described in the Work Plan, below, and discussed in Section II, above, include an extensive testing program to monitor the effectiveness of outputs in achieving multiple objectives (See Section VII and Logic Model).

Work Element III of this project will develop and implement a Surface- and Groundwater Monitoring Program: develop scientifically-based standards; conduct an on-going monitoring program; identify sources of contamination; take remedial action; quantify water flow within the aquifer; water table fluctuation; and determine and monitor flow patterns (hydrographs) in the surface streams; develop a Protection Plan, and implementation, including replacement of a failing culvert on outfall into Munsel Creek.

3.1 Work Element III Project/Tasks

This QAPP shall cover Work Element III of this project and shall complete the following major tasks and activities at the estimated timeline:

Note: Table was revised and content provided.

Table 3-1: Activities, Target Completion Dates, and Deliverables

Activities	Start	Target Completion	Deliverables
1) Prepare a QAPP	10/1/09	10/31/09	Draft QAPP
2) Review and Approval of QAPP	10/31/09	3/1/2010	Review and Approval Memo from EPA
3) Develop scientific-based standard protocols	10/31/09	3/1/2010	Final QAPP
4) Develop assessment and monitoring program methods	10/31/09	4/1/2010	Technical Memorandum: Monitoring Program Assessment and Monitoring Methods
5) Installation of groundwater monitoring wells; data loggers in estuary; and stream flow gauges and data loggers in Munsel and Ackerley Creeks.	1/21/2010	5/31/2010	Technical Memorandum: Report on Installation of Monitoring Devices
6) Collect baseline data	3/1/2010	9/30/2012	Technical Memorandum: Report on Baseline Data for Groundwater, Estuary, and Munsel and Ackerley Creeks
7) Identify existing contamination and source and take corrective actions.	5/31/2010	9/30/2012, if and when indicated	Technical Memoranda: Report on Existing Contamination and Remedial Actions Taken and Planned
8) Identify contamination threats and source and plan corrective actions.	5/31/2010	9/30/2012	Technical Memorandum: Report on Contamination Threats and Remedial Actions Analyzed and Planned
9) Adjust monitoring program as needed and collect updated data and analyze results	5/31/2010	9/30/2012, if and when indicated	Amendments to QAPP

Table 3-1: Activities, Target Completion Dates, and Deliverables			
Activities	**Start**	**Target Completion**	**Deliverables**
10) Establish routine monitoring program for surface and groundwater	7/1/2012	9/30/2012	Final Report on Monitoring Program (combining all Technical Memoranda and including plan for on-going program)

3.1.1. Primary Data Collection Activities:

Primary data collection activities for Work Element III involve three scenarios:

Scenario #1: Groundwater (Dunal aquifer and Clear Lake)
Scenario #2: Lakes/Creeks
Scenario #3: The Estuary (at Stormwater Demonstration Project and near River mouth)

3.1.1.1 Scenario #1: Groundwater (Aquifer and Clear Lake)

It is the City's goal to maintain and protect a sustainable drinking water resource, from water quality and water quantity perspectives. The City is interested in protecting its current drinking water supply and protecting future water supplies within all portions of the Dunal Aquifer. The key elements of a groundwater protection program are:

- Identification of, or refinement of, the source water protection area(s)
- Identification of potential sources of groundwater contamination
- Implementation of control strategies (land use planning, zoning, ordinances) to help prevent releases that could degrade groundwater quality
- Periodic groundwater monitoring to characterize natural conditions and ensure that unacceptable contaminants are not affecting the use of the water for drinking

3.1.1.1.1 Scenario I Tasks:

I. Expansion of the 2003 Oregon Drinking Water Program Groundwater Flow Model, a three-dimensional model GW Vistas 5.0.

Install 30 shallow (<20 ft) monitoring wells throughout aquifer, one to three deeper wells strategically located in deeper zones, and data loggers in one or two of the wells to determine lag time. Locations to include above and below Clear Lake to 1) quantify water flow within the aquifer (volume, direction, speed); track the rise and fall of the water table; establish head data as function of location and in response to storm events; 2) provide baseline water quality data; monitor static water levels in wells quarterly and after major storm events; and use data to calibrate Model.

II. Collect water samples to establish variability of water quality. Place up- and down-gradient sites in various land use areas (residential, commercial/industrial, transportation corridors, golf courses, etc.) and tailor analysis to dominant land use of monitored area. Monitor quarterly for the first year, semi.-annually on the second year with adjustments for pathogenic micro-organisms, as needed.

III. Analyze water samples for fecal coliform, nitrate, common ions, water quality parameters, IOCs, Volatile Organic Compounds (VOCs), e.g., fuels, solvents; and Synthetic Organic Chemicals (SOCs), e.g., pesticides.

IV. Analyze the analytical data and determine the existing contaminant problems and possible contaminant threats.

V. Identify the probable source(s) of the contamination and implement source control actions, if necessary, to mitigate or eliminate the source(s).

VI. Notify and work with the appropriate regulatory agencies that will determine whether the impacted water poses a health hazard and take necessary steps to protect public health and safety.

3.1.1.1.2 Monitoring Schedule:

The following schedule, as revised through mutual agreement with EPA and the project partners, will provide a representative and ongoing view of water quality and groundwater flow direction within the CITY and the CITY's urban growth boundary ("UGB") and within the Clear Lake watershed outside the UGB:

- Water Level Monitoring. The CITY will monitor the wells for static water levels quarterly for the first one or two years, and semi-annually thereafter. Monitoring may also include periods following major storm events. A monitoring well will be placed in proximity to Munsel Lake to the west. Water levels in this well will be monitored on the same frequency as the stream flow data (below).

- Chemical Monitoring. During the first year of the program, the CITY will conduct chemical monitoring on a quarterly basis, consistent with chemical monitoring requirements under the Safe Drinking Water Act. at all wells to identify the seasonal trends and variability that will establish baseline conditions for future comparison. After the first year, monitoring frequency may be reduced to semi-annually or annually, depending upon the results of the first year. The following chemical constituents will be monitored as part of a comprehensive groundwater monitoring program:

    i) Analyze all monitoring well data for the common ions, pH, temperature, oxidation reduction potential, conductivity, total organic carbon, and coliform bacteria.
    ii) test monitoring wells in the commercial and industrial areas annually for organic chemicals (volatiles and pesticides) following the drinking water standards protocols and /or the 40CFR136 analytical methods The frequency of testing may be reduced if the results are below drinking water standards.
    iii) test all monitoring wells within the UGB north of the CITY once to determine the presence or absence of organic chemicals (e.g., fuels, solvents and pesticides) in the residential area. If any of these chemicals are detected, monitor the wells quarterly.

iv) monitor all monitoring wells in the residential area of the UGB quarterly for nitrate, phosphorous and coliform bacteria, and after initial testing, monitoring frequency may be adjusted to further evaluate contamination threats.

v) confer with the Oregon Department of Environmental Quality (DEQ) and other appropriate parties to identify surface water sources to be tested. The CITY will test water from the identified sources for water quality parameters, including, coliform bacteria, pH, conductivity, nitrate, phosphorous, common ions, total organic carbon, and oxidation state.

- Microbial Monitoring. During the first year of the program, conduct microbial monitoring for coliform bacteria and e-coli, following standard protocols for sampling, handling, etc., on a quarterly basis at all wells to identify the seasonal trends and variability that will establish baseline conditions for future comparison. Depending on the results obtained after the first year of monitoring, sampling frequency may be reduced semi-annually or annually. Baseline is absent or non-detect for groundwater.

3.1.1.2 Scenario #2: Lakes/Creeks

Munsel Lake occurs on the eastern boundary of the Florence Dunal Aquifer and is in hydraulic connection with the aquifer. The extent of this connection must have a significant impact on groundwater flow to the west and south. Being able to characterize the water budget with respect to Munsel Lake will be of fundamental importance in developing the groundwater flow model. In order to quantify the influence of the lake on groundwater, two stream flow measurement systems will be installed. The first will be on Ackerly Creek that feeds into Munsel Lake from Ackerley and Clear Lake to the north. Although not the only feed into Munsel Lake, Ackerley Creek is the main inflow of water into Munsel Lake and is perennial in nature. The second stream flow monitoring point will be on Munsel Creek just below Munsel Lake and will supply a measurement of the outflow from the lake.

The stream flow monitoring stations will consist of a V-throated flume and standpipes operating on the principle that the height of the water level in a standpipe at a specific location within a V-throated flume of known dimensions can be converted to volume of water in the stream. The change of this instantaneous volume with time could then be used to compute volumetric stream flow.

3.1.1.2.1 Scenario 2 Tasks

I. Collect grab seep samples and outflows of surface water in Heceta Beach area where quality concerns have arisen;

II. Analyze samples collected annually from Clear Lake for pharmaceuticals and by-products, as recommended by the American Waterworks Association;

III. Install three stream flow gauges in Munsel Creek, and one in Ackerley Creek to determine and monitor flow patterns (hydrographs);

IV. Install three continuous three data loggers in Munsel Creek and one in Ackerley Creek to collect temperature data and use hand held devices and/or grab sampling to assess and monitor turbidity, DO, and pH. Coordinate these sampling activities with U.S. Geological Survey, ODFW, OWRD, and the Confederated Tribes.

3.1.1.2.2 Schedule

- Stream flow data will be collected at the two stations on a weekly basis between rain events, and every day before, during, and until flow stabilizes, around a storm event. A monitoring well will be placed in proximity to Munsel Lake to the west. Water levels in this well will be monitored on the same frequency as the stream flow data.
- The data loggers will be programmed to measure temperature at 10-minute intervals. Data will uploaded and stored electronically on a weekly basis. This schedule may be modified during storm events.

3.1.1.3 Scenario #3: Estuary

3.1.1.3.1 Scenario 3 Tasks

- The City shall install continuous data loggers upstream of, adjacent to, and downstream of the City Stormwater Demonstration Project, near mouth of river, to collect temperature data and use hand held devices and or grab sampling to assess and monitor turbidity, DO, and pH plus salinity. Coordinate with U.S. Geological Survey, ODFW, OWRD, and the Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians.
- Obtain samples for microbial analyses monthly.

3.1.1.3.2 Schedule

- The data loggers will be programmed to measure temperature at 10-minute intervals. Data will be uploaded and stored electronically on a weekly basis. This schedule may be modified during storm events.

<u>3.1.2 Secondary Data Collection</u>

3.1.2.1 Marine

Collate and evaluate marine testing data previously collected by OBMP for bacteria in the Heceta Beach area and work with OBMP to add Heceta Beach back into program. Document established minimum QC criteria for data acceptance for this project for microbiological data.

3.1.2.2 North Fork

Continue to monitor the Tribes' monitoring using continuous data loggers for temperature, turbidity, DO, salinity, and Ph; and bacteria sampling starting from year 2005 to present. Document established minimum QC criteria for data acceptance for this project for conventional analyses.

3.1.2.3 Estuary

Continue to monitor data conducted by: Army Corps of Engineers for sedimentation; Watershed Council (8 locations, grab sampling); and Tribes' monitoring with continuous data loggers for temperature, turbidity, DO, salinity, and Ph; and bacteria sampling. Document established minimum QC criteria for data acceptance for this project for these analyses.

4. Data Quality Objectives

Data quality objectives (DQOs) are related to the specific investigation activities related to the water sampling activities planned for the Siuslaw Watershed Project. DQOs are defined as the qualitative and quantitative statements that characterize the data needed to support a particular data usage. Therefore, DQOs for data collection and analysis are based on the end use of the data. All data will be gathered and handled in accordance with the USGS National Field Manual for the Collection of Water-Quality Data.

The data collected will be used to assess water quality trends, identify problem areas, calculate pollution loadings, and support overall water quality assessment in the Siuslaw River Watershed.

Objectives

- **Scenario #1 Groundwater, Objective:**
  To detect and address threats to water quality in the North Florence Sole Source Dunal Aquifer and Clear Lake, drinking water sources within the Florence Urban Growth Boundary (UGB);

  To meet the above objective, groundwater monitoring wells must be constructed in a manner to be able to collect representative samples. Wells will be constructed according to the Oregon Department of Water Resources guidelines for the construction of monitoring wells.

  In order to obtain representative groundwater samples from the properly constructed monitoring wells. The sampling protocol for the monitoring wells is described below.

  The laboratory analytical methods that will be used in this study, their detection limits and precision are given in Table 4.1.

  Static water level measurements within the monitoring wells will be conducted manually, at a minimum quarterly for the first two years of the study and semiannually from then on and may be more frequent as indicated. Additional contaminants may be monitored as indicated, e.g., lead near the gun range adjacent to Munsel Creek. Measurements will be accomplished by lowering a previously disinfected probe through the observation port and measuring the distance from ground surface to water level to the nearest 0.1 foot or 0.01 foot if feasible for manual measuring and recording.

  Scenario #2 Lakes/Creeks, Objective:
  To assess and monitor water flow patterns between the Creeks and Lakes and the aquifer; evaluate the hydraulic connection between the Lakes and aquifer, and to detect and address threats to water quality in Munsel Creek and Ackerley Creek to protect fish and wildlife habitat.

  Scenario #3 Estuary, Objective:
  To obtain baseline and on-going water quality data in the estuary at the point of the City's stormwater demonstration project and at the mouth of the river in order to assess and monitor the health of the estuary, in general, and to determine the effects of the demonstration project on water quality in the estuary; to protect fish and wildlife habitat.

4.1 Project Quality Objectives

The quality assurance objectives for this project are to develop and implement procedures that will ensure the collection of representative physical and chemical data of known and acceptable quality. Table 4-1 summarizes the quality assurance objectives for each type of water analysis in accordance with protocols for water analyses. The data quality parameters used to assess the acceptability of the data are precision, accuracy, representativeness, comparability, and completeness. These parameters are discussed below.

In order to identify and mitigate potential risks to water quality, the City, in consultation with the Oregon Department of Human Services' Drinking Water Program and the DEQ, will work together to establish chemical and microbial concentration action levels that, if exceeded, will result in response actions. Below are typical contaminants and their corresponding action levels.

Table 4: Typical Contaminants and Action Levels

Contaminant	Trigger Concentration[1]	Health Concern
E. coli	Presence	Acute response possible
Nitrate	5.0 mg/L[2]	Acute response possible
Phosphorous	0.1 mg/L	Nutrient
Fuels, solvents, etc.	Detection level	Chronic contaminant
Pesticides	Detection level	Chronic contaminant
Caffeine	Presence	Indicator

1 Source: E. coli, Safe Drinking Water Act MCL; phosphorous, DEQ adopted Clean Water Act Criteria, Fuels, Sovents, Pesticides, DHS monitoring requirements for Public Water Systems. If referenced agencies change the established trigger concentrations, new standards shall apply unless otherwise agreed to by the partners.

2. Trigger concentration to be 5 milligrams per liter (DHS standards for quarterly monitoring) unless otherwise determined by the partners based on analytical results of baseline monitoring. Since the naturally occurring nitrate level(s) is not known, a monitoring period of the groundwater for one year will be completed. A background or baseline level will be established through the testing program for groundwater in the areas outside of developed areas. Generally speaking, this would be areas north of the current Florence UGB.

4.2 Measurement Performance Criteria

Precision

Precision measures the reproducibility of measurements under a given set of conditions. Analytical precision is measured through matrix spike/matrix spike duplicate (MS/MSD) samples for organic analysis and through laboratory duplicate samples for inorganic analyses. Analytical precision measurements will be carried on project specific samples at a minimum frequency of 1 per laboratory analysis group or 1 in 20 samples, whichever is more frequent, per matrix analyzed. Laboratory precision will be evaluated against quantitative relative percent difference (RPD) performance criteria. General precision levels are presented in Table 4-1.

Field precision will be evaluated by the collection of blind field duplicates. One field duplicate per matrix will be collected. Currently, no performance criteria have been established for field duplicates. Field duplicate precision will therefore be screened against a RPD of 75 percent for water samples. However, no data will be qualified based solely on field duplicate precision. Precision measurements can be affected by the nearness of a chemical concentration to the method detection limit, where the percent error (expressed as either %RSD or RPD) increases. The equations used to express precision are as follows:

$$RPD = (C1 - C2) \times \frac{100\%}{(C1 + C2)/2}$$

Where:

RPD = relative percent difference
C1 = larger of the two observed values
C2 = smaller of the two observed values
%RSD = (SD/ Dave) x 100

Where:

SD = ?? (*D - Dave* 1)/(n - 1)
D = sample value
Dave = average sample value
n = number of samples

Table 4-1
Quality Assurance Objectives

Analyte	**Units**	**Precision**	**Accuracy**	**Completeness**	**EPA Method**	**Holding Times**
Total and Dis-solved Metals Cd, Cr, Cu, Pb, Hg, Ni, Zn)	Mg/L	+/-20%	+/- 25%	90%	200 Series	6 Months, 28 days for Hg
VOCs	Mg/L	+/-20%	+/- 30%	90%	524.2	7 days to extract
SOCs (SVOCs?)	Mg/L	+/-20%	+/- 30%	90%	E525.2, 508.1, 515.1, 515.2.547, 158.1, 549.2	7 days to extract
Alkalinity	Mg/L as CaCO3	+/-20%	+/- 30%	90%	310.1	7 days to extract
pH	pH units	+/-20%	+/- 30%	90%	150.1	Immediate
Fecal Coliform and *E. Coli*	Mg/L	+/-20%	+/- 30%	90%	SM 9222	30 Hours for groundwater; 24 hours or less for creeks and storm runoff
Fecal Streptococ-cus and Entero-cocci	Mg/L	+/-20%	+/- 30%	90%	SM 9230 B	30 Hours
Nitrate + Nitrite	Mg/L	+/-20%	+/- 30%	90%	300	28 Days
Total Kjeldahl Nitrogen	Mg/L	+/-20%	+/- 30%	90%	351.3, 351.4	28 Days
Total Phosphorus	Mg/L	+/-20%	+/- 30%	90%	365.1, 365.3	28 Days
Total Organic Carbon	Mg/L	+/-20%	+/- 30%	90%	415.3	7 Days
Total Suspended Solids	Mg/L	+/-20%	+/- 30%	90%	160.2	7 Days
Ca, Mg, Na, K, SiO2	Mg/L	+/-20%	+/- 30%	90%	200.5	7 Days
SO4, Cl,	Mg/L	+/-20%	+/- 30%	90%	300.0	7 Days
VOCs	Mg/L	+/-20%	+/-30%	90%	524.2	14 Days
pH[2]	pH units	TBD	TBD	TBD	Data Logger	
Temperature[2]	°C	TBD	TBD	TBD	Data Logger	
DO[2]	Mg/L	TBD	TBD	TBD	Data Logger	
Turbidity[2]	NTU	TBD	TBD	TBD	Data Logger	

1 = For those analyses on which sample spiking cannot be performed, QC reference standards will be analyzed to determine accuracy.
2 = Environmental parameters that will be collected using a continuous data logger in each of Ackery and Munsel Creeks

TBD = These values will be determined on site after data logger installation

Accuracy

Accuracy is an expression of the degree to which a measured or computed value represents the true value. Field accuracy is controlled by adherence to sample collection procedures outlined in the monitoring plan. To assess the potential for cross contamination in the field, one rinseate blank from the sampling device will be collected.

Analytical accuracy may be assessed by analyzing "spiked" samples with known standards (surrogates, laboratory control samples, and/or matrix spike) and measuring the percent recovery. Accuracy measurements on matrix spike samples will be carried out at a minimum frequency of one in 20 samples per matrix analyzed. Surrogate recoveries will be determined for every sample analyzed for organics.

Laboratory accuracy will be evaluated against quantitative matrix spike and surrogate spike recovery performance criteria as presented in the tables. Accuracy can be expressed as a percentage of the true or reference value, or as a percent recovery in those analyses where reference materials are not available and spiked samples are analyzed. The equation used to express accuracy is as follows:

$$\%R = 100\% \times (S-U)/Csa$$

Where:

%R = percent recovery
S = measured concentration in the spiked aliquot
U = measured concentration in the unspiked aliquot
Csa = actual concentration of spike added

Representativeness

Representativeness expresses the degree to which data accurately and precisely represent an environmental condition. For this program, the selected analyte has been identified as a constituent of concern based on numerous studies indicating the typical pollutants associated with groundwater.

Critical to the issue of representativeness is the sampling procedure. Samples must be collected in a manner that they reflect the sampling target. Individual sampling protocols are described below.

Representative water quality data had previously been obtained from other groundwater studies conducted by the EPA and USGS.

Comparability

Comparability expresses the confidence with which one data set can be evaluated in relation to another data set. For this monitoring program, comparability of data will be established through the use of standard analytical methodologies and reporting formats and of common National Institute of Standard and Technology or other traceable calibration and reference materials. Data will be used to evaluate trends over time and evaluate areas that appear to be contributing high pollution loads to the aquifer, the lakes, creeks, and the estuary.

Completeness

Completeness is a measure of the amount of data that is determined to be valid in proportion to the amount of data collected. Completeness will be calculated as follows:

C = (Number of acceptable data points) x100
(Total number of data points)

The data quality objective for completeness for all components of this project is 90 percent. Data that have been qualified as estimated because the quality control criteria were not met will be considered valid for the purpose of assessing completeness. Data that have been qualified as rejected will not be considered valid for the purpose of assessing completeness.

5. Documentation and Records

The data reports will be stored in digital files on City's local area network as well as in EPA files. The data will be retained in accordance with the public records retention requirements in State law and the Cooperative Agreement with EPA. The reports will be posted to the staff intranet site for use by the Inter-disciplinary Team and stored in project binders. The data will be used in final reports, including the Source Water Protection Plan and Stormwater BMP Manual. Final results will be posted to the project web page for public review.

B. Measurement Data Acquisition

6. Sampling Process Design

Sampling procedures for this investigation will follow Oregon DEQ Lab's Field Sampling Reference Guide and are described in more detail below. Sampling procedures are designed to ensure that all samples collected are consistent with project objectives and samples are identified, handled, and transported in a manner such that data are representative of actual site conditions and that information is not lost in sample transferral. The data collected will ultimately be used in determining whether there is groundwater contamination that is a threat to the drinking water system. To meet project objectives, special consideration is given to sample procurement, sample containers, holding times and preservation, field duplicates, equipment decontamination, blanks, (rinseate and field), sample documentation, transport and storage. Trace contaminants from sources external to the sample must be minimized through the use of good sampling techniques and proper cleaning of sampling equipment that comes in contact with the material being sampled.

7. Analytical Methods Requirements

7.1 Organics

7.2 Inorganics

7.3 Process Control Monitoring

The Analytical Methods Requirements are summarized in Table 7-1.

Table 7-1 Summary of Analytical Requirements						
Analyte	**Vol. Req. (mL)**	**Container**	**Preservation**	**Filter**	**EPA Method**	**Holding Times**
Total and Dissolved Metals - (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)	100	250 ml poly bottle	25 drops Nitric Acid (pH<2)	No (for Total); 0.45 um filter for dissolved metals	200 Series	6 Months
Volatile Organic Compounds Ascorbic acid or sodium thiosulfate, pH < 2, 1:1 HCL, store at 4C	25 ml	40 ml VOC vials 3 @ 40 mL, glass w/PTFE lined septum	4 + 2C	No	524.2	14 Days
Synthetic Organic Compounds	800	1000 ml amber jar	Ice	No	E525.2, 508.1, 515.1, 515.2.547, 158.1, 549.2	7 days to extract
Alkalinity	100	1000 ml poly bottle	Ice	No	310.1	72 hours
pH	100	1000 ml poly bottle	Ice	No	150.1	Immediate
Fecal Coliform and *E. Coli*	75	150 ml poly bottle	Ice	No	SM 9222	30 Hours for groundwater; 6-24 hours for creeks and runoff
Fecal Streptococcus and Enterococci	75	150 ml poly bottle	Ice	No	SM 9230 B	30 Hours
Nitrate + Nitrite	100	500 ml poly bottle	12 drops sulfuric acid (pH<2)	No	300	28 Days
Total Kjeldahl Nitrogen	500	500 ml poly bottle	12 drops sulfuric acid (pH<2)	No	351.3, 351.4	28 Days
Total Phosphorus	50	500 ml poly bottle	Add 12 drops concentrated H2SO4 – refrigerate	No		
Total Organic Carbon	20	500 ml poly bottle	Add 12 drops concentrated H2SO4 – refrigerate	No	415.3	28 Days
Total Suspended Solids	200	500 ml poly bottle	Ice	No	160.2	7 Days
Ca, Mg, Na, K, SiO2, Fe	100	250 ml poly bottle	25 drops HNO3 (pH<2)	No for total, 0.45 um filter for dissolved	200.5	28 Days
SO4, Cl	100	250 ml poly bottle	25 drops HNO3 (pH<2)	No for total, 0.45 um filter for dissolved	300.0	28 Days
pH[2]	pH units	On-site	NA	NA	Data Logger	
Temperature[2]	^{o}C	On-site	NA	NA	Data Logger	
DO[2]	Mg/L	On-site	NA	NA	Data Logger	

Table 7-1 Summary of Analytical Requirements						
Analyte	**Vol. Req. (mL)**	**Container**	**Preservation**	**Filter**	**EPA Method**	**Holding Times**
Turbidity[2]	NTU	On-site	NA	NA	Data Logger	

1 = For those analyses on which sample spiking cannot be performed, QC reference standards will be analyzed to determine accuracy.
2 = Environmental parameters that will be collected using a continuous data logger in each of Ackery and Munsel Creeks
TBD = To be determined on site after recorder installation.

8. Quality Control Requirements

8.1 Field QC Requirements

<u>All Scenarios</u>

Sample Handling
Sample collection and handling procedures are detailed in the Oregon DEQ Lab's Field Sampling Reference Guide. To control the integrity of the samples during transit to the laboratory and during hold prior to analysis, established preservation and storage measures would be taken. Table 9-1 presents sample volume, container type, preservation, and maximum holding times for the various analyses of groundwater samples.

Sample Custody Documentation
The Laboratory Standard Operating Procedures (SOP) provided by the contract analytical laboratory will describe in detail the chemical analytical procedures for this study. These SOPs will be kept in the project file at the analytical laboratory and will include written protocols for the analytical methods used.

<u>Scenario #1</u>

Monitoring wells will be installed by Oregon licensed monitoring well drillers. Drilling will be overseen by an Oregon licensed geologist. The field groundwater monitoring leaders will be trained by an Oregon licensed geologist in the proper methods of groundwater sampling and water level measurement collection. These trained leaders may then train their rank-and-file monitors.

Field sampling procedures are detailed in the Oregon DEQ Lab's Field Sampling Reference Guide. To control the quality of field samples, one field duplicate and one rinseate blank will be analyzed. Although validation guidelines have not been established for field quality control samples, their analysis is useful in identifying possible problems resulting from sample collection or sample processing in the field. All field quality control samples will be documented in the field logbook. The field quality control samples that will be collected as part of the groundwater monitoring program are discussed below.

Field Duplicates. For all water samples collected, one homogenized field duplicate will be collected and submitted for analysis. One field duplicate will be collected per 20 water samples.

Rinseate Blanks. A rinsate blank, consisting of analyte-free media which has been used to rinse the sampling equipment, will be collected after completion of equipment decontamination and prior to sampling. Water and sample bottles used in the collection of rinsate blanks shall be supplied by the laboratory which will be performing the analysis. Rinseate blanks are used to determine if cross contamination has occurred during sampling. One rinseate blank will be collected from DI water that has come in contact with the sampling device and will be submitted for analysis of organic and inorganic constituents being monitored during that given sampling event.

Trip Blanks. One trip blank consisting of organic-free water will be collected and carried through the sampling handling and analysis procedure. A trip blank will be included in each shipping container containing one or more samples to be analyzed for VOCs. All trip blanks submitted for analysis will be analyzed for VOCs.

Samples from the monitoring wells will be collected using a previously disinfected peristaltic pump or a sample bailer. We will be using typical low volume flow to prepare well for sampling, i.e., we will monitor temperature and/or conductivity during the pumping and will not collect samples until the values of these parameters stabilize, indicating that we are drawing directly from the aquifer.

Samples from Clear Lake will be collected in quiet water from the intake structure. Samples will be collected from the lake at a minimum of six inches below the surface.

Scenario #2: Lakes/Creeks

Continuous data loggers will be placed on Ackerly and Munsel Creek for temperature. Hand held devices and/or grab sampling will be used for pH, DO, and turbidity. Of prime importance in the placement of these data collection devices is that they are located in a manner that will reflect as close as possible the stream as a whole. Of equal importance is that the data loggers are properly calibrated, prior to and during the time frame of the study. The CITY will ensure that this is done and that the loggers are checked on a weekly basis, not only to upload data, but to ensure that the individual probes do not become fouled. As experience is gained with this process, less frequent checking will be employed, consistent with local conditions. Laboratory reproducibility of these instruments are generally reported to be within $\pm$ 1%, however, this value can be influenced by the matrix being analyzed. Data loggers will be set to record over short intervals initially to evaluate on site precision. During routine data collection, the frequency of measurement will be set at 10 minutes.

Scenario #3: Estuary

Continuous data loggers will be placed in the estuary adjacent to the planned Stormwater Demonstration Project and near the mouth of the River. Data will be collected for temperature. Hand held devices and/or grab sampling will be used for pH, DO, salinity and turbidity. Of prime importance in the placement of these data collection devices is that they are located in a manner that will reflect as close as possible the stream as a whole. Of equal importance is that the data loggers are properly calibrated, prior to and during the time frame of the study. The CITY will ensure that this is done and that the loggers are checked on a weekly basis, not only to download data, but to ensure that the individual probes do not become fouled. As experience is gained with this process, less frequent checking will be employed, consistent with local conditions. Laboratory reproducibility of these instruments are generally reported to be within $\pm$ 1%, however, this value can be influenced by the matrix being analyzed. Data loggers will be set to record over short intervals initially to evaluate on site precision. During routine data collection, the frequency of measurement will be set at 10 minutes.

8.2 Laboratory QC Requirements

The contract laboratory is expected to meet the following minimum requirements:

1. Be certified as a drinking water laboratory Adhere to the methods outlined in the Oregon Environmental Laboratory Accreditation Program which is the DHS program that certifies labs, including those that conduct drinking water analysis.;
2. Deliver fax, hard copy, and electronic data as specified;
3. Meet reporting requirements for deliverables;
4. Meet turnaround times for deliverables;
5. Implement QA/QC procedures, including the QAPP data quality requirements, laboratory analysis plan requirements, and performance evaluation testing requirements;
6. Allow laboratory and data audits to be performed, if deemed necessary; and
7. Follow documentation, chain of custody, and sample logbook procedures.

Changes in the laboratory procedures specified in the QAPP will not be permitted without written documentation of the intended change and the rationale. The Project QA/QC Manager must approve all changes in advance.

The analyst will review results of the quality control samples from each sample group immediately after a sample group has been analyzed. The quality control sample results will then be evaluated to determine if control limits have been exceeded. If control limits are exceeded in the sample group, the Project Manager or Project QA Manager will be contacted immediately and corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples.

All primary chemical standards and standard solutions used in this project will be traceable to the National Institute of Standards and Technology, Environmental Resource Associates, National Research Council of Canada, or other documented, reliable, commercial sources. Standards will be validated to determine their accuracy by comparison with an independent standard. Any impurities found in the standard will be documented.

9. Instrument Calibration and Frequency

The laboratory will calculate the method detection limit for each analyte in each matrix of interest and will establish an initial calibration curve for all analytes. The methods of analysis, associated reporting limits, and screening levels for the water analyses are identified in Table 7-1. Reporting limits have been set at or below ambient.

The following sections summarize the procedures that will be used to assess data quality throughout sample analysis.

Initial and Continuing Calibration. Multipoint initial calibration will be performed on each instrument at the start of the project, after each major interruption to the analytical instrument, and when any ongoing calibration does not meet control criteria. Ongoing calibration will be performed daily for organic analyses and with every sample batch for conventional parameters (when applicable) to track instrument performance. Instrument blanks or continuing calibration blanks provide information on the stability of the baseline established. Continuing calibration blanks will be analyzed immediately prior to continuing calibration verification at a frequency of 1 continuing calibration blank for every 10 samples analyzed at the instrument for inorganic analyses and every 21 hours for organic analyses. If the ongoing calibration is out of control, the analysis must come to a halt until the source of the control failure is eliminated or reduced to meet control specifications. All project samples analyzed while instrument calibration was out of control will be reanalyzed.

Matrix Replicates. Analytical replicates provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity and matrix effects. Analytical replicates are subsamples of the original sample that are prepared and analyzed as a separate sample. A minimum of 1 replicate will be analyzed per sample group or for every 20 samples, whichever is more frequent. When matrix spikes are not available or appropriate, a matrix triplicate will be analyzed per sample group or for every 20 samples, whichever is more frequent.

Matrix Spikes and Matrix Spike Duplicates. Analysis of matrix spike samples provides information on the extraction efficiency of the method on the sample matrix. By performing duplicate matrix spike analyses, information on the precision of the method is also provided for organic analyses. A minimum of 1 matrix spike will be analyzed for every sample group or for every 20 samples, whichever is more frequent, when possible Surrogate Spikes. All project samples analyzed for organic compounds will be spiked with appropriate surrogate compounds as defined in the analytical methods. The laboratories will report surrogate recoveries; however, no sample result will be corrected for recovery using these values.

Method Blanks. Method blanks are analyzed to assess possible laboratory contamination at all stages of sample preparation and analysis. A minimum of 1 method blank will be analyzed for every extraction batch or for every 20 samples (10 samples for conventional parameters), whichever is more frequent.

10. Non –Direct Data Acquisition Requirements

Types of data needed for project implementation and decision making that are obtained from non-measurement sources include such data as computer databases, programs, literature files, and historical databases. All data obtained from non-measurement sources will be fully documented as to source, data collection methodology, and any qualifications related to data accuracy and reliability.

Secondary Data Collection

Marine

Collate and evaluate marine testing data previously collected by OBMP, Siuslaw Watershed Council, and surfriders for bacteria on beaches and work with OBMP to add Heceta Beach back into program. Document established minimum QC criteria for data acceptance for microbiological data

North Fork

Continue to monitor the Tribes' monitoring data using continuous data loggers for temperature, turbidity, DO, salinity, and Ph; and bacteria sampling starting from year 2005 to present. Document established minimum QC criteria for data acceptance for this project for conventional analyses.

Estuary

Continue to monitor monitoring data conducted by: Army Corps of Engineers for sedimentation; Watershed Council (8 locations, grab sampling); and Tribes' monitoring with continuous data loggers for temperature, turbidity, DO, salinity, and Ph; and bacteria sampling. Document established minimum QC criteria for data acceptance for this project for these analyses.

Other examples are literature search results such as information on climate change effects; and data collected by agency partners.

11. Data Management

After environmental samples are collected in the field, they will be transported to the laboratory for analysis. Sample custody shall be maintained to preserve the integrity of the samples. Standard record-keeping procedures, chain-of custody and documented control systems, and the standard operating protocols used for data storage and retrieval on electronic media will be used.

The Project Manager will review the information gathered in the field with peer review of critical data elements. All errors will be corrected with oversight by the Project Manager.

All of the analytical results shall be reviewed and authorized for release by the contract laboratory's Project Manager. Standard data deliverables in Excel format shall be submitted by the laboratory.

At a minimum, all EPA data reporting requirements will be met. The format used to transmit the data to EPA will be compatible with EPA data format requirements.

C. Assessment/Oversight

12. Assessment and Response Actions

12.1 Technical Systems Audits
12.2 Performance Evaluation Audits

Laboratory and field performance audits and corrective action procedures are described in this section.

Laboratory and field performance audits consist of on-site reviews of quality assurance systems and equipment for sampling, calibration, and measurement. Laboratory audits will not be conducted as part of this study; however, all laboratory audit reports will be made available to the Project QC Coordinator upon request. All laboratories are required to have written procedures addressing internal QA/QC; these procedures will be submitted and reviewed by the Project QA/QC Manager to ensure compliance with the QAPP. All laboratories must ensure that personnel engaged in sampling and analysis tasks have appropriate training.

The Project Manager or QA/QC Manager will be notified immediately if any quality control sample exceeds the project-specified control limits. The analyst will identify and correct the anomaly before continuing with the sample analysis. The Laboratory Project Manager will document the corrective action taken in a memorandum submitted to the QA/QC Manager within five days of the initial notification. A narrative describing the anomaly, the steps taken to identify and correct the anomaly, and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, re-extraction) will be submitted with the data package in the form of a cover letter.

Corrective Action for Field Sampling
The Project Manager will be responsible for correcting equipment malfunctions during the field sampling effort and for resolving situations in the field that may result in noncompliance with the QAPP. All corrective measures will be immediately documented in the field logbook.

Corrective Action for Laboratory Analyses
All laboratories are required to submit and comply with their Standard Operating Procedures (SOPs). The Laboratory Project Manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this QAPP. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data.

13. Reports to Management

All data will undergo two levels of QA/QC evaluation: one at the laboratory, and one by the City's consultant (a chemist). Initial data reduction, evaluation, and reporting at the laboratory will be carried out as described in the appropriate analytical protocols and the laboratory's QA Manual. Quality control data resulting from methods and procedures described in this document will also be reported.

Minimum Data Reporting Requirements

The following describes the minimum data reporting requirements necessary for proper QA/QC evaluation of the analytical data.

Sample IDs. Records will be produced that clearly match all blind duplicate QA samples with laboratory sample IDs.

Sample Receipt. Chain of custody forms will be filled out for all sample shipments to document problems in sample packaging, custody, and sample preservation upon receipt at the laboratory.

Reporting. For each analytical method run, analytes will be reported as a detected concentration or as less than the specific reporting limit. The laboratories will also report dilution factors for each sample as well as date of extraction (if applicable) and date of analysis. Standard data packages will consist of a case narrative, sample results, QA sample results, and chain of custody forms.

Internal Quality Control Reporting

Internal quality control samples will be analyzed at the rates specified in the applicable analytical method.

Laboratory Blanks. All analytes will be reported for each laboratory blank. All non-blank sample results shall be designated as corresponding to a particular laboratory blank in terms of analytical batch processing.

Surrogate Spike Samples. Surrogate spike recoveries will be reported with all organic reports where appropriate. The report shall also specify the control limits for surrogate spike results. Any out of control recoveries (as defined in the specified method) will result in the sample being rerun or the data being qualified.

Matrix Spike Samples. Matrix spike recoveries will be reported for all analyses. All general sample results will be designated as corresponding to a particular matrix spike sample. The report will indicate what sample was spiked. The report will also specify the control limits for matrix spike results for each method and matrix.

Laboratory Duplicates and/or Matrix Spike Duplicate Pairs. Relative percent differences will be reported for all duplicate pairs as well as analyte/matrix specific control limits.

Laboratory Control Samples (LCS). When run for internal quality control, LCS results will be reported with the corresponding sample data. Control limits for LCS will be reported as specified.

Blind Duplicates. Blind duplicates will be reported as any other sample. Relative percent differences will be calculated for duplicate samples and evaluated as part of the data quality review.

D. Data Validation and Usability

14. Data Review, Validation, and Verification Requirements

Once data are received from the laboratory, a number of QC procedures will be followed to provide an accurate evaluation of the data quality. Specific procedures will be followed to assess data precision, accuracy, and completeness.

A qualified environmental chemist will perform a data quality review. The laboratories will deliver complete data packages for all chemical analyses. The data will be evaluated in accordance with the QAPP. All chemical data will be reviewed with regard to the following, as appropriate to the particular analysis:

- Completeness;
- Holding times;
- Blanks;
- Detection limits;
- Surrogate recoveries;
- Matrix spike/matrix spike recoveries; and
- Laboratory and field duplicate relative percent differences.

This data review will result in the proper data qualifiers being applied to the data. The results of the data quality review will be summarized as part of the annual monitoring report. This report will be submitted to the project QA Manager for final review and confirmation of the validity of the data.

15. Reconciliation with Data Quality Objectives

15.1 Assessment of Measurement Performance

15.2 Data Quality Assessment

Non-Direct Measurements
Water quantity, pump test data, water level, and other groundwater-related data records possessed by the City will be reviewed for potential use in constructing the groundwater flow model. Water quality records, compliance- related or otherwise, collected by the City will be included, as appropriate in the base-line water quality determination.

Corrective Action for Field Sampling
The Quality Assurance Officer will be responsible for correcting equipment malfunctions during the field sampling effort and for resolving situations in the field that may result in noncompli-

ance with the QAPP. All corrective measures will be immediately documented in the field logbook.

Corrective Action for Laboratory Analyses

All laboratories are required to submit and comply with their Standard Operating Procedures (SOPs). The Laboratory Project Manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this QAPP. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data.

The Project Manager or QA/QC Manager will be notified immediately if any quality control sample exceeds the project-specified control limits. The analyst will identify and correct the anomaly before continuing with the sample analysis. The Laboratory Project Manager will document the corrective action taken in a memorandum submitted to the QA/QC Manager within five days of the initial notification. A narrative describing the anomaly, the steps taken to identify and correct the anomaly, and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, re-extraction) will be submitted with the data package in the form of a cover letter.