CITY OF BUCKLEY
PIERCE COUNTY
WASHINGTON

STORMWATER MANAGEMENT
COMPREHENSIVE PLAN

G&O #06662
SEPTEMBER 2008

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Several sections of this document contain information provided or drafted by the City of Buckley staff or citizens that has not been verified by Gray & Osborne, Inc. Specific sections include, but are not limited to, Chapter 1, Water Quality and Quantity Goals, and Chapter 3, Flooding in the Spiketon Ditch Area – And Its Impacts on Spiketon Ditch.
TABLE OF CONTENTS

CHAPTER 1 – INTRODUCTION
PURPOSE ......................................................................................................................... 1-1
WATER QUALITY AND QUANTITY GOALS ..................................................................... 1-2
PLANNING PERIOD .......................................................................................................... 1-3
SCOPE OF WORK ........................................................................................................... 1-3
   City of Buckley Comprehensive Stormwater Plan ..................................................... 1-3
      Task 1 – Update System Basic Information and Components ... 1-3
      Task 2 – Model Stormwater Flows ........................................................................ 1-4
      Task 3 – Identification of Water Quality Problems ............................................. 1-4
      Task 4 – Identify Conveyance Problems ............................................................... 1-4
      Task 5 – Develop Outfall and Facility Inspection Data Sheets ............................. 1-5
      Task 6 – Identify Possible Solutions ................................................................... 1-5
      Task 7 – Recommendations for Phase II Compliance ......................................... 1-5
      Task 8 – Capital Improvement Plan ..................................................................... 1-6
      Task 9 – Presentation to Staff, Council and Public ............................................... 1-6
LIST OF PREVIOUS REPORTS ..................................................................................... 1-7
PROJECT CONTACTS ..................................................................................................... 1-8

CHAPTER 2 – REGULATORY CONSIDERATIONS

CHAPTER 3 – SERVICE AREA CHARACTERISTICS
LOCATION ......................................................................................................................... 3-1
SERVICE AREA AND URBAN GROWTH AREA ............................................................ 3-1
LAND USE AND ZONING ............................................................................................... 3-1
   Land Use Patterns and Activities ........................................................................... 3-2
      Planning Strategy .................................................................................................. 3-2
      Land Availability and Critical Areas .................................................................... 3-2
      Land Use Inventory .............................................................................................. 3-2
   Buildout Potential .................................................................................................... 3-3
FUTURE LAND USE AND CHARACTERISTICS .......................................................... 3-3
   Population ................................................................................................................. 3-3
   Groundwater and Aquifer Recharge ....................................................................... 3-5
      Groundwater ........................................................................................................ 3-5
   Climate ....................................................................................................................... 3-5
   Buckley Storm Drainage System ............................................................................. 3-7
   Flood Hazard Areas ................................................................................................ 3-7
   Flooding ...................................................................................................................... 3-7
   Recent Storms .......................................................................................................... 3-7
   Flooding in the Spiketon Ditch Area – And Its Impact on Spiketon Ditch ............. 3-8
   Flooding in the Sergeant-McNeely Area ................................................................. 3-11
   Timing of Peak Flood Waters ................................................................................. 3-11
   Previous Stormwater Projects ................................................................................. 3-11
STORMWATER DRAINAGE SYSTEM MAINTENANCE .................................................. 3-12

i
Minor City Ditches ................................................................. 3-12
Culverts ................................................................................. 3-13
Stormwater Pipes ................................................................. 3-13
Spiketon Ditch ....................................................................... 3-13
SR 410 Ditches ...................................................................... 3-14
The White River Flume ......................................................... 3-14
Stormwater Conveyance and Detention Requirements .......... 3-14

CHAPTER 4 – EXISTING STORMWATER DRAINAGE SYSTEM
INTRODUCTION ........................................................................ 4-1
EXISTING STORMWATER DRAINAGE INVENTORY .................... 4-1
Hydrology ................................................................................ 4-1
   Surface Drainage Patterns ................................................. 4-1
   Downtown Basin ............................................................... 4-2
   North Highway 410 Basin ............................................... 4-2
   Division Street and Spiketon Road Basin ......................... 4-2
   Mason Street Basin .......................................................... 4-2
   North River Avenue Basin ............................................... 4-3
   Collins Road Basin .......................................................... 4-3
   McNeely Road Basin ........................................................ 4-3
   Hinkleman Road South Basin ......................................... 4-3
   112th Street Basin ........................................................... 4-3
   Hinkleman Road East Basin ............................................. 4-4
   Mundy Loss Basin ............................................................ 4-4
   Hinkleman West Basin ...................................................... 4-4
   West Highway 410 Basin A .............................................. 4-4
   West Highway 410 Basin B .............................................. 4-4
   Spiketon Ditch Basin ...................................................... 4-4
   Elk Meadows Basin ........................................................ 4-5
   Sheets Road Diversion Basin ........................................... 4-5
   Rainier School Basin ...................................................... 4-5
   East White River Basin .................................................... 4-5
   East Flume Basin ............................................................ 4-5
   Northern Basin ............................................................... 4-5
   Northwest City Basin ...................................................... 4-6

CHAPTER 5 – HYDROLOGIC MODELING
MODELING BACKGROUND .......................................................... 5-1
Design Storm ......................................................................... 5-2
Capacity of the Existing System and Stormwater Modeling .... 5-3
   Downtown Basin Deficiencies ........................................... 5-3
   North Highway 410 Basin Deficiencies ............................ 5-11
   Division Street ............................................................... 5-12
   Ryan Road Basin ............................................................ 5-12
   Spiketon Road Basin ...................................................... 5-13
CHAPTER 6 – WATER QUALITY ANALYSIS
INTRODUCTION .................................................................................................................. 6-1
IMPACTS TO WATER QUALITY ......................................................................................... 6-1
WATER QUALITY STANDARDS .......................................................................................... 6-3
Parameters of Concern ....................................................................................................... 6-4
  Dissolved Oxygen ........................................................................................................... 6-4
  pH .................................................................................................................................. 6-4
  Temperature .................................................................................................................. 6-5
  Turbidity ...................................................................................................................... 6-5
  Nutrients ...................................................................................................................... 6-5
  Pathogens/Bacteria ...................................................................................................... 6-5
  High Oil and Grease .................................................................................................... 6-6
  Total Suspended Solids ................................................................................................ 6-6
  Metals ........................................................................................................................... 6-6
  Toxic Organic Compounds .......................................................................................... 6-6
  Organic Material .......................................................................................................... 6-7
Criteria .................................................................................................................................. 6-7
Existing Background Water Quality Surveys .................................................................... 6-11
  White River .................................................................................................................. 6-11
  South Prairie Creek (Tributary to the Carbon River) .................................................. 6-12
Sources of Nonpoint Pollutants ......................................................................................... 6-13
  Urban Development ..................................................................................................... 6-13
  Roadways ..................................................................................................................... 6-15
  Domestic Activities ..................................................................................................... 6-15

CHAPTER 7 – STORMWATER QUANTITY AND QUALITY CONTROL
GENERAL CONSIDERATIONS IN URBAN STORMWATER QUANTITY AND QUALITY CONTROL ........................................................................................................... 7-1
  Stormwater Quality Versus Quantity Control .............................................................. 7-2
  Construction Phase Versus Long-Term Site Operation Phase .......................................... 7-2
  Structural Versus Nonstructural Controls .................................................................. 7-2
  Source Control Versus Downstream Treatment ............................................................. 7-3
Control of Acute Versus Chronic Impacts ........................................ 7-3
Special Sensitive Area Considerations ........................................... 7-3
STORMWATER QUANTITY AND QUALITY CONTROL: STRUCTURAL ALTERNATIVES ........................................ 7-3
Low Impact Development ................................................................. 7-5
Storage and Regulated Release ......................................................... 7-5
   Wet Detention Basins ................................................................. 7-6
   Dry Detention Basins ................................................................. 7-6
Directly Connected Impervious Area ............................................... 7-7
Swales and Filter Strips ................................................................. 7-7
Parking Blocks .............................................................................. 7-8
Infiltration Devices ........................................................................ 7-9
STORMWATER QUANTITY AND QUALITY CONTROL: NONSTRUCTURAL ALTERNATIVES ........................................ 7-9
Source Control Measures ................................................................. 7-9
Maintenance Programs ................................................................... 7-11
   Streets ..................................................................................... 7-12
   Catch Basins ........................................................................... 7-12
Storm Sewer Pipes ........................................................................ 7-13
Open Ditches ................................................................................. 7-13
Detention Systems ......................................................................... 7-13
Oil/Water Separators ..................................................................... 7-13
Management of Maintenance Residuals ......................................... 7-14
   Street Waste Solids .................................................................. 7-14
   Street Waste Liquids ................................................................ 7-16
Staff Training .................................................................................. 7-16
Changes to Municipal Codes and Regulations ............................... 7-17
Enforcement .................................................................................... 7-17
Public Involvement and Education ................................................ 7-18
   Voluntary Ditch Maintenance .................................................... 7-18
   Catch Basin Stenciling ............................................................... 7-19
   Oil Recycling Center ................................................................. 7-19
Newsletter or Utility Bill Inserts .................................................... 7-19
Citizen Hotline .............................................................................. 7-20
   Neighborhood Compost Bin ....................................................... 7-20

CHAPTER 8 – CAPITAL IMPROVEMENT PLAN
INTRODUCTION .................................................................................. 8-1
   General Recommendations ........................................................ 8-6

CHAPTER 9 – FINANCING ANALYSIS
INTRODUCTION .................................................................................. 9-1
IMPLEMENTATION OF PLAN ............................................................. 9-1
   Future Stormwater Utility Operating Expenses ......................... 9-2
   Stormwater Utility Revenues ....................................................... 9-3
CAPITAL IMPROVEMENT FINANCING ........................................... 9-3

iv
ALTERNATIVE CAPITAL FINANCING SOURCES ........................................... 9-9
  Grant and Loan Funds ................................................................. 9-9
  Public Works Trust Fund .......................................................... 9-9
  Centennial Clean Water Fund ..................................................... 9-9
  State Revolving Fund ................................................................ 9-10
  Flood Control Assistance Account Program ............................... 9-10
  Aquatic Lands Enhancement Account ........................................ 9-10
DEBT FINANCING............................................................................... 9-11
DEVELOPER FEES.......................................................................... 9-11
IMPROVEMENT DISTRICTS AND SPECIAL ASSESSMENTS ................ 9-11
RECOMMENDATIONS ...................................................................... 9-12

LIST OF TABLES

<table>
<thead>
<tr>
<th>No.</th>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1</td>
<td>Stormwater Program Requirements</td>
<td>2-2</td>
</tr>
<tr>
<td>3-1</td>
<td>City of Buckley Land Use Distribution (City Limits Only)</td>
<td>3-3</td>
</tr>
<tr>
<td>3-2</td>
<td>Historical Population Changes in Buckley</td>
<td>3-4</td>
</tr>
<tr>
<td>3-3</td>
<td>Period of Record Monthly Climate Summary</td>
<td>3-6</td>
</tr>
<tr>
<td>3-4</td>
<td>Past Projects</td>
<td>3-12</td>
</tr>
<tr>
<td>5-1</td>
<td>Curve Numbers Based Upon Land Use</td>
<td>5-4</td>
</tr>
<tr>
<td>5-2</td>
<td>100-Year Storm System Deficiencies</td>
<td>5-6</td>
</tr>
<tr>
<td>6-1</td>
<td>Water Quality Criteria for the White River (WAC 173-201A)</td>
<td>6-9</td>
</tr>
<tr>
<td>6-2</td>
<td>Water Quality Criteria for South Prairie Creek (WAC 173-201A)</td>
<td>6-10</td>
</tr>
<tr>
<td>6-3</td>
<td>General Impact of Nonpoint Sources Likely to be of Concern in Buckley</td>
<td>6-11</td>
</tr>
<tr>
<td>8-1</td>
<td>Capital Improvement Projects</td>
<td>8-2</td>
</tr>
<tr>
<td>9-1</td>
<td>Stormwater Utility Operating Costs (2005 to 2007)</td>
<td>9-2</td>
</tr>
<tr>
<td>9-2</td>
<td>Recommended Capital Improvements</td>
<td>9-4</td>
</tr>
<tr>
<td>9-3</td>
<td>Projected Stormwater Utility Budget with CIP (PWTF Loans)</td>
<td>9-7</td>
</tr>
<tr>
<td>9-4</td>
<td>Projected Stormwater Utility Budget with CIP (6% Loans)</td>
<td>9-8</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

No. Figure On or Follows Page
3-1 Vicinity Map ................................................................. 3-2
3-2 City Map ................................................................. 3-2
3-3 Zoning .................................................................. 3-2
3-4 100-Year Floodplain ....................................................... 3-8
3-5 Mt. View Avenue during the November 7, 2006 Storm .......... 3-8
3-6 Spiketon Road (Looking North) during the November 7, 2006 Storm .... 3-8
3-7 Hinkelman Road East (Looking East) during the November 7, 2006 Storm .... 3-8
3-8 A Street South during the November 7, 2006 Storm .................. 3-8
3-9 House Along Spiketon Road, North of Ryan Road during the November 7, 2006 Storm ................................................................. 3-8
3-10 House Along Spiketon Road, North of Ryan Road during the November 7, 2006 Storm ................................................................. 3-8
3-11 House Along Spiketon Road, North of Ryan Road during the November 7, 2006 Storm ................................................................. 3-8
3-12 Overflowing Pond at end of Rose Place during the November 7, 2006 Storm .... 3-8
3-13 Flooding in Vicinity of Spiketon Ditch, November 7, 2006 .................. 3-8
4-1 Stormwater Comprehensive Plan Storm Base Map......................... back pocket
4-2 Drainage Basins ................................................................ 4-2
4-2a Non-Modeled Drainage Basins .................................................... 4-2
5-1 Modeled Networks ................................................................ 5-4
7-1 Examples of Directly Connected Impervious Areas ......................... 7-8
8-1 CIP Map ........................................................................ 8-2

APPENDICES

Appendix A – Regulatory Issues
Appendix B – Proposed Stormwater Management Program
Appendix D – Model Input Data
Appendix E – Draft Stormwater Management Ordinance
Appendix F – Plan Review Checklist
Appendix G – CIP Cost Estimates
Appendix H – SEPA Checklist
CHAPTER 1

INTRODUCTION

For many years stormwater management has meant controlling water quantity and the inundating effects of large storm events. However, more recently, the cumulative effects of smaller storms have been recognized as major contributors to water quality degradation.

Stormwater runoff carries excessive amounts of sediment from exposed construction sites and pollutants from residential, commercial, and industrial developments. Pollutants in stormwater runoff include metals such as lead, cadmium, and copper; oil and grease; pesticides and fertilizers; and harmful bacteria. In addition, the high rates of urbanization have increased the amount of impervious surfaces associated with rooftops, streets, and parking areas. An increase in impervious surfaces directly relates to an increase in runoff volumes and peak rate flows. The pollutant loads and increased volumes of stormwater runoff resulting from development, results in negative impacts to downstream properties and downstream water bodies including Spiketon Ditch, the Puget Sound Energy Flume, and the White River. Reduced infiltration to groundwater is also a problem. Critical area regulations and habitat management planning required due to the listing of Chinook salmon and bull trout for protection under the authority of the Endangered Species Act and new water quality regulations required under the Clean Water Act necessitate that municipalities implement stormwater control measures.

PURPOSE

The purpose of the City of Buckley’s Comprehensive Stormwater Management Plan (Plan) is to provide the City with a stormwater planning document that includes ordinances and programs necessary to fulfill the requirements of a comprehensive stormwater program. The Plan will additionally identify specific structural and nonstructural solutions to known flooding and water quality problems occurring within the City. The Comprehensive Stormwater Plan will meet local, state, and federal stormwater requirements; identify water quality and quantity problems associated with surface water runoff that may endanger the environment; and provide recommendations for improvements. The Plan includes a cost analysis and an implementation schedule.

The City of Buckley has been included in the group of western Washington communities falling under Phase II NPDES stormwater jurisdiction by the Department of Ecology. This plan will meet the stormwater provisions recommended by the Washington State Department of Ecology (Ecology) and the Puget Sound Water Quality Management Plan, which directs municipalities in the Puget Sound Basin to develop and implement a comprehensive stormwater management program. The City of Buckley has adopted the Ecology Stormwater Management Manual for the Puget Sound Basin, 1992, as the City’s
technical manual (BMC 14.30.061); however, as part of this plan and as required by the NPDES Phase II permit, it is required that the City adopt the 2005 Ecology Stormwater Management Manual for Western Washington. Other important elements of a stormwater program include operation and maintenance ordinances and a technical manual for structural and nonstructural control measures.

WATER QUALITY AND QUANTITY GOALS

The primary goal of the City’s Stormwater Comprehensive Plan is to preserve and protect water quality and the hydraulic regime within the City’s drainage basins including:

- Spiketon Ditch, which drains to South Prairie Creek;
- The Puget Sound Energy Flume, which conveys flow to Lake Tapps, the Dieringer Powerhouse, and the lower White River near Sumner; and
- White River, which flows to the Puyallup River.

The City of Buckley currently experiences flooding during larger storm events. During the wet season, the City generally experiences nuisance flooding in yards, streets, and residences. Portions of the City are characterized as having a relatively shallow gradient. Nonetheless, these areas have a difference in elevation based on a USGS published map as noted. If the base point is taken as the intersection of Ryan Road and Sheets Road, 747 feet, the elevation difference to the north, adjacent to the White River (elevation 720 feet) is approximately 27 feet in approximately 4,875 feet resulting in 0.55 percent slope. The elevation difference from the base point to the west, the intersection of Mundy Loss Road and SR 410 (elevation 698 feet), is approximately 49 feet in approximately 13,500 feet resulting in 0.36 percent slope. The elevation difference from the base point to the south, the intersection of Spiketon Road and Spiketon Ditch (elevation 723 feet), is approximately 24 feet in approximately 13,250 feet resulting in 0.18 percent slope.

Approximately the southern 25 percent of the City’s UGA receives a large influx of stormwater from outside the City’s UGA. The southern portion of the UGA tends to have a gradient to the west and south. This discharge totals nearly 35 percent of all stormwater exiting the City. The Rainier School, state lands, and those portions of the City bordering these properties tend to have a gradient to the north. The remaining portion of the City, which encompasses downtown Buckley and a majority of the heavily populated residential area, has a gradient to the west and north.

In addition, certain areas of the City experience high groundwater, which prevents infiltration of surface water. As additional development occurs within the city limits, the amount of impervious surfaces will increase. This will ultimately increase peak surface water runoff rates.
It is the City’s intent to manage stormwater to minimize contact with contaminants, mitigate the impacts of increased runoff due to major buildout and development within the City’s drainage areas, provide management of runoff from large and small construction sites, and to preserve wildlife habitat. These efforts would meet City goals to protect the health, safety, and welfare of the local citizenry and to preserve surface water resources within the City of Buckley.

PLANNING PERIOD

The planning period for this document has a 10-year planning horizon, which runs from 2007 through 2017.

SCOPE OF WORK

Gray & Osborne, Inc. (Engineer) will develop a Comprehensive Stormwater Plan that meets the State’s recommendations and guidelines for stormwater practices as developed in the Department of Ecology’s *Stormwater Management Manual*. The scope of work for this plan includes the following agreed-upon tasks.

CITY OF BUCKLEY COMPREHENSIVE STORMWATER PLAN

Task 1 – Update System Basic Information and Components

This task includes:

- Update the City’s stormwater base map to GIS format and include new information.
- Review basin delineation.
- Update information regarding regulatory considerations.
- Update service area characteristics including land use, zoning, and population projections.
- Identify current level of maintenance of public and privately owned systems through field survey and discussions with maintenance personnel.
- Develop maintenance schedule, procedure, and costs for performing facility maintenance.
Task 2 – Model Stormwater Flows

The original hydrologic/hydraulic model of the storm drainage system was developed using HYDRA, a Santa Barbara Unit Hydrograph based methodology to estimate the amount of flow that could be expected during specific rainfall events. This methodology no longer meets the minimum computational standards of the 2005 Ecology Stormwater Management Manual for Western Washington. The Western Washington Hydrology Model (WWHM) will be used to model the stormwater flows. The specific subtasks to complete this portion of the Stormwater Plan include the following:

- Use existing information and additional survey information, as necessary, to generate hydrologic information using WWHM and XP-SWMM to perform a hydraulic evaluation of the City storm drainage system.
- Install a rain gauge and flow meters in selected basins during dry and wet weather to obtain flow data.
- Using the collected rain and flow data, calibrate the model if necessary.
- Evaluate the water quality and quantity impact of the predicted runoff flows on the existing system.

Task 3 – Identification of Water Quality Problems

- Perform field surveys to identify areas that are possible sources of pollution. Specifically evaluate outfalls, erosion control practices, thoroughfares, development, and commercial activities. Distinguish point and nonpoint sources of pollution.
- Identify water quality problems in runoff and receiving waters.
- Update Chapter 6 – Water Quality Analysis and Chapter 7 – Stormwater Quantity and Quality Control as necessary.
- Review available information on TMDLs for the White River and South Prairie Creek. Identify the stormwater management needs to meet the TMDL requirements.

Task 4 – Identify Conveyance Problems

- Using data from the model and information from field surveys and interviews, identify portions of the drainage network that are not capable of conveying the design storm.
- Evaluate the probability of water quality related problems such as erosion, sedimentation, and pollutant transport due to conveyance system deficiencies.

**Task 5 – Develop Outfall and Facility Inspection Data Sheets**

- Develop inspection data sheets for each of the City’s outfalls and detention and water quality facilities. The data sheets will include a picture of the outfall or facility, a sketch of the outfall or facility identifying significant features, and identified projects. The data sheets will include checklists and comment boxes that City staff can use to perform and document routine inspections of City facilities.

**Task 6 – Identify Possible Solutions**

- Review the City’s design standards and policies for stormwater conveyance and water quality facilities. Recommend modifications to design standards if necessary. Use information from other jurisdictions, agencies, and academic and research organizations to institute the appropriate Best Management Practices.

- Review the City’s stormwater ordinance addressing erosion control practices, water quality control, and water quantity control measures to ensure that the Phase II minimum requirements for Erosion and Sediment Control Program for Construction and New Development and Redevelopment Runoff Program are satisfied.

- Propose facilities improvements for conveyance problems, including costs.

- Propose facilities improvements for water quality problems, including costs.

- Develop a public involvement plan that may involve water quality monitoring, volunteer projects for trash cleanup, storm drain stenciling, and education field activities.

**Task 7 – Recommendations for Phase II Compliance**

This scope of work will include a task that assesses the existing City programs and recommends additional programs/procedures that will need to be developed to be in compliance with the Phase II NPDES requirements.
• Review the existing City programs and make recommendations for revisions or new programs/procedures to ensure the City will be in compliance with the following Phase II minimum requirements:
  a. Public Education and Outreach
  b. Public Involvement and Participation Program
  c. New Development and Redevelopment Runoff Program
  d. Illicit Discharge Detection and Elimination Program
  e. Pollution Prevention (Good Housekeeping) Program
  f. Record Keeping and Recording
  g. Erosion and Sediment Control Program for Construction
  h. Implement Applicable TMDLs

• The cost of development of new or revised programs will be included in the Capital Improvement Plan.

• Purchase and set up the MS4 Permit Manager software, CBI Systems, with the NPDES programs elements the City will implement. The software will help the City to organize and manage implementation tasks developed in the Phase II program, collect and manage program data, and prepare annual reports. Provide 4 hours of training on the software.

Task 8 – Capital Improvement Plan

• Based on the improvements recommended in Task 4, propose a schedule of capital improvements for the 6-year and 10-year planning horizons. Provide funding options and priorities for improvements.

• Prepare rate analysis that includes operation and maintenance (O&M) costs, the CIP program, and Phase II compliance programs. The rate analysis will include an evaluation of the existing rate structure. The rate analysis will identify rate requirements to fund the recommended O&M program only, the recommended O&M program and Phase II compliance programs, or the recommended O&M program, Phase II compliance program, and recommended CIP program.

• Prepare a SEPA checklist.

Task 9 – Presentation to Staff, Council and Public

• Staff meetings to present the goals and requirements for the Stormwater Comprehensive Plan and NPDES Phase II program and an overview of the information that will be included in the Plan. A second meeting, approximately midway through the project will present progress to date. Present the draft Plan at a third meeting.
• Conduct one public workshop. Revise the Plan as necessary based on public comment.

Present the Stormwater Comprehensive Plan to the Council. Describe the methodology used to model the system. Describe the improvements necessary, how they were prioritized, and the alternatives for scheduling improvements. Discuss funding alternatives and rate impacts.

LIST OF PREVIOUS REPORTS

The following documents were used to provide background information for the development of the City of Buckley’s Stormwater Comprehensive Plan:


City of Buckley, Infiltration and Inflow Analysis, Gray & Osborne, August 1994.


City of Buckley, National Environmental Policy Act (NEPA) Environmental Assessment for the Ryan Road Water Main Replacement Project, prepared for submittal to the Environmental Protection Agency by Gray & Osborne, April 2004.

Flood Hazard Management Plan for the City of Buckley, City of Buckley and Gray & Osborne, Draft May 2002.


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CHAPTER 2

REGULATORY CONSIDERATIONS

The City of Buckley must comply with many federal and state regulations when implementing its stormwater plan. A detailed review of all of these policies, regulations, and ordinances is presented in Appendix A.

Table 2-1 presents these regulations and policies in more concise format. It explains how these policies affect the City of Buckley and what the City’s current status is in complying with these regulations. It also provides a recommended plan of action to bring the City into compliance with these policies and regulations.

The table is divided into four sections, each representing key aspects of the City’s stormwater program. The key activities listed in the table are:

A. Development of Needed Regulations and Standards
B. Operation and Maintenance
C. Public Education
D. Program Funding

As indicated in Table 2-1, the City is required to adopt a Stormwater Management Program per the NPDES Phase II permit requirements and adopt the 2005 Department of Ecology Stormwater Management Manual for Western Washington, or equivalent manual, as the City’s technical manual. Per the Ecology 2005 Stormwater Manual, page 1-25, “The engineered stormwater conveyance, treatment, and detention systems advocated by this and other stormwater manuals can reduce the impacts of development to water quality and hydrology. But they cannot replicate the natural hydrologic functions of the natural watershed that existed before development, nor can they remove sufficient pollutants to replicate the water quality of pre-development conditions. Ecology understands that despite the application of appropriate practices and technologies identified in this manual, some degradation of urban and suburban receiving waters will continue, and some beneficial uses will continue to be impaired or lost due to new development. This is because land development, as practiced today, is incompatible with the achievement of sustainable ecosystems. Unless development methods are adopted that cause significantly less disruption of the hydrologic cycle, the cycle of new development followed by beneficial use impairments will continue.”

A proposed Stormwater Management Program that addresses the minimum requirements of the Plan is presented in Appendix B. As part of this program, the City will need to adopt operation and maintenance standards for publicly owned facilities. A proposed manual addressing these standards can be found in Appendix C.
### TABLE 2-1

**Stormwater Program Requirements**

<table>
<thead>
<tr>
<th>Stormwater Program Activity</th>
<th>Ecology’s Stormwater Comprehensive Program</th>
<th>Requirements</th>
<th>Other Regulatory Programs</th>
<th>City Status</th>
<th>Plan of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A – Develop Regulations and Standards</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.1 – Develop Stormwater Management Standards for New Development, Redevelopment, and Construction Sites</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>● Adopt ordinances that require the use of Best Management Practices (BMPs) to control stormwater flows, provide treatment, and prevent erosion and sedimentation from all new development and redevelopment projects.</td>
<td>● Adopt ordinances that require the use of Best Management Practices (BMPs) to control stormwater flows, provide treatment, and prevent erosion and sedimentation from all new development, redevelopment, and construction sites that disturb more than 1 acre.</td>
<td>● Each permittee shall develop, implement, and enforce a program to reduce pollutants in stormwater runoff from all new development, redevelopment, and construction sites that disturb more than 1 acre.</td>
<td>The 4(d) Rule provides a list of activities that have a high risk of resulting in a “take” of the listed threatened or endangered salmonids. The following list includes items that should be included in design standards that would prohibit activities that the 4(d) Rule has determined are likely to result in injury or harm to listed salmonids. Design standards should prohibit:</td>
<td>Under Chapter 14.30.061 of the Buckley Municipal Code (BMC), the City has adopted the “Latest edition of Ecology’s Manual.”</td>
<td>Under Chapter 14.30.061 of the Buckle Municipal Code (BMC), the City has adopted “Latest edition of Ecology’s Manual.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>● Construction of structures like culverts, berms, or dams that eliminate or impede a listed species’ ability to migrate or gain access to habitat</td>
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<td></td>
<td></td>
<td></td>
<td>● Removal, addition, or alteration of rocks, soil, gravel, vegetation, or other physical structures that are essential to the integrity and function of a listed species’ habitat.</td>
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<td></td>
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<td></td>
<td>● Removal of water or otherwise altering streamflow in a manner that significantly impairs spawning, migration, feeding, or other essential behavioral patterns.</td>
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<td></td>
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<td></td>
<td>● Construction of dams or water diversion structures with inadequate fish screens or passage facilities.</td>
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<td></td>
<td>● Construction of inadequate bridges, roads, or trails on stream banks or unstable hill slopes adjacent to or above a listed species’ habitat.</td>
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<td></td>
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<td></td>
<td>● Operations that substantially disturb soil and increase the amount of sediment entering streams.</td>
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</tr>
</tbody>
</table>

**Notes:**
- Provisions must be made to ensure long-term operation and maintenance measures are in place.
- Records of inspections and enforcement by staff must be maintained.
- Provisions must be made to ensure clear authority to inspect construction sites, to require maintenance of BMPs, and to enforce violations.
- A program must include a site plan review process for all new development and redevelopment projects to ensure that stormwater control measures are adequate.
- Appropriate structural and nonstructural BMPs must be used.
- A regulatory mechanism must be in place to control erosion and sediment to the maximum extent practicable under state or local law.
- A program must include a permitting process containing plan reviews, inspection, and enforcement capabilities.
- Provided are the conditions of an ITS are protected with other federal agencies. Entities complying with the terms and conditions of an ITS are protected from ESA “take” liability.

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City of Buckley

Stormwater Management Comprehensive Plan

September 2008

**Gray & Osborne, Inc., Consulting Engineers**
### TABLE 2-1 – (continued)

**Stormwater Program Requirements**

<table>
<thead>
<tr>
<th>Stormwater Program Activity</th>
<th>Ecology’s Stormwater Comprehensive Program</th>
<th>Requirements</th>
<th>Endangered Species Act 4(d) Rule</th>
<th>Other Regulatory Programs</th>
<th>City Status</th>
<th>Plan of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A.1 – Develop Stormwater Management Standards for New Development, Redevelopment, and Construction Sites (continued)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>There are no known NPDES industrial permits in the City.</td>
<td>The City will be informed of Industrial Stormwater Permits within the city limits and will include these areas in observing areas for illicit discharges.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The City is required to notify contractors of their responsibility to obtain NPDES Construction Stormwater Permits.</td>
<td>The City will notify contractors of their responsibility to obtain NPDES Construction Stormwater Permits during the permitting process.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The City currently prohibits illicit discharges into its stormwater system through BMC 14.30.063.</td>
<td>The City will continue to prohibit illicit discharges through BMC 14.30.063.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The City has a current stormwater system map that is based in GIS.</td>
<td>The City will continue to update its stormwater system map as development and public works projects occur.</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>The City does not currently have a program in place that involves inspections for illicit discharges or how to respond to them.</td>
<td>As part of the Stormwater Management Plan, the City will institute a program that involves annual inspections of priority outfalls. A training program will be in place as well so the staff knows what to look for when inspecting for illicit discharges. A hotline will also be publicized so people know whom to call when an illicit discharge occurs.</td>
</tr>
</tbody>
</table>

### A.2 – Develop Regulations to Detect and Eliminate Illicit Discharges

- Local governments must adopt ordinances that prohibit dumping and illicit discharges and to carry out activities to detect, eliminate, and prevent illicit discharges, and respond to spills and water quality violations.

- Provisions must be made to review all development site plans for water quality impacts.

- The operator must develop a municipal stormwater system map displaying all elements owned, operated, and maintained by the permittee.

- The permittee must implement ordinances or other enforceable regulatory mechanisms that effectively prohibit illicit discharges into separate stormwater systems.

- The permittee must develop and implement an ongoing program to detect and address illicit discharges.

- The following list includes items that should be included in City regulations that would prevent activities that the 4(d) Rule has determined are likely to result in injury or harm to listed salmonids:

  - Standards shall prohibit discharge of pollutants, such as oil, toxic chemicals, radioactivity, carcinogens, mutagens, teratogens, or organic nutrient-laden water (including sewage water) into a listed species’ habitat.

  - Standards shall prohibit release of nonindigenous or artificially propagated species into a listed species’ habitat or into areas where they may gain access to that habitat.
### TABLE 2-1 – (continued)

**Stormwater Program Requirements**

<table>
<thead>
<tr>
<th>Stormwater Program Activity</th>
<th>Ecology’s Stormwater Comprehensive Program</th>
<th>NPDES Phase II Permit</th>
<th>Endangered Species Act 4(d) Rule</th>
<th>Other Regulatory Programs</th>
<th>City Status</th>
<th>Plan of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.2 – Develop Regulations to Detect and Eliminate Illicit Discharges (continued)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Public employees, businesses, and the general public must be informed of the hazards associated with illegal discharges and improper waste disposal.</td>
<td></td>
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<td></td>
<td></td>
<td>• Program assessment and evaluation procedures must be implemented and summaries of this information must be included in the annual report.</td>
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<td></td>
<td></td>
<td>• Appropriate training must be provided to municipal staff to identify and report illicit discharges.</td>
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<tr>
<td>A.3 – Other Regulations</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>State Shoreline Management Act (SMA) – Requires permits for activities along shorelines of the State including shorelines along rivers and larger streams with an average annual flow above 20 cfs, lakes over 20 acres, and along marine waterfront.</td>
<td></td>
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<td></td>
<td></td>
<td>State Growth Management Act – Requires permits for activities in environmentally “critical areas” and for any activities that would affect these “critical areas.”</td>
<td></td>
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<td></td>
<td></td>
<td>State Hydraulic Project Approval – The Washington State Department of Fish and Wildlife requires Hydraulic Project Approvals (HPAs) for any construction activities that will divert, obstruct, or change the bed or flow of state waters.</td>
<td></td>
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</tbody>
</table>

The City of Buckley has a Shoreline Master Program. Chapter 19.42 of the BMC addresses the City’s Shoreline Management Program. The City currently has these regulations in place (Chapter 12.08 of the BMC), providing protection for critical areas. The Washington State Department of Fish and Wildlife issues HPAs for construction activities that affect streams. Action is required to obtain this permit when the City engages in construction activities that need to obtain an HPA.
<table>
<thead>
<tr>
<th>Stormwater Program Activity</th>
<th>Ecology’s Stormwater Comprehensive Program</th>
<th>NPDES Phase II Permit</th>
<th>Endangered Species Act 4(d) Rule</th>
<th>Other Regulatory Programs</th>
<th>City Status</th>
<th>Plan of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.3 – Other Regulations (continued)</td>
<td></td>
<td></td>
<td></td>
<td>State Aquatic Lands Act – The Washington State Department of Natural Resources (DNR) negotiates leases and other authorizations for use of state-owned aquatic lands.</td>
<td>The Washington State DNR negotiates leases and other authorizations for use of state-owned aquatic lands.</td>
<td>Action required to obtain a lease when the City engages in activities that require the use of aquatic lands (usually from storm drain outfall).</td>
</tr>
</tbody>
</table>
TABLE 2-1 – (continued)

Stormwater Program Requirements

<table>
<thead>
<tr>
<th>Stormwater Program Activity</th>
<th>Ecology’s Stormwater Comprehensive Program</th>
<th>Requirements</th>
<th>Other Regulatory Programs</th>
<th>City Status</th>
<th>Plan of Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.3 – Other Regulations (continued)</td>
<td>Section 5 of the NPDES Phase II permit requires compliance with the requirements of applicable total maximum daily loads (TMDLs). The City shall keep records of actions and conduct monitoring in accordance with the Ecology-approved QAPP.</td>
<td>Endangered Species Act 4(d) Rule</td>
<td>The following list includes items that should be included in City regulations that would prevent activities that the 4(d) Rule has determined are likely to result in injury or harm to listed salmonids. Maintenance plans shall prohibit:</td>
<td>The White River and South Prairie Creek are both on the 303(d) List for fecal coliform and are currently listed by Ecology as Category 5 and 4A, respectively. A TMDL has been developed for the creek and is currently being implemented. A TMDL for pH is currently under development for the lower White River by the EPA, the Washington State Department of Ecology, and the Muckleshoot Indian Tribe. The Puyallup River TMDL is for biochemical oxygen demand (BOD), ammonia, and residual chlorine. The TMDL sets a maximum load for BOD and ammonia in the Puyallup River basin, including portions of the lower White River. The City of Buckley is a party to this agreement.</td>
<td>According to the Department of Ecology, a TMDL for fecal coliform for the White River will not be prepared for at least 5 years. When it is prepared, it will involve all necessary parties and will be implemented as necessary.</td>
</tr>
<tr>
<td><strong>B – Operation and Maintenance</strong></td>
<td></td>
<td></td>
<td>Section 303 of the Clean Water Act – The federal Clean Water Act requires NPDES-authorized states, such as Washington, to list water quality-impaired bodies on the 303(d) List and to prepare TMDL plans for water bodies that do not meet state water quality standards. These plans set total maximum limits on point and nonpoint source pollutants that can be discharged to each water body without exceeding state water quality standards. Local entities are responsible for implementing programs to address the water quality problems.</td>
<td></td>
<td></td>
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<tr>
<td>B.1 – Maintenance of Public Facilities</td>
<td>Local governments are to adopt ordinances that require all permanent stormwater facilities to be regularly maintained to ensure performance.</td>
<td></td>
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<tr>
<td>B.2 – Maintenance of Private Facilities</td>
<td>Provisions must be made for techniques of maintenance contracts that ensure that facilities on private land are maintained.</td>
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<td>Training must be provided for professionals who maintain stormwater facilities.</td>
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<td></td>
<td>The City must develop a Pollution Prevention (Good Housekeeping) Plan for Municipal Operations that accomplishes the following:</td>
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<td></td>
<td>• Adopt maintenance standards that are as protective, or more protective, of facility function as those specified in Chapter 4, Volume V, of the 2005 Stormwater Management Manual for Western Washington.</td>
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<td></td>
<td>• Annual inspection of all municipally owned and operated permanent stormwater facilities.</td>
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<td></td>
<td>• Checks for potentially damaged stormwater facilities after major (10-year, 24-hour recurrence interval) rainfall events.</td>
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</table>
### TABLE 2–1 – (continued)

**Stormwater Program Requirements**

<table>
<thead>
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</thead>
<tbody>
<tr>
<td><strong>B – Operation and Maintenance</strong></td>
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<tr>
<td>B.1 – Maintenance of Public Facilities</td>
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<tr>
<td>B.2 – Maintenance of Private Facilities (continued)</td>
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<tr>
<td><strong>C – Public Education</strong></td>
<td>Develop programs to educate and involve citizens, businesses, elected officials, site designers, developers, builders, and other members of the community to build awareness and understanding of stormwater and water quality issues.</td>
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<td></td>
<td>Develop a Public Education and Outreach Program on Stormwater Impacts that accomplishes the following:</td>
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<td>• Communities should be made aware of the impacts of stormwater discharges to water bodies and the available steps to reduce stormwater pollution.</td>
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<td></td>
<td>• A public education program must be implemented to distribute educational materials to the community. These materials may be provided by Ecology, Tribes, the EPA, public interest or trade organizations, or other MS4s.</td>
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<td></td>
<td>• Municipalities are encouraged to work with their states and Phase 1 communities to develop an education/outreach program more efficiently.</td>
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</table>

The City is not actively participating in a formal education program.

As part of the Stormwater Management Plan, the City will be involved in a public education program to include utility bill inserts and educating the public through its website. Topics will include disposal of hazardous wastes, gardening and lawn care activities, illegal dumping, and LID techniques.
### TABLE 2-1 – (continued)

**Stormwater Program Requirements**

<table>
<thead>
<tr>
<th>Stormwater Program Activity</th>
<th>Ecology’s Stormwater Comprehensive Program</th>
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<th>Other Regulatory Programs</th>
<th>City Status</th>
<th>Plan of Action</th>
</tr>
</thead>
</table>
| C – Public Education (continued) | | Develop a Public Participation Program:  
  - The public must be involved in the development and implementation of the City’s SWPP by following state, tribal, and local public notice requirements.  
  - All economic and ethnic groups should be included.  
  - Participation opportunities could include citizens serving on stormwater management panels, public hearings, and recruiting citizen volunteers for education and monitoring efforts. | | | | |
| D – Program Funding | Create local funding capacity, such as a utility, to ensure adequate, ongoing funding for program activities and to provide funding to contribute to regional stormwater projects. | | The City currently has a Stormwater Utility that collects rates from residential and commercial areas. The City has also participated in various funding programs such as the Public Works Trust Fund to obtain money for stormwater projects. | The City will raise its rates as necessary to fund the Stormwater Management Program. | | |
CHAPTER 3

SERVICE AREA CHARACTERISTICS

LOCATION

The City of Buckley is located in eastern Pierce County, south of the White River as shown on the Vicinity Map (Figure 3-1). Nearby communities along State Route 410 include the City of Sumner, approximately 11 miles west; the City of Bonney Lake, approximately 6 miles west; and the City of Enumclaw, which is 4 miles north.

SERVICE AREA AND URBAN GROWTH AREA

The planning area for this Stormwater Management Plan includes the area within the Buckley city limits, as well as the area along the Mundy Loss Ditch to the point of intersection with the Puget Sound Energy Flume, and the area along Highway 165 to the City’s boundary. Figure 3-2 shows the city limits.

Stormwater modeling has been completed on the drainage network within the city limits. The “model area” includes the City storm drainage system and the major drainage ditches. This information is presented in Chapters 4 and 5 of this plan. Portions of the area in the City between the Puget Sound Energy Flume and the White River are designated as 100-year floodplain. The areas owned by the WSU Dairy and the Rainier School were assumed to remain in their current sparsely developed state.

LAND USE AND ZONING

Land development impacts stormwater runoff by creating impervious surfaces. Impervious surfaces cause stormwater runoff to discharge more rapidly than natural systems. The increase in impervious surfaces can be mitigated through the use of on-site detention, which reduces the runoff rate and mitigates flooding in the receiving water bodies. The City of Buckley municipal code currently requires on-site detention of stormwater from new construction creating more than 5,000 square feet of new impervious surface area for all sites that discharge stormwater runoff directly or indirectly into a stream or river. As part of this plan and as mandated by the State of Washington, the City shall adopt the Department of Ecology’s 2005 Stormwater Management Manual for Western Washington. With the adoption of this manual, the impervious surface threshold for detention requirements will increase to 10,000 square feet; however, the requirements for pond design will result in larger ponds.

Additionally, the City’s Development Standards require that wherever possible, provisions shall be made for detainage and/or retainage of stormwater to decrease the
amount of storm runoff and, more importantly, to decrease the peak runoff volume. The City is also encouraged to adopt guidelines on Low Impact Development (LID) techniques which would help recharge groundwater and decrease the amount of runoff entering the City’s stormwater system.

**LAND USE PATTERNS AND ACTIVITIES**

**Planning Strategy**

The Comprehensive Plan unapproved future Urban Growth Area (UGA) encompasses 3,032 acres. Buckley used neighborhood planning areas to determine the current and future needs for urban growth, the transportation system, utilities, and infrastructure. It established general residential land use designations, ranging from two units per acre to seven units per acre.

**Land Availability and Critical Areas**

According to Pierce County GIS land use data, there are approximately 680 acres of vacant land within the city limits. Critical areas including, hydric soils, wetlands, frequently flooded lands, steep slopes, and seismic hazard areas reduce the amount of vacant land available for development to approximately 255.25 acres (Buckley Comprehensive Plan, Table 3, 2005). Development within the City is also constrained by the availability of sewer capital facilities and water rights.

The Growth Management Act (GMA) requires protection of critical areas. Buckley adopted an Environmentally Sensitive Areas Ordinance classifying and designating critical areas as required by the GMA. The land between the White River and Puget Sound Energy Flume and adjoining wetlands contains critical areas. The majority of the soil in Buckley is Buckley loam, a hydric soil, which can facilitate formation of jurisdictional wetlands under appropriate vegetative and hydrological conditions. The steep hills in the southern part of the planning area raise concerns regarding landslide and erosion control.

The Buckley city limits incorporate 2,452 acres. The future UGA encompasses 3,032 acres. Zoning designations are shown on the Zoning Map attached as Figure 3-3.

**Land Use Inventory**

Pierce County has not approved the future UGA areas for Buckley; hence, the inventoried area includes lands only within the City’s current limits.

Table 3-1, City of Buckley Land Use Distribution, provides details of the inventory. The areas in unincorporated Pierce County that are immediately adjacent to the future UGA include the land designations of rural residential and rural reserve.
TABLE 3-1

City of Buckley Land Use Distribution (City Limits Only)

<table>
<thead>
<tr>
<th>Land Use Category</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitive Area</td>
<td>405</td>
</tr>
<tr>
<td>Public/Institutional</td>
<td>376</td>
</tr>
<tr>
<td>Central Commercial</td>
<td>79</td>
</tr>
<tr>
<td>General Commercial</td>
<td>88</td>
</tr>
<tr>
<td>Historic Commercial</td>
<td>3</td>
</tr>
<tr>
<td>Light Industrial</td>
<td>46</td>
</tr>
<tr>
<td>High Density Residential</td>
<td>66</td>
</tr>
<tr>
<td>Residential, R-6000</td>
<td>284</td>
</tr>
<tr>
<td>Residential, R-8000</td>
<td>580</td>
</tr>
<tr>
<td>Residential, R-20000</td>
<td>238</td>
</tr>
<tr>
<td>Neighborhood Mixed Use</td>
<td>124</td>
</tr>
<tr>
<td>Roads</td>
<td>163</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,452</strong></td>
</tr>
</tbody>
</table>

BUILDOUT POTENTIAL

There are approximately 680 acres of vacant land within the City limits and the proposed future UGA. Hydric soils, wetlands, frequently flooded areas and other environmentally constrained areas limit the building potential to approximately 255.25 acres of the total vacant lands. In addition, the City has approximately 486.58 underdeveloped acres (Buckley Comprehensive Plan, Table 4, 2005).

FUTURE LAND USE AND CHARACTERISTICS

The plan for growth and development in the Buckley city limits is based on population and demographics, economic conditions, amenities, and infrastructure.

POPULATION

An analysis of local population and demographic trends is important for a broad understanding of the community and to anticipate future needs. The analysis of population projections for the next 20 years is based on Buckley’s population allocation, which was adopted by Pierce County following a collaborative process.

Over the 50 years between 1940 and 1990, Buckley’s population increased from 1,170 residents to 3,516 residents. However, for most of this period, the average annual rate of population growth fell, from 8.7 percent in 1940 to 1950, to -0.9 percent in 1970.
to 1980. In the late 1980s, the City population began to grow again, a trend that continued into the 1990s as the state population boom and Seattle/Tacoma metropolitan growth led to increased migration to Buckley. Table 3-2 shows the historical population changes in Buckley from 1940 to 2006.

**TABLE 3-2**

**Historical Population Changes in Buckley**

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>Population Change</th>
<th>Average Annual Change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>1,170</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>1950</td>
<td>2,705</td>
<td>+1,535</td>
<td>8.7</td>
</tr>
<tr>
<td>1960</td>
<td>3,538</td>
<td>+833</td>
<td>2.7</td>
</tr>
<tr>
<td>1970</td>
<td>3,446</td>
<td>-92</td>
<td>-0.2</td>
</tr>
<tr>
<td>1980</td>
<td>3,138</td>
<td>-308</td>
<td>-0.9</td>
</tr>
<tr>
<td>1990</td>
<td>3,516</td>
<td>+378</td>
<td>1.1</td>
</tr>
<tr>
<td>2000</td>
<td>4,145</td>
<td>+629</td>
<td>1.8</td>
</tr>
<tr>
<td>2001</td>
<td>4,330</td>
<td>+185</td>
<td>4.5</td>
</tr>
<tr>
<td>2002</td>
<td>4,410</td>
<td>+80</td>
<td>1.9</td>
</tr>
<tr>
<td>2003</td>
<td>4,505</td>
<td>+95</td>
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</tr>
<tr>
<td>2004</td>
<td>4,510</td>
<td>+5</td>
<td>0.1</td>
</tr>
<tr>
<td>2005</td>
<td>4,515</td>
<td>+5</td>
<td>0.1</td>
</tr>
<tr>
<td>2006</td>
<td>4,535</td>
<td>+20</td>
<td>0.4</td>
</tr>
</tbody>
</table>


Population changes in Buckley are tied to the economy. The population increased in the 1940s and 1950s with the opening of the Washington State Rainier School in 1939. In 1953, the school population was at an all time high of approximately 2,000 residents. Since that time, a gradual decline in Rainier School’s population has occurred, particularly during the 1970s.

The 2005 *City of Buckley Comprehensive Plan* noted that in 2003, the Pierce County Council projected a population of 5,200 by 2022. The Plan estimates that a 2024 population for the City will reach 8,750 people. This rate does not reflect historic growth rates; however, if sufficient water resources and wastewater disposal becomes available, the City may experience at least some years of accelerated growth to compensate for those years of slower growth. The initial phases of construction to upgrade the City’s wastewater treatment plant that adds capacity is anticipated to be in full operation by August 2008.
GROUNDWATER AND AQUIFER RECHARGE

Groundwater

Buckley is located atop the Oceola Mud Flow, which is the result of a major mud and debris flow (lahar) from a volcanic eruption that occurred at Mt. Rainier approximately 5,700 years ago. The lahar matrix at Buckley consists of several hundred feet of various sizes of randomly dispersed rock, gravel, and boulders in a mixture of mud and silt. This material is fairly impermeable to water, which discourages the formation of aquifers capable of supporting sustained pumping.

The City of Buckley and the Rainier School drilled several wells in the early 1990s in an attempt to locate additional sources of water. These wells produced marginal to adequate quality water, but they were unable to sustain pumping for extended periods. These wells are currently used as backup wells during the summer months when flows are low on South Prairie Creek, and during the winter when turbidity is high in the City’s surface water source (City of Buckley, Evaluation of a Slow Sand Filtration Process for Meeting the Surface Water Treatment Rule, Gray & Osborne, June 1995).

CLIMATE

The climate of the Buckley area is temperate and typical of that encountered elsewhere in the Puget Sound area. Summers are warm and comparatively dry, and winters are cool, wet, and cloudy. The Pacific Ocean moderates seasonal temperatures and provides the moisture for storms that periodically sweep inland, most frequently during the winter months. Seasonal offshore pressure centers control the prevailing wind direction, which shifts between northwesterly in the summer and southwesterly in the winter. A seasonal reversal in the offshore ocean current, bringing cool water down from the north in summer and warm water up from the south in winter, maintains the average temperature between about 40 degrees F in the winter and about 60 degrees F in the summer.

The majority of weather events with the potential to cause flooding occur during the late fall and winter months. The intense winter storms are typically accompanied by large quantities of precipitation. Temperature, precipitation, and other climatological records have been kept by the Western Regional Climate Center since January 1, 1931.

Table 3-3 provides monthly averages in temperatures and rainfall.
TABLE 3-3

Period of Record Monthly Climate Summary

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Average Maximum Temp.</td>
<td>44.7</td>
<td>49.1</td>
<td>53.4</td>
<td>59.0</td>
<td>65.7</td>
<td>70.4</td>
<td>76.3</td>
<td>76.1</td>
<td>70.5</td>
<td>60.0</td>
<td>50.3</td>
<td>45.4</td>
<td>60.1</td>
</tr>
<tr>
<td>Average Minimum Temp.</td>
<td>32.5</td>
<td>34.1</td>
<td>35.6</td>
<td>38.7</td>
<td>43.4</td>
<td>47.7</td>
<td>50.4</td>
<td>50.5</td>
<td>47.2</td>
<td>42.0</td>
<td>36.6</td>
<td>33.5</td>
<td>41.0</td>
</tr>
<tr>
<td>Average Total Precip.</td>
<td>5.89</td>
<td>4.80</td>
<td>4.62</td>
<td>3.98</td>
<td>3.15</td>
<td>3.06</td>
<td>1.39</td>
<td>1.63</td>
<td>2.64</td>
<td>4.53</td>
<td>6.45</td>
<td>6.43</td>
<td>4.05</td>
</tr>
<tr>
<td>Average Total Snowfall</td>
<td>4.0</td>
<td>2.0</td>
<td>1.6</td>
<td>0.2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.1</td>
<td>1.0</td>
<td>2.3</td>
<td>0.9</td>
</tr>
</tbody>
</table>
BUCKLEY STORM DRAINAGE SYSTEM

Moving stormwater within the City is difficult, because the entire area is basically a relatively level pasture with slowly draining soils. Buckley’s storm drainage system conveys stormwater runoff from individual basins to Spiketon Ditch, the Puget Sound Energy Flume (either directly or through Wickersham Basin), or the White River. It consists of typical components such as catch basins, piping, open ditches, natural streams, and wetlands.

The City of Buckley began installing its existing storm drain system in the 1930s. Much of this system is in very poor condition and in need of immediate improvements. Development that occurred in the 1960s and 1970s filled in existing ditches and installed undersized culverts. The City did not require stormwater detention facilities until 1992, and did not require them to be sized for 100-year events until 1996.

Flooding occurred during major storm events in 1996 and 1997. Standing water near the center of Buckley, along A Street and Ryan Road, blocked access to A Street and cut off access to houses and emergency services to the area. Floodwaters filled crawl spaces under houses and residents along Spiketon Ditch experienced water over access roads and standing water in barns, garages, lawns, and fields. Water jumped the discharge ditch to the Buckley Straights, forcing water into town along River Avenue. In addition, drainage along the Pierce County Mundy Loss Road backed water over the road surface on Hinkleman Road. Large storms were experienced in November 2006 and produced similar results.

FLOOD HAZARD AREAS

The 100-year floodplain is shown on Figure 3-4. These boundaries are in accordance with Flood Insurance Rate Map (FIRM) Panel Number 530138 0375, Exhibit A, which was prepared by the National Flood Insurance Program (NFIP) of the Federal Emergency Management Agency (FEMA).

FLOODING

The City of Buckley has kept no written record of flooding within its boundaries. Intense flooding occurred in the floodplain of the White River prior to the construction of Mud Mountain Dam, which was constructed in the late 1940s. White River flood flows have ranged as high as 28,000 cfs in 1933. More recent flood flow levels have ranged between 10,300 cfs in February of 1996 and near 15,000 cfs in December of 1977.

RECENT STORMS

River does not directly affect the City; however, localized flooding of pastures, crawl spaces, garages, and roadways occurred during these events and localized flooding in Buckley may have increased somewhat due to recent logging and development activity within the city limits.

Daily rainfall recordings taken from the City’s wastewater treatment plant indicate that on November 2, 2006, a storm event with rainfall of 1.00 inch occurred and was subsequently followed by events of 0.70 inch on November 3, 2006, 0.75 inch on November 4, 2006, 1.10 inches on November 5, 2006, 5.50 inches on November 6, 2006, and 1.00 inch on November 7, 2006. Other areas of the City such as those along Sheets Road recorded even greater amounts, as high as 6.50 inches during the event of November 6, 2006.

The event of November 6, 2006, was considered a 100-year event and due to the large amount of damage experienced region wide, was designated a federally declared disaster. Again, localized flooding was experienced throughout the City, especially in the Hinkelman Road and Ryan Road/Spiketon Road regions as seen on Figure 3-5 through Figure 3-13.

FLOODING IN THE SPIKETON DITCH AREA – AND ITS IMPACT ON SPIKETON DITCH

Some of the information included in this section was prepared by Mr. Marvin Sundstrom in August 2008. This information is noted in italics.

Spiketon Ditch obtained its name from the early ditch that went from Spiketon Road to South Prairie Creek. According to information provided by the Army Corp of Engineers runoff sources contributing to the ditch as it flows through Buckley include the 320 acres in Section 11 south of the southern city boundary, 140 acres in Section 12 along the City’s southeast boundary, 420 acres in northwest Section 11 (Note: 640 acres in a section – Mr. Sundstrom’s information adds up to 740 acres in Section 11), the north half of Section 10 and area north of Ryan Road. A portion of the 640 acre area west of Spiketon Road to Highway 165, drains to Spiketon Ditch. The City’s responsibility for runoff from this area ends at Division Street. The remainder of the area to the west of Division Street is the responsibility of Pierce County.

Spiketon Ditch was dug to provide drainage for the Town of Buckley domestic water reservoir. The City draws domestic water for the City from South Prairie Creek under Water Right R1.P.369. The Rainier School holds separate water rights, R13P1609 for domestic water and irrigation water, at the same diversion point. The 6.5-mile water transmission line from the intake on South Prairie Creek travels north to the water treatment plant located near the intersection of Levesque and Ryan Roads. Portions of the transmission line are not accessible by road. The combined diversion passes through a sand filter at the City of Buckley water treatment plant. When the capacity of the filters
Figure 3-5. Mt. View Ave during the Nov. 7, 2006 Storm.

Figure 3-6. Spiketon Rd. (looking north) during the Nov. 7, 2006 Storm.
Figure 3-7. Hinkelman Rd. E. (looking east) during the Nov. 7, 2006 Storm.

Figure 3-8. A St. South during the Nov. 7, 2006 Storm.
Figure 3-9. House along Spiketon Rd., north of Ryan Rd. during the Nov. 7, 2006 Storm.

Figure 3-10. House along Spiketon Rd., north of Ryan Rd. during the Nov. 7, 2006 Storm.
Figure 3-11. House along Spiketon Rd., north of Ryan Rd. during the Nov. 7, 2006 Storm.

Figure 3-12. Overflowing pond at end of Rose Pl. during the Nov. 7, 2006 Storm.
Normal Drainage from Elk Meadows (South of Sheets Road)

Drainage from Elk Meadows November 7, 2006

Figure 3-13 Drainage from Elk Meadows and West of Sheets Road
Normal Drainage Sundstrom property – 881 Sheets Road

Culvert – 881 Sheets Road. Culvert underwater for 3 days. November 7, 2006

Figure 3-13 continued
Water Exiting 881 Sheets Road. November 7, 2006

Looking North from 881 Sheets Road. November 7, 2006

Figure 3-13 continued
is exceeded, the overflow is currently diverted through a drainage pipe to an open ditch on Levesque Road, where it is conveyed to the White River. Easements were granted by various property owners to the City between 1909 and 1927 for domestic water purposes in the eastern part of the City and extending south toward the City’s present water intake on South Prairie Creek.

According to written comments prepared by Mr. Sundstrom in January 2002, Spiketon Ditch begins at the corner of Spiketon Road and Ryan Road. The first recorded drainage ditch was formalized June 4, 1934, Auditor’s file record #1116944 between Frank and Delia Glabais and the Town of Buckley. It read in part, “A right of way of a stripe of land ten (10) feet in width for an open drain to be used for drainage of any water that may come from the reservoir and water pipe line of said party of the party of the second part, over and across the flowing described land, to wit.” Mr. Sundstrom notes this was followed by metes and bounds description. The easement continues, “That the party of the second part will dig & construct an open drain on said right of way for the purpose aforesaid and for such purpose it will have the right to occupy the same for doing all the necessary work, and the parties of the first part, after said drain is constructed by the party of the second part, will thereafter maintain such drain in good condition, and after said drain is constructed, the party’s of the first part will not look to or ask the party of the second part for any further work to be done on such drain.” Mr. Sundstrom concluded that the open drain proceeded to the vicinity of Sheets Road and terminated at that point. Apparently, drainage from the reservoir ditch was conveyed north along Sheets Road to a ditch on Ryan Road, west along Ryan Road, to discharge into Spiketon Ditch at the intersection of Ryan Road and Spiketon Road.

The next event of record pertaining to Spiketon Ditch is a copy from records kept in Pierce County Planning and Land Use showing Probate file #27787 dated January 9, 1936 where an order was filed to the administrator of said estate to sign a waiver of damage to Pierce County, Washington to construct a drainage ditch sixty feet in width across Lots 14, 18 and 26 Garden Valley Tracts. The ditch appeared to have been dug in the upland next to a primitive road that has since been partially abandoned and named Spiketon Road Extension. During large storm water events the water in the ditch and the water in the fields north on those properties are separate flowing bodies to the west.

In 1952, the Town of Buckley attempted to obtain 10 feet of right-of-way from property owners on the north side of Ryan Road. The State was going to upgrade Ryan Road to serve as the main access to the Rainier School. As reported in the Town Council minutes for May 27, 1952, Town officials discussed the possibility of using other routes as the main access to Rainier School if easements along Ryan Road were not obtained, or alternatively, the overflow from the reservoir could be directed away from the Ryan Road ditch allowing the State to fill in the old ditch and use the existing 40-foot right-of-way for Ryan Road. The Council discussed obtaining easements for a new reservoir overflow.
ditch located closer to the Spiketon hill to replace the Ryan Road ditch and help drain the area.

The Mayor reported in the Council meeting on June 10, 1952, that he had “contacted most of the property owners along the proposed route of the reservoir overflow ditch and they were willing to grant easements, but that some of the grantors wanted the ditch to cross their property at specified places and that the ditch may have to be located accordingly.” The easements for the new ditch were discussed at the next Town Council meeting on June 17, 1952. As reported in the meeting minutes, the size and location of the ditch were discussed. The minutes reported that it seemed to be the sentiment of the group of property owners present that they would all sign the easements. By June 24, 1952, the Mayor had all easements from the property owners for the new reservoir ditch except for a Mrs. Allman.

The Town Council meeting minutes for July 9, 1952, included an item stating that the work of digging the new Ryan ditch would commence on July 14. The Town would install crossings at each property. The Mayor reported at the Town Council meeting on August 26, 1952, that the new ditch had been completed and that the overflow from the reservoir is now going down the ditch. In addition, the Mayor reported that the County would clean out the Spiketon ditch, which was the receiving water for the new ditch. Also discussed at this meeting was a dispute with a property owner on Spiketon Road who felt his property had sustained damages because the Town lowered the depth of Spiketon Ditch in front of his property. The Town Council decided that if the property owner supplied the drain tile, the Town would provide the dirt to provide piped drainage at the subject property.

Mr. Sundstrom reports that easements were granted by all property owners and were generally the same except in one case a bridge was required. They read in part: “the Grantee is desirous of constructing a drainage ditch over and through the below described real property of Grantor”...“hereby acknowledged to grant to the Grantee, an easement for the construction, maintenance and repair of said drainage ditch”...followed by a legal description of grantor’s property. The document went on to read “Said easement shall be for the purpose of constructing, repairing and maintaining a drainage ditch over and across the above described real property to a width not to exceed ten (10) feet, and also for the purpose of allowing Grantee access to and to come upon the above described real property as often as it shall be necessary to inspect, repair or maintain said drainage ditch. Dated this 23rd of June 1952.”

In the early 1980s, Weyerhaeuser logged 320 acres in the south half of Section 11, south of the City. Based on information provided by the City in the 2002 Draft Comprehensive Flood Hazard Management Plan, the elevation of Sheets Road was raised where it intercepts Spiketon Ditch. Weyerhaeuser also installed culverts under Sheets Road.
Flooding occurs in the Spiketon Ditch corridor. Pictures of the flooding in November 2006 taken by Mr. Sundstrom are included as Figure 3-13.

**FLOODING IN THE SERGEANT-MCNEELY AREA**

Two developments in the 1980s appear to have increased stormwater flooding on A Street. Both developments were constructed along Ryan Road, with 25-year detention facilities, using the Yrjanainen and Warren (Y&W) method of stormwater flow calculations. After the developments were built, homeowners on A Street complained of additional flooding, including water over the road and in garages and basements.

The owner of property along Sergeant Street, at the northern end of town, advised the City that after development on Sergeant Street, he experienced flooding in his pastures and in his barn. The development occurred prior to the adoption of city standards requiring stormwater detention.

**TIMING OF PEAK FLOOD WATERS**

Flooding on the White River, Spiketon Ditch, and in the Buckley area occurs primarily between November and March during the periods of greatest precipitation. Winter rain events determine the intensity and extent of flooding in the Spiketon Ditch and throughout Buckley.

**PREVIOUS STORMWATER PROJECTS**

The City completed several self-funded and grant-funded projects in the mid-1990s to install and improve its stormwater system. In addition, the City undertook a massive inflow and infiltration project in the late 1990s, which led to installation of separate pipes for sewer conveyance. The old sewer pipes became storm pipes. These projects provided for increased conveyance capacity and reduced maintenance. The recently completed storm drainage projects are identified in Table 3-4.
TABLE 3-4
Past Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Year Completed</th>
<th>Cost</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>River Avenue Storm Drain</td>
<td>1999</td>
<td>$20,000</td>
<td>Alleviate ponding on River Avenue.</td>
</tr>
<tr>
<td>Jefferson Storm Drain</td>
<td>1999</td>
<td>7,500</td>
<td>Increase conveyance capacity along Jefferson.</td>
</tr>
<tr>
<td>C Street Bypass</td>
<td>1998</td>
<td>37,500</td>
<td>Reduce pressure on existing conveyance on Ryan Road, which contributes to flooding on A Street.</td>
</tr>
<tr>
<td>Mason Avenue Storm Drain Phase II</td>
<td>1997</td>
<td>$100,000</td>
<td>Extend main stormwater conveyance system into developed residential neighborhood.</td>
</tr>
<tr>
<td>Mason Avenue Storm Drain Phase I</td>
<td>1996</td>
<td>$100,000</td>
<td>Extend main stormwater conveyance system into developed residential neighborhood.</td>
</tr>
<tr>
<td>Hinkleman Extension Storm Drainage</td>
<td>2001</td>
<td>100,000</td>
<td>Replaced ditch with 48-inch pipe.</td>
</tr>
<tr>
<td>River Avenue Storm Improvements (Post Office to Youth Center)</td>
<td>2005</td>
<td>60,000</td>
<td>Extend main stormwater conveyance system to new Youth Center.</td>
</tr>
<tr>
<td>Ryan Road Storm Drainage</td>
<td>2006</td>
<td>540,000</td>
<td>Installed 36-inch pipe to eventually be connected with the Hinkelman Extension Storm System.</td>
</tr>
</tbody>
</table>

STORMWATER DRAINAGE SYSTEM MAINTENANCE

Maintenance of the stormwater drainage system in Buckley is performed both in response to specific issues, and in the form of regularly scheduled maintenance of the catch basins and ditches. The system is generally inspected twice during the fall and culverts and catch basins are cleaned as needed. Leaves are generally removed from choke points twice each fall. Grass is mowed near culverts during the summer and fall.

MINOR CITY DITCHES

Vegetation in the ditches requires regular maintenance, most often mowing to keep the conveyances open. This is particularly true in the summer and early fall when the grass grows at a rapid rate and can quickly lead to reduced conveyance capacity when the rains begin in the fall.
CULVERTS

Entrances to the culverts become plugged with grass and debris if trash racks are present. Conversely, if trash racks are not present, the culverts themselves may become plugged. After the storm of February 8, 1996, a 2 x 6 piece of lumber was discovered blocking a culvert along Ryan Road, perhaps contributing to the flooding experienced on A Street.

STORMWATER PIPES

Generally, the stormwater pipe network in the City requires little maintenance. Storm drain catch basins should be vacuumed annually.

SPIKETON DITCH

The status and designation of Spiketon Ditch continues to be a controversial issue. Since the 1990s, the City has been in conflict with WDFW and DNR over the designation of this manmade channel. WDFW contends that due to documented fish presence taken from an electroshock survey conducted on April 7, 2004, Spiketon Ditch is a fish-bearing stream being fed from natural waters. The City contends that the channel was manmade and that the fish were arbitrarily introduced, and that the primary flow supporting these introductions will be eliminated with installation of the flow control valve. Although South Prairie Creek and a small section of Spiketon Ditch immediately upstream of the confluence with South Prairie Creek support runs of Chinook, Coho, chum, and pink salmon, steelhead, and bull trout, the upstream limit for anadromous fish in Spiketon Ditch is SR 165, where there is an obstruction to fish migration.

A formal program for maintenance of Spiketon Ditch will probably not be developed and/or implemented until this issue can be resolved between the City and the State.

However, if decided in the City’s favor, maintenance of the ditch will involve one or more of the following:

1. Annual mowing and vegetation removal.
2. Dredging and cleaning on an as-needed basis.
3. Install larger culverts under Spiketon Road and Sheets Road.
4. Install an overflow control at the point where the drainage ditch intersects Sheets Road.
5. Construct a regional detention facility.
6. Work with adjacent property owners to reduce and/or eliminate point and nonpoint discharges that carry potential contaminants and/or encourage buffers or conservation easements.

**SR 410 DITCHES**

The City of Buckley maintenance crew currently mows these ditches. The Washington State Department of Transportation assists with periodic maintenance.

**THE WHITE RIVER FLUME**

According to Puget Sound Energy’s (PSE’s) *White River Hydroelectric Project History*, five settling basins are located along the flume. Originally, these basins were cleaned out on a regular basis. The Wickersham Basin is the nearest of these basins to Buckley. It has been maintained by mechanically removing sediment deposits since 1939. McHugh and Printz Basins lie downstream, and they have been allowed to fill completely. Presently, they are maintained only enough to ensure unimpeded flow. The Wickersham Basin has been considered for development into a potential regional floodwater retention facility. According to Don Nauer, Habitat Biologist for the Puyallup River System, WDFW does not regulate development in the Puget Sound Energy Flume. Diversion of additional flood flows to Wickersham Basin and the flume would require approval from PSE. Potential use of Lake Tapps as a drinking water source may limit options for a regional stormwater detention facility.

**STORMWATER CONVEYANCE AND DETENTION REQUIREMENTS**


The analysis reflected existing conditions as well as impervious areas that are likely to result from the Comprehensive Plan-designated development. The existing drainage conditions, outfall capacities, and estimated future drainage flows were then reviewed to determine storm sewer improvements necessary to decrease flood potential.

Due to the NPDES Phase II permit requirements, the City is required to adopt the 2005 Ecology Manual (or equivalent). The use of this manual will require flows to be calculated using a continuous runoff model. Ecology created a software modeling program entitled the Western Washington Hydrology Model (WWHM). A continuous runoff model uses rainfall data from 40 years to determine peak storm flows that are more
representative of western Washington storms than those represented through the Santa Barbara Urban Hydrograph Method. The WWHM models typically result in lower peak flows, but larger volumes of water during a 24-hour period.

There are several basins within the City with inadequate storm drainage. The City lies in a relatively flat area, which makes management of drainage challenging. In addition, previous storm drainage detention standards either did not include detention, or included a 25-year Y&W detention analysis. These standards proved to be inadequate during the 1996 and 1997 floods. Some of the areas needing improvement simply require larger pipes or open channels. For others, increasing conveyance will move existing flooding to another location. In addition to these structural mitigation measures, alternatives including construction of detention facilities and restoration of historic drainage patterns must be considered.

New development must mitigate its own stormwater impacts. In some cases, this will require construction of a new conveyance system or upgrade of the existing conveyance system. Large areas of impervious surfaces will exacerbate existing surcharging and flooding unless an adequate drainage system is constructed. The City is required to adopt the 2005 Ecology Manual to help ensure impacts to the existing system are properly measured and addressed. The City will encourage the use of LID techniques for new developments and redevelopment of existing buildings.

Impervious areas associated with future development will increase stormwater loading to the conveyance system. This will require upsizing of existing pipes and ditches. It will also require installation of new stormwater detention, conveyance, and treatment facilities. The existing stormwater drainage system will be discussed in more detail in Chapter 4 and hydrological modeling information will be presented in Chapter 5.
CHAPTER 4

EXISTING STORMWATER DRAINAGE SYSTEM

INTRODUCTION

The analysis of stormwater runoff system performance requires knowledge of the components that make up the stormwater system. Buckley’s storm drainage collection and conveyance system conveys stormwater to Spiketon Ditch, the Puget Sound Energy Flume, or the White River. It consists of typical components such as catch basins, piping, open ditches, natural streams, and wetlands. This chapter presents a physical description of the current stormwater systems within the City.

EXISTING STORMWATER DRAINAGE INVENTORY

The evaluation of the City’s drainage facilities begins with the establishment of an inventory of the existing system’s components. Information included in the inventory for selected areas is pipe diameter, length and slope invert, elevations of catch basins, and configuration of open channels.

An inventory of the existing stormwater drainage system was compiled from field inspection data, surveying from previous jobs, and existing as-built maps. A summary of the results is shown in Table 5-2.

HYDROLOGY

Surface Drainage Patterns

The White River marks the northern city limit. The Puget Sound Energy Flume parallels the White River and occupies a strip of land immediately south of the river. Spiketon Ditch runs along the south edge of town, traveling generally westward. Predevelopment drainage patterns, prior to the introduction of manmade conveyance systems, have not been verified. Prior to the construction of the Spiketon Ditch and the Puget Sound Energy Flume, the major drainage feature in the vicinity of Buckley was the White River. The elevation of Buckley decreases from north to south at approximately 0.0055 feet per foot (ft/ft) towards the White River, and from east to west at approximately 0.0036 ft/ft.

The existing City drainage system contains a variety of ditches and piped systems that discharge to Spiketon Ditch, the White River, or the Puget Sound Energy Flume. A Stormwater System Base Map is shown on Figure 4-1.

Twenty-four drainage basins have been identified within the future UGA (Figures 4-2 and 4-2a). The basins have been delineated based on topography, existing drainage systems,
and outfall locations. Portions of the Spiketon Ditch, Elk Meadows, and Sheets Road Diversion Basins lie outside of the city limits. Many of the basins are divided into smaller subbasins for the purpose of analysis. Existing conveyance, piping, and stormwater outfall locations were surveyed. The following is a brief description of the basins.

**Downtown Basin**

The Downtown Basin is bounded by SR 410 to the west and north, and by Couls Avenue to the south. The basin extends to the east to Spruce Street. Aside from an occasional empty lot and the park area adjacent to the Foothills Trail, this 125-acre basin is entirely developed. Surface water in this basin flows generally to a pipe system of old, smaller stormwater lines and sewer lines that have been converted to stormwater pipes, to an old manhole in front of the high school. Stormwater is then conveyed to the north in a pipe of unknown size to the ditch along SR 410, where it flows to the Puget Sound Energy Flume.

**North Highway 410 Basin**

The North Highway 410 Basin lies on the east side of SR 410. It drains an area from Ryan Road North, necking down at C Street, and widening to include most of the old high school campus and parking lot. The basin is approximately 71 acres in size, with a sparsely populated area between Jefferson and Ryan, and approximately 5 acres of park and ball fields adjacent to the high school campus. Drainage from this area is conveyed through the old storm drain system in town, then north to SR 410.

**Division Street and Spiketon Road Basin**

Division, Ryan, and lower Spiketon are consolidated into one 252-acre basin that drains into both the north system toward SR 410 and Spiketon Ditch, which then flows on toward South Prairie Creek. The Division Street conveyance extends north to Jefferson Avenue and also carries water south of Ryan Road to Spiketon Ditch. The manhole situated at the intersection of Ryan Road and Division is set to overflow either north or south along Division (the inverts are set at the same elevation to spread the flow equally). The 36-inch pipe flowing along Ryan Road is intended to carry flow westerly toward the Hinkelman Extension conveyance system in the future. However, until this project is constructed, runoff is diverted either north or south along Division Street.

**Mason Street Basin**

The Mason Street Basin encompasses an area of approximately 96 acres. Developed areas in this drainage basin include the west side of SR 410, an area along Mill Street and Perkins Avenue that lies adjacent to Mason Avenue, and the development at Rainier Street. There is a large undeveloped area between Ryan Road and Mason Avenue.
FIG 4-2 MODELED DRAINAGE BASINS

LEGEND:
- Spiketon Ditch Basin
- CITY/UGA LIMITS
- SubBasins
- Water PARCELS
- 112th St Basin (7B)
- Collins Rd Basin (5)
- Division St Basin (3,4)
- Downtown Basin (2C)
- Hinkelman East Basin (7E2)
- Hinkelman South (6)
- Hinkelman West Basin (7E1)
- Mason St. Basin (1)
- McNeely Rd Basin (5X)
- Mundy Loss Basin (8)
- N 410 Basin (2A)
- River Ave N. Basin (2B,2C,2D)
- Ryan Rd Basin (4)
- Spiketon Rd Basin (9)
- West 410 Basin A (7C)
- West 410 Basin B (7D)
- Spiketon Ditch Basin
- Elk Meadows Basin
- Sheets Rd Diversion Basin
Drainage is collected by a large pipe along Mason Avenue, conveyed under SR 410, and then northwesterly toward Wickersham Basin.

**North River Avenue Basin**

The 131-acre North River Avenue Basin carries stormwater runoff from residential areas on Main Street and Rainier Street through the new Hamilton Estates Development, across school district property, and the Copperwynd Development.

**Collins Road Basin**

The 226-acre Collins Road Basin runs from the highest point between Mason Avenue and Ryan Road north to the flume. Water generally flows north to Collins Road, where it is trapped and conveyed through a series of pipes and ditches to the Dieringer Pipe. The Dieringer Pipe runs due north along the Spruce Street alignment. Approximately 40 acres north of Collins Road are undeveloped. The remainder of the basin is developed at low density, rural levels.

**McNeely Road Basin**

The McNeely Road Basin collects drainage from approximately 18 acres. It includes the area between McNeely Road and the property line for the WSU Dairy Facility. It is bounded to the south by Collins Road and to the north by the flume. The basin drains toward McNeely Road, then to the north in an open ditch with a series of undersized driveway culverts.

**Hinkleman Road South Basin**

This 35-acre basin drains northwesterly to a 48-inch detention pipe on the Hinkleman Extension Road. The drainage basin is bounded by Hinkleman Extension Road to the west, near Naches to the east, SR 410 to the south, and the Wickersham Basin to the north.

**112th Street Basin**

This 130-acre basin is bounded on the south by the high point in the topography south of 112th Street and approximately Mundy Loss Road to the west. It extends along SR 410 to its intersection with Third Street. The basin drains to a large, flat ditch along the north side of 112th Street. This ditch acts as both conveyance and storage, and flows west toward Mundy Loss Road. Flow continues to the west under Mundy Loss Road through two 24-inch pipes into the Pierce County ditch to the west of Mundy Loss Road.
Hinkleman Road East Basin

This basin includes the 57-acre area between SR 410 and Hinkleman Road East. About midway between Hinkleman Extension and Mundy Loss Road, the basin drains to a ditch that conveys water to the north.

Mundy Loss Basin

The Mundy Loss Basin drains 16 acres to a series of pipes along the east side of Mundy Loss Road, north of SR 410. These pipes collect water from the Mundy Loss Road and the area to the east of it. Flow is conveyed to the north to the flume. This basin includes a 30,000-cubic-foot detention pond at the intersection of Mundy Loss Road and Hinkleman Road, which helps control water along the highway.

Hinkleman West Basin

The 12-acre basin includes the area between Mundy Loss Road and the highest point between the ditch draining the Hinkleman East Basin and the pipes along Mundy Loss Road. It is bounded to the north by Hinkleman Road and to the south by SR 410. The area drains out of the City throughout the pipes at Mundy Loss Road.

West Highway 410 Basin A

The West Highway 410 Basin A lies on the south side of SR 410 between 112th Street and the highway. To the west, it is in close proximity to Mundy Loss Road and to the east, it lies near SR 165. It drains an area of 82 acres and generally flows north toward a large ditch that runs parallel to the highway.

West Highway 410 Basin B

The West Highway 410 Basin B lies on the north side of SR 410 between the highway and the high point between Hinkelman Road and SR 410. To the east, it borders the Hinkelman Extension Road and to the west, it lies in close proximity to Mundy Loss Road. It drains an area of 7 acres in a southern direction toward a large ditch that runs parallel to the highway.

Spiketon Ditch Basin

The Spiketon Ditch Basin includes approximately 571 acres, approximately half of which lies to the south of the city limits. The Spiketon Ditch Basin drains west to South Prairie Creek.
Elk Meadows Basin

The Elk Meadows Basin includes approximately 300 acres, the majority of which lies to the south of the city limits. The Elk Meadows Basin drains into the Spiketon Ditch Basin.

Sheets Road Diversion Basin

The Sheets Road Diversion Basin includes approximately 454 acres and includes areas to the east and south of the city limits.

The following basins were not included in the hydraulic modeling completed on the system.

Rainier School Basin

Approximately 76 acres of the Rainier School property is served by a collection system owned and maintained by the school. This area discharges to the White River.

East White River Basin

The East White River Basin includes an area of approximately 162 acres that discharges to the White River. This basin was not included in the hydraulic model since there are no identified problem areas, and future development will comply with the City’s requirements to limit stormwater flow from the development to meet the requirements of the 2005 Ecology Stormwater Management Manual for Western Washington.

East Flume Basin

The East Flume Basin includes an area of approximately 61 acres that discharges to the Puget Sound Energy Flume. This basin was not included in the hydraulic model since there are no identified problem areas, and future development will comply with the City’s requirements to limit stormwater flow from the development to meet the requirements of the 2005 Ecology Stormwater Management Manual for Western Washington.

Northern Basin

The Northern Basin includes approximately 297 acres between the Puget Sound Energy Flume and the White River. The area drains to the north to the White River. This basin was not included in the hydraulic model since there are no identified problem areas, and future development will comply with the City’s requirements to limit stormwater flow from the development to meet the requirements of the 2005 Ecology Stormwater Management Manual for Western Washington.
Northwest City Basin

The Northwest City Basin includes approximately 157 acres that discharges directly to the Puget Sound Energy Flume and Wickersham Basin. This basin was not included in the hydraulic model since there are no identified problem areas, and future development will comply with the City’s requirements to limit stormwater flow from the development to meet the requirements of the 2005 Ecology Stormwater Management Manual for Western Washington.
CHAPTER 5

HYDROLOGIC MODELING

Hydrologic and hydraulic analysis of the Buckley stormwater system was performed using the XP-SWMM computer software model. The program is capable of modeling existing basin conditions as well as future land use conditions to reflect anticipated stormwater runoff. The hydrologic/hydraulic model for the City of Buckley was developed to assess the capacity of the current stormwater system under existing and future conditions.

MODELING BACKGROUND

Hydrologic analysis addresses the movement of rainfall to the conveyance system. The purpose of a hydrologic model is to estimate or predict the flow of stormwater runoff into the conveyance system. The input parameters to the model assume that within each hydrologic basin or collection area, there are discreet locations at which runoff enters the conveyance system, such as catch basins. In actuality, runoff enters a conveyance system at numerous locations, for example any point along the entire length of a ditch. For modeling purposes, it is assumed that the runoff enters the system at a known point downstream and time of concentration values were adjusted accordingly. The information generated in the hydrologic model is presented in the form of a hydrograph, a standard plot of runoff (cubic feet per second (cfs)) versus time (hours) for a given location and design storm event.

Hydrologic modeling methods require input parameters that describe physical drainage basin characteristics. Together with the distribution of rainfall over time, these parameters determine the shape of the resulting hydrograph generated by the model. Key parameters are the area of pervious and impervious surfaces, the interconnectivity of the impervious areas, topography, and infiltration characteristics of the soil. As part of the hydraulic modeling, all stormwater conveyance information was obtained through the limited number of existing as-built surveys for the area, historical survey records, and data collected during field visits.

The basic steps in the development of the hydrologic or runoff model include:

- Development of rainfall intensity over time;
- Delineation of the drainage basins and subbasins;
- Identification of land use and estimation of the amount of pervious and impervious areas;
Identification of soil types and estimation of the infiltration parameters; and

Identification of topographic characteristics and estimation of flow parameters including average slope, roughness coefficients, and depression storage.

Based upon these parameters, the model estimates the resulting runoff from each subbasin. The resulting runoff hydrographs are added together within the conveyance system to provide inflow volumes. Hydraulic analysis is then used to estimate the peak flow rates and the water surface elevations over time throughout the conveyance system for a given storm event. Hydraulic analysis is based on the physical characteristics of the conveyance system, such as ditch cross-sectional area, pipe diameter, slope, and roughness.

The scope of work for this project included modeling the conveyance system using the Western Washington Hydraulic Model (WWHM) and XP-SWMM hydrologic model. The conveyance system was originally evaluated for conveyance capacity for the 25-year storm event. The City subsequently requested that the storm system should be evaluated under the conditions that would result from a 100-year storm event in an attempt to minimize flooding and standing water in the City to the maximum extent possible. The WWHM rainfall amounts are based on 40 years of rainfall records. The rainfall amount assumed in the WWHM model for the 24-hour period encompassing a 100-year event totals approximately 2.35 inches. The 100-year, 24-hour rainfall amount assumed in the XP-SWMM model is based on the information contained in isopluvial maps published by the National Oceanic and Atmospheric Administration (NOAA). The 100-year, 24-hour rainfall for Buckley is 4.5 inches (NOAA, Atlas 2, Volume IX).

The XP-SWMM model was used for modeling the conveyance system in Buckley since this model is based on the higher rainfall events experienced in Buckley. However, future modeling of detention systems for City projects or new development and redevelopment projects must be prepared using the WWHM as directed by the 2005 Ecology Stormwater Management Manual for Western Washington.

**DESIGN STORM**

All storm event models, such as XP-SWMM, require the input of data describing rainfall intensity over time. Design storms are defined in terms of:

- Return frequency – the statistically estimated length of time between which storms with a given total amount of rainfall will occur,
- Total rainfall (depth in inches), and
- Storm duration and rainfall distribution over time.
Design storms are hypothetical storms based upon a statistical analysis of historic storm events. The 1992 Ecology *Stormwater Management Manual for the Puget Sound Basin* will be referenced for the design criteria and modeling methodology for the Buckley conveyance system model since the 2005 Ecology *Stormwater Management Manual for Western Washington* does not include all of the design information required for preparation of the XP-SWMM model.

For western Washington, design storm rainfall, both intensity at a given time and the total volume, are described in the 1992 Ecology *Stormwater Management Manual for the Puget Sound Basin*. The 100-year design storm was used to size the conveyance system. This design storm results in a total precipitation of 4.5 inches over a 24-hour period. The design storm predicts the rainfall intensity at a given time and the total rainfall depth in inches.

The pipe sizes, slopes, and general ditch elevations for the storm drainage networks were obtained from the field survey. The ditch bottom elevations were assumed to be approximately 2 to 3 feet below the surrounding ground elevation.

Difficulties encountered in the modeling effort were related to the lack of elevation differential. The lack of “slope” within Buckley made the delineation of the drainage basins within the downtown core of the City difficult. Under current land use conditions, ponding occurs over much of the area in yards, especially within the flatter portions of the City. Depressions causing this ponding restrict stormwater from entering the conveyance systems. With increased development throughout Buckley, the areas where ponding will or can occur may be diminished due to regrading, forcing a greater volume of water to travel to the conveyance systems.

**CAPACITY OF THE EXISTING SYSTEM AND STORMWATER MODELING**

The results of the model are used to determine the adequacy of the system to convey the predicted peak rate of stormwater runoff from the design storm event under various land uses. The level of service chosen for new conveyance facilities is to provide the conveyance capacity for the 100-year, 24-hour event. Therefore, the City’s system was evaluated for the ability to convey the storm flow generated from the 100-year, 24-hour storm event. Due to City development regulations, which require developments to release stormwater from a detention facility to either existing or forested land use conditions, the system was modeled under existing conditions. The City’s system was modeled under the existing land use condition so as to provide a worst-case scenario. However, it should be noted that this model contains the assumption that future and existing detention facilities will be properly maintained and will function as designed.

Figure 5-1 illustrates the storm drainage network simulated in the XP-SWMM computer model. This model was developed to assess the capacity and demands of the existing system. XP-SWMM uses input data based on the following parameters:
Land use,
Basin size,
Precipitation intensity and magnitude,
Pipe or ditch sizes and slopes,
Pipe or ditch roughness factor,
The time for runoff to reach the outlet of each basin,
The percentage of impervious surfaces, and
Infiltration capacity of the area not covered with impervious surfaces.

Using this input data, XP-SWMM routes the stormwater through the storm drainage system, assuming gravity flow conditions, and accounts for the travel time within the pipes. The input data are presented in Appendix D.

The XP-SWMM program uses the Santa Barbara Urban Hydrograph method to estimate flow in the stormwater pipes and ditches. The curve numbers, used to estimate runoff, were derived using the 1992 Ecology Manual. The type of ground cover on pervious surfaces was estimated by field observation. Impervious areas were assigned a curve number of 98. The percentage of impervious area was estimated based upon the housing density within each subbasin and in some places, from aerial photographs. Previous modeling for the City assumed a high groundwater table, which leads to all land uses being modeled as impervious surfaces with a curve number of 98. Flow monitoring in 2006 to 2007 reflected a different condition where it became apparent that groundwater was not as high as previously thought. Therefore, land uses were modeled with curve numbers appropriated in the 1992 Ecology Manual. Table 5-1 below lists the curve numbers for each land use.

**TABLE 5-1**

**Curve Numbers Based Upon Land Use**

<table>
<thead>
<tr>
<th>Land Use Type</th>
<th>Curve Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pervious Areas:</strong></td>
<td></td>
</tr>
<tr>
<td>Residential and Public (Schools)</td>
<td>90 (grass)</td>
</tr>
<tr>
<td>All Other Land Uses</td>
<td>89 (pasture)</td>
</tr>
<tr>
<td>Exception for Subbasin 7B2</td>
<td>86 (forest)</td>
</tr>
<tr>
<td><strong>Impervious Areas:</strong></td>
<td></td>
</tr>
<tr>
<td>Impervious Surface</td>
<td>98</td>
</tr>
</tbody>
</table>

In addition to the curve numbers, the time of travel for each subbasin was input to XP-SWMM. The time of travel is the length of time it takes for runoff to reach the outlet from the most distant point in the subbasin. This time was calculated using the methodology discussed in the 1992 Ecology Manual.
The pipe sizes and slopes and general ditch elevations were obtained from the survey performed by Gray & Osborne, as well as City records on the existing system. All pipes were assigned a Manning’s “n” coefficient value of 0.014.

The major drainage ditches in the City of Buckley were modeled using the same XP-SWMM program. Results of this effort predict the water surface elevation during the design storm events peak discharge rates and indicate the conditions during various storm events when the water surface elevations will limit discharge from the collection system.

The model assumed the stormwater conveyance system has free and clear discharge from the City system into the adjacent Pierce County system at Mundy Loss Road, 112th Street, and at Hinkleman Road into Wickersham Basin and the Puget Sound Energy Flume. During periods of high flow, the discharge into Spiketon Ditch, the 112th Street drainage system, and the Mundy Loss drainage system may not be free-flowing conveyance systems. Increasing the size of conveyance to these discharge points may not result in increased capacity. The City should consider alternatives such as redversion and storage of stormwater flows.

Table 5-2 indicates the 100-year, 24-hour storm peak flow rate of the pipe segments identified as having inadequate capacity. Figure 5-1 shows the general locations of the pipe and ditch segments indicated in Table 5-2. Table 5-2 also indicates the recommended size for each of the segments identified as having inadequate capacity and the estimated costs to make the repair. The recommended improvements to increase capacity in existing ditches include rehabilitation of the ditches where feasible, i.e., right-of-way is available, future improvements in the corridor including increased road width, parking and sidewalks will not encroach on a ditch system, and connection to downstream existing systems can be maintained. The model results presented in this plan can be used to size additional ditch conveyance systems if the City’s vision for a specific corridor will accommodate the use of open ditches. There is limited space available, 5 to 6 feet, for open ditches within the right-of-way based on the existing City Street Standards for Minor Arterials, Collector, and Local Access streets without review and approval by the City. Full cost descriptions may be found in Appendix G.

Also note that it is standard practice to have downstream pipes that match the size of or are larger than the upstream pipes. Therefore, as seen throughout a portion of these modeling results, some pipes that have sufficient capacity were recommended for an increase in pipe size simply due to the fact that the surrounding pipes were undersized and needed to be increased.
# TABLE 5-2

## 100-Year Storm System Deficiencies

<table>
<thead>
<tr>
<th>General Location</th>
<th>Type (size)</th>
<th>Existing Capacity (cfs)</th>
<th>Peak Runoff 100-Year Storm (cfs)</th>
<th>Proposed Improvement</th>
<th>Length (feet)</th>
<th>Approximate Costs/Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mason Basin (Basin 1) – No Changes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Highway 410 Basin B (Basin 7D)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SR 410, 1,575' E of Hinkleman Ext.</td>
<td>Ditch</td>
<td>0.56</td>
<td>0.67</td>
<td>Rehabilitate ditch</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>SR 410/Hinkleman Ext. intersection</td>
<td>Ditch</td>
<td>0.17</td>
<td>1.56</td>
<td>Install 12&quot; pipe</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>North Highway 410 Basin (Basin 2A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total: $ 43,750</td>
</tr>
<tr>
<td>Under SR 410</td>
<td>Pipe (30&quot;)</td>
<td>9.8-17.0</td>
<td>55.2/53.0</td>
<td>Install 48&quot; pipe</td>
<td>210</td>
<td></td>
</tr>
<tr>
<td>Through School Property</td>
<td>Pipe (30&quot;/24&quot;)</td>
<td>6.3-13.9</td>
<td>53.0/22.6</td>
<td>Install 36&quot; pipe</td>
<td>1,240</td>
<td></td>
</tr>
<tr>
<td>Total: $ 966,250</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>River Avenue North Basin (Basins 2B, 2C, 2D)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NE of School (near W end of White River Park Rd.)</td>
<td>Pipe (24&quot;)</td>
<td>21.2/15.3</td>
<td>60.6/59.5</td>
<td>Install 36&quot; pipe</td>
<td>1,720</td>
<td></td>
</tr>
<tr>
<td>Total: $ 958,750</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downtown Basin (Basin 2C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From N “A” St. under SR 410</td>
<td>Pipe (18&quot;)</td>
<td>4.3/5.1/6.4</td>
<td>38.0</td>
<td>Install 36&quot; pipe</td>
<td>850</td>
<td></td>
</tr>
<tr>
<td>E of N “A” St., W of School</td>
<td>Pipe (18&quot;)</td>
<td>9.8</td>
<td>38.0</td>
<td>Install 24&quot; pipe</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td>Total: $ 606,250</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
### TABLE 5-2 (continued)

#### 100-Year Storm System Deficiencies

<table>
<thead>
<tr>
<th>General Location</th>
<th>Type (size)</th>
<th>Existing Capacity (cfs)</th>
<th>Peak Runoff 100-Year Storm (cfs)</th>
<th>Proposed Improvement</th>
<th>Length (feet)</th>
<th>Approximate Costs/Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ryan Road Basin</strong> (Basin 4)</td>
<td>Pipe (36&quot;)</td>
<td>27.6</td>
<td>72.1</td>
<td>Install 48&quot; pipe</td>
<td>217</td>
<td></td>
</tr>
<tr>
<td>W of Ryan/Division intersection</td>
<td>Pipe (36&quot;)</td>
<td>22.2-&gt;44.2</td>
<td>65.0</td>
<td>Install parallel 36&quot; pipe</td>
<td>1,659</td>
<td></td>
</tr>
<tr>
<td>E of LDS Church</td>
<td>Pipe (18&quot;)</td>
<td>5.1-&gt;8.0</td>
<td>40.8-&gt;52.9</td>
<td>Install 48&quot; pipe</td>
<td>1,018</td>
<td></td>
</tr>
<tr>
<td>~2,700' W of Sheets</td>
<td>Pipe (18&quot;)</td>
<td>7.0/7.0/15</td>
<td>40.8</td>
<td>Install 36&quot; pipe</td>
<td>3,175</td>
<td></td>
</tr>
<tr>
<td><strong>Division Street Basin</strong> (Basin 3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Just S of Ryan/Division intersection</td>
<td>Ditch</td>
<td></td>
<td></td>
<td>Rehabilitate</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>~2,000' S of Ryan/Division intersection</td>
<td>Pipe (18&quot;)</td>
<td></td>
<td></td>
<td>Install 24&quot; pipe</td>
<td>645</td>
<td></td>
</tr>
</tbody>
</table>

**Total:** $3,771,250

**Total:** $277,500
TABLE 5-2 (continued)

100-Year Storm System Deficiencies

<table>
<thead>
<tr>
<th>General Location</th>
<th>Type (size)</th>
<th>Existing Capacity (cfs)</th>
<th>Peak Runoff 100-Year Storm (cfs)</th>
<th>Proposed Improvement</th>
<th>Length (feet)</th>
<th>Approximate Costs/Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spiketon Road Basin</strong> (Basin 9)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>~30'-280' N of Spiketon Ditch crossing</td>
<td>Ditch</td>
<td>14.5/24.0</td>
<td>14.3</td>
<td>Install 2' x 3' box culvert</td>
<td>204</td>
<td></td>
</tr>
<tr>
<td>~30'-280' N of Spiketon Ditch crossing</td>
<td>Pipe (24&quot;)</td>
<td>15.6</td>
<td>14.3</td>
<td>Install 2' x 3' box culvert</td>
<td>204</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total: $ 173,750</strong></td>
</tr>
<tr>
<td>Spiketon Culvert</td>
<td>Culvert (parallel 24&quot;)</td>
<td>20</td>
<td>302</td>
<td>Install 12' x 3' bridge section</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total: $ 243,750</strong></td>
</tr>
<tr>
<td><strong>Collins Road Basin</strong> (Basin 5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collins, W of Spruce</td>
<td>Pipe (12&quot;-24&quot;)/Ditch</td>
<td>2.2-&gt;28.9</td>
<td>12.5</td>
<td>Install 18&quot; pipe</td>
<td>2,151</td>
<td></td>
</tr>
<tr>
<td>Collins, W of Spruce</td>
<td>Pipe (12&quot;-24&quot;)/Ditch</td>
<td>2.2-&gt;28.9</td>
<td>6.1</td>
<td>Install parallel 24&quot; pipe</td>
<td>1,464</td>
<td></td>
</tr>
<tr>
<td>S of Collins/Spruce intersection</td>
<td>Pipe (30&quot;)</td>
<td>13.7-74.6</td>
<td>108.4</td>
<td>Install 60&quot; pipe</td>
<td>3,290</td>
<td></td>
</tr>
<tr>
<td>N of S Collins intersection</td>
<td>Ditch</td>
<td>6.2-&gt;48.0</td>
<td>57.2</td>
<td>Install parallel 36&quot; pipe</td>
<td>1,314</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total: $4,797,500</strong></td>
</tr>
</tbody>
</table>
### TABLE 5-2 (continued)

#### 100-Year Storm System Deficiencies

<table>
<thead>
<tr>
<th>General Location</th>
<th>Type (size)</th>
<th>Existing Capacity (cfs)</th>
<th>Peak Runoff 100-Year Storm (cfs)</th>
<th>Proposed Improvement</th>
<th>Length (feet)</th>
<th>Approximate Costs/Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>McNeely Road Basin</strong> (Basin 5x)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N end of McNeely</td>
<td>Ditch</td>
<td>5.2</td>
<td>11.4</td>
<td>Install 24” culvert</td>
<td>188</td>
<td></td>
</tr>
<tr>
<td>N end of McNeely</td>
<td>Culvert (12”)</td>
<td>3.1</td>
<td>11.4</td>
<td>Install 24” culvert</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>Mid-McNeely</td>
<td>Culvert (12”)</td>
<td>1.7</td>
<td>11.4</td>
<td>Install 24” culvert</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>Mid-McNeely</td>
<td>Ditch/Culvert (12”)</td>
<td>7.4/2.0</td>
<td>11.4</td>
<td>Install 24” culvert</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>S end of McNeely</td>
<td>Culvert (12”)</td>
<td>0.8</td>
<td>11.4</td>
<td>Install 24” culvert</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>S end of McNeely</td>
<td>Culvert (12”)</td>
<td>1.7</td>
<td>11.4</td>
<td>Install 24” culvert</td>
<td>309</td>
<td></td>
</tr>
<tr>
<td>N and S ends of McNeely</td>
<td>Ditch</td>
<td>1.6-25.4</td>
<td>11.4 / 9.2</td>
<td>Rehabilitate ditch</td>
<td>354</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total: $ 438,750</strong></td>
</tr>
<tr>
<td><strong>112th Street East Basin</strong> (Basin 7B)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W of Mundy Loss/112th intersection</td>
<td>Ditch/Pipe (36”/48”)</td>
<td>2.5-143.2</td>
<td>21</td>
<td>Install 36” pipe (remove ditches)</td>
<td>1,541</td>
<td></td>
</tr>
<tr>
<td>W. of Mundy Loss/112th intersection</td>
<td>Ditch/Pipe (36”/48”)</td>
<td>2.5-143.2</td>
<td>36</td>
<td>Install parallel 48” pipe</td>
<td>1,541</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total: $1,786,250</strong></td>
</tr>
<tr>
<td><strong>West Hwy 410 Basin A</strong> (Basin 7C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From Mundy Loss to E end of 112th</td>
<td>Ditch/Culvert (12”/15”/18”)</td>
<td>0.2-67.5</td>
<td>30.4</td>
<td>Install 24” culvert, replace ditches</td>
<td>5,518</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total: $2,151,250</strong></td>
</tr>
</tbody>
</table>
TABLE 5-2 (continued)

100-Year Storm System Deficiencies

<table>
<thead>
<tr>
<th>General Location</th>
<th>Type (size)</th>
<th>Existing Capacity (cfs)</th>
<th>Peak Runoff 100-Year Storm (cfs)</th>
<th>Proposed Improvement</th>
<th>Length (feet)</th>
<th>Approximate Costs/Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hinkleman Road East Basin</strong> (Basin 7E2)</td>
<td>Ditch/Culvert (12&quot;/115&quot;/18&quot;)</td>
<td>2.2-&gt;108</td>
<td>35.5</td>
<td>Install 36” pipe</td>
<td>2,685</td>
<td>Total: $1,587,500</td>
</tr>
<tr>
<td>From Hinkleman Ext. E for ~2,700'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mundy Loss Road Basin</strong> (Basin 8) – No Changes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Specific problem areas in each basin will be discussed in the following sections.

**Downtown Basin Deficiencies**

The 69-acre Downtown Basin (Basin 2C) is bounded by SR 410 to the west and north, by Coul's Avenue to the south, and South C Street to the east. The basin is entirely developed. The existing 18-inch pipe that conveys the stormwater runoff from this basin has a minimum capacity of approximately 4.3 cfs. The capacity required to convey the runoff from this basin in a 100-year event is approximately 38 cfs.

**Problems and Recommendations**

According to City staff and Council members, the downtown area is not known for flooding. However, the model suggests that during a 100-year storm, the downstream segments of the 18-inch line through the Downtown Basin are insufficient. The 18-inch pipes should be replaced with 140 linear feet of 24-inch pipe and 850 linear feet of 36-inch pipe.

The estimated cost of repairing the system deficiencies in this basin is $606,250.

**North Highway 410 Basin Deficiencies**

The 65-acre North Highway 410 Basin (Basin 2A) lies on the east side of SR 410. It drains an area from north of Ryan Road, necking down at C Street, and widening to include most of the old high school campus and parking lot. The model indicates that the peak rate of stormwater flow from this basin would be approximately 55 cfs during a 100-year storm event.

**Problems and Recommendations**

Water ponds in the undeveloped areas, in yards, over low sidewalk areas, and in the ball fields throughout the winter and spring.

The basin is approximately 65 acres in size, with a sparsely populated area between Jefferson and Ryan, and approximately 5 acres of park and ball fields adjacent to the high school campus.

According to the model, flow is restricted in a 100-year event by the last five segments of the drainage system. These segments convey water across Buckley School District property, and then across land owned by the funeral home to the ditch along SR 410. Hydraulic modeling predicts surcharges in this system in the 1,200 linear feet of pipe crossing the high school campus, as well as the last 210 feet of pipe crossing the funeral home property and discharging into the ditch along SR 410. It is recommended these pipe segments be replaced with 36-inch and 48-inch pipe.
The estimated cost of repairing system deficiencies in this basin is $966,250.

**Division Street**

The Division Street Basin (Basin 3) is a 115-acre basin that drains into Spiketon Ditch and South Prairie Creek. The Division Street conveyance extends north to Couls Avenue, and carries water south to Spiketon Ditch.

Peak flow discharge at the south end of Division Street during a 100-year, 24-hour storm event is expected to be approximately 53 cfs. The existing system capacity is 32 cfs.

**Problems and Recommendations**

In 1996, floodwaters filled crawl spaces under houses. Water covered roads, including Spiketon Road where Spiketon Ditch crosses under it. Water stood in barns, garages, lawns, and fields, especially in the pastures along SR 165 in unincorporated Pierce County. The ditch system was not adequate and as a result, flooding occurred along River Avenue. Surcharges in the piped system caused flooding along A Street. Residents attributed it to recent developments along C Street and Ryan Road.

Hydraulic modeling indicates that approximately 645 feet of the piped system in Division Street in the vicinity of Division Street and Ryan Road, and the southernmost section of ditch on Division Street are insufficiently sized to convey a 100-year storm event from the Ryan Road system. The recommended size for the piped conveyance system in the vicinity of Division Street and Ryan Road is 24 inches. The ditch at the south end of Division Street should be rehabilitated to have a 2-foot bottom width.

The estimated cost of repairing system deficiencies in this basin is $277,500.

**Ryan Road Basin**

The Ryan Road Basin (Basin 4) is a 104-acre basin that drains into the Ryan Road stormwater system, which also mixes with a portion of the Division Street Basin. Runoff from the areas lying adjacent to Ryan Road currently flows either north or south down Division Street at the Ryan Road/Division Street intersection. In the future, it is intended that the Ryan Road runoff would continue flowing westerly toward 112th Street and then turn north where it would connect with the Hinkelman Extension. The existing 18-inch and 36-inch piped conveyance system on Ryan Road has a capacity of approximately 5 cfs. The predicted peak flow from the 100-year, 24-hour event in this region is 20 cfs.

Hydraulic modeling indicates that approximately 3,175 linear feet of 36-inch pipe would be needed along Ryan Road. In addition, 1,659 linear feet of parallel 36-inch pipe would be needed next to the 36-inch pipe placed along Ryan Road in 2006. The model also indicated that 1,018 linear feet of 48-inch pipe will be needed to convey the 100-year storm and an additional 3,175 linear feet would be needed as well. These pipes would
extend into the Division Street Basin, with the intention of connecting to a system that would link into the 48-inch Hinkelman Extension storm system in the future.

The intersection of Ryan Road and Sheets Road is located at the east end of the Ryan Road Basin. An existing 18-inch and 24-inch pipe convey runoff collected from Sheets Road, under Ryan Road, to a large ditch that parallels the west side of the Rainier School property near the intersection of Sheets Road and Ryan Road. The property owners at the south end of Sheets Road are concerned with the flooding of Spiketon Ditch across their property. One solution to help alleviate flooding in this area is to divert a portion of flow in Spiketon Ditch to the east of Sheets Road to the north, along the conveyance channel for Sheets Road. The conveyance system along the east side of the road consists of a grass-lined ditch connected by existing 36-inch driveway culverts. Hydraulic modeling indicates that the culverts have capacity for approximately 18 to 28 cfs. The culverts would need to be replaced with 48-inch culverts to handle the anticipated 84 cfs that would occur during the 100-year storm event.

The two existing culverts under Ryan Road at the intersection of Sheets Road and Ryan Road have adequate capacity to convey 84 cfs. Installation of a flow splitter at the north end of Sheets Road to evenly disburse flow between the existing 18-inch and 24-inch culverts that cross under Ryan Road is recommended. Additional downstream capacity will be required. The existing 36-inch culvert at the north end of the Rainier School property would need to be replaced with a 60-inch pipe in order to handle the flows from the 100-year event.

The estimated cost of repairing system deficiencies in the Ryan Road Basin is $3,771,250. The estimated cost of modifying pipes along the Sheets Road diversion route is $672,500.

**Spiketon Road Basin**

The Spiketon Road Basin (Basin 9) is a 34-acre basin that drains westerly toward the stormwater system along Spiketon Road, which conveys water to the Spiketon Ditch. The ditch along Spiketon Road carries water through a ditch and pipe from Ryan Road south, through a series of pipes and ditches along Spiketon Road, to the point where Spiketon Ditch crosses the road. Floodwaters spill over the road at the crossing. Previously, Ryan Road and Spiketon Road drainage included large, deep ditches on both sides of both roads. As development occurred, the ditches were replaced with 18-inch culverts. The hydraulic model revealed a 242 linear foot section along Spiketon Road that had insufficient capacity for the 100-year storm. A 2’ x 3’ box culvert is proposed for this area along Spiketon Road.

Culverts on Spiketon Ditch at Spiketon Road were also evaluated. The existing crossing, two 24-inch concrete pipes at Spiketon Road, is undersized for a 100-year storm event. Spiketon Ditch was modeled to convey flows from the 571-acre Spiketon Basin and 300-acre Elk Meadows Basin in addition to the Spiketon Road Basin. The Spiketon
Road culvert has approximately 5 percent of the capacity required to convey the 100-year event (20 cfs versus 448 cfs peak flow). Based on the model, a 12-foot-wide by 3-foot-tall concrete box culvert is required at the Spiketon Road crossing. Due to constructability issues and maintaining access for residents, it is recommended that the City review the option of placing a bridge section in this area.

According to previous revisions to this plan prepared by City staff, several County residents identified flooding that occurs adjacent to Spiketon Ditch, downstream of the city limits. Potential flood mitigation measures for this basin should address preexisting downstream problems. For example, a solution that simply increases the capacity of the culvert crossing Spiketon Road will likely exacerbate downstream flooding problems. Elevation of the Spiketon Road roadway and creating additional storage capacity are other potential mitigation measures.

The estimated cost of repairing the 242 linear foot section along Spiketon Road is $173,750. The estimated cost of replacing the two 24-inch culverts under Spiketon Road is $243,750.

**Mason Street Basin**

The Mason Street Basin (Basin 1) drains an area of approximately 96 acres. Developed areas in this drainage include the west side of SR 410, an area along Mill Street and Perkins Avenue that lies adjacent to Mason Avenue, and the development at Rainier Street. Drainage is collected by a large pipe along Mason Avenue, conveyed under SR 410, and then northwesterly toward Wickersham Basin.

**Problems and Recommendations**

No chronic problems have been reported in this basin. The hydraulic model also indicates no flow restrictions for this region.

**North River Avenue Basin**

The 155-acre North River Avenue Basin (Basins 2B, 2C, and 2D) carries stormwater runoff from residential areas on Main Street and Rainier Street through the Hamilton Estates development, across School District property, and the Copperwynd development.

A 1,720-foot section of existing 24-inch pipe is capable of conveying 15 cfs. Modeling indicated that during a 100-year storm event, the system would be required to convey 21 cfs. During construction of the Copperwynd development, the developer installed a parallel redundant system around the perimeter of the development as part of a settlement with adjacent property owners. This may help alleviate predevelopment capacity problems caused by the old, undersized 24-inch pipe.
Problems and Recommendations

No reported problems have occurred in this area; however, in the past, two residences north of the Hamilton Estates development and two residences along River Avenue experienced standing water during winter storm events. Based on the model, it is recommended that approximately 1,720 feet of 24-inch pipe be replaced with 36-inch pipe.

The estimated cost of repairing the system deficiencies in this basin is $958,750.

Collins Road Basin

The 226-acre Collins Road Basin (Basin 5) runs from the highest point between Mason Avenue and Ryan Road north to the Puget Sound Energy Flume. Water generally flows north to Collins Road, where it is trapped and conveyed through a series of pipes and ditches to the “Dieringer Pipe.” The Dieringer Pipe runs due north along the Spruce Street alignment. Approximately 40 acres north of Collins Road are undeveloped, with the remainder of the basin developed at low-density, rural levels. However, Invesco will be developing a portion of the southern end of this basin (near Ryan Road) per the residential zoning code in this region.

Problems and Recommendations

A property owner along Sergeant Street advised the City that after development on Sergeant Street, he experienced flooding in his pastures and barn. Residents between McNeely and Sergeant experience water in their barns, pastures, and occasionally crawl spaces during heavy rains. Drainage from the Sergeant Street areas appears to surcharge the Collins Road system during high flows. The Collins Road ditch overflows into yards during large storm events. Two components in this system are insufficient to convey the runoff from a 100-year storm event; Spruce Street drainage and the Collins Road drainage. The area immediately in front of Spruce Street is a combination of open ditch and an assortment of driveway culverts, where the drainage system is inadequate to convey 100-year flows. For example, one of the driveway culverts is capable of carrying 6.2 cfs, while the model predicts flows of 28.5 cfs in a 100-year storm event. Residents of Spruce Street describe sheet flows over the roadway during significant storm events, and standing water in front lawns and garages.

Another portion of the Collins Road Basin drainage that is undersized to convey 100-year storm flows is the section of pipe and ditch between Main Street and the area north of Collins. This pipe is approximately 30 inches in diameter and must be increased to a 60-inch pipe to convey a 100-year storm event.

The estimated cost of repairing the system deficiencies in the entire Collins Road Basin is $4,797,500.
**McNeely Road Basin**

The McNeely Road Basin (Basin 5X) includes approximately 18 acres between McNeely Road and the property line for the WSU Dairy Facility. It is bounded to the south by Collins Road and to the north by the Puget Sound Energy Flume. The basin drains toward McNeely Road, then to the north in an open ditch with a series of undersized driveway culverts.

**Problems and Recommendations**

The peak 100-year, 24-hour flow for this basin is approximately 12 cfs. The existing ditch and culvert system is inadequate to convey this flow. Recommendations for this basin include ditch rehabilitation and replacing existing driveway culverts with 24-inch culverts.

The estimated cost of repairing the system deficiencies in this basin is $438,750.

**Hinkleman Road South Basin**

This 35-acre basin (Basin 6) drains northwesterly to 48-inch pipes on the Hinkleman Extension Road. The drainage basin is bounded by Hinkleman Extension Road to the west, Naches to the east, SR 410 to the south, and Wickersham Basin to the north. According to the model, no improvements were necessary for this basin.

**112th Street Basin**

This basin (Basin 7B) is bounded by the high point in the topography south of 112th Street and Mundy Loss Road to the west. It extends along SR 410 to its intersection with Third Street. Approximately 130 acres drain to a large, very flat ditch along the north side of 112th Street. This ditch acts as both conveyance and storage, and flows are generally restricted as they pass through two 24-inch pipes running under Mundy Loss Road.

**Problems and Recommendations**

According to the model, flows during a 100-year event will require the installation of 1,541 linear feet of parallel 36-inch and 48-inch pipes. These parallel pipes would begin at Mundy Loss Road and would extend eastward.

The estimated cost to repair the system deficiencies in this basin is $1,786,250.

**West Highway 410 Basins**

The West Highway 410A Basin (Basin 7C) covers approximately 82 acres between 112th Street and SR 410. Water flows westerly along SR 410 in a large ditch system.
The West Highway 410B Basin (Basin 7D) includes a narrow strip immediately north of SR 410 that drains to SR 410.

Problems and Recommendations

During the storms of 1997, water sheet flowed across Mundy Loss Road near the intersection of SR 410 and Mundy Loss Road. There are numerous culvert crossings in the West Highway 410A Basin that the model predicts to be undersized for a 100-year storm event. It is recommended the culverts and ditch system be replaced with 5,520 linear feet of 24-inch pipe.

The model predicts portions of the ditch system in the West Highway 410B Basin system to be undersized. The first section, approximately 75 feet in length, should be replaced with a 12-inch culvert since the existing capacity of the ditch is 0.16 cfs. The second area is an 84-foot section a little further west. It is recommended that this existing ditch be rehabilitated.

The estimated cost to repair the system deficiencies in West Highway 410A (Basin 7C) is $2,151,250. The estimated cost to repair the system deficiencies in West Highway 410B (Basin 7D) is $43,750.

East Hinkleman Road Basin

This basin (Basin 7E2) includes the 58-acre area between SR 410 and Hinkleman East. About midway between Hinkleman Extension and Mundy Loss Road, it flows into a drainage ditch that conveys water almost due north across private property.

Problems and Recommendations

There are several segments of open ditch and culvert pipe on the south side of Hinkleman Road that are identified as undersized for a 100-year storm. Surcharges in the Hinkleman Road East Basin lead to standing water on the roadway. It is recommended that 2,685 linear feet of 36-inch pipe replace the existing ditch along the south side of the road. It is also recommended that the flow be reversed and discharged to the 48-inch Hinkleman Road Extension system.

The estimated cost to repair the system deficiencies in this basin is $1,587,500.

Mundy Loss Road Basin

The Mundy Loss Basin (Basin 8) drains 16 acres to the north to an open ditch along Mundy Loss Road. This ditch collects water off the Mundy Loss Road and flows beyond the city limits to the Puget Sound Energy Flume. This basin includes a 30,000 cubic foot detention pond near SR 410.
Problems and Recommendations

The model assumes all water is able to flow in an unrestricted manner as it leaves the city system. The model does not include the detention pond. The 100-year, 24-hour peak flow from this basin is indicated to be approximately 14 cfs. The limit of the existing system capacity is approximately 8 cfs, so a portion of the system surcharges but not enough to create surface flooding. Therefore, no improvements are recommended for this basin.

Hinkleman West Basin

This 12-acre basin (Basin 7E1) includes the area between Mundy Loss Road and the highest point between the ditch draining the Hinkleman East Basin and the ditch along Mundy Loss Road. It is bounded to the north by Hinkleman Road and to the south by SR 410. The area drains out of the City through the ditch at Mundy Loss Road. Although the model does not identify deficiencies, residents have experienced standing water in pastures and across the roadway during large storm events.

Highway 165

The improvement of drainage in the Spiketon Ditch Basin will increase the peak rate of stormwater runoff conveyed to the SR 165 crossing. The Spiketon Ditch culvert located under SR 165 was evaluated for capacity during the 100-year design storm event. The existing culvert is a 4’ x 4’ box culvert. To handle the estimated flows from Spiketon Ditch when the recommended improvements have been completed (estimated to be 626 cfs), the existing culvert will need to be a 4’ x 8’ box culvert.

REGIONAL WATER QUALITY TREATMENT AND DETENTION FACILITIES

The City will prepare a feasibility study to investigate the potential of installing regional detention pond(s) and explore potential low-impact alternatives, such as further expansion and use of open ditches to provide stormwater conveyance and treatment alternatives, and rehabilitation of existing ditches to improve the treatment and habitat benefit of these facilities. Additionally, the City may look at facilities for providing water quality treatment required for new development at a centralized location. Alternative locations for regional water quality treatment/detention facilities are in the vicinity of the White River, Puget Sound Energy Flume, Wickersham Basin, the area south of Mason Avenue near the Collins Road Basin, and in the area located between SR 410 and 112th Street.
CHAPTER 6

WATER QUALITY ANALYSIS

INTRODUCTION

The City of Buckley lies on a flat plateau, just above the 100-year floodplain of the White River. Stormwater from the northern portion of Buckley generally flows overland to the White River, or via ditches and pipes to the Puget Sound Energy (PSE) Flume. Spiketon Ditch drains the southeastern and western portions of Buckley to South Prairie Creek, which lies approximately 4 miles to the southwest.

Buckley’s surface water features are a significant part of its natural beauty and rich heritage. Fish and wildlife habitat, clean water, and aesthetic appeal are benefits of the surface water resources, which must be managed wisely to protect their value. Without proper management, urban runoff may cause the degradation of surface water resources.

Both the White River and South Prairie Creek support runs of Chinook, Coho, chum, and pink salmon, steelhead, and bull trout. Coho, pink, and chum salmon are known to use Spiketon Ditch below SR 165, approximately 1 mile upstream from the confluence of South Prairie Creek and Spiketon Ditch. An obstruction to fish passage at the railroad crossing does not allow anadromous fish to travel upstream of this point.

As rain falls and runs off of urban surfaces, pollutants associated with the urban environment are transported to natural surface waters where they may damage aquatic organisms and reduce the aesthetic value of the water body. Nationwide, approximately 30 percent of water quality problems have been attributed to stormwater runoff. Many sources of stormwater pollution are uncontrolled. Sources of nonpoint pollution are numerous, varied, and hard to detect, but their cumulative effect on water quality and habitats can be significant. Compared to most communities nationwide, Buckley is relatively undeveloped and the City’s stormwater is unlikely to carry significant concentrations of metals and polyaromatic hydrocarbons (PAHs) normally associated with urban runoff. However, due to livestock and pets, bacterial concentrations may be similar if not higher in rural areas, such as Buckley, than in highly urbanized areas.

IMPACTS TO WATER QUALITY

Pollutants discharged in stormwater are largely uncontrolled. In the Puget Sound area, stormwater has been estimated to contribute about 7 percent of the total flow from all point and nonpoint sources but about 60 percent of the total lead, 30 percent of the total zinc, and nearly all of the total fecal coliform bacteria. Research in western Washington has shown that the concentrations of many pollutants found in stormwater from residential, commercial, and industrial areas exceed water quality criteria.
The National Water Quality Inventory 1986 Report to Congress (EPA, 1986) also concluded that diffuse sources of water pollution, including runoff from urban areas, are the leading cause of water quality impairment.

The Nationwide Urban Runoff Program (NURP) (EPA, 1983) included extensive field monitoring throughout the United States to characterize urban runoff flows and pollutant concentrations. According to this study, nonpoint pollution includes heavy metals (especially copper, lead, and zinc), organic priority pollutants, coliform bacteria, nutrients, oxygen-demanding substances, and total suspended solids (TSS).

The effects of the pollutants on receiving waters are site specific; however, the following generalities can be assumed:

- Urban runoff produces frequent exceedances of ambient water quality criteria for heavy metals on freshwater aquatic life. Metals content in Buckley stormwater should be lower than most cities, due to the low population and relatively low traffic volumes.

- Although a significant number of problem situations could result from heavy metals in urban runoff, levels of freshwater aquatic life impairment (suggested by the magnitude and frequency of ambient criteria exceedances) were not observed.

- Copper, lead, and zinc appear to pose a significant threat to aquatic life uses in some areas of the country. Copper is suggested to be the most significant of the three.

- Organic priority pollutants in urban runoff generally do not pose a general threat to freshwater aquatic life.

- The physical aspects of urban runoff, e.g., erosion and scour, can be significant causes of habitat disruption and can affect the type of fishery present.

- Sediment contamination due to the buildup of priority pollutants can be attributed wholly or in part to urban runoff.

- Coliform bacteria may be present at high levels in urban runoff, and may be expected to exceed EPA water quality criteria during and immediately after storm events in most rivers and streams. Coliform bacteria discharges in urban runoff have a significant negative impact on the recreational uses of lakes.

- Domestic water supply systems with intakes located on streams in close proximity to urban runoff discharges are encouraged to check for priority
pollutants which have been detected in urban runoff, particularly those in the organic category.

- Nutrients in urban runoff may accelerate eutrophication problems and severely limit recreational uses, especially in lakes. However, NURP’s lake projects indicate that the degree of beneficial use impairment varies widely, as does the significance of the urban runoff component.

- Adverse effects of urban runoff in marine waters are highly specific to the local situation. Though estuaries and embayments were studied to a very limited extent in the NURP, they were not believed to be generally threatened by urban runoff. Coliform bacteria present in urban runoff are the primary pollutants of concern, causing direct impacts on shellfish harvesting and beach closures.

- Groundwater aquifers that received deliberate recharge of urban runoff do not appear to be imminently threatened by this practice at the two locations where they were investigated.

The conclusions reached by the NURP study indicate that sedimentation, erosion, and bacterial pollution are the pollutants of most concern in stormwater runoff. The Bellevue, Washington NURP project concluded that habitat changes associated with streambed scour and sedimentation produced by urbanization were more significant than pollutant concentrations. The results of these two studies illustrate the importance of controlling both stormwater quality and quantity.

**WATER QUALITY STANDARDS**

The following discussion focuses on the criteria used to evaluate water quality contaminants and sources most common in runoff. Water quality problems in the Buckley area are identified further in this chapter. Appropriate strategies for addressing problem areas and reducing adverse impacts are discussed in Chapter 7.

Stormwater runoff constitutes the primary transport mechanism for nonpoint pollution. Pollution problems associated with land utilization and development encompass the common use of potential pollutants such as pesticides, fertilizers, petroleum products, and solid waste. A further problem stemming from residential, commercial, and industrial land uses is the higher peak rate and volume of runoff because of the higher percentage of impervious area. Pollutants accumulate in surficial soils and on paved surfaces from vehicular emissions, atmospheric deposition, spills, leaks, improper waste storage/disposal practices, and fertilizer/pesticide application. They are then washed off the land surface during storm events and transported via stormwater runoff to nearby water bodies or infiltrated to shallow groundwater.
These types of nonpoint pollution are seldom attributed to an individual source and their intermittent nature makes them difficult to identify and control. Parameters that define nonpoint pollution are discussed below in terms of State standards and potential sources.

PARAMETERS OF CONCERN

Water quality parameters affecting stormwater comprise a long list and are classified in many ways. Typical categories include sediment, nutrients, and metals; oxygen-demanding and inert material; particulate and dissolved; chemical, biological, and physical; toxic and nontoxic; and organic and inorganic. Many specific pollutants are incorporated into one classification if their effects on receiving water are similar. Receiving water can assimilate a limited quantity of each, but there are thresholds beyond which the measured amount becomes a pollutant and results in an undesirable impact.

Human health considerations for fresh water can be monitored through the analysis of conventional water column parameters, nutrients, and oil and grease. The following section provides a brief description of contaminants, likely sources, and potential environmental effects.

Dissolved Oxygen

Dissolved oxygen (DO) is necessary in water to maintain a robust ecosystem. Fish kills and reductions in aesthetic values have resulted from low DO conditions. During the oxidation of organic matter by biological activities, oxygen from water is used. Low DO problems result when the rate of uptake by oxygen-demanding material exceeds the rate of replenishment. Maintenance of adequate DO levels is especially important during summer when low stream flows and high temperatures make oxygen less available to aquatic life. Dissolved oxygen concentrations may also become critical when wastes that require oxygen for decomposition enter the water. Dissolved oxygen concentrations vary between day and night, and between seasons and stream site. These natural variations are caused by differences in such things as light intensity, nutrient levels, and hydrogeologic conditions. Natural variation can also be caused by water sources. Some groundwater or water draining from bogs and marshes will have lower DO concentrations.

pH

pH impacts chemical and biological systems of natural waters. Similar to DO, pH responds to natural environmental factors. Changes in pH affect the degree of dissociation of weak acids and bases, which affect the toxicity, reactivity, and solubility of many compounds. Diurnal variations in pH occur as a result of changes in production and respiration rates, and different water sources such as groundwater or water draining wetlands. The high pH of White River is caused by periphytic algal growth stimulated by excessive nutrient loading. This high pH condition has the potential to adversely impact salmonids.
Temperature

Temperature extremes affect stream productivity and eventually may result in loss of aquatic life. Temperature also affects stream chemistry, specifically the solubility of oxygen, carbon dioxide, and metals. Temperature varies diurnally and seasonally.

Turbidity

Turbidity is not a measurement of mass or concentration; it is a water quality attribute. Therefore, it cannot be used as a quantitative measure to calculate loadings, but is used qualitatively to compare against a standard. Turbidity increases in response to physical factors such as runoff, proximity to exposed erodible soils, and stream flow.

Nutrients

Nutrients are chemicals that stimulate the growth of algae and water plants. Typical sources include detergents, fertilizers, septic system effluent, manure, etc. The primary nutrients of concern are nitrogen and phosphorous. Forms of nitrogen include ammonia, nitrite, and nitrate, which are components of fertilizers, septic system effluent, and manure. The typical nutrient concentrations in stormwater runoff are often more than sufficient to stimulate the growth of algae and plant species. The increased algal activity will initially raise DO levels. Once decomposition of dead algae begins; DO levels drop, surface algal scums form, and water discoloration and odors may occur.

Nitrogen and phosphorus are the principal nutrients for algae and other plants in freshwater ecosystems including wetlands, streams, and lakes. Phosphorus is often the controlling nutrient for algae growth in fresh water. A large input from nonpoint sources can result in algal blooms that can affect recreational use and reduce the overall quality of receiving waters. Nitrogen is also an important parameter for water used as drinking water supplies as it can cause oxygen deficiencies in small children.

Pathogens/Bacteria

Pathogens/bacteria commonly refer to fecal coliform bacteria, which are found in the intestinal tracts of warm-blooded animals, including humans. Concentrations of fecal coliform bacteria in surface water have historically been used as an indicator of waterborne pathogenic bacteria or viruses. Therefore, fecal coliform bacteria concentrations are used as indicators of potential public health concerns. High levels can indicate failing septic systems, poor livestock management practices, poorly operated wastewater treatment systems, municipal storm and sanitary sewers, and other point or nonpoint sources.

Bacterial quality is one measure of water’s ability to provide beneficial uses. The potential sources of nonpoint coliform pollution include:
- On-site septic systems,
- Urban stormwater runoff,
- Livestock, and
- Pets and wildlife.

**High Oil and Grease**

High oil and grease concentrations are associated with urban and industrial stormwater runoff. In addition to representing a water quality problem, they can also serve as indicators of a wide array of hydrocarbon compounds that can be toxic to aquatic life at low concentrations. Typically, oil and grease concentrations are low in receiving waters and are usually associated with runoff events.

**Total Suspended Solids**

Total suspended solids originate from erosion of urban and agricultural soils. Sediments washed off paved surfaces are transported by runoff and discharged to receiving waters. Land-clearing activities associated with urban development as well as poor livestock and crop management can accelerate soil erosion and increase sediment transport to receiving waters. The conversion of land from forest to urban uses increases impervious surfaces and accelerates stormwater runoff. The total volume and peak rate of stormwater is increased due to an increase in impervious surfaces and can cause scouring in stream channels, thereby increasing the suspended solids loading in the stream.

**Metals**

Metals commonly found in stormwater runoff from road surfaces and parking areas include lead, zinc, copper, chromium, arsenic, cadmium, and nickel. Other potential sources of metals originate from commercial car washes, auto repair facilities, and industrial operations. Most metals are adsorbed onto suspended solids present in the runoff and are probably not toxic to aquatic life.

**Toxic Organic Compounds**

Toxic organic compounds include a variety of contaminants such as pesticides, petroleum hydrocarbons, and volatile organic compounds (VOCs). Potential nonpoint sources of these contaminants include urban and agricultural runoff, hazardous substance spills, improper disposal of waste products, and industrial discharges. Compounds that are most frequently found in runoff include phosphates, polyaromatic hydrocarbons (PAHs), VOCs, and some pesticides. The availability of toxic organic compounds to aquatic life is difficult to determine because of their adsorption to particulate matter. Particulate-bound contaminants are usually flushed out of the receiving system during high stormwater flows.
Organic Material

Organic material is an integral component of topsoil. The organic content of soil is primarily produced by microorganisms during the degradation of dead plant and animal material. The microbial degradation of organic matter in aerobic systems results in the consumption of oxygen. Waters high in organic matter may experience depressed oxygen concentrations.

CRITERIA

Water quality standards for surface water in Washington State are established in Chapter 173-201A of the Washington Administrative Code (WAC). Standard criteria allow for comparison of the data of interest to a safe or desired concentration or level. Management practices that violate established standards are subject to further investigation, and ultimately appropriate corrective measures.

The Department of Ecology has responsibility for managing the State’s water resources. The State adopted revised water quality standards in 2003, but the EPA only approved some of them. As a result, the State issued a newly revised water quality standard rule on November 20, 2006, that went into effect on December 21, 2006. The surface waters of Buckley will be governed under this new 2006 rule.

The 2006 rule assigns specific use categories to surface waters of the State, such as aquatic life uses, recreational uses, water supply uses, and miscellaneous uses. Water quality standards have been assigned to each specific use category for parameters such as fecal coliform, dissolved oxygen, temperature, pH, turbidity, and toxic, radioactive, and deleterious substances. According to the rule, the surface waters of Buckley are to be protected for the designated uses: primary contact recreation; domestic, industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values. The surface waters of Buckley differ in their aquatic life use designations. The White River is designated as a use of core summer salmonid habitat while South Prairie Creek is designated an aquatic life use category of char spawning and rearing. Water quality parameters based on these uses are listed in Tables 6-1 and 6-2.

Discharges from the City of Buckley to the White River, Spiketon Ditch, and the PSE Flume include:

- Storm sewers that discharge into Spiketon Ditch, the PSE Flume, and the White River; and
- Wastewater treatment plant discharge located on the White River at approximately River Mile 23.5.
Due to the relatively light level of development in Buckley, impacts on water quality in the White River and Spiketon Ditch associated with storm sewer overflows may be limited. No water quality testing for specific parameters has been done on the stormwater discharges into the adjacent water bodies. The wastewater treatment plant generally meets the discharge effluent limitations contained in the City’s NPDES permit.

In addition to the water quality parameters listed in Tables 6-1 and 6-2, concentrations of toxic substances, such as organic compounds and metals, must not exceed standards specified in WAC 173-201A-240. These standards are based on the EPA Quality Criteria for Water (1986), which are derived from federal water quality criteria based on aquatic toxicology.

The Washington Administrative Code defines both acute and chronic criteria for toxic substances. Acute toxicity criteria are based on death percentages of test organisms within 24 hours. Chronic toxicity criteria are defined as the concentration that causes long-term adverse effects on an organism’s functions.

Water quality criteria for nutrients are not defined in federal or state regulations for surface water. However, because of their influence on algal growth in surface waters, nitrogen and phosphorus are the nutrients of greatest interest in stormwater runoff. Phosphorus is often the limiting nutrient for growth of plants in freshwater systems. Phosphorus enrichment can, therefore, result in the excessive algal blooms and associated nuisance conditions in streams and lakes. The general threshold for eutrophic conditions in lakes is 20 µg/L total phosphorous. Criteria for defining eutrophic thresholds in streams do not exist. However, soluble phosphorous in the range of 15 to 25 µg/L promotes nuisance conditions in streams.
### TABLE 6-1

**Water Quality Criteria for the White River (WAC 173-201A)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>Freshwater – Fecal coliform organisms shall not exceed a geometric mean value of 100 colonies/100 ml, with not more than 10 percent of samples exceeding 200 colonies/100 ml.</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>Freshwater – Dissolved oxygen shall exceed 9.5 mg/L.</td>
</tr>
<tr>
<td>Total Dissolved Gas</td>
<td>Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.</td>
</tr>
<tr>
<td>Temperature</td>
<td>The 7-day average of daily maximum temperatures (7-DADMax) shall not exceed 16.0 degrees C. When natural conditions exceed 16.0 degrees C, no temperature increases are allowed that raise the receiving water 7-DADMax more than 0.3 degree C. (1)</td>
</tr>
<tr>
<td>pH</td>
<td>pH shall be within the range of 6.5 to 8.5 (freshwater) with a man-caused variation within a range of less than 0.2 unit.</td>
</tr>
<tr>
<td>Turbidity</td>
<td>Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.</td>
</tr>
<tr>
<td>Toxic, Radioactive, or Deleterious Materials</td>
<td>Toxic, radioactive, or deleterious material concentrations must be below those which have the potential, either singularly or cumulatively, to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health (see WAC 173-201A-240, toxic substances, and 173-201A-250, radioactive substances).</td>
</tr>
<tr>
<td>Aesthetic Values</td>
<td>Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.</td>
</tr>
</tbody>
</table>

(1) Chapter 173-201A WAC identifies portions of the lower White River requiring protection for spawning and incubation with an additional water temperature standard of 13 degrees C from September 15 to July 1.
### TABLE 6-2

**Water Quality Criteria for South Prairie Creek (WAC 173-201A)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>Freshwater – Fecal coliform organisms shall not exceed a geometric mean value of 100 colonies/100 ml, with not more than 10 percent of samples exceeding 200 colonies/100 ml.</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>Freshwater – Dissolved oxygen shall exceed 9.5 mg/L.</td>
</tr>
<tr>
<td>Total Dissolved Gas</td>
<td>Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.</td>
</tr>
<tr>
<td>Temperature</td>
<td>The 7-day average of daily maximum temperatures (7-DADMax) shall not exceed 12.0 degrees C. When natural conditions exceed 12.0 degrees C, no temperature increases are allowed that raise the receiving water 7-DADMax more than 0.3 degree C.</td>
</tr>
<tr>
<td>pH</td>
<td>pH shall be within the range of 6.5 to 8.5 (freshwater) with a man-caused variation within a range of less than 0.2 unit.</td>
</tr>
<tr>
<td>Turbidity</td>
<td>Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.</td>
</tr>
<tr>
<td>Toxic, Radioactive, or Deleterious Materials</td>
<td>Toxic, radioactive, or deleterious material concentrations must be below those which have the potential, either singularly or cumulatively, to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health (see WAC 173-201A-240, toxic substances, and 173-201A-250, radioactive substances).</td>
</tr>
<tr>
<td>Aesthetic Values</td>
<td>Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.</td>
</tr>
</tbody>
</table>

Groundwater standards in the State of Washington are listed in Chapter 173-200 WAC. The standards establish criteria for maximum contaminant concentrations in terms of primary and secondary contaminants and radionuclides based on human health-based criteria. Special protection areas can be designated because of wellheads and recharge areas that are vulnerable to pollution because of hydrogeologic characteristics, and sole source aquifer status by federal designation. Wellhead Protection Areas have been designated in the City of Buckley and at the Rainier School.

The general impacts of nonpoint sources on beneficial uses that are likely to be of concern to water bodies in or adjacent to the City of Buckley are indicated in Table 6-3.
TABLE 6-3

General Impact of Nonpoint Sources Likely to be of Concern in Buckley

<table>
<thead>
<tr>
<th>Body</th>
<th>Key Pollutants</th>
<th>Affect on Water</th>
<th>Affected Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streams</td>
<td>Sediment/suspended solids</td>
<td>Turbidity deposition in stream pools and wetlands</td>
<td>Loss of flood control capacity, fishing, loss of wetland cleaning ability, visual pollution</td>
</tr>
<tr>
<td></td>
<td>Hydraulic erosion</td>
<td>Streambank loss and sediment deposit downstream</td>
<td>Damage of private and public property</td>
</tr>
<tr>
<td></td>
<td>Bacteria/viruses</td>
<td>Contamination</td>
<td>Swimming</td>
</tr>
<tr>
<td>Groundwater</td>
<td>Nitrates</td>
<td>Loss of use as a drinking water supply</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Toxic organics</td>
<td>Cancer, related diseases</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bacteria/viruses</td>
<td>Contamination</td>
<td></td>
</tr>
</tbody>
</table>

EXISTING BACKGROUND WATER QUALITY SURVEYS

The federal government defines water quality impaired water bodies as the following:

“...any (water body) segment where it is known that water quality does not meet applicable water quality standards, and/or is not expected to meet applicable water quality standards even after the application of the technology based effluent limitations required by 301(b) and 306 of the Clean Water Act” (40 CFR 130.2(i)).

The same federal regulations require that DOE perform a total maximum daily load (TMDL) evaluation, and complete either or both a waste load allocation (WLA) for point sources and a load allocation (LA) for nonpoint sources in water quality-limited areas. The basic goal of the TMDL/WLA procedure is to bring water bodies back into standards compliance by limiting pollutant loading based on the characteristics of the water bodies, rather than by the limits capable from the usual source treatment processes.

The Department of Ecology maintains a list of water quality impaired water bodies in the State. This list is known as the 303(d) List. In general, water quality problems in the vicinity of Buckley include summer high temperatures and low dissolved oxygen levels in the streams and lakes. The Department of Ecology’s Clean Water Act Section 303(d) List includes the following information regarding water bodies in the vicinity of Buckley.

**White River**

The White River is listed on the 2002/2004 303(d) List for temperature, pH, and fecal coliform. These listings include Category 5 303(d) Listings which require the
preparation of a TMDL. The Department of Ecology, the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and the Washington State Department of Fish and Wildlife have determined the White River flow volume is inadequate in the bypass reach of the PSE’s White River Hydroelectric Project (River Miles 3.5 to 24.25). For the 2002/2004 303(d) List, the number of parameters for the White River near Buckley was reduced simply to fecal coliform.

Total maximum daily loads (TMDLs) for ammonia N and BOD 5-day were approved for the Puyallup Watershed in 1994. A TMDL for pH is under development in the lower White (Stuck) River area and TMDLs for temperature are under development for several tributaries of the White River above Mud Mountain Dam. At the time of this plan, an Ecology representative indicated that a TMDL for fecal coliform on the White River will probably not be conducted within the next 5 years.

**South Prairie Creek (Tributary to the Carbon River)**

Spiketon Ditch discharges to South Prairie Creek at approximately River Mile 7. South Prairie Creek was listed on the 2002/2004 303(d) List for fecal coliform. Ecology also listed South Prairie Creek in 1998 for temperature and fecal coliform. According to the 1998 listing, “data collected by the Muckleshoot Indian Tribe indicated 9 excursions beyond the criterion occurred out of 60 samples (15%) during 8/97 and 9/97 at RM 11 on South Prairie Creek, which is well downstream of the City of Buckley water diversion point.”

Ecology completed the “South Prairie Creek Bacteria and Temperature Total Maximum Daily Load Study” in 2003 and specifically identifies that coliform loads from Spiketon Ditch must be reduced. The NPDES Phase II Stormwater Permit for Western Washington Section S7, Compliance with Total Maximum Daily Load Requirements, Subsection A, includes the following:

“For applicable TMDLs listed in Appendix 2, affected permittees shall comply with the specific requirements identified in Appendix 2. Each Permittee shall keep records of all actions required by this Permit that are relevant to applicable TMDLs within their jurisdiction. The status of the TMDL implementation shall be included as part of the annual report submitted to Ecology.

Where monitoring is required in Appendix 2, the Permittee shall conduct the monitoring according to a Quality Assurance Project Plan (QAPP) approved by Ecology.”

Appendix 2, Total Maximum Daily Loads, of the NPDES Phase II Stormwater Permit for Western Washington includes specific requirements for the City due to the South Prairie Creek Bacteria and Temperature TMDL Study. The specific requirements for the City include the following:
“In cooperation with the Pierce Conservation District, investigate Spiketon Creek bacterial sources impacting the city’s stormwater drainage system adjacent to Spiketon Creek while it remains out of compliance with clean water standards. If necessary, identify activities impacting surface discharges to the drainage system and perform sampling to verify bacterial sources, determine the relative contributions of bacteria from these activities, and the combined contribution from the stormwater drainage system at the City outfalls into Spiketon Creek.

Assess current road roadway maintenance practices adjacent to the city’s stormwater drainage system along Spiketon Road. Determine the type, frequency, and schedule of maintenance activity and identify those which indirectly support bacterial contributions. Revise or modify maintenance activities to minimize bacterial contributions.”

**SOURCES OF NONPOINT POLLUTANTS**

The major types of nonpoint pollution sources in the Buckley area are related to urban development, agricultural activities, and transportation-related activities. Other important sources of nonpoint pollution may include illicit connections to the storm drain system, on-site sewage systems, and improper waste storage and disposal practices.

The following sources of nonpoint pollution may occur in the City:

- Lack of preventive maintenance of stormwater facilities,
- Bacterial loading from garbage storage at groceries and restaurants,
- Pollutant wash-off from car and truck parking areas,
- Dumping of used motor oil into the City’s storm drainage system,
- Nutrient loading due to excessive fertilizer usage,
- Bacterial contamination from pet wastes that are not “scooped,” and
- Livestock grazing in close proximity to drainage systems without adequate buffers.

**Urban Development**

Commercial development in the City includes full-service restaurants, a grocery store, motels, agricultural equipment dealerships, and miscellaneous smaller businesses. Potential sources of pollution from these developments include oil and grease, suspended solids and metals from the parking lots, bacterial loads and garbage from improper waste...
storage from residential and business sites, and fertilizers, pesticides, and herbicides from landscaping and farming activities.

Runoff from roadways and parking areas is likely to be contributing metals, such as cadmium and lead, to stormwater runoff. These contaminants are produced by dryfall from vehicle emissions, vehicle wear and tear, and chemical products used in vehicles. Other contaminants that may be associated with businesses in Buckley include toxic organic compounds such as pesticides and PAHs. Volatile organic compounds, such as solvents, may also be present in urban runoff and are typically associated with spills and improper waste disposal activities. Improper chemical storage and waste disposal practices are common sources of contaminants migrating off site from commercial and industrial establishments. The improper use of garbage dumpsters, such as exposing the contents to rain or depositing garbage on the ground rather than in the dumpster, are potential sources of stormwater pollution.

Throughout the City, undeveloped land is being converted to residential and commercial use. The construction-related activities of land clearing and site preparation are potential sources of stormwater pollution. Areas that have been cleared of vegetation are more prone to erosion and can significantly increase sediment loading to nearby water bodies. Sediments can be deposited in natural and constructed channels, thereby reducing the hydraulic capacity. The efficiency and capacity of associated stormwater control structures such as culverts, pipes, and detention facilities is also affected by the deposition of sediment.

The amount of stormwater runoff usually increases during construction activities as vegetative cover is removed. Leaf interception and infiltration provide a natural detention benefit while plant roots generally improve the water holding capacity of soil. When vegetation is removed from an area, the total runoff volume and peak runoff rate increases, which can erode streambanks and accelerate channel scouring. Erosion and scouring of can damage property, destroy riparian habitat, and degrade water quality.

In addition to soil erosion, other pollutants can also be generated by building activities. Pesticides, fertilizers, petroleum products, cleaning solvents, paints, asphalt byproducts, acids, salts, and solid wastes are potential sources of stormwater pollution if improperly handled on a construction site.

The impact of increased development on stormwater pollution does not stop after construction. The volume of stormwater runoff and peak discharge rates increases as a direct result of the increase in the amount of impervious area. Higher flow rates accelerate bank erosion and scour in the receiving systems, which result in an increase in sediment deposition downstream. Higher flow rates can also cause localized flooding where the carrying capacity of natural streams and piped conveyance systems is exceeded. The pollutant load of stormwater in residential areas also increases as development increases. The potential pollutant sources in residential areas include fertilizers, pesticides and herbicides from landscaping activities, biological loads from pet
wastes, waste oil disposal from vehicle maintenance activities, improper disposal of household and yard wastes, and illegal connections of sanitary sewers to the storm sewer system.

Urban development can severely impact wetlands in several ways. Development often includes the filling in of wetlands. When increased stormwater flows due to development are directed to a wetland area, the hydrologic regime of the wetland may be altered which may lead to the destruction of the wetland. Nutrient pollution from urban development may impact wetlands by promoting the growth of nuisance plants and pesticide, herbicide, or fertilizer pollution from urban development may destroy wetland plants. Organic pollution from urban development may increase the oxygen demand in wetlands that may contribute to destruction of existing ecosystems.

Roadways

Stormwater runoff from highways, city arterials, and residential streets can contain elevated concentrations of metals, suspended solids, and organic compounds such as petroleum hydrocarbons. Studies have shown that pollutant loading is directly related to the amount of vehicle traffic during a storm event (Horner and Mar, 1982). Major highways with high vehicle use can be significant sources of nonpoint pollutant loading. Sanding in the winter further contributes sediment to the drainage system. Major thoroughfares in the City include SR 410 and SR 165 and provide access to Wilkeson and the Carbon River Entrance to Mount Rainier National Park. SR 164 and SR 169 link Auburn and Enumclaw with Buckley.

Domestic Activities

Nonpoint pollution from domestic activities in the City consists primarily of pet waste and domestic gardens. Pet wastes are likely the most significant source of nonpoint pollution from residential activities. Runoff laden with animal wastes, fertilizers, pesticides, or herbicides can contribute to nonpoint pollution.
CHAPTER 7

STORMWATER QUANTITY AND QUALITY CONTROL

The following sections discuss general considerations for the control of stormwater pollution from the sources identified in Chapter 6 and present some specific recommendations for the City of Buckley.

GENERAL CONSIDERATIONS IN URBAN STORMWATER QUANTITY AND QUALITY CONTROL

Each issue discussed in the previous chapter for stormwater quality problems represents a classic stormwater quantity or quality management problem. Stormwater management solutions to alleviate the stormwater problem areas must incorporate sound engineering. They must also comply with the current and proposed state and federal regulations, as discussed in Chapter 2. The City of Buckley was issued a Phase II NPDES stormwater permit by Ecology. Phase II is a narrative rule that requires the implementation of Best Management Practices (BMPs) to assure that stormwater discharges will not cause or contribute to instream exceedences of water quality standards. The City will be required to implement and enforce a stormwater management program designed to reduce the discharge of pollutants to the maximum extent practicable (MEP), to protect water quality, and to satisfy the appropriate water quality requirements of the Clean Water Act.

Effective stormwater management is often achieved from a management systems approach, as opposed to an approach that focuses on individual practices. BMPs can be structural or nonstructural facilities, or programs that can be implemented to achieve protection of water quality. Once pollutants are present in a water body, or after a receiving water body’s physical structure and habitat have been altered, it is much more difficult and expensive to restore it to an undegraded condition. Implementation of a management system that emphasizes prevention of receiving water degradation is recommended.

As the consequences of uncontrolled urban runoff have become more widely recognized and better understood, and as more alternatives for control and treatment of runoff have been made available, stormwater management has become more complex. Several general issues have been identified to provide a framework for review of methods employed by the City of Buckley to implement its stormwater management program. These issues are briefly discussed in the following paragraphs and include:

- Stormwater quality versus quantity control,
- Construction phase versus long-term site operation phase,
- Structural versus nonstructural controls,
Source control versus downstream treatment, and
Special sensitive area considerations.

**STORMWATER QUALITY VERSUS QUANTITY CONTROL**

Stormwater management has traditionally been concerned with control of runoff quantities for the purpose of flood prevention. Accordingly, most regulations and engineering design procedures address this concern. The quality of stormwater runoff has become an added concern as the regulatory community has recognized that water quality goals often cannot be realized through control of point sources of water pollution alone.

The design of quantity and quality control begins with the same basic task: predict the amount of runoff resulting under various conditions. In the case of quantity control, the objective is to release storm runoff at a rate that does not exceed stream channel capacity (which may not be the same as matching predevelopment hydrologic conditions for a given site). Excessive flow rates and volume of stormwater can also cause water quality concerns through erosion and bank cutting. For quality control, the objective is to provide sufficient holding time for the effective gravity settling or biochemical removal of pollutants. Because storage may benefit both quantity and quality of runoff, some of the same storage strategies, if correctly applied, can advance both goals. This discussion will emphasize the achievement of dual stormwater quantity and quality control goals wherever possible.

**CONSTRUCTION PHASE VERSUS LONG-TERM SITE OPERATION PHASE**

In general, the types of potential water quality problems associated with construction differ from those associated with the operation of a developed site. Therefore, these project stages should be treated separately in stormwater management planning. At the same time, there should be awareness that some stormwater management measures installed for the construction phase can be converted to permanent service, once construction is complete.

**STRUCTURAL VERSUS NONSTRUCTURAL CONTROLS**

Control of water pollution relies to a large extent on structural treatment devices. Structural stormwater treatment infrastructure includes grass swales, oil/water separators, and wet ponds. Structural stormwater quality and quantity controls are difficult and costly to retrofit into existing development. Nonstructural stormwater quality controls can be employed in new and existing developments. Nonstructural approaches may include enhanced maintenance programs, regulations, public involvement, land use controls, and other measures. The most effective stormwater quality programs utilize a mix of structural and nonstructural alternatives.
SOURCE CONTROL VERSUS DOWNSTREAM TREATMENT

While the distinction is not perfect, source controls generally prevent pollutants from coming into contact with stormwater and they are located at the site of pollutant generation. Downstream treatment infrastructure is typically removed from the source. Source control measures (such as enclosing or covering a pollutant source) are usually applied at multiple locations, while a downstream treatment measure (such as an artificial wetland) often receives drainage from more than one source. In the extreme case, a single downstream treatment structure (such as a regional detention pond) can receive and treat runoff from several subbasins.

CONTROL OF ACUTE VERSUS CHRONIC IMPACTS

Acute impacts are defined as the impact caused by a one-time event. For example, if antifreeze were poured into a catch basin near a creek, a fish kill might result.

Chronic impacts are defined as a constant impact caused by an ongoing event or situation. For example, gradual removal of vegetation and increases in impervious areas associated with road building and development increase runoff rates and reduce groundwater recharge, resulting in erosion and siltation of streams and loss of fish and wildlife habitat.

Different strategies may be required to address acute and chronic stormwater impacts. Methods used to reduce acute and chronic impacts often overlap. The most successful stormwater quality management programs utilize an integrated approach.

SPECIAL SENSITIVE AREA CONSIDERATIONS

Areas particularly susceptible to adverse impacts from urban runoff include:

- Stream corridors, especially those with valuable fish habitat;
- Floodplains;
- Wetlands;
- Steep slopes; and
- Groundwater aquifers and their recharge areas.

Special considerations in stormwater management apply to these areas. These considerations will be brought into the discussion as appropriate.

STORMWATER QUANTITY AND QUALITY CONTROL: STRUCTURAL ALTERNATIVES

Stormwater management alternatives for the control of the quantity of stormwater runoff and the quality of the runoff are not mutually exclusive. The outdated method of
designing stormwater conveyance systems that relied on curbs and gutters to transport stormwater directly into pipes that discharged the stormwater directly into a stream, river, or lake provided little stormwater quantity control and no stormwater quality control. As stormwater management techniques evolve, it has become apparent that many stormwater management tools designed to address quantity issues also aid in improving stormwater quality. In the remainder of this chapter, stormwater management alternatives designed to limit the quantity of stormwater runoff and improve runoff quality will be discussed.

The incorporation of runoff quality controls into urban landscape may be difficult due to space and economic restraints. However, if the design is developed with the following concepts in mind, a good water quality management system will result:

- Design runoff quality controls to capture small storms;
- Design to maximize sediment removal, and removal of other pollutants will generally be good;
- The most effective method for reducing urban runoff pollution is to minimize directly connected impervious area (DCIA);
- Infiltration devices are most efficient but are most difficult to maintain, and should not be used on sites with poor soil conditions;
- Dry detention is easiest to design and operate, but efficiency can be low; and
- Wet detention is more difficult to design but more efficient than dry detention, and often more aesthetic.

Site controls can minimize the quantity of stormwater released as well as provide water quality benefits. Site controls are generally those controls that attempt to reduce runoff rate and volume at or near the point where the rainfall hits the ground surface. The following types of site controls are common:

- Low impact development,
- Storage and regulated release,
- Minimization of DCIA,
- Swales and filter strips,
- Porous pavement and parking blocks, and
- Infiltration devices, such as trenches and basins.
LOW IMPACT DEVELOPMENT

Low impact development is one method for controlling stormwater on a site. The primary goal of low impact development methods is to mimic the predevelopment site hydrology by using site design techniques that store, infiltrate, evaporate, and detain runoff. Use of these techniques helps to reduce off-site runoff and ensure adequate groundwater recharge. As mentioned in Appendix A, the *Puget Sound Water Quality Management Plan* recommends that low impact development include the following:

- Maintain the predeveloped, undisturbed stormwater flows and water quality;
- Retain native vegetation and soils to intercept, evaporate, and transpire stormwater on the site (rather than using traditional ponds and conveyances);
- Emphasize a higher standard of soil quality in disturbed soils (by using compost and other methods) to improve infiltration, reduce runoff, and protect water quality;
- Cluster development and roads on the site and retain natural features that promote infiltration; and
- Reduce impervious surface area and use permeable surfaces instead.

Management practices often used to achieve low impact development goals include bioretention facilities, dry wells, filter/buffer strips, grass swales, rain barrels, rain gardens, cisterns, and/or infiltration trenches. Low impact development is an efficient method for decreasing the amount of runoff associated with developing a site. Maintenance in low impact developments is critical and should be addressed prior to implementation. The 2005 *Low Impact Development Technical Guidance Manual for Puget Sound* by the Puget Sound Action Team/WSU Pierce County Extension is a manual being adopted by a number of jurisdictions to aid in the design of low impact development techniques. Included in this manual is a list of available techniques, appropriate design standards, and maintenance recommendations.

STORAGE AND REGULATED RELEASE

Storage and regulated release of stormwater has been implemented in the City of Buckley in the form of sedimentation and detention ponds, pipes, and ditches. In addition, detention also occurs in the form of ponding in yards, pastures, vacant lots, and ditches. Storage and regulated release of stormwater requires the installation of detention systems to insure that the rate of stormwater runoff leaving the site in the post-development condition is no greater than the predevelopment rate for the same design storm event.
This method of stormwater control minimizes downstream impacts on the existing conveyance system.

Wet and dry detention systems are used for runoff quantity control. If wet detention systems are properly sized, they can also serve as effective runoff quality control devices.

**Wet Detention Basins**

A wet detention basin consists of:

- A permanent water pool,
- An overlying zone with capacity to temporarily store the design runoff volume for release at the allowed peak discharge rate, and
- A shallow littoral zone (the biological filter), which serves to treat the permanent volume between storm events.

The permanent water pool volume and the vegetated littoral zone are important for water quality enhancement. If properly designed and maintained, wet detention ponds can provide effective flood and water quality protection, and ancillary benefits such as enhanced aesthetics and wildlife habitat.

The removal of stormwater pollutants in a wet detention system is accomplished by a number of physical, chemical, and biological processes. Gravity settling removes particles through the physical process of sedimentation. Chemical flocculation occurs when heavier sediment particles coalesce with smaller, lighter particles to form still larger particles. Biological removal of dissolved stormwater pollutants includes uptake by aquatic plants and metabolism by phytoplankton and microorganisms that inhabit the bottom sediments.

**Dry Detention Basins**

Dry detention basins are the most common type of detention basin used for peak flow attenuation. Dry detention systems perform very poorly as treatment devices for runoff. This is primarily due to short residence time and the fact that these basins do not remove any dissolved pollutants.

DIRECTLY CONNECTED IMPERVIOUS AREA

Directly connected impervious area is defined as the impermeable area that drains directly to the improved drainage system, i.e., paved gutter, improved ditch, or pipe. Minimization of DCIA is an effective method of runoff quantity and quality control because it reduces the flow into the improved drainage system and maximizes the opportunity for rainfall to infiltrate. Figure 7-1 illustrates the difference between an area where the DCIA is extensive and one where DCIA has been minimized. The residential lot on the north side of the street has all impervious areas on the lot draining directly to the gutter. This drainage plan does not provide the opportunity for water falling on the impervious surfaces to infiltrate into the ground. The system is laid out so that the rain falling on the impervious areas is quickly concentrated and drained to the gutter. The result is a greatly increased peak runoff rate and runoff volume compared to the predevelopment condition. The pollutants contained in the runoff from the rooftop, driveway, sidewalk, and street are collected in the gutter and must be dealt with downstream.

In contrast, the drainage layout for the lot on the south side of the street has been designed to minimize DCIA. All impervious areas drain to a pervious area before they reach the grassed swale that serves as the primary conveyance facility for runoff from the lot. The roof runoff drains to the lawn and sheet flows across it, the driveway is sloped to drain to the lawn instead of the street, and the sidewalk and the street sheet flow across a grass filter strip before reaching the grassed swale. All of these techniques combine to promote infiltration and reduce the runoff rate. This approach to drainage system layout, which emphasizes peak flow reduction and pollutant capture, is called stormwater management, in contrast with the north lot design, which is simply a drainage plan.

The majority of residences in Buckley, particularly the older homes, have been constructed with minimal DCIA. Commercial development and more recent housing developments tend to exhibit greater DCIA. Future development in the Buckley area should attempt to minimize DCIA.

SWALES AND FILTER STRIPS

Swales, or grassed waterways, and filter strips are among the oldest stormwater control measures. They have been used alongside streets and highways, and to contain, filter, and convey agricultural runoff for many years. A swale is a shallow trench that has the following characteristics:

- Side slopes flatter than 3 feet horizontally to 1 foot vertically,
- Contiguous areas of standing or flowing water only following rainfall, and
- Lined with vegetation suitable for soil stabilization, stormwater treatment, and nutrient uptake.

A filter strip is a vegetated strip of land across which stormwater flows prior to entering adjacent receiving waters. Filter strips receive runoff from streets, parking lots, rooftops, etc.

For small storms, both swales and filter strips remove pollutants from stormwater by reducing the velocity which increases the settling and filtering of solids out of the water as it travels over the grassed area. In addition, depending on the underlying soil conditions, swales and filter strips may allow infiltration into the underlying soil. Vegetation in the filter strip or swale may also function as a fixed media to support growth of microorganisms that can break down dilute concentrations of organics, including oil residues. Heavy metals are typically trapped in the upper regions of the soil column.

In general, the higher the flow rate through a swale or across a filter strip, the lower the efficiency. Thus, low velocity and shallow depth are key design criteria. A swale designed with a shallow bottom slope and check dams will perform more efficiently than one without check dams. Raised driveway culverts can be effective as swale check dams. For maximum efficiency of pollutant removal during small storms, a trapezoidal swale with a large bottom width is desirable. This will maximize surface area to provide stormwater contact with the vegetation and soil.

Design equations for swales and filter strips can be found in Chapter 9, Volume V of the 2005 Ecology Stormwater Management Manual for Western Washington. Maintenance of these devices is critical to maintain aesthetics, hydraulic efficiency, and treatment capacity.

**PARKING BLOCKS**

Parking blocks are a very effective site control device. Parking blocks are hollow concrete blocks similar to the masonry blocks used in construction. In commercial parking lots, private driveways, and parking areas, the use of parking blocks in the less frequently used areas will may reduce runoff quantity, flow rates, and pollution. Parking blocks should only be used in less heavily traveled areas. The traffic lanes should be paved in the normal fashion. Parking blocks are put in place in rows, with soil surrounding each one. Appropriate vegetation is planted to fill the voids in the blocks. Runoff is reduced if the underlying soils allow infiltration in the planted areas. The quality of the runoff may be better than the runoff from a normal parking lot because the vegetation matrix retains the pollutants.
EXAMPLES OF MAXIMIZING (North Lot) AND MINIMIZING (South Lot) DIRECTLY CONNECTED IMPERVIOUS AREAS
INfiltration devices are stormwater quantity and quality control measures that completely capture runoff from the design storm and allow it to infiltrate into the ground. The 2005 Ecology *Stormwater Management Manual for Western Washington* provides design and sizing guidance in Chapter 7 of Volume V (Runoff Treatment BMPs). Infiltration systems provide groundwater recharge and pollutant removal. Infiltration systems can be integrated into a site’s landscaped and open areas. If the system is designed properly, infiltration devices can serve larger developments.

Infiltration devices should be used only in situations where the captured volume of water can infiltrate into the ground before the next storm and where soils, slope, and cover will not promote sloughing and mass wasting (landslides). The applicability of infiltration systems in the Buckley area is limited due to the high groundwater and the underlying soil conditions. Infiltration systems in this area may only be used if tests reveal that sufficient permeability exists within the soil.

Stormwater Management Comprehensive Plan

Management of a stormwater system can be improved by strengthening various areas of city administration. The administrative issues, also termed nonstructural controls, include a wide variety of measures. The NPDES Phase II permit program will require the City to adopt nonstructural controls to comply with the minimum requirements of the program.

Nonstructural stormwater management alternatives include:

- Source control measures,
- Maintenance programs,
- Staff training,
- Changes to the municipal codes or regulations,
- Enforcement actions for noncompliance with stormwater regulations, and
- Public education.

Source Control Measures

Source control measures are designed to minimize or eliminate contact of pollutants with stormwater at the site of origin. Regulation of development, such as requiring the enclosure of a pollutant source, physically segregating the pollutant source to prevent runoff of uncontaminated water, and direct connection of pollutant sources to the sanitary sewer are forms of source control. A requirement for erosion and sedimentation control during construction is a source control method for reducing pollutant load to receiving waters. Source control methods also include education of the public to prevent disposal
of yard wastes, household chemicals, and motor oil into drainage facilities. Source control measures that City staff can implement include pet waste ordinances, pollution prevention/good housekeeping programs for municipal operations, an education program to inform the general public and businesses on the water quality impacts of outdoor washing of automobiles, or an education program to inform businesses of the proper way to store waste materials to prevent pollution carried by stormwater.

The 2005 Ecology Stormwater Management Manual for Western Washington lists many types of BMPs specific to the operation being conducted such as activities for boat yards, commercial composting areas, landscaping, roadside ditches, manufacturing activities, mobile fueling of vehicles, and scrap yards among others. The manual also provides BMPs to apply to all commercial and industrial establishments. These include the following:

- **Formation of a Pollution Prevention Team:** One or more individuals should be assigned responsibility for stormwater pollution control. Regular meetings should be held and should address schedules for maintenance, inspections, operation and maintenance, and emergency situations.

- **Good Housekeeping:** The business should contain and clean up solid and liquid pollutant leaks and spills; sweep paved areas regularly; clean oils, debris sludge, etc.; repair or replace all substantially cracked or damaged paved secondary containment high-intensity parking and any other drainage areas; and repair leaking connections, pipes, hoses, valves, etc., which can contaminate stormwater.

- **Preventative Maintenance:** Prevent discharge of unpermitted liquid or solid wastes to ground or surface water; do not connect floor drains to storm drains, clean oily parts within a building; do not pave over contaminated soil; construct impervious areas that are compatible with the materials handled; use drip pans; and store liquids in containers.

- **Spill Prevention and Cleanup:** Immediately stop, contain, and clean up spills; have spill containment kit readily accessible; notify Ecology if spill has reached storm sewer or groundwater; and do not flush absorbent materials or other spill cleanup materials to a storm drain.

- **Employee Training:** Train all employees that work in pollutant source areas; use Ecology’s “Guidance Manual for Preparing/Updating a Stormwater Pollution Prevention Plan for Industrial Facilities.”

- **Inspections:** Conduct quarterly visual inspections; verify descriptions of pollutant sources, pollutant control BMPs; update site map; include
observations of presence of floating materials, suspended solids, grease, etc.; and conduct annual dry weather inspection for illicit connections to storm drain.

- **Record Keeping:** Retain reports for 3 years on implementation of Stormwater Pollution Prevention Plan (SWPPP) and any reports on spills.

The source control BMPs are found in Volume IV of the 2005 Ecology *Stormwater Management Manual for Western Washington*.

**MAINTENANCE PROGRAMS**

The objective of a stormwater maintenance program is to assure the reliability and dependability of the stormwater system. A complete maintenance program includes more than the following physical tasks of cleaning catch basins, pipes, and open ditches, maintaining the vegetation in biological treatment structures, and the proper disposal of debris from the maintenance activities.

Maintenance programs also involve management items such as completing and maintaining a facilities inventory and maintenance schedule, maintaining cost and manpower information to assist in the budget process, and maintaining a log of citizen drainage complaints and corrective actions.

In order to perform maintenance at the appropriate time, a budget, staff, and priority schedule needs to be established. Certain types of maintenance are more important than others. It is important that catch basins and conveyance facilities be inspected before the wet season to assure that debris has not blocked a channel or taken up capacity in a manhole. Street sweeping in the fall is important because leaves block catch basin grates, which could result in overland flow across private property or flooding of roadways. Loss of vegetative cover in treatment swales and filter strips during summer drought conditions can result in reduced effectiveness during the “first flush” of autumn storms.

Reports and record keeping are important feedback mechanisms that enable management to compare actual versus planned costs, production, and efficiency. Reports provide a database for improved budgeting and resource allocation. Records and reports should include personnel hours, equipment hours, materials used, and the unit of work completed.

Maintenance control establishes accountability for specific results within a specific time frame and budget. The maintenance program needs a control hierarchy to establish a chain of command to complete the work.

Appendix C includes a proposed manual for operating and maintaining stormwater facilities. This appendix also includes a table describing a maintenance schedule to
conclude such procedures in accordance with the NPDES Phase II permit requirements. Within the manual, potential problems and the necessary corrective actions for typical stormwater treatment, detention, and conveyance facilities are noted. Of course, as these facilities are maintained, the need may arise for maintenance at a level more (or less) than these typical values. It should also be noted that at the time of facility installation, the City should request a manual describing specific maintenance necessary for the facility. This, coupled with a routine schedule, will help ensure proper maintenance of the facility.

One item of critical importance is the City’s diligence in inspecting privately owned and maintained facilities. Through the NPDES Phase II permit, the City is required perform inspections and issue notices of inspections to those private parties not maintaining their facilities. To facilitate maintenance of the stormwater system, it is recommended that the City seek easements for those portions of the system that lie outside of the right-of-way.

A sample of the various stormwater facilities that require maintenance are described below.

**Streets**

Streets with concrete curb and gutter or thickened edges are part of the stormwater conveyance system. All streets accumulate vehicular emission particles, silt, leaves, and other debris and pollutants that could enter the stormwater conveyance system. Street sweeping (not washing) is an important maintenance item to reduce pollution in the receiving waters and to reduce the potential for blockage of the conveyance system. Street sweeping is recommended nine times per year, especially towards the fall, after the leaves have fallen.

**Catch Basins**

Catch basins in the City include ones with and without sumps. Sumps are important features that allow the deposition of particulate matter carried in stormwater. When sumps become filled to 60 percent of their volume, the efficiency of silt removal diminishes significantly. Catch basins should be inspected annually. Once a maintenance tracking program is in place, the City will be able to develop a history on particular areas to determine which basins require more frequent attention. Catch basins are normally cleaned with a vactor truck that removes the sediment from the basin. This sediment must be disposed of properly into an appropriate disposal site. Pierce County Transportation Services Road Operations Division operates two Vactor Disposal Sites for its own use. King County operates a Vactor Disposal Site that accepts vactor contents from other entities. For the purposes of this plan, catch basin cleaning is estimated to be required an average of once a year. The NPDES Phase II permit requires inspection of all City catch basins within 5 years.
Storm Sewer Pipes

Pipes in the City vary in size from 12-inch to 48-inch diameter. Pipe types include concrete, clay, corrugated metal, and PVC. All pipes should be inspected and cleaned as needed. A vacuum system is recommended for cleaning. If pipe flushing is used, adequate downstream siltation control must be in place.

Open Ditches

Some roads in the City of Buckley are drained by means of roadside ditches. Ditches and swales can provide biofiltration if vegetation is allowed to remain within the channel and on the sides. The primary pollutant removal mechanism of a bioswale (or ditch) involves filtration by grass blades, which enhance sedimentation, as well as trapping and adhesion of pollutants to the grass and thatch. To be most effective, the vegetation within the ditch should be cut down to a height between 2 and 6 inches. Swales can be cleaned by the use of a horizontal auger. Ditches should be inspected every 9 months and maintained if necessary, preferably during the summer months to allow vegetation to grow back before the rainy season. The edges of the ditches should be mowed four times a year.

Detention Systems

When a detention system is installed, the City should request a manual regarding specific maintenance requirements for the facilities. At a minimum, detention systems should be monitored annually for sediment accumulation. Removal of accumulated sediment is anticipated to be required once every 5 years.

Oil/Water Separators

Oil/water separators must be maintained in order to be effective. If deposited material is not removed on a periodic basis, it may be flushed downstream by winter storms. Inspection of oil/water separators should be scheduled periodically for pollutants and annually for cracks and other structural damage. Maintenance cleaning should be scheduled annually and more frequently if required.

All components of the stormwater system should be inspected per the schedule in Appendix C. Additional inspections may be warranted in problem areas and in areas where land development is occurring, due to the potential for erosion and sedimentation. Routine maintenance should be performed on all components based on these inspections. In general, most jurisdictions do not provide an appropriate level of maintenance for all portions of their system. Maintenance is often reactive, rather than proactive.

Several benefits can be realized by maintaining all portions of the stormwater system. Better treatment and flow control can be achieved with a well-maintained system. The public recognizes a well-run maintenance program. If the system is well maintained, it is
easier to identify problems and resolve complaints. Flooding, icing of roadways, and damage to the system are minimized if the system is well maintained.

**MANAGEMENT OF MAINTENANCE RESIDUALS**

The Department of Ecology developed a guidance document (Recommendations for Management of Street Wastes, Appendix IV-G, 2005 *Stormwater Management Manual for Western Washington*) that addresses waste generated from stormwater maintenance activities such as street sweeping and the cleaning of catch basins and other stormwater conveyance and treatment facilities.

Street wastes include liquid and solid wastes collected during maintenance of catch basins, detention/retention ponds and ditches, and similar stormwater treatment and conveyance structures and solid wastes collected during street and parking lot sweeping. Ecology states that sampling to date has shown that material collected from routine maintenance of streets and stormwater facilities does not classify as dangerous waste. However, if the waste originates from spills or illegal dumping, the waste material could classify as dangerous waste. The owner of the stormwater facility or collector of street waste is considered the waste generator and is responsible for determining whether or not the waste should be classified as dangerous waste.

Street waste from normal street and highway maintenance is solid waste and is regulated by the Solid Waste Management Act (Chapter 70.95 RCW) and under Minimum Functional Standards for Solid Waste Handling (Chapter 173-304 WAC). Local health departments have primary jurisdiction over solid waste management. Street wastes do not typically qualify as clean soil that can be reused as soil due to the presence of total petroleum hydrocarbons (TPH) and polyaromatic hydrocarbons (PAH). If reuse of street wastes is allowed, the appropriate reuse sites are commercial or industrial areas, or other sites where public exposure is limited or prevented.

Ecology has the following recommendations for handling street wastes that do not exceed recommended values for metals, TPH, PAH, and other constituents (Table G.4, Appendix G, Volume IV, 2005 Manual).

**Street Waste Solids**

Street waste solids can be handled by one of the following methods:

- Street sweepings that consist primarily of leaves, pine needles and branches, and grass cuttings from mowing grassy swales can be composted. Litter and other foreign material must be removed prior to composting. Screened trash is solid waste and must be disposed of at an appropriate solid waste handling facility.
Coarse sand screened from street sweeping after recent road sanding, may be reused for street sanding, providing there is no obvious contamination from spills.

Roadside ditch cleanings, not contaminated by a spill or other release and not associated with a stormwater treatment system such as a bioswale, may be screened to remove litter and separated into soil and vegetative matter (leaves, grass, needles, branches, etc.). The solids from these activities are not generally regulated as solid waste. If the ditching material may be contaminated, it must be stored, tested, and handled in the same manner as other street waste solids.

Construction street wastes – solids collected from sweeping or in stormwater treatment systems at active construction sites – may be placed back onto the site that generated it or managed by another method, provided it has not been contaminated as a result of a spill.

Screen street waste soils may be used as feedstock materials for topsoil operations if the street waste has very low levels of contamination.

Fill in parks, play fields, golf courses, and other recreational settings, where direct exposure by the public is limited or prevented. This can be accomplished by covering the fill with sod, grass, or other capping material to reduce the risk of soil being ingested.

Fill in commercial and industrial areas, including soil or top dressing for use at industrial sites, roadway medians, airport infields, and similar sites where there is limited direct human contact with the soil, and the soils will be stabilized with vegetation or other means.

Top dressing on roadway slopes, road or parking lot construction material, and road subgrade, parking lot subgrade, or other road fill.

Recycling through incorporation into a manufactured product, such as Portland cement, prefabricated concrete, or asphalt. The facility operator should be consulted to determine conditions of acceptance.

Other end use as approved by the local health department.

Disposal at an appropriate solid waste handling facility.
If the street waste exceeds the suggested maximum values for TPH, PAH, and other constituents (Table G.4, Appendix G, Volume IV, 2005 Manual) the following disposal methods can be applied:

- Treatment at a permitted contaminated soil treatment facility.
- Recycling through incorporation into a manufactured product, such as Portland cement, prefabricated concrete, or asphalt.
- Other end use as approved by the local health department.
- Disposal at an appropriate solid waste handling facility.

**Street Waste Liquids**

The primary objective of street sweeping or maintenance programs is to collect solids. Street waste liquids usually contain high amounts of suspended solids and adsorbed materials. Discharges of street waste liquids to sanitary sewer or storm sewer generally must be approved by the entity responsible for operation and maintenance of the system. Ecology recommends the following disposal options, in order of preference, for catch basin decant liquid and water removed from stormwater treatment facilities:

- Discharge of catch basin decant liquids to municipal sanitary sewer connected to a public owned treatment works is the preferred disposal option. However, this requires the approval of the sewer authority. Ideally, the liquids would be disposed of at a decant station that provides settling. State and local regulations generally prohibit discharge of stormwater runoff into sanitary sewers to avoid hydraulic overloads and treatment performance problems. The volume of stormwater discharged from catch basins and small stormwater treatment facilities is generally not sufficient to be a problem, provided the discharge point is properly selected and designed.

- Stormwater removed from catch basins and stormwater treatment wet vaults, ponds, or oversized catch basins may be returned to the storm sewer system if other practical means are not reasonably available and pretreatment is provided by discharge back into the pond, vault, or catch basin.

**STAFF TRAINING**

A fundamental part of a stormwater program is training for city personnel on how to address stormwater issues. The City should ensure that the city staff is well trained on how to inspect and maintain the stormwater system. The City is required to train...
personnel on various stormwater issues through the NPDES Phase II permit. At a minimum, staff should be educated on how to maintain catch basins, detention ponds and control structures, bioswales/ditches, and any other best management practices implemented within the City. Staff shall also be knowledgeable in identifying pollutant sources and in understanding pollutant control measures, spill response procedures, illicit discharges/connections, and environmentally acceptable material handling practices. Ecology’s “Stormwater Pollution Prevention Planning for Industrial Facilities” (WQ-R-93-015, 9/93) may be used as a training reference. The Utilities Supervisor may be designated as responsible for setting up training for new employees regarding these issues. Renewal training for all employees on a biannual basis is recommended.

Personnel must be trained to spot and respond to sediment and erosion control issues so they can properly investigate and advise contractors regarding construction problem areas. Staff members should be certified through the “Construction Site Erosion and Sediment Control Certification Course” offered through out the year by the Associated General Contractors of Washington Education Foundation or an approved equivalent. Equivalent certification programs include:

- WSDOT certification in Construction Site Erosion and Sediment Control, and
- Certified Professional in Erosion and Sediment Control (CPESC) offered by the International Erosion Control Association (IECA).

Erosion and sediment control certification for staff members should be renewed every 3 years.

**CHANGES TO MUNICIPAL CODES AND REGULATIONS**

The federal, state, and local rules, regulations, and guidelines that govern stormwater have been discussed in Chapter 2 and Appendix A of this document.

In order to consolidate the various regulations and policy directives, proposed changes to the City’s Stormwater Management Code, BMC 14.30, are included in Appendix E. The proposed changes provide the ability for the City to adopt the 2005 Ecology Stormwater Management Manual for Western Washington. Adoption of this manual will provide the City with a comprehensive technical support document for implementing erosion and sedimentation control facilities on development sites, allow establishment of technical requirements for BMPs, and provide design criteria for structural stormwater management facilities.
ENFORCEMENT

City staffing levels must be sufficient to monitor construction activity, respond to surface water complaints, and provide periodic inspection of private stormwater treatment facilities, such as oil/water separators and detention facilities. Existing staff should document the hours spent on site inspections, together with the frequency of inspection of construction sites and private stormwater facilities. From these records and the records of time spent responding to complaints, an understanding of the adequacy of the current staffing level can be gained.

PUBLIC INVOLVEMENT AND EDUCATION

An important element of a stormwater management plan is public involvement and education. The involvement of the public is necessary to insure the overall success of the stormwater management plan. For the public to be motivated to participate in stormwater management, it must first be made aware of the existing surface water problems, what role the public has in causing surface water problems, and what can be done about them. One of the Phase II minimum requirements is to implement a public education program that informs residents and businesses about the causes and prevention of stormwater pollution.

The general public should be made aware of how their normal activities affect stormwater quality and quantity. Most citizens believe that stormwater management is someone else’s problem. In order to educate the public, it is necessary to identify those subjects that have local relevance and then design a program that addresses those issues. Public education programs in the Buckley area may focus on the following issues:

- Voluntary ditch maintenance,
- Catch basin stenciling,
- Oil recycling center,
- Newsletter articles,
- Citizen hotline, and
- Neighborhood compost bin.

Voluntary Ditch Maintenance

A voluntary drainage ditch maintenance program should be established that encourages property owners to mow and otherwise maintain the drainage ditches adjacent to their properties. Local groups, clubs, and service organizations can be recruited to provide maintenance for drainage features which have a more community-wide significance. The City could provide a clearinghouse for coordination of stormwater volunteer maintenance activities. The goal of the program is to ensure that drainage ditches are maintained in a condition which ensures that they will be able to carry their full design capacity of stormwater when needed. The City may wish to consider an ordinance that requires
property owners to maintain the ditches adjacent to their property. Such an ordinance would be similar to sidewalk maintenance ordinances used by other cities.

**Catch Basin Stenciling**

A program that encourages citizens and local service groups to stencil catch basins is needed to discourage the dumping of oil or other harmful substances and to inform citizens that materials dumped in the catch basins end up in water bodies. The goal of this program could be to have 100 percent coverage of all catch basins stenciled.

Many, if not most, people are unaware that storm drains usually discharge into nearby surface waters. By stenciling all catch basins within the City with an appropriate warning, citizens will be made aware that anything dumped into a catch basin will soon enter the Spiketon Ditch, PSE Flume, or the White River.

**Oil Recycling Center**

This program could encourage a local business to become a drop-off point for recycling of waste oil. The general public must be made aware of the location and hours for the local recycling station, and the procedures for disposing of waste oil at the station.

The goal of this program will be to provide a suitable destination for waste oil. This will serve to provide alternatives to other practices that have been used in the past, such as dumping of waste oil down storm drains. An effort should be made to coordinate the establishment of the waste oil recycling center with other nearby jurisdictions.

**Newsletter or Utility Bill Inserts**

A community newsletter or inserts included with utility bills that addresses stormwater issues should be published. The newsletter or inserts could include articles containing relevant information of local interest to help citizens eliminate or minimize stormwater quantity or quality problems.

The goal of this program would be to place issues concerning activities affecting the watershed before citizens in a timely manner. Issues to be addressed could include:

- Composting,
- Fertilization practices,
- Hazard household waste disposal,
- Waste oil recycling,
- Pesticide use,
- Ditch maintenance,
- Sensitive area protection,
- Waterfowl feeding (adverse effects),
- Wetlands protection/maintenance, and
- Citizen hotline.

**Citizen Hotline**

The City could establish and publish a phone number for use by citizens to report activities that could cause water quality problems. It would also be used for reporting surface water quality problems and illicit discharges/connections.

The goal of this program would be to reduce water quality impacts from stormwater and to assure that appropriate education or enforcement actions are undertaken.

**Neighborhood Compost Bin**

A neighborhood compost bin could provide a site for disposal of yard wastes for residents without sufficient space for a residential compost bin or for those whose properties are unsuitable for such use. The City will maintain and manage the compost bin and use the resulting compost in the city parks and public places.

The goal of this program is to ensure that all yard wastes are disposed of in an environmentally sound manner. Side benefits of this program include the reduction of the quantity of yard wastes sent to landfills and provision of a source of landscaping material for the City.
CHAPTER 8
CAPITAL IMPROVEMENT PLAN

INTRODUCTION

The Capital Improvement Program (CIP) is based on:

- Known storm drainage problems,
- Recommended conveyance improvements based on the results of the hydrologic/hydraulic model, and
- Recommended water quality improvements.

Whenever an inadequate pipe or channel is replaced or reconstructed, the improvement may transfer the problem downstream. Therefore, capital improvement projects for each basin must be coordinated to make sure that downstream problems will not be created or exacerbated.

The cost estimates are conservative in nature and should be considered adequate for planning purposes. Site survey and geotechnical analysis may be required prior to the design of the capital improvements identified in this plan.

The recommended structural alternative for minimizing flooding and localized ponding in the City of Buckley is to repair the under-capacity conveyance facilities in the basins along Ryan Road, Collins Road, and the McNeely Road Basin. Implementation of these projects will minimize flooding in the Spiketon Ditch area and provide the potential for regional water quality treatment and detention in the vicinity of the White River, Puget Sound Energy Flume, or Wickersham Basin.

Table 8-1 includes the recommended capital improvement projects listed in order of priority. The cost per basin includes all recommended projects in the basin. Project costs include 20 percent construction contingency, 8.4 percent sales tax, and 25 percent permitting, engineering, and construction administration fees. These CIPs are also shown on Figure 8-1.

Some aspects of the CIP may be appropriate for implementation by developers, or done in conjunction with street improvement or other utility projects. For planning purposes, all the recommended improvements for each basin are included.
TABLE 8-1

Capital Improvement Projects

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<th>Priority</th>
<th>Project</th>
<th>Location</th>
<th>Estimated Cost</th>
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</thead>
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<tr>
<td>1</td>
<td>CIP 1</td>
<td>Spiketon Bridge</td>
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<td>2</td>
<td>CIP 2</td>
<td>Dundass Avenue</td>
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<td>10</td>
<td>CIP 10</td>
<td>Elk Meadows Ditch</td>
<td>$476,250</td>
</tr>
<tr>
<td>11</td>
<td>CIP 11</td>
<td>Spiketon Road</td>
<td>$173,750</td>
</tr>
<tr>
<td>12</td>
<td>CIP 12</td>
<td>Collins Road</td>
<td>$4,797,500</td>
</tr>
<tr>
<td>13</td>
<td>CIP 13</td>
<td>Ryan Road</td>
<td>$3,771,250</td>
</tr>
<tr>
<td>14</td>
<td>CIP 14</td>
<td>Downtown</td>
<td>$606,250</td>
</tr>
<tr>
<td>15</td>
<td>CIP 15</td>
<td>North Highway 410</td>
<td>$966,250</td>
</tr>
<tr>
<td>16</td>
<td>CIP 16</td>
<td>River Avenue North</td>
<td>$958,750</td>
</tr>
<tr>
<td>17</td>
<td>CIP 17</td>
<td>112th Street East</td>
<td>$1,786,250</td>
</tr>
<tr>
<td>18</td>
<td>CIP 18</td>
<td>Highway 410B</td>
<td>$43,750</td>
</tr>
<tr>
<td>19</td>
<td>CIP 19</td>
<td>Highway 410A</td>
<td>$2,151,250</td>
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Additional Future Projects

<table>
<thead>
<tr>
<th>Priority</th>
<th>Project</th>
<th>Location</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>CIP 4</td>
<td>Division Street (Ryan Diversion)</td>
<td>$277,500</td>
</tr>
</tbody>
</table>

**CIP 1 – Spiketon Bridge** involves the installation of a 12-foot-wide by 3-foot-tall bridge section at the Spiketon Road crossing. This will replace the two 24-inch concrete pipes at Spiketon Road and will help minimize flooding currently experienced in this area during a 100-year storm event. This project is listed as the highest priority due to the extent of flooding seen by residents throughout this area in the past. The estimated cost of this improvement is $243,750.

**CIP 2 – Dundass Avenue** is a project that was brought to the attention of City staff by a resident in 2006. This project includes connecting 135 linear feet of new 12-inch pipe between 3rd Street and 4th Street to the existing storm system. The installation of this pipe should alleviate the flooding seen in this area. This project was given second priority due to its need and its minimal cost. The estimated cost of this project is $77,500.

**CIP 3 – The Sheets Road Diversion** project involves the diversion of flow from Spiketon Ditch to the ditch along the east side of Sheets Road. This ditch flows north, under Ryan Road, and then along the west side of the Rainier School property where it crosses Collins Road, and eventually discharges to the PSE Flume. In diverting water...
1. Spiketon Culverts - 40 LF 12' x 3' Conspan Bridge Section
2. Dundass between 3rd and 4th - 135 LF 12-in pipe
4. Division St. / Ryan Rd. Diversion - 645 LF 24-in pipe; 100 LF Ditch Rehabilitation
5. Hinkelman East - 2,685 LF 36-in pipe, Reverse flow to east
6. Regional Detention Facilities - Feasibility study for potential detention facilities near Highway 410 (Basin A), 112th St., and Collins Rd.
7. Regional Water Quality Facilities - Feasibility study for potential water quality areas at Wickersham Basin and PSE area
8. Hinkelman Ext./Ryan Ext. - 3,440 LF 48-in pipe
9. Ryan Rd. - 3,175 LF 36-in pipe; 1,659 LF parallel 36-in pipe; 1,018 LF 48-in pipe
10. McNeely - 797 LF 24-in pipe; 354 LF
11. Elk Meadows Ditch - 1,915 LF rehabilitated ditch; (2) 3'x3' Box Culverts; 3'x5' Box Culvert
12. Spiketon - 2,151 LF 18-in; 1,464 LF 24-in; Parallel 36" for 1,314 total LF; 3,290 LF 60-in Rehabilitated Ditch
13. Collins - 2,685 LF 36-in pipe; 850 LF 36-in pipe
14. Downtown - 140 LF 24-in pipe; 850 LF 36-in pipe
15. N. 410 - 1,240 LF 36-in; 210 LF 48-in pipe
16. River Ave. N. - 1,720 LF 36-in pipe
17. 112th St. E. - 1,541 LF 36-in pipe; Parallel 1,541 LF 48-in pipe
18. Hwy 410 (Basin B) - 75 LF 12-in pipe, 85 LF ditch rehabilitation
19. Hwy 410 (Basin A) - 5,520 LF 24-in pipe;
north along Sheets Road, flooding will be lessened on the properties surrounding Spiketon Ditch west of Sheets Road. This project involves the upgrade of existing Sheets Road driveway culverts to 36-inch pipes and the replacement of a 36-inch pipe south of Collins Road with 1,025 linear feet of 60-inch pipe. Flow splitters will also be needed to direct flow north along Sheets Road, and then again near Ryan Road where flow will need to be disbursed between the existing 18-inch and 24-inch pipes in this area. This project is given third priority so as to minimize the recurrent flood impacts seen along Spiketon Ditch. The anticipated cost of this project is $672,500.

CIP 4 – The Division Street (Ryan Road Diversion) project is a temporary measure to implement prior to the installation of a 48-inch pipe that will connect runoff from Ryan Road to the existing 48-inch pipes in Hinkelman Extension. The purpose of the Division Street project is to divert water from Ryan Road south along Division Street. By doing so, the first 645 linear feet of pipe will need to be replaced with 24-inch pipe. In addition, 100 linear feet of ditch will need to be rehabilitated near the south end of Division Street. This project was given fourth priority to help alleviate flooding seen along Ryan Road until the 48-inch pipe to the Hinkelman Extension could be installed. The estimated cost of this project is $277,500.

CIP 5 – The Hinkleman Road East Basin is a 58-acre basin that drains to the north via a ditch across private property midway between the Hinkleman Extension and Mundy Loss Road. This improvement is listed as the fifth priority because this subbasin discharges through private property. The recommended improvements in this basin include the installation of 2,685 linear feet of 36-inch pipe on the south of Hinkelman Road. The drainage should be directed east, opposite of its current flow direction, to the 48-inch storm sewer system installed in the Hinkleman Road Extension. The estimated cost of this improvement is $1,587,500.

CIP 6 – The Hinkelman Extension/Ryan Road Extension project was noted above as the installation of 3,440 linear feet of 48-inch pipe. This pipe will connect the Ryan Road storm system to the existing 48-inch pipes at Hinkelman Extension. The pipes will extend west of the intersection of Ryan Road and Division Street, west toward 112th Street East. The installation of this pipe will improve the flooding seen along Ryan Road and A Street. It will also help restore the flow back to its natural discharge location. Due to these reasons, the project is listed as sixth on the priority list. The estimated cost of this project is $2,276,250.

CIP 7 – The McNeely basin includes the area between McNeely Road and the WSU Dairy Farm property, and is bounded on the south by Collins Road and the north by the PSE flume. The improvements in this basin are listed as the seventh priority of the CIP plan. The basin is lightly developed at this time. The ditch and driveway culverts that run north through this basin and along McNeely Road are not adequately sized to convey the 100-year event. The ditch should be rehabilitated for 354 linear feet, and 797 linear feet of pipe and culverts will need to be replaced with 24-inch pipes. The estimated cost of repairing the system deficiencies in this basin is $438,750.
CIPs 8 and 9 – Regional Treatment and Detention Feasibility Studies to identify the feasibility of installation of one or more regional stormwater treatment and detention ponds should be prepared. These projects were ranked eighth and ninth. The City will need the results of the feasibility study in order to evaluate alternatives for system improvements. The use of regional stormwater treatment and detention ponds could eliminate the need for multiple treatment and detention facilities located on private property. Regional ponds, because of their size, may provide better opportunities for water quality treatment and more effective maintenance. The feasibility studies are estimated at $10,000 each.

CIP 10 – The Elk Meadows Ditch project involves the enhancement of an existing ditch and culverts west of Sheets Road along private property. According to local residents, this area floods from Spiketon Ditch under extreme storm events. This project would involve the upgrade of three driveway culverts to two 3’ x 3’ box culverts and one 3’ x 5’ box culvert. In addition, 1,915 linear feet of ditch would need to be rehabilitated to handle the anticipated flow from a 100-year storm. Since this project is on private property, it is listed as tenth on the priority list. The anticipated cost of this project is $476,250.

CIP 11 – The Spiketon Road project is a minor project that resulted from the hydraulic modeling done along Spiketon Road. Under the 100-year storm condition, a 242 linear foot section of ditch was found to have insufficient capacity. Therefore, it is recommended that a 2’ x 3’ box culvert replace this ditch. This project is listed as eleventh in priority and has an estimated cost of $173,750.

CIP 12 – The Collins Road Basin includes the drainage systems along Collins Road, Sergeant Street, and Spruce Street. Improvements in this basin are listed as the twelfth priority due to the extensive costs involved. The basin has a large number of drainage deficiencies and the continuing development in this basin will continue to exacerbate the problem. The improvements recommended in the Collins Road Basin include pipe and ditch replacement. Approximately 2,150 linear feet of 18-inch pipe and 1,464 linear feet of 24-inch pipe would be installed along Collins Road. South of Collins Road, 1,314 linear feet of parallel 36-inch pipe would be installed, which would then connect to the Collins Road system which continues northerly. From Collins Road north, the existing pipe would be replaced with 3,290 linear feet of 60-inch pipe where it would then discharge into the PSE Flume. The estimated cost of repairing the system deficiencies in this basin is $4,797,500.

CIP 13 – The Ryan Road project includes the extension of the new 48-inch pipe of the Hinkelman Extension/Ryan Extension project. A 36-inch pipe was placed in Ryan Road during 2006 that extended from the Division Street/Ryan Road intersection east toward Spiketon Road. According to the hydraulic model, this pipe will need to be supplemented with 1,659 linear feet of a parallel 36-inch pipe. In addition, this project includes the installation of 3,175 linear feet of 36-inch pipe and 1,018 linear feet of
48-inch pipe. In terms of priority, this project was listed thirteenth, after the Hinkelman Extension/Ryan Extension project is completed. The estimated cost for this project is $3,771,250. A possible alternative to this project relates to the option of diverting the ditch system lying east of the LDS Church along the north side of Ryan Road. In the vicinity of the church, the ditch would be diverted south through private property to Spiketon Ditch. Prior to constructing this alternative, the City would need to conduct a feasibility study to investigate the capacity of Spiketon Ditch and other issues related to permitting and easements.

CIP 14 – The Downtown area consists of insufficient 18-inch pipes at the downstream end of the system in this basin. The Downtown project consists of replacing these 18-inch pipes with 140 linear feet of 24-inch pipes and 850 linear feet of 36-inch pipe. This project is fourteenth on the priority list and the estimated cost of repairing the system deficiencies in this basin is $606,250.

CIP 15 – The North Highway 410 project incorporates the replacement of existing pipes with 1,240 linear feet of new 36-inch pipe and 210 linear feet of 48-inch pipe at the downstream end of this basin. Staff and residents do not seem to indicate this area as a current problem, and therefore, this project was placed as fifteenth on the priority list. The estimated cost for this project is $966,250.

CIP 16 – The River Avenue North project is similar to the Downtown and North Highway 410 projects in that it includes the replacement of existing pipes with 1,720 linear feet of 36-inch pipe at the downstream end of the stormwater system in this area. Again, this is not currently seen as a problem by City staff or residents, and so it was placed as sixteenth on the list of priorities. The estimated cost for the River Avenue North project is $958,750.

CIP 17 – The 112th Street Basin is bounded on the south by the high point in the topography south of 112th Street and Mundy Loss Road to the west. The improvements in this basin are given seventeenth priority. The drainage problems here have been minor in nature, yet the hydraulic model indicated that during a 100-year storm along the west end of 112th Street, the existing pipes and ditch need to be replaced with 1,541 linear feet of parallel 36-inch and 48-inch pipe. The estimated cost to repair the system deficiencies in this basin is $1,786,250.

CIPs 18 and 19 – West Highway 410A and 410B are located on the south and north sides of SR 410, respectively. The results of the hydrologic/hydraulic model indicated that the ditch should be replaced with 5,520 linear feet of 24-inch pipe on the south side of SR 410. It was also found that 75 linear feet of 12-inch pipe should be installed on the north side of SR 410 along with 85 linear feet of ditch that should be rehabilitated. The estimated cost of the southern repairs (410A) is $2,151,250 and the cost of the northern repairs (410B) is estimated at $43,750. This project is given a low priority since drainage improvements will most likely be included if WSDOT upgrades the highway.
GENERAL RECOMMENDATIONS

The City must develop a Stormwater Management Program that satisfies the NPDES Phase II requirements. The City filed a Notice of Intent for coverage under the Phase II program with the Department of Ecology in March 2003. The City should begin compliance with the Phase II permit requirements by:

- Developing public involvement and public education policies and programs related to stormwater,

- Enforcing erosion and sediment control and stormwater development standards,

- Developing procedures for the detection and elimination of illicit discharges to the stormwater system, and

- Developing a program for following good housekeeping procedures at municipal facilities.

The City should continue to develop the stormwater system base map and inventory, including a survey of the entire system. The base map should be updated at least once per year. Several areas may require television inspection in order to verify the configuration of the system. The City may choose to utilize summer employees to perform these tasks and preliminary inspections. A proposed Stormwater Management Plan for the City is included in Appendix B.

The City should enact a complete enhanced maintenance program that includes not only cleaning catch basins, pipes, and open ditches, but also includes items such as completing and maintaining a system inventory, maintenance scheduling, assessing costs for contract maintenance versus staff maintenance, and record keeping. In order to ensure that maintenance will be provided on a regular basis throughout the entire City, it is highly recommended that the City obtain easements for those portions of the municipal stormwater system that exist on private property.

During review of development proposals, the City should strictly enforce the development codes with respect to stormwater flow and water quality control, and erosion and sediment control and the requirements of the City’s stormwater design manual.

The City should prepare a feasibility study that investigates the alternatives available for regional stormwater treatment and detention facilities.

Appendix 2, Total Maximum Daily Loads, of the NPDES Phase II Stormwater Permit for Western Washington includes specific requirements for the City due to the South Prairie
Creek Bacteria and Temperature TMDL Study. The specific requirements for the City include the following:

“In cooperation with the Pierce Conservation District, investigate Spiketon Creek bacterial sources impacting the city’s stormwater drainage system adjacent to Spiketon Creek while it remains out of compliance with clean water standards. If necessary, identify activities impacting surface discharges to the drainage system and perform sampling to verify bacterial sources, determine the relative contributions of bacteria from these activities, and the combined contribution from the stormwater drainage system at the City outfalls into Spiketon Creek.

Assess current road roadway maintenance practices adjacent to the city’s stormwater drainage system along Spiketon Road. Determine the type, frequency, and schedule of maintenance activity and identify those which indirectly support bacterial contributions. Revise or modify maintenance activities to minimize bacterial contributions.”

The City has joined the consortium of cities appealing the NPDES Phase II stormwater permit due to the extra requirements resulting from the South Prairie Creek TMDL for water quality sampling. The maintenance information provided in Appendix C identifies methods and schedules for maintenance activities that will minimize bacterial contributions to Spiketon Ditch.
CHAPTER 9

FINANCING ANALYSIS

INTRODUCTION

This chapter discusses methods of providing financing for the stormwater system operation and maintenance program, capital improvement projects, and NPDES Phase II Stormwater Program, which were recommended in Chapter 8, Capital Improvement Plan.

Funding for the capital improvements listed in Chapter 8 is an essential requirement for the implementation of the recommendations. The financial resources available to the City for the implementation of stormwater capital improvement projects, other than service charges and connection charges, include grant and loan funds, debt financing, and improvement districts.

IMPLEMENTATION OF PLAN

The City of Buckley created a stormwater utility in 1992. At that time, the City Council found the level of funding for storm drainage and surface water control to be inadequate to meet current and future requirements to protect private and public property from damage caused by urban stormwater runoff. The Buckley Municipal Code includes:

“All developed real property within the corporate boundaries of the City contributes runoff to the city’s stormwater drainage system and all developed property benefits from the stormwater management efforts of the city and should participate financially in the payment of all expenses for administration, maintenance, operation, and improvement of such a stormwater drainage system.”

In BMC 14.28.010, the Council established the creation of a funding method as one of the purposes of the stormwater utility. This funding method must provide financing for planning, development, management, operation, maintenance, use, and alteration of the surface water management system in the drainage basins of the City.

The current stormwater utility rates, as of January 2008, are $12.61 per month for a single-family residence, $8.32 per month for multifamily residential units, and $12.61 per month per ERU for all other parcels. ERU is defined to mean 8,000 square feet of impervious surface area.

In addition to the monthly stormwater utility fee, the City collects a general stormwater facilities charge of $781/ERU (BMC 14.28.140). An ERU or equivalent residential unit means 8,000 square feet of impervious surface. As described later, the financial analysis
prepared for this plan assumes that this figure will need to be increased to $6,000 to cover future economic impacts.

FUTURE STORMWATER UTILITY OPERATING EXPENSES

Future stormwater utility operation and maintenance expenses are estimated using input from staff, previous maintenance expenditures, and estimates for additional operation and maintenance items.

The City currently does its own catch basin cleaning and ditch maintenance. Maintenance of the stormwater drainage system is mostly performed in response to specific issues. It is recommended that the City perform regularly scheduled maintenance of the catch basins and ditches in accordance with the procedures described in Appendix C. The system should generally be inspected twice during the fall with culverts and catch basins being cleaned as needed. Catch basins are to be vacuumed annually. Leaves are generally removed from choke points twice each fall. Grass is mowed near culverts during the summer and fall.

The City of Buckley maintenance crew currently mows the SR 410 ditches. The Washington State Department of Transportation assists with periodic maintenance.

A projection of future operating costs is based upon a review of costs charged to the stormwater fund during 2005 to 2007 and estimated measures needed to comply with NPDES permit regulations. In 1995, the City began accounting for its stormwater costs by charging the actual hours worked on the stormwater system, rather than a theoretical apportionment. Table 9-1 shows the history of the operation and maintenance costs for the stormwater system based on information provided in the revenue and expense information generated by the City for 2005 and 2006, and the budgeted expenses for 2007.

**TABLE 9-1**

| Stormwater Utility Operating Costs (2005 to 2007) |
|-----------------|-----------------|-----------------|
|                | **2005**        | **2006**        | **2007**(1)     |
| Operations     | $ 68,052        | $ 73,274        | $104,284        |
| General Services | $ 11,446       | $ 13,796        | $ 22,044        |
| Contract Work  | $129,500        | $165,000        | $ 32,500        |
| Other Financing| $ 64,628        | $ 73,159        | $ 63,163        |
| **Total**      | **$275,631**    | **$327,235**    | **$221,991**    |

(1) The 2007 costs are the budgeted costs, not actual costs.

The operating costs shown in Table 9-1 reflect contract work. The contract work will be adjusted for the estimated capital improvement project costs estimated over the next
10 years as appropriate. This plan will assume that the future operating costs will begin in 2008 based on the budgeted operation costs for 2007 minus the contract work, $159,491, and then inflated 3 percent per year for each year thereafter.

STORMWATER UTILITY REVENUES

The rate basis is a method by which the revenue required to maintain the stormwater system is recovered from utility customers. The most common rate basis for stormwater utilities is contribution of runoff, reflecting the belief that those who cause the problem are most served by the maintenance services provided. Contribution of runoff is often measured by the amount of “impervious” surface area on a property. Impervious surface area is defined as hard surface that retards or prevents the absorption of water into the ground. Examples include rooftops, paved parking lots, sidewalks, and patios.

Typically single-family residential stormwater customers are charged for one equivalent unit. BMC names the equivalent unit as an Equivalent Residential Unit (ERU) in BMC 14.28.120 and as an Equivalent Service Unit (ESU) in BMC 14.28.130. For commercial and industrial development, charges are based on the amount of impervious surface area. The City of Buckley defines a commercial ERU/ESU as 8,000 square feet of impervious surface. In practice, the City charges commercial connections twice the single-family residential rate. For the purposes of this analysis, the number of ERUs in the City was estimated by dividing the total stormwater revenue by the 2007 single-family residential rate of $8.88. In doing this estimate, the commercial and residential ERUs are combined and are then averaged to determine the equivalent number of single-family residential ERUs that exist in the City. The estimated total number of equivalent single-family residential ERUs in 2007 is 1,648.

The City also charges a one-time utility general facilities charge at the time a property is developed. The ESU for the general facilities charge is defined in BMC 14.28.140(2) as 3,600 square feet of impervious groundcover, with a minimum on one ESU.

CAPITAL IMPROVEMENT FINANCING

The recommended capital improvements for the stormwater utility are detailed in Chapter 8. The list of projects, recommended schedule for implementation, their costs in year 2007 dollars, and their costs adjusted for a 3 percent annual inflation factor for the year they are scheduled to be constructed are shown in Table 9-2. It should be noted that the McNeely, Elk Meadows, Spiketon Road, and Collins Road projects are beyond the 6-year CIP horizon.
TABLE 9-2

Recommended Capital Improvements

<table>
<thead>
<tr>
<th>Priority</th>
<th>Project</th>
<th>Estimated Date</th>
<th>Estimated Cost (2008 dollars)</th>
<th>Estimated Cost in Year of Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spiketon Bridge</td>
<td>2010</td>
<td>$243,750</td>
<td>$243,750</td>
</tr>
<tr>
<td>2</td>
<td>Dundass Avenue</td>
<td>2011</td>
<td>$77,500</td>
<td>$77,500</td>
</tr>
<tr>
<td>3</td>
<td>Sheets Road Diversion</td>
<td>2012</td>
<td>$672,500</td>
<td>$733,025</td>
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<tr>
<td>4</td>
<td>Division Street (Ryan Diversion)</td>
<td>2012</td>
<td>$277,500</td>
<td>$302,475</td>
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<td>5</td>
<td>Hinkelman East</td>
<td>2012</td>
<td>$1,587,500</td>
<td>$1,730,375</td>
</tr>
<tr>
<td>6</td>
<td>Regional Detention Facilities</td>
<td>2013</td>
<td>$10,000</td>
<td>$10,600</td>
</tr>
<tr>
<td>7</td>
<td>Regional Water Quality Facilities</td>
<td>2013</td>
<td>$10,000</td>
<td>$10,600</td>
</tr>
<tr>
<td>8</td>
<td>Hinkelman Extension/Ryan Extension</td>
<td>2014</td>
<td>$2,276,250</td>
<td>$2,617,688</td>
</tr>
<tr>
<td>9</td>
<td>Ryan Road</td>
<td>2014</td>
<td>$3,771,250</td>
<td>$4,336,938</td>
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<td>10</td>
<td>McNeely</td>
<td>2016</td>
<td>$438,750</td>
<td>$530,888</td>
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<tr>
<td>11</td>
<td>Elk Meadows Ditch</td>
<td>2016</td>
<td>$476,250</td>
<td>$576,263</td>
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<td>12</td>
<td>Spiketon Road</td>
<td>2017</td>
<td>$173,750</td>
<td>$215,450</td>
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<td>13</td>
<td>Collins Road</td>
<td>2018</td>
<td>$4,797,500</td>
<td>$6,092,825</td>
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</table>
Two analyses are presented in Tables 9-3 and 9-4, showing budget projections for the 10-year CIP as well as estimated operation and maintenance costs. The budget projections assume annual stormwater operation and maintenance expenses for the years 2008 through 2017, based on the budgeted expenses for 2008 and the estimated Stormwater Management Program costs associated with complying with the NPDES Phase II permit. All expenses are increased by a 3.0 percent annual inflation factor in the rate analysis. The number of ERUs paying stormwater utility rates each year is increased by 2.2 percent, one-half of the growth projection presented in the City’s Comprehensive Plan to compensate for the housing slowdown seen in 2008.

Table 9-3 represents a scenario where the City pays for CIPs through Public Works Trust Fund (PWTF) loans. The second scenario, shown in Table 9-4, includes the City paying for CIPs through loans obtained through other sources at an estimated interest rate of 6 percent. In both tables, the rates were increased from 2009 to 2017. The utility currently does not collect enough revenue to support the CIP plan at the present utility rate. The current single-family residential rate is $12.61 per year. For analysis purposes, this rate was raised 3 percent per year to a rate of $16.45 in 2017. These rate increases are necessary to insure that all future operation and maintenance costs can be paid by rates alone. General facility charges should apply only to capital improvement projects, not operation and maintenance costs. Due to this, the general facility charge was increased significantly from the 2007 value of $781/ESU to $6,000/ESU in 2008. For both scenarios presented in Tables 9-3 and 9-4, the $6,000 facilities charge remained the same through 2017. Each year, the total collection from facilities charges was estimated to be the anticipated city growth rate (4.8%) multiplied by the existing number of ERUs present in the City for that particular year, which was then multiplied by the $6,000 charge. The drastic increase of $781 to $6,000 in general facility charges is necessary to pay for the capital improvement projects listed in Table 9-2. If the general facility charge remained at $781, the City’s rates would have to increase significantly to cover the costs of the projected CIPs.

The analysis in Table 9-3 assumes the capital improvement projects from Table 9-2 are funded from monthly service rates, connection charges, and a low-interest loan from the PWTF program. Use of these low-interest loans may be financially favorable to self-financing, as long as the interest costs of the loans are less than the interest that can be earned from reserve funds. These programs are discussed in detail in the next section. For the purposes of this discussion, we have assumed that all CIPs except for CIPs 2, 6, 7, and 12 (Dundass, Regional Detention Study, Regional Water Quality Study, and Spiketon Road, respectively) are funded by a 1 percent, 20-year PWTF loan. This loan would require a 10 percent cash match in the first year of the project. The CIPs not funded by the PWTF loan would be covered by city funds collected from rates and connection charges.

The analysis in Table 9-4 assumes that the same CIPs funded by PWTF loans in Table 9-3 are funded through monthly service rates, connection charges, and a 6 percent
interest loan instead of the low-interest PWTF loans. As in Table 9-3, the remaining CIPs would be funded through rates and connection charges. A 6 percent interest loan allows for less cash needed at the beginning of a project, but it will require more money over time. The 6 percent loan option does not depend on a selection process like the PWTF program, and therefore, in terms of budgeting, would provide a more reliable option to the City.

The Capital Improvement line items in Tables 9-3 and 9-4 include the cash payments the City will contribute to the project. The debt service paid for the remainder of the project costs are shown in the Debt Service line items. This analysis assumes the City will contribute 10 percent cash to the cost of the project if a project is funded by a low-interest PWTF loan. If the same project is funded by a 6 percent loan or bond, the City would not contribute cash to the project but would finance all project costs.

The information provided in Table 9-3 indicates that an increase of 31 percent in 2009 followed by annual 3 percent increases in 2010 through 2012, an increase of 10 percent in 2013, and an annual 3 percent increase in rates from 2014 through 2017 would allow the City to complete the recommended 10-year CIP schedule and maintain cash on hand through 2016 if the CIP projects are funded with a low-interest loan. The information provided in Table 9-4 indicates that an increase of 31 percent in 2009 followed by annual 3 percent increases through 2017 would allow the City to complete the recommended 10-year CIP schedule and maintain cash on hand through 2016 if the CIP projects are funded with a 6 percent loan or bond. The City will review rates annually, in conjunction with the city’s growth rate, to determine appropriate rates needed to complete the planned CIPs. The priorities of the CIPs shall also be reevaluated based upon development potential and the need for emergency repairs.
TABLE 9-3
Projected Stormwater Utility Budget with CIP (PWTF Loans)

<table>
<thead>
<tr>
<th></th>
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<td>$165,012</td>
<td>$1,876,158</td>
<td>$1,355,201</td>
<td>$1,100,807</td>
<td>$1,003,489</td>
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<tr>
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- City funded project
- Rate Increase: 3.0%
- City Growth: 4.8%
- Interest Earned Rate: 2.0%
- Wage/Benefit Expense Increase: 3%
- Other Expense Increase: 3%
- Capital Cost Increase per year from 2008: 3%
- General Facility Charges: $6,000

City of Buckley
Stormwater Management Comprehensive Plan
September 2008
## TABLE 9-4
Projected Stormwater Utility Budget with CIP (6% Loans)

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<td>1,988</td>
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<td><strong>$15.97</strong></td>
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<td>Interest (Earned Based on Beg Fund Bal)</td>
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</table>
ALTERNATIVE CAPITAL FINANCING SOURCES

GRANT AND LOAN FUNDS

There are several grant and loan funds available for capital improvements. Among these are the PWTF, Centennial Clean Water Fund (CCWF), and the State Revolving Fund (SRF). In addition, the Department of Ecology Flood Control Assistance Account Program (FCAAP) can be utilized to construct flood control projects. The Aquatic Lands Enhancement Account (ALEA) provides grants for preservation or improvement of wetlands, natural systems, waterfront redevelopment, plus some aquatic-land related planning. Grant funding is extremely limited, therefore, loans are the more likely source for outside funding.

PUBLIC WORKS TRUST FUND

The PWTF is a revolving loan fund designed to help local governments finance needed public works projects through low-interest loans and technical assistance. The PWTF, established in 1985 by legislative action, offers loans substantially below market rates, payable over periods ranging up to 20 years.

Interest rates are 0.5 percent, 1.0 percent, or 2.0 percent, with the lower interest rates providing an incentive for a higher financial share. To qualify for a 2.0 percent loan, the local community must provide a minimum of 5 percent local matching funds of the project’s costs. A 10 percent local share qualifies the applicant for a 1.0 percent interest rate and a 15 percent local share qualifies for a 0.5 percent loan. The useful life of the project determines the loan term, with a maximum term of 20 years.

To be eligible, an applicant must be a local government such as a city, town, county, or special purpose utility district, and have a long-term plan for financing its public works needs. If the applicant is a town, city, or county, it must adopt a 1/4 percent real estate excise tax dedicated to capital purposes. Eligible public works systems include streets and roads, bridges, storm sewers, sanitary sewers, and domestic water. Loans are presently offered only for purposes of repair, replacement, rehabilitation, reconstruction, or improvement of existing eligible public works. Eligible project costs can include expenses related to serving 20-year forecasted growth as identified in comprehensive plans.

CENTENNIAL CLEAN WATER FUND

The CCWF is administered by the Department of Ecology and provides loans and grants for projects that enhance water quality. Eligible stormwater projects include water quality treatment facilities and projects or facilities that address nonpoint pollution problems. Projects which only address flood control or wetlands purchases are not eligible under CCWF. Under the CCWF grant program, water quality facilities construction projects
may receive 50 percent of the eligible cost; however, grant funding is only available to those who can document hardship. Hardship is demonstrated when projects costs for construction of facilities results in total cost for debt service and operation and maintenance that exceeds 1.5 percent of the median household income. The design and construction of water quality facilities are also eligible for 100 percent loans. Recent loan terms have been 1.5 percent interest rate up to 5 years and 3.1 percent between 5 and 20 years. The CCWF is a competitive program. Applications are scored according to a rating system that includes such factors as seriousness of the water quality problem, public health impacts, and beneficial impact of the project on water quality.

STATE REVOLVING FUND

The SRF program will provide loans for stormwater-related projects. The Department of Ecology administers the SRF program. Projects that are eligible for funding under this program must have a component that contributes to the improvement of water quality. Flood control projects are not eligible. Loan terms vary depending on the payback period. Recent loan terms are 2.7 percent interest on loans for 20 years with 1.4 percent interest on loans paid back in 5 years. Loans can cover 100 percent of the project cost.

FLOOD CONTROL ASSISTANCE ACCOUNT PROGRAM

The FCAAP was established by the State of Washington in 1984 to assist local jurisdictions with comprehensive flood planning and maintenance efforts to reduce flood damages. The program is administered through the Department of Ecology in association with the Department of Fish and Wildlife and County engineers. Funding for the program is approximately $2.0 million each biennium. Operations, maintenance, and capital improvement projects are all eligible for grant assistance as long as the public entity has a certified comprehensive flood control management plan in place. The FCAAP is generally written through the county. This means that the all projects within the county are ranked and compete for the portion of the total FCAAP funds available to the county. The City of Buckley received a grant from FCAAP in 1998 to complete a Flood Hazard Management Plan. This plan was completed in 2001 by Gray & Osborne and approved by Ecology in early 2002.

AQUATIC LANDS ENHANCEMENT ACCOUNT

The ALEA was established in 1994 to provide grants to cities, towns, counties, and port districts for preservation or improvement of wetlands, natural systems, waterfront redevelopment, plus some aquatic-land related planning. The maximum grant is $100,000 and the project must be associated with state-owned aquatic lands. A storm project that redirects or treats runoff and thus improves state-owned aquatic lands would be an eligible project under this program.
DEBT FINANCING

Two forms of debt financing are available for capital improvements including general obligation (G.O.) bonds and revenue bonds. General obligation bonds are backed by the “full faith and credit of the City” and are paid for through property tax levies. These bonds require voter approval before they can be implemented. A less common means of financing capital improvements associated with stormwater projects is through the use of revenue bonds. The City, like other municipalities, is capable of issuing tax-exempt bonds. The principal and interest of such bonds are repaid from revenue generated from a water, sewer, or stormwater utility. This type of funding may be offered without voter approval. However, in order to qualify to sell revenue bonds, the City must establish that its net operating income, gross income less expenses, is equal to or greater than its debt coverage factor (typically 1.3 to 1.4) times the annual principal and interest due for all outstanding bonded indebtedness. Essentially, utility rates have to be set high enough to ensure revenue bond repayment.

DEVELOPER FEES

The City may require improvements for service to a property within new plats or commercial improvements to be financed by the developer. The developer, for example, is usually required to construct detention facilities in accordance with city standards or pay into a fund for construction of an off-site facility to service multiple properties. The alternative approach allows the City to develop facilities in a planned and cost-effective manner. However, several developments are generally required before the City has available funds to construct a regional facility. The City has little control over the scheduling of such facilities unless alternative funding sources, such as service charge revenues, are utilized on a short-term basis to fund initial construction and are then repaid as developer fees are collected.

IMPROVEMENT DISTRICTS AND SPECIAL ASSESSMENTS

Levying of special assessments on benefited properties has been used throughout the State for stormwater improvements. Projects funded through special assessments must have an identifiable benefit to the properties included in the assessment area, and charges for each parcel must be consistent with the relative benefit to each property. In Washington, municipalities can establish a local improvement district (LID) or utility local improvement district (ULID). These approaches require an assessment against benefited property owners within the district boundaries. In order to establish the district and implement this approach, a minimum percentage of property owners within the proposed district must vote their approval.

The use of LIDs to fund stormwater projects is complicated by the difficulty in quantifying benefits for individual property owners. For water and sewer improvements,
for example, the benefits are generally easy to identify. With drainage improvements, however, upstream or hillside properties, which could contribute significantly to runoff, may actually benefit little from improvements because of their protected location. One result may be to narrowly establish the boundaries of the LID, which may be counterproductive to comprehensive stormwater management. Another problem with LIDs is that they place heavy administrative burdens on City staff to maintain the improvements in the district.

**RECOMMENDATIONS**

The City should obtain loans with an interest rate of 6 percent (or lower) to complete the planned CIPs described in Chapter 8. The stormwater utility fees will need to be increased from $12.61 in 2008 to $20.93 in 2017 in order to finance the CIP program as presented. The 6-year budget should be reevaluated annually to account for changes in operation and maintenance expenses, city growth rates, and collection of service connection charges.
APPENDIX A

REGULATORY ISSUES
APPENDIX A

REGULATORY ISSUES

INTRODUCTION

Stormwater drainage planning and construction have historically been provided to drain property and roadways, and protect structures and property from damage due to stormwater runoff. Over the last 30 years, many new regulations have come forth to protect the natural environment from the increasing flows and pollution contained in stormwater runoff. Chapters 6 and 7 describe many of the water quality and quantity problems associated with today’s urban stormwater runoff.

The federal government has delegated Washington State the authority to implement the rules and regulations of the Clean Water Act within the State. The State has delegated some of this authority to the local agencies (city, county). Local agencies enact development regulations to enforce the rules set down by the State. Local agencies are free to enact and enforce rules and policies that are more stringent than those of the State, but they cannot enact any that are less stringent. Permits may be issued by all three levels of government depending on the type of project and the impacts it may have on the natural drainage systems, which may include streams (intermittent or year-around flows), wetlands, lakes, ponds, rivers, estuaries, marine waters, and groundwater.

The role of federal, state, and local stormwater regulations is to provide minimum standards for the drainage and discharge of stormwater runoff. The goals of the regulations are: (1) to reduce the damaging effects of increased runoff volumes due to increased urbanization, (2) to prevent pollutants from being discharged into runoff, and (3) to remove the pollutants that become entrained in the runoff.

Because of changing administrations, conditions, and technology, all of these policies, rules, and regulations are subject to significant change through time.

FEDERAL REGULATIONS

The federal government regulates stormwater through several different programs. Responsibility for implementing the policies of these programs is often delegated to the state and local agencies through various rules, regulations, and permitting policies. The federal government maintains responsibility for activities that are of national interest.

FEDERAL WATER POLLUTION CONTROL ACT (CLEAN WATER ACT)

The Clean Water Act (CWA) is a 1977 amendment to the Federal Water Pollution Control Act of 1972, which set the basic structure for regulating discharges of pollutants
The CWA makes it unlawful for any person to discharge any pollutant from a point source into waters of the United States unless a National Pollutant Discharge Elimination System (NPDES) permit is obtained under the act.

The CWA provides for the delegation by the EPA of many permitting, administrative, and enforcement aspects of the law to state governments. In states with the authority to implement CWA programs, the EPA still retains oversight responsibilities.

**Phase I NPDES Stormwater Permits**

The EPA set regulations for Phase I stormwater permits in 1991 for large and medium municipalities as well as industries and construction sites. The NPDES permit program was originally designed to reduce pollution from point sources such as domestic and industrial wastewater discharges. Section 402 of the CWA establishes a regulatory program for point sources of pollution, but exempts most agricultural activities. Phase I of the program included runoff discharges from specific industrial activities, including construction sites that disturb more than 5 acres of land and runoff discharges operated by local governments with a population over 100,000. Compliance with the Phase I NPDES permit requires the development and implementation of a plan to reduce the discharge of pollutants to the “Maximum Extent Practicable,” protect water quality, and satisfy the appropriate water quality requirements of the Clean Water Act.

**Phase II NPDES Stormwater Permits**

The EPA issued draft regulations for Phase II NPDES stormwater permits in January 1998 and issued final Phase II regulations on December 8, 1999. The EPA proposes to cover all urban areas, areas with populations greater than 10,000, or located in a federally designated urbanizing area not initially covered by Phase I regulations under a general Phase II permit. The City of Buckley is located in a federally designated urbanizing area and is therefore subject to the requirements of the Phase II permit. The regulations call for the development and implementation of a Stormwater Management Program (SWMP) which shall include the following components:

1. Public Education and Outreach Program:
   a. A public education and outreach program must be implemented to reduce or eliminate behaviors and practices that cause or contribute to adverse stormwater impacts.
   b. Communities should be made aware of the impacts of stormwater discharges to water bodies and the available steps to reduce stormwater pollution.
The City may use stormwater educational materials provided by Ecology, Tribes, EPA, public interest or trade organizations, or other MS4s.

2. Public Involvement and Participation Program:

   a. The public must be involved in the development and implementation of the City’s SWMP. This participation process must comply with State, Tribal, and local public notice requirements.
   b. Public participation opportunities could involve inviting citizens serving on local stormwater management panels, public hearings, and recruiting citizen volunteers for education and monitoring efforts.

3. Illicit Discharge Detection and Elimination Program:

   a. The permittee is required to develop, implement, and enforce a program to detect and eliminate illicit discharges.
   b. A municipal stormwater conveyance system map must be developed and maintained that includes information on all known outfalls, receiving waters, and structural stormwater Best Management Practices (BMPs) owned, operated, and maintained by the permittee.
   c. The permittee must develop and implement ordinances or other regulatory mechanisms to prohibit illicit discharges.
   d. Public employees, businesses, and the general public must be informed of the hazards associated with illegal discharges.

4. New Development, Redevelopment, and Construction Runoff Program:

   a. Permittees must develop, implement, and enforce a program to reduce pollutants in stormwater runoff to a regulated small MS4 from all new development, redevelopment, and construction site activities that result in land disturbances of at least 1 acre or more. This includes projects less than 1 acre that are part of a larger common plan of development or sale.
   b. An enforceable regulatory mechanism such as an ordinance must be used to control this runoff. This measure must include the minimum requirements, technical thresholds, and definitions of Appendix 1 of the Ecology NPDES Phase II permit.
   c. The program shall include a permitting process containing plan reviews, inspection, and enforcement capabilities.
d. The program must ensure adequate long-term operation and maintenance measures are in place.

e. Records of inspections and enforcements by staff must be maintained.

5. Pollution Prevention (Good Housekeeping) Program: Permittees must develop and implement an operation and maintenance (O&M) program, including a training component, with the goal of preventing or reducing pollutant runoff from municipal operations.

The stormwater management measures must include quantitative goals and a description of how these goals will be met.

Phase II applies to *regulated small* municipal separate storm sewer systems. The regulatory definition of “municipal separate storm sewer system” according to 40 CFR 122.26(b)(8) is, “municipal separate storm sewer” means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

(i.) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law)...including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges into waters of the United States.

(ii.) Designed or used for collecting or conveying storm water;

(iii.) Which is not a combined sewer; and

(iv.) Which is not part of a Publicly Owned Treatment Works as defined at 40 CFR 122.2.”

The NPDES permittee must submit reports to the permitting authority on an annual basis during the first permit term.

The reports must include the following:

- The status of compliance with permit conditions including:
  - Status of implementation of each of the SWMP components,
  - Assessment of progress in meeting minimum performance standards of each of the SWMP components,
• A description of activities being implemented to comply with each of the SWMP components, and
• A detailed SWMP implementation schedule and plans for meeting permit deadlines;

• Notice of relying on another governmental entity to satisfy some of the permit obligations (if applicable);

• Notice of any annexations or incorporations resulting in an increase in the geographic area of the permit;

• Updated information from the prior annual report plus any new information received during the reporting period; and

• Certification and signature of the report and notification of any changes to authorization.

Phase II NPDES permits for municipal and industrial point and nonpoint source discharges in the State of Washington are issued and administered by the Department of Ecology. An estimated 102 municipalities are subject to the Phase II requirements. The Department of Ecology issued the NPDES Phase II permit in January 2007. The State is requiring that jurisdictions needing a Phase II NPDES permit adopt either the Department of Ecology’s 2005 Stormwater Management Manual for Western Washington or an equivalent manual. A proposed Stormwater Management Program meeting the NPDES Phase II permit requirements can be found in Appendix B of this plan. Likewise, proposed operation and maintenance standards for public facilities meeting the Phase II permit requirements can be found in Appendix C.

Total Maximum Daily Loads

Total maximum daily loads (TMDLs) are an assessment of the amount of pollutant a water body can receive and not violate water quality standards. A TMDL determines how much pollutant load a lake or stream can assimilate. TMDLs take into account pollution from all sources, including stormwater runoff from developed and natural sources.

Section 303(d) of the Clean Water Act contains requirements for the identifications and prioritization of impaired water which require TMDLs. When a TMDL is developed, it is implemented through existing NPDES permits for point source discharges, and voluntary nonpoint source control programs to achieve the necessary pollutant reductions. If a community is regulated under the Phase I or Phase II NPDES stormwater permits and the receiving water body has a TMDL, the stormwater management program must address TMDL issues.
The White River and South Prairie Creek are both listed on the 2002/2004 303(d) List for fecal coliform. The White River is listed under Category 5 by Ecology and South Prairie Creek is listed under Category 4A, meaning that a TMDL has been approved and is currently being implemented. South Prairie Creek is also listed under Category 2, Waters of Concern, for pH. In addition, Spiketon Ditch is also listed under Category 2 for fecal coliform. The White River is a Category 5, which means water quality standards for fecal coliform have been violated and there is no TMDL in place. This area should be monitored carefully to ensure the health of the White River is not compromised and the City is not in violation of any “take” limits under the Endangered Species Act (ESA). At the time of this plan, an Ecology representative indicated that a TMDL for fecal coliform on the White River will not likely be created within the next 5 years.

ENDANGERED SPECIES ACT

The purpose of the 1972 ESA is to “provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved...” In pursuit of this goal, the ESA authorizes the United States Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service to list species as endangered or threatened, and to identify and protect the critical habitat of listed species. The USFWS has jurisdiction over terrestrial and freshwater plants and animals such as bull trout, while the NOAA Fisheries Service is responsible for protection of marine species including anadromous salmon. Under the ESA, endangered status is conferred upon “any species which is in danger of extinction throughout all or a significant portion of its range...,” while threatened status is conferred upon “any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” The ESA defines critical habitat as the “geographical area containing physical and biological features essential to the conservation of the species.”

NOAA Fisheries Service

Under the ESA, the NOAA Fisheries Service is responsible for the protection of marine life, including anadromous salmon such as Chinook and Coho, and steelhead. The threatened status of many anadromous salmon and steelhead species allowed the NOAA Fisheries Service to establish regulations designed to protect these species under the Section 4(d) rule.

The NOAA Fisheries Service has designated the White River to contain Chinook.

United States Fish and Wildlife Service

Under the ESA, the USFWS is responsible for the protection of all non-marine life such as bull trout. The bull trout was listed as threatened in 1999. The White River has been designated as critical habitat for bull trout.
“Take” Prohibition

Once a species is listed as endangered or threatened, the ESA makes it illegal for the government or individuals to “take” a listed species. “Take” is defined in Section 9 of the act and includes killing, hunting, trapping, or otherwise “harming” the listed species or habitat the species depends upon. The federal courts have interpreted the term “take” to include “significant modification or degradation of critical habitat” that impairs essential behavior patterns. For species listed as endangered, the blanket prohibitions against “take” are immediate.

The ESA Section 9 “take” prohibition applies to all “persons” including local public entities. State and local governments face twin exposures to the “take” prohibition through their direct conduct and through the exercise of their regulatory authority over activities that may result in a “take.” Endangered Species Act listings significantly affect activities that affect salmon and bull trout habitat, such as water use, land use, construction activities, wastewater disposal, and stormwater management.

Threatened species may be protected through a more flexible Section 4(d) rule that describes activities that are likely to result in a “take” and exempts certain activities from “take” liabilities so long as the “take” occurs as the result of a program that adequately protects the listed species and its habitat. The 4(d) rule approves some specific existing state and local programs, and creates a means for the NOAA Fisheries Service to approve additional programs if they meet certain standards set out in the rule. The 4(d) rule is intended to encourage governments and private citizens to adjust their programs and activities to be “salmon safe.”

The USFWS does not differentiate between threatened and endangered species, so a Section 4(d) rule will not contain exceptions to the Section 9 prohibition on “take.”

The 4(d) rules may exempt certain activities from “take” liabilities and thereby offer an alternative mechanism by which to secure relief from potential “take” liability. The 4(d) rule approves some specific existing state and local programs, and creates a means for the NOAA Fisheries Service to approve additional programs if they meet certain standards set out in the rule. The NOAA Fisheries Service published a “Citizens Guide to the 4(d) Rule for Threatened Salmon and Steelhead on the West Coast” in June 2000. The guide introduces and explains the rule and is summarized below.

One of the limitations on the “take” prohibitions contained in the 4(d) rule is Limit No. 12 – Municipal, Residential, Commercial and Industrial Development and Redevelopment. The 4(d) rule recognizes that municipal, residential, commercial, and industrial development and redevelopment can degrade habitat and injure or kill salmon and steelhead. The 4(d) guide states that with appropriate safeguards, municipal, residential, commercial, and industrial development can minimize impacts on listed fish.
The guide further states that the NOAA Fisheries Service would individually apply the following 12 evaluation considerations when determining whether municipal, residential, or commercial, and industrial development ordinances or plans adequately conserve listed fish:

1. Development will avoid inappropriate areas such as unstable slopes, wetlands, areas of high habitat value, and similarly constrained sites.

2. Stormwater discharge will not impact water quality and quantity and stream flow patterns in the watershed – including peak and base flows in perennial streams.

3. Riparian areas will be adequately protected to maintain proper functioning condition so they can provide the biological requirements of the fish, around all rivers, estuaries, streams, lakes, deepwater habitats, and intermittent streams.

4. Stream crossings will be avoided wherever possible, and where crossings must be provided, they will be designed to have minimal impacts.

5. Historic stream meander patterns and channel migration zones will be protected and hardening stream banks and shorelines will be avoided.

6. Wetlands, wetland buffers, and wetland functions will be protected.

7. The capacity of permanent and intermittent streams to pass peak flows will be protected.

8. Landscaping with native vegetation will be encouraged to reduce the need to water and apply herbicides, pesticides, and fertilizer.

9. Erosion and sediment runoff will be prevented during and after construction in order to prevent sedimentation and pollutant discharge to streams, wetlands, and other water bodies that support listed fish.

10. Demands on the water supply will be met without affecting the flows salmon need either directly or through groundwater withdrawals.

11. There will be mechanisms for monitoring, enforcing, funding, reporting, and implementing the program.

12. All other state and federal environmental and natural resource laws and permits will be complied with.
In response to existing and proposed ESA listings of salmon, steelhead, and trout species throughout Washington State, the Office of Salmon Recovery was established in 1997 to direct the State’s salmon recovery efforts. The Office of Salmon Recovery is also supported by the Joint Natural Resources Council (composed of representatives of state natural resources agencies) in the preparation of the Statewide Strategy to Recover Salmon, entitled “Extinction is Not an Option” (January 1999). The goal of the strategy to recover salmon is to restore wild salmon, steelhead, and trout populations to harvestable levels. Rather than attempting to avert additional ESA listings, the statewide strategy intends to provide local input into, and hopefully maintain some local control over, the salmon recovery regulatory process that will inevitably affect the majority of Washington State. The statewide strategy was submitted to the NOAA Fisheries Service in 1999 for possible inclusion in the Section 4(d) rule. The draft of the Section 4(d) rule was published in the Federal Register on January 3, 2000 (Federal Register Vol. 65, No. 1). The final 4(d) rule was published in June 2000 and became effective January 8, 2001. The Statewide Strategy to Recover Salmon was not included in the 4(d) rule.

In order to minimize liability under the ESA, local governments will need to demonstrate that their land use regulations will not result in a prohibited “take” of a listed species, including adverse modification of critical habitat. Possible regulatory impacts may include the following:

- Adopt model critical area ordinances designed to protect critical habitat;
- Amend critical area ordinances to include riparian buffers, vegetative retention, soil retention, maximum road density within a watershed, maximum impervious surface in a watershed, and limits on road crossings of streams;
- Amend Growth Management Act comprehensive plans to require an “environmental protection element;”
- Adopt stormwater operation and maintenance ordinances requiring regular, frequent maintenance of stormwater facilities;
- Increase inspection and enforcement of stormwater BMPs;
- Require monitoring of BMPs;
- Provide adequate funding of stormwater infrastructure, which may include implementation of stormwater utilities; and
• Amend Shoreline Master Programs to encourage greater use of conservancy and natural designations, and limit conversion of agricultural and forest land.

STATE STORMWATER REGULATIONS

The principal state programs that relate to stormwater management include the municipal NPDES stormwater permits, the Growth Management Act, the Shorelines Management Act, the Hydraulic Project Approvals, and the Statewide Strategy to Recover Salmon.

NPDES PHASE II AND THE DEPARTMENT OF ECOLOGY STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON, 2005

The Ecology Stormwater Manual was originally developed as a requirement of the Puget Sound Water Quality Management Plan. Its goal was to develop an integrated stormwater management approach through the implementation of programs and development of rules and permits by local governments. Though the manual was specifically written to address stormwater management in the Puget Sound region, Ecology has since found that the concepts included in the manual are applicable throughout all of western Washington.

Though the manual does not have any regulatory authority nor does it establish any new environmental regulatory requirements, the City’s status as an NPDES Phase II permittee requires it to adopt either the 2005 Stormwater Management Manual for Western Washington or an equivalent approved by Ecology under the NPDES Phase I municipal stormwater permit.

The City of Buckley has currently adopted Ecology’s 1992 Stormwater Manual by reference in city ordinances. Seeing that a move to the newer 2005 Manual is imminent, a listing of their key differences follows.

### TABLE A1


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<tr>
<td><strong>New Development</strong></td>
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<tr>
<td>Small Parcel (meet erosion and sediment control during construction, comply with small parcel Req. 1 to 5, prepare small parcel ESC plan):</td>
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<td></td>
<td>• Creates or adds &lt;5,000 sf of new impervious</td>
<td>• ≥2,000 sf of new impervious area and/or land disturbing activity ≥7,000 sf, meet Min. Req. 1 to 5</td>
<td>• In terms of adding new impervious area, more projects will require a site plan, preservation of the natural drainage system, source control, and on-site management. All have to provide ESC (same as before).</td>
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<td></td>
<td>• Land disturbing activity of 1 acre or less</td>
<td>• &lt;2,000 sf of impervious and &lt;7,000 sf land disturbing activity must provide Construction Stormwater Pollution Prevention Plan appropriate for site (Req. 2)</td>
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<td>Large Parcel (meet all Req. 1 to 11):</td>
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<tr>
<td></td>
<td>• ≥5,000 sf of new impervious</td>
<td>• ≥5,000 sf of new impervious area</td>
<td>• Widened the threshold so more projects need to comply with treatment and flow control requirements.</td>
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<td>• Land disturbing activity of &gt;1 acre (if land disturbance &lt;1 acre do not need to meet Req. 1)</td>
<td>• Convert 3/4 acre of native vegetation to lawn</td>
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<tr>
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<td>• Convert 2.5 acres of native vegetation to pasture</td>
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<tr>
<td><strong>Redevelopment</strong></td>
<td>• ≥5,000 sf of new impervious</td>
<td>All redevelopment must comply with Min. Req. 2:</td>
<td>• More redevelopment projects will require treatment and flow control, especially if replacing existing impervious area. Allows areas to be retrofitted to today’s standards.</td>
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<td></td>
<td>• Req. 1 to 11 apply to the portion of the site being redeveloped. Source control BMPs apply to entire site. Stormwater site plan required</td>
<td>• If new, replaced, or total of new plus replaced impervious surfaces is ≥2,000 sf or ≥7,000 sf of land disturbing activities, Min. Req. 1 to 5 apply</td>
<td>• Cost is now involved so conflicts may exist with this issue (i.e., appraised value of improvements).</td>
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<td></td>
<td>• If existing site &gt;1 acre and 50% or more impervious or site discharges to a receiving water with documented water quality problem, Min. Req. 1 to 11 apply to entire site</td>
<td>• If ≥5,000 sf of new impervious surface, or converts 3/4 acre of native vegetation to lawn, or converts 2.5 acres of native vegetation to pasture Min. Req. 1 to 10 must be applied to the new impervious surface and converted pervious areas</td>
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**Definition:** On an already developed site, the creation or addition of impervious surfaces, structural development including construction, installation or expansion of a building or other structural and/or replacement of impervious surface.
### TABLE A1 (continued)

**Comparison of 1992 and 2005 Ecology Stormwater Manuals**

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<tr>
<td>• Applies all requirements (flow control and treatment) to new impervious areas. Replaced impervious areas have to meet these same requirements only if the value of all improvements (including interior improvements) &gt;50% cost of the assessment (or replacement) value of the existing site improvements, or if it is a road, if the added area is &gt;50% of the impervious surfaces within the project limits.</td>
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**Definition:** On a site that is already substantially developed (i.e., has 35% or more of existing impervious surface coverage), the creation or addition of impervious surfaces; the expansion of a building footprint or addition or replacement of a structure; structural development including construction, installation or expansion of a building or other structure, replacement of impervious surface, replacement of a surface that is not part of a routine maintenance activity and land disturbing activities.
### TABLE A1 (continued)

**Comparison of 1992 and 2005 Ecology Stormwater Manuals**

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<tbody>
<tr>
<td>Detention – Modeling</td>
<td>• Meet 50% of predeveloped (today’s) conditions for 2-year <strong>peak</strong> flow (for stream bank erosion control)</td>
<td>• Meet predeveloped (<strong>forested</strong> unless proven as historically pasture) discharge <strong>durations</strong> for 50% of 2-year flow through 100% of 50-year flow</td>
<td>• Use of duration versus use of previous condition peak flow.</td>
</tr>
<tr>
<td></td>
<td>• Meet 100% of predeveloped (today’s) conditions for 10-year <strong>peak</strong> flow</td>
<td>• May be modeled as existing conditions if the entire drainage basin has been at least 40% total impervious area for the last 20 years</td>
<td>• Requirement of modeling duration means using continuous runoff models. Ecology has created a free model to use called WWHM.</td>
</tr>
<tr>
<td></td>
<td>• Meet 100% of predeveloped (today’s) conditions for 100-year <strong>peak</strong> flow</td>
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<td>• Modeling durations more accurately reflect Puget Sound storms compared to previous method of matching peaks.</td>
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**Flow Control**

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<tr>
<td>• Flow control required only for situations where stormwater runoff is discharged directly or indirectly to a stream</td>
<td>• All projects ≥10,000 sf of new impervious, conversion of 3/4 acre of native vegetation to lawn, and/or conversion of 2.5 acres of native vegetation to pasture; or</td>
<td>• More projects required to provide flow control.</td>
</tr>
<tr>
<td>• Flow control to match existing hydroperiod if flow discharges directly or indirectly through a conveyance system to a wetland</td>
<td>• Projects that cause an increase of 0.1 cfs in the 100-year flow frequency from a threshold discharge area, and that discharge directly, or indirectly through a conveyance system into a fresh water, except for certain water bodies, or wetland must provide flow control to reduce impacts of increased stormwater runoff</td>
<td>• Need to specifically include need for off-site analysis and mitigation in adopting regulation.</td>
</tr>
<tr>
<td>• May be required if downstream analysis (1/4 mile minimum) indicates impact if flows not controlled</td>
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*Requirement: Match developed discharge durations to predeveloped durations for the range from 50% of the 2-year peak flow up to the full 50-year peak flow.*

*Note: Off-site analysis and mitigation included as optional guidance only.*
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<tbody>
<tr>
<td>Detention – Thresholds</td>
<td>• ≥5,000 sf new impervious area</td>
<td>• ≥10,000 sf effective impervious area</td>
<td>• Some smaller projects may not need to provide detention.</td>
</tr>
<tr>
<td></td>
<td>• Land disturbing activity of &gt;1 acre</td>
<td>• Convert 3/4 acre of native vegetation to lawn</td>
<td>• More facilities incorporated with land conversions.</td>
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<td></td>
<td>• Convert 2.5 acres of native vegetation to pasture</td>
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<td>• Project that through a combination of effective impervious surfaces and converted pervious surfaces causes a 0.1 cfs increase in the 100-year flow frequency from a threshold discharge area</td>
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<tr>
<td></td>
<td></td>
<td>Definitions: Effective Impervious Area – Impervious areas that are connected via sheet flow or discrete conveyance to a drainage system. Impervious surfaces on residential development sites are considered ineffective if the runoff is dispersed through at least 100 feet of native vegetation. Threshold Discharge Area – An on-site area draining to a single natural discharge location or multiple natural discharge locations that combine within 1/4 mile downstream.</td>
<td></td>
</tr>
<tr>
<td>Detention – Infiltration</td>
<td>• Requires 3 feet from bottom depth to bedrock, water table or impermeable layer</td>
<td>• Requires 5 feet from depth to bedrock, water table or impermeable layer</td>
<td>• Greater insurance of less impact to groundwater.</td>
</tr>
<tr>
<td></td>
<td>• Correction factor of 2 used to size flow control infiltration facility</td>
<td>• Correction factors of 2 to 4 for various soil types used for flow control infiltration facility</td>
<td>• May decrease applicability of infiltration systems for certain project sites.</td>
</tr>
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<td>• Potentially larger systems due to greater correction factors.</td>
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TABLE A1 (continued)


|---------------------------|-------------|-------------|------------------|
| Flow Control Credits     | None        | ● Roof runoff infiltrated – roof area removed from calculating size of detention system  
                          |              | ● Roof runoff dispersed area (and meets lot size and flow path requirements) – roof area modeled as grassed surface instead of impervious  
                          |              | ● Porous pavers and permeable interlocking concrete assumed to be 85% impervious and 15% lawn  
                          |              | ● Vegetated roofs, rainwater harvesting, reverse slope sidewalks, minimal excavation foundations, rain gardens | ● Potentially longer lasting systems with greater correction factors.  
                          |              | ● Potentially smaller flow control and/or conveyance facilities required. |
### TABLE A1 (continued)

**Comparison of 1992 and 2005 Ecology Stormwater Manuals**

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<tbody>
<tr>
<td>Treatment – Thresholds</td>
<td>● ≥5,000 sf of new impervious</td>
<td>● ≥5,000 sf of <strong>effective pollution generating</strong> impervious surface</td>
<td></td>
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<tr>
<td></td>
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<td>● ≥3/4 acre <strong>pollution generating</strong> pervious surface in a threshold discharge area (i.e., collection basin) exists</td>
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<td><strong>Definitions:</strong></td>
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<td><em>Pollution Generating Impervious Surface –</em> Those impervious surfaces considered to be a significant source of pollutants in stormwater runoff, including vehicle use and metal roofs unless coated with an inert, non-leachable material. A surface, whether paved or not, shall be considered subject to vehicular use if it is regularly used by motor vehicles (i.e., roads, unvegetated road shoulders, bike lines within the traveled lane of a roadway, driveways, parking lots, unfenced fire lines, vehicular equipment storage yards).</td>
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<td></td>
<td><em>Pollution-Generating Pervious Surfaces (PGPS) –</em> Any non-impervious surface subject to use of pesticides and fertilizers or loss of soil. Typical PGPS include lawns, landscaped areas, golf courses, parks, cemeteries, and sports fields.</td>
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<td></td>
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<td>● Refined definition of impervious surface may result in fewer projects needing treatment (for example, if roof runoff does not require treatment), may be offset by need to treat some pollution-generating pervious surfaces.</td>
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<tr>
<td></td>
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<td>● Targets treatment of pollution sources.</td>
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<td>● All projects must include on-site stormwater BMPs.</td>
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<td></td>
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<td>● No credit for alternative pavement.</td>
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### TABLE A1 (continued)

**Comparison of 1992 and 2005 Ecology Stormwater Manuals**

|---------------------------|-------------|-------------|-----------------|
| Treatment – Specific Areas | None        | Four Water Quality Menus: | • Better coverage of pollutant sources.  
|                           |             | • Oil Control – For “high use” sites | • More complex than previous manual.  
|                           |             | • Phosphorus – Based on local authority but Ecology recommends 303(d) listed bodies | • City would have to decide locations that would require Phosphorus menu.  
|                           |             | • Enhanced – For industrial, commercial, multifamily, and arterials/highways that discharge to fish-bearing streams |  
|                           |             | • Basic – All other sites that meet threshold of \( \geq 5,000 \text{ sf} \) of pollution-generating impervious surface or \( \geq 3/4 \text{ acre} \) of pollution-generating pervious surface |  
| Treatment – Sizing | • Design for volume from 6-month storm (64% of 2-year) | • Design for volume from 6-month storm (72% of 2-year) | • Requires treatment of higher design flows which theoretically, are more representative of flows needed to be captured for treatment purposes.  
| Additional BMPs | N/A | Added more BMPs: | • Greater flexibility in achieving treatment and quantity goals.  
|               |     | • Construction wheel wash, polyacrylamide (PAM), saw cutting pollution prevention, contractor erosion and spill control lead, scheduling, straw wattles, chemical treatment, soil amendments | • May provide more economically feasible BMP options.  
| Emerging Technologies | N/A | • Added section on emerging technologies that Ecology is in the process of reviewing and approving. Includes media filters, amended sand filters, catch basin inserts, high-efficiency street sweepers | • City staff/inspector needs knowledge of these items.  

### TABLE A1 (continued)

**Comparison of 1992 and 2005 Ecology Stormwater Manuals**

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<tr>
<td>“On-Site” BMPs</td>
<td>N/A</td>
<td>● Added “on-site” or low impact development concepts: dispersion of water through downspouts, sheet flow, vegetated rooftops, porous pavement, permeable interlocking concrete pavement</td>
<td>● Separate flow control or treatment facilities are not necessary if these measures are used to fully disperse, treat, and/or infiltrate on site.</td>
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**TABLE A2**


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<thead>
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<tbody>
<tr>
<td>Small Parcel Requirements (&lt;5,000 sf impervious surface and/or &lt;1 acre land disturbing activity) comply with the following:</td>
<td>Equivalent Small Parcel Requirement (projects that add or replace &lt;2,000 sf of impervious surface or disturb &lt;7,000 sf of land must consider the following elements of Min. Req. 2, Construction Stormwater Pollution Prevention, and develop controls for all elements that pertain to the site):</td>
</tr>
<tr>
<td>1. Construction Access Route</td>
<td>1. Mark Clearing Limits</td>
</tr>
<tr>
<td>2. Stabilization of Denuded Areas</td>
<td>2. Establish Construction Access</td>
</tr>
<tr>
<td>3. Protection of Adjacent Properties</td>
<td>3. Control Flow Rates</td>
</tr>
<tr>
<td>4. Maintenance</td>
<td>4. Install Sediment Controls</td>
</tr>
<tr>
<td>5. Other BMPs (as necessary to mitigate effects of increased runoff)</td>
<td>5. Stabilize Soils</td>
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<td>6. Protect Slopes</td>
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<td></td>
<td>7. Protect Drain Inlets</td>
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<td></td>
<td>8. Stabilize Channels and Outlets</td>
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<td>9. Control Pollutants</td>
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<td></td>
<td>10. Control Dewatering</td>
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<td>11. Maintain BMPs</td>
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<td>12. Manage the Project</td>
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### TABLE A2 (continued)


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<tbody>
<tr>
<td><strong>Large Parcel Requirements</strong> (≥5,000 sf impervious surface and/or ≥1 acre land disturbing activity) prepare a stormwater site plan and comply with Min. Req. 1 to 11:</td>
<td><strong>New Development</strong> (≥2,000 sf new, replaced or new plus replaced impervious surface area or ≥7,000 sf land disturbing activity) comply with Min. Req. 1 to 5:</td>
</tr>
<tr>
<td>1. Erosion and Sediment Control:</td>
<td>1. Preparation of Stormwater Site Plans</td>
</tr>
<tr>
<td>a. Stabilization and Sediment Trapping</td>
<td>2. Construction Stormwater Pollution Prevention (Items 1 to 12 listed above)</td>
</tr>
<tr>
<td>b. Delineate Clearing and Easement Limits</td>
<td>3. Source Control of Pollution</td>
</tr>
<tr>
<td>d. Cut and Fill Slopes</td>
<td>5. On-Site Stormwater Management</td>
</tr>
<tr>
<td>e. Controlling Off-Site Erosion</td>
<td><strong>New Development</strong> (≥5,000 sf new impervious surface, or converts ≥3/4 acre native vegetation to lawn or landscaped areas, or ≥2.5 acres native vegetation to pasture) apply Min. Req. 1 to 5 (described above) and Min. Req. 6 to 10:</td>
</tr>
<tr>
<td>f. Stabilization of Temporary Conveyance Channels and Outlets</td>
<td>6. Runoff Treatment (requires on-site BMPs is &lt;3/4 acre pollution-generating impervious surface or &lt;5,000 sf of pollution-generating impervious surface and treatment facilities if ≥3/4 acre pollution-generating pervious surface or ≥5,000 sf pollution-generating impervious surface)</td>
</tr>
<tr>
<td>g. Storm Drain Inlet Protection</td>
<td>7. Flow Control (on-site controls unless project ≥10,000 sf of impervious surface in a threshold discharge area, or convert ≥3/4 acre native vegetation to lawn or landscaped area, or convert ≥2 acres native vegetation to pasture, or increase runoff by ≥0.1 cfs for 100-year event)</td>
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<tr>
<td>h. Underground Utility Construction</td>
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<tr>
<td>i. Construction Access Routes</td>
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<td>j. Removal of Temporary BMPs</td>
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<td>k. Dewatering Construction Sites</td>
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<tr>
<td>l. Control of Pollutants Other than Sediment on Construction Sites</td>
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<td>m. Maintenance</td>
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<tr>
<td>n. Financial Liability</td>
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<tr>
<td><strong>2. Preservation of Natural Drainage Systems</strong></td>
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<tr>
<td><strong>3. Source Control of Pollution</strong></td>
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<tr>
<td><strong>4. Runoff Treatment BMPs</strong></td>
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<tr>
<td><strong>5. Streambank Erosion Control</strong></td>
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<tr>
<td><strong>6. Wetlands</strong></td>
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<tr>
<td><strong>7. Water Quality Sensitive Areas</strong></td>
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<tr>
<td><strong>8. Off-Site Analysis and Mitigation</strong></td>
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<tr>
<td><strong>9. Basin Planning</strong></td>
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<td><strong>10. Operation and Maintenance</strong></td>
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<tr>
<td><strong>11. Financial Liability</strong></td>
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TABLE A2 (continued)


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<tbody>
<tr>
<td>Redevelopment (≥5,000 sf) apply Min. Req. 1 to 11 to the portion of the site being redeveloped and source controls to entire site including adjacent parcels if part of the project. A stormwater site plan must be prepared.</td>
<td>Redevelopment (&lt;2,000 sf new plus replaced impervious surface and &lt;7,000 sf land disturbing activities) comply with Equivalent Small Parcel Requirements.</td>
</tr>
<tr>
<td>Redevelopment (≥5,000 sf and/or any of the following:</td>
<td>Redevelopment (≥2,000 sf new, replaced, or new plus replaced impervious surface area or ≥7,000 sf land disturbing activity) apply Min. Req. 1 to 5.</td>
</tr>
<tr>
<td>1. Existing site &gt;1 acre with more than 50% impervious surface</td>
<td>Redevelopment (≥5,000 sf new impervious surface, or converts ≥3/4 acre native vegetation to lawn or landscaped areas, or ≥2.5 acres native vegetation to pasture) apply Min. Req. 1 to 10.</td>
</tr>
<tr>
<td>2. Site discharges to a receiving water with a documented water quality problem, then prepare Stormwater Site Plan that includes a schedule for implementing Min. Req. 1 to 11 for the entire site including adjacent parcels if part of the project</td>
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</tr>
<tr>
<td>Optional Guidance:</td>
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</tr>
<tr>
<td>1. Financial Liability</td>
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</tr>
<tr>
<td>2. Off-Site Analysis and Mitigation</td>
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The provisions of the 2005 Manual that may be of particular interest to Buckley include the lower threshold for additional storm control requirements, which would increase the number of projects required to provide flow control and targeted treatment requirements. The flow control requirements in the 2005 Manual are more restrictive than the 1992 Manual because of the requirement to use flow durations in Ecology’s hydrologic model. This requirement results in detention facilities that are significantly larger than what would be required under the 1992 guidelines. However, Ecology raised the threshold that requires developments to provide flow control to 10,000 square feet instead of 5,000 square feet.

The Washington State Legislature created an Independent Science Panel (ISP) in 1998 to provide scientific review and oversight, and help ensure that sound science is used in
Washington’s salmon, steelhead, and trout recovery efforts. One of the items the ISP panel reviewed was Ecology’s 2001 Manual. The ISP concluded that the 2001 Manual did a credible job in developing the guidelines and standards presented in the manual using the information available; however, there were several areas identified for improvements.

Ecology recognizes that implementation of stormwater BMPs alone will not prevent further environmental degradation. Per the Ecology 2005 Manual, page 1-25, “The engineered stormwater conveyance, treatment, and detention systems advocated by this and other stormwater manuals can reduce the impacts of development to water quality and hydrology. But they cannot replicate the natural hydrologic functions of the natural watershed that existed before development, nor can they remove sufficient pollutants to replicate the water quality of pre-development conditions. Ecology understands that despite the application of appropriate practices and technologies identified in this manual, some degradation of urban and suburban receiving waters will continue, and some beneficial uses will continue to be impaired or lost due to new development. This is because land development, as practiced today, is incompatible with the achievement of sustainable ecosystems. Unless development methods are adopted that cause significantly less disruption of the hydrologic cycle, the cycle of new development followed by beneficial use impairments will continue.”

STATE OF WASHINGTON SHORELINE MANAGEMENT ACT

In December 2003, the Department of Ecology adopted new Shoreline Master Program (SMP) guidelines, updating the regulations for the first time since 1972. The 2003 Legislature replaced a 2-year update schedule for local governments with a phased-in schedule from 2005 to 2014. The State has set up a grant program to assist communities in updating their SMPs.

It is suggested that local jurisdictions may want to update their SMPs earlier if communities desire to integrate them with their Growth Management Act Comprehensive Plans or if the older SMPs are no longer in tune with the municipality’s environmental standards or procedures.

The Shoreline Management Act (SMA) applies to shorelines along rivers and larger streams with average annual flow above 20 cfs, lakes over 20 acres, and along marine waterfronts. Chapter 19.42 of the Buckley Municipal Code (BMC) addresses its Shoreline Master Program.

WASHINGTON STATE SALMON RECOVERY STRATEGY

In 1998, Governor Locke issued a Draft Salmon Recovery Plan and created the Governor’s Office of Salmon Recovery in response to the listing of Puget Sound Chinook salmon as “threatened” and the potential for other listings. Once the Final Salmon
Recovery Plan is implemented throughout the State of Washington, further stormwater flow controls will likely be required. The Draft Salmon Recovery Plan stormwater strategy emphasizes preservation of existing high-quality habitat and restricting new development. Retrofitting of existing development is recommended only in priority habitat areas due to the high cost and limited potential for successful rehabilitation. The Draft Salmon Recovery Plan relies on voluntary measures and greater enforcement and monitoring of existing regulations.

Currently, the Office collects data and releases reports regarding recovery efforts and management implementation as outlined in the Draft Salmon Recovery Plan. The 2004 State of Salmon in Watersheds Report lists the basin encompassing Buckley as being in “good” condition for water quality and in “fair” condition for fish habitat.

HYDRAULIC PROJECT APPROVAL

The Washington State Department of Fish and Wildlife (WDFW) requires Hydraulic Project Approval (HPA) for construction activities that will use, divert, obstruct, or change the bed or flow of state waters. The law came from the recognition that virtually any construction that affects the bed or flow of the waters of the State has the potential to cause habitat damage. The law’s purpose is to see that needed construction is done in a manner to prevent damage to the State’s fish and shellfish as well as their habitat. Any construction activities, such as channel widening or culvert improvements within the ordinary high water mark of any stream, would fall under the HPA permit requirements.

GROWTH MANAGEMENT ACT

The Growth Management Act (GMA) was written in response to the realization that uncoordinated and unplanned growth posed a threat to the environment, sustainable economic development, and the quality of life in Washington. It was adopted by the Washington State Legislature in 1990 and has been amended several times since. The GMA requires that local governments manage growth by identifying and protecting critical areas and natural resource lands, designating Urban Growth Areas (UGAs), and preparing and implementing comprehensive plans.

STATE FLOODPLAIN REGULATIONS

Chapter 86.16 RCW gives the Department of Ecology the authority to regulate elements of the National Flood Insurance Program (NFIP). Under Chapter 173-158 WAC, Ecology requires local governments to adopt and administer regulatory programs compliant with the minimum standards of the NFIP.

Ecology also establishes land management criteria in the base floodplain area by adopting the federal standards and definitions contained in 44 CFR Parts 59 and 60 as minimum
state standards. In addition to adopting the federal standards, the state regulations provide for additional regulation of residential development in the floodplain.

A Flood Insurance Study and associated Flood Insurance Rate Maps for Buckley, Washington were published in May 1980 and adopted by WAC 16.04.060.

**CITY OF BUCKLEY REGULATIONS**

**CITY PLANS, POLICIES, AND REGULATIONS**

This section provides a review of the City of Buckley’s policies, ordinances, and regulations relevant to stormwater management. The City’s regulations are set forth in the Buckley Municipal Code. The City’s Comprehensive Plan is also summarized.

**City of Buckley Comprehensive Plan**

The City of Buckley adopted its current Comprehensive Plan in 2005. RCW 36.70A.130 requires that Pierce County and the cities in the County must take action to review, and if necessary, revise their comprehensive plans and development regulations on or before December 1, 2004, and every 7 years thereafter. However, House Bill, HB2171, granted a 1-year grace period beyond this date to gain compliance with the GMA. The Comprehensive Plan, which contains utilities, housing, transportation, land use, and capital facilities elements, is required by the State of Washington GMA. The plan is a statement of goals and policies to guide the development of land in the City.

The Land Use element takes into consideration the general distribution and location of land uses, and the appropriate intensity and density of land uses given the development trends forecast at the time the plan was prepared.

The Critical Areas element addresses the need to adopt regulations to protect groundwater quality and quantity as well as surface water quality.

The stormwater-related policies of the Plan contain the following:

- **Utility Goals:**
  - To facilitate the development and maintenance of all utilities at the appropriate levels of service to accommodate growth that is anticipated to occur in the City of Buckley and its UGA.
  - To facilitate the provision of utilities that are environmentally sensitive, safe and reliable, aesthetically compatible with the surrounding land uses, available at a reasonable economic cost, and can be provided in an efficient manner.
To process permits and approvals for utility facilities in a fair and timely manner, and in accord with the development regulations which encourage predictability and consistency.

- **Policy D-1**: Coordinate management of the stormwater system with property owners to prevent property damage from flooding, protect water quality, maintain recharge of aquifers, provide for the safety and enjoyment of citizens, and preserve and enhance habitat and sensitive areas.

- **Policy D-2**: Enforce surface water controls in order to protect surface and groundwater quality.

**City of Buckley Design Standards (Section 5 – Storm Drainage)**

Section 5 of the City of Buckley Design Standards contains specifications regarding construction of stormwater systems. These standards should be reviewed to ensure they fully comply with the 2005 *Stormwater Management Manual for Western Washington*.

**Buckley Municipal Code**

The City’s code contains numerous sections pertaining to stormwater. These chapter sections are listed here. Each section will need to be reviewed for compliance with NPDES Phase II permit requirements and revised accordingly.

**Surface Water Management Utility (BMC Chapter 14.28)**

Chapter 14.28 created a surface water management utility with the ability to establish rates, connection charges, general facilities charges, and the right of the City to require mitigation of the off-site impacts that land use will have upon surface water runoff in the City. An Equivalent Service Unit (ESU) is defined to mean 3,600 square feet of impervious ground cover. This definition of ESU is used to determine general facilities charges for nonresidential development.

Three sections of this chapter discuss different methods for determination of monthly rates for nonresidential properties:

- **Section 14.28.120**, Service Charge, Part 3, indicates that rates for nonresidential properties is determined on the basis of an ERU, defined as 8,000 square feet of impervious surface.

- **Section 14.28.125**, Alternative Commercial Service Charge, provides an alternative to service charges set forth under Section 14.28.120 such that commercial developed parcels will be charged a flat rate per business and
a separate flat rate for parking “without regard to whether the parking is on-site or off-site.” Section 14.28.125 further states that if this method of determining the rate conflicts with the charge set forth under Section 14.28.120, the rate determined by Section 14.28.125 shall govern.

- Section 14.28.130, Method of Calculating Service Charge, indicates that the City shall measure the impervious surface of all nonresidential undeveloped (sic) parcels in the City, except exempt properties. The impervious area will be divided into ESU (previously defined as 3,600 square feet) and the number of ESUs will be multiplied by a base rate to determine the surface water management charge assessed against each parcel.

Stormwater Management (BMC Chapter 14.30)

This chapter includes the stormwater management regulations adopted in 1995. The activities covered under this regulation include land-disturbing activities; structural development including construction, installation, or expansion of a building or other structure; creation of impervious surfaces; Class IV general forest practices that are conversions from timber land to other uses; subdivision, short subdivision, and binding site plans; and redevelopment.

The purpose of the stormwater management regulations is to:

1. Minimize water quality degradation and sedimentation in streams, ponds, lakes, wetlands, and other water bodies;
2. Minimize the impact of increased runoff, erosion, and sedimentation caused by land development and maintenance practices;
3. Maintain and protect groundwater resources;
4. Minimize adverse impacts of alterations on ground and surface water quantities, locations, and flow patterns;
5. Decrease potential landslide, flood, and erosion damage to public and private property;
6. Promote site planning and construction practices that are consistent with natural topographical, vegetation, and hydrological conditions;
7. Maintain and protect the City’s stormwater management infrastructure and those downstream;
8. Provide a means of regulating clearing and grading of private and public land, while minimizing water quality impacts in order to protect public health and safety; and

9. Provide minimum development regulations and construction procedures, which will preserve, replace, or enhance, to the extent practical, existing vegetation to preserve and enhance Buckley.

This chapter adopts the 1992 Ecology *Stormwater Management Manual for the Puget Sound Basin* as the City’s technical manual. The requirements for construction erosion and sediment control and post-construction stormwater management are discussed in this chapter.

Illicit discharge is defined as all nonstormwater discharges to stormwater drainage systems that cause or contribute to a violation of state water quality, sediment quality, or groundwater quality standards, including but not limited to sanitary sewer connections, industrial process water, interior floor drains, car washing, and gray water systems. Section 14.30.063 prohibits illicit discharges to the stormwater drainage system.

**Stormwater Maintenance (BMC Chapter 14.40)**

This chapter includes requirements for maintenance of stormwater facilities. All stormwater facilities must be maintained in accordance with Chapter 4, Volume V of the 2005 *Stormwater Management Manual for Western Washington* or more stringent requirements. At a minimum, facilities must be inspected and cleared of debris, sediment, and vegetation when they affect the functioning and/or design capacity of the facility. This chapter grants the City the authority to inspect the stormwater facility and implement enforcement actions for noncompliance. This chapter shall be reviewed for compliance with the NPDES Phase II permit requirements and revised as necessary.

The policies and goals contained in the Comprehensive Plan, BMC, and Design Standards are the minimum standards for the design and construction of storm drainage facilities. The guidelines require that adequate provisions shall be made for storm drainage, storm sewers, and associated appurtenances sufficient to transmit designated seasonal flows. The design standards are currently the 1992 Ecology *Stormwater Management Manual for the Puget Sound Basin*. However, the City’s status as a Phase II NPDES permitee requires it to adopt the 2005 *Stormwater Management Manual for Western Washington*. To ensure all submitted drainage plans comply with the City’s stormwater regulations, a checklist of required elements has been prepared and is included in Appendix F.
JURISDICTIONAL COORDINATION

The main purpose of stormwater management is to preserve or improve surface water quality, prevent or control flooding, and control the flow regime of the natural drainage systems. This purpose will be accomplished through the adoption and implementation of the capital improvements and maintenance and operation program contained in this document. In addition, the City’s stormwater ordinance should be comprehensive in nature and consistent with the ordinances of surrounding jurisdictions.

CONCLUSION

The City of Buckley is located in a federally designated urbanized area and must comply with the NPDES Phase II permit requirements. The State’s Phase II NPDES permit requires permittees to adopt the 2005 Stormwater Management Manual for Western Washington or an equivalent manual. In addition, the Stormwater Management Plan must include programs and regulations to enable the City to meet the minimum requirements of the Phase II permit.

As a result of the recommendations of this plan and the NDPES permit requirements, the City will adopt the 2005 Manual.

Stormwater originating in Buckley discharges to waterways that are tributary to habitat for Chinook salmon and bull trout. Therefore, the Stormwater Management Program should contain elements that will protect the City from “take” liability.

Stormwater originating in Buckley discharges to both the White River and South Prairie Creek, which are currently on Ecology’s 2002/2004 303(d) List for fecal coliform. These waters are categorized as “Category 5” and “Category 4A,” respectively. Category 4A means that a TMDL has already been approved and is actively being implemented. Category 5 means that there is a water quality violation and that no TMDL is in place yet. Stormwater quantity or quality controls that address issues associated with the TMDLs will need to be included in the City’s program in the near future.

Neither the 1992 Manual nor the 2005 Manual has any independent regulatory authority and neither establishes new environmental regulatory requirements or standards. The manuals are guidance documents, which provide local governments, state and federal agencies, developers, and project proponents with a set of stormwater management practices to assist in the design of stormwater site or pollution prevention plans. The minimum requirements in the manual and technical guidance only become required through:

- Ordinances and rules established by local governments; and
- Permits and other authorizations issued by local, state, and federal authorities.

Ecology is currently requiring the adoption of the 2005 Manual or an equivalent manual as a condition of the Phase II NPDES permit.
APPENDIX B

PROPOSED STORMWATER MANAGEMENT PROGRAM
City of Buckley

Proposed Stormwater Management Program

January 2008
PUBLIC EDUCATION AND OUTREACH PROGRAM

As of January 17, 2007, Ecology issued requirements for the public education and outreach program requirement of the State NPDES Phase II permit program. The following program is based on these requirements.

Public Education and Outreach. An informed and knowledgeable community is crucial to the success of a stormwater management program since it helps to ensure greater support for the program and greater compliance. To satisfy this minimum control measure, the permittee needs to:

1. No later than two years after the effective date of this Permit, the Permittee shall provide an education and outreach program for the area served by the MS4. The outreach program shall be designed to achieve measurable improvements in the target audience’s understanding of the problem and what they can do to solve it.
   a. Education and outreach efforts shall be prioritized to target the following audiences and subject areas:

   i. General public
      • General impacts of stormwater flows into surface waters.
      • Impacts from impervious surfaces.
      • Source control BMPs and environmental stewardship actions and opportunities in the areas of pet waste, vehicle maintenance, landscaping and buffers.

   ii. General public, businesses, including home-based and mobile businesses
      • BMPs for use and storage of automotive chemicals, hazardous cleaning supplies, carwash soaps and other hazardous materials.
      • Impacts of illicit discharges and how to report them.

   iii. Homeowners, landscapers and property managers
      • Yard care techniques protective of water quality.
      • BMPs for use and storage of pesticides and fertilizers.
      • BMPs for carpet cleaning and auto repair and maintenance.
      • Low Impact Development techniques, including site design, pervious paving, retention of forests and mature trees.
      • Stormwater pond maintenance.

   iv. Engineers, contractors, developers, review staff and land use planners
      • Technical standards for stormwater site and erosion control plans.
      • Low Impact Development techniques, including site design, pervious paving, retention of forests and mature trees.
      • Stormwater treatment and flow control BMPs.
b. Each Permittee shall measure the understanding and adoption of the targeted behaviors among the targeted audiences. The resulting measurements shall be used to direct education and outreach resources most effectively, as well as to evaluate changes in adoption of the targeted behaviors.

c. Each Permittee shall track and maintain records of public education and outreach activities.

The City of Buckley will implement Best Management Practices (BMPs) to perform public education and outreach activities on stormwater impacts. Specifically, the City will implement the following BMPs as discussed herein.

- BMP 1(A): Utility Bill Inserts
- BMP 1(B): Stormwater Website
- BMP 1(C): Encourage Proper Disposal of Household Hazardous Wastes
- BMP 1(D): Address Illegal Dumping and Littering
- BMP 1(E): Gardening and Lawn Care Activities
- BMP 1(F): Education on New/Low Impact Development

**Objective:** Reduce pollutants from residential and industrial runoff through increased public awareness of the impacts of pollution stormwater runoff.

**BMP 1(A): UTILITY BILL INSERTS**

**Measurable Goals**
1. Develop list of subjects addressing:
   - Citizen reporting under the illicit discharge and construction programs
   - Water quality impacts of stormwater runoff and impervious surfaces to local water bodies
   - Steps the public can take to reduce stormwater pollution including source control BMPs
   - Public involvement programs
   - Environmentally friendly landscaping and pest management techniques
2. Design and print utility bill inserts for selected topics
3. Track number of materials created and distributed

**Description**
Printed materials are a common way to inform the public about stormwater pollution. For greatest effectiveness, the City will determine who the targeted audience is, how the audience of these materials will receive its information, and the knowledge base of the audience.

When designing the layout of an insert, brochure or flyer, the City will consider the following aspects:
• Restraint in design, consistency in artwork and graphic types, and quality materials are important factors because the audience should be invited into the materials with appealing, user-friendly layouts.
• The text will be kept to a minimum but still be interesting for readers.
• Using various formats and an active voice will make the text more engaging.
• Graphics – photos, logos, or other artwork, are great for breaking up long blocks of text, allowing readers a visual break.
• Images of lakes, streams, rivers, wetlands, and other stormwater features are “naturals” for enhancing any printed material and will be used if available.

The City will use inserts since they can easily be distributed to a large population. The City will use materials available from the EPA, the State or other public agencies as appropriate. They can be made using simple materials and graphics or they can be made more elaborate. They can also be made for all age levels, in any language or for specific audiences.

A one-page flyer will be produced to carry the basic message. Utility inserts offer an inexpensive, convenient way to convey the message to a large audience. These brochures will be appropriate for the public and can be effective if engaging, concise and memorable. They will contain brief, important messages, provide overview for the problems and solutions, or implore simple actions. The text in the brochures will be brief, the letters fairly large and the design attractive.

An example of information that will be included in a brochure discussing environmentally friendly landscaping techniques is included below. These topics are appropriate for the residential, business and industrial community.

Planning and design
It is important to emphasize the need for property owners to develop a landscape plan that utilizes the natural conditions of the property. For example, the regional and climatic conditions of the site, existing vegetation, topography, intended uses of the property, and the grouping of plants by their water needs are important considerations in designing a site that promotes natural vegetation growth while minimizing water loss and contamination.

Appropriate Plant Selection
The City will encourage property owners to choose local or regional plants when developing an environmentally friendly landscape. Indigenous plant species are generally more water efficient and disease resistant.

Use of Mulches
Mulches help retain water, reduce weed growth, prevent erosion, and improve the soil for plant growth. Mulches are usually wood bark chips, wood grindings, small gravel or shredded landscape clippings. Property owners will be encouraged to use mulches and will be informed of the benefits of these materials.
Fertilizers
Property owners will be discouraged from using fertilizers, or if they are used, from over-applying them. The City will recommend less-toxic alternatives to commercial fertilizers, such as composted organic material.

Pesticides
Like fertilizers, pesticides should be used on lawns and gardens only when absolutely necessary. Pesticide use can be avoided entirely by selecting hearty plants that are native to the area and by keeping them healthy. It is also important to identify any potential pests to determine if they are truly harmful to the plant. The pests should always be removed by hand if possible. Chemical pest control should be used only if other approaches fail.

The City will obtain information from the following sources when preparing the brochures.


Copies of brochures and posters prepared by Ecology, Seattle, Bellevue, and Tacoma that look at surface water pollution are available from the Puget Sound Action Team at their website. (http://www.psat.wa.gov/Publications/Pub_Master.htm#pollution). Brochures and other printed material developed by EPA are available at their website (http://cfpub.epa.gov/npdes/stormwatermonth.cfm)

Timeline for Completion
The City will create and/or research for an annual insert and distribute it through utility bills in 2008 through 2012.

**BMP 1(B): STORMWATER WEBSITE**

**Measurable Goals**
1. Develop a list of subjects for inclusion and discussion on the stormwater website
2. Track number of updates to website per year
3. Develop login counter to determine the number of website hits per year

**Description**

Websites serve as a useful tool for disseminating stormwater related information to a broad audience. Since the internet is used regularly by citizens, agency personnel, environmental group leaders, and the business community, it can be a valuable tool in conveying a stormwater pollution related message. To target a specific audience, the City will create an automated e-mail address list (list server) which becomes an inexpensive way to disseminate information to interested parties. This list can be used to inform parties of updates on meetings, policy discussions and other matters. Specifically, the City will create list servers to the following audiences:

1. **Businesses:** Describe use and storage of automotive chemicals, hazardous cleaning supplies, carwash soaps, other hazardous material.
2. **Landscapers and property managers:** Describe yard care techniques, BMPs for use and storage of pesticides/fertilizers, carpet cleaning, and auto repair/maintenance, LID techniques and stormwater pond maintenance
3. **Engineers/Developers:** Technical standards for stormwater site and erosion control plans, LID standards, and stormwater treatment and flow control BMPs

Included on the website will be information pertaining to the City’s stormwater program such as brochures or displays and pertinent addresses and contact phone numbers. Also included will be information on community car washes, NPDES permits, maps of the storm drainage system, glossary of standard stormwater terms, recommended best management practices, rate explanations, volunteer opportunities, fish/habitat related information, water quality data and a link to the City’s Comprehensive Stormwater Plan. The website may also have links to state and national programs such as EPA’s website and the Washington State Department of Ecology.

**Timeline for Completion**

The City will institute their stormwater website in 2008 and will make subsequent updates in following years.

**BMP 1(C): ENCOURAGE PROPER DISPOSAL OF HOUSEHOLD HAZARDOUS WASTES**

**Measurable Goals**

1. Research local and regional opportunities for the public to properly dispose of household hazardous waste
2. Develop an inventory of proper disposal events and opportunities based on research.
3. Number of stormwater brochure materials dealing with hazardous materials disposal created and distributed.
Description
Oftentimes, bad habits that lead to water pollution stem from the fact that citizens don’t know that certain chemicals are dangerous to the environment. Once they are informed, they can adjust their behavior to help protect water quality. The City will use articles in the utility insert or on the City website discussing hazardous waste handling to make the residents aware of the potential impacts of hazardous household materials on water quality and inform residents of ways to properly store, handle, and dispose of the chemicals. Such household hazardous wastes include automotive chemicals, hazardous cleaning supplies, and carwash soap. The City will also provide information about less-toxic alternatives to household hazardous wastes. The information regarding hazardous waste storage, handling and disposal will be equally applicable to the commercial and industrial community.

A “Wastemobile” may be available where citizens can dispose of pesticides, oil-based paints, toxic cleaning products, products containing mercury, fluorescent light bulbs, automotive batteries, hobby chemicals, thinners and solvents, automotive products, aerosols, glues and adhesives, propane tanks and latex paint. In addition, transfer stations accept hazardous materials year round. The City of Buckley will promote this program by providing brochures on the program at City Hall and will arrange for waste disposal activities to be held throughout the year.

The City will obtain information from the following sources when preparing the brochure entries.


Timeline for Completion
The City will hold waste disposal events on an annual basis beginning in 2008. The City will create a stormwater brochure discussing waste management that will be distributed between 2008 and 2012.

BMP 1(D): ADDRESSING ILLEGAL DUMPING AND LITTERING

Measurable Goals
1. Number of additional trash bins installed
2. Number of signs posted at detention ponds
3. Litter ordinance reviewed and enforced
4. Distribute illegal dumping, littering, and illicit discharge public education material

Description
Trash and floating debris in waterways have become significant pollutants, especially in areas where a large volume of trash is generated in a concentrated area. Trash in waterbodies contributes to visual pollution and detracts from the aesthetic qualities of the
landscape. It also poses a threat to wildlife and human health. In addition, less litter from individuals can save the City money for maintenance of structural-runoff controls.

When developing a trash management strategy, the City will follow the EPA recommended considerations discussed below.

- Regular cleaning and maintenance are necessary to prevent the trash accumulated at control structures from being hazardous itself.
- Control strategies should not just transport trash to another waterbody, but should reduce the quantity of trash in the water as a whole.

The EPA indicates that there are two main methods of trash control: source control and structural control. Source control includes community education, improved infrastructure, waste reduction and cleanup campaigns. Community education will be incorporated into City stormwater brochures and/or utility inserts. Citizen awareness is key to a successful trash management program. Citizens will be informed about the environmental consequences of littering. The City proposes to install signs at detention ponds indicating these consequences. The City also plans to increase the number of trash receptacles available for public use to encourage responsible trash management. Waste reduction programs such as encouraging the use of recycled products and products that contain limited amounts of packaging may be addressed in the stormwater brochure. The City will plan for cleanup campaigns such as street sweeping, receptacle servicing and using cleanup crews along roadsides.

Structural control involves structures that physically filter wastes and conduct centrifugal separation of trash. Physical methods of filtering include trash racks, mesh nets, bar screens and trash booms, all of which prevent trash from floating downstream. Centrifugal separation is the means of separating floating trash from water by increasing the settling rate of trash and particles. A number of commercial products based on this concept are available for stormwater applications. The City intends to encourage these forms of structural controls within its litter and stormwater ordinances.

The City will also provide pamphlets and educational material on its website regarding illicit discharges and illicit connections. A hotline to report these items will be listed on the materials as well.

**Timeline for Completion**
The City will evaluate the need for additional trash bins in 2008 and continue through 2012. Additional trash bins will be added if necessary starting in 2010. In addition, the City will address signage and the litter ordinance in the first year and revise it as necessary through 2012. Illicit discharge/connection information will be published as a topic in the utility insert.

**BMP I(E): GARDENING AND LAWN CARE ACTIVITIES**
**Measurable Goal**
1. Develop a list of subjects to be included in public education material based on local gardening and lawn care practices.
2. Distribute gardening and lawn care public education material in accordance with the identified schedule.

**Description**

Lawn and garden activities can result in contamination of stormwater through pesticide, soil, and fertilizer runoff. Proper landscape management, however, can effectively reduce water use and contaminant runoff and enhance the aesthetics of a property. Environmentally friendly landscape management can protect the environment through careful planning and design, routine soil analysis, appropriate plant selection, use of practical turf areas, water use efficiency, use of mulches and appropriate maintenance.

It is important to emphasize that property owners develop a landscape plan that utilizes the natural conditions of the property. For example, the regional and climatic conditions of the site, existing vegetation, topography, intended uses of the property, and the grouping of plants by their water needs are all important considerations in designing a site that promotes natural vegetation growth while minimizing water loss and contamination. Residents and municipal crews can partner with local nurseries and irrigation and lawn services to identify the appropriate landscape design for a specific site and to offer environmentally friendly practices to homeowners.

Property owners and municipalities should be discouraged from using fertilizers, or if they are used, from over-applying them. The City can recommend less-toxic alternatives to commercial fertilizers, such as composted organic material. The City can also recommend practices to reduce the amount of fertilizer entering runoff. For example, slow-release organic fertilizers are less likely to enter stormwater. Application techniques such as tilling fertilizers into moist soil to move the chemicals directly into the root zone, reduce the likelihood that the chemicals will be mobilized in stormwater. Timing is also a concern where warm season grasses should be fertilized in the summer in frequent and small doses while cool season grasses should be fertilized in the fall. In addition, pesticides should only be used when necessary.

Using proper landscaping techniques can effectively increase the value of a property while benefiting the environment through reducing water use, decreasing energy use (due to less water pumping), and minimizing storm runoff that transport soils, fertilizers and pesticides.

**Timeline for Completion**

The City will begin their gardening and lawn care strategy in 2008 and will revise it as needed in years 2009 and 2012.
BMP 1(F): EDUCATION ON NEW DEVELOPMENT AND LOW IMPACT DEVELOPMENT (LID)

Measurable Goals
1. Land use codes reviewed to ensure consistency with low impact development (LID) principles
2. Identify construction related subjects for inclusion in construction/new development public education materials that focus on local construction
3. Distribute low impact development education material
4. Publish City Development Standards on the website
5. Number of new site plans with LID practices

Description
Using LID approaches for new development can help to achieve stormwater pollution reduction goals. Through LID approaches, stormwater runoff can be controlled while development objectives are achieved. In order for these measures to be implemented, the City will inform the public about these practices.

The first step in achieving LID involves the City’s encouragement of developers to adopt such approaches. Simultaneously, the City will develop and implement a program to ensure that LID design standards are met.

When the City’s program has been successfully implemented, the City will benefit from a reduction of stormwater runoff and pollution from LID developments. The developer will benefit from establishment of a marketing tool that will attract environmentally conscious buyers and create more landscaped areas that enhance the aesthetics of developed areas. In addition, the City program will educate property owners on effective pollution prevention measures and provide technical standards, promote the proper maintenance of BMPs, and inform commercial property owners of potential cost savings from using LID approaches.

As a first step, the City will adopt and implement appropriate LID practices that are beneficial to the community and target the goal of controlling runoff onsite and reducing pollutants in stormwater. The product of the program is a set of clear, concise LID codes that the developer may utilize. Once these measures have been adopted, an outreach program will be developed. For instance, in the planning stage of a development, the developer would meet with the City and determine which BMPs are applicable and would identify the maintenance requirements needed for a specific property. The developer should obtain and understand documentation of the construction and maintenance requirements of the BMPs and then pass this information on to the property owners. In addition, as an example to builders and homeowners in the community, the City shall implement these LID practices for their own facilities where feasible.

Timeline for Completion
The City will develop its LID codes and distribute educational information in 2008. In 2009 through 2012, the City will begin to monitor the number of private development plans implementing LID practices and the number of City facilities utilizing LID BMPs.
PUBLIC INVOLVEMENT AND PARTICIPATION PROGRAM

As of January 17, 2007, Ecology developed requirements for the public involvement and participation program requirement of the state NPDES Phase II permit program. The following program is based on these requirements.

Public Involvement and Participation Program. Public involvement/participation activities can be effective tools used to gain much needed public support for stormwater management program implementation. To satisfy this minimum control measure, the permittee needs to:

a. No later than one year from the effective date of this Permit, all permittees shall create opportunities for the public to participate in the decision-making processes involving the development, implementation and update of the Permittee’s entire SWMP. Each Permittee shall develop and implement a process for consideration of public comments on their SWMP.

b. Each Permittee shall make their SWMP, the annual report required under S9.A and all other submittals required by this Permit, available to the public. The annual report, and SWMP that was submitted with the latest annual report, shall be posted on the permittee’s website. To comply with the posting requirement, a permittee that does not maintain a website may submit the updated SWMP in electronic format to the Department for posting on the Department’s website.

The City of Buckley will implement Best Management Practices (BMPs) to implement a public involvement and participation program. These include notifying the public of stormwater related opportunities and encouragement of public participation. Specifically, the City will implement the following BMPs as discussed herein.

- BMP 2(A): Post Public Involvement Opportunities on Website
- BMP 2(B): Stormwater Management Program Meetings
- BMP 2(C): Coordination with Adopt-a-Stream Program
- BMP 2(D): Coordination with Adopt-a-Road Program
- BMP 2(E): Storm Drain Stenciling
- BMP 2(F): Volunteer Monitoring
- BMP 2(G): Community Hotline

Objective: Provide opportunity for public involvement and participation.

**BMP 2(A): POST PUBLIC INVOLVEMENT OPPORTUNITIES**

**Measurable Goal**
1. Number of updates to the City stormwater website.
Description

The City will post its public involvement opportunities on its website. Such opportunities include public workshops on the City’s Stormwater Management Program, storm drain stenciling, Adopt-a-Stream, Adopt-a-Street and volunteer monitoring as described further in this Plan. Later into the permit cycle, the City may evaluate whether other opportunities are available to the public and post these as well. In addition, the City will post its annual stormwater reports.

Timeline for Completion

The City will determine an initial posting schedule in 2007 and will continue to update the website throughout 2012.

BMP 2(B): STORMWATER MANAGEMENT PROGRAM MEETINGS

Measurable Goal

1. Hold two public meetings during the first year of the program.
2. Publish a minimum of two notices during the first year of the program.

Description

The City shall hold a minimum of two public meetings during the first permit year to promote public involvement and participation in the City’s stormwater management program. The City will ensure that all meetings are well advertised, will follow the applicable advertisement requirements for the City, Pierce County, Tribes and State, and will make a concerted effort to solicit input from various sectors. Advertisement methods will include print media, and posting notices in public places, etc. When planning the public meetings, the City determined it would implement the following Ecology recommended steps.

1. Determine the Appropriate Type of Public Meeting Format. There are many things to consider when planning a public meeting, including format, time, location, agenda and the use of a facilitator. Not all public meeting formats are alike. The format chosen will depend on the goal of the meeting and the items on the agenda. Since the goal of the initial meeting is to inform and obtain stakeholder input, formats such as workshops and/or open houses are most appropriate. Stakeholders attending the meeting will be given an overview of the stormwater program and then transition into a format (e.g., workgroups) conducive to sharing ideas and information.

The City will be sensitive to the factors that can influence stakeholder participation, such as the date and time of the meeting, the actual meeting site, and method of advertising for the meeting. The City will also consider other factors that may affect participation in the meeting such as, ensuring that presentation materials will avoid excessive use of acronyms, technical terminology, and large amounts of text and that the agenda allots enough time for people to ask questions and provide feedback. The City shall keep in mind that not all people feel comfortable speaking in public, so they may consider having a public comment form available for each participant.
2. **Announce the Meetings.** The City will ensure that announcements for the public meeting reach all stakeholders within the community, and that each category of stakeholder (i.e., similar to target audiences identified for public education and outreach) is represented during the public meeting. They will ensure that the announcements go out to all interested parties and will create and distribute the meeting announcement to local newspapers or through other appropriate mechanisms.

3. **Conduct Meeting and Solicit Stakeholder Input.** The City shall ensure that the agenda includes enough time for people to ask questions and provide feedback. A staff member will have the responsibility of recording comments from the public and the responses that they receive. Since not all people feel comfortable speaking in public, a public comment form will be available for participants to fill out. If possible, staff will be available for one-on-one discussions. In addition, participants may fill out an evaluation form to determine if the meeting was an effective mechanism to reach people.

4. **Perform Meeting Follow-up Activities.** Follow-up activities are just as important as planning. Essential follow-up activities include preparing a summary of the questions and answers discussed at the meeting, generating a participants’ contact list (include these people on a mailing list), and compiling public comment forms received via mail or fax. City staff will review the information on the meeting evaluation forms and use the information when planning future public meetings. The types of information collected through the public meeting will help determine who was or wasn’t represented during the meeting, what the perceptions and attitudes are of the participants and how best to reach stakeholders in the future.

The City will use stakeholder input to develop and/or modify the stormwater program. Stakeholder input may influence the type of BMPs selected for each minimum measure and/or the measurable goals developed to track implementation progress. The City will make meeting follow-up information available to the public, either through newspapers, websites or a mailing. This will demonstrate to stakeholders that their input is taken seriously and that they have influence. This may have a positive impact on whether the stakeholder will continue to participate.

**Timeline for Completion**
The City will hold two public meetings and submit related public notices in the first permit year, 2007.

**BMP 2(C): COORDINATION WITH ADOPT-A-STREAM PROGRAM**

**Measurable Goal**
1. Identify target groups for the Adopt-a-Stream Foundation program.
2. Contact groups to participate in the program and assist in setting up training.
**Description**
The City shall identify target groups to be included in the Adopt-a-Stream program. Once the groups are identified, they shall be listed and contacted for interest in the program. Such groups may include local boy and girl scout organizations, school groups, fundraising groups, or other civic organizations. The City can coordinate their program with the Tom Murdock of the Adopt-a-Stream Foundation (tomm@streamkeeper.org). Their current program information can be found at: [http://www.streamkeeper.org/](http://www.streamkeeper.org/)

**Timeline for Completion**
The City will coordinate the program in the third permit year (2009) and will continue to run it for each year thereafter.

**BMP 2(D): COORDINATION WITH ADOPT-A-ROAD PROGRAM**

**Measurable Goal**
1. Identify target areas or streets to be included in the Adopt-a-Road program.
2. Identify groups to participate in the program

**Description**
The City shall identify target streets to be included in the Adopt-a-Road program. Once the streets or areas are identified, groups shall be listed and contacted for interest in the program. Such groups may include local boy and girl scout organizations, school groups, fundraising groups, or other civic organizations. The City can coordinate their program with the Pierce County Public Works and Utilities Department. Their current program information can be found at: [https://www.piercecountywa.org/pc/abtus/ourorg/pwu/roadops/Adopt_A_Road.htm](https://www.piercecountywa.org/pc/abtus/ourorg/pwu/roadops/Adopt_A_Road.htm)

**Timeline for Completion**
The City will coordinate the program in the third permit year (2009) and will continue to run it for each year thereafter.

**BMP 2(E): STORM DRAIN STENCILING**

**Measurable Goal**
1. Identify target areas or streets to be included in the storm drain stenciling program.
2. Develop stencils
3. List and invite targeted groups to participate in stenciling program

**Description**
The City shall continue to identify target areas or streets to be included in the storm drainage stenciling program. Once the streets or areas are identified, groups shall be listed and contacted for interest in the program. Such groups may include local boy and girl scout organizations, school groups, fundraising groups, or other civic organizations. The stencils shall be designed and created with slogans, logos and/or text appropriate for the area. Necessary support shall be given to the groups including stencils, appliqués, paint, rollers, traffic control if necessary, safety equipment, and trash bags.
Records of storm drain stenciling shall be maintained throughout the year and indicated in the annual report at the end of the year.

**Timeline for Completion**
The City will create the program in the first permit year (2007) and will continue to run it for each year thereafter.

### BMP 2(F): VOLUNTEER MONITORING

**Measurable Goal**
1. Identify outfalls or areas that are safe for volunteer monitoring groups to conduct stormwater monitoring or dry weather screening.
2. Develop guidelines for conducting volunteer monitoring in identified areas.
3. Invite identified groups to participate in the volunteer monitoring program.

**Description**
Data from volunteer monitoring can be useful to the City in terms of correcting actions that are currently degrading the environment or it can be used to set the background necessary to determine if a continuing downward trend is present. However, in order for this data to be useful, the City must develop appropriate guidelines so that data is collected in a uniform manner that may be used comparatively with data collected by others.

For its volunteer monitoring program, the City will identify outfalls or areas safe for volunteer monitoring groups to conduct stormwater monitoring or dry weather screening. They will then assemble and provide the proper training and equipment for the groups. Guidelines detailing specific monitoring requirements will be developed and explained to each group. The guidelines shall be easy enough for volunteers to understand and follow completely. Potential volunteer groups will be listed and then contacted in regards to the program. If interested, the groups will be trained and given the appropriate equipment including data forms and safety equipment.

Records of each monitoring effort will be maintained and reported at the end of the year.

**Timeline for Completion**
The City will create the program in the first permit year (2007) and will continue to advertise and/or monitor for each of the four years thereafter.

### BMP 2(G): COMMUNITY HOTLINE

**Measurable Goal**
1. Identify phone number and contact person to receive reports on stormwater quality issues through the community.
2. Distribute phone number to community.
3. Number of inspections provided in response to public calls.

**Description**
Since regulators and authorities cannot monitor all waterbodies at once, the City will rely on the public to keep them informed of water polluters. An accessible phone number provides a means for concerned citizens and agencies to contact the appropriate authority when they see water quality problems. The City will provide a direct phone number or upon completion of their stormwater site, they can provide an electronic form linked directly to the City. A typical call may report a leaking automobile, concrete wash-out dumped on the street, paint in a creek, or organic debris (including pet waste) in a drainage system or waterway.

It is important to first establish a contact for these concerns. Therefore, the name and phone number for this contact will be advertised and distributed to the public. The phone number will be available on all distributed materials such as the utility insert and the City’s website. The City may provide an electronic form on its website which will include spaces for information about the person making the complaint and the alleged violation. If worried about privacy, the citizen can submit a complaint by telephone.

When a complaint comes in, City staff will dispatch qualified water quality investigators to respond to the complaint. They will make every attempt to determine the responsible party and inform them of the environmental impact of their actions. The responsible party will be required to stop the action that is polluting the surface water. In addition, staff members will provide the violator with information on cleanup, alternative disposal options, erosion control and other BMPs as approved by the City.

**Timeline for Completion**
The City will designate a few hours a year to monitor the progress of community calls beginning in 2007 and will continue through 2012.
ILLICIT DISCHARGE DETECTION AND ELIMINATION PROGRAM

Ecology has developed final permit requirements for the illicit discharge detection and elimination program requirement of the State’s NPDES Phase II permit program. The following program is based on these requirements.

Illicit Discharge Detection and Elimination. Discharges from cities often include wastes and wastewater from non-stormwater sources. Illicit discharges enter the system through either direct connections, such as wastewater piping mistakenly or deliberately connected to the storm drains, or indirect connection, such as infiltration from cracked sanitary sewers, spills collected by drain outlets, or materials dumped into storm drains. To satisfy this minimum control measure, the permittee must develop, implement and enforce an illicit discharge detection and elimination program. Permittees shall fully implement an ongoing illicit discharge detection and elimination program no later than three years from the effective date of this permit.

The minimum performance measures are:

a. A municipal storm sewer system map shall be developed no later than four years from the effective date of this permit. Municipal storm sewer system maps shall be periodically updated and shall include the following information:

i. The location of all known municipal separate storm sewer outfalls and receiving waters and structural stormwater BMPs owned, operated, or maintained by the Permittee. Each Permittee shall map the attributes listed below for all storm sewer outfalls with a 24 inch nominal diameter or larger, or an equivalent cross-sectional area for non-pipe systems:
   • Tributary conveyances (indicate type, material, and size where known).
   • Associated drainage areas.
   • Land use.

ii. Each Permittee shall initiate a program to develop and maintain a map of all connections to the municipal separate storm sewer authorized or allowed by the Permittee after the effective date of this Permit.

iii. Geographic areas served by the Permittee’s MS4 that do not discharge stormwater to surface waters.

iv. Each Permittee shall make available to Ecology, upon request, municipal storm sewer system map(s) depicting the information required in S5.C.3.a.i. through iv above. The preferred format of submission will be an electronic format with fully described mapping standards. An example description is provided on Ecology WebPages under Core Services, GIS Data.
vi. Upon request, and to the extent appropriate, permittees shall provide mapping information to co-permittees and secondary permittees.

b. Each Permittee shall develop and implement an ordinance or other regulatory mechanism to effectively prohibit non-stormwater, illegal discharges, and/or dumping into the Permittee’s municipal separate storm sewer system to the maximum extent allowable under State and Federal law. The ordinance or other regulatory mechanism shall be adopted no later than 30 months from the effective date of this Permit.

i. The regulatory mechanism does not need to prohibit the following categories of non-stormwater discharges:
   - Diverted stream flows.
   - Rising ground waters.
   - Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20)).
   - Uncontaminated pumped ground water.
   - Foundation drains.
   - Air conditioning condensation.
   - Irrigation water from agricultural sources that is commingled with urban stormwater.
   - Springs.
   - Water from crawl space pumps.
   - Footing drains.
   - Flows from riparian habitats and wetlands.
   - Non-stormwater discharges covered by another NPDES permit.
   - Discharges from emergency fire fighting activities in accordance with S2 Authorized Discharges.

ii. The regulatory mechanism shall prohibit the following categories of non-stormwater discharges unless the stated conditions are met:
   - Discharges from potable water sources, including water line flushing, hyperchlorinated water line flushing, fire hydrant system flushing, and pipeline hydrostatic test water. Planned discharges shall be de-chlorinated to a concentration of 0.1 ppm or less, pH-adjusted, if necessary, and volumetrically and velocity controlled to prevent re-suspension of sediments in the MS4.
   - Discharges from lawn watering and other irrigation runoff. These shall be minimized through, at a minimum, public education activities (see section S5.C.1) and water conservation efforts.
   - Dechlorinated swimming pool discharges. The discharges shall be dechlorinated to a concentration of 0.1 ppm or less, pH-adjusted and reoxygenized if necessary, volumetrically and velocity controlled to prevent re-suspension of sediments in the
MS4. Swimming pool cleaning wastewater and filter backwash shall not be discharged to the MS4.

- Street and sidewalk wash water, water used to control dust, and routine external building wash down that does not use detergents. The Permittee shall reduce these discharges through, at a minimum, public education activities (see section S5.C.1.) and/or water conservation efforts. To avoid washing pollutants into the MS4, Permittees must minimize the amount of street wash and dust control water used. At active construction sites, street sweeping must be performed prior to washing the street.

- Other non-stormwater discharges. The discharges shall be in compliance with the requirements of the stormwater pollution prevention plan reviewed by the Permittee, which addresses control of construction site de-watering discharges.

iii. The Permittee’s SWMP shall, at a minimum, address each category in ii above in accordance with the conditions stated therein.

iv. The SWMP shall further address any category of discharges in i or ii above if the discharges are identified as significant sources of pollutants to waters of the State.

v. The ordinance or other regulatory mechanism shall include escalating enforcement procedures and actions.

vi. The Permittee shall develop an enforcement strategy and implement the enforcement provisions of the ordinance or other regulatory mechanism.

c. Each Permittee shall develop and implement an ongoing program to detect and address non-stormwater discharges, spills, illicit connections and illegal dumping into the Permittee’s municipal separate storm sewer system. The program shall be fully implemented no later than 180 days prior to the expiration date of this Permit and shall include:

i. Procedures for locating priority areas likely to have illicit discharges, including at a minimum: evaluating land uses and associated business/industrial activities present; areas where complaints have been registered in the past; and areas with storage of large quantities of materials that could result in spills.

ii. Field assessment activities, including visual inspection of priority outfalls identified in i, above, during dry weather and for the purposes of verifying outfall locations, identifying previously unknown outfalls, and detecting illicit discharges.

- Receiving waters shall be prioritized for visual inspection no later than three years from the effective date of this Permit, with field assessments of three high priority water bodies made no later than four years from the effective date of this Permit. Field assessments on at least one high priority water body shall be made each year thereafter.

iii. Procedures for characterizing the nature of, and potential public or environmental threat posed by, any illicit discharges found by or reported to the Permittee. Procedures shall include detailed instructions for evaluating whether the discharge must be immediately contained and steps to be taken for containment of the discharge.

Compliance with this provision shall be achieved by investigating (or referring to the appropriate agency) within 7 days, on average, any complaints, reports or monitoring information that indicates a potential illicit discharge, spill, or illegal dumping; and immediately investigating (or referring) problems and violations determined to be emergencies or otherwise judged to be urgent or severe.

iv. Procedures for tracing the source of an illicit discharge; including visual inspections, and when necessary, opening manholes, using mobile cameras, collecting and analyzing water samples, and/or other detailed inspection procedures.

v. Procedures for removing the source of the discharge; including notification of appropriate authorities; notification of the property owner; technical assistance for eliminating the discharge; follow-up inspections; and escalating enforcement and legal actions if the discharge is not eliminated.

Compliance with this provision shall be achieved by initiating an investigation within 21 days of a report or discovery of a suspected illicit connection to determine the source of the connection, the nature and volume of discharge through the connection, and the party responsible for the connection. Upon confirmation of the illicit nature of a storm drain connection, termination of the connection shall be verified within 180 days, using enforcement authority as needed.

d. Permittees shall inform public employees, businesses, and the general public of hazards associated with illegal discharges and improper disposal of waste.

i. No later than 180 days prior to the expiration date of this Permit, distribute appropriate information to target audiences identified pursuant to S5.C.1.

ii. No later than two years from the effective date of this Permit, publicly list and publicize a hotline or other local telephone number for public reporting of spills and other illicit discharges. Keep a record of calls received and follow-up actions taken in accordance with S5.C.3.c.ii. through v. above; include a summary in the annual
report (see section S9 Reporting and Record Keeping Requirements).

e. Permittees shall adopt and implement procedures for program evaluation and assessment, including tracking the number and type of spills or illicit discharges identified; inspections made; and any feedback received from public education efforts. A summary of this information shall be included in the Permittee’s annual report (see section S9 Reporting and Recordkeeping Requirements).

f. Each Permittee will provide appropriate training for municipal field staff on the identification and reporting of illicit discharges into MS4s.

i. No later than thirty months after the effective date of this Permit, each Permittee shall ensure that all municipal field staff who are responsible for identification, investigation, termination, cleanup, and reporting illicit discharges, including spills, improper disposal and illicit connections are trained to conduct these activities. Follow-up training shall be provided as needed to address changes in procedures, techniques or requirements. Permittees shall document and maintain records of the training provided and the staff trained.

ii. No later than three years after the effective date of this Permit, an ongoing training program shall be developed and implemented for all municipal field staff, which, as part of their normal job responsibilities, might come into contact with or otherwise observe an illicit discharge or illicit connection to the storm sewer system shall be trained on the identification of an illicit discharge/connection, and on the proper procedures for reporting and responding to the illicit discharge/connection. Follow-up training shall be provided as needed to address changes in procedures, techniques or requirements. Permittees shall document and maintain records of the training provided and the staff trained.

The City of Buckley will implement Best Management Practices (BMPs) to detect and eliminate illicit connections during this permit cycle. This Plan further refines the City’s program. The City will specifically address the following BMPs.

- BMP 3(A): Review Illicit Discharge Legal Authority/Ordinance
- BMP 3(B): Maintain Stormwater Inventory (Base Map)
- BMP 3(C): Conduct Outfall Screening
- BMP 3(D): Identify Stormwater Hotspots
- BMP 3(E): Elimination of Septic/Gray Water Discharges
- BMP 3(F): Sanitary Sewer Leak Elimination
- BMP 3(G): Illicit Discharge Training
- BMP 3(H): Illicit Discharge Hotline
- BMP 3(I): Identify/Eliminate Discharges from Storage Tanks
**Objective:** Establish and carry out procedures to identify and remove illicit discharges, and encourage public education and involvement in eliminating illicit discharges.

### BMP 3(A): REVIEW ILLICIT DISCHARGE LEGAL AUTHORITY/ORDINANCE

**Measurable Goal**
1. Review of related ordinance.
2. Develop supplemental legal authority if needed.

**Description**
The City will first determine if their existing codes relate appropriately to the prohibition of illicit discharges. The existing City of Buckley Municipal Code (BMC) contains regulations that prohibit illicit discharges and illegal dumping and authorizes enforcement actions on public and private property.

The following sections of the BMC address illicit discharges.

- **14.30.020 Definitions**
  Illicit discharge means all nonstormwater discharges to stormwater drainage systems that cause or contribute to a violation of state water quality, sediment quality or ground water quality standards, including, but not limited to, sanitary sewer connections, industrial process water, interior floor drains, car washing and greywater systems.

- **14.30.063 Illicit Discharges**
  Illicit discharges to stormwater drainage systems are prohibited (Ord. 25-95 §1, 1995).

The City will ensure that, as a minimum, the illicit discharge ordinance contains the Ecology permit requirements as noted earlier.

**Timeline for Completion**
The City will review its existing codes in 2007 and will revise them as necessary to meet the intent of this BMP. The fourth year of the permit, 2010, will entail an evaluation of the revised code to make certain the codes are assisting in accomplishing the desired task of enforcing the prohibition of illicit discharges.

### BMP 3(B): MAINTAIN STORMWATER INVENTORY (BASE MAP)

**Measurable Goal**
1. Ensure current base map includes full stormwater system, receiving streams, outfalls, and displays the permit coverage area.
2. Develop procedures for updating base map.
3. Update base map with as-built information.
Description
A base map depicting the existing storm sewer system will be maintained by the City to aid in eliminating illicit discharges. The current storm sewer base map is stored in an AutoCAD format and must be updated to meet the needs of this Plan. The map will show at a minimum, the locations of all outfalls and the names and locations of all waterbodies that receive a discharge from those outfalls and tributary conveyance systems, associated tributary drainage areas, and land uses, of all municipal separate storm sewer outfalls with a 24 inches nominal diameter or larger, or an equivalent cross-sectional area for non-pipe systems, indicating type, material, and size where known. The map will be a minimum of 1” = 800’ and will depict features such as storm sewer pipes, inlets, streets, and political boundaries. Drainage basin lines will be shown so the contributing area for a particular illicit discharge can be determined.

The City will use the map to target outfalls with dry weather flows and other suspicious discharges. These outfalls will receive more in-depth inspection and monitoring. The map will be used to coordinate management activities to remove illicit connections and track storm drain system maintenance. Subsequent updates will be provided by the City as development and repairs to the storm system occur.

Timeline for Completion
The City will review and update the existing storm sewer base map in 2007. Updates to this map will occur on an annual basis as necessary through 2012 and beyond.

BMP 3(C): CONDUCT OUTFALL SCREENING
BMP 3(D): IDENTIFY STORMWATER HOTSPOTS
BMP 3(E): ELIMINATION OF SEPTIC/GRAY WATER DISCHARGES
BMP 3(F): SANITARY SEWER LEAK ELIMINATION

Measurable Goals
1. Identify local facilities that have a high probability of discharging pollutants (stormwater hot spots).
2. Develop a list of potential pollutants that may be associated with stormwater hot spots.
3. Conduct inventory and prioritize sites for inspection.
4. Develop a schedule where 20% of outfalls are inspected each year in the permit cycle.
5. Number of illicit connections found and/or repaired.

Description
An illicit connection is defined as an illegal and/or improper connection to a storm drainage system and receiving water. A discharge of industrial wastewater to a storm sewer is “illicit” because it would ordinarily require a permit under the Clean Water Act. Many building owners or operators are not aware that improper connections exist in their facilities. Identifying and removing illicit connections is a measure that will reduce stormwater pollution. Illegal dumping is also an illicit discharge to storm drainage systems.
Procedures for detecting and addressing illicit discharges include evaluation of land uses, identification of priority areas for assessment, field assessment activities, characterization of any discharges found, tracing of illicit discharge, and removal of the illicit discharge.

The major components of the City’s future illicit discharge detection plan are described below:

Define priority areas. The procedure for locating priority areas in Buckley is simplified since the likelihood of illicit connections is greatest in the commercial areas of Buckley. Many illicit connections are a result of connections to the storm drainage system that are unknown to the business owner and may not be evident in architectural plans. Illicit industrial connections can arise from cross connections with sanitary sewers and floor drains improperly attached to storm drainage pipes. The connections may be accidental or planned and may occur in new buildings as well as in existing buildings.

Another source of illicit connections is improperly constructed residential sewer systems. For new construction, preventative practices such as thorough inspection and verification during the entire construction phase can avoid the need for more extensive detection techniques and disconnection.

Field testing of dry weather discharges. Storm drain outfalls are monitored to identify those areas where discharges that exceed water quality standards are occurring. To satisfy the permit requirements, three high priority areas need to be assessed in the field by the third permit year and one high priority area needs to be assessed each year thereafter. Monitoring includes both visual inspection and chemical analysis to aid in identifying potential discharge sources.

Dry weather visual inspection for the presence of non-stormwater discharges will be conducted at the major outfalls. Field notes, recorded on the field inspection form, and photographs will be taken during the inspection and will be maintained for reference. If the outfall is not accessible, field crews must use the system map and identify the nearest point to assess the system. Staff will locate the storm sewer manhole closest to the outfall and remove the cover to identify signs of dry-weather flow, such as odor or residue.


Odor – Most strong odors, especially gasoline, oils, and solvents, are likely associated with high responses on the toxicity screening test. Typical obvious odors include: gasoline, oil, sanitary wastewater, industrial chemicals, and decomposing organic wastes.
• **Sewage**: Smell associated with the stale sanitary wastewater, especially in pools near outfalls.

• **Sulfur ("rotten eggs"):** Industries that discharge sulfide compounds or organics (meat packers, canneries, dairies, etc.).

• **Rancid-sour**: Food preparation facilities (restaurants, hotels, etc.)

• **Oil and gas**: Petroleum refineries or many facilities associated with vehicle maintenance or petroleum product storage.

**Color** – Important indicator of inappropriate industrial sources. Industrial dry-weather discharges may be of any color, but dark colors, such as brown, gray, or black, are most common.

• **Yellow**: Chemical plants, textile, and tanning plants.

• **Brown**: Meat packers, printing plants, metal works, stone and concrete, fertilizers, and petroleum refining facilities.

• **Green**: Chemical plants, and textile facilities.

• **Red**: Meat packers.

• **Gray**: Dairies.

**Turbidity** – Often affected by the degree of gross contamination. Dry-weather industrial flows with moderate turbidity can be cloudy, while highly turbid flows can be opaque. High turbidity is often a characteristic of undiluted dry-weather industrial discharges.

• **Cloudy**: Sanitary wastewater, concrete or stone operations, fertilizer facilities, automotive dealers.

• **Opaque**: Food processors, lumber mills, metal operations, and pigment plants.

**Floatable matter** – A contaminated flow may contain floating solids or liquids directly related to industrial or sanitary wastewater pollution. Floatables of industrial origin may include animal fats, spoiled food, oils, solvents, sawdust, foams, packing materials, or fuel.

• **Oil sheen**: Petroleum refineries or storage facilities, and vehicle service facilities.

• **Sewage**: Sanitary wastewater.
Deposits and Stains – Refer to any type of coating near the outfall and are usually of a dark color. Deposits and stains often will contain fragments of floatable substances. These situations are illustrated by the grayish-black deposits that contain fragments of animal flesh and hair, which often are produced by leather tanneries, or the white crystalline powder that commonly coats outfalls due to nitrogenous fertilizer wastes.

- **Sediment:** Construction site erosion.
- **Oils:** Petroleum refineries or storage facilities and vehicle service facilities.

Vegetation – Vegetation surrounding an outfall may show the effects of industrial pollutants. Decaying organic materials coming from various food product wastes would cause an increase in plant life, while the discharge of chemical dyes and inorganic pigments from textile mills could noticeably decrease vegetation. It is important not to confuse the adverse effects of high stormwater flows on vegetation with highly toxic dry-weather intermittent flows.

- **Excessive growth:** Food product facilities.
- **Inhibited growth:** High stormwater flows, beverage facilities, printing plants, metal product facilities, drug manufacturing, petroleum facilities, vehicle service facilities and automobile dealers.

Damage to Outfall Structures – Another readily visible indication of industrial contamination. Cracking, deterioration, and spalling of concrete or peeling of surface paint, occurring at an outfall are usually caused by severely contaminated discharges, usually of industrial origin. These contaminants are usually very acidic or basic in nature. Primary metal industries have a strong potential for causing outfall structural damage because their batch dumps are highly acidic. Poor construction, hydraulic scour, and old age may also adversely affect the condition of the outfall structure.

- **Concrete cracking:** Industrial flows
- **Concrete spalling:** Industrial flows
- **Peeling paint:** Industrial flows
- **Metal corrosion:** Industrial flows

The City’s goal is to inspect all outfalls over the 5-year permit term. Priority outfalls will be identified per the timeline set in the permit and then 3 priority outfalls will be inspected every year thereafter. If an indication of an illicit discharge exists, it will be reported to the Public Works Director and steps will be followed to identify and eliminate the source of the discharge.
If non-stormwater discharges are identified at an outfall, the source of the discharge will be investigated through several means including identification of potential sources within the basin, chemical analysis of the non-stormwater discharge to identify potential source, review of citizen complaints of dumping, odors, unusual activity, and review of sanitary sewer maps to identify possible cross connections. The list of potential non-stormwater discharge sites within the basin will be matched to the type of discharge identified. Often the source of the non-stormwater discharge will not be able to be readily identified. The presence of commercial or industrial activities, the surrounding land uses and the authority to investigate illicit connections given by City ordinances will affect the methods used to identify illicit connections.

In establishing illicit discharge investigation protocol, the City will evaluate the following EPA recommendations for detecting illicit connections.

- Instituting building and plumbing codes to prevent connections of sources of potentially hazardous pollutants to storm drains.
- Prioritizing structures to be inspected by building age and use. Older buildings and buildings whose processes have the potential to affect water quality should be given first priority.
- Mapping each area to be surveyed and indicating the route of the sewer system and the locations of storm drains on the map. This enables planners to estimate the likely locations of illicit connections.
- Survey individual buildings to identify connections to storm drains.
- Inspect sewer lines with television equipment to identify all physical connections.
- Compare the results of the field tests and the video inspection with the known connections on the map. Suspicious areas should be further investigated.
- Institute mandatory inspections for new developments or remodeling projects to identify illicit connections to the storm sewer system.
- Remove and test sediment from the catch basins or equivalent structures.
- Inspect suspected illicit connections to determine whether they should be connected to the storm drain system or to the sanitary sewer. Use methods of identification such as dye testing, visual inspection, smoke testing, or flow monitoring, as described below.

*Dye Testing.* Flushing fluorometric dye into suspicious downspouts, sanitary fixtures, or sewers can be useful to identify illicit connections. Once the dye has been introduced into the suspicious connection, the storm and/or sanitary collection system is monitored to determine whether dye is present. The presence of dye will confirm whether the suspect element is connected to the proper collection system or is an illicit connection.

*Visual Inspection.* Remotely guiding television cameras through sewer lines is another way to identify physical connections.

*Smoke Testing.* Smoke testing is another method used to discover illicit connections. Zinc chloride smoke is injected into the sewer line and emerges via
vents on connected buildings, through cracks or leaks in the sewer line, or through catch basins if the storm and sanitary sewers are cross connected. Monitoring and recording where the smoke emerges, crews can identify legal and illegal connections to the sewer system. Properly functioning drains should prevent the smoke from entering buildings; however, in some instances, this will occur. It is important to notify the public prior to smoke testing an area, to inform them that the smoke is non-toxic, though it should be avoided as it can cause irritation of the nose and throat for some people.

Flow Monitoring. Monitoring increases in storm sewer flows during dry periods can also lead investigators to sources of infiltration due to improper connections.

Infrared, Aerial, and Thermal Photography. Researchers are experimenting with the use of aerial, infrared, and thermal photography to locate sources of illicit discharges by studying the temperature of the receiving water and soils or land surface moisture and vegetative growth. This technique assumes that a failing septic system would create moisture in the surface soil, the area would be warmer, and the vegetation would grow faster than in the surrounding area.

The City will prioritize inspection sites in order to maximize the results of the inspections with the available time and funds associated with this BMP. The City is considering incorporating the following EPA prioritization scheme into their illicit detection program:

1. Automobile-related businesses/facilities and heavy manufacturing
2. Printers, dry cleaners/laundries, photo processors, utilities, paint stores, water conditioners, chemical laboratories, construction companies and medium light manufacturing
3. Institutional facilities, private service agencies, retail establishments, and schools

Timeline for Completion
The City will begin to prioritize and start inspections of illicit discharge connections in the third permit year of 2009. The number of illicit connections found in these inspections will be tallied annually.

BMP 3(G): RECEIVE TRAINING ON ILLICIT DISCHARGES

Measurable Goal
1. Develop list of personnel to be trained.
2. Develop training materials and/or research available classes.
3. Number of training days for staff.

Description
Training for detection and elimination of illicit discharges will be conducted for selected City staff, such as field maintenance crews and illicit discharge inspectors, on the proper BMPs to use for detecting and eliminating illicit discharges. The class will include
various means to identify illicit connections and methods used to disconnect them from the stormwater system. Reporting requirements will also be included in the training.

**Timeline for Completion**
The City will begin training their staff on illicit discharges beginning in 2008 and will continue a refresher class every other year in the following years.

### BMP 3(H): COMMUNITY HOTLINE

**Measurable Goal**
1. Identify phone number and contact person to receive reports on illicit discharges through the community.
2. Distribute phone number to community.
3. Number of inspections provided in response to public calls.

**Description**
As noted for general stormwater concerns, a community hotline will help make City staff aware of illicit discharges throughout the City. When a complaint comes in, City staff will dispatch qualified investigators to respond to the complaint. They will make every attempt to determine the responsible party and inform them of the environmental impact of their actions. The responsible party will be required to remedy the illegal connection or discharge.

**Timeline for Completion**
The City will designate a few hours a year to monitoring the progress of community calls beginning in 2008 and will continue this monitoring through 2012.

### BMP 3(I): IDENTIFY/ELIMINATE DISCHARGES FROM STORAGE TANKS

**Measurable Goal**
1. Identify facilities that own and operate large above or below ground storage tanks.
2. Distribute educational material on SWPPP elements for the tanks.

**Description**
Storage tanks, either above or below ground, may potentially degrade water quality if leaks are present. To contend with this problem, the City intends to first identify facilities within the area that own and operate large above or below ground storage tanks. Educational material regarding maintenance for these tanks will be compiled and distributed to owners of these tanks. If needed, enforcement actions will be taken.

**Timeline for Completion**
The City will address the storage tank issue in 2008 with a follow up review in 2010.
CONTROL STORMWATER RUNOFF FROM NEW DEVELOPMENT, REDEVELOPMENT, AND CONSTRUCTION SITES

As with the other NPDES Phase II requirements, Ecology has developed requirements for the development related minimum control measures in the federal NPDES Phase II permit program. The following program is based on the January 17, 2007 permit requirements.

Site Runoff Control. Polluted stormwater runoff from construction and developed sites often flows to cities and ultimately is discharged into local rivers and streams. The Phase II Final Rule requires an operator of a regulated small city to develop, implement, and enforce a program to reduce pollutants in stormwater runoff to their city from construction activities that result in a land disturbance of greater than or equal to one acre or contain less than one acre and are part of a larger common plan of the development or sale. The permittee is required to have:

a. The program shall include an ordinance or other enforceable mechanism that addresses runoff from new development, redevelopment, and construction site projects. Pursuant to S5.A.2., in adopting this ordinance or other regulatory mechanism, existing local requirements to apply stormwater controls at smaller sites, or at lower thresholds than required pursuant to S5.C.4., shall be retained. The ordinance or other enforceable mechanism shall be in place no later than thirty months from the effective date of this Permit. The ordinance or other enforceable mechanism shall include, at a minimum:

i. The Minimum Requirements, technical thresholds, and definitions in Appendix 1 or an equivalent approved by Ecology under the NPDES Phase I Municipal Stormwater Permit, for new development, redevelopment, and construction sites. Adjustment and variance criteria equivalent to those in Appendix 1 shall be included. More stringent requirements may be used, and/or certain requirements may be tailored to local circumstances through the use of basin plans or other similar water quality and quantity planning efforts. Such local requirements shall provide equal protection of receiving waters and equal levels of pollutant control to those provided in Appendix 1.

ii. A site planning process and BMP selection and design criteria that, when used to implement the minimum requirements in Appendix 1 (or equivalent approved by Ecology under the Phase I Permit) will protect water quality, reduce the discharge of pollutants to the maximum extent practicable and satisfy the State requirement under Chapter 90.48 RCW to apply all known, available and reasonable methods of prevention, control and treatment (AKART) prior to
discharge. Permittees shall document how the criteria and requirements will protect water quality, reduce the discharge of pollutants to the maximum extent practicable, and satisfy State AKART requirements. Permittees who choose to use the site planning process and BMP selection and design criteria in the 2005 *Stormwater Management Manual for Western Washington*, or an equivalent manual approved by the Department under the Phase I Permit, may cite this choice as their sole documentation to meet this requirement.

iii. The legal authority, through the approval process for new development, to inspect private stormwater facilities that discharge to the Permittee’s MS4.

iv. Provisions to allow non-structural preventive actions and source reduction approaches such as Low Impact Development Techniques (LID), measures to minimize the creation of impervious surfaces and measures to minimize the disturbance of native soils and vegetation. Provisions for LID should take into account site conditions, access and long term maintenance.

v. If the Permittee chooses to allow construction sites to apply the “Erosivity Waiver” in Appendix 1, Minimum Requirement #2, the ordinance or regulatory mechanism shall include appropriate, escalating enforcement sanctions for construction sites that provide notice to the Permittee of their intention to apply the waiver but do not meet the requirements (including timeframe restrictions, limits on activities that result in non-stormwater discharges, and implementation of appropriate BMPs to prevent violations of water quality standards) to qualify for the waiver.

b. The program shall include a permitting process with plan review, inspection and enforcement capability to meet the standards listed in (i) through (iv) below, for both private and public projects, using qualified personnel (as defined in Definitions and Acronyms). At a minimum, this program shall be applied to all sites that disturb a land area 1 acre or greater, including projects less than one acre that are part of a larger common plan of the development or sale. The process shall be in place no later than thirty months from the effective date of this Permit.

i. Except as provided in S5.C.4.b.vii. below, review of all stormwater site plans for proposed development activities.

ii. Except as provided in S5.C.4.b.vii. below, inspect, prior to clearing and construction, all known development sites that have a high potential for sediment transport as determined through plan review based on definitions and requirements in Appendix 7 Identifying Construction Site Sediment Transport Potential.

iii. Except as provided in S5.C.4.b.vii. below, inspect all known permitted development sites during construction to verify proper installation and maintenance of required erosion and sediment controls. Enforce as necessary based on the inspection.
iv. Inspect all permitted development sites upon completion of construction and prior to final approval or occupancy to ensure proper installation of permanent stormwater controls such as stormwater facilities and structural BMPs. Also, verify a maintenance plan is completed and responsibility for maintenance is assigned. Enforce as necessary based on the inspection.

v. Compliance with the inspection requirements in (ii), (iii) and (iv) above shall be determined by the presence and records of an established inspection program designed to inspect all sites and achieving at least 95% of scheduled inspections.

vi. An enforcement strategy shall be developed and implemented to respond to issues of non-compliance.

vii. If the Permittee chooses to allow construction sites to apply the “Erosivity Waiver” in Appendix 1, Minimum Requirement #2, the Permittee is not required to review the construction stormwater pollution prevention plans as part of the site plan review in (i) above, and is not required to perform the construction phase inspections identified in (ii) and (iii) above related to construction sites which are eligible for the erosivity waiver.

c. The program shall include provisions to verify adequate long-term operation and maintenance (O&M) of post-construction stormwater facilities and BMPs that are permitted and constructed pursuant to (b) above. These provisions shall be in place no later than thirty months from the effective date of this Permit and shall include:

i. Adoption of an ordinance or other enforceable mechanism that clearly identifies the party responsible for maintenance, requires inspection of facilities in accordance with the requirements in (ii) through (iv) below, and establishes enforcement procedures.

ii. Each Permittee shall establish maintenance standards that are as protective or more protective of facility function than those specified in Chapter 4 of Volume V of the 2005 Stormwater Management Manual for Western Washington. For facilities which do not have maintenance standards, the Permittee shall develop a maintenance standard.

(1) The purpose of the maintenance standard is to determine if maintenance is required. The maintenance standard is not a measure of the facilities required condition at all times between inspections. Exceeding the maintenance standard between the period of inspections is not a permit violation.

(2) Unless there are circumstances beyond the Permittees control, when an inspection identifies an exceedence of the maintenance standard, maintenance shall be performed:

- Within 1 year for wet pool facilities and retention/detention ponds.
- Within 6 months for typical maintenance.
• Within 9 months for maintenance requiring re-vegetation, and
• Within 2 years for maintenance that requires capital construction of less than $25,000.

Circumstances beyond the permittees control include denial or delay of access by property owners, denial or delay of necessary permit approvals, and unexpected reallocations of maintenance staff to perform emergency work. For each exceedence of the required timeframe, the Permittee must document the circumstances and how they were beyond their control.

iii. Annual inspections of all stormwater treatment and flow control facilities (other than catch basins) permitted by the Permittee according to S5.C.4.b. unless there are maintenance records to justify a different frequency. Reducing the inspection frequency shall be based on maintenance records of double the length of time of the proposed inspection frequency. In the absence of maintenance records, the Permittee may substitute written statements to document a specific less frequent inspection schedule. Written statements shall be based on actual inspection and maintenance experience and shall be certified in accordance with G19 Certification and Signature.

iv. Inspections of all new flow control and water quality treatment facilities, including catch basins, for new residential developments that are a part of a larger common plan of development or sale, every 6 months during the period of heaviest house construction (i.e., 1 to 2 years following subdivision approval) to identify maintenance needs and enforce compliance with maintenance standards as needed.

d. The program shall include a procedure for keeping records of inspections and enforcement actions by staff, including inspection reports, warning letters, notices of violations, and other enforcement records. Records of maintenance inspections and maintenance activities shall be maintained. Permittees shall keep records of all projects disturbing more than one acre, and all projects of any size that are part of a common plan of development or sale that is greater than one acre that are approved after the effective date of this Permit.

e. The program shall make available copies of the "Notice of Intent for Construction Activity" and copies of the "Notice of Intent for Industrial Activity" to representatives of proposed new development and redevelopment. Permittees will continue to enforce local ordinances controlling runoff from sites that are also covered by stormwater permits issued by Ecology.

f. No later than thirty months from the effective date of this Permit, each Permittee shall verify that all staff responsible for implementing the program to control stormwater runoff from new development,
redevelopment, and construction sites, including permitting, plan review, construction site inspections, and enforcement, are trained to conduct these activities. Follow-up training shall be provided as needed to address changes in procedures, techniques or staffing. Permitees shall document and maintain records of the training provided and the staff trained.

The City of Buckley will implement Best Management Practices (BMPs) to address site run-off control from new development, redevelopment and construction sites. These include the development, implementation and enforcement of a program to reduce site runoff and site inspections to enforce City ordinances related to site run-off. Specifically, the City is planning to implement the following BMPs.

- BMP 4(A): Develop and Update Legal Authority/Ordinances
- BMP 4(C): Conduct Construction Inspections
- BMP 4(D): Plan Reviews for New and Redevelopment
- BMP 4(E): Conduct Post-Developed Inspections
- BMP 4(F): Provide Training for Personnel
- BMP 4(G): Identify Sensitive Water Bodies and Protective Measures
- BMP 4(H): Encourage Low Impact Development
- BMP 4(I): Local Watershed Planning/Modeling

**Objective:** Continue and upgrade the set of development requirements for construction sites per the City’s adopted ordinance, including planning, installation, inspection, maintenance and enforcement of development practices.

**BMP 4(A): DEVELOP AND UPDATE LEGAL AUTHORITY/ORDINANCES**

**Measurable Goal**
1. Identify any regulation areas not addressed within the current ordinance and revise if necessary.

**Description**
The City currently has regulations that require applicants for construction projects to plan for and implement erosion control practices and describe the inspection and enforcement authority of the City. The City will ensure that the erosion and sediment control ordinance(s) include all sufficient stormwater pollution prevention elements to prevent pollution resulting from erosion and sediment runoff during the construction phase, and an adequate enforcement plan to ensure compliance with the ordinance.

The following sections of the BMC Chapter 14.30. {Stormwater Management} pertain to construction run-off control measures.

14.30.062 Best Management Practices
General. BMPs shall be used to control pollution from stormwater. BMPs shall be used to comply with the standards in this chapter. BMPs are in the manual.

Experimental BMPs. In those instances where appropriate BMPs are not in the manual, experimental BMPs should be considered. Experimental BMPs are encouraged as a means of solving problems in a manner not addressed by the manual in an effort to improve stormwater quality technology. Experimental BMPs must be approved in accordance with the approval process outlined in the manual. (Ord. 25-95 § 1, 1995).

14.30.723 Minimum Requirement No. 1 - Erosion and Sediment Control

All new development and redevelopment that includes land disturbing activities of less than one acre shall comply with the small parcel minimum requirements found in BMC


The City will take Ecology’s recommendation of referencing the adopted Ecology manual for details on appropriate BMPs to be applied rather than describing them within the ordinance itself. The City ordinance will require the submittal of a Construction Stormwater Pollution Prevention Plan (SWPPP) which will cover the following 12 elements.

1. Mark Clearing Limits
2. Establish Construction Access
3. Control Flow Rates
4. Install Sediment Controls
5. Stabilize Soils
6. Protect Slopes
7. Protect Drain Inlets
8. Stabilize Channels and Outlets
9. Control Pollutants
10. Control De-Watering
11. Maintain BMPs
12. Manage the Project

In addition to the BMPs contained in the Ecology Manual, the City will reference erosion and sediment control techniques on its stormwater website that owners of construction sites would be allowed to use. The EPA has developed the National Menu of Best Management Practices which is available at http://cfpub2.epa.gov/npdes/stormwater/menofbmps/index.cfm. The menu contains fact
sheets on techniques for controlling erosion and sedimentation from construction sites. The techniques include:

- Minimize clearing (land grading, permanent diversions, preserving natural vegetation and construction entrances)
- Stabilize drainage ways (check dams, filter berms, grass-lined channels, riprap)
- Stabilize exposed soils (chemical stabilization, mulching, permanent seeding, sodding, soil roughening,
- Protect steep slopes (geotextiles, gradient terraces, soil retention, temporary slope drain)
- Phase construction (construction sequencing, dust control)
- Install perimeter controls (temporary diversion dikes, wind fences and sand fences, brush barrier, silt fence)
- Install sediment trapping devices (Sediment basins and rock dams, sediment filters and sediment chambers, sediment trap)
- Inlet protection (storm drain inlet protection)
- Good Housekeeping (general construction site waste management, spill prevention and control plan, vehicle maintenance and washing areas)
- Education and awareness (contractor certification and inspector training, construction review, BMP inspection and maintenance)

The ordinance will also incorporate an enforcement plan that includes enforcement procedures against inadequate construction erosion and sediment controls. City code currently describes different levels of enforcement available to inspectors, such as warnings, compliance orders and stop work orders.

For developed or redeveloped sites, the City currently has regulations that establish the minimum level of compliance which must be met to permit a property to be developed or redeveloped within the City. The purpose of the regulations are to:

A. Minimize water quality degradation and sedimentation in streams, ponds, lakes, wetlands and other water bodies;
B. Minimize the impact of increased run-off, erosion and sedimentation caused by land development and maintenance practices;
C. Minimize adverse impacts of alterations on ground and surface water quantities, locations and flow patterns; and
D. Decrease potential landslide, flood and erosion damage to public and private property.

The following sections of the BMC 14.30, {Stormwater Management}, currently regulate post-construction run-off control for new and re-developed sites.

14.30.726 Minimum Requirement No. 4 – Runoff Treatment BMPs.
All projects shall provide treatment of stormwater. Treatment BMPs shall be sized to capture and treat the water quality design storm, defined as the six-month, 24-hour return period storm. The first priority for treatment shall be to infiltrate as much as possible of the water quality design storm, only if site conditions are appropriate and ground water quality will not be impaired. Direct discharge of untreated stormwater to ground water is prohibited. All treatment BMPs shall be selected, designed and maintained according to an approved manual.

Stormwater treatment BMPs shall not be built within a natural vegetated buffer, except for necessary conveyance systems as approved by the local government.

An adopted and implemented basin plan (minimum requirement No. 9) may be used to develop runoff treatment requirements that are tailored to a specific basin. (Ord. 25-95 § 1, 1995).

14.30.727 Minimum Requirement No. 5 – Streambank Erosion Control.
The requirement below applies only to situations where stormwater runoff is discharged directly or indirectly to a stream, and must be met in addition to meeting the requirements in minimum requirement No. 4, runoff treatment BMPs:

Stormwater discharges to streams shall control streambank erosion by limiting the peak rate of runoff from individual development sites to 50 percent of the existing condition two-year, 24-hour design storm while maintaining the existing condition peak runoff rate for the 10-year, 24-hour and 100-year, 24-hour design storms. As the first priority, streambank erosion control BMPs shall utilize infiltration to the fullest extent practicable, only if site conditions are appropriate and ground water quality is protected. Streambank erosion control BMPs shall be selected, designed and maintained according to an approved manual.

Stormwater treatment BMPs shall not be built within a natural vegetated buffer, except for necessary conveyance systems as approved by the local government.
An adopted and implemented basin plan (minimum requirement No. 9) may be used to develop streambank erosion control requirements that are tailored to a specific basin. (Ord. 25-95 § 1, 1995).

The City will review its current ordinance to determine the effectiveness of current measures in place. The City will adopt the 2005 Ecology Manual, including its Minimum Requirements, and will ensure that through this adoption, the ordinance will address post-construction runoff from new developments and redevelopment projects that disturb more than one acre. In this sense, “redevelopment” refers to alterations of a property that change the “footprint” of a site or building and is not intended to include such activities as exterior remodeling, which would not be expected to cause adverse stormwater quality impacts and offer no new opportunity for stormwater controls. The ordinance shall also allow for structural and non-structural BMPs and shall implement standards to ensure long-term operation and maintenance of the BMPs. The maintenance schedule will comply with the NPDES Phase II Permit requirements. Within the ordinance, the City must also state who will be responsible for the long term maintenance of permanent stormwater facilities. Record keeping of all inspections and maintenance will be performed as well.

By adopting the 2005 Ecology Manual, the City is addressing the post-construction runoff issue by requiring a permanent stormwater control plan which is part of the ten minimum requirements noted in the Manual. Stormwater technologies are constantly being improved and the City’s program will be responsive to these changes, developments or improvements in control technologies.

**Timeline for Completion**
The City will review its existing codes in 2007 and will revise them as necessary in 2008 to meet the intent of this BMP. The fourth year of the permit, 2010, will include an evaluation of the revised code to make certain the codes are assisting in accomplishing the desired task of enforcing construction related erosion and sediment controls as well as developed and redeveloped site runoff.

**BMP 4(B): ADOPT 2005 DOE STORMWATER MANUAL**

**Measurable Goal**

**Description**
Per the NPDES Phase II permit requirements, the City shall adopt the 2005 Department of Ecology’s *Stormwater Management Manual for Western Washington*. The objective of the Manual is to provide guidance on the measures necessary to control the quantity and quality of stormwater produced by new development and redevelopment such that they comply with water quality standards and contribute to the protection of beneficial uses of the receiving waters. The manual establishes minimum requirements for development and redevelopment projects and provides guidance concerning how to prepare and implement stormwater site plans. DOE claims that projects following the
approach presented by the Manual will apply reasonable, technology-based BMPS and water quality-based BMPs to reduce the adverse impacts of stormwater.

**Timeline for Completion**
The City will adopt the manual in the 2008.

**BMP 4(C): CONDUCT CONSTRUCTION INSPECTIONS**

**Measurable Goal**
1. Number of inspectors.
2. Develop inspection forms.
3. Frequency of inspection for compliance with construction site erosion/sediment controls and maintenance of installed BMPs.
4. An inventory of inspection activities created, maintained annually.
5. Review of ordinance for site inspection requirements.
6. Number of compliance letters.

**Description**
Inspections are necessary to ensure that erosion and sediment controls are properly installed and maintained and that the site plan reflects changes made on-site (e.g. different types of controls used and changed location of controls). To minimize the amount of staff needed for this BMP, erosion control inspectors include building inspectors and/or other staff under the duration of the Public Works Director. Frequent and consistent inspections are the key to ensuring proper installation and maintenance of erosion and sediment controls. The frequency for inspection of construction sites will be determined by the City but, at a minimum, will be at least once during the duration of a project. More frequent inspections may be required during wet weather months.

Inspections will be prioritized based on the following:
- Construction sites on steep slopes or highly erodible areas
- Construction sites operated by contractors with past violations
- Construction sites disturbing more than one acre and/or
- Construction sites in operation during rain events

**Timeline for Completion**
Inspections is on-going and will continue throughout the following permit years.

**BMP 4(D): REVIEW SITE PLANS**

**Measurable Goal**
1. Number of trained reviewers.
2. Develop checklist for reviewers.
3. Number of plans reviewed.
Description
The City (or consultant) will review construction site plans prior to construction to ensure that they include the required stormwater controls, erosion and sediment controls and post-construction controls in compliance with City codes.

At a minimum, the City will review all plans for sites disturbing at least one acre (or if less than one acre and are part of a planned development) to verify the following factors:

- Erosion and sediment controls consistent with City codes and control requirements.
- The construction operator is aware of his responsibility for implementing and maintaining erosion and sediment controls and is aware of the penalties for failing to do so.
- Post-construction controls consistent with the City codes are clearly described on the plan and are sized appropriately.
- The construction operator and landowner are aware of the responsibility for implementing and maintaining the post-construction controls and of the penalties for failing to do so.

To aid in the reviewing process, the City will create a developer review checklist to make certain that all concerns are addressed during the review. A pre-construction site plan meeting with the construction operator may be required to ensure that all parties are comfortable with the plan and requirements.

Timeline for Completion
The City currently reviews plans prior to construction. This review will continue throughout the 5-year permit cycle. A reviewer’s checklist will be developed during 2007 and implemented in 2008.

BMP 4(E): CONDUCT POST-DEVELOPED INSPECTIONS

Measurable Goal
1. Number of inspectors.
2. Develop inspection forms.
3. Frequency of inspection for compliance with installed BMPs.
4. An inventory of inspection activities created, maintained annually.
5. Review of ordinance for site inspection requirements.
6. Number of compliance letters.

Description
Similar to construction inspections, post-developed inspections are necessary to ensure that stormwater controls are properly installed and maintained. Inspections will be conducted to ensure facilities were built as designed. A maintenance plan will be verified as part of this process as well. Compliance with inspections should be achieved at a 95% level. To minimize the amount of staff needed for this BMP, inspectors will include building inspectors and/or other staff under the direction of the Public Works Director.
Timeline for Completion
Inspections shall begin in 2008 and continue throughout the following permit years.

BMP 4(F): PROVIDE TRAINING FOR PERSONNEL

Measurable Goal
1. Develop list of personnel to be trained.
2. Number of training days for staff.

Description
As noted previously, the City will adopt the latest Ecology Manual into their Municipal Code. The Manual states:

Plans involving construction of treatment facilities or flow control facilities (detention ponds or infiltration basins), structural source control BMPs or drainage conveyance systems generally involve engineering principles and should be prepared by or under the direction of a licensed engineer. Construction Stormwater Pollution Prevention Plans (SWPPPs) that involve engineering calculations must also be prepared by or under the direction of a licensed engineer.

One of the most important factors determining whether or not erosion and sediment controls will be properly installed and maintained on a construction site is the knowledge and experience of the contractor. Minimum requirement #2, Construction Stormwater Pollution Prevention, in the 2005 Ecology Stormwater Management Manual for Western Washington requires that a Certified Professional in Erosion and Sediment Control must be on-site or on-call at all times during a construction project. By adopting the 2005 Manual, the City will include this requirement by ordinance.

A construction site inspection program is also very important to ensure that the sediment and erosion control plans for the construction site are properly implemented and that best management practices are properly installed and maintained. The City of Buckley will evaluate whether the funding and staffing resources are available to support a construction site inspection program using City staff or whether it is better to hire certified private inspectors with stormwater management and ESC training on a job by job basis.

A variety of organizations offer training courses on construction site sediment and erosion control. The Association of General Contractors (AGC) offers two courses on erosion and sediment control. “Construction Site Erosion and Sediment Control Certification” is a 12-hour course that meets Ecology’s requirements for Contractor Erosion and Spill Control Lead (CESCL) certification. “Construction BMP Field Training” is a two-day course that combines classroom work with field exercises. AGC states that this course will set the standard for proper erosion and control training on construction sites in Washington. Course information for these training programs and others is available on the Internet at the addresses below:
Timeline for Completion
The City will allow staff to attend an erosion and sediment control class (or one refresher course) for each year of the permit cycle.

**BMP 4(G): IDENTIFY SENSITIVE WATER BODIES AND PROTECTIVE MEASURES**

**Measurable Goal**
1. Identify sensitive water bodies within the jurisdiction.
2. Develop guidelines for permitting development projects near sensitive areas.
3. Review/revise zoning in sensitive areas.
4. Review and revise critical area requirements/buffers in relation to sensitive areas.

**Description**
Sensitive water bodies play a crucial part in the health of an overall stormwater system. Spiketon Ditch has been identified as the sensitive or impaired water bodies located within the City. The TMDL study for South Prairie Creek includes specific monitoring requirements the City is supposed to carry out on Spiketon Ditch. Staff will also research opportunities for changing the zoning of buffer areas adjacent to the sensitive or impaired water bodies. Guidelines may be developed with the consideration of using hiking and biking trails, parks and natural spaces, minimizing impervious areas, and using riparian corridors and/or wetlands.

**Timeline for Completion**
The sensitive or impaired water bodies have been identified. If warranted the City will prepare updates on the status of Spiketon Ditch in 2009 and 2011.

**BMP 4(H): ENCOURAGE LOW IMPACT DEVELOPMENT (LID)**

**Measurable Goals**
1. Land use codes reviewed to ensure consistency with low impact development (LID) principles
2. Identify construction related subjects for inclusion in construction/new development public education materials that focus on local construction
3. Distribute development education material
4. Number of new site plans with LID practices
Description
As indicated with BMP 1(F), using low-impact development approaches for new development can help to achieve stormwater pollution reduction goals. Through LID approaches, stormwater runoff can be controlled while development objectives are achieved. In order for these measures to be implemented, the City will inform the public about these practices through the adoption of LID practices and the establishment of an outreach program as described for BMP 1(F).

Timeline for Completion
The City will develop its LID codes and distribute educational information in 2008. In 2010 and 2012, an assessment of the LID program will be conducted for effectiveness and will be revised if necessary.

BMP 4(I): LOCAL WATERSHED PLANNING/MODELING

Measurable Goal
1. Create a list of involved participants/interested parties within the watersheds.
2. Number of public meetings held on watershed related planning efforts.

Description
The City is in the process of updating their Stormwater Comprehensive Plan which will address the jurisdiction on a watershed wide basis. The Plan recommends use of the 2005 DOE Stormwater Manual whose applicable guidelines will be used to ensure watershed wide efforts are conducted for the benefit of protecting water quality resources within the area.

Timeline for Completion
The City will complete its Stormwater Comprehensive Plan in 2008 and will hold a public meeting to address recommended developer guidelines and capital improvement projects mentioned within the plan.
POLLUTION PREVENTION AND OPERATIONS AND MAINTENANCE FOR MUNICIPAL OPERATIONS PROGRAM

As with the other elements, Ecology developed permit requirements for the pollution prevention (good housekeeping) program minimum measure of the federal NPDES Phase II permit program. The following program is based on DOE’s permit requirements.

This measure requires the City to examine and subsequently alter their own actions to help ensure a reduction in the amount and type of pollution that: (1) collects on streets, parking lots, open spaces, and storage and vehicle maintenance areas and is discharged into local waterways; and (2) results from actions such as environmentally damaging land development and flood management practices or maintenance of storm sewer systems.

The DOE Phase II permit states that the “Within three years of the effective date of this permit, each Permittee shall develop and implement an Operations & Maintenance program that includes a training component and has the ultimate goal of preventing or reducing pollutant runoff from municipal operations.”

The permit regulations require the permit holder to do the following:

a. Each Permittee shall establish maintenance standards that are as protective, or more protective, of facility function than those specified in Chapter 4 of Volume V of the 2005 Stormwater Management Manual for Western Washington. For facilities which do not have maintenance standards, the Permittee shall develop a maintenance standard.

i. The purpose of the maintenance standard is to determine if maintenance is required. The maintenance standard is not a measure of the facilities required condition at all times between inspections. Exceeding the maintenance standard between inspections and/or maintenance is not a permit violation.

ii. Unless there are circumstances beyond the Permittees control, when an inspection identifies an exceedence of the maintenance standard, maintenance shall be performed:

• Within 1 year for wet pool facilities and retention/detention ponds.
• Within 6 months for typical maintenance.
• Within 9 months for maintenance requiring re-vegetation.
• Within 2 years for maintenance that requires capital construction of less than $25,000.

Circumstances beyond the permittees control include denial or delay of access by property owners, denial or delay of necessary permit approvals, and unexpected reallocations of maintenance staff to perform emergency work. For each exceedence of the required
timeframe, the Permittee shall document the circumstances and how they were beyond their control.

b. Annual inspection of all municipally owned or operated permanent stormwater treatment and flow control facilities, other than catch basins, and taking appropriate maintenance actions in accordance with the adopted maintenance standards. The annual inspection requirement may be reduced based on inspection records. Reducing the inspection frequency shall be based on maintenance records of double the length of time of the proposed inspection frequency. In the absence of maintenance records, the Permittee may substitute written statements to document a specific less frequent inspection schedule. Written statements shall be based on actual inspection and maintenance experience and shall be certified in accordance with G19 Certification and Signature.

c. Spot checks of potentially damaged permanent treatment and flow control facilities (other than catch basins) after major (greater than 24-hour-10-year recurrence interval rainfall) storm events. If spot checks indicate widespread damage/maintenance needs, inspect all stormwater treatment and flow control facilities that may be affected. Conduct repairs or take appropriate maintenance action in accordance with maintenance standards established above, based on the results of the inspections.

d. Inspection of all catch basins and inlets owned or operated by the Permittee at least once before the end of the Permit term. Clean catch basins if the inspection indicates cleaning is needed to comply with maintenance standards established in the 2005 Stormwater Management Manual for Western Washington. Decant water shall be disposed of in accordance with Appendix 6 Street Waste Disposal. Inspections may be conducted on a “circuit basis” whereby a sampling of catch basins and inlets within each circuit is inspected to identify maintenance needs. Include in the sampling an inspection of the catch basin immediately upstream of any system outfall. Clean all catch basins within a given circuit at one time if the inspection sampling indicates cleaning is needed to comply with maintenance standards established under S5.C.4.c., above.

As an alternative to inspecting catch basins on a “circuit basis,” the Permittee may inspect all catch basins, and clean only catch basins where cleaning is needed to comply with maintenance standards.

e. Compliance with the inspection requirements in a, b, c and d above shall be determined by the presence of an established inspection program designed to inspect all sites and achieving inspection of 95% of all sites.

f. Establishment and implementation of practices to reduce stormwater impacts associated with runoff from streets, parking lots, roads or highways owned or maintained by the Permittee, and road maintenance activities conducted by the Permittee. The following activities shall be addressed:
• Pipe cleaning
• Cleaning of culverts that convey stormwater in ditch systems
• Ditch maintenance
• Street cleaning
• Road repair and resurfacing, including pavement grinding
• Snow and ice control
• Utility installation
• Pavement striping maintenance
• Maintaining roadside areas, including vegetation management
• Dust control

g. Establishment and implementation of policies and procedures to reduce pollutants in discharges from all lands owned or maintained by the Permittee and subject to this Permit, including but not limited to: parks, open space, road right-of-way, maintenance yards, and stormwater treatment and flow control facilities. These policies and procedures shall address, but are not limited to:
• Application of fertilizer, pesticides, and herbicides including the development of nutrient management and integrated pest management plans.
• Sediment and erosion control.
• Landscape maintenance and vegetation disposal.
• Trash management.
• Building exterior cleaning and maintenance.

h. Develop and implement an on-going training program for employees of the Permittee whose construction, operations or maintenance job functions may impact stormwater quality. The training program shall address the importance of protecting water quality, the requirements of this Permit, operation and maintenance standards, inspection procedures, selecting appropriate BMPs, ways to perform their job activities to prevent or minimize impacts to water quality, and procedures for reporting water quality concerns, including potential illicit discharges. Follow-up training shall be provided as needed to address changes in procedures, techniques or requirements. Permittees shall document and maintain records of training provided.

i. Development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) for all heavy equipment maintenance or storage yards, and material storage facilities owned or operated by the Permittee in areas subject to this Permit that are not required to have coverage under the Industrial Stormwater General Permit. Implementation of non-structural BMPs shall begin immediately after the pollution prevention plan is developed. A schedule for implementation of structural BMPs shall be included in the SWPPP. Generic SWPPPs that can be applied at multiple sites may be used to comply with this requirement. The SWPPP shall include periodic visual observation of discharges from the facility to evaluate the effectiveness of the BMP.
j. Records of inspections and maintenance or repair activities conducted by the Permittee shall be maintained in accordance with S9 Reporting Requirements.

The City of Buckley plans to implement the following BMPs to address pollution prevention.

- BMP 5(A): Provide Employee Training
- BMP 5(B): Develop Stormwater Pollution Prevention Plan (SWPPP) for City Facilities and Implement Maintenance Standards

Objective: Promote pollution prevention/good housekeeping measures.

BMP 5(A): EMPLOYEE TRAINING

Measurable Goal
1. Number of training hours for staff.

Description
At a minimum, the City will ensure that employees in stormwater and maintenance related positions are trained on the requirements of the stormwater good housekeeping/pollution prevention program by the end of the permit term. The training program will incorporate the following measures.

- Crews trained in proper maintenance activities, including record keeping, disposal and inspections.
- Only properly trained individuals will be allowed to handle hazardous materials/wastes.
- City employees from all departments will be trained to recognize and report illegal dumping.
- City employees will be trained and will educate businesses, contractors, and the general public in proper and consistent methods for disposal.
- City staff will be trained regarding non-stormwater discharges (illicit connections).

A general, brief, 1-hour training session will be held for the employees. Longer, specific training will be given for program specific areas such as vehicle washing and illicit discharge inspections.

The City will also ensure that employees have access to public education materials produced as part of this permit so that they may implement best management practices in their day-to-day actions as well.

Timeline for Completion
The City will begin tracking employee training hours in 2007 which is Year 1 of the permit cycle. Tracking will continue through 2012.
Measurable Goal
1. Develop a Stormwater Pollution Prevention Plan (SWPPP)
2. Adopt City Operation and Maintenance Standards
3. Measures in the SWPPP are implemented

Description
During the first Phase II NPDES permit cycle, the City of Buckley will concentrate on developing, implementing and monitoring the success of a stormwater pollution prevention plan/good housekeeping program for City facilities and activities. The program will include the following:

- Adoption of maintenance standards
- Training in the proper methods of facility maintenance to minimize stormwater pollution,
- Training in the proper methods for disposal of solid and liquid wastes from maintenance activities,
- Develop and implement a maintenance schedule to include inspection of 95% of all sites, and
- Evaluate the effectiveness of the program.

A plan that discusses good housekeeping procedures is essential to ensure that all City activities and programs impacting stormwater are implemented efficiently and effectively. The Good Housekeeping/Stormwater Pollution Prevention Plan is intended to reduce the amount of pollutants carried by stormwater runoff into the storm drainage system. Comprised of a description of procedures and associated schedules, the Good Housekeeping/Stormwater Pollution Prevention Plan will serve as a tool for all City employees that are directly involved in stormwater management or administer programs that impact stormwater. The plan will contain the following:

- Description of activities and programs that have the potential to impact stormwater quality and procedures to follow to minimize the risk of pollution. These activities include the application of fertilizers/pesticides/herbicides, sediment and erosion control, landscape maintenance and vegetation disposal, trash management, and building exterior cleaning and maintenance.
- List of responsible departments and personnel for each activity
- Schedule of activities, including maintenance, inspections and reporting which will comply with the NPDES Phase II permit requirements

To gain an understanding of existing City operations, the City will assemble and review existing materials from various departments who perform these activities. In reviewing information on existing programs, specific attention will be paid to the frequency of activities; types of substances used; materials storage, handling and disposal practices;
type and frequency of employee training; record keeping practices; and inspection procedures and frequencies. If the documentation does not exist, brief interviews with the staff from the various departments may be conducted. If no program exists for certain activities, then the City will determine which department would best be suited to take on the activity.

The final Good Housekeeping/Stormwater Pollution Prevention Plan will serve as a reference manual for all City employees. To fully implement the program, training for City staff should be conducted on the information contained within the Plan.

**Timeline for Completion**
In 2008, the City will develop a Good Housekeeping/Stormwater Pollution Prevention Plan with the elements stated above.
LONG TERM MONITORING PLAN

As of January 17, 2007, Ecology developed an NPDES Phase II permit which contained a requirement for the compilation of a long term monitoring plan to be implemented in the second permit cycle (beginning in 2012). The following program is based on this proposed requirement.

Long Term Monitoring Plan. According to the Phase II permit, permittees shall develop a comprehensive long-term water quality monitoring program during the term of the permit. The following requirements shall be met:

1. All cities, towns and counties shall prepare to participate in the implementation of a comprehensive long-term monitoring program. The monitoring program will include two components: stormwater monitoring and targeted Stormwater Management Program (SWMP) effectiveness monitoring. Stormwater monitoring is intended to characterize stormwater runoff quantity and quality at a limited number of locations in a manner that allows analysis of loadings and changes in conditions over time and generalization across the permittees’ jurisdictions. Stormwater program effectiveness monitoring is intended to improve stormwater management efforts by evaluating issues that significantly affect the success of, or confidence in, stormwater controls. The monitoring program can include long-term monitoring and short-term studies. The results of the monitoring program will be used to support the adaptive management process and lead to refinements of the SWMP.
   a. Stormwater monitoring
      Cities having a population greater than 10,000 and counties having a population greater than 25,000 shall identify sites for long-term stormwater monitoring. Adequate sites will be those completely mapped as required in S5.C.3.a. and be suitable for permanent installation and operation of flow-weighted composite sampling equipment. No later than December 31, 2010:
      i. Each county having a population greater than 100,000 shall identify three outfalls or conveyances where stormwater sampling could be conducted. One outfall or conveyance shall represent commercial land use, the second shall represent low-density residential land use and the third will represent medium-to-high density residential land use.
      ii. Each city having a population greater than 75,000 shall identify three outfalls or conveyances where stormwater sampling could be conducted. One outfall or conveyance shall represent commercial land use, the second shall represent high-density residential land use and the third will represent industrial land use.
      iii. Each county having a population between 25,000 and 100,000 shall identify two outfalls or conveyances where stormwater sampling
could be conducted. One outfall shall represent commercial land use and the second one will represent low-density residential land use.
iv. Each city having a population between 10,000 and 75,000 shall identify two outfalls or conveyances where stormwater sampling could be conducted. One outfall shall represent commercial land use and the second will represent high-density residential land use.
v. Permittees shall document how sites are selected and justify the basin size, based on comparison of the times of concentration with rainfall durations for typical seasonal storms. Each site shall represent a discernible type of land use, but not be a single industrial or commercial complex. Ideally, to represent a particular land use, no less than 80% of the area served by the outfall or conveyance will be classified as having that land use. Permittees may move upstream in the conveyance system to achieve the desired land use, or, if a primarily industrial or commercial area is not present, an area of mixed industrial and commercial land use may be selected.

b. SWMP effectiveness monitoring
i. Each city, town and county shall prepare to conduct monitoring to determine the effectiveness of the Permittee’s SWMP at controlling stormwater-related problems that are directly addressed by actions in the SWMP. This component of the monitoring program shall be designed to answer the following types of questions:
   • How effective is a targeted action or narrow suite of actions?
   • Is the SWMP achieving a targeted environmental outcome?
ii. No later than December 31, 2010, each city, town and county shall identify at least two suitable questions and select sites where monitoring will be conducted. This monitoring shall include, at a minimum, plans for stormwater, sediment or receiving water monitoring of physical, chemical and/or biological characteristics. This monitoring may also include data collection and analysis of other measures of program effectiveness, problem identification and characterizing discharges for planning purposes.
iii. For each question, the Permittee shall develop a monitoring plan containing the following elements:
   ▪ A statement of the question, an explanation of how and why the issue is significant to the Permittee, and a discussion of whether and how the results of the monitoring may be significant to other MS4s.
   ▪ A specific hypothesis about the issue or management actions that will be tested.
   ▪ Specific parameters or attributes to be measured.
   ▪ Expected modifications to management actions depending on the outcome of hypothesis testing.

2. Monitoring program reporting requirements
   a. The fourth annual report shall:
i. Describe the status of identification of sites for stormwater monitoring, if required for the Permittee.

ii. Include a summary of proposed questions for the SWMP effectiveness monitoring and describe the status of developing the monitoring plan, including the proposed purpose, design, and methods.

b. To comply with the requirements of all or part(s) of this section, permittees in a single Urbanized Area or WRIA may choose to submit a collaborative report or reports in lieu of separate reports.

The City of Buckley will develop a monitoring plan to meet these guidelines.

**Objective:** Develop a monitoring plan to be used during the second permit cycle beginning in 2012.

### BMP 6(A): LONG TERM MONITORING PLAN

**Measurable Goal**

1. Monitoring plan developed.

**Description**

In an attempt to determine the effectiveness of stormwater BMPs, DOE is requiring municipalities to develop and eventually implement a stormwater monitoring plan. This plan can be created with neighboring jurisdictions in mind, if applicable, to lessen the burden of extensive monitoring costs, analysis and record keeping. The City will create a plan developed around the DOE guidelines in regards to the effectiveness of BMPs to prevent adverse impacts to water quality.

**Timeline for Completion**

The City will begin to develop this plan in 2009, yet the plan will not go into effect until the second permit cycle beginning in 2012.
REPORTING REQUIREMENTS

As with the other elements, Ecology developed permit requirements for the NPDES Phase II reporting requirement. The following program is based on DOE’s permit requirements.

Reporting Requirement. According to the Phase II permit, each Permittee, Co-permittee and Secondary Permittee shall submit, no later than March 31st of each year beginning in the year 2008, an annual report. The reporting period for each annual report shall be the previous calendar year.

The following requirements shall be met:

A. No later than March 31 of each year beginning in 2008, each Permittee shall submit an annual report. The reporting period for the first annual report will be from the effective date of this permit through December 31, 2007. The reporting period for all subsequent annual reports will be the previous calendar year.

B. Two printed copies and an electronic (PDF) copy of each document shall be submitted to Ecology. All submittals shall be delivered to:

   Department of Ecology
   Water Quality Program
   Municipal Stormwater Permits
   P.O. Box 47696
   Olympia, WA 98504-7696

C. Each Permittee is required to keep all records related to this permit and the SWMP for at least five years. Except for the requirements of the annual reports described in this permit, records shall be submitted to Ecology only upon request,

D. Each Permittee shall make all records related to this permit and the Permittee’s SWMP available to the public at reasonable times during business hours. The Permittee will provide a copy of the most recent annual report to any individual or entity, upon request.
   1. A reasonable charge may be assessed by the Permittee for making photocopies of records.
   2. The Permittee may require reasonable advance notice of intent to review records related to this Permit.

E. The annual report for cities, towns, and counties

   Each annual report shall include the following:
   2. Submittal of Appendix 3 – Annual Report Form for Cities, Towns, and Counties, which is intended to summarize the Permittees compliance with the conditions of this permit, including:
a. Status of implementation of each component of the SWMP in section S5 *Stormwater Management Program for Cities, Towns and Counties*.

b. An assessment of the Permittee’s progress in meeting the minimum performance standards established for each of the minimum control measures of the SWMP.

c. A description of activities being implemented to comply with each component of the SWMP, including the number and type of inspections, enforcement actions, public education and involvement activities, and illicit discharges detected and eliminated.

d. The Permittee’s SWMP implementation schedule and plans for meeting permit deadlines, and the status of SWMP implementation to date. If permit deadlines are not met, or may not be met in the future, include: reasons why, corrective steps taken and proposed, and expected dates that the deadlines will be met.

e. A summary of the Permittee’s evaluation of their SWMP, according to sections S5.A.4. and S8.B.2.

f. If applicable, notice that the MS4 is relying on another governmental entity to satisfy any of the obligations under this permit.

g. Updated information from the prior annual report plus any new information received during the reporting period, pursuant to S8.B.2. above.

h. Certification and signature pursuant to G19.D, and notification of any changes to authorization pursuant to G19.C.

3. Permittees shall include with the annual report, notification of any annexations, incorporations or jurisdictional boundary changes resulting in an increase or decrease in the Permittee’s geographic area of permit coverage during the reporting period, and implications for the SWMP.

The City of Buckley will develop an annual report to meet these guidelines.

**Objective:** Prepare annual report on effectiveness of Stormwater Management Program.

**BMP 7(A): ANNUAL STORMWATER MANAGEMENT PROGRAM REPORT**

**Measurable Goal**

1. Annual report prepared.

**Description**

The City will compile an annual report beginning in 2008 per the permit requirements noted earlier.

**Timeline for Completion**

The City will submit the first annual report by March 31st of 2008 and will continue each year thereafter.
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City of Buckley
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**Illicit Discharge Detection and Elimination Program**

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**Control Stormwater Runoff from New Development, Redevelopment and Construction Sites**

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**Total Annual Cost:** $73,844 $79,846 $76,523 $76,485 $70,721
APPENDIX C

WATER QUALITY BEST MANAGEMENT PRACTICES FOR OPERATION AND MAINTENANCE OF PUBLICLY OWNED PROPERTY
WATER QUALITY
BEST MANAGEMENT PRACTICES FOR
OPERATION AND MAINTENANCE OF
PUBLICLY-OWNED PROPERTY

April 2007
# Table of Contents

## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAPTER 1. OPERATION’S ACTIVITIES THAT REQUIRE WATER QUALITY BMPS</td>
<td>7</td>
</tr>
<tr>
<td>Introduction</td>
<td>7</td>
</tr>
<tr>
<td>Purpose</td>
<td>7</td>
</tr>
<tr>
<td>Scope</td>
<td>7</td>
</tr>
<tr>
<td>Method for Creating this Manual</td>
<td>7</td>
</tr>
<tr>
<td>Manual Layout</td>
<td>8</td>
</tr>
<tr>
<td>Further Work</td>
<td>9</td>
</tr>
<tr>
<td>CHAPTER 2. STORMWATER FACILITY OPERATION AND MAINTENANCE</td>
<td>10</td>
</tr>
<tr>
<td>Special Facilities Maintenance Requirements</td>
<td>11</td>
</tr>
<tr>
<td>Catch Basins and Inlets</td>
<td>12</td>
</tr>
<tr>
<td>Debris Barriers/Trash Racks</td>
<td>14</td>
</tr>
<tr>
<td>Energy Dissipaters</td>
<td>15</td>
</tr>
<tr>
<td>Fences, Gates, and Water Quality Signs</td>
<td>16</td>
</tr>
<tr>
<td>Access Roads and Easements</td>
<td>17</td>
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<tr>
<td>Manholes</td>
<td>18</td>
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<tr>
<td>Oil/Water Separators and Buried Wet Vaults</td>
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</tr>
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<td>StormFilter™ (Leaf Compost Filter)</td>
<td>21</td>
</tr>
<tr>
<td>Catch Basin Inserts</td>
<td>23</td>
</tr>
<tr>
<td>Stormwater Biofiltration Swales</td>
<td>25</td>
</tr>
<tr>
<td>Wet Biofiltration Swales and Treatment Wetlands</td>
<td>27</td>
</tr>
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</table>
CHAPTER 7. VEGETATION MANAGEMENT ACTIVITIES

Activity: Maintaining Shrub Beds in Highly Managed Areas
Activity: Landscaped Turf Maintenance (Highly-Managed Areas)
Activity: Landscaped Turf Maintenance (Highly-Managed Areas)
Activity: Maintaining Roadsides and Lower Use Areas of Parks
Activity: Vegetation and Pest Management in Less-Managed Areas
Activity: Vegetation and Pest Management in Impacted Natural Areas
Activity: Vegetation and Pest Management in Intact Natural Areas
Activity: Vegetation and Pest Management in Stormwater Control Facilities
Activity: Vegetation and Pest Management in Constructed Wetland Areas
Activity: Weed Control within Water Bodies

CHAPTER 8. TRAINING

Initiation Training
BMP Training
Procedure Cards/Sheets
Water Quality Kits for Trucks
Map/Track Problem Areas ..................................................................................................... 117
Map Habitat Areas/Streams/Wetlands ................................................................................. 117
Awards .................................................................................................................................... 118
Chapter 1. Operation’s Activities That Require Water Quality BMPs

Introduction
Water quality protection is now a consideration for all activities performed by the City. Many activities, such as road construction have specific water resource protections in City code. Other activities, such as storm sewer maintenance, have not been required to meet specific water quality requirements.

The City has adopted an ordinance that requires businesses and public agencies to use water quality protection practices, referred to as best management practices or BMPs, to eliminate or reduce pollution from their outdoor activities.

Purpose
This manual is intended to meet specific needs of the City of Buckley. The goal is to provide standard water quality and vegetation management practices for each activity maintenance crews perform.

Scope
Water quality protection practices are addressed here. These include two main categories:
- Practices to eliminate or reduce the pollution caused by operation and maintenance activities such as ditch cleaning or road repairs and
- Practices to assure that water quality BMPs such as swales and treatment ponds are maintained to make sure they are performing as intended.

Habitat preservation practices are largely avoiding or minimizing vegetation removal and the use of chemical controls, and promoting native vegetation where feasible.

Practices in this manual are subject to updates as more detailed storm sewer and road maintenance standards are developed.

Method for Creating this Manual
This manual was modeled after Clark County’s Water Quality Best Management Practices for Operation and Maintenance of Publicly-Owned Property. Other manuals were reviewed during the creation of Clark County’s manual. Notable examples include the ODOT Water Quality and Habitat Guide (June 1997), City of Portland Parks Department Policies and Procedures for Pest Management, and the King County Road Maintenance BMP Manual (September 1998). This manual draws on these manuals to present lists of best management practices for numerous operation and maintenance activities. King County’s manual lists and describes in detail, BMPs that might apply to thirteen broad categories of activity. The ODOT Guide lists in general language, the BMPs that should be applied to each of 92 specific tasks. To suit the City’s needs, this manual combines some of the ODOT tasks and adds activities that ODOT does not include, such as maintaining storm sewer facilities and park land.
Best management practices are compiled from several manuals, programs, or guides. They are:

- Clark County NPDES stormwater management program (April, 1999)
- Clark County Public Works internal assessments of activities affected by the ESA (spring 1999)
- ODOT (June 1997) Maintenance BMPs for Water Quality and Habitat
- AWQA (June 1998) Oregon Toolbox
- King County (September 1998) Appendix A, Private Facilities Maintenance Requirements
- City of Portland, Parks and Recreation Bureau, April 1999, Waterways Pest Management Policy
- Tri-County ESA 4(d) stormwater proposal maintenance standards (April 2000)

This manual has been reviewed for completeness and usability.

**Manual Layout**

The manual lists activities to operate storm sewers, maintain roads, operate shops and maintenance yards, and perform park and landscape maintenance.

For each activity, this manual:

- Briefly describes the activity which needs BMPs.
- Lists the water quality and non-water quality outcomes from the activity. In many cases there is added description of the desired outcome for the activity.
- Lists the BMPs to meet the water quality protection requirements.

**Activities**

Activities are the actions that road and storm sewer maintenance crews take in the routine performance of their jobs. Some activities such as catch basin cleaning are water quality best management practices. Others, such as ditch maintenance require best management practices. The activities are listed in the table of contents.

Activities covered by this manual may include small capital projects and overlays, but any project with work in a habitat buffer or stream channel is a larger project that requires permitting and specific BMPs beyond those included here.

**Outcomes**

Each activity meets desired outcomes, which are listed for each activity. There are two sets of outcomes for each activity:

- Water Quality Outcomes
- Infrastructure Maintenance Outcomes

This manual provides practices to reach the water quality outcomes and infrastructure maintenance requirements specific to water quality or habitat protection.
The Water Quality Outcomes are:
O1 Minimize sediment and pollutant discharges from the work area
O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources
O3 Minimize vegetation removal
O4 Preserve native plants

The Infrastructure Maintenance Outcomes are:
O5 Protect public safety and health
O6 Prevent catastrophic infrastructure failures
O7 Maintain or restore the intended infrastructure function
O8 Prevent or reduce flooding
O9 Protect infrastructure
O10 Meet public expectations for aesthetics

Practices
Practices are the best management practices necessary to meet the water quality outcomes for each activity. Practices were compiled from other agencies’ manuals, the NPDES stormwater management program, or from regulatory requirements.

The practices listed for each activity may be more thoroughly described in separate chapters about BMPs or in other agencies’ manuals. The source manuals are also a good reference for specific BMPs. For example, the King County manual is a good source for sediment and erosion control and the Ecology Stormwater Manual (February 2005) is the most complete source for all stormwater BMPs.

Where to Find More Information on Best Management Practices
This manual provides a quick reference of the specific categories of BMPs that apply to Operations activities. It does not provide detailed description of each BMP. The supervisor or crew chief is referred to the source manuals for descriptions and diagrams of BMPs.

Further Work
The manual also includes areas where much further work will be required. These include:
• Training in the use of BMPs
• Developing a habitat conservation plan
• More detailed description of BMPs
• Updates of this manual
• Developing an integrated pest management plan
• Developing comprehensive road maintenance standards
Chapter 2. Stormwater Facility Operation and Maintenance

Stormwater facility maintenance is activities that care for storm drains. They include all of the pipes, catch basins, drywells, manholes, swales, retention/detention ponds, oil/water separators, etc. in urbanized areas and some subdivisions in rural areas. Storm sewer maintenance does not include roadside ditch maintenance, which is described as a road maintenance activity.

The storm sewer maintenance standards include complete operation and maintenance standards adopted by the City.
Special Facilities Maintenance Requirements
This manual provides a set of minimum standards and practices for maintaining stormwater facilities. Manufactured stormwater facilities such as leaf compost filters and oil/water separators often have maintenance requirements and manuals specified or written by the manufacturer. Also, larger or more complex stormwater facilities may include specifications for maintenance and vegetation management that provide specific detail above this manual.

Manufacturer or Designer’s Maintenance Manuals
Where the Public Works Director determines that manuals or plans provide equal or greater level of maintenance and water quality protection, they shall be followed by the owner. These individual maintenance plans, specifications, or manuals must be approved by the Public Works Director. Review of the manuals and plans should include an engineer, senior maintenance staff and, if available, the manual preparer.

One of a Kind Facilities
The director may require development and implementation of a site-specific maintenance plan for complex or unusual facilities. The plan is required when the general provisions of this manual do not provide sufficient detail for inspection, maintenance, vegetation management, and repair practices to operate the facility.
**Catch Basins and Inlets**

Catch Basins trap sediment and some oils that can pollute water bodies. They need to be inspected and cleaned annually to remove accumulated sediment, fluids, and trash.

**Outcomes**

- **O1** Avoid or minimize sediment and pollutant discharges from the work area
- **O2** Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- **O7** Maintain or restore the intended infrastructure function
- **O8** Prevent or reduce flooding
- **O9** Protect infrastructure

**Operation and Maintenance Practices**

*Inspection*

Inspect catch basins at least once per year. All catch basins within the City should be inspected within a 5-year period.

Periodically inspect the catch basin and surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Act to have the pollutant source removed.

*Cleaning*

Clean catch basins when they become one third full to maintain sediment-trapping capacity. Catch basin and manhole cleaning should be performed in a manner that keeps removed sediment and water from being discharged back into the storm sewer.

Clean putrid materials from catch basins when discovered or reported.

Keep the inlet cleared of debris and litter.

*Safety*

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

*Materials Handling*

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be disposed of in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according the manufacture’s instructions.

*Repairs*

Repair any damages that prevent the catch basin from functioning as designed. An example is broken or missing outlet elbow.
Follow the practices described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.
Debris Barriers/Trash Racks

Trash racks are barred covers to pipe openings. They prevent large objects from entering pipes and keep pets and people out of pipes. In cases where there is fish migration, maintaining unblocked trash racks allows fish passage.

Outcomes

O1 Avoid or minimize sediment and pollutant discharges from the work area
O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
O5 Protect public safety and health
O6 Prevent catastrophic infrastructure failures
O7 Maintain or restore the intended infrastructure function
O8 Prevent or reduce flooding
O9 Protect infrastructure

Operation and Maintenance Practices

Inspection

Inspect trash racks at least once per year.

Cleaning

Clean trash racks when debris is plugging more than 20 percent of the openings or when obstructions to fish passage are created. Consult the Washington Department of Wildlife if in a fish-bearing drainageway.

Repairs

Immediately replace missing racks and missing bars.

Replace bars that are deteriorated to the point where they may be easily removed.

Bend bent bars back into position.

Follow the practices described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.
**Energy Dissipaters**

Energy dissipaters are critical for preventing erosion at storm drain outfalls. There are a variety of designs including wire gabion baskets, rock splash pads, trenches, and specially designed pools or manholes.

**Outcomes**

O1 Avoid or minimize sediment and pollutant discharges from the work area  
O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources  
O7 Maintain or restore the intended "infrastructure function"  
O8 Prevent or reduce flooding  
O9 Protect infrastructure

**Operation and Maintenance Practices**

*Inspection*

Inspect at least once per year.

*Cleaning*

Dispersion Trench:

Remove sediment from pipe when it reaches 20 percent of pipe diameter.

*Repairs*

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.

Rock Pads:

Replace missing or moved rock to cover exposed soil and meet design standards.

Dispersion Trench:

Repair conditions that cause concentrated flow along the trench.

Clean pipe perforations when one half of them are plugged or if flows bypass or overflow the trench.

Manhole/Chamber.

When the structure deteriorates to one half its original size or it becomes structurally unsound, replace it to the design standards.
**Fences, Gates, and Water Quality Signs**

Stormwater facilities such as detention ponds or treatment wetlands often have fences to protect them from damage and keep children away from ponds or hazardous areas. Certain facilities such as biofiltration swales, approved by the City, may also be required to have informational signs telling the public that the swale is a stormwater facility.

**Outcomes**

O5  Protect public safety and health  
O7  Maintain or restore the intended infrastructure function  
O9  Protect infrastructure

**Operation and Maintenance Practices**

*Inspection*

Inspect fences, gates, and water quality signs when facilities are maintained.

*Repairs*

Repair any opening that allows entry into the facility.

Close any opening that allows access beneath a fence

Replace any missing gates.

Repair broken gate hinges or gates which do not close and lock properly.

Replace any missing signs or signs that have more than 20 percent unreadable surface.

Repair sign posts that lean more than 8 inches off vertical.
Access Roads and Easements
Many stormwater facilities have access roads to bring in heavy equipment for facility maintenance. These roads should be maintained for inspection access and ease of equipment access.

Outcomes
O1 Avoid or minimize sediment and pollutant discharges from the work area
O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
O7 Maintain or restore the intended infrastructure function
O10 Meet public expectations for aesthetics

Operation and Maintenance Practices

Inspection
Inspect once a year or when facilities are maintained.

Cleaning
Remove litter when mowing or litter accumulation exceeds one cubic foot (about one and a half five-gallon buckets) per 1,000 square feet.

Remove any debris that blocks roads or may damage tires.

Vegetation Management
Manage vegetation as for the rest of the facility. Trees and shrubs may be removed from access roads and easements if they block access for necessary maintenance or will prevent or harm intended stormwater facility function.

Repairs
Correct any bare or eroded soils by seeding or cover BMP.

Repair road surfaces when they may lead to erosion or limit equipment access.
**Manholes**

Manholes are large cylindrical vaults usually set at storm sewer pipe connections. Unless you have OSHA approved training and equipment, never enter a manhole. There is a considerable risk of poisonous gas and injury.

**Outcomes**

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O8 Prevent or reduce flooding
- O9 Protect infrastructure

**Operation and Maintenance Practices**

**Inspection**

Inspect manholes once per year. All manholes within the City shall be checked within a 5-year period. Check the frame and lid for cracks and wear, such as rocking lids or lids moved by traffic.

Periodically inspect the manhole and surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Take action to have the pollutant source removed.

**Cleaning**

Clean manholes when there is a blockage of a water flow path. Cleaning should be performed in a way that ensures removed sediment and water is not discharged back into the storm sewer.

**Safety**

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

**Materials Handling**

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be disposed in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

**Repairs**

Repair all security and access features so they are fully functional. This includes locking lids, covers, and ladder rungs.

Replace broken parts or lids that rock or are moved by traffic.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.
Oil/Water Separators and Buried Wet Vaults

An oil/water separator is an underground vault that treats stormwater by mechanically separating oil from water. The oil rises to the surface and floats on the water and sediment settles to the bottom. Buried wet vaults are similar to oil/water separators in that they are sub-surface vaults that separate sediment and floating materials from stormwater.

These facilities have special problems for maintenance and should be serviced by contractors. The main issues are working in confined spaces and properly handling any sludge and oil cleaned from vaults or oil/water separators.

Outcomes

O1 Avoid or minimize sediment and pollutant discharges from the work area
O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
O7 Maintain or restore the intended infrastructure function
O9 Protect infrastructure

Operation and Maintenance Practices

Inspection

Periodically check stormwater flow out of the facility. It should be clear and not have a thick visible oil sheen.

Annually check for cracks large enough to let soil enter the vault, broken or defective plates and baffles, and crushed or damaged pipes.

Periodically inspect the surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Take action to have the pollutant source removed.

Inspect water levels after an extended dry period to check for leakage.

Cleaning

Remove trash and litter from the vault, inlet and piping.

Remove oil when it reaches one-inch thickness.

Remove sediment when it accumulates to 6 inches depth.

Safety

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

Material Handling

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.
Removed sediment must be disposed in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

**Repairs**

Repair any cracked or defective plates or baffles. Cracks are repaired so that no cracks greater than ¼-inch are present. Repair any leaks that allow water levels to drop and cause oil to be washed from the unit.

Repair all security and access features so they are fully functional. This includes locking lids, covers, and ladder rungs.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.
StormFilter™ (Leaf Compost Filter)
The StormFilter is a patented system for treating stormwater. The systems have evolved during the years from very simple above ground filter beds to a variety of vault devices containing cylindrical filters filled with leaf compost pellets. StormFilter facilities consist of cartridges filled with one or a combination of media. Media can be selected to target pollutants specific to a particular site. The cartridges are housed in pre-cast or cast in place concrete vaults or in a steel catch basin configuration. Each configuration uses baffles to promote settling of solids and separation of oils and other floatable materials. The majority of pollutants are captured by the media and held in the cartridges. Some additional settling will occur in the inlet and cartridge bays of each vault.

The manufacturer has a detailed maintenance manual for these facilities. That manual should be used. The following practices are general requirements.

Outcomes
O1 Avoid or minimize sediment and pollutant discharges from the work area
O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
O7 Maintain or restore the intended infrastructure function
O9 Protect infrastructure

Operation and Maintenance Practices

Inspection
Inspect the StormFilter every six months. The inspection should determine sediment depth and the specific maintenance and repairs needed.

Annually check for cracks large enough to let soil enter the vault, broken or defective plates and baffles, and crushed or damaged pipes.

Periodically inspect the catch basin and surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Take action to have the pollutant source removed.

Cleaning
Remove trash and litter from the vault, inlet and piping.

Remove sediment when it accumulates to 6 inches depth in settling chambers.

Remove sediment when it exceeds 0.25 inches on filter media.

Safety
Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

Material Handling
Disposal of waste from maintenance of drainage facilities shall be conducted 'in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste
Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be disposed in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils; are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

Return used compost or canisters to the manufacturer for proper disposal or dispose of them in the garbage as solid waste.

*Repairs*

Repair any cracked or defective plates or baffles. Cracks are repaired so that no cracks greater than \( \frac{1}{4} \)-inch are found.

Replace media cartridges if it takes longer than an hour for water to empty through media or if water frequently overflows the treatment chamber. Replace defective cartridges.

Repair all security and access features so they are fully functional. This includes locking manhole lids, covers, and ladder rungs.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.
**Catch Basin Inserts**

Catch basin inserts are becoming more widely used to trap sediment and oil entering catch basins. Most involve some type of filter media and oil-absorbent pads. Filters avoid flooding by overflowing when they become clogged or there are high storm flows.

**Outcomes**

O1 Avoid or minimize sediment and pollutant discharges from the work area  
O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources  
O7 Maintain or restore the intended infrastructure function  
O9 Protect infrastructure

**Operation and Maintenance Practices**

*Inspection*

Inspect following the manufacturer's specifications. During the wet season (October through April), inserts should be inspected once every two weeks. Two-week inspection can determine if a longer inspection interval is appropriate at a specific site. During the dry season, inspect them at least every two months.

If inserts are used for trapping sediment on a construction project, they should be inspected after every major storm.

Periodically inspect the catch basin and surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Take action to have the pollutant source removed.

*Cleaning*

Generally, the filter media is removed, then cleaned or disposed. It is easier to remove the filter after it has drained and dried. If this is not possible, consider contracting the service or de-watering the filter in a container.

Remove trash and litter from the filter.

If discharges have an oily sheen, replace the oil-trapping media. If the oil trapping media is full, remove it and replace it with a new one or if manufacturer's specifications allow, clean and replace it.

If sediment clogs media, clean it following manufacturer's specifications or replace the filter.

*Material Handling*

Persons handling used filters should wear rubber gloves and safety protection.

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.
Removed sediment must be handled and disposed of in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

Repairs
Replace any media after typical service life.
**Stormwater Biofiltration Swales**

Biofiltration swales use grass or other dense vegetation to filter sediment and oily materials out of stormwater. Usually they look like flat-bottomed channels with grass growing in them. Swales are stormwater treatment devices that must be properly maintained to sustain pollutant removal capacity.

**Outcomes**

O1  Avoid or minimize sediment and pollutant discharges from the work area  
O2  Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources  
O7  Maintain or restore the intended infrastructure function  
O10 Meet public expectations for aesthetics

**Operation and Maintenance Practices**

*Inspection*

Swales are easy to inspect and need to be well maintained to treat stormwater. Every 9 months, make frequent visual inspections for problems such as channeling flow, rills, bare ground, sediment and oily material.

Identify and remove pollutant sources discharging to the swale.

*Cleaning*

Clear inlets and outlets to prevent blockage.

Remove litter when mowing or litter accumulation exceeds two inches.

Use a rake and shovel to hand remove sediment accumulations greater than 2 inches thick that cover grass areas, avoiding vegetation removal.

*Vegetation Management*

Mow to keep grass at the optimum height (6 inches). Mow to no less than 4 inches height and a minimum of four cuttings per year.

Remove clippings from the treatment area in the base of the swale. Clippings may be raked or blown onto the side slopes. If the swale has vertical walls or no side-slopes, the clippings must be removed.

Preserve healthy vegetation or reestablish vegetation where needed. Seed bare spots.

Use cover BMPs on bare soils. BMPs include hydroteeading or mulches.

Trees and shrubbery should be allowed to grow unless they interfere with facility function or maintenance activities. Any cut trees should be salvaged for habitat enhancement or converted to mulch or firewood.

Stormwater control facilities are, in effect, water body buffers where pesticides and fertilizer are not used. See Vegetation Management in Stormwater Control Facilities for more information.
Repairs

Often swales have problems due to flooding or erosion. Where possible, correct the underlying problem before trying to repair the symptom.

Level spreaders must be in proper working order for swales to function properly. Where level spreaders are damaged, sunken, or bypassed by erosion, repair them to design standard.

If there is a problem with grass dying due to the swale being flooded during the wet season, there are two options: convert the swale to plant varieties that can stand being flooded or find a way to fix the swale so it drains better.
**Wet Biofiltration Swales and Treatment Wetlands**

Wet biofiltration swales and treatment wetlands use dense wetland vegetation and settling to filter sediment and oily materials out of stormwater. These stormwater treatment devices must be properly maintained to sustain pollutant removal capacity. In some cases, biofiltration swales that were designed to drain between storms remain wet and need to be rebuilt or converted to wetland swales. A designed wet biofiltration swale uses wetland plants instead of grass.

**Outcomes**

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O10 Meet public expectations for aesthetics

**Operation and Maintenance Practices**

*Inspection*

Swales are easy to inspect and need to be well maintained to treat stormwater. Every 9 months, make visual inspections for problems such as bare ground, sediment and oily material.

Identify and remove pollutant sources to the swale.

*Cleaning*

Clear inlets and outlets to prevent blockage.

Remove litter and trash when accumulation exceeds one cubic foot (about one and a half, five gallon buckets) per thousand square feet.

Where possible, use a rake and shovel to hand remove sediment accumulations greater than 2 inches thick in 10 percent of the treatment area.

*Vegetation Management*

Sparse vegetation or dense clumps of cattail do not properly treat stormwater. Try to find the cause of the problem and fix it to ensure dense vegetation. Cut back excessive cattail shoots. Normally, wetland vegetation does not need to be harvested unless there is an excessive die back that causes water quality problems.

If there is a problem with grass dying due to the swale being flooded during the wet season, there are two options: plant varieties that can stand being flooded or find a way to fix the swale so it drains better.

Outside of the treatment area, preserve healthy vegetation or reestablish vegetation where needed. Seed bare spots. Use cover BMPs on bare soils.

Trees and shrubbery should be allowed to grow unless they interfere with facility function or maintenance activities. Any cut trees should be salvaged for habitat enhancement or converted to mulch or firewood.
Stormwater control facilities are, in effect, water body buffers where pesticides and fertilizer are not used. See Vegetation Management in Stormwater Control Facilities for more information.

**Repairs**

Often swales have problems due to flooding or erosion. Where possible, correct the underlying problem before trying to repair the symptom.

Repair any defect that causes the wet swale to dry out during the wet season.

Replace stormwater facility signs that are broken, damaged, or stolen.
Filter Strips
Filter strips are linear strips of grass that remove sediment and oils from stormwater by filtering it. Stormwater is treated as it runs across the filter. Usually, filter strips are placed along the edge linear paved areas such as parking lots and roads. Where designed filter strips are installed; road shoulders should only be graded to maintain level flow off the road.

Outcomes
O1 Avoid or minimize sediment and pollutant discharges from the work area
O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
O7 Maintain or restore the intended infrastructure function
O10 Meet public expectations for aesthetics

Operation and Maintenance Practices

Inspection
Filter strips are easy to inspect and need to be well maintained to treat stormwater. Every 9 months, make visual inspections for problems such as bare ground, sediment and oily material.

Identify and remove pollutant sources.

Cleaning
Clear inlets and outlets to prevent blockage.

Remove litter when mowing or litter accumulates.

Use a rake and shovel to hand remove sediment accumulations greater than 2 inches thick that cover grass areas, avoiding vegetation removal. Remove sediment to re-level the slope to an even surface so that water spreads and does not form channels.

Vegetation Management
Mow to keep grass at the optimum height (6 inches). Mow to no less than 4 inches height and a minimum of four cuttings per year.

Remove clippings from the treatment area. They may be spread elsewhere on site where they will not reenter the stormwater facility.

Preserve healthy vegetation or reestablish vegetation where needed. Seed bare spots.

Use cover BMPs on bare soils.

Stormwater control facilities are, in effect, water body buffers where pesticides and fertilizer are not used. See Vegetation Management in Stormwater Control Facilities for details.

Repairs
Where possible, correct the underlying problem before trying to repair the symptom.
The flow spreader must be level and spread flow evenly across the filter. Immediately repair any defects in the flow spreader.

If ruts develop, fill them with coarse soil, level the surface and reseed.
**Sand Filters**
Sand filters treat stormwater by filtering it through a bed of sand into an under-drain beneath the sand. They are effective at removing pollutants but must be carefully designed and well maintained. Sand filters may have serious maintenance problems in sites with excessive sediment. Along with normal maintenance, the filter media needs replacement periodically. Consult engineer's operation manual written for the sand filter or have a licensed professional engineer assist in media replacement.

Sand filters are either above ground and open to view or below ground in vaults. Above ground filters are much easier to maintain. Below ground units require special training and equipment approved by OSHA for any work.

**Outcomes**
- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O10 Meet public expectations for aesthetics

**Operation and Maintenance Practices**

*Inspection*
Above ground filters are easy to inspect and need to be well maintained to treat stormwater. Make frequent visual inspections for problems such as overtopping or bypasses, taking longer than 24 hours to draw down, and channels. Make a complete inspection of all features at least once a year.

Underground units must be inspected for all features at least once per year. More frequent inspections should be performed as a part of routine site maintenance. Check for indicators that the facility is not functioning. Examples include checking stormwater effluent for oil sheen, checking for overflowing, and checking for short circuiting.

Identify and remove pollutant sources.

*Cleaning*
Clean out accumulated sediment when it accumulates to 1/2 inch depth.

Remove any trash or litter from the sand bed and other parts of the facility. Rake up and remove accumulations of leaves or other plant debris that wash into the facility and begin to form a mat.

Clean sediment out of pre-settling chambers when 6 inches of sediment accumulates.

Clean out any drain pipes or clean outs that become filled with sediment.

*Vegetation Management*
Above ground sand filters may, or may not be designed with a vegetation surface. If a facility has vegetation, follow the maintenance procedures for a stormwater biofiltration swale.
If it does not have designed vegetation, mechanically remove vegetation before it begins to cover parts of the facility.

Remove all clippings or pulled weeds from the facility.

Safety
Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

Material Handling
Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be disposed in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

Repairs
Where possible, correct the underlying problem before trying to repair the symptom.

If it takes more than 24 hours for a storm to drain through the sand media or it frequently overflows, the sand media needs to be serviced. This problem is caused by fine particles clogging the sand filter. Have a licensed professional engineer oversee this procedure. At the very least, the upper few inches will need to be replaced. Sieve analyses may be helpful for determining the depth that needs to be removed and replaced with new sand. Replace clogged sand with the type of sand specified by the designer or approved by a Public Works Department Engineer.

If there are prolonged, low-rate flows into the facility due to groundwater seeps or detention facilities, route them to a smaller part of the facility using a low wood divider or shallow channel.

The flow spreader must be level and distribute flow evenly across the filter. Immediately repair any defects in the flow spreader.

If parts of the sand filter erode, find ways to correct the problem by compacting the sand or protecting the eroding area with geotextile or other means.

Replace or repair any damaged pipes.

Repair any cracked or defective plates or baffles. Cracks are repaired so that no cracks greater than ¼-inch are found.

Repair any joints that are cracked and allow soil into the facility.

Repair all security and access features so they are fully functional. This includes locking lids, covers, and ladder rungs.
Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.
Detention Ponds

Detention facilities are designed to hold and slowly release stormwater by use of a pond and specially designed control structure. Styles vary greatly from well manicured to natural appearing. Generally, more natural-appearing vegetation is preferred for reduced maintenance and wildlife habitat. Some facilities are designed to appear as natural water bodies or are in park-like areas.

Some older facilities are bat in stream channels and require special permits such as an HPA from the Washington Department of Fish and Wildlife.

Outcomes

O1 Avoid or minimize sediment and pollutant discharges from the work area
O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
O3 Avoid or minimize vegetation removal
O7 Maintain or restore the intended infrastructure function
O8 Prevent or reduce flooding
O10 Meet public expectations for aesthetics

Operation and Maintenance Practices

Inspection

On an annual basis, identify and report pollutant sources to the facility. Inspect the facility for oil and other pollutants and remove any pollutants greater in volume than a surface sheen.

Cleaning

Trash is removed when it exceeds 1 cubic foot per 1000 square feet.

Remove sediment when it accumulates to 10 percent designed pond depth. Cleaning or excavating stormwater facilities within natural or altered streams will likely require an HPA from WDFW. Work within seasonally dry or ditched watercourses may also require an HPA. Consult the official state water type maps for assistance in determining whether watercourses are typed streams that are regulated by WDFW. Contact the WDFW Regional office for additional information on whether specific watercourses are regulated under the State Hydraulic Code, or if unmapped streams are encountered.

If there is an emergency (e.g., immediate threat to life or property, or threat of environmental degradation), a verbal HPA may be obtained by calling the Washington Department of Fish and Wildlife Regional Office, or the Statewide Emergency Hotline HPA Hotline (360) 902-2537.

Material Handling

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.
Vegetation Management

Where a facility has natural area, vegetation management should be timed to avoid or minimize impacts on wildlife. An example is facilities used by breeding birds such as red-winged black birds.

Mow or control vegetation to match surrounding area or sustain any other intended use of the facility, such as wildlife habitat or recreation.

Stormwater control facilities are, in effect, water body buffers in which pesticides and fertilizer are not used.

Use mechanical methods to control weeds. Pesticides, herbicides and fertilizers are not used in stormwater control facilities. See the activity: Vegetation Management in Stormwater Control Facilities for more information.

Trees should not be allowed to grow on emergency overflows and berms that are over 4 feet high. Trees can block flows and roots can lead to berm failure. Remove any trees. Remove larger roots (where the base of the tree is greater than 4 inches) and restore the berm.

Trees and shrubbery should be allowed to grow unless they interfere with facility function or maintenance activities. Any cut trees should be salvaged for habitat enhancement or converted to mulch or firewood.

Repairs

Repair and seed bare areas. Repair eroded slopes when rills form, where the cause of damage is present, or there is potential for future erosion. Use cover BMPs on exposed soils.

Level spreaders must be in proper working order to function properly. Where level spreaders are damaged, sunken, or bypassed by erosion, repair them to design standard.

Rodent holes on a dam or berm can pipe water. Destroy the rodents, preferably by trapping, and repair the dam or berm. Check with the Washington Department of Fish and Wildlife before removing a game animal or far-bearer, for example muskrat, beaver, and nutria.

Repair the liner if it is visible and repair or replace where there are more than three holes greater than ¼-inch diameter.

If berms or dams show signs of settlement or sinkholes, serious problems may be occurring. Consult a licensed professional engineer to determine the cause of the settlement or sinkhole.

Spillway areas should be completely covered by more than one layer of rock.
**Drywells**

Drywells are perforated, open-bottomed manholes used to infiltrate stormwater into the ground. While not the intended use, drywells trap sediment and some of the oily pollutants in runoff. Drywells are more likely to fill with oily sediment in areas that lack swales or other treatment facilities. Fine oil sediment can clog drywells and lead to localize street flooding. Also, pollutants discharged into drywells can migrate into groundwater. Drywells were often installed in closed topographic depressions, areas with well-drained soils, or areas having inadequate storm sewers. Often, drywells contain groundwater.

Because drywells can be easily clogged and tend to concentrate pollutants in one place; pollution and sediment control practices should be used to protect them.

**Outcomes**

- O1  Avoid or minimize sediment and pollutant discharges from the work area
- O2  Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7  Maintain or restore the intended infrastructure function
- O8  Prevent or reduce flooding
- O9  Protect infrastructure

**Operation and Maintenance Practices**

*Inspection*

Drywells should be inspected at least once a year and no less than once every five years.

Periodically inspect the drywell and surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Take action to have the pollutant source removed.

If a problem with flooding or slow drainage occurs, observe or inspect the drywell for infiltration rate and observe water level depths if monitoring wells are installed.

*Cleaning*

Clean out drywells when sediment depth is greater than 1/3 of the distance between the base and inlet pipe.

Drywell cleaning should be performed in a way that makes certain removed sediment and water is not discharged back into the storm sewer.

*Safety*

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

*Material Handling*

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.
Removed sediment must be disposed in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

**Repairs**

Work in drywells requires special OSHA-required confined space equipment and procedures. The most practical method for cleaning drywells may be to contract with a sewer-cleaning contractor.

If the drywell does not dissipate stormwater, it should be replaced or repaired.

It is possible to restore some drywell capacity by water-jetting clogged openings.

Another option is installing a new drywell or drainage trench, and converting the clogged drywell into a sediment trap. This has the advantage of providing a sediment trap and some amount of spill trapping. The sediment trap conversion requires grouting the holes, covering the base with concrete, and adding piping.

If there is standing water in a drywell, it probably is into the water table. Drywells in the water table should be rebuilt to prevent stormwater from going directly into groundwater.

Repair all security and access features so they are fully functional. This includes locking lids, covers, and ladder rungs.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.
**Drainage Trenches**

Drainage trenches are subsurface gravel-lined drain fields built to infiltrate stormwater into the ground. They have a large, perforated pipe in a bed of sorted gravel. Fine, oily sediment can clog drainfields and lead to localized street flooding. Also, pollutants discharged into drainfield can migrate into groundwater. Drainage trenches were often installed in closed topographic depressions, areas with well-drained soils, or areas having inadequate storm sewers.

**Outcomes**

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O8 Prevent or reduce flooding
- O9 Protect infrastructure

**Operation and Maintenance Practices**

*Inspection*

Some drainage trenches have special inspection wells or clean out manholes. They should be inspected at once a year and no less than once every five years.

A thorough inspection of the observation points should be made if there is a decrease in capacity. Inspection points can include: inspection ports, monitoring ports built into the trench, and water table depth monitoring wells. Water levels in these inspection points can provide information about the performance of the facility.

If there is a problem with flooding or slow drainage, the facility design rate needs to be verified. If there are monitoring tubes in the drain field, use them to observe infiltration rates.

Periodically inspect the surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Take action to have the pollutant source removed.

*Cleaning*

If a drainage trench begins to clog, try cleaning the perforated drainpipe.

Cleaning should be performed in a way that makes certain removed sediment and water is not discharged back into the storm sewer.

*Safety*

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

*Material Handling*

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste.
Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be disposed in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according the manufacturer’s instructions.

**Repairs**

Repairing a clogged drainage trench will involve excavation and replacement of part or all of the facility.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.
**Infiltration Basins/Ponds**

Infiltration facilities dispose of water by holding it in an area where it can soak into the ground. These are open facilities that may either drain rapidly and have grass bases, or have perpetual ponds where water levels rise and fall with stormwater flows. Infiltration facilities may be designed to handle all of the runoff from an area or they may overflow and bypass larger storms.

Since the facility is designed to pass water into the ground, anything that can cause the base to clog will reduce performance and is a large concern. Generally, infiltration basins are managed like detention ponds but with greater emphasis on maintaining the capacity to infiltrate stormwater.

**Outcomes**

O1 Avoid or minimize sediment and pollutant discharges from the work area  
O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources  
O3 Avoid or minimize vegetation removal  
O7 Maintain or restore the intended infrastructure function  
O8 Prevent or reduce flooding  
O10 Meet public expectations for aesthetics

**Operation and Maintenance Practices**

*Inspection*

Check once per year after a rainstorm to see if the facility is draining as intended. Inspect annually for all features.

A thorough inspection of the observation points should be made if there is a decrease in retention basin capacity. Inspection points can include monitoring ports built into the base of the facility and water table depth monitoring wells. Water levels in these inspection points can provide information about the performance of the facility. It will probably require a licensed professional engineer or other professional trained in hydraulics to interpret the information.

Identify and remove pollutant sources to the facility. Inspect the facility for oil and other pollutants and remove any pollutants greater in volume than a surface sheen.

*Cleaning*

Trash is removed when it exceeds 1 cubic foot per 1000 square feet.

Remove sediment when it accumulates to 2 inches or if the facility does not drain between storms or meet 90 percent of design capabilities.

If the facility has a sediment trap, clean out the sediment when one-half foot accumulates.
**Materials Handling**

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

**Vegetation Management**

Mow or control vegetation to match surrounding area or sustain any other intended use of the facility, such as wildlife habitat or recreation.

Stormwater control facilities are, in effect, water body buffers where pesticides and fertilizer are not normally used. See the activity Vegetation Management in Stormwater Control Facilities for details.

Use mechanical methods to control weeds. Pesticides, herbicides and fertilizers are not normally used in stormwater control facilities.

Trees should not be allowed to grow on emergency overflows and berms that are over 4 feet high. Trees can block flows and roots can lead to berm failure. Remove any trees. Remove larger roots (where the base of the tree is greater than 4 inches) and restore the berm.

Trees and shrubbery should be allowed to grow unless they interfere with facility function or maintenance activities. Any cut trees should be salvaged for habitat enhancement or converted to mulch or firewood.

**Repairs**

If the facility is overflowing for storms it was designed to infiltrate, it needs to be repaired. This requires removing accumulated sediment and cleaning or rebuilding the system so that it works according to design.

Repair and seed bare areas. Repair eroded slopes when rills form, where the cause of damage is still present, or there is potential for future erosion. Use cover BMPs on exposed soils.

Rodent holes on a dam or berm can pipe water. Destroy rodents, preferably by trapping, and repair the dam or berm. Check with the Washington Department of Fish and Wildlife before removing a game animal or fur-bearer, for example muskrat, beaver, nutria.

Spillway areas should be completely covered by more than one layer of rock.
Closed Detention Systems in Tanks or Vaults

Underground tanks or vaults usually are placed under paved areas. They are hold and slowly release stormwater runoff from roofs and pavement.

Tanks and vaults are confined spaces where work requires special OSHA approved training and equipment.

Outcomes

O1 Avoid or minimize sediment and pollutant discharges from the work area
O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
O7 Maintain or restore the intended infrastructure function
O9 Protect infrastructure

Operation and Maintenance Practices

Inspection

Inspect annually for the features listed under Cleaning and Repairs.

Periodically inspect the facility and surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Take action to have the pollutant source removed.

Cleaning

Remove trash and litter from the vault, inlet and piping.

Clean air vents that have one half of their area plugged.

Remove sediment when it accumulates to 1/10th the depth of a rectangular vault or 1/10th the diameter of a round tank or pipe.

Safety

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

Material Handling

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be handled and disposed of in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

Repairs

Repair any cracked or defective plates or baffles. Cracks are repaired so that no cracks greater than ¼-inch are found.
Any part of a tank or pipe that is bent out of shape more than 10 percent of its design shape must be replaced or repaired.

Repair any joints that are cracked and allow soil into the facility.

Repair all security and access features. This includes locking lids, covers, and ladder rungs.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.
Flow Control Structures/Flow Restrictors

Flow control structures and flow restrictors direct or restrict flow in or out of facility components. Outflow controls on detention facilities are a common example where flow control structures slowly release stormwater at a specific rate. If these flow controls are damaged, plugged, bypassed, or not working properly, the facility could overtop or be releasing water at too high of a rate. This will likely damage streams habitat and property. Site plans should have detailed drawings showing how the flow control structures should appear. Consult a licensed professional engineer for assistance.

Outcomes

O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
O7 Maintain or restore the intended infrastructure function
O9 Protect infrastructure

Operation and Maintenance Practices

Inspection

Inspect at least once per year for all features listed under Cleaning and Repairs, or when a facility does not drain properly or other problems occur.

Cleaning

Remove sediment within one and ½ feet of the bottom of an orifice plate.

Remove trash and debris that may block the orifice plate.

Remove any trash or debris that may block an overflow pipe-

Safety

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

Material Handling

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must disposed in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

Repairs

Repair or replace to original design specification any outlet orifice that is enlarged, bypassed or damaged.

Make certain that overflow outlets are not blocked.

Structures should be securely in place and within 10 percent of vertical.
Repair outlet pipe structures that have leaking connections or holes not specified by the design.

Repair or replace a non-functional or damaged cleanout gate.

Repair or replace damaged orifice plates to original design specification.

No outflow controls can be modified without approval of a Public Works Department engineer.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.
**Storm Pipe**

Storm sewer pipes convey stormwater. Pipes are built from many materials and are sometimes perforated to allow stormwater to infiltrate into the ground. Storm pipes are cleaned to remove sediment or blockages when problems are identified. Storm pipes must be clear of obstructions and breaks to prevent localized flooding.

**Outcomes**

- **O1** Avoid or minimize sediment and pollutant discharges from the work area
- **O2** Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- **O7** Maintain or restore the intended infrastructure function
- **O8** Prevent or reduce flooding
- **O9** Protect infrastructure

**Operation and Maintenance Practices**

*Inspection*

Pipes are difficult to inspect, requiring special equipment and training. Usually, if a problem occurs the owner needs to call a sewer or plumbing contractor to inspect, repair or clean pipelines.

*Cleaning*

Clean pipes when sediment depth is greater than 20 percent of pipe diameter. When cleaning a pipe, minimize sediment and debris discharges from pipes to the storm sewer. Install downstream debris traps (where applicable) before cleaning and then remove material.

Generally, use mechanical methods to remove root obstructions from inside storm sewer pipes. Do not put root-dissolving chemicals in storm sewer pipes. If there is a problem, remove the vegetation over the line.

Cleaning or excavating a pipe or culvert within natural or altered streams will likely require an HPA from WDFW. Work within seasonally dry or ditched watercourses may also require an HPA. Consult the official state water type maps for assistance in determining whether watercourses are typed streams that are regulated by WDFW. Contact the WDFW Regional office for additional information on whether specific watercourses are regulated under the State Hydraulic Code, or if unmapped streams are encountered.

If there is an emergency (e.g., immediate threat to life or property, or threat of environmental degradation), a verbal HPA may be obtained by calling the Washington Department of Fish and Wildlife Regional Office, or the Statewide Emergency Hotline HPA Hotline (360) 902-2537.
Safety
Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

Materials Handling
Sediment and debris from pipes should be disposed in the garbage as solid waste. Pick out any rocks first.

Repairs
Repair or replace pipes when a dent or break closes more than 20 percent of the pipe diameter.

Repair or replace pipes damaged by rust or deterioration.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.
Dry Drainage Ditches

Ditches are manmade open channels that carry only stormwater. This does not include ditches that have water flowing in them during dry weather.

Ditches are often maintained for drainage to prevent localized flooding by draining stormwater. Maintenance includes removing sediment, debris and overgrown vegetation.

Protecting water quality dictates minimizing vegetation removal and preventing erosion.

Outcomes

O1  Avoid or minimize sediment and pollutant discharges from the work area
O2  Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
O3  Avoid or minimize vegetation removal
O4  Preserve native plants
O7  Maintain or restore the intended infrastructure function
O8  Prevent or reduce flooding
O9  Protect infrastructure

Operation and Maintenance Practices

Inspection

Inspect ditches during routine site maintenance or at least once per year.

Cleaning

Land disturbing activities that remove vegetation or disturb soil are subject to City erosion control requirements. A good time to clean is during the growing season, when it's easiest to reestablish vegetation. This is generally April through June and September through October.

Cleaning or excavating a pipe or culvert within natural or altered streams will likely require an HPA from WDFW. Work within seasonally dry or ditched watercourses may also require an HPA. Consult the official state water type maps for assistance in determining whether watercourses are typed streams that are regulated by WDFW. Contact the WDFW Regional office for additional information on whether specific watercourses are regulated under the State Hydraulic Code, or if unmapped streams are encountered.

If there is an emergency (e.g., immediate threat to life or property, or threat of environmental degradation), a verbal HPA may be obtained by calling the Washington Department of Fish and Wildlife Regional Office, or the Statewide Emergency Hotline HPA Hotline (360) 902-2537.

If feasible, remove small amounts of sediment by hand when performing routine site maintenance.

Vegetation should only be removed when it reduces free movement of water through the ditch. Never remove more vegetation than is absolutely needed.

Only remove sediment when it reaches 20 percent of the ditch depth or affects the historic or designed hydraulic capacity.
Alternate cleaning areas with undisturbed areas, leaving undisturbed sections to act as sediment-trapping filters between worked areas.

Trap sediment that is generated by ditch maintenance to keep it from entering water bodies. Use sediment-trapping BMPs such as fabric fencing or filter bags at the lower end of each excavated area.

Prevent sediment from eroding when ditch work is performed. Perform work during dry weather unless there is an emergency such as property or road flooding.

Vegetate bare soils by hydroseeding or cover bare soils with an approved BMP. Hand seed for smaller areas.
**Water-Bearing (base flow) Drainage Ditches**

Many manmade drainage ditches carry water when it is not raining. This water comes from groundwater seeps and wetlands. These ditches can be recognized by the presence of wetland plants such as cattails. Any work that disturbs these channels is probably subject to a variety of environmental regulations and will probably require an HPA permit from the Washington Department of Fish and Wildlife.

Water-bearing drainage ditches require permits for work. Requirements of county, state, and federal laws and permits may apply. Contact the Washington Department of Fish and Wildlife before beginning work.
Installation, Repair and Replacement of Enclosed Drainage Systems

This activity includes tasks such as repair and replacement of pipe, catch basins, drywells and manholes. It also includes drainage projects that add new pipes, catch basins, or infiltration structures. New drainage projects are subject to regulations under City Code. Source control BMPs are required for activities such as concrete cutting.

Outcomes

O1 Avoid or minimize sediment and pollutant discharges from the work area
O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
O7 Maintain or restore the intended infrastructure function
O8 Prevent or reduce flooding

Practices

Avoid or minimize vegetation removal. If work is near a stream or wetland, there are regulatory requirements under City Code.

Follow any construction permit requirements of the Stormwater Control Ordinance, Chapter 13.29 CCC.

If work is performed under contract, specify BMP performance under inspection/contract administration.

Prevent debris, oils, cleaning agents, and sediment from entering waterways.

Avoid or minimize work in wet weather. This will reduce the problems of containing sediment.

Carry spill control kit to contain and clean up possible small spills in the work area.

Protect storm drains.

- Cover storm sewer inlets, catch basins and open manholes to block sediment-bearing water.
- If runoff contains sediment, use gravel-filled filter bags or an equivalent product to build berms around inlets. Gravel-filled bags are more stable than chip-filled bags.
- Catch basin inserts are also an acceptable sediment trapping option.

At stream crossings, trap materials using screens or another form of containment. Use containment BMPs to protect roadside ditches during wet weather.

Avoid using water to clean up work sites. Sweep or vacuum dust and debris from the repair job. Do not wash materials into storm sewers.

Place stockpiles away from drainage ways, wetlands, and natural wetland and habitat buffers. Cover stockpiles or contain them with berms or other containment devices if there is a chance that materials will erode into a storm drain or water body.
Cleaning or excavating a pipe or culvert within natural or altered streams will likely require an HPA from WDFW. Work within seasonally dry or ditched watercourses may also require an HPA. Consult the official state water type maps for assistance in determining whether watercourses are typed streams that are regulated by WDFW. Contact the WDFW Regional office for additional information on whether specific watercourses are regulated under the State Hydraulic Code, or if unmapped streams are encountered.

If there is an emergency (e.g., immediate threat to life or property, or threat of environmental degradation), a verbal HPA may be obtained by calling the Washington Department of Fish and Wildlife Regional Office, or the Statewide Emergency Hotline HPA Hotline (360) 902-2537.
**Minor Culvert Repair (not in a stream)**

This activity is the replacement or repair of culverts and inlets less than 6 feet in diameter. It applies only to structures that are in ditches but specifically for drainage that do not carry water during dry weather. If there is any question about whether the ditch is a storm drain or a stream consult, with the Washington Department of Fish and Wildlife.

**Outcomes**

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O3 Avoid or minimize vegetation removal
- O7 Maintain or restore the intended infrastructure function
- O8 Prevent or reduce flooding
- O9 Protect infrastructure

**Maintenance Practices**

Comply with stormwater and erosion control requirements of the City Code.

Avoid or minimize vegetation removal. If work is near a stream or wetland, there are likely regulatory requirements under the City Code.

Other than to address a threat to public safety or property due to flooding, perform work during the dry season.

Minimize soil disturbance.

Use sediment controls to trap any sediment and prevent sediment from entering storm sewer and water bodies. Sediment trapping BMPs are used to the extent practical during emergencies.

Use cover BMPs to prevent erosion of bare soil. Vegetate bare soils.

Cleaning or excavating a pipe or culvert within natural or altered streams will likely require an HPA from WDFW. Work within seasonally dry or ditched watercourses may also require an HPA. Consult the official state water type maps for assistance in determining whether watercourses are typed streams that are regulated by WDFW. Contact the WDFW Regional office for additional information on whether specific watercourses are regulated under the State Hydraulic Code, or if unmapped streams are encountered.

If there is an emergency (e.g., immediate threat to life or property, or threat of environmental degradation), a verbal HPA may be obtained by calling the Washington Department of Fish and Wildlife Regional Office, or the Statewide Emergency Hotline HPA Hotline (360) 902-2537.
**Major Culvert Repair (At a Stream Crossing)**

This activity is the replacement or repair of culverts and inlets greater than 6 feet in diameter or bridging a stream or ditch with flowing water during dry weather. If there is any question about whether the ditch is a storm drain or a stream consult with the Washington Department of Fish and Wildlife.

These projects must meet all regulatory requirements.

- SEPA
- Shoreline Management
- State HPA
- Flood Plain
Pavement Sweeping

Sweeping is performed to remove sand and litter from streets and curb gutters. Sweeping also reduces dust during dry weather. Street sweeping is also storm sewer maintenance practice because it limits sediment washed into stormwater facilities. Water quality practices for street sweeping focus on sediment disposal. Reducing the amount of sediment washed into catch basins, detention facilities, drywells, and other facilities can save money because sweeping is generally cheaper than removing sediment from facilities. Sweeping also helps protect facilities from clogging with sediment.

Outcomes

O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
O5 Protect public safety and health
O10 Meet public expectations for aesthetics

Practices

Sweep the site if it will help keep sediment and from storm sewers or water bodies. Sweeping is especially useful for cleaning up work areas.

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Sweepings should be disposed of as solid waste or under a program permitted by the Health District.
Chapter 3. Road Operation and Maintenance

Road maintenance activities include just routine maintenance activities on roads, roadsides and bridges or stream culverts. It includes activities such as sweeping, roadside vegetation management, ditch cleaning, clearing debris from culverts and de-icing.

The overall goal of water quality BMPs for road O and M is to make sure that:

- Systems that control pollutants, such as vegetation in roadside ditches are preserved
- Work on roads does not become a source of pollutants such as sediment.
- Activities near sensitive areas such as stream buffers and wetland buffers follow habitat protection procedures
- Sources of pollutants to roadside ditches are identified and removed.
**Activity: Street Sweeping (vacuum pickup)**

Street sweeping is performed largely for aesthetics and to remove sand and litter sediment from streets and curb gutters. Street sweeping is a water quality BMP. Water quality practices for street sweeping focus on sediment disposal.

**Outcomes**
- O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources
- O5 Protect public safety and health
- O10 Meet public expectations for aesthetics

**Practices**

Subdivision streets are swept 9 times per year and arterial roads and collector roads are swept 12 times per year. Sweeping schedules may be revised following monitoring of the program.

Materials storage BMPs from the Stormwater Pollution Control Manual will be used for sweepings.

Sweepings are disposed as provided for by the Washington Department of Ecology and Health District requirements. Sweepings are screened to separate litter and trash (disposed as solid waste), then used as reclamation fill in permitted gravel pits.
**Activity: Sweeping (non pick up)**
This sweeping brushes debris off the road surface onto road shoulders and into the ditch sides.

**Outcomes**
- O1 Minimize sediment and pollutant discharges from the work area
- O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources
- O5 Protect public safety and health
- O10 Meet public expectations for aesthetics

**Practices**
Do not sweep debris into wet ditches (storm or base flow) or into streams, ponds, or wetlands. Sweep debris into vegetated areas of shoulder or ditch.

Vacuum sweepers are used on bridges, and within 250 feet of water bodies, streams and wetlands.
**Activity: Roadside Mowing**

Mowing maintains sight distances, promotes grass growth and controls unwanted vegetation. It can include mowing of grass, brush and shrubbery.

**Outcomes**

O1 Minimize sediment and pollutant discharges from the work area
O3 Minimize vegetation removal
O4 Preserve native plants
O5 Protect public safety and health
O10 Meet public expectations for aesthetics

**Practices**

Perform mowing to the extent needed to control unwanted vegetation. Natural vegetation is left in place to the extent possible, considering safety issues for visibility and the need to maintain ditch flow capacity.

Minimize mowing to the backslope to include areas where noxious weeds or unwanted vegetation need to be controlled.

Roadside ditches are stormwater conveyances, and are in effect, water body buffers where pesticides and fertilizer are not normally used. See Activity: Vegetation and Pest Management in Stormwater Control Facilities for details.

In Habitat Conservation Areas where roads abut natural vegetation (not cultivated fields, lawns and pastures), mowing is restricted to the road shoulder and for control of patches of blackberries or other noxious or nuisance vegetation.
Activity: Roadside Chemical Vegetation Control

Weed control is performed to control noxious weeds on city right-of-way and to kill vegetation along the edge of pavement along arterial roads and major collectors, within pavement cracks, and on landscaped medians. This activity does not include maintaining stormwater swales or other vegetated stormwater facilities.

Outcomes

O1 Minimize sediment and pollutant discharges from the work area
O3 Minimize vegetation removal
O4 Preserve native plants
O5 Protect public safety and health
O7 Maintain or restore the intended infrastructure function
O10 Meet public expectations for aesthetics

Practices

Chemical controls are used where it is not practical to control by mechanical removal or cultural controls.

Herbicide is sprayed to either the top of the ditch or two feet from the edge of pavement (whichever is less) to control vegetation.

Never spray herbicides into water. Many roadside ditches carry water during dry periods and can be recognized by the presence of water and wetland plants such as cattails. Do not spray herbicide in these ditches.

Within 250 feet of a water body or wetland, or within a designated Habitat Conservation Areas, follow the practices of Activity: Vegetation and Pest Management in Stormwater Control Facilities or avoid chemical applications within 100 feet of a water body.
Activity: Roadside Brush and Tree Clearing
This includes mechanical, hand removal, and spot herbicide spraying of undesirable shrubs, bushes and trees along roads.

Outcomes
O1 Minimize sediment and pollutant discharges from the work area
O3 Minimize vegetation removal
O4 Preserve native plants
O5 Protect public safety and health
O9 Protect infrastructure
O10 Meet public expectations for aesthetics

Practices
Limit brush removal to the shoulder and ditch. Only remove brush and trees or branches to provide sight distance and maintain ditch flow capacity.

Do not remove native shrubs or trees within Habitat Conservation Areas, wetland buffers, or along drainage ditches that have dry weather flow unless it poses a hazard or is a nuisance or noxious weed. These ditches often have wetland plants such as cattails in them. Consult with the area supervisor before removing trees or brush within 250 feet of a stream. A habitat biologist should be consulted before removing trees in a Habitat Conservation Area. For drainage ditches, follow the practices of Activity: Vegetation and Pest Management in Stormwater Control Facilities. For other roadside areas with natural vegetation, follow vegetation management activity: Vegetation Management in Less-Managed Areas.

Only trees that pose a danger of falling onto roadways or structures may be removed within Habitat Conservation Areas. Removed trees are replaced with the same type of trees that cover an equal area as the canopy of the removed tree. Tree replacement is within the same basin.

If practical, hand remove weeds such as black berry vines, nightshade and scotch broom while keeping other bushes and trees.

If there is a water body or ditch with water flow during dry weather, only clear bushes when sight distance is an issue, and after checking with the area supervisor.

Cover bared soils with an erosion prevention cover BMP. Vegetate bare soils.
**Activity: Brush and Tree Clearing Near Bridges**

This includes hand removal of undesirable shrubs, bushes and trees along bridge approaches and under bridges. Bridges over water bodies are always in Habitat Conservation Areas.

**Outcomes**

O1 Minimize sediment and pollutant discharges from the work area  
O3 Minimize vegetation removal  
O4 Preserve native plants  
O5 Protect public safety and health  
O7 Maintain or restore the intended infrastructure function  
O9 Protect infrastructure  
O10 Meet public expectations for aesthetics

**Practices**

Limit brush removal to area between the edge of pavement to the back side of the ditch or to a location that provides adequate sight distance.

If practical, hand remove weeds such as black berry vines, nightshade and scotch broom while keeping other bushes and trees.

Only trees that pose a danger of falling onto roadways or structures may be removed within Habitat Conservation Areas. Do not remove native shrubs or trees within Habitat Conservation Buffers, wetland buffers, or along drainage ditches that have summer base flow. Consult with the area supervisor before removing trees or brush within 250 feet of a stream. A habitat biologist should be consulted before removing trees in an Habitat Conservation Area.

Removed shrubs and trees will be replaced as directed by a Habitat Conservation Plan or to replace an area equal to the vegetation area and tree canopy removed. Trees are replaced within the same basin.

Cover exposed soil with an erosion prevention cover BMP. Vegetate bare soils.

Within 250 feet of a water body or wetland, follow the practices of Activity: Vegetation and Pest Management in Stormwater Control Facilities
**Activity: Bridge Channel Debris Removal**

This activity involves removing any debris that has accumulated against or around a bridge in a stream channel where normal to high water flows occur. See Activity: Brush and Tree Clearing Near Bridges for information on managing vegetation on streamside areas. The main concerns for debris removal are preventing a hazard to the bridge while protecting stream habit.

Any work that may modify a stream bed or stream bank requires consultation with Engineering staff and consultation with the Washington Department of Fish and Wildlife.

**Outcomes**

- O1 Minimize sediment and pollutant discharges from the work area
- O3 Minimize vegetation removal
- O5 Protect public safety and health
- O6 Prevent catastrophic infrastructure failures
- O9 Protect infrastructure

**Practices**

Follow the Habitat Preservation Ordinance and Wetland Protection Ordinance requirements and obtain the needed permits before constructing access routes in stream buffers, wetlands or wetland buffers.

Only remove debris from channel and stream bank areas. Where no downstream obstructions exist, dislodge debris and turn it to flow downstream through the bridge. Only cut apart wood debris when necessary to clear it.

Do not remove any debris outside of the structure, stream channel or stream bank.

Follow source controls for petroleum and hydraulic fluid leaks.

Use ground cover BMPs for any bare soil and vegetate any bare areas with approved cover vegetation.

Consult with the Washington Department of Fish and Wildlife if any work involves modifications to the stream bank or channel. If an emergency exists, contact the Department of Fish and Wildlife for verbal approval.
**Activity: Roadside Ditch Cleaning and Reshaping**

This activity includes machine or hand cleaning of ditches, reshaping ditches to promote drainage, and managing any removed materials. This practice does not include ditches that have water flowing in them. See the stormwater facility O and M standards for Dry Drainage Ditches.

Protecting water quality dictates minimizing vegetation removal and preventing erosion.

**Outcomes**

O1 Minimize sediment and pollutant discharges from the work area  
O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources  
O3 Minimize vegetation removal  
O7 Maintain or restore the intended infrastructure function  
O8 Prevent or reduce flooding  
O9 Protect infrastructure

**Practices**

Use mowing as the first method to reduce capacity loss. If mowing is insufficient, use ditch cleaning methods.

Where practical, perform work during dry weather.

Only clean areas where there is a flow restriction.

Never remove more vegetation than is absolutely needed. Leave untouched sections at least 200 feet long (where feasible) to act as sediment trapping filters between cleaned sections.

Remove small amounts of sediment by hand when performing routine maintenance.

Use sediment-trapping BMPs at the lower end of each excavated area to keep it from washing out of the work area or entering water bodies.

If there are problems with steep gradient or flowing water, use a stabilization BMP such as a silt mat on the ditch bottom.

Cover bare soils with a cover BMP. Vegetate bare soils. During summer, seeding may not be feasible. Hydroseed unvegetated soils in early fall to assure growth before rainy weather begins in October.

Transport sediment to the appropriate permitted site, grading project, or gravel pit reclamation project.

Avoid work within 250 feet of a stream, wetland or Habitat Conservation Area. If work is required to solve a drainage problem in a Habitat Conservation Area, use ground cover matting to stabilize the area and sediment trapping BMPs.
**Activity: Culvert and Inlet Cleaning**

This activity includes cleaning sediment and debris from culverts, inlets and other drainage structures less than 6 feet in diameter. These structures are in dry drainage ditches that do not contain water during dry weather. Cleaning is performed to restore drainage capacity using flushing equipment or hand tool.

If there is any question about whether the inlet is in a storm drain or a natural or altered stream, consult with the Washington Department of Fish and Wildlife.

**Outcomes**

O1 Minimize sediment and pollutant discharges from the work area  
O3 Minimize vegetation removal  
O7 Maintain or restore the intended infrastructure function  
O8 Prevent or reduce flooding  
O9 Protect infrastructure

**Practices**

Other than to address a threat to public safety or property due to flooding, perform work during the dry season.

Minimize soil disturbance. Never remove more vegetation than is absolutely needed.

Use sediment controls to trap any sediment and prevent sediment from entering storm sewer and water bodies. Sediment trapping BMPs are used to the extent practical during emergencies.

Cover bare soils with a cover BMP. Vegetate bare soils. During summer, seeding may not be feasible. Unvegetated soil will be hydro-seeded in early fall to assure growth before rainy weather begins in October.

If there are problems with steep gradient or flowing water, use a stabilization BMP such as a silt mat on the ditch bottom.

Transport sediment to the appropriate permitted site, grading project, or gravel pit reclamation project.

Avoid work within 250 feet of a stream, wetland or Habitat Conservation Area. If work is required to solve a drainage problem in a Habitat Conservation Area, use ground cover matting to stabilize the area and sediment trapping BMPs.
**Activity: Minor Culvert Repair (not in a stream)**

This activity is the replacement or repair of culverts and inlets less than 6 feet in diameter. It applies only to structures that are in ditches built specifically for drainage and do not carry water during dry weather.

If there is any question about whether the ditch is a storm drain or a natural or altered stream, consult with the Washington Department of Fish and Wildlife.

**Outcomes**

O1 Minimize sediment and pollutant discharges from the work area  
O3 Minimize vegetation removal  
O7 Maintain or restore the intended infrastructure function  
O8 Prevent or reduce flooding  
O9 Protect infrastructure

**Practices**

Other than to address a threat to public safety or property due to flooding, perform work during the dry season.

Minimize soil disturbance. Never remove more vegetation than is absolutely needed.

Use sediment controls to trap any sediment and prevent sediment from entering storm sewer and water bodies. Sediment trapping BMPs are used to the extent practical during emergencies.

If there are problems with steep gradient or flowing water, use a stabilization BMP such as a silt mat on the ditch bottom.

Cover bare soils with a cover BMP. Vegetate bare soils. During summer, seeding may not be feasible. Unvegetated soil will be hydro-seeded in early fall to assure growth before rainy weather begins in October.

Transport sediment to the appropriate permitted site, grading project, or gravel pit reclamation project.

Avoid work within 250 feet of a stream, wetland or Habitat Conservation Area. If work is required to solve a drainage problem in a Habitat Conservation Area, use ground cover matting to stabilize the area and sediment trapping BMPs.
**Activity: Major Culvert Repair (At a Stream Crossing)**

This activity is the replacement or repair of culverts and inlets greater than 6 feet in diameter or bridging a stream or ditch with flowing water during dry weather. If there is any question about whether the ditch is a storm drain or a stream consult with a supervisor, crew chief or Washington Department of Fish and Wildlife.

**Practices**

These projects are designed by engineering staff and must meet all regulatory requirements. Follow practices specified by engineering staff and permit conditions.
Activity: Erosion Repair

This activity includes the clean up and repair caused by erosion or minor soil failures. It involves reshaping the slope using material on site, importing fill material and removing material.

This activity does not include larger slide or stream erosion projects, which are overseen by an engineer who specifies the BMPs.

Outcomes

O1 Minimize sediment and pollutant discharges from the work area
O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources
O3 Minimize vegetation removal
O4 Preserve native plants
O5 Protect public safety and health
O6 Prevent catastrophic infrastructure failures
O7 Maintain or restore the intended infrastructure function
O9 Protect infrastructure

Practices

Unless work is to address a threat to public safety or property, perform work during dry weather.

Never remove more vegetation than is absolutely necessary to complete the job.

Use sediment-trapping BMPs at the lower end of each excavated area. Trap sediment that is generated by work to keep it from entering water bodies.

Cover bare soils with a cover BMP. Vegetate bare soils.

Transport sediment to the appropriate permitted site, grading project, or gravel pit reclamation project.

Avoid work within 250 feet of a stream, wetland or Habitat Conservation Area. If work is required to solve a drainage problem in a Habitat Conservation Area, use ground cover matting to stabilize the area and sediment trapping BMPs.
Activity: Emergency Slide/Washout Repair

This activity is emergency actions that must be immediately taken to avoid an imminent threat to public health or safety, or to prevent an imminent threat of serious environmental degradation (Section 197-11-880 WAC).

Outcomes
O1 Minimize sediment and pollutant discharges from the work area
O5 Protect public safety and health
O6 Prevent catastrophic infrastructure failures
O7 Maintain or restore the intended infrastructure function
O9 Protect infrastructure

Practices
Install sediment control BMPs.

Use BMPs to avoid or minimize additional impacts to streams and wetlands.

If possible, divert water around the work area with temporary measures such as sandbags.

Transport sediment to the appropriate permitted site, grading project, or gravel pit reclamation project.

Install cover BMPs on bare soil and vegetate the area.

Where required, emergency permits will be obtained from appropriate agencies. Possible permits include:
- Grading
- SEPA
- Shoreline
- State HPA
- Flood Plain
**Activity: Bridge Deck Cleaning and Maintenance**

These are minor activities to care for bridge decks such as patching and cleaning sediment. Consultation with Washington Department of Fish and Wildlife is required if the work will impact a stream.

**Outcomes**

- O1 Minimize sediment and pollutant discharges from the work area
- O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources
- O5 Protect public safety and health
- O7 Maintain or restore the intended infrastructure function
- O9 Protect infrastructure

**Practices**

Block drains during pressure washing or cleaning to route water off the deck and prevent material from entering water bodies.

Collect and properly dispose of debris. Use screening on the ground or in a catch basin to filter out particles for disposal as solid waste.

Sweep up debris at the end of each workday.

Properly dispose of any removed material according to standard procedures.
Activity: Bridge Structure Maintenance

This activity includes a variety of activities that may be part of routine bridge maintenance. They include washing, scraping, and painting. If activities are part of a project, the project engineer will specify BMPs after consultation with Washington Department of Fish and Wildlife.

Bridges are almost always in Habitat Conservation Areas where clearing must be limited.

Outcomes

O1 Minimize sediment and pollutant discharges from the work area
O3 Minimize vegetation removal
O4 Preserve native plants
O5 Protect public safety and health
O7 Maintain or restore the intended infrastructure function
O9 Protect infrastructure
O10 Meet public expectations for aesthetics

Practices

Block drains during washing or cleaning to route water off the deck to prevent debris, paint chips and paint from entering surface water. Sweep up debris at the end of each workday.

Collect debris and properly dispose of it. Use screening on the ground or in a catch basin to filter out particles for disposal as solid waste or hazardous material.

Use netting or other material to catch material dislodged from beneath (King County BMP 3.4.6 or 3.4.8).

Properly dispose of any removed material according to standard procedures.

Most bridges are constructed of concrete and have little or no surfaces that have been covered by lead-based paint. If paint is being removed and there is a chance that it is lead based, paint chips are tested for lead content and use lead control and safety practices if lead, cadmium or chromium is found. Contact the safety officer for information on control and safety practices.

Have spill control and cleanup materials on site.

When applying paint, use paints that minimize environmental risk. Roll paint when feasible.

Minimize disturbing vegetation to trimming branches. If vegetation or trees must be removed to complete the project, replace the vegetation and tree with an equal type and area covered at the site or another within the same basin.
Activity: Chemical Road De-Icer Use
This is a practice of using a chemical to prevent or retard ice formation on roads and structures. The primary purpose is to protect public safety.

Outcomes
O1 Minimize sediment and pollutant discharges from the work area
O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources
O5 Protect public safety and health

Practices
Limit de-icer use to areas where traffic hazards occur. Apply the current Washington Department of Transportation approved material.

List sites where de-icer is required. Use de-icer as specified in manufacturer’s instructions. Follow materials storage and transfer BMPs in the DOE Manual or City Code.
Activity: Sanding for Ice
Sand is used to provide traction in certain areas where snow and ice cause safety problems.

Outcomes
O1 Minimize sediment and pollutant discharges from the work area
O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources
O5 Protect public safety and health

Practices
Recover and reuse sand by using pick-up sweepers in urban areas, within 250 feet of lakes, ponds and streams, and on bridges.

In rural areas, and not near a water body, sweep sand onto vegetated shoulders.

Properly store sand and use containment or covering BMPs specified in the DOE Manual or adopted City Code.
**Activity: Snow Removal**

This activity is snow removal from roads, shoulders, and bridges using various snowplowing devices. Plowed snow can include sediment and debris from roads and shoulders.

**Outcomes**

- O1 Minimize sediment and pollutant discharges from the work area
- O3 Minimize vegetation removal
- O4 Preserve native plants
- O5 Protect public safety and health
- O7 Maintain or restore the intended infrastructure function

**Practices**

Minimize the amount of sediment and debris entering water bodies. When moving snow and ice, avoid pushing or casting snow directly into a water body.

Consider the influence that plowed or cast snow has on roadside vegetation. Minimize crushing or disturbance of roadside shrubs and trees within Habitat Conservation Areas.

Reduce speed, change plow angle or use other methods to protect water bodies and sensitive habitat areas.
Activity: Road Surface Maintenance

This activity includes surface repairs and paving jobs. Tasks include using asphaltic concrete, midland pavement, and other materials for patching potholes, filling cracks, paving shoulders, and overlaying roads. If the job cuts or places concrete, see the concrete work activity BMPs.

The major concern is rainfall runoff carrying oils from the work area and particles of material being washed or swept into storm drains or water bodies.

Outcomes

O1 Minimize sediment and pollutant discharges from the work area
O3 Minimize vegetation removal
O5 Protect public safety and health
O7 Maintain or restore the intended infrastructure function
O9 Protect infrastructure

Practices

If resurfacing work is performed under contract, specify BMP performance under inspection/contract administration.

Prevent debris, oils, cleaning agents, and sediment from entering waterways. If feasible block inlets and drains.

Avoid work in wet weather. This will reduce the problems of containing sediment or oil laden runoff from the job.

Carry spill control kit.

If the work is creating sediment or other pollutants that can be washed from the work area, protect storm drains. Use the following practices as feasible.

- Cover storm sewer inlets, catch basins and open manholes to prevent or block sediment-bearing water.
- If runoff contains oil and grease use sandbags, booms, or other absorbent products to trap oil at inlets or in drainage ditches. Use catch basin inserts with oil trapping material.
- If runoff contains sediment, use gravel-filled filter bags or other appropriate products to build berms around inlets. Gravel-filled bags are more stable that chip-filled bags.
- At stream crossings, trap materials using screens or another form of containment. Use containment BMPs to protect roadside ditches during wet weather.

Avoid using water to clean up work sites. Sweep or vacuum dust and debris from the repair job. Do not wash materials into storm sewers.

Properly contain and dispose of any residue from cleaning tools. Use heat to clean equipment where possible, avoiding solvents. If vehicles and equipment are left at the site overnight, use drip pans to contain leaks.
Minimize vehicle and equipment cleaning at the site. If cleaning is performed, dispose of cleaning residue in a sanitary sewer or into a grassy area or small temporary infiltration pit.

Place cold mix and material stockpiles away from drainageways. Cover or contain stock piles to prevent material or residues from washing off.

Recycle asphalt and fill material when possible.
**Activity: Concrete Work**

This activity is the installation, cutting, or repair of concrete facilities such as road surfaces, curb and gutter, sidewalks, and drainage structures.

**Outcomes**

O1  Minimize sediment and pollutant discharges from the work area  
O5  Protect public safety and health  
O7  Maintain or restore the intended infrastructure function

**Practices**

When necessary, place storm drain covers or containment devices over all drain inlets or discharge points at the beginning of each workday. Remove all accumulated material at the end of each workday. Properly dispose of the material.

Dispose of concrete where it will not wash into a water body, ditch or storm drain. Collect slurry from exposed aggregate washing, grinding water, and any truck washout and dispose of it properly. It is acceptable to dig a hole to hold any slurry or rinse water.

Use curing and form release materials that minimize pollutant discharge.

Do not use water to wash down the area.
**Activity: Shoulder Blading**

This activity is blading and shaping of unpaved shoulders to correct ruts, sediment accumulation, excessive plant material accumulation, and to maintain drainage from the pavement to the ditch. It usually involves work on relatively flat gravel shoulders.

**Outcomes**

O1 Minimize sediment and pollutant discharges from the work area  
O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources  
O3 Minimize vegetation removal  
O5 Protect public safety and health  
O7 Maintain or restore the intended infrastructure function

**Practices**

Try to limit this work to dry weather.

Minimize vegetation removal. If soils are disturbed beyond the top of the ditch or on a slope, apply erosion prevention BMPs and vegetate the bare areas.

Avoid or minimize vegetation removal within Habitat Conservation Areas, and wetland buffers. Consider avoiding shoulder blading.
Activity: Shoulder Rebuilding
This activity is an expansion from shoulder blading that involves adding material to the shoulder, reshaping, and compacting aggregate. It may also include removing material. Shoulders are generally cleared and mowed areas vegetated with grass and brush and are not specifically subject to requirements of the Habitat Conservation Ordinance.

If work will take place between the road and stream, and increases the size of the should or impacts vegetation or a stream channel, consult with an engineer to determine if permits are required.

Outcomes
O1 Minimize sediment and pollutant discharges from the work area
O3 Minimize vegetation removal
O4 Preserve native plants
O7 Maintain or restore the intended infrastructure function
O9 Protect infrastructure

Practices
Use erosion controls and prevent sediment and debris from entering water bodies and wetlands. Apply sediment control BMPs at the outside edges of the work area.

Minimize vegetation removal. Avoid or minimize vegetation removal within Habitat Conservation Areas and wetland buffers.

Where possible, create a grassy vegetated slope area between the road and ditch bottom when rebuilding a shoulder.
**Activity: Pavement Marking**

This activity includes striping roadway surfaces and applying other markings such as hot plastic material to define special traffic control features such as crosswalks, and application of special markers using adhesives.

**Outcomes**

O1 Minimize sediment and pollutant discharges from the work area
O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources
O5 Protect public safety and health

**Practices**

As current paint stocks are consumed, water based or low VOC paints replace them.

Prevent paint from entering storm sewers and water bodies. Use over-spray control.

Store paint in spill proof containers or covered areas. Clean up spills during storage and handling.

When cleaning up, use methods that properly contain and dispose of unused paint, cleaning materials, and other spent materials.

When removing markings, prevent debris from entering water bodies. Clean up debris from grinding or power washing and dispose of it according to standard procedures.

Avoid using water to clean pavement and do not wash debris into storm sewers or ditches. Protect inlets, manholes and roadside ditches during any washing activities.
Activity: Sign Installation and Repair
This activity is the routine replacement, installation, repair, straightening and cleaning of signs.

Outcomes
O1 Minimize sediment and pollutant discharges from the work area
O3 Minimize vegetation removal
O5 Protect public safety and health
O7 Maintain or restore the intended infrastructure function

Practices
Prevent disturbed soil from entering storm sewer or surface water bodies. Seed bare soils.

Avoid discharging cleaners to storm sewers or surface water by making sure they run into vegetated areas or limiting the amount used.

Clean up any materials or debris left by the work.

Attempt to avoid placing signs in areas where there are shrubs and trees that will have to be removed and periodically cleared to keep the sign visible.
Activity: Traffic Signal Maintenance
This activity is the routine repair and preventative maintenance of traffic signals and luminaires, including lamps, poles and bases.

Outcomes
O1 Minimize sediment and pollutant discharges from the work area
O3 Minimize vegetation removal
O5 Protect public safety and health
O7 Maintain or restore the intended infrastructure function

Practices
Prevent disturbed soil from entering storm sewer or surface water bodies. Use sediment trapping or cover BMPs and seed bare soils.

Avoid discharging cleaners to storm sewers or surface water by making sure they run into vegetated areas or limiting the amount used.

Clean up any materials or debris left by the work.
**Activity: Maintenance of Posts, Guardrails, Concrete Barriers and Other Road Features**

This activity is the routine repair and replacement of guardrails and similar features. It can include straightening and minor excavation.

**Outcomes**

<table>
<thead>
<tr>
<th>O1</th>
<th>Minimize sediment and pollutant discharges from the work area</th>
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<tr>
<td>O3</td>
<td>Minimize vegetation removal</td>
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<td>O5</td>
<td>Protect public safety and health</td>
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<tr>
<td>O7</td>
<td>Maintain or restore the intended infrastructure function</td>
</tr>
<tr>
<td>O10</td>
<td>Meet public expectations for aesthetics</td>
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</tbody>
</table>

**Practices**

Prevent disturbed soil from entering storm sewer or surface water bodies.

Minimize the area of soil disturbance.

If soil is disturbed, use sediment trapping and cover BMPs. Seed disturbed soils if the area will sustain vegetation.

Prevent pollutants such as paint and debris from entering storm sewer or surface water bodies.

If power washing, avoid discharging water and debris directly to storm sewers or surface water by trapping with gravel-filled bags and blocking inlets. If sand blasting, contain and sweep up residues and dispose of them following standard procedures.

Carry a spill response kit.
Chapter 4. Spill and Hazardous Materials Response

Spill or hazardous materials response applies to any activity. It includes finding abandoned containers on city right-of-way or drainage structures; spills to roads, ditches or storm structures; and clean up and vehicle accidents.

The following procedures are subject to change as training, equipment, and staff changes occur.

Spill/Incident Response while in the Office or while in the field

Purpose/Intent: This policy ensures that all Public Works employees understand notification procedures for calls or field discovery of chemicals spills (specifically, chemical spills into the City stormwater sewer system, as well as into surface and groundwater), abandoned chemical containers or garbage or trash.

Individual divisions and sections that have field staff that investigate, collect or clean up materials must have proper training and procedures in place.

This policy applies to all Public Works employees. All employees are responsible to ensure compliance with this policy.

Policy Provisions:

1.0 Spills and Leaking Containers

When an employee receives call or discovers a chemical spill into the City Stormwater System (roadside ditches, retention/detention ponds, drywells, and catch basins), and/or into surface water or groundwater (e.g., via drywell, etc.), the employee shall immediately take the following information from the caller:

a. Caller's name, telephone number, address, and where they can be reached later that day;
b. The address of the spill;
c. The physical location of the spill (e.g., northeast side of intersection...; near mile marker...; north on highway near...creek, etc.); and
d. License plates numbers, names of individuals, company names/logos on vehicles, if available.

Notification and tracking procedure

1. Call 911 (Emergency Services) and report the call and information
2. Call the Washington Department of Ecology Spill Response at 360-407-6300
3. Notify Public Works at 360-829-1631 that a call has been report to 911 and to the Washington Department of Ecology Spill Response

2.0 Abandoned Non-leaking Chemical Containers

Calls about contained material such as paint cans or barrels, calls should go to:

1. Public Works at 360-829-1631. Operations will evaluate the situation and complete the notification and reporting procedure.
3.0 Trash and Garbage

Calls about garbage and trash should go to:
1. Public Works at 360-829-1631. Operations will evaluate the situation and complete the notification and reporting procedure.
**Activity: Accident Clean Up**
This activity involves clean up of debris and spilled automotive fluids at accident scenes. Larger spills are discussed in the Spill Response Activity.

**Outcomes**
O1 Minimize sediment and pollutant discharges from the work area  
O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources  
O5 Protect public safety and health  
O7 Maintain or restore the intended infrastructure function

**Practices**
Follow city procedures for spill cleanup. Each maintenance vehicle has spill response instructions. Contact the Public Works safety officer for more information.
**Activity: Spill Response (illicit dumping or chemical spill)**

This is in response to a spill on a city-owned road or a spill impacting a storm sewer owned or operated by the City.

**Outcomes**

- **O1** Minimize sediment and pollutant discharges from the work area
- **O2** Prevent city roads, drainage systems, facilities and property from becoming pollutant sources
- **O5** Protect public safety and health
- **O6** Prevent catastrophic infrastructure failures
- **O7** Maintain or restore the intended infrastructure function

**Practices**

Follow practices defined in the spill reporting or response plan and policies. Each maintenance vehicle has spill response instructions. Contact the Public Works safety officer for more information.
**Activity: Abandoned Container Response**

This is response to discovery of abandoned waste containers on roads or other facilities owned or operated by the City.

**Outcomes**

O2  Prevent city roads, drainage systems, facilities and property from becoming pollutant sources

O5  Protect public safety and health

**Practices**

Follow practices defined in the abandoned materials policy. Each maintenance vehicle has instructions on responding to abandoned containers. Contact the Public Works safety officer for more information.
Chapter 5. Facilities Operation:

Facilities operation includes a variety of activities such as materials stockpiling, fuel storage, fueling stations, vehicle repair, and equipment storage.

Outcomes
O1 Minimize sediment and pollutant discharges from the work area
O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources

Practices
The City follows best management practices required by the City’s Ordinance. These are listed in the DOE Manual.
Chapter 6. Vegetation Management Goals, Vegetation Management Areas, and General BMPs

Vegetation management activities listed here are performed by grounds maintenance crews who care for parks, natural areas and landscaped areas. Roadside vegetation management is covered in Chapter 3, Road Operation and Maintenance.

Chapter 7, Description of Vegetation and Pest Management Practices provides specific practices for each vegetation management activity in this chapter.

Vegetation management practices are adapted, with minor modifications for format and local practices, from City of Portland Parks Pest Management Policy (April 1999).

General Goals and Philosophy

The City recognizes the special importance of the rivers, streams, wetlands, ponds, and stormwater treatment facilities that fall under our stewardship. The sensitive nature of such habitats, their plant and animal communities, and their direct link with other waterways require that we establish specific policies to ensure their health. These sets of practices for vegetation management, pesticide use and fertilizer use establish guidelines and limitations regarding maintenance for waterways and adjacent lands.

All landscape management decisions for controlling unwanted vegetation, diseases, and pests will follow Integrated Pest Management (IPM) principles and decision-making rationale. These are

- Proper planning and management decisions begin the IPM process.
- Cultural methods of vegetation and pest control are preferred and are first employed.
- Mechanical means of vegetation and pest control are next in line of preference, and are utilized where feasible.
- Biological methods of vegetation and pest control are considered before chemical means, where they are feasible.
- Botanical and synthetic pesticides are used only when no other feasible methods exist.

Main Categories of Vegetation Management Areas

Vegetation management practices vary for areas having different management objectives. The standards here apply to all areas, but more strict controls are placed on areas where code or policy dictate that native vegetation be preserved and in areas near water bodies. These are identified for each activity. There are special management areas for pesticide and fertilizer use in 25 foot setbacks from water bodies and in stormwater control facilities. Special clearing requirements may apply in areas defined by the City’s Code.

All Areas

Practices for vegetation management apply as minimum standards for all areas. More restrictive standards and practices for protected habitat and water body setbacks are listed in each activity.
Habitat Conservation Areas

Few wetlands or wetlands buffers are mapped because very few wetlands are accurately mapped. Consult wetland maps or check with technical staff regarding the potential area and buffers for a wetland. Separate practices are established for vegetation management and pest control near water bodies and inside city Habitat Conservation Areas which include protections for existing trees and shrubs and special set backs from water bodies for controls on pesticide and fertilizer use. Vegetation management practice for specific activities or types of area such as intensively managed parks or natural areas are listed in Chapter 7, Vegetation Management Activities.

Descriptions and Examples of Types of Vegetation Management Areas and Activities

The City has grouped landscape management activities by the condition and use of the area. These can include areas inside Habitat Conservation Areas, areas in water body set backs for pesticide and fertilizer use, and areas remote from Habitat Conservation Areas (HCA) or water bodies.

Park landscapes near waterways, lakes and ponds are divided into four classifications, ranging from intensively managed high-use areas to intact natural areas. The classifications describe their current features, as well as define the differing objectives and maintenance rationales of their care. Along with these landscapes, there are activities for maintaining storm sewer facilities and constructed wetlands.

Features and Objectives in Highly-Managed Areas.

These are areas where there is exceptionally high traffic and can include areas where there are special standards for vegetation maintenance.


Features of Highly Managed Areas:
Ornamental landscape
Public access and activity
High public use
Mowing of turf, sometimes to edge of waterway
May have facilities adjacent to water
May have highly modified stream banks
Often limited plantings in water body buffers

Objectives for Highly Managed Areas
Healthy plants and turf
Maintain ability to handle high use
May have high expectation for aesthetics in general
Minimize need for chemical intervention
Control invasive plants
Safe access
No bare soil areas
Low tolerance for weeds

**Features and Objectives in Less-Managed Areas**

Less-managed areas can include a wide variety of areas where there is a lower level of vegetation management due to public access or the area is within a water body buffer. General examples are road shoulders, less used or natural areas in developed parks, and unused land where seasonal or less frequent vegetation management occurs.

*Features of Less Managed Areas:*
- There is a mix of native and non-native plants
- Water bodies are have adjacent areas of predominantly native plants
- Some impacts from use and park development apparent in water body buffers
- Managed landscapes may be nearby
- Stream bank erosion may be occurring due to use

*Objectives for Less Managed Areas:*
- Maintain healthy plants in HCAs or water body buffers
- Minimize need for chemical intervention
- Control invasive plants where feasible
- Minimize impact on water body buffers
- No bare soil areas
- Tolerance for natural appearance and weeds

**Features and Objectives in Impacted Natural Areas**

Impacted natural areas are generally in parks and undeveloped land. These areas may or may not be in Habitat Conservation Areas or water body set backs.

*Features of Impacted Areas:*
- Very limited impact to native vegetation
- Stream banks are buffered with predominately native plants
- There are observable limited impacts from use and park development
- Managed landscapes are not nearby

*Objectives for Impacted Areas:*
- Maintain healthy plant community
- Minimize need for chemical intervention
- Lower tolerance of invasive plants, non- natives
- Minimize any impacts on buffer
- No bare soil areas are allowed

**Features and Objectives in Intact Natural Areas**

Intact natural areas are rare and exceptional places where there is intact and self-sustaining native vegetation.
Features of Intact Natural Areas:
Very limited visitor impact
Native plant communities exist
No nearby developed park areas

Objectives for Intact Natural Areas:
Maintain healthy plant community
No tolerance of invasive plants, non-natives
Minimize any impacts from activities

Features and Objectives in Stormwater Facilities
Stormwater facilities are constructed features that control or treat stormwater. The most common types of facility are swales, ponds and treatment wetlands. Many include vegetation for treatment, habitat or aesthetics. Specific maintenance requirements are included in activities for storm sewer maintenance.

Features of Stormwater Facilities:
There is a mix of native and non-native plants
Generally not used by the public
Include areas managed to promote design function, such as turf in swales
Managed landscapes may be nearby

Objectives for Intermediate Areas:
Maintain healthy plant communities
Minimize need for chemical intervention
Control invasive plants where feasible
No bare soil areas are allowed
Tolerance for natural appearance and weeds

Features and Objectives in Constructed Wetlands
Constructed wetlands refer to wetlands built to replace lost wetlands or as a habitat feature. They are not stormwater facilities and are considered natural surface water bodies. Constructed wetlands have specific plans for establishing and maintaining vegetation which should be consulted and followed in addition to the requirements in this manual.

Features of Constructed Wetlands:
Limited public access
Plants may or may not be well established depending on age and condition

Objectives for Constructed Wetlands:
Maintain healthy plant communities
Minimize need for chemical intervention
Low tolerance of invasive plants, non-natives
Bare soil areas are not allowed
**Mulching**

Mulches and other ground coverings are useful during the installation and restoration of landscapes as well as their ongoing maintenance. Mulches meet a variety of needs. They suppress weeds, help to retain moisture around plants, reduce possible erosion, and provide visual enhancement.

Always consider the possible impacts when using mulches, which may include:

- Inadvertent introduction of non-native weeds and diseases to the site.
- Leaching of substances such as tannins from the mulch into nearby waterways.
- Migration of mulch material into waterways.
- Nutrient leaching into waterways.

The most serious problems are probably introduction of weeds and diseases. Routine maintenance in waterway buffers should minimize the use of mulches. Mulching is best used as a part of restoration activity. Mulching in areas that are below typical high water lines is discouraged in any buffer areas.

It is permissible to plant cover crops to control erosion in buffer zones. Cover crops should never introduce any persistent non-native plant species.

**Use Low-Volume Directed-Pesticide Application Equipment**

Pesticide delivery will be by hand with directed, low volume, single wand sprayers, wiping, daubing and painting equipment, injections systems, or drop spreaders. Typically, application is performed using backpack sprayers, but may also include using the same hand application methods with larger tanks. These delivery methods have low volume applications and low pressure spraying which minimizes the formation of fine mists that might drift off target. It also helps make sure that pesticides will reach targeted plants or targeted soil surfaces.

**Minimize Pesticide Drift**

Managing drift is of particular importance when surface waters are nearby. Application equipment used in the application shall employ all necessary methods to limit drift. Nozzle size, pressure regulation, droplet size, and height of spray wand, are all techniques that can be modified to reduce unwanted drift of pesticides.

Spray applications are not to be allowed in a water body set back area when:

- wind speed is above 8 mph
- wind direction or activity would carry pesticides toward, or deposit them upon open water

**Use Acceptable Pesticides**

To minimize possible aquatic impacts, only a limited group of pesticides are allowed in buffer areas. Only the pesticides specifically listed in the following tables may be used as specified in each activity. Generally, restrictions fall into two groups: general use outside of water body set backs and within 25 foot water body set backs. This selection of pesticides considers any possible effects on aquatic life as well as pesticide tendencies to move in the environment.
This list of pesticides may be revised to include or drop compounds. Reasons for changes include the potential for plants to become tolerant or build resistance to specific compounds, addition of a new compound to state approved pesticides, or federal or state removal of a pesticide.

**Materials allowed in Buffer Areas in Certain Circumstances (see individual activities):**

<table>
<thead>
<tr>
<th>Post-emergent herbicides:</th>
<th>Pre-emergent herbicides:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate products: Roundup Pro, Rodeo</td>
<td>Oryzalin (Surflan)</td>
</tr>
<tr>
<td>Triclopyr products: Garlon 3A (or other amine formulations only, not Garlon 4)</td>
<td>Napropamide (Devrinol)</td>
</tr>
<tr>
<td>Surfactant (i.e. R-11)</td>
<td></td>
</tr>
</tbody>
</table>

**Materials Allowed in for Use in Aquatic Habitats under Certain Circumstances:**

**Aquatic labeled only:**

- Glyphosate (Rodeo)
- Approved surfactant (R-11 or equivalent)
- Aquashade (acid blue 9, acid yellow 23)
The following matrix gives specific guidelines for pesticide and fertilizer use in 25-foot water-body set backs that have varying levels of management. Pesticide and fertilizer use also depends on whether the activity is routine maintenance or restoration and construction projects.

See the requirements for each maintenance activity in Chapter 7 for specifics in each area.

**Use of pesticides and fertilizers within 25-foot water body set backs**

<table>
<thead>
<tr>
<th>Chemical used</th>
<th>Maintenance Activity</th>
<th>Intensively Managed Areas</th>
<th>Less Intensively Managed Areas/Stormwater Facilities</th>
<th>Impacted areas and Constructed Wetlands</th>
<th>Intact Natural Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-emergent herbicide use possible?</strong></td>
<td>Routine Maintenance</td>
<td>Only in shrub beds above high water line</td>
<td>Not Allowed</td>
<td>Not Allowed</td>
<td>Not Allowed</td>
</tr>
<tr>
<td></td>
<td>During Construction or Restoration</td>
<td>Only in shrub beds above high water line</td>
<td>Not Allowed</td>
<td>Not Allowed</td>
<td>Not Allowed</td>
</tr>
<tr>
<td><strong>Glyphosate use possible?</strong></td>
<td>Routine Maintenance</td>
<td>Spot spray and broadcast spray</td>
<td>Spot spray and broadcast spray</td>
<td>Spot spray and broadcast spray</td>
<td>Spot spray for target list weeds only*</td>
</tr>
<tr>
<td></td>
<td>During Construction or Restoration</td>
<td>Spot spray and broadcast spray</td>
<td>Spot spray and broadcast spray</td>
<td>Spot spray and broadcast spray</td>
<td>Spot spray and broadcast spray for non-natives*</td>
</tr>
<tr>
<td><strong>Triclopyr use possible?</strong></td>
<td>Routine Maintenance</td>
<td>Cut and treat stems. Spot spray</td>
<td>Cut and treat stems. Spot spray to establish monocots*</td>
<td>Cut and treat stems. Spot spray</td>
<td>Not Allowed</td>
</tr>
<tr>
<td></td>
<td>During Construction or Restoration</td>
<td>Cut and treat stems. Broadcast spray*</td>
<td>Cut and treat stems. Spot spray/ broadcast to establish monocots*</td>
<td>Cut and treat stems. Broadcast spray*</td>
<td>Not Allowed</td>
</tr>
<tr>
<td><strong>Fertilizer Used:</strong></td>
<td>Routine Maintenance</td>
<td>Directed applications to shrub beds if no flooding possible</td>
<td>Not Allowed</td>
<td>Not Allowed</td>
<td>Not Allowed</td>
</tr>
<tr>
<td><strong>Slow release fertilizer use possible?</strong></td>
<td>Routine Maintenance</td>
<td>Directed applications to shrub beds if no flooding possible</td>
<td>Not Allowed</td>
<td>Not Allowed</td>
<td>Not Allowed</td>
</tr>
<tr>
<td></td>
<td>During Construction or Restoration</td>
<td>Directed applications if no flooding possible</td>
<td>Directed applications if no flooding possible</td>
<td>Directed applications if no flooding possible</td>
<td>Directed applications if no flooding possible</td>
</tr>
</tbody>
</table>

*Requires approval of Manager, or Wetland Ecologist*
Materials Available for Tree Injections

If a pest or disease threatens the health of important and valuable trees within a Habitat Conservation Area or 25-foot water body set back, there may be a need to treat them. Instances of this occurring are rare however. The intent and limit of this exception to the approved buffer area pesticide list is to allow only the insecticides or fungicides necessary to combat direct threats to the health of valuable trees. In these special cases, the use of injected pesticides may be employed, with the following limitations:

- The pesticide applied must be delivered by methods that inject or otherwise distribute the material entirely within interior tree tissues.
- Pesticides will not be injected into the soil surrounding the tree. Tree surfaces will not be sprayed or treated with pesticides, with the exception of approved fungicides and biological agents.

Following These BMPs in All Other Areas:

Water body setbacks have the most restrictive controls on pesticide and fertilizer use. Generally, the standards for outside setbacks are quite similar. See each individual vegetation management activity for specific requirements.

Keep Good Records of Pesticide Use (Record Keeping Requirements)

Regular application record keeping requirements are required for all pesticide applications. Records shall include:
- Applicator name and license number;
- Date and the time intervals of the application;
- Location of application;
- Temperature and wind conditions;
- Materials and concentrations used; and
- Amount applied, coverage rate, and equipment used.

Have a State Applicators’ Licenses

All personnel who apply pesticides to City lands must be Washington Department of Agriculture licensed applicators or have a license recognized by the Washington Department of Agriculture. Only licensed personnel who have received an additional aquatics license certification may apply pesticides to aquatic sites.
Chapter 7. Vegetation Management Activities

This section describes specific vegetation management activities and the best management practices to follow.

Refer to Chapter 6 for description of the types of areas and description of the practices required by this chapter.
**Activity: Maintaining Shrub Beds in Highly Managed Areas**

This activity is caring for shrubs and plants in high-use areas such as day use parks, road medians, landscaped areas along roads, and public building landscapes. Due to their use as public areas and surroundings to public buildings, there is a low tolerance for weeds in these areas. Maintenance includes pruning, plant replacement, flower planting, plant removal, weeding and bark dust or mulch placement, litter removal, edging and irrigation system operation.

**Outcomes**

O1 Minimize sediment and pollutant discharges from the work area  
O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources  
O3 Minimize vegetation removal  
O4 Preserve native plants  
O5 Protect public safety and health  
O7 Maintain or restore the intended infrastructure function  
O10 Meet public expectations for aesthetics

**Practices**

The main goal in maintaining these areas is sustaining the appearance of the planting bed. This is largely through weed control, pruning, and mulching.

Vegetation is trimmed to keep clear “sight distances” and to keep signs visible. Trees and shrubbery are trimmed to allow street sweepers clear access to curbs.

Do not remove native shrubs or trees within stream buffers, wetland buffers, or along drainage ditches that have base flow. Consult with the area supervisor before removing trees or brush within 250 feet of a stream.

When applying bark dust or mulch, make sure that it is placed in a manner that prevents it from washing into storm sewers, ditches or streams. Bare spots are minimized by the use of mulch or appropriate cover plants to prevent erosion. Cover bare soils with an erosion prevention cover BMP. Vegetate bare soils.

Minimize the use of mulches within 25 feet of a waterbody.

Hand remove weeds such as black berry vines, nightshade, scotch broom, English ivy, and holly, while keeping other bushes and trees. Chemical intervention is minimized.

Follow BMPs for pesticide and fertilizer application, storage, disposal and record keeping as outlined in Chapter 6.

Follow chemical use listed in the attached table. This list of pesticides and fertilizers may be revised to include or drop compounds. Reasons for changes include the potential for plants to become tolerant or build resistance to specific compounds, addition of a new compound to state approved pesticides, or federal or state removal of a pesticide.
**Use of Pesticides and Fertilizers in for Shrub Beds in Highly-Managed Areas**

<table>
<thead>
<tr>
<th>Chemical used</th>
<th>Maintenance Activity</th>
<th>Allowed Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-emergent herbicide use possible?</td>
<td>Routine Maintenance</td>
<td>Only in shrub beds above high water line</td>
</tr>
<tr>
<td></td>
<td>During Construction or Restoration</td>
<td>Only in shrub beds above high water line</td>
</tr>
<tr>
<td>Glyphosate use possible?</td>
<td>Routine Maintenance</td>
<td>Spot spray and broadcast spray</td>
</tr>
<tr>
<td></td>
<td>During Construction or Restoration</td>
<td>Spot spray and Broadcast spray</td>
</tr>
<tr>
<td>Triclopyr use possible?</td>
<td>Routine Maintenance</td>
<td>Cut and treat stems. Spot spray</td>
</tr>
<tr>
<td></td>
<td>During Construction or Restoration</td>
<td>Cut and treat stems. Broadcast spray*</td>
</tr>
<tr>
<td><strong>Fertilizer Used:</strong></td>
<td><strong>Maintenance Activity</strong></td>
<td><strong>Allowed Uses</strong></td>
</tr>
<tr>
<td>Slow release fertilizer use possible?</td>
<td>Routine Maintenance</td>
<td>Directed applications to shrub beds if no flooding possible</td>
</tr>
<tr>
<td></td>
<td>During Construction or Restoration</td>
<td>Directed applications if no flooding possible</td>
</tr>
</tbody>
</table>
**Activity: Landscaped Turf Maintenance (Highly-Managed Areas)**

This activity is caring for turf in landscaped areas such as parks, road medians, and around buildings. It includes mowing, fertilizing, herbicide use, sweeping, raking, top dressing, aerating, edging, debris removal, and irrigation.

**Outcomes**

O1 Minimize sediment and pollutant discharges from the work area  
O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources  
O3 Minimize vegetation removal  
O5 Protect public safety and health  
O7 Maintain or restore the intended infrastructure function  
O10 Meet public expectations for aesthetics

**Practices**

The main goal in maintaining these areas is maintaining appearance and vigorous turf growth for high-traffic areas. This includes having healthy turf and plants, minimizing weeds and bare spots, and providing safe access to the water.

Bare spots are minimized by seeding turf.

Mower clippings are left on the ground unless they are so thick that they cover the turf. Minimize the use of mulches within 25 feet of a water body.

Chemical intervention is minimized. This includes spot spraying for weeds and minimizing insecticides and fungicides. Fertilizer use is limited to that needed to sustain intended use.

Follow chemical use listed in the attached table. Outside of the 25-foot water body set back, fertilizers are applied to sustain turf growth. Lime is applied once per year. This list of pesticides and fertilizers may be revised to include or drop compounds. Reasons for changes include the potential for plants to become tolerant or build resistance to specific compounds, addition of a new compound to state approved pesticides, or federal or state removal of a pesticide.

Follow BMPs for pesticide and fertilizer application, storage, disposal and record keeping as outlined in Chapter 6.

Where feasible, turf areas will be fitted with computerized irrigation systems to better maintain turf during the summer. Better irrigation will allow more frequent mowing and better control irrigation runoff.

**Turf Management in Near Lakes and Ponds**

Several parks have intensively maintained turf extending to the edge of water bodies. In these areas, special management measures are used as much as feasible considering the management objectives. Special measures include more frequent, low rate fertilizer application or temperature release fertilizer and computerized irrigation systems that prevent over watering and fertilizer runoff.
## Use of Pesticides and Fertilizers for Turf Management (Highly Managed Areas)

<table>
<thead>
<tr>
<th>Chemical used</th>
<th>Maintenance Activity</th>
<th>Allowed Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-emergent herbicide use possible?</strong></td>
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<tr>
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</tr>
<tr>
<td><strong>Glyphosate use possible?</strong></td>
<td>Routine Maintenance</td>
<td>Spot spray and broadcast spray</td>
</tr>
<tr>
<td></td>
<td>During Construction or Restoration</td>
<td>Spot spray and broadcast spray</td>
</tr>
<tr>
<td><strong>Triclopyr use possible?</strong></td>
<td>Routine Maintenance</td>
<td>Cut and treat stems. Spot spray</td>
</tr>
<tr>
<td></td>
<td>During Construction or Restoration</td>
<td>Cut and treat stems. Broadcast spray*</td>
</tr>
<tr>
<td><strong>Fertilizer Used:</strong></td>
<td><strong>Maintenance Activity</strong></td>
<td><strong>Allowed Uses</strong></td>
</tr>
<tr>
<td><strong>Slow release fertilizer use possible?</strong></td>
<td><strong>Routine Maintenance</strong></td>
<td>Directed applications to if no flooding possible</td>
</tr>
<tr>
<td></td>
<td>During Construction or Restoration</td>
<td>Directed applications if no flooding possible</td>
</tr>
</tbody>
</table>

*Requires approval of Parks Manager or Wetland Ecologist*
Activity: Maintaining Roadsides and Lower Use Areas of Parks

This activity is lower intensity management of plants along roads and lower use areas of parks, or other low use landscapes. There is a higher tolerance for weeds in these areas than in day-use parks and landscaped areas around public buildings.

Outcomes

O1 Minimize sediment and pollutant discharges from the work area
O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources
O3 Minimize vegetation removal
O4 Preserve native plants
O5 Protect public safety and health
O7 Maintain or restore the intended infrastructure function
O10 Meet public expectations for aesthetics

Practices

The main goal in maintaining these areas is maintaining appearance with a minimum amount of work and chemical intervention. This largely includes controlling weeds.

Consider hardiness and drought tolerance when selecting plants.

Do not remove native shrubs or trees within stream buffers, wetland buffers, or along drainage ditches that have base flow. Consult with the area supervisor before removing trees or brush within 250 feet of a stream.

If there is a water body or ditch with water flow during dry weather, only remove desirable shrubs or bushes when sight distance is an issue, and after checking with the area supervisor.

When applying mulches or bark dust, make sure that it will not wash off into storm sewer, ditches or streams. Bare spots are minimized by the use of mulch or appropriate cover plants to prevent erosion. Cover bare soils with an erosion prevention cover BMP. Vegetate bare soils.

Hand remove weeds such as black berry vines, nightshade, scotch broom, English ivy, and holly, while keeping other bushes and trees. Chemical intervention is minimized.

The attached list of pesticides and fertilizers may be revised to include or drop compounds. Reasons for changes include the potential for plants to become tolerant or build resistance to specific compounds, addition of a new compound to state approved pesticides, or federal or state removal of a pesticide.
### Use of Pesticides and Fertilizers in Lower Use Areas and Roadside Plantings

<table>
<thead>
<tr>
<th>Chemical used</th>
<th>Maintenance Activity</th>
<th>Allowed Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-emergent herbicide use possible?</td>
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<td>Only in shrub beds above high water line</td>
</tr>
<tr>
<td></td>
<td>During Construction or Restoration</td>
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</tr>
<tr>
<td>Glyphosate use possible?</td>
<td>Routine Maintenance</td>
<td>Spot spray and broadcast spray</td>
</tr>
<tr>
<td></td>
<td>During Construction or Restoration</td>
<td>Spot spray and broadcast spray</td>
</tr>
<tr>
<td>Triclopyr use possible?</td>
<td>Routine Maintenance</td>
<td>Cut and treat stems. Spot spray</td>
</tr>
<tr>
<td></td>
<td>During Construction or Restoration</td>
<td>Cut and treat stems. Broadcast spray*</td>
</tr>
<tr>
<td>Fertilizer Used:</td>
<td>Maintenance Activity</td>
<td>Allowed Uses</td>
</tr>
<tr>
<td>Slow release fertilizer use possible?</td>
<td>Routine Maintenance</td>
<td>Directed applications to shrub beds if no flooding possible</td>
</tr>
<tr>
<td></td>
<td>During Construction or Restoration</td>
<td>Directed applications if no flooding possible</td>
</tr>
</tbody>
</table>

*Requires approval of Parks Manager or Wetland Ecologist*
Activity: Vegetation and Pest Management in Less-Managed Areas

These are areas in parks or other lands that are less actively managed than turf or shrub beds. These areas may include degraded or modified natural areas or unused land that is maintained periodically or seasonally. In Habitat Conservation Areas, these land areas are maintained for the purpose of establishing natural vegetation. There is a tolerance for natural appearance and weeds. There may be some use such as water access by the public, but that is not the primary use of the area.

Outcomes

O1  Minimize sediment and pollutant discharges from the work area
O2  Prevent city roads, drainage systems, facilities and property from becoming pollutant sources
O3  Minimize vegetation removal
O4  Preserve native plants
O7  Maintain or restore the intended infrastructure function

Practices

Practices in these less-managed areas focus on establishing and maintaining healthy native plantings. This includes controlling invasive plants where feasible, minimizing the human impact on the buffer, and planting cover on bare soils.

Follow BMPs for pesticide and fertilizer application, storage, disposal and record keeping as outlined in the following section.

Within natural areas, limit the use of mulches to covering bare soils while establishing plantings.

Pesticide and fertilizer should be avoided within 25 feet of a water body.

The attached list of pesticides and fertilizers may be revised to include or drop compounds. Reasons for changes include the potential for plants to become tolerant or build resistance to specific compounds, addition of a new compound to state approved pesticides, or federal or state removal of a pesticide.
<table>
<thead>
<tr>
<th>Chemical used</th>
<th>Maintenance Activity</th>
<th>Allowed Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-emergent</td>
<td>Routine Maintenance</td>
<td>Not Allowed</td>
</tr>
<tr>
<td>herbicide use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>possible?</td>
<td>During Construction or Restoration</td>
<td>Not Allowed</td>
</tr>
<tr>
<td>glyphosate use</td>
<td>Routine Maintenance</td>
<td>Spot spray and broadcast spray</td>
</tr>
<tr>
<td>possible?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>during construction</td>
<td>Routine Maintenance</td>
<td>Spot spray and broadcast spray</td>
</tr>
<tr>
<td>or restoration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>triclopyr use</td>
<td>Routine Maintenance</td>
<td>Cut and treat stems. Spot spray</td>
</tr>
<tr>
<td>possible?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>during construction</td>
<td>Routine Maintenance</td>
<td>Cut and treat stems. Broadcast</td>
</tr>
<tr>
<td>or restoration</td>
<td></td>
<td>spray*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fertilizer Used:</th>
<th>Maintenance Activity</th>
<th>Allowed Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>slow release</td>
<td>Routine Maintenance</td>
<td>Not Allowed</td>
</tr>
<tr>
<td>fertilizer use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>possible?</td>
<td>During Construction or Restoration</td>
<td>Directed applications if no flooding possible</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Requires approval of Parks Manager or Wetland Ecologist
**Activity: Vegetation and Pest Management in Impacted Natural Areas**

Impacted natural areas are predominately native plants and limited influence from public use and park development. The main objective is to maintain and improve the healthy plant community. Impacted areas have a lower tolerance for invasive or non-native plants.

**Outcomes**

- O4  Preserve native plants
- O7  Maintain or restore the intended infrastructure function

**Practices**

Practices in these areas focus on establishing and maintaining healthy native plantings. This includes more vigorously controlling invasive plants and the human impact on the buffer. It also includes covering for bare soils with native plants.

Limit mulch use to covering bare soil while establishing plantings.

Pesticide and fertilizer use is minimized and is avoided if possible within 25 feet of a water body.

Follow BMPs for pesticide and fertilizer application, storage, disposal and record keeping as outlined in Chapter 6. The attached list of pesticides and fertilizers may be revised to include or drop compounds. Reasons for changes include the potential for plants to become tolerant or build resistance to specific compounds, addition of a new compound to state approved pesticides, or federal or state removal of a pesticide.
### Use of Pesticides and Fertilizers in Impacted Natural Areas

<table>
<thead>
<tr>
<th>Chemical used</th>
<th>Maintenance Activity</th>
<th>Allowed Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-emergent herbicide use</td>
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**Fertilizer Used:**

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<tr>
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*Requires approval of Parks Manager or Wetland Ecologist*
Activity: Vegetation and Pest Management in Intact Natural Areas

Intact natural areas are separate from developed parks and have very limited public access. They have established native plant communities. The objective is to maintain the healthy plant buffer and provide wildlife habitat. There is no tolerance for invasive or non-native plants. There is little public access to these areas other than trails.

Outcomes
O4 Preserve native plants
O7 Maintain or restore the intended infrastructure function

Practices

Practices in these areas focus on maintaining healthy native plantings. This includes vigorously controlling invasive plants and human impact on the buffer.

Avoid the use of mulches.

Pesticide and fertilizer use is minimized or not allowed.

Follow BMPs for pesticide and fertilizer application, storage, disposal and record keeping as outlined in Chapter 6. The attached list of pesticides and fertilizers may be revised to include or drop compounds. Reasons for changes include the potential for plants to become tolerant or build resistance to specific compounds, addition of a new compound to state approved pesticides, or federal or state removal of a pesticide.
### Use of Pesticides and Fertilizers in Intact Natural Areas of Habitat Buffers

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<td>or Restoration</td>
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<td>Routine Maintenance</td>
<td>Directed applications if no flooding possible</td>
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<td>or Restoration</td>
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</table>

* Requires approval of Parks Manager
Activity: Vegetation and Pest Management in Stormwater Control Facilities

Stormwater control facilities include biofiltration treatment swales, treatment wetlands, treatment ponds, detention ponds, open channels, and infiltration basins. Stormwater control facilities discharge to surface water or groundwater either directly or through pipes or ditches. Many facilities are built to remove pollutants from stormwater.

Generally, vegetation should be maintained to blend into surrounding areas. Stormwater facilities can provide habitat for aquatic life and birds. Promoting natural vegetation where feasible improves habitat. Swales often blend into intensively managed landscapes. Pond perimeters can include natural vegetation.

The use of pesticides and, in most cases fertilizer, is not compatible with the task of pollutant removal or the direct connection of stormwater facilities to streams and groundwater.

Features of Stormwater Facilities:
- There is a mix of native and non-native plants
- Generally not used by the public
- Include areas managed to promote design function, such as turf in swales
- Managed landscapes may be nearby
- May be used by fish and wildlife

Objectives for Stormwater Facilities:
- Maintain healthy plant communities
- Avoid or minimize need for chemical intervention
- Control invasive plants where feasible
- No bare soil areas are allowed
- Tolerance for natural appearance and weeds

Outcomes
O1 Minimize sediment and pollutant discharges from the work area
O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources
O3 Minimize vegetation removal
O4 Preserve native plants
O7 Maintain or restore the intended infrastructure function
O8 Prevent or reduce flooding
O10 Meet public expectations for aesthetics

Practices
Pest management practices in stormwater facilities mirror the less-managed park areas. The focus is establishing and maintaining healthy, low-maintenance native or landscape plantings and sustaining the design function of vegetated filters such as biofiltration swales. This
includes controlling invasive plants where feasible, minimizing the human impact on the buffer, and planting cover on bare soils.

In some cases, the original plantings may not be appropriate for the actual condition at a facility. One example is a frequently flooded swale that cannot support normal turf. In cases like this, replace turf with appropriate plants if the underlying drainage problem cannot be fixed.

Consider the use of soil amendments such as compost before using fertilizer.

Limit mulch use to covering bare soil while establishing plantings.

Follow BMPs for pesticide and fertilizer application, storage, disposal and record keeping as outlined in Chapter 6. The attached list of pesticides and fertilizers may be revised to include or drop compounds. Reasons for changes include the potential for plants to become tolerant or build resistance to specific compounds, addition of a new compound to state approved pesticides, or federal or state removal of a pesticide.

Chemical use should be avoided within 25 feet of any area that holds or conveys surface water or stormwater. This includes the base of a biofiltration swale.

Stormwater treatment and control facilities, including wetlands, intercept storm water run-off before it enters surface water or groundwater. There are no provisions for herbicide use below the high water line of these facilities.

Trees or shrubs that block access roads may be trimmed (or removed if within the access road) at the time of when access is required for maintenance by heavy equipment.

Trees that pose a risk to stormwater structures due to root growth may be removed and replaced by smaller shrubs.
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<tr>
<th>Chemical used</th>
<th>Maintenance Activity</th>
<th>Allowed Uses</th>
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<td>During Construction or Restoration</td>
<td>Directed applications if no flooding possible</td>
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</table>

*Requires approval of Parks Manager or Wetland Ecologist*
Activity: Vegetation and Pest Management in Constructed Wetland Areas

The City may build wetlands to mitigate for wetlands lost during road construction or other public works. These are not stormwater facilities, but compensation for wetlands taken during construction projects. This activity applies only to parts of wetlands that are not subject to inundation during the growing season. Operations or Parks crews use no chemical controls in wetland water bodies.

Noxious weed controls may include herbicide use in wetlands.

 Constructed wetlands progress from little or no natural vegetation to an ideal state where they are self-sustaining natural areas. As water bodies, wetlands connect to streams and groundwater. Wetlands also host insects, fish, amphibians, and birds that are sensitive to horticultural chemicals. Because of this, chemical use should be minimized in wetland buffers. Wetland management has a low tolerance for invasive or non-native plants.

Outcomes

O1 Minimize sediment and pollutant discharges from the work area
O2 Prevent city roads, drainage systems, facilities and property from becoming pollutant sources
O3 Minimize vegetation removal
O4 Preserve native plants
O7 Maintain or restore the intended infrastructure function

Practices

Practices in these areas focus on establishing and maintaining healthy native plantings. This includes more vigorously controlling invasive plants and the human impact on the buffer. It also includes covering for bare soils.

Consider the use of soil amendments such as compost before using fertilizer.

Limit mulch use to covering bare soil while establishing plantings.

Chemical intervention is minimized and is avoided if possible within 25 feet of a water body.

Follow BMPs for pesticide and fertilizer application, storage, disposal and record keeping as outlined in Chapter 6. The attached list of pesticides and fertilizers may be revised to include or drop compounds. Reasons for changes include the potential for plants to become tolerant or build resistance to specific compounds, addition of a new compound to state approved pesticides, or federal or state removal of a pesticide.
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</table>

*Requires approval of Parks Manager or Wetland Ecologist*
**Activity: Weed Control within Water Bodies**

Specific practices are allowed in water bodies such as streams, ponds and wetlands. Chemical controls are allowed only in extreme cases where there is a threat of near complete habitat loss due to an invasive weed.

Weed control within natural water bodies requires an authorization under the State Hydraulic Code. Activities such as dredging require approval from the Washington Department of Fish and Wildlife. Mechanical harvesting is allowed without consultation with Washington Department of Fish and Wildlife if practices in their publication *#APD-1-98, Aquatic Plants and Fish* are followed.

**Within Streams**

In the rare need for control of noxious weeds and invasive non-native plants within a stream itself, mechanical and biological means will be utilized.

**Within Pond and Lake Areas**

Weed control is by mechanical removal. There are special requirements for disposal of aquatic weeds to prevent spreading seeds. The Parks Manager will determine the proper disposal methods.

Biological controls are used in some situations.

If an emergency situation arises where habitat is endangered by non-native invasive submerged weeds in ponds and lakes, the Manager may approve the use of an aquatic use approved herbicide for control as a last resort.

Herbicide use is only allowed where there is no direct outflow of the treated water to streams or waterways. The herbicide utilized shall be of very low toxicity to aquatic organisms, and be applied in such a way that there are no appreciable negative effects on the health of the aquatic environment.

**Within Wetlands Areas**

There are no provisions for the use of herbicides in open water areas in wetlands or constructed wetlands. Aquatic use approved herbicides may be used during establishment of constructed wetlands. The City may control noxious weeds in some cases.

**Within Stormwater Ponds, Swale Treatment Areas and Treatment Wetlands**

Stormwater treatment and control facilities, including wetlands, intercept storm water runoff before it enters surface water or groundwater. There are no provisions for herbicide use below the high water line of these facilities. The City may control noxious weeds in some cases.
Chapter 8. Training

Training is an essential component to successful water quality BMP use. Simple diagrams and descriptions will not be adequate to demonstrate the use of many BMPs in the field. Training should include field demonstrations, videos, slide shows, and reference cards or field manuals.

Initiation Training

Training for new employees should include the basic do’s and don’ts. Why things like dirt are a pollutant that we control during routine operations. What is absolutely not allowed, such as dumping excavated material into streams, washing debris into storm drains and streams, and so forth.

This training should set the base for added training about implementing BMPs.

BMP Training

Staff should be provided with basic manuals that include diagrams and descriptions of the practices to meet standards for water quality.

Crew chiefs and employees under their supervision should have training in BMP use for the activities they perform. Specific training, classroom and field, in the use of the BMP should lead to more successful implementation than simply providing a written manual.

Procedure Cards/Sheets

Cards can be made for each activity and the required BMPs. These can go to each vehicle as needed.

Every vehicle should have a card, describing spill and abandoned container response.

Water Quality Kits for Trucks

Each vehicle should be equipped with a water quality kit that contains:
- Lightweight cover materials for exposed materials and eroding areas.
- Seed mix for planting bare areas.
- Sediment barriers for storm sewer inlets.
- Absorbent for small spills.
- Drip pans for leaky vehicles.

Map/Track Problem Areas

Problem areas where erosion, sediment accumulation in ditches or other water quality problems occur should be mapped so that they can be systematically tracked and solutions documented.

Map Habitat Areas/Streams/Wetlands

Create wall maps and atlases that show the extent and type of Habitat Conservation Areas, known wetlands, and streams that require special consideration under City code.
The purpose of the maps is to raise awareness of the extent of these areas as well as simply show where they are.

**Awards**

Establish awards for actively performing environmental stewardship.
APPENDIX D

MODEL INPUT DATA
100 Year Precip (from Isopluvials) = 4.5”; Using Type IA storm, SBUH Method

<table>
<thead>
<tr>
<th>Subbasin Name</th>
<th>Total Acre</th>
<th>%Imperv Area</th>
<th>Pervious CN</th>
<th>Tc (mins)</th>
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APPENDIX E

DRAFT STORMWATER MANAGEMENT ORDINANCE
Chapter 14.30
STORMWATER MANAGEMENT

Sections:
14.30.012   Need.
14.30.013   Purpose.
14.30.020   Definitions.
14.30.030   Abrogation and Greater Restrictions.
14.30.032   Interpretation.
14.30.040   Applicability.
14.30.050   Minimum Requirement Thresholds
14.30.051   Regulated activitiesMinimum Requirements.
14.30.052   ExemptionsContents of a Stormwater Site Plan.
14.30.063   Illicit Discharges.
14.30.071   Small parcel minimum requirements.
14.30.072   Small parcel requirement No. 1 – Construction access route.
14.30.073   Small parcel requirement No. 2 – Stabilization of denuded areas – Soil stabilization.
14.30.074   Small parcel requirement No. 3 – Protection of adjacent properties.
14.30.075   Small parcel requirement No. 4 – Maintenance.
14.30.076   Small parcel requirement No. 5 – Other BMPs.
14.30.077   Large development minimum requirements – New development.
14.30.078   Redefinition.
14.30.079   Minimum requirement No. 1 – Erosion and sediment control.
14.30.080   Minimum requirement No. 2 – Preservation of natural drainage systems.
14.30.081   Minimum requirement No. 3 – Source control of pollution.
14.30.082   Minimum requirement No. 4 – Runoff treatment BMPS.
14.30.083   Minimum requirement No. 5 – Streambank erosion control.
14.30.084   Minimum requirement No. 6 – Wetlands.
14.30.085   Minimum requirement No. 7 – Water quality sensitive areas.
14.30.086   Minimum requirement No. 8 – Off-site analysis and mitigation.
14.30.087   Minimum requirement No. 9 – Basin planning.
14.30.088   Minimum requirement No. 10 – Operation and maintenance.
14.30.090   Exceptions.
14.30.091   Administration and Director.
14.30.092   Review and Approval.
14.30.093   Enforcement Authority.
14.30.094   Inspection.
14.30.095   General.
14.30.011 Findings of Fact. The city council adopts the findings of the model stormwater management ordinance provided by the Department of Ecology that:

(1) Stormwater pollution is a problem associated with land utilization and development and the common occurrence of potential pollutants such as pesticides, fertilizers, petroleum products, pet wastes and numerous others. Land utilization and development is also known to increase both the volume and duration of peak flows. The resulting erosion, scouring and deposition of sediment affect the ecological balance in the stream. Sedimentation and stormwater pollution cause diversity of species to decrease and allow more tolerant (and usually less desirable) species to remain. Stormwater pollution can cause or contribute to restrictions on public use of the waters within Buckley.

(2) An expanding population and increased development of land have led to:
Water quality degradation through discharge of nutrients, metals, oil and grease, toxic materials, and other detrimental substances including, without limitation, insect and weed control compounds; drainage and storm and surface water runoff problems within the city; and safety hazards to both lives and property posed by uncontrolled water runoff on streets and highways.

(3) Continuation of present stormwater management practices, to the extent that they exist, will lead to water quality degradation, erosion, and property damage, and endanger the health and safety of the inhabitants of the city.

(4) In the future such problems and dangers will be reduced or avoided if existing properties and future developers, both private and public, provide for stormwater quality and quantity controls.

(5) Stormwater quality and quantity controls can be achieved when land is developed or redeveloped by implementing appropriate best management practices (BMPs).
Best management practices can be expected to perform as intended only when properly designed, constructed and maintained. (Ord. 25-95 § 1, 1995).

14.30.012 Need.
The city council adopts the needs set forth in the model stormwater management ordinance provided by the Department of Ecology that this chapter is necessary in order to:

(1) Minimize or eliminate water quality degradation;

(2) Prevent erosion and sedimentation in creeks, streams, ponds, lakes and other water bodies;

(3) Protect property owners adjacent to existing and developing lands from increased runoff rates which could cause erosion of abutting property;

(4) Preserve and enhance the suitability of waters for contact recreation, fishing, and other beneficial uses;

(5) Preserve and enhance the aesthetic quality of the water;

(6) Promote sound development policies which respect and preserve city surface water, ground water and sediment;

(7) Ensure the safety of city roads and rights-of-way;

(8) Decrease stormwater-related damage to public and private property from existing and future runoff;

(9) Protect the health, safety and welfare of the inhabitants of the city. (Ord. 25-95 § 1, 1995).

14.30.013 Purpose.
The city council adopts the purpose set forth in the model stormwater management ordinance provided by the Department of Ecology that the provisions of this chapter are intended to guide and advise all who conduct new development or redevelopment within city. The provisions of this chapter establish the minimum level of compliance which must be met to permit a property to be developed or redeveloped within city. It is the purpose of this chapter to:
(1) Minimize water quality degradation and sedimentation in streams, ponds, lakes, wetlands and other water bodies;

(2) Minimize the impact of increased runoff, erosion and sedimentation caused by land development and maintenance practices;

(3) Maintain and protect ground water resources;

(4) Minimize adverse impacts of alterations on ground and surface water quantities, locations and flow patterns;

(5) Decrease potential landslide, flood and erosion damage to public and private property;

(6) Promote site planning and construction practices that are consistent with natural topographical, vegetational and hydrological conditions;

(7) Maintain and protect the city stormwater management infrastructure and those downstream;

(8) Provide a means of regulating clearing and grading of private and public land while minimizing water quality impacts in order to protect public health and safety; and

(9) Provide minimum development regulations and construction procedures which will preserve, replace or enhance, to the extent practical, existing vegetation to preserve and enhance Buckley. *(Ord. 25-95 § 1, 1995)*.

### 14.30.020 Definitions.
For the purposes of this chapter, the following definitions shall apply:


“Approval” means the proposed work or completed work conforms to this chapter in the opinion of the administrator.

“As-graded” means the extent of surface conditions on completion of grading.

1. “Basin plan” means a plan adopting and all-implementing all regulations and procedures including, but not limited to, land use management practices adopted by ordinance for managing surface and stormwater management facilities and features within individual sub-basins or drainage areas, including any basin or area identified in the city stormwater management plan. A plan should include but not be limited to recommendations for:

   A. Stormwater requirements for new development and redevelopment;

   B. Capital improvement projects
C. Source control activities including public education and involvement, and business programs
D. Other targeted stormwater programs and activities, such as maintenance, inspections, and enforcement
E. Monitoring

An implementation schedule and funding strategy.

Shouldn’t this definition be geared more toward the watershed/basin Plan?

“Bedrock” means the more or less solid rock in place either on or beneath the surface of the earth. It may be soft, medium or hard and have a smooth or irregular surface.

“Bench” means a relatively level step excavated into earth material on which fill is to be placed.

“Best management practice” or “BMP” the schedule of activities, prohibitions of practices, physical, structural, managerial practices that, when used singly or in combination, prevent or reduce pollution of water. BMPs are listed and described in the stormwater management manual.

“Civil engineer” means a professional engineer licensed in the state of Washington in civil engineering who is experienced and knowledgeable in the practice of soils engineering.

“Civil engineering” means the application of the knowledge of the forces of nature, principles of mechanics and the properties of materials to the evaluation, design and construction of civil works for the beneficial uses of mankind.

“Clearing” means the destruction and removal of vegetation by manual, mechanical or chemical methods.

“Commercial agriculture” means those activities conducted on lands defined in RCW 84.34.020(2), and activities involved in the production of crops or livestock for wholesale trade. An activity ceases to be considered commercial agriculture when the area on which it is conducted is proposed for conversion to a nonagricultural use or has lain idle for more than five years, unless the idle land is registered in a federal or state soils conservation program, or unless the activity is maintenance of irrigation ditches, laterals, canals or drainage ditches related to an existing and ongoing agricultural activity.

“Compaction” means densification of a fill by mechanical means.

“Construction stormwater pollution prevention plan” or "Construction SWPPP” means a plan that includes a narrative, drawings, and details for describing construction practices.
stabilization techniques, and structural BMPs that are to be implemented to prevent erosion and sedimentation, and control other pollutants at a construction site.

“Conveyance System” means the drainage facilities, both natural and manmade, which collect, contain, and provide for the flow of surface and stormwater from the highest points on the land down to the receiving water. The natural elements of the conveyance system include swales and small drainage courses, streams, rivers, lakes, and wetlands. The human-made elements of the conveyance system include gutters, ditches, pipes, channels, and most retention/detention facilities.

“Contractor Erosion and Spill Control Lead (CESCL) means the employee designated as the responsible representative in charge of erosion and spill control. The CESCL shall have a current certificate in construction site erosion and sediment control from Associated General Contractors – Education Foundation or approved equivalent.

“Critical areas” mean, at a minimum, areas which include wetlands, areas with a critical recharging effect on aquifers used for potable water, fish and wildlife habitat conservation areas, frequently flooded areas, geologically hazardous areas, including unstable slopes, and associated areas and ecosystems.

“Design storm” means a prescribed hyetograph and total precipitation amount (for a specific duration recurrence frequency) used to estimate runoff for a hypothetical storm of interest or concern for the purposes of analyzing existing drainage, designing new drainage facilities or assessing other impacts of a proposed project on the flow of surface water. (A hyetograph is a graph of percentages of total precipitation for a series of time steps representing the total time during which the precipitation occurs.)

“Detention” means the release of stormwater runoff from the site at a slower rate than it is collected by the stormwater facility system, the difference being held in temporary storage.

“Detention facility” means an above or below ground facility, such as a pond or tank, that temporarily stores stormwater runoff and subsequently releases it at a slower rate than it is collected by the drainage facility system. There is little or no infiltration of stored stormwater.

“Drainage basin” means a geographic and hydrologic subunit of a watershed.

“Drainage system” means the system of collecting, conveying, and storing surface and stormwater runoff. Drainage facilities shall include but not be limited to all surface and stormwater runoff conveyance and containment facilities including: streams, pipelines, channels, ditches, swamps, lakes, wetlands, closed depressions, infiltration facilities, retention/detention facilities, erosion/sedimentation control facilities, and other drainage structures and appurtenances, both natural and manmade.

“Earth material” means any rock, natural soil or fill and/or any combination thereof.

“Effective impervious area” means those impervious surfaces that are connected via sheet flow or discrete conveyance to a drainage system.

“Engineering geologist” means a geologist experienced and knowledgeable in engineering geology.

“Engineering geology” means the application of geologic knowledge and principles in the investigation and evaluation of naturally occurring rock and soil for use in the design of civil works.

“Erosion” means the wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep and detachment and movement of soil or rock fragments by water, wind, ice or gravity.

“Excavation” means the mechanical removal of earth material.

“Existing site conditions” mean:

(a) For developed sites with stormwater facilities that have been constructed to meet the standards in the minimum requirements of this manual, “existing site conditions” shall mean the existing conditions on the site.

(b) For developed sites that do not have stormwater facilities that meet the minimum requirements, “existing site conditions” shall mean the conditions that existed prior to local government adoption of a stormwater management program. If in question, the existing site conditions shall be documented by aerial photograph records, or other appropriate means.

(c) For all sites in water quality sensitive areas as identified under minimum requirement No. 7, water quality sensitive areas, “existing site conditions” shall mean undisturbed forest, for the purpose of calculating runoff characteristics.

(d) For all undeveloped sites outside of water quality sensitive areas, “existing site conditions” shall mean the existing conditions on the site.

“Experimental BMP” means a BMP that has not been tested and evaluated by the Department of Ecology in collaboration with local governments and technical experts.

“Fill” means a deposit of earth—manmade and natural material placed by artificial means.

“Forest practice” means any activity conducted on or directly pertaining to forest land and relating to growing, harvesting or processing timber, including, but not limited to:

(a) Road and trail construction;
(b) Harvesting, final and intermediate;
(c) Precommercial thinning;
(d) Reforestation;
(e) Fertilization;
(f) Prevention and suppression of diseases and insects;
(g) Salvage of trees;
(h) Brush control.

“Frequently flooded areas” mean the 100-year floodplain designations of the Federal Emergency Management Agency and the National Flood Insurance Program.

“Geologically hazardous areas” mean areas that, because of their susceptibility to erosion, sliding, earthquake or other geological events, are not suited to the siting of commercial, residential or industrial development consistent with public health or safety concerns.

“Grade” means the slope of a road, channel or natural ground; the finished surface of a canal bed, roadbed, top of embankment, or bottom of excavation; or any surface prepared for the support of construction such as paving or the laying of a conduit.

(a) Existing Grade. The grade prior to grading.
(b) Rough Grade. The stage at which the grade approximately conforms to the approved plan.
(c) Finish Grade. The final grade of the site which conforms to the approved plan.

(To) “grade” means to finish the surface of a canal bed, roadbed, top of embankment or bottom of excavation.

“Gradient terrace” means an earth embankment or a ridge-and-channel constructed with suitable spacing and an acceptable grade to reduce erosion damage by intercepting surface runoff and conducting it to a stable outlet at a stable nonerosive velocity.

“Ground water” means water in a saturated zone or stratum beneath the surface of land or a surface water body.
“Hydroperiod” means the seasonal occurrence of flooding and/or soil saturation; it encompasses depth, frequency, duration, and seasonal pattern of inundation.

“Illicit discharge” means all nonstormwater discharges to stormwater drainage systems that cause or contribute to a violation of state water quality, sediment quality or ground water quality standards, including, but not limited to, sanitary sewer connections, industrial process water, interior floor drains, car washing and grey water systems.

“Impervious surface” means a hard surface area which either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development, and/or a hard surface area which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt pavement, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces for purposes of determining whether the thresholds for application of Minimum Requirements are exceeded. Open, uncovered retention/detention facilities shall be considered impervious surfaces for purposes of runoff modeling.

“Interflow” means that portion of rainfall that infiltrates into the soil and moves laterally through the upper soil horizons until intercepted by a stream channel or until it returns to the surface, for example, in a wetland, spring or seep.

“Land clearing” or “Clearing” means the destruction or removal of vegetation from a site by physical, mechanical, chemical or other means. This does not mean mowing, landscape maintenance or pruning consistent with accepted horticultural and arboricultural practices, which does not impair the health or survival of the trees and associated vegetation.

“Land disturbing activity” means any activity that results in a movement of earth or a change in the existing soil cover (both vegetative and nonvegetative) and/or the existing soil topography. Land disturbing activities include, but are not limited to, demolition, construction, clearing, grading, filling and excavation. Compaction that is associated with stabilization of structures and road construction shall also be considered a land disturbing activity.

Why add the last sentence? It seems to me that this would already be included under the scope of work requiring the compaction already?

“Large parcel erosion and sediment control plan” or “large parcel ESC plan” means a plan to implement BMPs to control pollution generated during land disturbing activity.

“Mitigation” means, in the following order of preference:

(a) Avoiding the impact altogether by not taking a certain action or part of an action;

(b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts;

(c) Rectifying the impact by repairing, rehabilitating or restoring the affected environment;

(d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and

(e) Compensation for the impact by replacing, enhancing or providing substitute resources or environments.

“Native vegetation” means vegetation comprised of plant species, other than noxious weeds, that are indigenous to the coastal region of the Pacific Northwest and which reasonably could have been expected to naturally occur on the site. Examples include trees such as Douglas fir, western hemlock, western red cedar, alder, big-leaf maple, and vine maple; shrubs such as willow, elderberry, salmonberry, and salal; and herbaceous plants such as sword fern, foam flower, and fireweed.

“Natural location” means the location of those channels, swales, and other non-manmade conveyance systems as defined by the first documented topographic contours existing for the subject property, either from maps or photographs, or such other means as appropriate.

“New development” means the following activities: land disturbing activities; structural development, including construction, installation or expansion of a building or other structure; creation of impervious surfaces; Class IV – General forest practices that are conversions from timber land to other uses; and subdivision and short subdivision of land as defined in RCW 58.17.020. All other forest practices and commercial agriculture are not considered new development.

“On-site stormwater management BMPs” means site development techniques that serve to infiltrate, disperse, and retain stormwater runoff on-site.
“Permanent erosion and sediment control” means the continuous on-site and off-site control measures that are needed to prevent accelerated erosion, sedimentation or related pollution from occurring after completion of the grading activity or the construction project.

“Permanent stormwater quality control (PSQC) plan” means a plan which includes permanent BMPs for the control of pollution from stormwater runoff after construction and/or land disturbing activity has been completed. For small sites, this requirement is met by implementing a small parcel erosion and sediment control plan.

“Person” means any individual, partnership, corporation, association, organization, cooperative, public or municipal corporation, agency of the state, or local government unit, however designated.

“Pollutant” shall mean any substance which, when added to water, would contaminate or alter the chemical, physical, or biological properties of any waters of the City’s drainage system or of the State. This includes a change in temperature, taste, color, turbidity, or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the City’s drainage system or of the State and will or is likely to create a nuisance. It also includes any substance, which renders such waters harmful, detrimental, or injurious to the public health, safety, or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial use, or to livestock, wild animals, birds, fish, or other aquatic life.

“Pollution” means contamination or other alteration of the physical, chemical or biological properties of waters of the state, including change in temperature, taste, color, turbidity or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive or other substance into any waters of the state as will or is likely to create a nuisance or render such waters harmful, detrimental or injurious to the public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life.

“Pollution-generating impervious surface (PGIS)” means those impervious surfaces considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those which are subject to: vehicular use; industrial activities; or storage of erodible or leachable materials, wastes, or chemicals, and which receive direct rainfall or the run-on or blow-in of rainfall. Erodible or leachable materials, wastes, or chemicals are those substances which, when exposed to rainfall, measurably alter the physical or chemical characteristics of the rainfall runoff. Examples include erodible soils that are stockpiled, uncovered process wastes, manure, fertilizers, oily substances, ashes, kiln dust, and garbage dumpster leakage. Metal roofs are also considered to be PGIS unless they are coated with an inert, non-leachable material (e.g., baked-on enamel coating).
A surface, whether paved or not, shall be considered subject to vehicular use if it is regularly used by motor vehicles. The following are considered regularly-used surfaces: roads, unvegetated road shoulders, bike lanes within the traveled lane of a roadway, driveways, parking lots, unfenced fire lanes, vehicular equipment storage yards, and airport runways.

The following are not considered regularly-used surfaces: paved bicycle pathways separated from and not subject to drainage from roads for motor vehicles, fenced fire lanes, and infrequently used maintenance access roads.

“Pollution-generating pervious surface (PGPS)” means any non-impervious surface subject to use of pesticides, fertilizers, or loss of soil.

“Project Site” means that portion of a property, properties, or right of way subject to land disturbing activities, new impervious surfaces, or replaced impervious surfaces.

“Redevelopment” means, on an already substantially developed site (i.e. has 35 percent or more of existing impervious surface coverage), the creation or addition of impervious surfaces, structural development including construction, installation or expansion of a building footprint or addition or replacement of a structure, and/or replacement of impervious surface that is not part of a routine maintenance activity, and land disturbing activities associated with structural or impervious redevelopment.

“Regional retention/detention system” means a stormwater quantity control structure designed to correct existing excess surface water runoff problems of a basin or sub-basin. The area downstream has been previously identified as having existing or predicted significant and regional flooding and/or erosion problems. This term is also used when a detention facility is used to detain stormwater runoff from a number of different businesses, developments or areas within a catchment.

“Replaced impervious surface” means the removal and replacement of any exterior impervious surfaces or foundation of a structure. Other impervious surfaces are considered replaced if first removed down to bare soil or base course.

“Retention/detention facility (R/D)” means a type of drainage facility designed either to hold water for a considerable length of time and then release it by evaporation, plant transpiration, and/or infiltration into the ground; or to hold surface and stormwater runoff for a short period of time and then release it to the surface and stormwater management system.

“Sediment” means solid particulate matter, both mineral and organic, that has been or is being transported by water, air, gravity, or ice from its original site of origin.

“Sedimentation” means the process by which sediment has been transported off the site of the grading activity and settled onto land or the bed of a creek, stream, river, wetland, pond, or other water body.
“Site” means the area within the legal boundaries of a parcel or parcels of land subject to new development or redevelopment. For road projects, the length of the project site and the right-of-way boundaries define the site, meaning the portion of a piece of property which is directly subject to development.

“Slope” means the degree of deviation of a surface from the horizontal, measured as a numerical ratio, percent, or in degrees. Expressed as a ratio, the first number is the horizontal distance (run) and the second is the vertical distance (rise), as 2:1. A 2:1 slope is a 50 percent slope. Expressed in degrees, the slope is the angle from the horizontal plane, with a 90-degree slope being vertical (maximum) and 45-degree being a 1:1 or 100 percent slope.

“Small parcel erosion and sediment control plan” or “small parcel ESC plan” means a plan for small sites to implement temporary BMPs to control pollution generated during the construction phase only, primarily erosion and sediment.

“Soil” means the unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.

“Source control BMP” means a BMP structure or operation that is intended to prevent pollutants from entering coming into contact with stormwater through physical separation of areas or careful management of activities that are sources of pollutants. A few examples of source control BMPs are erosion control practices, maintenance of stormwater facilities, constructing roofs over storage and working areas, and directing wash water and similar discharges to the sanitary sewer or a dead end sump.

“Stormwater” means that portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, channels or pipes other features of a stormwater system into a defined surface water channel, or a constructed infiltration facility.

“Stormwater drainage system” means constructed and natural features which function together as a system to collect, convey, channel, hold, inhibit, retain, detain, infiltrate, divert, treat or filter stormwater.

“Stormwater facility” means a constructed component of a stormwater drainage system, designed or constructed to perform a particular function, or multiple functions. Stormwater facilities include, but are not limited to, pipes, swales, ditches, culverts, street gutters, detention basins, retention basins, constructed wetlands, infiltration devices, catch basins, oil/water separators, sediment basins and modular pavement.

“Stormwater management manual” or “manual” means the manual adopted by reference and prepared by Ecology that contains BMPs to prevent or reduce pollution.
“Stormwater site plan” means the comprehensive report containing all of the technical information and analysis necessary to evaluate a proposed new development or redevelopment project for compliance with stormwater requirements. Contents of the Stormwater Site Plan will vary with the type and size of the project, and individual site characteristics. It includes a Construction Stormwater Pollution Prevention Plan (Construction SWPPP) and a Permanent Stormwater Control Plan (PSC Plan). It means a plan which includes an erosion and sediment control (ESC) plan and/or a permanent stormwater quality control plan (PSQCP). For small sites, this plan is the equivalent of a small parcel erosion and sediment control plan.

“Surface water” means the naturally occurring water that flows over or is stored on the earth’s surface.

“Temporary erosion control” means the on-site and off-site control measures that are needed during construction activities to prevent accelerated erosion, sedimentation or related pollution from occurring, but may not be needed when the project is completed or when ground conditions have been stabilized by permanent erosion control measures.

“Threshold discharge area” means an on-site area draining to a single natural discharge location or multiple natural discharge locations that combine within one-quarter mile downstream (as determined by the shortest flowpath).

“Toe of slope” means a point or line of slope in an excavation or cut where the lower surface changes to horizontal or meets the exiting ground slope.

“Top of slope” means a point or line on the upper surface of a slope where it changes to horizontal or meets the original surface.

“Treatment BMP” means a BMP that is intended to remove pollutants from stormwater. A few examples of treatment BMPs are detention ponds, oil/water separators, biofiltration swales and constructed wetlands.

“Unstable slopes” mean those sloping areas of land which have in the past exhibited, are currently exhibiting, or will likely in the future exhibit mass movement of earth.

“Vegetation” means all organic plant life growing on the surface of the earth. (Ord. 25-95 § 1, 1995).

“Water body” means surface waters including rivers, streams, lakes, marine waters, estuaries and wetlands.

“Water quality design flow rate” means:
A. Preceding detention facilities or when detention facilities are not required: that rate at or below which 91 percent of the runoff volume, as estimated by an approved continuous runoff model, will be treated.

B. Downstream of detention facilities: the full 2-year release rate from the detention facility

“Water quality design storm” means the 24-hour rainfall amount with a 6-month return frequency. It is commonly referred to as the 6-month, 24-hour design storm.

“Water quality design storm volume” means the volume of runoff predicted from a 24-hour storm with a 6-month return frequency.

“Watershed” means a geographic region within which water drains into a particular river, stream, or body of water as identified and numbered by the State of Washington Water Resource Inventory Areas (WRIAs) as defined in Chapter 173-500 WAC.

“Wetlands” means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. This includes wetlands created, restored or enhanced as part of a mitigation procedure. This does not include constructed wetlands or the following surface waters of the state intentionally constructed from sites that are not wetlands: irrigation and drainage ditches, grass-lined swales, canals, agricultural detention facilities, farm ponds and landscape amenities.

“Wetpool” means a pond or constructed wetland that stores runoff temporarily and whose normal discharge location is elevated so as to maintain a permanent pool of water between storm events.

“Vegetation” means all organic plant life growing on the surface of the earth. (Ord. 25-95 § 1, 1995).

14.30.030 Abrogation and Greater Restrictions.
It is not intended that this chapter repeal, abrogate or impair any existing regulations, easements, covenants or deed restrictions. However, where this chapter imposes greater restrictions, the provisions of this chapter shall prevail. (Ord. 25-95 § 1, 1995).

14.30.032 Interpretation.
The provisions of this chapter shall be held to be minimum requirements in their interpretation and application and shall be liberally construed to serve the purposes of this chapter. (Ord. 25-95 § 1, 1995).
14.30.040 Applicability.
When any provision of any other chapter of the Buckley Municipal Code conflicts with this chapter, that which provides more environmental protection shall apply unless specifically provided otherwise in this chapter.

- The city is authorized to adopt written procedures for the purpose of carrying out the provisions of this chapter. Prior to fulfilling the requirements of this chapter, the city shall not grant any approval or permission to conduct a regulated activity including but not limited to the following: building permit, commercial or residential; binding site plan; conditional use permit; franchise right of way construction permit; grading and clearing permit; master plan development; planned unit development; right of way permit; unclassified use permit; variance; zone reclassification; subdivision; short subdivision; special use permit; utility and other use permit; or any subsequently adopted permit or required approval not expressly exempted by this chapter.

Regulated activities shall be conducted only after the city approves a stormwater site plan which includes one or more of the following as required by this chapter:

(1) Small parcel erosion and sediment control plan;
(2) Large parcel erosion and sediment control plan;
(3) Permanent stormwater quality control (PSQC) plan. (Ord. 25-95 § 1, 1995).

1. Actions. All persons taking any of the following actions or applying for any of the following permits and/or approvals may be required to submit for approval a Stormwater Site Plan with their application and/or request:

   A. Creation or alteration of new or additional impervious surfaces;
   B. New development;
   C. Redevelopment;
   D. Building permit;
   E. Subdivision approval;
   F. Short subdivision approval;
   G. Binding site plan approval;
   H. Commercial, industrial, or multifamily site plan approval;
   I. Planned unit development;
   J. Development within or adjacent to critical areas;
   K. Franchise utility right of way use or other right of way use;
   L. Conditional and special use permits;
   M. Substantial development permit; and
N. Logging, clearing, grading and other land disturbing activities.

2. Exemptions. The following are exempt from the provisions of the Minimum Requirements described in 14.30.051:

   A. Forest practices regulated under Title 222 WAC, except for Class IV General forest practices that are conversions from timber land to other uses;

   B. Commercial agricultural practices involving working the land for production are generally exempt. However, the conversion from timberland to agriculture, and the construction of impervious surfaces are not exempt; and

   C. The following road maintenance practices are exempt: pothole and square cut patching, overlaying existing asphalt or concrete pavement with asphalt or concrete without expanding the area of coverage, shoulder grading, reshaping/regrading drainage systems, crack sealing, resurfacing with in-kind material without expanding the road prism, and vegetation maintenance. See the Manual for road activities not exempt.

3. Beginning Construction. Commencement of construction work under any of the actions, permits, or applications set forth in this Section shall not begin until the Stormwater Site Plan is approved.


5. Conflicting Requirements. When any provision of any other Chapter of the City Code and state or federal requirements conflicts with this Chapter, that which provides more environmental protection shall apply unless specifically provided otherwise in this Chapter.

6. Minimum Requirements. The provisions of this Chapter shall be held to be minimum requirements in their interpretation and application and shall be liberally construed to serve the purposes of this Chapter.

14.30.050 Minimum Requirement Thresholds (New Section)

1. New Development. The Minimum Requirements discussed in this Section are described in Section 14.30.051. All new development shall be required to comply with Minimum Requirement Nos. 1, 2, and 4. In addition, new development that exceeds certain thresholds shall be required to comply with additional Minimum Requirements described in Section 14.30.051 as follows:

   A. The following new development shall comply with Minimum Requirement Nos. 1 through 5.
   1.) Development that includes the creation or addition of 2,000 square feet or greater, of new, replaced, or new plus replaced impervious surface area; or
2.) Development that includes land disturbing activity of 7,000 square feet or greater.

B. The following new development shall comply with Minimum Requirements No. 1 through No. 10.

1.) Creates or adds 5,000 square feet or greater, of new impervious surface area; or

2.) Converts ¾ acres or more of native vegetation to lawn or landscaped areas; or

3.) Converts 2.5 acres or more of native vegetation to pasture.

2. Redevelopment. All redevelopment shall be required to comply with Minimum Requirement No. 2. In addition, redevelopment that exceeds certain thresholds shall be required to comply with additional Minimum Requirements described in Section 14.30.051 as follows:

A. The following redevelopment shall comply with Minimum Requirement Nos. 1 through 5 for the new and replaced impervious surfaces and the land disturbed:

1.) The new, replaced, or total of new plus replaced impervious surfaces is 2,000 square feet or more; or

2.) Redevelopment that includes land disturbing activity of 7,000 square feet or more.

B. The following redevelopment shall comply with Minimum Requirement Nos. 1 through 10 for the new impervious surfaces and converted pervious surfaces:

1.) Redevelopment that adds 5,000 square feet or more of new impervious surfaces; or

2.) Redevelopment that converts ¾ acres or more of native vegetation to lawn or landscaped areas; or

3.) Redevelopment that converts 2.5 acres or more of native vegetation to pasture.

C. Commingled Stormwater. If the runoff from the new impervious surfaces and converted pervious surfaces is not separated from runoff from other surfaces on the project site, the stormwater treatment facilities must be sized for the entire flow that is directed to them.

D. Equivalent Area. The Director may allow the Minimum Requirements to be met for an equivalent (flow and pollution characteristics) area within the same site.
For public road projects, the equivalent area does not have to be within the project limits, but must drain to the same receiving water.

E. Road Related Projects. Runoff from the replaced and new impervious surfaces (including pavement, shoulders, curbs, and sidewalks) shall meet all the Minimum Requirements if the new impervious surfaces total 5,000 square feet or more and total 50 percent or more of the existing impervious surfaces within the project limits. The project limits shall be defined by the length of the project and the width of the right-of-way.

*Can’t we adopt some other criteria as well?*

F. Regional Facilities. The Director may exempt or institute a stop-loss provision for redevelopment projects from compliance with Minimum Requirements for treatment, flow control, and wetlands protection as applied to the replaced impervious surfaces if the City has adopted a plan and schedule that fulfills those requirements in regional facilities.

14.30.051 Regulated activities Minimum Requirements.

This Section identifies the eleven Minimum Requirements for stormwater management applicable to new development and redevelopment sites. See the Manual for additional details related to each of the Minimum Requirements.

1. Minimum Requirement #1: Preparation of Stormwater Site Plans. All projects meeting the thresholds in Section 14.30.050 shall prepare a Stormwater Site Plan.

2. Minimum Requirement #2: Construction Stormwater Pollution Prevention (SWPP). All new development and redevelopment shall comply with Construction SWPP Elements #1 through #12 below.

   Projects in which the new, replaced, or new plus replaced impervious surfaces total 2,000 square feet or more or disturb 7,000 square feet or more of land must prepare a Construction SWPP Plan (SWPPP) as part of the Stormwater Site Plan. Each of the twelve elements must be considered and included in the Construction SWPPP unless the Director decides that site conditions render the element unnecessary and the exemption from that element is clearly justified in the narrative of the SWPPP.

   Projects that add or replace less than 2,000 square feet of impervious surface or disturb less than 7,000 square feet of land are not required to prepare a Construction SWPPP, but must consider all of the twelve Elements of Construction Stormwater Pollution Prevention and develop controls for all elements that pertain to the project site.

A. Element 1: Mark Clearing Limits.

   1.) Prior to beginning land disturbing activities, including clearing and grading, all clearing limits, sensitive areas and their buffers, and trees that are to be
preserved within the construction area should be clearly marked, both in the field and on the plans, to prevent damage and offsite impacts.

2.) Plastic, metal, or stake wire fence may be used to mark the clearing limits.


1.) Access Limited. Construction vehicle access and exit shall be limited to one route if possible.
2.) Tracking Sediment. Access points shall be stabilized with quarry spall or crushed rock to minimize the tracking of sediment onto public roads.
3.) Wheel Wash. Wheel wash or tire baths should be located on-site, if applicable.
4.) Clean Public Roads. Public roads shall be cleaned thoroughly at the end of each day. Sediment shall be removed from roads by shoveling or pickup sweeping and shall be transported to a controlled sediment disposal area. Street washing will be allowed only after sediment is removed in this manner.
5.) Street Wash Water. Street wash wastewater shall be controlled by pumping back on-site, or otherwise be prevented from discharging into systems tributary to state surface waters.

C. Element 3: Control Flow Rates.

1.) General. Properties and waterways downstream from development sites shall be protected from erosion due to increases in the volume, velocity, and peak flow rate of stormwater runoff from the project site.
2.) Downstream Analysis. Downstream analysis is necessary if changes in flows could impair or alter conveyance systems, stream banks, bed sediment or aquatic habitat.
3.) BMPs Functional. Stormwater retention/detention facilities shall be constructed as one of the first steps in grading. Detention facilities shall be functional prior to construction of site improvements (e.g. impervious surfaces).
4.) Additional Flow Standards. The Director may require pond designs that provide additional or different stormwater flow control if necessary to address local conditions or to protect properties and waterways downstream from erosion due to increases in the volume, velocity, and peak flow rate of stormwater runoff from the project site.
5.) Permanent Infiltration Ponds. If permanent infiltration ponds are used for flow control during construction, these facilities should be protected from siltation during the construction phase.

D. Element 4: Install Sediment Controls.

1.) Natural Vegetation. The duff layer, native top soil, and natural vegetation shall be retained in an undisturbed state to the maximum extent practicable.
2.) Sediment Removal BMP. Prior to leaving a construction site, or prior to discharge to an infiltration facility, stormwater runoff from disturbed areas shall pass through a sediment pond or other appropriate sediment removal BMP. Runoff from fully stabilized areas may be discharged without a sediment removal BMP, but must meet the flow control performance standard of Element #3. Full stabilization means concrete or asphalt paving; quarry spalls used as ditch lining; or the use of rolled erosion products, a bonded fiber matrix product, or vegetative cover in a manner that will fully prevent soil erosion. The Director
shall inspect and approve areas stabilized by means other than pavement or quarry spalls.

3.) BMPs Functional. Sediment ponds, vegetated buffer strips, sediment barriers or filters, dikes, and other BMPs intended to trap sediment on-site shall be constructed as one of the first steps in grading. These BMPs shall be functional before other land disturbing activities take place.

4.) Seeding. Earthen structures such as dams, dikes, and diversions shall be seeded and mulched according to the timing indicated in Element #5.

E. Element 5: Stabilize Soils.

1.) General. All exposed and unworked soils shall be stabilized by application of effective BMPs that protect the soil from the erosive forces of raindrop impact and flowing water, and wind erosion.

2.) Seasonal Work Limitations. From October 1 through April 30, no soils shall remain exposed and unworked for more than 2 days. From May 1 to September 30, no soils shall remain exposed and unworked for more than 7 days. This condition applies to all soils on-site, whether at final grade or not.

3.) Applicable Practices. Applicable practices include, but are not limited to, temporary and permanent seeding, sodding, mulching, plastic covering, soil application of polyacrylamide (PAM), early application of gravel base on areas to be paved, and dust control.

4.) Soil Stabilization. Soil stabilization measures selected should be appropriate for the time of year, site conditions, estimated duration of use, and potential water quality impacts that stabilization agents may have on downstream waters or ground water.

5.) Soil Stockpiles. Soil stockpiles must be stabilized and protected with sediment trapping measures.

6.) Linear Facilities. Work on linear construction sites and activities, including right-of-way and easement clearing, roadway development, pipelines, and trenching for utilities, shall not exceed the capability of the individual contractor for his portion of the project to install the bedding materials, roadbeds, structures, pipelines, and/or utilities, and to re-stabilize the disturbed soils, meeting the timing conditions listed above in Section 14.30.051.2.G.2.).

F. Element 6: Protect Slopes.

1.) Cut and Fill Slopes. Cut and fill slopes shall be designed and constructed in a manner that will minimize erosion.

2.) Soil Types. Consider soil type and its potential for erosion.

3.) Runoff Velocities. Reduce slope runoff velocities by reducing the continuous length of slope with terracing and diversions, reduce slope steepness, and roughen slope surface.

4.) Diverted Flows. Divert upslope drainage and run-on waters from off-site with interceptors at top of slope. Off-site stormwater should be handled separately from stormwater generated on the site. Diversion of off-site stormwater around

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1 These time limits are based upon the average time between storm events for the two periods based upon SeaTac rainfall. These time limits may be adjusted by a local government if it can document different average times between storm events. Adjustments are subject to review and approval by Ecology.
the site may be a viable option. Diverted flows shall be redirected to the natural drainage location at or before the property boundary.

5.) Collected Flows. Contain downslope collected flows in pipes, slope drains, or protected channels.

6.) Ground Water. Provide drainage to remove ground water intersecting the slope surface of exposed soil areas.

7.) Excavation. Excavated material shall be placed on the uphill side of trenches, consistent with safety and space considerations.

8.) Check Dams. Check dams shall be placed at regular intervals within trenches that are cut down a slope.

9.) Stabilize Soils. Stabilize soils on slopes, as specified in Element #5.

G. Element 7: Protect Drain Inlets.

1.) General. All storm drain inlets made operable during construction shall be protected so that stormwater runoff shall not enter the conveyance system without first being filtered or treated to remove sediment.

2.) Roads. All approach roads shall be kept clean, and all sediment and street wash water shall not be allowed to enter storm drains without prior and adequate treatment unless treatment is provided before the storm drain discharges to waters of the State.

H. Element 8: Stabilize Channels and Outlets.

1.) General. All temporary on-site conveyance channels shall be designed, constructed and stabilized to prevent erosion from the expected velocity of flow from a 2 year, 24-hour frequency storm for the developed condition.

2.) Stabilization. Stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream reaches shall be provided at the outlets of all conveyance systems.

I. Element 9: Control Pollutants.

1.) General. All pollutants, including waste materials and demolition debris, that occur on-site during construction shall be handled and disposed of in a manner that does not cause contamination of stormwater.

2.) Vandalism. Cover, containment, and protection from vandalism shall be provided for all chemicals, liquid products, petroleum products, and non-inert wastes present on the site.

3.) Equipment Maintenance. Maintenance and repair of heavy equipment and vehicles involving oil changes, hydraulic system drain down, solvent and degreasing cleaning operations, fuel tank drain down and removal, and other activities which may result in discharge or spillage of pollutants to the ground or into stormwater runoff must be conducted using spill prevention measures, such as drip pans. Contaminated surfaces shall be cleaned immediately following any discharge or spill incident. Emergency repairs may be performed on-site using temporary plastic placed beneath and, if raining, over the vehicle.

4.) Wheel Wash. Wheel wash, or tire bath wastewater, shall be discharged to a separate on-site treatment system. It may be discharged to the sanitary sewer system only if expressly allowed by the local sewer district authority.

5.) Agricultural Chemicals. Application of agricultural chemicals, including fertilizers and pesticides, shall be conducted in a manner and at application rates
that will not result in loss of chemical to stormwater runoff. Manufacturers’ recommendations shall be followed for application rates and procedures.

6.) pH Management. Management of pH-modifying sources shall prevent contamination of runoff and stormwater collected on the site. These sources include, but are not limited to, bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, and concrete pumping and mixer washout waters.


1.) General. All foundation, vault, and trench de-watering water, which have similar characteristics to stormwater runoff at the site, shall be discharged into a controlled conveyance system, prior to discharge to a sediment trap or sediment pond. Channels must be stabilized, as specified in Element #8.

2.) Clean Water. Clean, non-turbid de-watering water, such as well-point ground water, can be discharged to systems tributary to state surface waters, as specified in Element #8, provided the de-watering flow does not cause erosion or flooding of the receiving waters. These clean waters should not be routed through sediment ponds with stormwater.

3.) Contaminated Water. Highly turbid or otherwise contaminated dewatering water, such as from construction equipment operation, clamshell digging, concrete tremie pour, or work inside a cofferdam, shall be handled separately from stormwater at the site.

4.) Other Disposal Options. Depending on site constraints, dewatering may include: infiltration; transport off-site in vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters; on-site treatment using chemical treatment or other suitable treatment technologies; or sanitary sewer discharge with [local sewer district approval] approval if there is no other option.

K. Element 11: Maintain BMPs.

1.) General. All temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. All maintenance and repair shall be conducted in accordance with BMPs.

2.) Inspection. Sediment control BMPs shall be inspected weekly or after a runoff-producing storm event during the dry season and daily during the wet season.

3.) Remove BMPs. All temporary erosion and sediment control BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment shall be removed or stabilized on-site. Disturbed soil areas resulting from removal of BMPs or vegetation shall be permanently stabilized.

L. Element 12: Manage The Project.

1.) Phasing of Construction. Development projects shall be phased where feasible in order to prevent, to the maximum extent practicable, the transport of sediment from the project site during construction. Revegetation of exposed areas and maintenance of that vegetation shall be an integral part of the activities for any phase. Clearing and grading activities for developments shall
be permitted only if conducted pursuant to an approved site development plan (e.g., subdivision approval) that establishes permitted areas of clearing, grading, cutting, and filling. When establishing these permitted clearing and grading areas, consideration should be given to minimizing removal of existing trees and minimizing disturbance/compaction of native soils except as needed for building purposes. These permitted clearing and grading areas and any other areas required to preserve critical or sensitive areas, buffers, native growth protection easements, or tree retention areas as may be required by the Director, shall be delineated on the site plans and the development site.

2.) Seasonal Work Limitations. From October 1 through April 30, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the Director that silt-laden runoff will be prevented from leaving the construction site through a combination of the following:

3.) Site conditions including existing vegetative coverage, slope, soil type and proximity to receiving waters; and

4.) Limitations on activities and the extent of disturbed areas; and

5.) Proposed erosion and sediment control measures.

6.) Modify Seasonal Limits. Based on the information provided, and/or local weather conditions, the Director may expand or restrict the seasonal limitation on site disturbance. If, during the course of any construction activity or soil disturbance during the seasonal limitation period, silt-laden runoff leaving the construction site causes a violation of the surface water quality standard or if clearing and grading limits or erosion and sediment control measures shown in the approved plan are not maintained, the Director shall take enforcement action according to Section 14.30.803.

7.) Exemptions. The following activities are exempt from the seasonal clearing and grading limitations:

- Routine maintenance and necessary repair of erosion and sediment control BMPs;
- Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to soil; and
- Activities where there is one hundred percent infiltration of surface water runoff within the site in approved and installed erosion and sediment control facilities.

8.) Coordination with Other Contractors. The primary project applicant shall evaluate, with input from utilities and other contractors, the stormwater management requirements for the entire project, including the utilities, when preparing the Construction SWPPP.

9.) Inspection. All BMPs shall be inspected, maintained, and repaired as needed to assure continued performance of their intended function.

10.) Certified Professional. A Certified Erosion and Sediment Control Specialist shall be identified in the Construction SWPPP and shall be on-site or on-call at all times. Certification may be obtained through an approved training program that meets the erosion and sediment control training standards established by Ecology.
11.) Sampling. Sampling and analysis of the stormwater discharges from a construction site may be necessary on a case-by-case basis to ensure compliance with standards. Monitoring and reporting requirements may be established by the Director when necessary.

12.) Modify SWPPP. Whenever inspection and/or monitoring reveals that the BMPs identified in the Construction SWPPP are inadequate, due to the actual discharge of or potential to discharge a significant amount of any pollutant, the SWPPP shall be modified, as appropriate, in a timely manner.

13.) Construction SWPPP. The Construction SWPPP shall be retained on-site or within reasonable access to the site. The Construction SWPPP shall be modified whenever there is a significant change in the design, construction, operation, or maintenance of any BMP.

3. Minimum Requirement #3: Source Control of Pollution. All known, available and reasonable source control BMPs shall be applied to all projects. Source control BMPs shall be selected, designed, and maintained according to the Manual.

4. Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls. Natural drainage patterns shall be maintained, and discharges from the project site shall occur at the natural location, to the maximum extent practicable. All outfalls require energy dissipation.

The manner by which runoff is discharged from the project site must not cause a significant adverse impact to downstream receiving waters and downgradient properties. Downstream properties shall not be unreasonably burdened with increased flow rates, negative impacts or unreasonable changes in manner of flow from upstream properties. Drainage problems shall not be transferred from one location to another. However, downstream properties cannot block natural or existing runoff through their site and shall accept runoff from upstream properties.

Planning and design of drainage systems shall not be based on the premise that stormwater can be transferred from one basin to another unless part of an adopted City regional drainage system plan.

The flow of storm runoff shall be maintained within its natural drainage course unless reasonable use is demonstrated otherwise. When stormwater is discharged into an existing drainage course, the peak discharge into the water course shall not adversely affect or cause damage to property along the drainage course now or in the future based on existing zoning. Erosional impacts due to concentration of flows and increased flow durations shall be evaluated and mitigated.

5. Minimum Requirement #5: On-site Stormwater Management. Projects shall employ on-site Stormwater Management BMPs to infiltrate, disperse, and retain stormwater runoff on-site to the maximum extent feasible without causing flooding or erosion impacts. On-site Stormwater Management BMPs as identified in the Manual shall be used for roof downspout control, flow dispersion, and soil quality.

A. Thresholds. The following require construction of stormwater treatment facilities (see Table 14.30.051.6.A):

1.) Projects in which the total of effective, pollution-generating impervious surface (PGIS) is 5,000 square feet or more in a threshold discharge area of the project; or
2.) Projects in which the total of pollution-generating pervious surfaces (PGPS) is three-quarters (3/4) of an acre or more in a threshold discharge area, and from which there is a surface discharge in a natural or man-made conveyance system from the site.
3.) That portion of any development project in which the above PGIS or PGPS thresholds are not exceeded in a threshold discharge area shall apply On-site Stormwater Management BMPs in accordance with Minimum Requirement #5.

Table 14.30.051.6.A:

<table>
<thead>
<tr>
<th>Treatment Requirements by Threshold Discharge Area</th>
<th>&lt; ¾ acres of PGPS</th>
<th>&gt; ¾ acres PGPS</th>
<th>&lt; 5,000 sf PGIS</th>
<th>&gt; 5,000 sf PGIS</th>
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<tr>
<td>Treatment Facilities</td>
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<td></td>
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<td></td>
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<tr>
<td>Onsite Stormwater BMPs</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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</tbody>
</table>

PGPS = pollution-generating pervious surfaces
PGIS = pollution-generating impervious surfaces
sf = square feet

B. Treatment Facility Sizing. Treatment facilities shall be sized to provide effective treatment of 91 percent of the annual average runoff volume.

1.) The Water Quality Design Volume shall be used to size volume-based treatment facilities. The volume of runoff shall be estimated using methods approved in the Manual.
2.) The Water Quality Design Flow Rate shall be used to size flow rate-based treatment facilities.
3.) The Director may allow alternative methods if they identify volumes and flow rates that are at least equivalent.

C. Treatment Facility Selection, Design, and Maintenance. Stormwater treatment facilities shall be:

1.) Selected in accordance with the process identified in the Manual;
2.) Designed in accordance with the design criteria in the Manual; and
3.) Maintained in accordance with the maintenance schedule in the Manual.

D. Untreated Stormwater. Direct discharge of untreated stormwater from pollution-generating impervious surfaces to ground water is prohibited, except for the discharge
achieved by infiltration or dispersion of runoff from residential sites through use of On-site Stormwater Management BMPs.


A. Applicability

1.) Flow Control. Projects must provide flow control to reduce the impacts of stormwater runoff from impervious surfaces and land cover conversions. The requirement below applies to projects that discharge stormwater directly or indirectly through a conveyance system, into a fresh water, except for discharges into a stream that leads to a wetland or to a wetland that has an outflow to a stream in which both this requirement and Minimum Requirement #8 must be met.

2.) Exempt Areas. The Director may petition the Department of Ecology to exempt projects in certain areas provided those areas also meet the following criteria:

   a.) The area must be drained by a conveyance system that is comprised entirely of manmade conveyance elements (e.g., pipes, ditches, outfall protection, etc.) and extends to the ordinary high water line of the receiving water; and

   b.) Any erodible elements of the manmade conveyance system for the area must be adequately stabilized to prevent erosion; and

   c.) Surface water from the area must not be diverted from or increased to an existing wetland, stream, or near-shore habitat sufficient to cause a significant adverse impact.
B. Thresholds. The following require construction of flow control facilities and/or land use management BMPs:

Table 14.30.051.7.A

<table>
<thead>
<tr>
<th>Flow Control Requirements by Threshold Discharge Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; ¾ acres conversion to lawn/landscape, or &lt; 2.5 acres to pasture</td>
</tr>
<tr>
<td>&gt; ¾ acres conversion to lawn/landscape, or &gt; 2.5 acres to pasture</td>
</tr>
<tr>
<td>&lt; 10,000 square feet of effective impervious area</td>
</tr>
<tr>
<td>≥ 10,000 square feet of effective impervious area</td>
</tr>
<tr>
<td>&gt; 0.1 cubic feet per second increase in the 100-year flood frequency</td>
</tr>
</tbody>
</table>

1.) Projects in which the total of effective impervious surfaces is 10,000 square feet or more in a threshold discharge area, or

2.) Projects that convert ¾ acres or more of native vegetation to lawn or landscape, or convert 2.5 acres or more of native vegetation to pasture in a threshold discharge area, and from which there is a surface discharge in a natural or man-made conveyance system from the site, or

3.) Projects that through a combination of effective impervious surfaces and converted pervious surfaces, cause a 0.1 cubic feet per second increase in the 100-year flow frequency from a threshold discharge area as estimated using the Western Washington Hydrology Model or other model authorized by the Director.

4.) That portion of any development project in which the above thresholds are not exceeded in a threshold discharge area shall apply Onsite Stormwater Management BMPs in accordance with Minimum Requirement 5.

5.) The Director may require flow control for individual lots due to sensitive areas, historical flooding, or other relevant reasons as deemed necessary by the Director.

C. Standard Requirement

1.) Peak Flows. Stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50 percent of the 2-year peak flow up to the full 50-year peak flow.
2.) Pre-developed Condition. The pre-developed condition to be matched shall be a forested land cover unless
   a.) reasonable, historic information is provided that indicates the site was prairie prior to settlement (modeled as “pasture” in the Western Washington Hydrology Model); or
   b.) the drainage area of the immediate stream and all subsequent downstream basins have had at least 40% total impervious area for the last 20 years. In this case, the pre-developed condition to be matched shall be the existing land cover condition. Whenever basin-specific studies determine a stream channel to be unstable, even though the above criterion is met, the pre-developed condition assumption shall be the “historic” land cover condition, or a land cover condition commensurate with achieving a target flow regime identified by an approved basin study.

3.) This standard requirement is waived for sites that will reliably infiltrate all the runoff from impervious surfaces and converted pervious surfaces.

4.) Flow Control Facility Selection, Design, and Maintenance. Flow Control facilities shall be selected, designed, and maintained in accordance with the Manual.


   A. Applicability. The requirements below apply only to projects whose stormwater discharges into a wetland, either directly or indirectly through a conveyance system. These requirements must be met in addition to meeting Minimum Requirement #6, Runoff Treatment.

   B. Thresholds. The thresholds identified in Minimum Requirement #6 – Runoff Treatment, and Minimum Requirement #7 – Flow Control shall also be applied for discharges to wetlands.

   C. Standard Requirement. Discharges to wetlands shall maintain the hydrologic conditions, hydrophytic vegetation, and substrate characteristics necessary to support existing and designated uses. A wetland can be considered for hydrologic modification and/or stormwater treatment in accordance with guidance within the Manual.

   D. Additional Requirements. The standard requirement does not excuse any discharge from the obligation to apply whatever technology is necessary to comply with state water quality standards, Chapter 173-201A WAC, or state ground water standards, Chapter 173-200 WAC or successor regulations. Stormwater treatment and flow control facilities shall not be built within a natural vegetated buffer, except for: necessary conveyance systems as approved by the Director; or as allowed in wetlands approved for hydrologic modification and/or treatment in accordance with the Manual. An adopted and implemented basin plan (Minimum Requirement #9), or a Total Maximum Daily Load (TMDL) may be used to develop requirements for wetlands that are tailored to a specific basin.
9. Minimum Requirement #9: Basin/Watershed Planning. Projects may be subject to equivalent or more stringent minimum requirements for erosion control, source control, treatment, and operation and maintenance, and alternative requirements for flow control and wetlands hydrologic control as identified in Basin/Watershed Plans. Standards developed from basin plans shall not modify any of the above minimum requirements until the basin plan is formally adopted and implemented by the City within the basin, and approved or concurred with by the Department of Ecology.

10. Minimum Requirement #10: Operation and Maintenance. An operation and maintenance manual that is consistent with the Manual shall be provided for all proposed stormwater facilities and BMPs, and the person responsible for maintenance and operation shall be identified. At private facilities, a copy of the manual shall be retained on-site or within reasonable access to the site, and shall be transferred with the property to the new owner. For public facilities, a copy of the manual shall be retained by the Director or other appropriate location. A log of maintenance activity that indicates what actions were taken shall be kept and be available for inspection by the Director.

11. Minimum Requirement #11 – Financial Liability. Projects that may require bonding include, but are not limited to, those occurring in environmentally sensitive areas and where problems are anticipated. (Ord. 1313 § 3, 1997).
   1.) Financial Instrument Required. The Director shall require all persons proposing activities regulated by this Chapter to provide an acceptable financial instrument to protect the city. Where such person has previously provided, or are required to provide, another financial instrument on the facility itself or on other construction related to the facility, such person may, with the permission of the Director, and to the extent allowable by law, combine all such financial instrument into a single instrument; provided, that at no time shall the amount guaranteed be less than the total amount which would have been required by the separate instruments; and provided further, that such an instrument shall on its face clearly delineate those separate instruments which it is intended to replace.
   2.) Construction. Prior to commencing construction, the person constructing the facility shall post a construction bond in an amount not less than 150 percent of the cost of drainage improvements and shall be sufficient to cover the cost of performing said construction per the approved drainage plans. Alternatively, an equivalent cash deposit to an escrow account administered by a local bank may be allowed by the Director. An assignment of funds shall be administered for pre-construction activities such as for erosion control.
   3.) Maintenance. After satisfactory completion of the facilities and release of the construction financial instrument by the City, the person constructing the facility shall satisfactorily maintain the facility for a two-year period. A financial instrument to be used at the discretion of the City, to correct deficiencies in maintenance must be provided and continued throughout the two-year maintenance period. The amount of the financial instrument shall be 150 percent of the cost of drainage improvements. In addition, at the discretion of the
Director, a financial instrument to cover the cost of design defects or failures in workmanship shall also be posted and maintained through the two-year maintenance period. Alternatively, the Director may allow an equivalent cash deposit to an escrow account administered by a local bank.

4.) Liability Policy. The person constructing the facility shall maintain a liability policy in an amount to be determined by the Director which shall name the City as an additional insured and which shall protect the City from any liability for any accident, negligence, failure of the facility, or any other liability whatsoever, relating to the construction or maintenance of the facility. The owner of the facility shall maintain the liability policy for the duration of the facility.

14.30.052 Contents of a Stormwater Site Plan. (New Section)
1. Site Plan Required. All projects for new development or redevelopment, which exceed the thresholds of 2,000 square feet for impervious surfaces or 7,000 square feet for land disturbance, must prepare a Stormwater Site Plan.

2. Contents of Plan. Contents of a Stormwater Site Plan will vary with the type and size of the project and individual site characteristics. Two major elements included in a Stormwater Site Plan are a Construction Stormwater Pollution Prevention Plan and a Permanent Stormwater Control Plan. The following documents are to be included in a Stormwater Site Plan:
   A. Project overview;
   B. Existing conditions summary;
   C. Off-site Analysis Report;
   D. Construction Stormwater Pollution Prevention Plan;
   E. Permanent Stormwater Control Plan;
   F. Special Reports and Studies;
   G. Other Permits;
   H. Operation and Maintenance Manual; and
   I. Bond Quantities Worksheet


Consistent with the minimum requirements contained in this chapter, the public works director shall approve, conditionally approve or disapprove the following activities, unless exempted in BMC 14.30.052:

(1) New Development:
   (a) Land disturbing activities;
   (b) Structural development, including construction, installation or expansion of a building or other structure;
   (c) Creation of impervious surfaces;
(d) Class IV—General forest practices that are conversions from timber land to other uses;

(e) Subdivision, short subdivision and binding site plans, as defined in RCW 58.17.020.

(2) Redevelopment. On an already developed site, the creation or addition of impervious surfaces, structural development including construction, installation or expansion of a building or other structure, land disturbing activity, and/or replacement of impervious surface that is not part of a routine maintenance activity, and land disturbing activities associated with structural or impervious redevelopment. (Ord. 25-95 § 1, 1995).

14.30.052 Exemptions.
Commercial agriculture and forest practices regulated under WAC Title 222, except for Class IV—General forest practices that are conversions from timber land to other uses, are exempt from the provisions of this chapter.

Development undertaken by the Washington State Department of Transportation in state highway rights-of-way is regulated by Chapter 173-270 WAC, the Puget Sound Highway Runoff Program.

All other new development and redevelopment is subject to the minimum requirements of this chapter. (Ord. 25-95 § 1, 1995).

The latest edition of Ecology’s stormwater management manual is hereby adopted by reference and is hereinafter referred to as the manual. (Ord. 25-95 § 1, 1995).

(1) General. BMPs shall be used to control pollution from stormwater. BMPs shall be used to comply with the standards in this chapter. BMPs are in the manual.

(2) Experimental BMPs. In those instances where appropriate BMPs are not in the manual, experimental BMPs should be considered. Experimental BMPs are encouraged as a means of solving problems in a manner not addressed by the manual in an effort to improve stormwater quality technology. Experimental BMPs must be approved in accordance with the approval process outlined in the manual. (Ord. 25-95 § 1, 1995).

14.30.063 Illicit Discharges.
Illicit discharges to stormwater drainage systems are prohibited. (Ord. 25-95 § 1, 1995).

14.30.734 Exceptions.
Exceptions to minimum requirements Nos. 1 through 11 may be granted by the City Council prior to permit approval and construction. An exception may be granted following a public hearing conducted by the City Council; provided, that a written finding of fact is prepared that addresses the following:
(1) The exception provides equivalent environmental protection and is in the overriding public interest; and that the objectives of safety, function, environmental protection and facility maintenance, based upon sound engineering, are fully met;

(2) That there are special physical circumstances or conditions affecting the property such that the strict application of these provisions would deprive the applicant of all reasonable use of the parcel of land in question, and every effort to find creative ways to meet the intent of the minimum standards has been made;

(3) That the granting of the exception will not be detrimental to the public health and welfare, nor injurious to other properties in the vicinity and/or downstream, and to the quality of waters of the state; and

(4) The exception is the least possible exception that could be granted to comply with the intent of the minimum requirements. (Ord. 25-95 § 1, 1995).

14.30.801 Administration and Director.
The public works director shall administer this chapter and shall be referred to as the director. The director shall have the authority to develop and implement administrative procedures to administer and enforce this chapter. (Ord. 25-95 § 1, 1995).

14.30.802 Review and Approval.
The director may approve, conditionally approve or deny an application for activities regulated by this chapter. (Ord. 25-95 § 1, 1995).

14.30.803 Enforcement Authority.
The director shall enforce this chapter. (Ord. 25-95 § 1, 1995).

14.30.804 Inspection.
All activities regulated by this chapter, except those exempt in BMC 14.30.052.040(2), shall be inspected by the director. The director shall inspect projects at various stages of the work requiring approval to determine that adequate control is being exercised. Stages of work requiring inspection include, but are not limited to, preconstruction; installation of BMPs; land disturbing activities; installation of utilities, landscaping, retaining walls and completion of project. When required by the director, a special inspection and/or testing shall be performed. (Ord. 25-95 § 1, 1995).

14.30.901 General.
Enforcement action shall be in accordance with this chapter whenever a person has violated any provision of this chapter. The choice of enforcement action and the severity of any penalty shall be based on the nature of the violation, the damage or risk to the public or to public resources, and/or the degree of bad faith of the person subject to the enforcement action. (Ord. 25-95 § 1, 1995).

14.30.902 Enforcement, violations and penalties.
Any person violating or failing to comply with any of the provisions of this title shall be subject to the notice requirements, enforcement, violations and/or penalty provisions of Chapter 1.12 BMC.

14.30.1005 Appeals
Administrative interpretations and administrative Type A-1 and Type A-2 decisions may be appealed, by applicants or parties of record, to the board of adjustment subject to the provisions of BMC 20.01.260.

Decisions made by the City Council on exceptions to the requirements granted under authority of BMC 14.30.734 shall be final and conclusive.
APPENDIX F

PLAN REVIEW CHECKLIST
CITY OF BUCKLEY
Plan Review Checklist

NAME/NUMBER OF PROJECT ________________________________

DATE SUBMITTED ________________________________

General
Title Sheet
Notes, Conditions, and Index Sheet (NC)
Overall Survey Control Sheet (SC-1)
Individual Survey Control/Calculation Sheets (SC)
Overall Temporary Erosion and Sediment Control Sheet (ESC-1)
Individual Temporary Erosion and Sediment Control Sheets (ESC)
Overall Clearing and Grading Plan Sheet (GP-1)
Individual Clearing and Grading Plan Sheets (GP)
Stormwater Site Plan (3 copies)
Geotechnical Report (3 copies)
Storm Drainage Overall Plan Index (SD-1)
Storm Drainage Overall Plan (SD)
Individual Storm Drainage Sheets (SD)
Stormwater Facility Sheets (P)
Storm Sewer Vault Sheets (V)
Structural Sheets (S)
Detention Pipe Details and Notes (PD)
Road and Storm Detail Sheets (D)
Wetland Mitigation Plan (WM)
The following represents most, if not all, of the plans, drawings, reports, calculations, etc., that could be required for your project. In many cases, you will be required to submit only a portion of these. You should consult with the City staff prior to starting the engineering design of the project and verify what is required. Sheets should be ordered and numbered as presented herein.

☐ General submittal requirements:
   - Plans submitted for approval must not be stamped as “preliminary” or “not for construction”.
   - All plan sets must have a title/cover sheet.
   - All sheets must be signed and dated.
   - All sheets must have an “Approved for Construction” signature block in upper/lower right corner.

APPROVED FOR CONSTRUCTION

BY: ___________________________ DATE: ___________________________

CITY OF BUCKLEY

- All plan sheets must have North Arrow and Scale Bar.
- Scale:
  - Plan view – 1”=50’, but 1”=20’ preferable
  - Profile view - 1”=20’ horizontally and 1”=5’ vertically
  - Overall or section cover page – variable, but 1”=100’ preferable
- All sheets shall be maximum 24” x 36”. Half-size (11” x 17”) plan sets shall be made available prior to start of construction. Provide a minimum of four (4) full-size copies of the plans for each submittal.
- Final approved drawings shall be on mylar and given to the City for signature.
- All sheets must have a title block on the bottom or right edge. Title block should include:
  - Company Name and Contact Information
  - Revision Block including the following:
    - Revision Number
    - Date
    - Description of Revision
    - Made By/Checked By
  - Project Information Block – This block contains text noting scale, drawing name, drafter/designer initials, and approving engineer’s initials
  - Engineers seal
  - Scale
  - Sheet title, including:
    - Sheet title, project name, city project number
    - Sheet number in the lower right corner. Number sheets as follows:
      - NC-1, 2, etc – Notes, Index, and Conditions
- SC-1, 2, etc – Survey Control
- GP-1, 2, etc – Clearing and Grading
- ESC-1, 2, etc – Temporary Erosion and Sediment Control
- SD-1, 2, etc – Storm Sewer
- P-1, 2, etc –Pond (ponds and control structures)
- V-1, 2, etc –Vault (vaults and control structures)
- S-1, 2, etc – Structural (walls and vaults)
- PD-1, 2, etc –Detention Pipe (details, notes, and control structures)
- D-1, 2, etc – Storm Detail
- WM-1, 2, etc – Wetland Mitigation Plan

Title/cover Sheet:
- Project name
- Title of plans (e.g., “Road and Storm Drainage Improvements”)
- Section, Township, and Range
- “City of Buckley, Washington”
- City Project number
- Date of Original Plans
- Revision dates
- Owner’s (developer’s) name, address, and phone
- Engineer’s name, address, and phone
- Approval block (positioned in lower right corner)

Notes, Index, Conditions Sheets (NC):
- Conditions of approval (beginning at top left)
- Vicinity Map (Buckley) – not to scale
- Soils Map – not to scale
- Listing of all pertinent utility companies, phone
- Contact information for all involved owners, trustees, surveyors, and engineers (civil, geotechnical, structural)
- “Recommended for Approval” block
- “Approved for Construction” block (lower right corner)
- Index of all sheets with sheet numbers and titles
- Legend including abbreviations and symbols (APWA Standard Symbols)

Overall Survey Control Sheet (SC-1) - (No approval block required)
- This single sheet should show entire project and surrounding areas
- Indicate graphically and by written text the basis for the survey control including:
  - Basis of position – showing street breakdown
  - Basis of bearing – showing boundary dimensions and bearings
  - Horizontal and vertical datum (bench mark elevation and location)
  - Monumentation – found and set
- Features of the sheet that should be identified and labeled by the following text:
  - Lots – numbers
• Tracts – letters
• Easements – dashed lines with labels
• Adjacent parcel/right-of-way lines – dashed lines with parcel numbers
• Adjacent parcels names (“Plat of _____”, etc)
• Street names – as approved by the City

Individual Survey Control/Calculation Sheets (SC):
• For smaller projects, information can be included on the Overall Survey Control Sheet
• Bearing, length and curve data (including delta, radii, length) for right-of-way centerlines
• Right-of-way width
• Stationing set at 100-foot increments, with tick marks at 50 feet
• Street names, street classifications, lot numbers
• Square Footage (or acreage) of tracts
• Each lot, tract, and easement boundary should be labeled with its length and bearing.
• Each tract should have its purpose noted (i.e. public/private; park, landscape, etc.).
• Each tract should have its boundary and buffer clearly labeled.
• Adjacent parcels names (“Plat of _____”, etc)
• Monument locations (existing and proposed)

Overall Temporary Erosion and Sediment Control Sheet (ESC-1):
• Entire site showing ESC sheet breakdown
• Sensitive areas and associated buffers
• All tracts and parcels (including adjacent properties)
• TESC features are not required on this sheet.

Individual Temporary Erosion and Sediment Control Sheets (ESC):
• Scale, legend, parcel lines, lot numbers, street names
• Standard Erosion and Sedimentation Control Notes
• Existing and finished grade contours. The existing contours should be screened.
• Sensitive areas and their associated buffers
• Surface runoff flow direction noted by flow arrows
• Run-on from upstream properties
• Show all TESC measures. These should include, but are not limited to:
  • Clearing limits
  • Cover measures (temporary and permanent)
  • Perimeter protection
  • Traffic area stabilization
  • Sediment retention (ponds, traps, riser and outlet details)
  • Surface water control (temporary piping, conveyance ditches, interceptor swales, temporary outfalls)
  • Significant features (i.e. rock walls, retaining walls)
  • Un-contained areas
- Drainage basin boundaries for each discharge
- Other BMPs
- Sediment retention sizing calculations (also include in TIR)

☐ Overall Clearing and Grading Sheet (GP-1):
- Entire site showing GP sheet breakdown
- Sensitive areas and associated buffers
- All tracts and parcels (including adjacent properties)
- Clearing and grading features do not need to be shown on this sheet.

☐ Individual Clearing and Grading Sheets (GP):
- Scale, legend, parcel lines, lot numbers, street names, construction easements
- Existing contours (minor – 2’, major – 10’) screened or shaded
- Proposed contours (minor – 2’, major – 10’)
- Plan view:
  - Existing and proposed contours (existing contours screened back)
  - Sensitive areas and associated buffers
  - All other significant topographic features
  - Walls, type with top and bottom elevation labeled (Note indicating a separate building permit required for walls)
- Profile/cross sections (specific locations as required by City)
- Existing and proposed contours (existing contours screened back)

☐ Stormwater Site Plan:
- As specified in the DOE Stormwater Management Manual for Western Washington
- Text must clearly describe assumptions, means of compliance, etc.,
- Report must include drawings of the facilities, including details
- All critical data on computer sheets should be identified to assist reviewer
- Site Plan must be as-built at end of project to indicate constructed facility performance

☐ Geotechnical Report:
- Must be reviewed by geotechnical consultant
- Structural assumptions for walls and vaults
- Site hazards and stability issues (existing or proposed)
- Erosion and Sedimentation Control
- Structural fill
- Groundwater
- Geotechnical Engineer-of-Record must stay with project through construction per UBC, Chapter Appendix 33

☐ Storm Drainage Overall Plan Index Sheet (SD-1):
- Entire site showing SD sheet breakdown
- All storm utilities shown (no details)
• All ponds, lots, streets, and tracts labeled

☐ Overall Road and Storm Drainage Plan Sheets (SD):
• Entire site with existing and proposed contours
• Storm components shown and labeled (number and type)
• All ponds, lots, streets, and tracts labeled

☐ Individual Storm Drainage Plan and Profile Sheets (SD):
• Each sheet must show plan view with drainpipe centerline profile
• Connection to existing improvements (separate sheets)
• Plan view must show:
  • All parcels, lots, and tracts labeled
  • Clearing limits
  • Existing and proposed contours (minor – 2’, major – 10’) 50’ beyond site
  • Stationing
  • Easements, width and type
  • Sensitive areas and associated buffers
  • Walls (see GP sheets for type and elevations)
  • Call-outs to other sheets for details and match lines
• Roadway features identified in plan view (with symbols, text where needed):
• Storm drainage features identified in plan view (with symbols, text where needed):
  • Catch basins, inlets, manholes - number and type
  • Pipe length, size, type, flow direction, and slope
  • Outfalls
  • Outline of underground facilities
  • Special storm components (arched culverts, dispersal trench, outfalls, weirs, headwalls, etc..)
  • Wall and yard drain stub invert elevations
  • Individual downspout stub invert elevations
  • Flow direction arrows
  • Call-outs to other sheets for details
  • Facility (pond, vault, sand filter, etc..) name/number
  • Facility features (general on this sheet) – access roads, manholes, pipes, inlets and outlets, spillways, 100-year (design) water surface elevation, water quality water surface elevation, bottom elevation

• Profile view must show:
  • Existing and proposed grade elevations at road/drainpipe centerline
  • Street name and classification
  • Stationing
  • Slope (%)
  • Utilities – size and type labeled
  • Storm system in profile view:
• Length, size, type, and slope of each pipe/feature
• Structure number, station, offset, rim elevation, invert elevations including IN/OUT, pipe diameters, pipe materials
• Underground vaults, ponds, tanks with elevations, inverts
• Callouts to detail sheets

Stormwater Facility (ponds, vaults, or tanks) Sheets (P, V, or PD):
• Plan view (No plan view required for tanks):
  • Existing and finished grade contours
  • Easement and tract boundaries
  • Sensitive areas and their associated buffers
  • Access roads, ramps, walls, and buildings
  • Identify cells and dividing berms or baffle walls (vaults)
  • Bottom, top of dead storage, water quality surface, 100-year water surface, berm, spillway, and pipe invert elevations
  • Access hatches, manholes, and risers (vaults)
  • Dimensions, slope, curvature, and materials for access roads, trails, spillway
  • Interior dimensions (vaults)
  • Structures – name, type, size, rim and invert elevations or callouts to detail sheets
  • Pipes – length, type, size, slope, inverts
  • Walls – type, top and bottom elevation
  • Outfalls – size, material, energy dissipation
  • Signage, fences, gates, bollards
  • Special notes regarding geotechnical details for berm construction, etc.,
• A table providing the following information:
  • Facility type and name
  • Required live storage volume
  • Design live storage volume
  • 100-year (design) water surface elevation
  • Overflow water surface elevation
  • Emergency overflow water surface elevation
  • Berm or inside top of vault elevation
  • Required dead storage volume (WQ)
  • Design dead storage volume (WQ)
  • Top of dead water surface (WQ)
  • Sediment storage elevation
  • Bottom elevation

• Profile/Cross sections
  • Include minimum 2 sections per facility
  • Scale exaggeration 10:1 ratio maximum
  • Sections should go well beyond the limits of the facility to include adjacent walls, roads, etc.,
  • Existing and finished grade contours
- Berm elevation and width
- Inside top of vault elevation (vaults)
- Interior dimensions (vaults)
- Foundation, walls, and lid must be shown to scale on vaults with callout to structural plans and details (vaults)
- Wall penetrations (vaults)
- Slopes (horizontal:vertical)
- Tract/easement boundaries
- Sensitive areas and associated buffers
- Call-outs to details
- Label:
  - Bottom elevation
  - Sediment storage depth
  - Top of dead water surface (WQ)
  - 100-year (design) water surface elevation
  - Overflow water surface elevation
  - Emergency overflow water surface elevation
  - Pipe type, size, length, slope, inverts
  - Structure name, rim elevation, invert elevations
  - Special features (drains, beveled outfalls, spall pads, valves, sleeves, etc.,)

- Individual control structure detail sheets:
  - Call-outs to details (D sheets)
  - Plan view indicating (drawn to scale):
    - Ladder and clearances
    - Cleanouts, elbow restrictors, and risers
    - Knockout diameter
    - Platforms
  - Profile view indicating (drawn to scale):
    - Bottom, rim, platform elevations
    - 100-year (design) water surface elevation
    - Overflow water surface elevation
    - Emergency overflow water surface elevation
    - Cleanouts, elbow restrictors, and risers
    - Restrictor elbow invert, diameter
    - Orifice elevation, diameter
    - Pipe inverts and sizes
    - Ladder steps

☐ Structural Sheets (S):
  - Structural calculations, with supporting geotechnical data and assumptions
  - Structural drawings showing elevations, walls, bottom/top slabs, re-steel, ties, water stops, foundation material, backfill, perimeter drains, penetrations, etc.
Storm Detail Sheets (D):
- Catch basin, inlets, and manholes
- Frame and grate/ring and lid
- Details indicating structure orientation beneath curbs
- Stormwater facility access roads
- Roof drain laterals connection to public storm system
- Spillway
- Infiltration/dispersal trenches
- Removable and fixed bollards
- FROP-T flow restrictor/spill control device, including shear gate
- Elbow restrictor
- Ladders and steps
- “Jailhouse window”
- Access risers
- Signs (pond, wetland, wildlife, confined space entry, etc.)
- Overflow structure (“birdcage”)
- General drainage notes
- Planting notes
- Geotechnical notes for pond berm construction
- Trench detail

Wetland Mitigation Plan (WM):
- Prepared in accordance with appropriate department
APPENDIX G

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Subtotal $149,660  
Contingencies (20%) $29,932  
Subtotal $179,592  
Sales Tax (8.4%) $15,085.73  
Total Construction Cost $194,678  
Total Construction Cost (Rounded) $195,000  
Permitting, Engineering, Construction Admin. Cost (25% of Construction Cost) $48,750  
Total Project Cost $243,750
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<th>AMOUNT</th>
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Subtotal $47,360
Contingencies (20%) $9,472
Subtotal $56,832
Sales Tax (8.4%) $4,773.89
Total Construction Cost $61,606
Total Construction Cost (Rounded) $62,000

Permitting, Engineering, Construction Admin. Cost (25% of Construction Cost) $15,500

Total Project Cost $77,500
### City of Buckley

**CIP 3: Sheets Rd. Diversion**  
**ENGINEER'S COST ESTIMATE**  
**20-Sep-07**

**G &O #06662**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>ESTIMATED QUANTITY</th>
<th>UNIT</th>
<th>PRICE</th>
<th>AMOUNT</th>
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Subtotal $412,860  
Contingencies (20%) $82,572  
Subtotal $495,432

Sales Tax (8.4%) $41,616.29  
**Total Construction Cost** $537,048  
**Total Construction Cost (Rounded)** $538,000

Permitting, Engineering, Construction Admin. Cost (25% of Construction Cost) $134,500

**Total Project Cost** $672,500
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<th>ITEM NO.</th>
<th>DESCRIPTION</th>
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<th>UNIT</th>
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<th>AMOUNT</th>
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<tbody>
<tr>
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<td>6</td>
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<td>$3,000.00</td>
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<tr>
<td>7</td>
<td>Dewatering</td>
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<td>8</td>
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Subtotal $170,570
Contingencies (20%) $34,114
Subtotal $204,684

Sales Tax (8.4%) $17,193.46
Total Construction Cost $221,877
Total Construction Cost (Rounded) $222,000

Permitting, Engineering, Construction Admin. Cost (25% of Construction Cost) $55,500

Total Project Cost $277,500
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<th>ROAD</th>
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<th>UNIT</th>
<th>PRICE</th>
<th>AMOUNT</th>
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<p>|            | Subtotal                                             |          |            |          |      |        | $975,905|
|            | Contingencies (20%)                                  |          |            |          |      |        | $195,181|
|            | Subtotal                                             |          |            |          |      |        | $1,171,086|
|            | Sales Tax (8.4%)                                     |          |            |          |      |        | $98,371.22|
|            | Total Construction Cost                              |          |            |          |      |        | $1,269,457|
|            | Total Construction Cost (Rounded)                    |          |            |          |      |        | $1,270,000|
|            | Permitting, Engineering, Construction Admin. Cost    |          |            |          |      |        | $317,500|
|            | Total Project Cost                                   |          |            |          |      |        | $1,587,500|</p>
<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>DESCRIPTION</th>
<th>ESTIMATED QUANTITY</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
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<td>Total Project Cost</td>
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## City of Buckley
### CIP 7: Regional Water Quality Facilities Study
### ENGINEER'S COST ESTIMATE
30-Aug-07

**G &O #06662**

CIP 7: Division Rd. (Diversion from Ryan)

<table>
<thead>
<tr>
<th>ITEM NO.</th>
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<th>ESTIMATED QUANTITY</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
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<td><strong>Total Project Cost</strong></td>
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Water Quality Facility Feasibility Study for Wickersham Basin and PSE Area
<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>DESCRIPTION</th>
<th>ROAD</th>
<th>EASEMENT</th>
<th>QUANTITY</th>
<th>PRICE</th>
<th>AMOUNT</th>
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<tr>
<td>1.</td>
<td>Mobilization, Cleanup and Demobilization</td>
<td>1 LS</td>
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<td>Construction Surveying, Staking, and As-built Drawings</td>
<td>1 LS</td>
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<tr>
<td>3.</td>
<td>Clearing and Grubbing</td>
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Subtotal $1,399,240
Contingencies (20%) $279,848
Subtotal $1,679,088

Sales Tax (8.4%) $141,043.39
Total Construction Cost $1,820,131

Total Construction Cost (Rounded) $1,821,000

Permitting, Engineering, Construction Admin. Cost (25% of Construction Cost) $455,250

Total Project Cost $2,276,250
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Subtotal $2,318,850
Contingencies (20%)$463,770
Subtotal $2,782,620

Sales Tax (8.4%)$233,740.08
Total Construction Cost $3,016,360

Permitting, Engineering, Construction Admin. Cost (25% of Construction Cost) $754,250

Total Project Cost $3,771,250
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<th>UNIT PRICE</th>
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<td>17</td>
<td>Crushed Surfacing Base Course</td>
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<td>18</td>
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Subtotal: $269,720
Contingencies (20%): $53,944
Subtotal: $323,664

Sales Tax (8.4%): $27,187.78
Total Construction Cost: $350,852
Total Construction Cost (Rounded): $351,000

Permitting, Engineering, Construction Admin. Cost (25% of Construction Cost): $87,750

Total Project Cost: $438,750
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<td>3.</td>
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## ITEM DESCRIPTION

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<th>UNIT</th>
<th>PRICE</th>
<th>AMOUNT</th>
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<tr>
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Subtotal | $106,340 |
Contingencies (20%) | $21,268 |
Subtotal | $127,608 |

Sales Tax (8.4%) | $10,719.07 |
Total Construction Cost | $138,327 |
Total Construction Cost ( Rounded) | $139,000 |

Permitting, Engineering, Construction Admin. Cost (25% of Construction Cost) | $34,750 |

Total Project Cost | $173,750 |
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<th>AMOUNT</th>
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Subtotal $2,950,210  
Contingencies (20%) $590,042  
Subtotal $3,540,252

Sales Tax (8.4%) $297,381.17  
Total Construction Cost $3,837,633

Total Construction Cost (Rounded) $3,838,000

Permitting, Engineering, Construction Admin. Cost (25% of Construction Cost) $959,500

Total Project Cost $4,797,500

G &O #06662

City of Buckley  
CIP 13: Collins Rd.  
ENGINEER'S COST ESTIMATE  
30-Aug-07  

12/31/2007  
L:/Buckley/06662/costs/CIP CostEstimates3.xls
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<th>UNIT PRICES</th>
<th>AMOUNT</th>
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<td>1.</td>
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Subtotal: $372,840
Contingencies (20%): $74,568
Subtotal: $447,408
Sales Tax (8.4%): $37,582.27
Total Construction Cost: $484,990
Total Construction Cost (Rounded): $485,000

Permitting, Engineering, Construction Admin. Cost (25% of Construction Cost): $121,250
Total Project Cost: $606,250
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<th>AMOUNT</th>
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Subtotal: $589,290  
Contingencies (20%)  
$117,858  
Subtotal: $707,148  
Sales Tax (8.4%)  
$59,400.43  
Total Construction Cost  
$766,548  
Total Construction Cost (Rounded)  
$767,000  
Permitting, Engineering, Construction Admin. Cost (25% of Construction Cost)  
$191,750  
Total Project Cost  
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**Subtotal** $1,097,890
**Contingencies (20%)** $219,578
**Subtotal** $1,317,468

**Sales Tax (8.4%)** $110,667.31

**Total Construction Cost** $1,428,135

**Total Construction Cost (Rounded)** $1,429,000

**Permitting, Engineering, Construction Admin. Cost** (25% of Construction Cost) $357,250

**Total Project Cost** $1,786,250
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City of Buckley
CIP 18: Hwy 410B
ENGINEER'S COST ESTIMATE
29-Aug-07

G & O #06662
### ITEM

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Subtotal $1,322,640  
Contingencies (20%) $264,528  
Subtotal $1,587,168  
Sales Tax (8.4%) $133,322.11  
**Total Construction Cost** $1,720,490  
**Total Construction Cost (Rounded)** $1,721,000  
Permitting, Engineering, Construction Admin. Cost (25% of Construction Cost) $430,250  
**Total Project Cost** $2,151,250
APPENDIX H

SEPA CHECKLIST
SEPA NOTICE

DETERMINATION OF NON-SIGNIFICANCE (DNS)

DESCRIPTION OF PROPOSAL: This is a non-project action that introduces a new citywide Comprehensive Stormwater Management Plan for adoption. The purpose of the City of Buckley’s Comprehensive Stormwater Management Plan (Plan) is to provide the City with a stormwater-planning document that includes ordinances and programs necessary to fulfill the requirements of a comprehensive stormwater program. The plan will additionally identify specific structural and non-structural solutions to known flooding and water quality problems occurring within the City. The Comprehensive Stormwater Plan will meet local, state, and federal stormwater requirements; identify water quality and quantity problems associated with surface water runoff that may endanger the environment; and provide recommendations for improvements. The Plan includes a cost analysis and an implementation schedule.

LOCATION OF PROPOSAL, INCLUDING STREET ADDRESS, IF ANY: Corporate limits of the City of Buckley

PROPONE NT: City of Buckley, P.O. Box 1960, Buckley, WA 98321

LEAD AGENCY: City of Buckley, P.O. Box 1960, Buckley, WA 98321

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) IS NOT required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the City of Buckley. This information along with a full copy of the Comprehensive Stormwater Management Plan is available for public review upon request.

This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for fourteen (14) days from the publication date denoted below. Written comments must be received by 5:00 p.m., July 22, 2008.

RESPONSIBLE OFFICIAL: Dave Schmidt, City Administrator DATED: July 2, 2008

PUBLICATION DATE: July 9, 2008

For further information contact City Hall at (360) 829-1921 ext. 200

APPEALS: This decision is appealable to the city council. Such appeal may be perfected by the proponent or any aggrieved party giving notice to the city administrator within 10 days of the decision being appealed. Review by the city council shall be on a de novo basis. The notice of appeal shall be made upon a form to be supplied by the city administrator. A nonrefundable fee of two hundred fifty dollars shall be paid at the time the notice of appeal is submitted. A hearing shall than be scheduled before the council within thirty days of the filing of the notice of appeal and appeal fee.
CITY OF BUCKLEY

Environmental Checklist

A. BACKGROUND

1. Name of proposed project, if applicable: 2008 City of Buckley Comprehensive Stormwater Management Plan.

2. Name of applicant: City of Buckley, PO Box 1960, 933 Main Street, Buckley, WA 98321

3. Address and phone number of applicant and contact person: David Schmidt, PO Box 1960, 933 Main Street, Buckley (360) 829-1921 ext 200.

4. Date checklist prepared: June 30, 2008

5. Agency requiring checklist: City of Buckley

6. Proposed timing or schedule (including phasing, if applicable):

   ◆ Issued DNS and Public Comment begins July 9, 2008
   ◆ End Public Comment July 22, 2008
   ◆ Public Hearing w/ City Council July 22, 2008
   ◆ Review and decision by City Council and tentative adoption July 22, 2008
   ◆ Tentative effective date of Ordinance August 4, 2008

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain. Yes. Future evaluation of this Comprehensive Stormwater Plan may require additional changes or amendments as needed. Individual stormwater projects are to be completed in the future per the management plan. Environmental review will be conducted on project specific basis.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal. None

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain. None

10. List any governmental approvals or permits that will be needed for your proposal, if known. City Council adoption of the Stormwater Management Plan.
11. Give brief, complete description of your proposal, including the proposed uses and size of the project and site. There are several questions later in this checklist that ask you to decide certain aspects of your proposal. You do not need to repeat those answers on this page. **This is a non-project action that proposes to adopt a citywide Stormwater Management Plan to establish maintenance guidelines and identify capital infrastructure projects and funding sources to improve the City’s stormwater drainage system.**

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist. (Attach complete legal description if available.) **All areas within the corporate limits of the City of Buckley.**
B. ENVIRONMENTAL ELEMENTS

1. Earth

   a. General description of the site (circle one):

      Flat, rolling, hilly, steep slopes, mountainous, other ________________.

      The City of Buckley is comprised of a variety of topographical land forms and gradients.

   b. What is the steepest slope on the site (approximate percent slope)?

      The City of Buckley contains a variety of topographical land forms and slope characteristics to include flat to slopes in excess of 40%. Specific slope characteristics of sites within the areas affected by this Plan shall be identified during project level environmental review when appropriate.

   c. What general types of soils are found on the site (for example: clay, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland. Specific soil characteristics of sites within the areas affected by this Plan shall be identified during project level environmental review when appropriate.

   d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe. Unstable soils may exist within the City of Buckley. Specific soil limitations for the sites within the areas affected by this Plan shall be identified during project level environmental review when appropriate.

   e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill. Specific fill quantities of sites within the areas affected by this Plan shall be identified during project level environmental review when appropriate.

   f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe. The erosion impacts of individual projects within the areas affected by this Plan shall be identified during project level environmental review when appropriate.

   g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)? Not applicable to this project. This issue shall be addressed during
project-specific review when appropriate.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any: The erosion potential of future projects shall be addressed on a project by project basis. All projects shall be required to comply with adopted sedimentation and erosion control guidelines.

2. Air

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known. Various emissions, many construction related, may result from future individual projects in the City of Buckley. The air quality impacts of future projects shall be evaluated during project-specific environmental review when appropriate.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe. Not applicable to this project. This issue shall be addressed during project-specific review when appropriate.

c. Proposed measures to reduce or control emissions or other impacts to air, if any: Not applicable to this project. This issue shall be addressed during project-specific review when appropriate.

3. Water

a. Surface:

1. Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into. There are various bodies of water within the City of Buckley to include the White River, Spiketon Ditch which drains into Spiketon Creek and various wetland classifications.

2. Will the project require any work over, in or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans. Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.
3. Estimate the amount of fill and dredge material that would be placed in or remove from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.  
*Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

4. Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.  
*Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

5. Does the proposal lie within a 100 year flood plain? If so, note location on the site plan.  
*Areas of the City are located within the 100 year flood plain, but this is a planning level document which is a non-project action and does not propose a specific project located within one of the flood plain areas. This information shall be provided and reviewed during application for a specific-project action.*

6. Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.  
*Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

b. Ground:

1. Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.  
*Not applicable to this non-project action. The adoption of this Plan does not involve withdrawals from or discharges to the groundwater supply. Impacts to the groundwater supply shall be addressed during project-specific review when appropriate.*

2. Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage, industrial, containing the following chemicals...; agricultural; etc.)Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.  
*Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

c. Water Runoff (including storm water):
1. Describe the source of runoff (including storm water) and the method of collection and disposal, if any (including quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe. **Not applicable to this non-project action.** The adoption of this Plan does not involve the creation of impervious surfaces which would increase normal runoff. Any impacts relating to an increase of runoff shall be addressed separately during project-specific review.

2. Could waste materials enter ground or surface waters? If so, generally describe. **Not applicable to this non-project action.** This information shall be provided and reviewed during application for a specific-project action.

4. **Plants**

   a. Check or circle types of vegetation found on the site:

   - X deciduous tree: alder, maple, aspen, other
   - X evergreen tree: Douglas-fir, cedar, pine, other
   - X shrubs
   - X grass
   - X pasture
   - X crop or grain
   - X wet soil plants: cattail, buttercup, bulrush, skunk cabbage, other
   - X water plants: water lily, eelgrass, milfoil, other
   - X other types of vegetation - describe

   **The City of Buckley has many different varieties of plant species within its borders and may include any and/or all of the above mentioned species or plant classes. This non-project action does not result in a disturbance to any vegetation. Impacts to existing vegetation shall be reviewed on a project-specific basis.**

   b. What kind and amount of vegetation will be removed or altered? **Not applicable to this non-project action.** This information shall be provided and reviewed during application for a specific-project action.
c. List threatened or endangered species known to be on or near the site. *Not applicable to this non-project action. The City of Buckley may or may not have existing species of threatened or endangered plant species. Any species that meet this criteria will be identified and inventoried during application for a specific-project action.*

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any: *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

5. **Animals**

a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:
   - birds: hawk, heron, eagle, songbirds, other ____________________________
   - mammals: deer, bear, elk, beaver, other ____________________________
   - fish: bass, salmon, trout, herring, shellfish, other ____________________________

*The City of Buckley has a variety of bird and animal species within its borders. This non-project action does not result in a disturbance to any specific site where they might exist. All individual, project-specific applications shall be reviewed for potential impacts to any existing species or habitat.*

b. List any threatened or endangered species known to be on or near the site. *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

c. Is the site part of a migration route? If so, please explain. *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

d. Proposed measures to preserve or enhance wildlife if any. *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

6. **Energy and Natural Resources**
a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project’s energy needs? Describe manufacturing, etc. *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe. *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any: *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

7. **Environmental Health**

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste that could occur as a result of this proposal? If so, describe. *Please see Supplemental Sheet for non-project actions.*

1. Describe special emergency services that might be required. *Please see Supplemental Sheet for non-project actions.*

2. Proposed measures to reduce or control environmental health hazards, if any: *Please see Supplemental Sheet for non-project actions.*

b. **Noise**

1. What types of noise exist in the area which may affect your project (for example, traffic, equipment, operation, other)? *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

2. What types and level of noise would be created by or associated with the project on a short-term or a long-term basis (for example, traffic, construction, operation, other)? Indicate what hours noise would come from the site. *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*
3. Proposed measures to reduce or control noise impacts, if any:
Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.

8. Land and Shoreline Use

a. What is the current use of the site and adjacent properties? There are a variety of land uses within the City of Buckley, including residential, commercial, utility, public, recreational, etc. This information shall be provided and reviewed during application for a specific-project action.

b. Has the site been used for agriculture: If so, describe. Buckley has been historically a logging and farming community with numerous dairies, pastureland and berry farms in operation over its long history. However, this update is a non-project action and proposes no changes to existing uses. This information shall be provided and reviewed during application for a specific-project action.

c. Describe any structures on the site. Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.

d. Will any structures be demolished? If so, what? Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.

e. What is the current zoning classification of the site? The City of Buckley currently contains several zoning classifications within its boundaries to include low, medium and high residential, mixed-use residential, historical commercial, central commercial, general commercial and light industrial. Site zoning information shall be provided and reviewed during application for a specific-project action.

f. What is the current comprehensive plan designation of the site? Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.

g. If applicable, what is the current shoreline master program designation of the site? Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.
h. Has any part of the site been classified as an “environmentally sensitive” area? If so, specify. *The City of Buckley does contain sites that are listed as “environmentally sensitive” and may contain others which have not been identified or classified through a formal delineation process. However this proposal is a non-project action and development of this Plan does not propose disturbance or impact to any of these areas. Site specific information shall be provided and reviewed during application for a specific-project action.*

i. Approximately how many people would reside or work in the completed project? *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

j. Approximately how many people would the completed project displace? *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

k. Proposed measures to avoid or reduce displacement impacts, if any: *None Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any: *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

9. **Housing**

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing. *None. Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing. *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

c. Proposed measures to reduce or control housing impacts, if any: *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*
10. **Aesthetics**

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed? *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

b. What views in the immediate vicinity would be altered or obstructed? *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

c. Proposed measures to reduce or control aesthetic impacts, if any. *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

11. **Light and Glare**

a. What type of light or glare will the proposal produce? What time of day would it mainly occur? *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

b. Could light or glare from the finished project be a safety hazard or interfere with views? *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

c. What existing off-site sources of light or glare may affect your proposal? *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

d. Proposed measures to reduce or control light and glare impacts, if any. *Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.*

12. **Recreation**
a. What designated and informal recreational opportunities are in the immediate vicinity? There are a variety of formal and informal active and passive recreational opportunities within the City of Buckley.

b. Would the proposed project displace any existing recreational uses? If so, describe. Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any. Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.

13. Historic and Cultural Preservation

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe. The City may or may not have places and/or objects listed on or proposed for national, state or local preservation registers, however, these will be identified and assessed during application for a specific-project action.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site. Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.

c. Proposed measures to reduce or control impacts, if any. Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.

14. Transportation

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any. This update is a non-project action and therefore does not identify a specific or individual roadway. Any site-specific streets and/or highways will be identified during application for a specific-project action.
b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop and where is it? Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.

c. How many parking spaces would the completed project have? How many would the project eliminate? Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private). Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe. Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.

f. How many vehicular trips per day would be generated by the completed projects? If known, indicate when peak volumes would occur. Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.

g. Proposed measures to reduce or control transportation impacts, if any. Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.

15. Public Services

a. Would the project result in an increased need for public services (for example, fire protection, police protection, health care, schools, other)? If so generally describe. Proposal is a planning document and is not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.

b. Proposed measures to reduce or control direct impacts on public services, if any. Not applicable to this non-project action. This information shall be provided and reviewed during application for a specific-project action.
16. Utilities

a. Circle utilities currently available at the site: Electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other. Currently the City of Buckley is served with electricity, natural gas, water, garbage service, telephone, cable, sanitary sewer and septic systems.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed. This update is a non-project action and therefore does not identify a specific or individual project impacted. Any site-specific utilities or projects affecting utilities will be identified during application for a specific-project action.

C. SIGNATURE

THE ABOVE ANSWERS ARE TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE. I UNDERSTAND THAT THE LEAD AGENCY IS RELYING ON THEM TO MAKE ITS DECISION.

Signature: ________________________________

Date Submitted: __________________________

D. SUPPLEMENTAL SHEET FOR NON-PROJECT ACTIONS

Because these questions are very general, it may be helpful to read them in connection with the list of elements of the environment.
When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise? This is a non-project action. Any discharge to water; emission to air; production, storage, or release of toxic or hazardous substances; or production of noise shall be addressed during project-specific environmental review of separate applications.

Proposed measures to avoid or reduce such increases are: Compliance and enforcement of all adopted environmental and stormwater management regulations.

2. How would the proposal be likely to affect plants, animals, fish, or marine life? This non-project action does not result in a disturbance to any specific site where they might exist. All individual, project-specific applications shall be reviewed for potential impacts to any existing species or habitat.

Proposed measures to protect or conserve plants, animals, fish, or marine life are: Compliance and enforcement of all adopted environmental regulations.

3. How would the proposal be likely to deplete energy or natural resources? This is a non-project action. The adoption of this Plan shall not involve the use of an energy source.

Proposed measures to protect or conserve energy and natural resources are: None required

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection: such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands? This is a non-project action. The adoption of this Plan will not be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection.

Proposed measures to protect such resources or to avoid or reduce impacts are: None required

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans? This is a non-project action. The adoption of this Plan will not result in uses incompatible with existing plans.
Proposed measures to avoid or reduce shoreline and land use impacts are:

*None required*

6. How would the proposal be likely to increase demands on transportation or public services and utilities? *This is a non-project action. The adoption of this Plan will not result in additional demands on transportation, public services and/or utilities.*

Proposed measures to reduce or respond to such demand(s) are:

*None required*

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment. *This is a non-project action. The adoption of this Plan will not result in any conflict with local, state or federal environmental protection requirements.*