Appendix A.

National Pollutant Discharge Elimination System (NPDES)
Eastern Washington Phase II Municipal Stormwater Permit

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Issuance Date: August 1, 2012
Effective Date: August 1, 2014
Expiration Date: July 31, 2019

Eastern Washington Phase II Municipal Stormwater Permit

National Pollutant Discharge Elimination System and
State Waste Discharge General Permit for Discharges
from Small Municipal Separate Storm Sewers
in Eastern Washington

State of Washington
Department of Ecology
Olympia, Washington 98504-7600

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1251 et seq.

Until this permit expires, is modified, or revoked, Permittees that have properly obtained coverage under this permit are authorized to discharge to waters of the state in accordance with the special and general conditions which follow.

Kelly Susewind, P.E., P.G.
Water Quality Program Manager
Department of Ecology

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APPENDICES

SPECIAL CONDITIONS

S1. PERMIT COVERAGE AND PERMITTEES

A. Geographic Area of Permit Coverage

This permit is applicable to owners or operators of regulated small municipal separate storm sewer systems (MS4s) located in eastern Washington State, which is bounded on the western side by the Cascade Mountains crest except in Yakima and Klickitat counties which are, in their entireties, included.

1. For all Cities required to obtain coverage under this permit, the geographic area of coverage is the entire incorporated area of the City.

2. For all Counties required to obtain coverage under this permit, the geographic area of coverage is the urbanized areas and the unincorporated urban growth areas associated with permitted Cities within the urbanized areas that are under the jurisdictional control of the County. The geographic area of coverage also includes any urban growth areas that are contiguous to permitted urbanized areas that are under the jurisdictional control of the County.

   For Walla Walla County, the geographic area of coverage also includes the unincorporated urban growth areas associated with the Cities of Walla Walla and College Place.

   For Yakima County, the geographic area of coverage also includes the unincorporated urban growth area associated with the City of Sunnyside.

3. For Secondary Permittees required to obtain coverage under this permit, the minimum geographic area of coverage includes all areas identified under S1.A.1. and S1.A.2., above. At the time of permit coverage, Ecology may establish a geographic area of coverage specific to an individual Secondary Permittee.

4. All regulated small MS4s owned or operated by the Permittees named in S1.D.2.a.(i) and (ii) and located in another city or county area requiring coverage under either this permit or the *Western Washington Phase II Municipal Stormwater Permit* or the *Phase I Municipal Stormwater Permit* are also covered under this permit.

B. Regulated small municipal separate storm sewer systems (MS4s)

All operators of regulated small MS4s are required to apply for and obtain coverage under this permit or be permitted under a separate individual or general permit, unless waived or exempted in accordance with condition S1.C.

1. A regulated small MS4:

   a. Is a "small MS4" as defined in the Definitions and Acronyms section at the end of this permit; and

b. Is located within, or partially located within, an urbanized area as defined by the latest decennial census conducted by the U.S. Bureau of Census or is designated by Ecology pursuant to either 40 CFR 122.35(b) or 40 CFR 122.26(f); and

c. Discharges stormwater from the MS4 to a surface water of Washington State; and

d. Is not eligible for a waiver or exemption under S1.C below.

2. All other operators of MS4s, including special purpose districts which meet the criteria for a regulated small MS4, shall obtain coverage under this permit. Other operators of MS4s may include, but are not limited to: flood control, or diking and drainage districts, schools including universities and correctional facilities which own or operate a small MS4 serving non-agricultural land uses.

3. Any other operators of small MS4s may be required by Ecology to obtain coverage under this permit or an alternative NPDES permit if Ecology determines the small MS4 is a significant source of pollution to surface waters of the state. Notification of Ecology's determination that permit coverage is required will be through the issuance of an Administrative Order issued in accordance with RCW 90.48.

4. The owner or operator of a regulated small MS4 may obtain coverage under this permit as a Permittee, Co-Permittee, or Secondary Permittee as defined in S1.D.1 below.

5. Pursuant to 40 CFR 122.26(f), any person or organization may petition Ecology to require that additional MS4s obtain coverage under this permit. The process for petitioning Ecology is:

   a. The person or organization shall submit a complete petition in writing to Ecology. A complete petition shall address each of the relevant factors for petitions outlined on Ecology's website.

   b. In making its determination on the petition, Ecology may request additional information from either the petitioner or the entity that is the subject of the petition.

   c. Ecology will make a final determination on a complete petition within 180 days after receipt of the petition and inform both the petitioner and the MS4 of the decision, in writing.

   d. If Ecology's final determination is that the candidate MS4 will be regulated, Ecology will issue an order to the MS4 requiring them to obtain coverage under this permit. The order will specify:

      i. The geographic area of permit coverage for the MS4;

ii. Any modified dates or deadlines for developing and implementing this permit, as appropriate to the MS4, and for submitting their first annual report; and

iii. A deadline for the MS4 to submit a complete Notice of Intent (see Appendix 5) to Ecology.

C. Owners and operators of an otherwise regulated small MS4 are not required to obtain coverage under this permit if:

1. The small MS4 is operated by:

a. A federal entity, including any department, agency or instrumentality of the executive, legislative, and judicial branches of the Federal government of the United States; or

b. Federally recognized Indian Tribes located within Indian Country, including all trust or restricted lands within the 1873 Survey Area of the Puyallup Tribe of Indians; or

c. The Washington State Department of Transportation.

Or,

2. The portions of the small MS4 located within the census-defined urban area(s) serve a total population of less than 1,000 people and a, b, and c below all apply:

a. The small MS4 is not contributing substantially to the pollutant loadings of a physically interconnected MS4 that is regulated by the NPDES stormwater program.

b. The discharge of pollutants from the small MS4 has not been identified as a cause of impairment of any water body to which the MS4 discharges.

c. In areas where an EPA approved TMDL has been completed, stormwater controls on the MS4 have not been identified as being necessary.

In determining the total population served by the small MS4, both resident and commuter populations shall be included. For example:

- For publicly operated school complexes including universities and colleges, the total population served would include the sum of the average annual student enrollment plus staff.

- For flood control, diking, and drainage districts the total population served would include residential population and any non-residents regularly employed in the areas served by the small MS4.

D. Obtaining coverage under this permit

All operators of regulated small MS4s are required to apply for and obtain coverage in accordance with this section, unless waived or exempted in accordance with section S1.C.

1. Unless otherwise noted, the term "Permittee" includes a city, town or county Permittee, New Permittee, Co-Permittee, Secondary Permittee, and New Secondary Permittee, as defined below:

    a. A "Permittee" is a City, Town or County owning or operating a regulated small MS4 and receiving a permit as a single entity.

    b. A "New Permittee" is a City, Town or County that is subject to the *Eastern Washington Phase II Municipal Stormwater General Permit* and was not subject to the permit prior to August 1, 2014.

    c. A "Co-Permittee" is any owner or operator of a regulated small MS4 that is applying in a cooperative agreement with at least one other applicant for coverage under this permit. A Co-Permittee owns or operates a regulated small MS4 located within or in proximity to another regulated small MS4.

    d. A "Secondary Permittee" is an operator of a regulated small MS4 that is not a City, Town or County. Secondary Permittees include special purpose districts and other MS4s that meet the criteria for a regulated small MS4 in S1.B above.

    e. A "New Secondary Permittee" is a Secondary Permittee that is covered under a municipal stormwater general permit and was not covered by the permit prior to August 1, 2014.

2. Operators of regulated small MS4s have submitted or shall submit an application to Ecology by either the *Notice of Intent (NOI) for Coverage under National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater General Permit* provided in Appendix 5; or the *Duty to Reapply – NOI*.

    a. The following Permittees and Secondary Permittees submitted a *Duty to Reapply- NOI* to Ecology prior to August 19, 2011:

        i. Cities and Towns: Asotin, Clarkston, East Wenatchee, Ellensburg, Kennewick, Moses Lake, Pasco, Pullman, Richland, Selah, Spokane, Spokane Valley, Sunnyside, Union Gap, Walla Walla, Wenatchee, West Richland, Yakima

        ii. Counties: Asotin County, Chelan County, Douglas County, Spokane County, Walla Walla County, Yakima County

        iii. Secondary Permittees: Central Washington University, Eastmont Metropolitan Park District, Port of Benton, Selah School District #119, Sunnyside Valley Irrigation District, Washington State

University Pullman, Washington State University Spokane, Washington State University Tri-Cities, and Yakima Valley Community College.

b. Operators of regulated small MS4s listed in S1.D.2.a do not need to submit a new application to be covered under this permit.

c. For operators of regulated small MS4s listed in S1.D.2.a, coverage under this permit is automatic and begins on the effective date of this permit, unless the operator chooses to opt out of this General Permit. Any operator of a regulated small MS4 that is opting out of this permit shall submit an application for an individual MS4 permit in accordance with 40 CFR 122.33(b)(2)(ii) no later than the effective date of this permit.

d. Operators of regulated small MS4s which want to be covered under this permit as Co-Permittees shall each submit a NOI to Ecology.

e. Operators of regulated small MS4s which are relying on another entity to satisfy all of their permit obligations shall submit a NOI to Ecology.

f. Operators of small MS4s designated by Ecology pursuant to S1.B.3 of this permit shall submit a NOI to Ecology within 120 days of receiving notification from Ecology that permit coverage is required.

3. Application requirements

a. For NOIs submitted after the issuance date of this Permit, the applicant shall include a certification that the public notification requirements of WAC 173-226-130(5) have been satisfied. Ecology will notify applicants in writing of their status concerning coverage under this permit within 90 days of Ecology's receipt of a complete NOI.

b. Each Permittee applying as a Co-Permittee shall submit a NOI provided in Appendix 5. The NOI will clearly identify the areas of the MS4 for which the Co-Permittee is responsible.

c. Permittees which are relying on another entity or entities to satisfy one or more of their permit obligations shall include with the NOI a summary of the permit obligations that will be carried out by another entity. The summary shall identify the other entity or entities and shall be signed by the other entity or entities. During the term of the permit, Permittees may terminate or amend shared responsibility arrangements by notifying Ecology, provided this does not alter implementation deadlines.

d. Secondary Permittees required to obtain coverage under this permit, and the *Western Washington Phase II Municipal Stormwater Permit* or the *Phase I Municipal Stormwater Permit* may obtain coverage by submitting a single NOI.

S2. AUTHORIZED DISCHARGES

A. This permit authorizes the discharge of stormwater to surface waters and to ground waters of the state from MS4s owned or operated by each Permittee covered under this permit, in the geographic area covered pursuant to S1.A. These discharges are subject to the following limitations:

1. Discharges to ground waters of the state through facilities regulated under the Underground Injection Control (UIC) program, Chapter 173-218 WAC, are not authorized under this permit.

2. Discharges to ground waters not subject to regulation under the federal Clean Water Act are authorized in this permit only under state authorities, Chapter 90.48 RCW, the Water Pollution Control Act

B. This permit authorizes discharges of non-stormwater flows to surface waters and to ground waters of the state from MS4s owned or operated by each Permittee covered under this permit, in the geographic area covered pursuant to S1.A, only under the following conditions:

1. The discharge is authorized by a separate NPDES permit or State Waste Discharge Permit.

2. The discharge is from emergency fire fighting activities.

3. The discharge is from another illicit or non-stormwater discharge that is managed by the Permittee as provided in Special Condition S5.B.3 or S6.D.3.

These discharges are also subject to the limitations in S2.A.1 and S.2.A.2, above.

C. This permit does not relieve entities that cause illicit discharges, including spills of oil or hazardous substances, from responsibilities and liabilities under state and federal laws and regulations pertaining to those discharges.

D. Discharges from MS4s constructed after the effective date of this permit shall receive all applicable state and local permits and use authorizations, including compliance with Chapter 43.21C RCW (the State Environmental Policy Act).

E. This permit does not authorize discharges of stormwater to waters within Indian Country or to waters subject to water quality standards of Indian Tribes, including portions of the Puyallup River and other waters on trust or restricted lands within the 1873 Survey Area of the Puyallup Tribe of Indians Reservation, except where authority has been specifically delegated to Ecology by the U.S. Environmental Protection Agency. The exclusion of such discharges from this permit does not waive any rights the State may have with respect to the regulation of the discharges.

S3. RESPONSIBILITIES OF PERMITTEES

A. Each Permittee covered under this Permit is responsible for compliance with the terms of this permit for the regulated small MS4s which they operate. Compliance with (1) or (2) below is required as applicable to each Permittee, whether the

Permittee has applied for coverage as a Permittee, a Co-Permittee or a Secondary Permittee..

1. All city, town and county Permittees are required to comply with all conditions of this permit, including any appendices referenced therein, except for section S6 Stormwater Management Program for Secondary Permittees.

2. All Secondary Permittees are required to comply with all conditions of this permit, including any appendices referenced therein, except for sections S5 Stormwater Management Program for Cities, Towns and Counties and S8.B and S8.C.

B. Permittees may rely on another entity to satisfy one or more of the requirements of this permit. Permittees that are relying on another entity to satisfy one or more of their permit obligations remain responsible for permit compliance if the other entity fails to implement the permit conditions. Permittees may rely on another entity provided all of the requirements of 40 CFR 122.35(a) are satisfied, including but not limited to:

1. The other entity, in fact, implements the permit requirements.

2. The other entity agrees to take on responsibility for implementation of the permit requirement(s) as indicated in the NOI.

S4. COMPLIANCE WITH STANDARDS

A. In accordance with RCW 90.48.520, the discharge of toxicants to waters of the State of Washington which would violate any water quality standard, including toxicant standards, sediment criteria, and dilution zone criteria is prohibited. The required response to such discharges is defined in section S4.F, below.

B. This permit does not authorize a discharge which would be a violation of Washington State Surface Water Quality Standards (WAC 173-201A), Ground Water Quality Standards (chapter 173-200 WAC), Sediment Management Standards (chapter 173-204 WAC), or human health-based criteria in the national Toxics Rule (Federal Register, Vol. 57, NO. 246, Dec. 22, 1992, pages 60848-60923). The required response to such discharges is defined in section S4.F, below.

C. The Permittee shall reduce the discharge of pollutants to the maximum extent practicable (MEP).

D. The Permittee shall use all known, available, and reasonable methods of prevention, control and treatment (AKART) to prevent and control pollution of waters of the State of Washington.

E. In order to meet the goals of the Clean Water Act, and comply with S4.A, S4.B, S4.C and S4.D, each Permittee shall comply with all of the applicable requirements of this permit as defined in S3 Responsibilities of Permittees.

F. A Permittee remains in compliance with S4 despite any discharges prohibited by S4.A or S4.B, when the Permittee undertakes the following response toward long-term water quality improvement:

1. A Permittee shall notify Ecology in writing within 30 days of becoming aware, based on credible site-specific information that a discharge from the MS4 owned or operated by the Permittee is causing or contributing to a known or likely violation of Water Quality Standards in the receiving water. Written notification provided under this subsection shall, at a minimum, identify the source of the site-specific information, describe the nature and extent of the known or likely violation in the receiving water, and explain the reasons why the MS4 discharge is believed to be causing or contributing to the problem. For ongoing or continuing violations, a single written notification to Ecology will fulfill this requirement.

2. In the event that Ecology determines, based on a notification provided under S4.F.1 or through any other means, that a discharge from a MS4 owned or operated by the Permittee is causing or contributing to a violation of Water Quality Standards in a receiving water, Ecology will notify the Permittee in writing that an adaptive management response outlined in S4.F.3 below is required, unless:

   a. Ecology determines that the violation of Water Quality Standards is already being addressed by a Total Maximum Daily Load (TMDL) or other enforceable water quality cleanup plan; or

   b. Ecology concludes the MS4 contribution to the violation will be eliminated through implementation of other permit requirements.

3. Adaptive Management Response

   a. Within 60 days of receiving a notification under S4.F.2, or by an alternative date established by Ecology, the Permittee shall review its Stormwater Management Program (SWMP) and submit a report to Ecology. The report shall include:

      i. A description of the operational and/or structural Best Management Practices (BMPs) that are currently being implemented to prevent or reduce any pollutants that are causing or contributing to the violation of Water Quality Standards, including a qualitative assessment of the effectiveness of each best management practice (BMP).

      ii. A description of potential additional operational and/or structural BMPs that will or may be implemented in order to apply AKART on a site-specific basis to prevent or reduce any pollutants that are causing or contributing to the violation of Water Quality Standards.

      iii. A description of the potential monitoring or other assessment and evaluation efforts that will or may be implemented to monitor, assess, or evaluate the effectiveness of the additional BMPs.

iv. A schedule for implementing the additional BMPs including, as appropriate: funding, training, purchasing, construction, monitoring, and other assessment and evaluation components of implementation.

b. Ecology will, in writing, acknowledge receipt of the report within a reasonable time and notify the Permittee when it expects to complete its review of the report. Ecology will either approve the additional BMPs and implementation schedule or require the Permittee to modify the report as needed to meet AKART on a site-specific basis. If modifications are required, Ecology will specify a reasonable time frame in which the Permittee shall submit and Ecology will review the revised report.

c. The Permittee shall implement the additional BMPs, pursuant to the schedule approved by Ecology, beginning immediately upon receipt of written notification of approval.

d. The Permittee shall include with each subsequent annual report the results of any monitoring, assessment or evaluation efforts conducted during the reporting period. If, based on the information provided under this subsection, Ecology determines that modification of the BMPs or implementation schedule is necessary to meet AKART on a site-specific basis, the Permittee shall make such modifications as Ecology directs. In the event there are ongoing violations of water quality standards despite the implementation of the BMP approach of this section, the Permittee may be subject to compliance schedules to eliminate the violation under WAC 173-201A-510(4) and WAC 173-226-180 or other enforcement orders as Ecology deems appropriate during the term of this permit.

e. A TMDL or other enforceable water quality cleanup plan that has been approved and is being implemented to address the MS4's contribution to the Water Quality Standards violation supersedes and terminates the S4.F.3 implementation plan.

f. Provided the Permittee is implementing the approved adaptive management response under this section, the Permittee remains in compliance with Condition S4, despite any on-going violations of Water Quality Standards identified under S4.A or B above.

g. The adaptive management process provided under Section S.4.F is not intended to create a shield for the Permittee from any liability it may face under 42 U.S.C. 9601 *et seq.* or RCW 70.105D.

G. Ecology may modify or revoke and reissue this General Permit in accordance with G14 General Permit Modification and Revocation if Ecology becomes aware of additional control measures, management practices or other actions beyond what is required in this permit, that are necessary to:

1. Reduce the discharge of pollutants to the MEP;

2. Comply with the state AKART requirements; or

3. Control the discharge of toxicants to waters of the State of Washington.

S5. STORMWATER MANAGEMENT PROGRAM FOR CITIES, TOWNS AND COUNTIES

This section applies to all Cities, Towns and Counties covered under this permit. Where the term "Permittee" is used in this section, the requirements apply to any City, Town or County, whether permit coverage is obtained as a Permittee or as a Co-Permittee.

New Permittees obtaining coverage after the issuance date of this permit shall fully meet the requirements in S5 as specified in an alternate schedule as a condition of coverage by Ecology.

A. All Permittees shall implement a Stormwater Management Program (SWMP) during the term of this permit. The SWMP shall be implemented, at a minimum, throughout the geographic area described for the Permittee in S1.A.

1. A SWMP is a set of actions and activities comprising the components listed in S5 and any additional actions necessary to meet the requirements of applicable TMDLs pursuant to S7 *Compliance with TMDL Requirements,* and S8 *Monitoring and Assessment*. The SWMP shall be designed to reduce the discharge of pollutants from the regulated small MS4 to the MEP, to satisfy the state requirement under Chapter 90.48 RCW to apply AKART prior to discharge, and to protect water quality.

2. Permittees shall continue implementation of existing stormwater management programs until they begin implementation of the updated stormwater management program in accordance with the terms of this permit, including implementation schedules.

3. Each Permittee shall prepare written documentation of the SWMP, called the SWMP Plan. The SWMP Plan shall be organized according to the program components in S5.B below or a format approved by Ecology, and shall be updated at least annually for submittal with the Permittee's annual reports to Ecology (see S9 Reporting and Recordkeeping). The SWMP Plan shall be written to inform the general public of planned SWMP activities for the upcoming calendar year, and shall include a description of:

a. Planned activities for each of the program components included in S5.B.1 through S5.B.6, and

b. Any additional planned actions to meet the requirements of applicable TMDLs pursuant to S7 *Compliance with Total Maximum Daily Load Requirements*.

c. Any additional planned actions to meet the requirements of S8 *Monitoring.*

4. Gathering, maintaining, and using information

    a. Each Permittee shall have an ongoing program for gathering, tracking, maintaining, and using information to evaluate SWMP development and implementation and permit compliance, and to set priorities.

        i. Each Permittee shall track the number of inspections performed, official enforcement actions taken, and types of public education activities implemented as required for each SWMP component. This information shall be included in the annual report.

        ii. Each Permittee shall track the estimated cost of development and implementation of each component of the SWMP. This information shall be provided to Ecology upon request.

5. Coordination among Permittees

    a. Coordination among entities covered under this permit is encouraged. The SWMP should include coordination mechanisms to encourage coordinated stormwater-related policies, programs and projects within adjoining or shared areas, including:

        i. Coordination mechanisms clarifying roles and responsibilities for the control of pollutants between physically interconnected MS4s covered by a municipal stormwater permit.

        ii. Coordinating stormwater management activities for shared water bodies among Permittees, to avoid conflicting plans, policies and regulations.

    b. The SWMP shall also include coordination mechanisms among departments within each jurisdiction to eliminate barriers to compliance with the terms of this permit. Permittees shall include a written description of internal coordination mechanisms in the Annual Report due no later than March 31, 2016.

B. The SWMP shall include the components listed below. To the extent allowable under state and federal law, all components are mandatory for each City, Town, and County covered under this permit, whether covered as an individual Permittee or as a Co-Permittee.

1. Public Education and Outreach

    Permittees shall implement a public education and outreach program to distribute educational materials to the community or conduct equivalent outreach activities about the impacts of stormwater discharges to water bodies and the steps the public can take to reduce pollutants in stormwater. Outreach and educational efforts should include a multimedia approach and shall be targeted and presented to specific audiences for increased effectiveness. The education program may be developed and implemented locally or regionally.

The minimum performance measures are:

a. All Permittees shall continue to implement a public education and outreach program designed to achieve improvements in the target audience's understanding of the problem and what they can do to solve it. The program shall, at a minimum, include the following, based on the land uses and target audiences found within the community:

   i. Information for the general public, including school-age children, about: the importance of improving water quality and protecting beneficial uses of waters of the state; potential impacts from stormwater discharges; methods for avoiding, minimizing, reducing and/or eliminating the adverse impacts of stormwater discharges; and actions individuals can take to improve water quality, including encouraging participation in local environmental stewardship activities and programs.

   ii. Information for businesses and the general public about: preventing illicit discharges, including what constitutes illicit discharges, the impacts of illicit discharges, and promoting the proper management and disposal of waste. Targeted business education should include topics appropriate to the type of business, such as the management of restaurant dumpsters and wastewater, and the use and storage of automotive chemicals, hazardous cleaning supplies, carwash soaps, and other hazardous materials.

   iii. Information for engineers, construction contractors, developers, development review staff, and land use planners about: technical standards, the development of stormwater site plans and erosion control plans, low impact development (LID) when it becomes available, and stormwater Best Management Practices (BMPs) for reducing adverse impacts from stormwater runoff from development sites.

b. All Permittees shall continue to implement a public education and outreach strategy. The strategy shall be designed to reach all of the target audiences identified within the geographic area of the Permittee's jurisdiction covered under this permit to meet the education and outreach goals listed in (a) above.

2. Public Involvement and Participation

Permittees shall provide ongoing opportunities for public involvement and participation such as advisory panels, public hearings, watershed committees, participation in developing rate-structures, or other similar activities. Permittees shall comply with applicable state and local public notice requirements when developing elements of the SWMP.

The minimum performance measures are:

a. Permittees shall implement a program or policy directive to create opportunities for the public to provide input during the decision making processes involving the development, implementation and update of the SWMP, including development and adoption of all required ordinances and regulatory mechanisms.

b. No later than May 31 each year, Permittees shall post on their website and make the latest version of the annual report and SWMP Plan available to the public. All other submittals should be available to the public upon request. Co-Permittees and other groups of Permittees that are developing the SWMP in a cooperative effort may post the updated SWMP Plan on a single entity's website. To comply with the posting requirement, a Permittee that does not maintain a website may submit the updated SWMP Plan in electronic format to Ecology for posting on its website.

3. Illicit Discharge Detection and Elimination

Each Permittee shall implement and enforce a program designed to prevent, detect, characterize, trace and eliminate illicit connections and illicit discharges into the MS4.

The minimum performance measures are:

a. Each Permittee shall continue to maintain a map of the MS4, showing the location of all known and new connections to the MS4 authorized or approved by the Permittee; all known outfalls; the names and locations of all waters of the state that receive discharges from those outfalls; and areas served by discharges to ground.

i. Field surveys conducted pursuant to the requirements of S5.B.3.c.iii. shall verify outfall locations and identify previously unknown outfalls on priority water bodies. Permittees shall, upon request and to the extent consistent with national security laws and directives, provide maps and mapping information to Ecology, other entities covered under this permit, other municipalities, and/or federally-recognized Indian Tribes. This permit does not preclude Permittees from recovering reasonable costs associated with fulfilling mapping information requests by other municipalities, federally-recognized Indian Tribes, Co-Permittees and Secondary Permittees.

ii. The preferred, but not required, format for mapping is an electronic format with fully described mapping standards. An example description is provided on Ecology's website.

iii. The Permittee shall maintain documentation of the information included in the map, and the map shall be updated periodically.

b. Each Permittee shall effectively prohibit, through ordinance or other regulatory mechanism, non-stormwater discharges into the MS4.

i. Each Permittee shall implement an ordinance or other regulatory mechanism that prohibits illicit discharges and authorizes enforcement actions, including on private property.

ii. Allowable discharges. The ordinance or other 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.
- Uncontaminated water from crawl space pumps.
- Footing drains.
- Flows from riparian habitats and wetlands.
- Discharges from emergency fire fighting activities in accordance with S2 *Authorized Discharges.*
- Non-stormwater discharges authorized by another NPDES permit or state waste discharge permit.

iii. Conditionally allowable discharges. The ordinance or other regulatory mechanism may allow the following categories of non-stormwater discharges only if the stated conditions are met:

- Discharges from potable water sources, including but not limited to water line flushing, hyperchlorinated water line flushing, fire hydrant system flushing, and pipeline hydrostatic test water. Planned discharges shall be dechlorinated to a total residual chlorine concentration of 0.1 ppm or less, pH-adjusted if necessary, and volumetrically and velocity controlled to prevent resuspension of sediments in the MS4.

- Discharges from lawn watering and other irrigation runoff. These discharges shall be minimized through, at a minimum, public education activities (see S5.B.1.) and water conservation efforts.

- Dechlorinated swimming pool, spa and hot tub discharges. The discharges shall be dechlorinated to a total residual chlorine concentration of 0.1 ppm or less, pH-adjusted and reoxygenated if necessary, and volumetrically and velocity controlled to prevent resuspension of sediments in the MS4. Discharges shall be thermally controlled to prevent an increase in temperature of the receiving water. 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 washdown that does not use detergents. The Permittee shall reduce these discharges through, at a minimum, public education activities (see S5.B.1) and/or water conservation efforts. To avoid washing pollutants into the MS4, Permittees shall minimize the amount of street wash and dust control water used.

- Other non-stormwater discharges. Other non-stormwater discharges shall be in compliance with the requirements of a pollution prevention plan reviewed by the Permittee which addresses control of such discharges.

iv. The ordinance or other regulatory mechanism shall further address any category of discharges in (ii) or (iii) above if the discharge is identified as a significant source 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 implement a compliance strategy that includes informal compliance actions such as public education and technical assistance, as well as the enforcement provisions of the ordinance or other regulatory mechanism. To implement an effective compliance strategy, the Permittee's ordinance or other regulatory mechanism may need to include the following tools:

- The application of operational and/or structural source control BMPs for pollutant generating sources associated with existing land uses and activities where necessary to prevent illicit discharges. The source control BMPs referenced in this subsection are in Volume IV of the 2004 *Stormwater Management Manual for Eastern Washington* or another technical manual approved by Ecology.

- The maintenance of stormwater facilities which discharge into the Permittee's MS4 in accordance with maintenance standards established under S5.B.5 where necessary to prevent illicit discharges.

vii. The Permittee's ordinance or other regulatory mechanism in effect as of the effective date of this permit shall be revised if necessary to meet the requirements of this section, no later than February 2, 2019.

c. Each Permittee shall implement an ongoing program designed to detect and identify illicit discharges and illicit connections into the Permittee's MS4. The program shall include the following components:

i. Procedures for conducting investigations of the Permittee's MS4, including field screening to identify potential sources.

ii. 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 illicit discharges, including spills.

iii. Field assessment activities, including outfalls, or facilities serving priority areas identified in (ii) above, during dry weather and for the purposes of verifying outfall locations and detecting illicit discharges.

Compliance with this provision shall be achieved by: field assessing at least 40% of the MS4 within the Permittee's coverage area no later than December 31, 2018 and on average 12% each year thereafter to verify outfall locations and detect illicit discharges.

iv. A publicly listed and publicized hotline or other telephone number for public reporting of spills and other illicit discharges.

v. Permittees shall provide adequate training 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, on the identification of an illicit discharge/connection, and on the proper procedures for reporting and responding, as appropriate, to the illicit discharge/connection. Follow-up training shall be provided as needed to address changes in procedures, techniques, requirements, or staffing. Permittees shall document and maintain records of the trainings provided and the staff trained.

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

d. Permittees shall implement an ongoing program designed to address illicit discharges, including spills, and illicit connections into the MS4. The plan shall include:

i. 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 address the evaluation of whether the discharge shall be immediately contained and steps to be taken for containment of the discharge.

ii. 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.

iii. Procedures for eliminating the discharge, including notification of appropriate authorities; notification of the property owner; technical assistance; follow-up inspections; and use of the compliance strategy developed pursuant to S5.B.3.b.vi including escalating enforcement and legal actions if the discharge is not eliminated.

iv. Compliance with the provisions in (i), (ii), and (iii) above, shall be achieved by meeting the following timelines:

- Immediately respond to all illicit discharges, including spills, which are determined to constitute a threat to human health, welfare, or the environment, consistent with General Condition G3.

- Investigate (or refer to the appropriate agency with the authority to act) within 7 days, any complaints, reports, or monitoring information that indicates a potential illicit discharge.

- Initiate an investigation within 21 days of any 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 an illicit connection, use the compliance strategy outlined in S5.B.3.b.vi in a documented effort to eliminate the illicit connection within 6 months. All known illicit connections to the MS4 shall be eliminated.

e. Permittees shall train staff who are responsible for identification, investigation, termination, cleanup, and reporting of illicit discharges, including spills, and illicit connections to conduct these activities. Follow-up training shall be provided as needed to address changes in procedures,

techniques, requirements, or staff. Permittees shall document and maintain records of the training provided and the staff trained.

f. Recordkeeping: Permittees shall track and maintain records of the activities conducted to meet the requirements of this section.

4. Construction Site Stormwater Runoff Control

All Permittees shall implement and enforce a program to reduce pollutants in any stormwater runoff to the MS4 from construction activities that disturb one acre or more, and from construction projects of less than one acre that are part of a larger common plan of development or sale.

Public and private projects, including projects proposed by the Permittee's own departments and agencies, shall comply with these requirements. The Permittee shall implement an ongoing process for ensuring proper project review, inspection, and compliance by its own departments and agencies.

The minimum performance measures are:

a. Permittees shall implement an ordinance or other regulatory mechanism to require erosion and sediment controls, and other construction-phase stormwater pollution controls at new development and redevelopment projects. The ordinance or other regulatory mechanism shall include sanctions to ensure compliance.

i. The ordinance or other regulatory mechanism shall apply, at a minimum, to construction sites disturbing one acre or more and to construction projects of less than one acre that are part of a larger common plan of development or sale.

ii. The ordinance or other regulatory mechanism shall require construction operators to adhere, at a minimum, to the requirements of Appendix 1, Core Element #2, including preparation of Construction Stormwater Pollution Prevention Plans (Construction SWPPPs) and application of BMPs as necessary to protect water quality, reduce the discharge of pollutants to the MEP, and satisfy state AKART requirements.

- The ordinance or other regulatory mechanism shall include requirements for construction site operators to implement appropriate erosion and sediment control BMPs. The ordinance or other regulatory mechanism shall include requirements for construction site operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality.

- Permittees shall document how the requirements of the ordinance or other regulatory mechanism protect water quality,

reduce the discharge of pollutants to the MEP, and satisfy state AKART requirements. Documentation shall include:

- How stormwater BMPs were selected;
- The pollutant removal expected from the selected BMPs;
- The technical basis which supports the performance claims for the selected BMPs; and
- How the selected BMPs will comply with applicable state water quality standards and satisfy the state requirement to apply AKART prior to discharge.

Permittees who choose to use the BMP selection, design, installation, operation and maintenance standards in the *Stormwater Management Manual for Eastern Washington* (2004), or another technical stormwater manual approved by Ecology, may cite this reference as the sole documentation that the ordinance or regulatory mechanism is protecting water quality, reducing the discharge of pollutants to the MEP, and satisfying state AKART requirements.

iii. The ordinance or other regulatory mechanism shall include appropriate, escalating enforcement procedures and actions.

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

v. The ordinance shall include a provision for access by qualified personnel to inspect construction-phase stormwater BMPs on private properties that discharge to the MS4.

b. Permittees shall implement procedures for site plan review which incorporate consideration of potential water quality impacts.

i. Prior to construction, Permittees shall review Construction SWPPPs for, at a minimum, all construction sites that disturb one acre or more, or are less than one acre and are part of a larger common plan of development or sale, to ensure that the plans are complete pursuant to the requirements of Appendix 1, Core Element #2. The Construction SWPPP review shall be performed by qualified personnel and shall be performed in coordination with S5.B.5.b.i review of Stormwater Site Plans.

- To comply with this provision, Permittees shall keep records of all projects disturbing one acre or more, and all projects of any size that are part of a common plan of development or sale that is one acre or more, that are approved after the effective date of

this permit. Permittees shall keep records of these projects for five years or until construction is completed, whichever is longer.

- If the Permittee chooses to allow construction sites to apply the "Erosivity Waiver" in Appendix 1, Core Element #2, the Permittee is not required to review Construction SWPPPs for individual sites applying the waiver.

ii. Permittees shall provide adequate training for all staff involved in permitting, planning, and review to carry out these provisions. The training records to be kept include dates, activities or course descriptions, and names and positions of staff in attendance.

c. Permittees shall implement procedures for site inspection and enforcement of construction stormwater pollution control measures.

i. Each Permittee shall implement a procedure for keeping records of inspections and enforcement actions by staff, including inspection reports, warning letters, notices of violations, and other enforcement records.

ii. Permittees shall provide adequate training for all staff involved in plan review, field inspection and enforcement to carry out the provisions of this SWMP component. The training records to be kept include dates, activities or course descriptions, and names and positions of staff in attendance.

iii. All new construction sites that disturb one acre or more, or are part of a larger common plan of development or sale, shall be inspected at least once by qualified personnel.

- To comply with this provision, Permittees shall keep records of all projects disturbing one acre or more, and all projects of any size that are part of a common plan of development or sale that is one acre or more, that are approved after the effective date of this permit.

- Permittees shall keep project records for five years or until construction is completed, whichever is longer.

- Compliance with this inspection requirement will be determined by the Permittee having and maintaining records of an inspection program that is designed to inspect all sites. Compliance during this permit term will be determined by the Permittee achieving an inspection rate of at least 80% of the sites.

d. Permittees shall provide information to construction site operators about training available on how to install and maintain effective erosion and

sediment controls and how to comply with the requirements of Appendix 1 and apply the BMPs described in Chapter 7 of the *Stormwater Management Manual for Eastern Washington (2004)*, or another technical stormwater manual approved by Ecology.

Permittees shall keep copies of information provided to construction site operators, and if information is distributed to a large number of design professionals at once, the dates of the mailings and lists of recipients.

e. If the Permittee chooses to allow construction sites to apply the "Erosivity Waiver" in Appendix 1, Core Element #2, the Permittee shall keep a record of all construction sites that provide notice to the Permittee of their intention to apply the waiver. The Permittee shall investigate complaints about these sites in the same manner as it will investigate complaints about sites that have submitted Construction SWPPPs for review pursuant to S5.B.4.b.i. above.

5. Post-Construction Stormwater Management for New Development and Redevelopment

All Permittees shall implement and enforce a program to address post-construction stormwater runoff to the MS4 from new development and redevelopment projects that disturb one acre or more, and from projects of less than one acre that are part of a larger common plan of development or sale. The program shall ensure that controls to prevent or minimize water quality impacts are in place.

Public and private projects, including projects proposed by the Permittee's own departments and agencies, shall comply with these requirements. The Permittee shall implement an ongoing process for ensuring proper project review, inspection, and compliance by its own departments and agencies.

The minimum performance measures are:

a. Permittees shall implement an ordinance or other regulatory mechanism that requires post-construction stormwater controls at new development and redevelopment projects. The ordinance or other regulatory mechanism shall include sanctions to ensure compliance. The local program adopted to meet the requirements of S5.B.5.a.ii(a) and (b)(2) below shall apply to all applications[1] submitted after December 31, 2017 and shall apply to projects approved prior to January 1, 2018, which have not started construction[2] by December 31, 2023.

[1] In this context, "application" means, at a minimum a complete project description, site plan, and, if applicable, SEPA checklist. Permittees may establish additional elements of a complete application.

[2] In this context, "started construction" means at a minimum the site work associated with, and directly related to the approved project has begun. For example: grading the project site to final grade or utility installation. Simply

i. The ordinance or other regulatory mechanism shall apply, at a minimum, to new development and redevelopment sites that discharge to the MS4 and that disturb one acre or more or are less than one acre and are part of a larger common plan of development or sale.

ii. The ordinance or other regulatory mechanism shall require project proponents and property owners to adhere to the minimum technical requirements in Appendix 1 and shall include BMP selection, design, installation, operation, and maintenance standards necessary to protect water quality, reduce the discharge of pollutants to the MEP, and satisfy state AKART requirements.

(a) All Permittees shall implement a policy of encouraging project proponents to maintain natural drainages to the maximum extent possible, including reducing the total amount of impervious surfaces created by the project.

No later than December 31, 2017, Permittees shall allow non-structural preventive actions and source reduction approaches such as Low Impact Development (LID) techniques, 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 and long term maintenance.

(b) The ordinance or other regulatory mechanism shall include requirements for project proponents and property owners to implement appropriate runoff treatment, flow control, and source control BMPs considering the proposed land use at the site to minimize adverse impacts to water quality.

(1) Each Permittee shall implement a specific hydrologic method or methods for calculating runoff volumes and flow rates to ensure consistent sizing of structural BMPs in their jurisdiction and to facilitate plan review. Permittees may allow proponents of unique or complex projects to use other methodologies.

(2) No later than December 31, 2017, Permittees must require projects approved under S5.B.5 to retain runoff generated on-site for, at a minimum, the 10-year, 24-hour rainfall event or a local equivalent. Permittees may meet this requirement using on-site or regional stormwater facilities. Permittees that are not already meeting this

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clearing the project site does not constitute the start of construction. Permittees may establish additional requirements related to the start of construction.

requirement in existing ordinances shall develop and implement criteria to determine when it is infeasible for a project to meet this requirement[3], including but not limited to:

- Site/Engineering-based conditions such as soils that do not allow for infiltration of the required volume of stormwater runoff; proximity to a known hazardous waste site or landfill; proximity to a drinking water well or spring; proximity to an onsite sewage system or underground storage tank; setbacks from structures; landslide hazard areas or slopes; seasonal high groundwater; incompatibility with the surrounding drainage system from elevation or location; areas prone to erosion.
- Incompatibility with uses related to concerns such as public safety, protection from spills, contaminated sites, or frequently flooded areas.
- Incompatibility with state or federal laws.
- Permittees shall submit to Ecology with the Annual Report due no later than March 31, 2018 a summary of the criteria defining infeasibility, or a citation for the criteria adopted pursuant to a regional LID manual.

(3) To meet the requirements of Appendix 1, Core Element #5 (Runoff Treatment) and Core Element #6 (Flow Control), Permittees may choose to apply the definitions and requirements in Chapter 2.2.5 and 2.2.6 of the *Stormwater Management Manual for Eastern Washington* (2004), or portions thereof, and the methods described in Chapters 4 and 6 of the *Stormwater Management Manual for Eastern Washington* (2004), or another technical stormwater manual approved by Ecology.

(c) The ordinance or other regulatory mechanism shall include requirements to ensure adequate ongoing long-term operation and maintenance of the BMPs approved by the Permittee.

(d) Permittees shall document how the requirements of the ordinance or other regulatory mechanism protect water quality,

[3] Ecology issued a grant in 2012 to work with Permittees to develop an Eastern Washington LID Manual. Permittees may choose to meet this requirement by adopting the criteria developed in that process.

reduce the discharge of pollutants to the MEP, and satisfy state AKART requirements. Documentation shall include:

(1) How stormwater BMPs were selected;

(2) The pollutant removal expected from the selected BMPs;

(3) The technical basis which supports the performance claims for the selected BMPs; and

(4) How the selected BMPs will comply with applicable state water quality standards and satisfy the state requirement to apply AKART prior to discharge.

Permittees who choose to use the BMP selection, design, installation, operation and maintenance standards in the *Stormwater Management Manual for Eastern Washington* (2004), or another technical stormwater manual approved by Ecology, may cite this reference as the sole documentation that the ordinance or regulatory mechanism is protecting water quality, reducing the discharge of pollutants to the MEP, and satisfying state AKART requirements.

iii. The ordinance or other regulatory mechanism shall include provisions for both construction-phase and post-construction access for Permittees to inspect stormwater BMPs on private properties that discharge to the MS4. If deemed necessary for post-construction access, the ordinance or other regulatory mechanism may, in lieu of requiring that continued access be granted to the Permittee's staff or qualified personnel, instead require private property owners to provide annual certification by a qualified third party that adequate maintenance has been performed and the facilities are operating as designed to protect water quality.

iv. The ordinance or other regulatory mechanism shall include appropriate, escalating enforcement procedures and actions.

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

b. Permittees shall implement procedures for site plan review which incorporate consideration of potential water quality impacts.

i. Prior to construction, Permittees shall review Stormwater Site Plans for, at a minimum, all new development and redevelopment sites that meet the thresholds in S5.B.5.a.i to ensure that the plans include stormwater pollution prevention measures that meet the requirements in S5.B.5.a.ii.

To comply with this provision, 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 one acre or more, that are approved after the effective date of this permit. Permittees shall keep records of these projects for five years or until construction is completed, whichever is longer.

ii. The site plan review shall be performed by qualified personnel and shall include review of Construction Stormwater Pollution Prevention Plans where required pursuant to S5.B.4.b.i.

c. Permittees shall implement procedures for site inspection and enforcement of post-construction stormwater control measures.

i. 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. At a minimum, inspection and enforcement procedures shall be applied to all new development and redevelopment sites that meet the thresholds in S5.B.5.a.i.

ii. Structural BMPs shall be inspected at least once during installation by qualified personnel.

iii. Structural BMPs shall be inspected at least once every five years after final installation, or more frequently as determined by the Permittee to be necessary to prevent adverse water quality impacts, to ensure that adequate maintenance is being performed. The inspection shall be performed by qualified personnel.

iv. Recommended operation and maintenance standards for structural BMPs in the *Stormwater Management Manual for Eastern Washington* (2004), or another technical stormwater manual approved by Ecology, shall be met. If a BMP is not inspected, the Permittee is not in violation of this provision unless a violation of water quality standards occurs due to lack of operation and maintenance of the facility.

v. If a site is inspected and problems are identified, the Permittee is not in violation of this provision, provided the Permittee requires and confirms that necessary operation, maintenance and/or repair to correct the problem is performed as soon as practicable.

d. Permittees shall provide adequate training for all staff involved in permitting, planning, review, inspection, and enforcement to carry out the provisions of this SWMP component.

e. Permittees shall provide information to design professionals about training available on how to comply with the requirements of Appendix 1 and apply the BMPs described in the *Stormwater Management Manual for*

Eastern Washington (2004), or another technical stormwater manual approved by Ecology.

f. To comply with these provisions, Permittees shall keep records of all projects disturbing one acre or more, and all projects of any size that are part of a common plan of development or sale that is one acre or more, that are approved after the effective date of this permit.

i. Permittees shall keep project records for five years or until construction is completed, whichever is longer, with the following exceptions: approved site plans and O&M plans shall be kept as needed to comply with the ongoing inspection requirements of this permit.

ii. The training records to be kept (for d, above) include dates, activities or course descriptions, and names and positions of staff in attendance.

iii. Permittees shall keep copies of information that is provided to design professionals (for e, above); and, if information is distributed to a large number of design professionals at once, the dates of the mailings and lists of recipients.

6. Municipal Operations and Maintenance

Permittees shall implement an operation and maintenance program that includes a training component and has the ultimate goal of preventing or reducing pollutant runoff from municipal operations.

The minimum performance measures are:

a. Permittees shall implement a schedule of municipal Operation and Maintenance activities (an O&M Plan). Permittees shall review and, if needed, update the O&M Plan no later than August 1, 2017. The schedule shall include BMPs that, when applied to the municipal activity or facility, will protect water quality, reduce the discharge of pollutants to the MEP, and satisfy state AKART requirements. Chapter 8 of the *Stormwater Management Manual for Eastern Washington* provides a selection of appropriate BMPs that meet these requirements for various types of facilities. Operation and maintenance standards in the O&M Plan shall be at least as protective as those included in Chapters 5, 6, and 8 of the *Stormwater Management Manual for Eastern Washington* (2004), or another technical stormwater manual approved by Ecology. Record keeping shall be done pursuant to the requirements in S9 *Reporting and Recordkeeping*.

i. The O&M Plan shall include appropriate pollution prevention and good housekeeping procedures for all of the following types of facilities and/or activities listed below.

(a) Stormwater collection and conveyance system, including catch basins, stormwater sewer pipes, open channels, culverts, structural stormwater controls, and structural runoff treatment and/or flow control facilities. The O&M Plan shall address, but is not limited to: regular inspections, cleaning, proper disposal of waste removed from the system in accordance with Appendix 6 *Street Waste Disposal*, and record keeping. Permittees shall implement catch basin cleaning, stormwater system maintenance, scheduled structural BMP inspections and maintenance, and pollution prevention/good housekeeping practices. Decant water shall be disposed of in accordance with Appendix 6 *Street Waste Disposal.*

(b) Roads, highways, and parking lots. The O&M Plan shall address, at a minimum: deicing, anti-icing, and snow removal practices; snow disposal areas and runoff from snow storage areas; material (e.g. salt, sand, or other chemical) storage areas; and all-season BMPs to reduce road and parking lot debris and other pollutants from entering the MS4. Permittees shall implement all pollution prevention/good housekeeping practices established in the O&M Plan for all roads, highways, and parking lots with more than 5,000 square feet of pollutant generating impervious surface that are owned, operated, or maintained by the Permittee.

(c) Vehicle fleets. The O&M Plan shall address, at a minimum: storage, washing, maintenance, repair, and fueling of municipal vehicle fleets. Permittees shall conduct all vehicle and equipment washing and maintenance in a self-contained covered building or in designated wash and/or maintenance areas operated to separate wash water from stormwater.

(d) Municipal buildings. The O&M Plan shall address, at a minimum: cleaning, washing, painting and other maintenance activities. Permittees shall implement all pollution prevention/good housekeeping practices established in the O&M Plan for buildings owned, operated, or maintained by the Permittee.

(e) Parks and open space. The O&M Plan shall address, at a minimum: proper application of fertilizer, pesticides, and herbicides; pet waste BMPs; sediment and erosion control; BMPs for landscape maintenance and vegetation disposal; trash and dumpster management; and BMPs for building exterior cleaning and maintenance. Permittees shall implement park and open space maintenance pollution prevention/good housekeeping practices at all park areas and other open spaces owned or operated by the Permittee.

(f) Construction Projects. Public construction projects shall comply with the requirements applied to private projects. All construction

projects owned or operated by the Permittee that are required to have an NPDES permit shall be covered under either the *General NPDES Permit for Stormwater Discharges Associated with Construction Activities* or another NPDES permit that authorizes stormwater discharges associated with the activity. All public projects shall include construction and post-construction controls selected and implemented pursuant to the requirements in Appendix 1.

(g) Industrial Activities. All facilities owned or operated by the Permittee that are required to have NPDES permit coverage shall be covered under the *General NPDES Permit for Stormwater Discharges Associated with Industrial Activities* or another NPDES permit that authorizes stormwater discharges associated with the activity.

(h) Material storage areas, heavy equipment storage areas and maintenance areas. Permittees shall implement a Stormwater Pollution Prevention Plan to protect water quality at each of these facilities owned or operated by the Permittee and not required to have coverage under the *General NPDES Permit for Stormwater Discharges Associated with Industrial Activities* or another NPDES permit that authorizes stormwater discharges associated with the activity. Generic Stormwater Pollution Prevention Plans that can be applied at multiple sites may be used to comply with this requirement.

(i) Flood management projects. Permittees shall assess water quality impacts in the design of all new flood management projects that are associated with the MS4 or that discharge to the MS4, including considering use of controls that minimize impacts to site hydrology and still meet project objectives.

(j) Other facilities that would reasonably be expected to discharge contaminated runoff. Permittees shall implement BMPs to protect water quality from discharges from these sites in the O&M Plan.

ii. The O&M plan shall include a schedule of inspections and requirements for record keeping pursuant to S9 *Reporting and Recordkeeping*.

(a) A minimum of 95% of all known stormwater treatment and flow control facilities (except catch basins) owned, operated or maintained by the Permittee shall be inspected at least once every two years, with problem facilities identified during inspections to be inspected more frequently.

(b) All catch basins and inlets owned or operated by the Permittee shall be inspected at least once by December 31, 2018 and every two years thereafter. Clean catch basins if the inspection indicates

cleaning is needed to comply with the maintenance standards adopted pursuant to S5.B.6.a.

The following alternatives to the standard approach of inspecting catch basins once by December 31, 2018 and every two years thereafter may be applied to all or portions of the system:

- The catch basin inspection schedule of once by December 31, 2018 and every two years thereafter may be changed as appropriate to meet the maintenance standard based on maintenance records of double the length of time of the proposed inspection frequency. In the absence of maintenance records for catch basins, the Permittee may substitute written statements to document a specific, less frequent inspection schedule. Written statements shall be based on actual inspection and maintenance experiences and shall be certified in accordance with G19 *Certification and Signature.*
- Inspections at least once by December 31, 2018 and every two years thereafter may be conducted on a "circuit basis" whereby 25% of catch basins and inlets within each circuit are inspected to identify maintenance needs. Include in the inspection the catch basin immediately upstream of any system outfall, if applicable. Clean all catch basins within a given circuit for which the inspection indicates cleaning is needed to comply with maintenance standards established under S5.B.4.a, above.
- The Permittee may clean all pipes, ditches, catch basins, and inlets within a circuit once during the permit term. Circuits selected for this alternative must drain to a single point.

(c) Spot checks for potentially damaged stormwater treatment and flow control facilities will be conducted after major storm events (24 hour storm event with a 10-year or greater recurrence interval). Any needed repair or maintenance shall be performed as soon as practicable pursuant to the findings of a regular inspection or spot check.

iii. The O&M plan shall identify the department (and where appropriate, the specific staff) responsible for performing each activity.

b. Permittees shall provide training for all employees who have primary construction, operations, or maintenance job functions that are likely to impact stormwater quality. Training shall address the importance of protecting water quality, operation and maintenance requirements, inspection procedures, and ways to perform their job activities to prevent or

minimize impacts to water quality. Follow-up training shall be provided as needed to address changes in procedures, methods or staffing.

S6. STORMWATER MANAGEMENT PROGRAM FOR SECONDARY PERMITTEES

A. This section applies to all Secondary Permittees, whether coverage under this Permit is obtained individually or as a Co-Permittee with a City and/or Town and/or County and/or another Secondary Permittee.

New Secondary Permittees subject to this Permit shall fully meet the requirements of this section as modified in footnotes in S6.D below, or as established as a condition of coverage by Ecology.

1. To the extent allowable under state, federal and local law, all components are mandatory for each Secondary Permittee covered under this permit, whether covered as an individual Permittee or as a Co-Permittee.

2. Each Secondary Permittee shall develop and implement a stormwater management program (SWMP). A SWMP is a set of actions and activities comprising the components listed in S6 and any additional actions necessary to meet the requirements of applicable TMDLs pursuant to S7 *Compliance with TMDL Requirements,* and S8 *Monitoring and Assessment*. The SWMP shall be designed to reduce the discharge of pollutants from regulated small MS4s to the MEP and protect water quality.

3. Unless an alternate implementation schedule is established by Ecology as a condition of permit coverage, the SWMP shall be developed and implemented in accordance with the schedules contained in this section and shall be fully developed and implemented no later than four and one-half years from initial permit coverage date. Secondary Permittees that are already implementing some or all of the required SWMP components shall continue implementation of those components.

4. Secondary Permittees may implement parts of their SWMP in accordance with the schedule for cities, towns and counties in S5, provided they have signed a memorandum of understanding or other agreement to jointly implement the activity or activities with one or more jurisdictions listed in S1.D.2.a, and submitted a copy of the agreement to Ecology.

5. Each Secondary Permittee shall prepare written documentation of the SWMP, called the SWMP Plan. The SWMP Plan shall include a description of program activities for the upcoming calendar year.

B. Coordination

Secondary Permittees shall coordinate stormwater-related policies, programs and projects within a watershed and with interconnected MS4s. Where relevant and appropriate, the SWMP shall coordinate among departments of the Secondary Permittee to ensure compliance with the terms of this Permit.

C. Legal Authority

To the extent allowable under state law and federal law, each Secondary Permittee shall be able to demonstrate that they can operate pursuant to legal authority which authorizes or enables the Secondary Permittee to control discharges to and from MS4s owned or operated by the Secondary Permittee.

This legal authority may be a combination of statutes, ordinances, permits, contracts, orders, interagency agreements, or similar instruments.

D. Stormwater Management Program for Secondary Permittees

Permittees that are already implementing some or all of the SWMP components in this section shall continue implementation of those components of their SWMP.

The SWMP for Secondary Permittees shall include the following components:

1. Public Education and Outreach

Each Secondary Permittee shall implement the following stormwater education strategies:

a. Storm drain inlets owned or operated by the Secondary Permittee that are located in maintenance yards, in parking lots, along sidewalks, and at pedestrian access points shall be clearly labeled with a message similar to "Dump no waste – Drains to water body".[4]

As identified during visual inspection and regular maintenance of storm drain inlets per the requirements of S6.D.3.d and S6.D.6.a.i below, or as otherwise reported to the Secondary Permittee, any inlet having a label that is no longer clearly visible and/or easily readable shall be re-labeled within 90 days.

b. Each year beginning no later than three years from the initial date of permit coverage, public ports, colleges and universities shall distribute educational information to tenants and residents on the impact of stormwater discharges on receiving waters, and steps that can be taken to reduce pollutants in stormwater runoff. Distribution may be by hard copy or electronic means. Appropriate topics may include:

i. How stormwater runoff affects local waterbodies.

ii. Proper use and application of pesticides and fertilizers.

iii. Benefits of using well-adapted vegetation.

[4] New Secondary Permittees shall label all inlets as described in S5.D.1.a no later than four years from the initial date of permit coverage.

iv. Alternative equipment washing practices including cars and trucks that minimize pollutants in stormwater.

v. Benefits of proper vehicle maintenance and alternative transportation choices; proper handling and disposal of wastes, including the location of hazardous waste collection facilities in the area.

vi. Hazards associated with illicit connections and illicit discharges.

vii. Benefits of litter control and proper disposal of pet waste.

2. Public Involvement and Participation

Each year no later than May 31, each Secondary Permittee shall:

a. Make the annual report available on the Secondary Permittee's website.

b. Make the latest updated version of the SWMP Plan available on the Secondary Permittee's website.

c. To comply with the posting requirement, a Secondary Permittee that does not maintain a website may submit the updated SWMP Plan in electronic format to Ecology for posting on Ecology's website.

3. Illicit Discharge Detection and Elimination

Each Secondary Permittee shall:

a. From the initial date of permit coverage, comply with all relevant ordinances, rules, and regulations of the local jurisdiction(s) in which the Secondary Permittee is located that govern non-stormwater discharges.

b. Implement appropriate policies prohibiting illicit discharges[5] and an enforcement plan to ensure compliance with illicit discharge policies.[6] These policies shall address, at a minimum: illicit connections; non-stormwater discharges, including spills, of hazardous materials; and improper disposal of pet waste and litter.

i. Allowable discharges. The policies do not need to prohibit the following categories of non-stormwater discharges:

- Diverted stream flows.

- Rising ground waters.

[5] New Secondary Permittees shall develop and implement appropriate policies prohibiting illicit discharges, and identify possible enforcement mechanisms as described in S6.D.3.b no later than one year from the initial date of permit coverage.

[6] New Secondary Permittees shall develop and implement an enforcement plan as described in S6.D.3.b no later than 18 months from the initial date of permit coverage.

- 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.
- Uncontaminated water from crawl space pumps.
- Footing drains.
- Flows from riparian habitats and wetlands.
- Discharges from emergency fire fighting activities in accordance with S2 *Authorized Discharges*.
- Non-stormwater discharges authorized by another NPDES or state waste discharge permit.

ii. Conditionally allowable discharges. The policies may allow the following categories of non-stormwater discharges only if the stated conditions are met and such discharges are allowed by local codes:

- Discharges from potable water sources, including but not limited to water line flushing, hyperchlorinated water line flushing, fire hydrant system flushing, and pipeline hydrostatic test water. Planned discharges shall be dechlorinated to a total residual chlorine concentration of 0.1 ppm or less, pH-adjusted if necessary, and volumetrically and velocity controlled to prevent resuspension of sediments in the MS4.
- Discharges from lawn watering and other irrigation runoff. These discharges shall be minimized through, at a minimum, public education activities and water conservation efforts conducted by the Secondary Permittee and/or the local jurisdiction.
- Dechlorinated swimming pool, spa and hot tub discharges. The discharges shall be dechlorinated to a total residual chlorine concentration of 0.1 ppm or less, pH-adjusted and

reoxygenated if necessary, and volumetrically and velocity controlled to prevent resuspension of sediments in the MS4. Discharges shall be thermally controlled to prevent an increase in temperature of the receiving water. 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 Secondary Permittee shall reduce these discharges through, at a minimum, public education activities and/or water conservation efforts conducted by the Secondary Permittee and/or the local jurisdiction. To avoid washing pollutants into the MS4, the Secondary Permittee shall minimize the amount of street wash and dust control water used.

- Other non-stormwater discharges shall be in compliance with the requirements of a pollution prevention plan reviewed by the Permittee which addresses control of such discharges.

iii. The Secondary Permittee shall address any category of discharges in (ii) or (iii) above if the discharge is identified as a significant source of pollutants to waters of the State.

c. Maintain a storm sewer system map showing the locations of all known storm drain outfalls, labeling the receiving waters, other than ground water, and delineating the areas contributing runoff to each outfall. Make the map (or completed portions of the map) available on request to Ecology and to the extent appropriate, to other Permittees. The preferred format for mapping is an electronic format with fully described mapping standards. An example description is provided on Ecology's website.[7]

d. Conduct field inspections and visually inspect for illicit discharges at all known MS4 outfalls. Visually inspect at least one third (on average) of all known outfalls each year beginning no later than two years from the initial date of permit coverage. Implement procedures to identify and remove any illicit discharges. Keep records of inspections and follow-up activities.[8]

[7] New Secondary Permittees shall meet the requirements of S6.D.4.c no later than four and one-half years from the initial date of permit coverage.

[8] New Secondary Permittees shall develop and implement procedures described in S6.D.3.d no later than two years from the initial date of permit coverage.

e. Implement a spill response plan that includes coordination with a qualified spill responder.[9]

f. No later than two years from the initial date of permit coverage, provide staff training or coordinate with existing training efforts to educate staff on proper best management practices for preventing illicit discharges. Train all Permittee staff who, as part of their normal job responsibilities, have a role in preventing such illicit discharges.

4. Construction Site Stormwater Runoff Control

From the initial date of permit coverage, each Secondary Permittee shall:

a. Comply with all relevant ordinances, rules, and regulations of the local jurisdiction(s) in which the Secondary Permittee is located that govern construction phase stormwater pollution prevention measures.

b. Ensure that all construction projects under the functional control of the Secondary Permittee which require a construction stormwater permit obtain coverage under the NPDES *General Permit for Stormwater Discharges Associated with Construction Activities,* or an individual NPDES permit prior to discharging construction related stormwater.

c. Coordinate with the local jurisdiction regarding projects owned or operated by other entities which discharge into the Secondary Permittee's MS4, to assist the local jurisdiction with achieving compliance with all relevant ordinances, rules, and regulations of the local jurisdiction(s).

d. Provide training or coordinate with existing training efforts to educate relevant staff in erosion and sediment control BMPs and requirements, or hire trained contractors to perform the work.

e. Coordinate as requested with Ecology or the local jurisdiction to provide access for inspection of construction sites or other land disturbances, which are under the functional control of the Secondary Permittee during the land disturbing activities and/or construction period.

5. Post-Construction Stormwater Management for New Development and Redevelopment

From the initial date of permit coverage, each Secondary Permittee shall:

a. Comply with all relevant ordinances, rules and regulations of the local jurisdiction(s) in which the Secondary Permittee is located that govern post-construction stormwater pollution prevention measures.

[9] New Secondary Permittees shall develop and implement a spill response plan as described in S6.D.3.e no later than four and one-half years from the initial date of permit coverage.

b. Coordinate with the local jurisdiction regarding projects owned or operated by other entities which discharge into the Secondary Permittee's MS4, to assist the local jurisdiction with achieving compliance with all relevant ordinances, rules, and regulations of the local jurisdiction(s).

6. Pollution Prevention and Good Housekeeping for Municipal Operations

Each Secondary Permittee shall:

a. Implement a municipal operation and maintenance (O&M) plan to minimize stormwater pollution from activities conducted by the Secondary Permittee. The O&M Plan shall include appropriate pollution prevention and good housekeeping procedures for all of the following operations, activities, and/or types of facilities that are present within the Secondary Permittee's boundaries and under the functional control of the Secondary Permittee.[10]

i. Stormwater collection and conveyance systems, including catch basins**,** stormwater pipes, open channels, culverts, and stormwater treatment and/or flow control BMPs and facilities. The O&M Plan shall address, at a minimum: scheduled inspections and maintenance activities, including cleaning and proper disposal of waste removed from the system. Secondary Permittees shall properly maintain stormwater collection and conveyance systems owned or operated by the Secondary Permittee and regularly inspect and maintain all stormwater facilities to ensure facility function.

Secondary Permittees shall establish maintenance standards that are as protective or more protective of facility function than those specified in Chapters 5, 6 and 8 of the 2004 *Stormwater Management Manual for Eastern Washington*.

Secondary Permittees shall review their maintenance standards to ensure they are consistent with the requirements of this section.

Secondary Permittees shall conduct spot checks of potentially damaged permanent stormwater treatment and flow control facilities following major storm events (24 hour storm event with a 10 year or greater recurrence interval).

ii. Roads, highways, and parking lots. The O&M Plan shall address, but is not limited to: deicing, anti-icing, and snow removal practices; snow disposal areas; material (e.g. salt, sand, or other chemical) storage areas; all-season BMPs to reduce road and parking lot debris and other pollutants from entering the MS4.

[10] New Secondary Permittees shall develop and implement the operation and maintenance plan described in S6.D.6.a no later than three years from the initial date of permit coverage.

iii. Vehicle fleets. The O&M Plan shall address, but is not limited to: storage, washing, and maintenance of Secondary Permittee vehicle fleets; and fueling facilities. Secondary Permittees shall conduct all vehicle and equipment washing and maintenance in a self-contained covered building or in designated wash and/or maintenance areas.

iv. External building maintenance. The O&M Plan shall address, building exterior cleaning and maintenance including cleaning, washing, painting; and maintenance and management of dumpsters; and other maintenance activities.

v. Parks and open space. The O&M Plan shall address, but is not limited to: proper application of fertilizer, pesticides, and herbicides; sediment and erosion control; BMPs for landscape maintenance and vegetation disposal; and trash and pet waste management.

vi. Material storage facilities and heavy equipment maintenance or storage yards. Secondary Permittees shall develop and implement a Stormwater Pollution Prevention Plan to protect water quality at each of these facilities owned or operated by the Secondary Permittee and not covered under the *General NPDES Permit for Stormwater Discharges Associated with Industrial Activities* or under another NPDES permit that authorizes stormwater discharges associated with the activity.

vii. Other facilities that would reasonably be expected to discharge contaminated runoff. The O&M Plan shall address proper stormwater pollution prevention practices for each facility.

b. From the initial date of permit coverage, Secondary Permittees shall also have permit coverage for all facilities operated by the Secondary Permittee that are required to be covered under the *General NPDES Permit for Stormwater Discharges Associated with Industrial Activities* or another NPDES permit that authorizes surface water discharges associated with the activity.

c. The O&M Plan shall include sufficient documentation and records as necessary to demonstrate compliance with the O&M Plan requirements in S6.D.6.a.(i) through (vii) above.

d. No later than three years from the initial date of permit coverage, Secondary Permittees shall implement a program designed to train all employees whose construction, operations, or maintenance job functions may impact stormwater quality. The training shall address:

i. The importance of protecting water quality.

ii. The requirements of this Permit.

iii. Operation and maintenance requirements.

iv. Inspection procedures.

v. Ways to perform their job activities to prevent or minimize impacts to water quality.

vi. Procedures for reporting water quality concerns, including potential illicit discharges, including spills.

S7. COMPLIANCE WITH TOTAL MAXIMUM DAILY LOAD REQUIREMENTS

The following requirements apply if an applicable TMDL is approved for stormwater discharges from MS4s owned or operated by the Permittee. Applicable TMDLs are TMDLs which have been approved by EPA on or before the issuance date of this permit, or prior to the date that Ecology issues coverage, whichever is later.

A. 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. Each annual report shall include a summary of relevant SWMP and Appendix 2 activities conducted in the TMDL area to address the applicable TMDL parameter(s).

B. For applicable TMDLs not listed in Appendix 2, compliance with this permit shall constitute compliance with those TMDLs.

C. For TMDLs that are approved by EPA after this permit is issued, Ecology may establish TMDL-related permit requirements through future permit modification if Ecology determines implementation of actions, monitoring or reporting necessary to demonstrate reasonable further progress toward achieving TMDL waste load allocations, and other targets, are not occurring and shall be implemented during the term of this permit or when this permit is reissued. Permittees are encouraged to participate in development of TMDLs within their jurisdiction and to begin implementation.

S8. MONITORING AND ASSESSMENT

A. All Permittees including Secondary Permittees shall provide, in each annual report, a description of any stormwater monitoring or stormwater-related studies conducted by the Permittee during the reporting period. If other stormwater monitoring or stormwater-related studies were conducted on behalf of the Permittee during the reporting period, or if stormwater-related investigations conducted by other entities were reported to the Permittee during the reporting period, a brief description of the type of information gathered or received shall be included in the annual report.

Annual reporting of any monitoring, studies, or analyses conducted as part of S8.B below must follow the requirements specified in the approved Quality Assurance Project Plans (QAPPs).

B. Stormwater Management Program Effectiveness Studies. Each city and county Permittee listed in S1.D.2.a.i and S1.D.2.a.ii shall collaborate with other Permittees to select, propose, develop, and conduct Ecology-approved studies to assess, on a regional or sub-regional basis, effectiveness of permit-required stormwater management program activities and best management practices. Permittees shall:

1. Review the individual study ideas that were proposed in Permittees' annual reports due March 31, 2010 and add new ideas for collaborative studies of permit-required programmatic, operational, or structural best management practices. For each study idea, discuss: what data are needed to evaluate the effectiveness of the practice; how Permittees' stormwater management programs might be improved based on the findings of a study; and potential partnerships between Permittees whereby data can be collected efficiently and effectively.

2. Rank the study ideas and compile a final list of twelve to fifteen study ideas for Eastern Washington. For each of these twelve to fifteen study ideas, identify a single Permittee as lead entity and also identify the sub-region or other grouping of Permittees that will participate.

3. On or before June 30, 2016, submit the ranked list of twelve to fifteen study ideas for Eastern Washington to Ecology. Include a brief summary of the data collection that will be necessary to evaluate the effectiveness of the practice. For each study idea, list the lead entity and the other Permittees that will participate.

4. Lead entities shall develop detailed study design proposals for a combined total of no fewer than eight and no more than twelve of the top-ranked ideas. For each study, describe the purpose, objectives, design, and methods; list the Permittees that will participate, and their roles and responsibilities; describe anticipated outcomes; identify methods to report the results; and describe expected modifications to the Permittees' stormwater management programs.

5. On or before June 30, 2017, lead entities shall submit the detailed proposals to Ecology in both electronic and paper form.

6. Lead entities shall submit a Quality Assurance Project Plan (QAPP) for each study within six months of Ecology's written approval of each detailed proposal. A combined total of no fewer than eight and no more than twelve QAPPs shall be submitted from all lead entities. All QAPPs shall be submitted in both electronic and paper form. If Ecology does not request changes or provide written approval within 90 days of the QAPP submittal, the QAPP is considered approved as submitted.

7. Lead entities of a minimum of four studies shall begin to implement each study no later than six months following approval of the QAPP. Lead entities for the

remainder of the studies shall begin to implement each study no later than fifteen months following approval of the QAPP.

8. For all studies, lead entities shall describe interim results and status of the study in their annual reports throughout the duration of the study.

9. For all studies, lead entities and/or participating Permittees shall enter all applicable data collected as part of conducting the study into Ecology's Environmental Information Management (EIM) database before the end of the water year in which it is collected, or within six months of collecting the sample, whichever is later.

10. All participating Permittees shall report the final results of each study and recommend future actions based on the findings. Reports and recommendations shall be submitted to Ecology no later than six months after completion of the study and by other means and timelines identified in the approved QAPPs.

C. Each city and county Permittee listed in S1.D.2.a.i and S1.D.2.a.ii shall provide, in each annual report, a description of the Permittee's participation in Eastern Washington Stormwater Management Program Effectiveness Studies planning efforts, and related outcomes.

S9. REPORTING AND RECORDKEEPING

A. No later than March 31 of each year beginning in 2016, each Permittee shall submit an annual report. The reporting period for the first annual report will be January 1, 2015 through December 31, 2015. The reporting period for all subsequent annual reports will be the previous calendar year unless otherwise specified.

Permittees shall submit annual reports electronically using Ecology's WQWebDMR program available on Ecology's website at http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html unless otherwise directed by Ecology.

Permittees unable to submit electronically through Ecology's WQWebDMR must contact Ecology to request a waiver and obtain instructions on how to submit an annual report in an alternative format.

B. Each Permittee is required to keep all records related to this permit for at least five years.

C. 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.

D. Annual report for Cities, Towns and Counties

Each annual report shall include the following:

1. A copy of the Permittee's current Stormwater Management Program Plan (SWMP Plan) as required by S5.A.2.
2. Submittal of the annual report form as provided by Ecology pursuant to S9.A, describing the status of implementation of the requirements of this permit during the reporting period.
3. Attachments to the annual report form including summaries, descriptions, reports, and other information as required, or as applicable, to meet the conditions of this permit during the reporting period. Refer to Appendix 3 for annual report questions.
4. If applicable, notice that the MS4 is relying on another governmental entity to satisfy any of the obligations under this permit.
5. Certification and signature pursuant to G19.D, and notification of any changes to authorization pursuant to G19.C.
6. 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.

E. Annual report for Secondary Permittees

.Each annual report shall include the following:

1. Submittal of the annual report form as provided by Ecology pursuant to S9.A, describing the status of implementation of the requirements of this permit during the reporting period.
2. Attachments to the annual report form including summaries, descriptions, reports, and other information as required, or as applicable, to meet the conditions of this permit during the reporting period. Refer to Appendix 4 for annual report questions.
3. Certification and signature pursuant to G19.D, and notification of any changes to authorization pursuant to G19.C.
4. If applicable, notice that the MS4 is relying on another governmental entity to satisfy any of the obligations under this permit.
5. Secondary Permittees shall include with the annual report notification of any jurisdictional boundary changes resulting in an increase or decrease in the Permittee's geographic area of permit coverage during the reporting period.

GENERAL CONDITIONS

G1. DISCHARGE VIOLATIONS

All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit.

G2. PROPER OPERATION AND MAINTENANCE

The Permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment, and control (and related appurtenances) which are installed or used by the Permittee for pollution control to achieve compliance with the terms and conditions of this permit.

G3. NOTIFICATION OF DISCHARGE INCLUDING SPILLS

If a Permittee has knowledge of a discharge, including spills, into or from a MS4 which could constitute a threat to human health, welfare, or the environment, the Permittee shall:

A. Take appropriate action to correct or minimize the threat to human health, welfare, and/or the environment.

B. Notify the Ecology regional office and other appropriate spill response authorities immediately but in no case later than within 24 hours of obtaining that knowledge. The Ecology Central Regional Office 24-hour number is 509-575-2490, and for the Eastern Regional Office the 24-hour number is 509-329-3400.

C. Immediately report spills or discharges of oils or hazardous substances to the Ecology regional office and to the Washington Emergency Management Division, 1-800-258-5990.

G4. BYPASS PROHIBITED

The intentional bypass of stormwater from all or any portion of a stormwater treatment BMP whenever the design capacity of the treatment BMP is not exceeded, is prohibited unless the following conditions are met:

A. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the Clean Water Act (*CWA*); and

B. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated stormwater, or maintenance during normal dry periods.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

G5. RIGHT OF ENTRY

The Permittee shall allow an authorized representative of Ecology, upon the presentation of credentials and such other documents as may be required by law at reasonable times:

A. To enter upon the Permittee's premises where a discharge is located or where any records shall be kept under the terms and conditions of this permit;

B. To have access to, and copy at reasonable cost and at reasonable times, any records that shall be kept under the terms of the permit;

C. To inspect at reasonable times any monitoring equipment or method of monitoring required in the permit;

D. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities; and

E. To sample at reasonable times any discharge of pollutants.

G6. DUTY TO MITIGATE

The Permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

G7. PROPERTY RIGHTS

This permit does not convey any property rights of any sort, or any exclusive privilege.

G8. COMPLIANCE WITH OTHER LAWS AND STATUTES

Nothing in this permit will be construed as excusing the Permittee from compliance with any other applicable federal, state, or local statutes, ordinances, or regulations.

G9. MONITORING

A. Representative Sampling: Samples and measurements taken to meet the requirements of this permit shall be representative of the volume and nature of the monitored discharge, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions affecting effluent quality.

B. Records Retention: The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least five years. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology. On request, monitoring data and analysis shall be provided to Ecology.

C. Recording of Results: For each measurement or sample taken, the Permittee shall record the following information: (1) the date, exact place and time of sampling; (2) the individual who performed the sampling or measurement; (3) the dates the analyses were performed; (4) who performed the analyses; (5) the analytical techniques or methods used; and (6) the results of all analyses.

D. Test Procedures: All sampling and analytical methods used to meet the monitoring requirements specified in this permit shall conform to the Guidelines Establishing Test Procedures for the Analysis of Pollutants contained in 40 CFR Part 136, unless otherwise specified in this permit or approved in writing by Ecology.

E. Flow Measurement: Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated, and maintained to ensure that the accuracy of the measurements is consistent with the accepted industry standard for that type of device. Frequency of calibration shall be in conformance with manufacturer's recommendations or at a minimum frequency of at least one calibration per year. Calibration records should be maintained for a minimum of three years.

F. Lab Accreditation: All monitoring data, except for flow, temperature, conductivity, pH, total residual chlorine, and other exceptions approved by Ecology, shall be prepared by a laboratory registered or accredited under the provisions of, Accreditation of Environmental Laboratories, Chapter 173-50 WAC. Soils and hazardous waste data are exempted from this requirement pending accreditation of laboratories for analysis of these media by Ecology. Quick methods of field detection of pollutants including nutrients, surfactants, salinity, and other parameters are exempted from this requirement when the purpose of the sampling is identification and removal of a suspected illicit discharge.

G. Additional Monitoring: Ecology may establish specific monitoring requirements in addition to those contained in this permit by permit modification.

G10. REMOVED SUBSTANCES

With the exception of decant from street waste vehicles, the Permittee shall not allow collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of stormwater to be re-suspended or reintroduced to the storm sewer system or to waters of the state. Decant from street waste vehicles resulting from cleaning stormwater facilities may be reintroduced only when other practical means are not available and only in accordance with the Street Waste Disposal Guidelines in Appendix 6. Solids generated from maintenance of the MS4 may be reclaimed, recycled, or reused when allowed by local codes and ordinances. Soils that are identified as contaminated pursuant to Chapter 173-350 WAC shall be disposed at a qualified solid waste disposal facility (see Appendix 6).

G11. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit will not be affected thereby.

G12. REVOCATION OF COVERAGE

The director may terminate coverage under this General Permit in accordance with Chapter 43.21B RCW and Chapter 173-226 WAC. Cases where coverage may be terminated include, but are not limited to the following:

A. Violation of any term or condition of this General Permit;

B. Obtaining coverage under this General Permit by misrepresentation or failure to disclose fully all relevant facts;

C. A change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge;

D. A determination that the permitted activity endangers human health or the environment, or contributes significantly to water quality standards violations;

E. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090;

F. Nonpayment of permit fees assessed pursuant to RCW 90.48.465;

Revocation of coverage under this General Permit may be initiated by Ecology or requested by any interested person.

G13. TRANSFER OF COVERAGE

The director may require any discharger authorized by this General Permit to apply for and obtain an individual permit in accordance with Chapter 43.21B RCW and Chapter 173-226 WAC.

G14. GENERAL PERMIT MODIFICATION AND REVOCATION

This General Permit may be modified, revoked and reissued, or terminated in accordance with the provisions of WAC 173-226-230. Grounds for modification, revocation and re-issuance, or termination include, but are not limited to the following:

A. A change occurs in the technology or practices for control or abatement of pollutants applicable to the category of dischargers covered under this General Permit;

B. Effluent limitation guidelines or standards are promulgated pursuant to the CWA or chapter 90.48 RCW, for the category of dischargers covered under this General Permit;

C. A water quality management plan containing requirements applicable to the category of dischargers covered under this General Permit is approved;

D. Information is obtained which indicates that cumulative effects on the environment from dischargers covered under this General Permit are unacceptable; or

E. Changes made to State law reference this permit.

G15. REPORTING A CAUSE FOR MODIFICATION OR REVOCATION

A Permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and re-issuance under Condition G12, G14, or 40 CFR 122.62 shall report such plans, or such information, to Ecology so that a decision can be made on whether action to modify, or revoke and reissue this permit will be required. Ecology may then require submission of a new or amended application. Submission of such application does not relieve the Permittee of the duty to comply with this permit until it is modified or reissued.

G16. APPEALS

A. The terms and conditions of this General Permit, as they apply to the appropriate class of dischargers, are subject to appeal within thirty days of issuance of this general permit, in accordance with Chapter 43.21B RCW, and Chapter 173-226 WAC.

B. The terms and conditions of this General Permit, as they apply to an individual discharger, can be appealed in accordance with Chapter 43.21B RCW within thirty days of the effective date of coverage of that discharger. Consideration of an appeal of general permit coverage of an individual discharger is limited to the general permit's applicability or non-applicability to that individual discharger.

C. The appeal of general permit coverage of an individual discharger does not affect any other dischargers covered under this General Permit. If the terms and conditions of this general permit are found to be inapplicable to any individual discharger(s), the matter will be remanded to Ecology for consideration of issuance of an individual permit or permits.

D. Modifications of this permit can be appealed in accordance with Chapter 43.21B RCW and Chapter 173-226 WAC.

G17. PENALTIES

40 CFR 122.41(a)(2) and (3), 40 CFR 122.41(j)(5), and 40 CFR 122.41(k)(2) are hereby incorporated into this permit by reference.

G18. DUTY TO REAPPLY

The Permittee shall apply for permit renewal at least 180 days prior to the specified expiration date of this permit.

G19. CERTIFICATION AND SIGNATURE

All formal submittals to Ecology shall be signed and certified.

A. All permit applications shall be signed by either a principal executive officer or ranking elected official.

B. All formal submittals required by this permit shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

1. The authorization is made in writing by a person described above and submitted to Ecology, and

2. The authorization specifies either an individual or a position having responsibility for the overall development and implementation of the stormwater management program. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

C. Changes to authorization. If an authorization under General Condition G19.B.2 is no longer accurate because a different individual or position has responsibility for the overall development and implementation of the stormwater management program, a new authorization satisfying the requirements of General Condition G19.B.2 shall be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.

D. Certification. Any person signing a formal submittal under this permit shall make the following certification:

"I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that Qualified Personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for willful violations."

G20. NON-COMPLIANCE NOTIFICATION

In the event it is unable to comply with any of the terms and conditions of this permit, the Permittee must:

A. Notify Ecology of the failure to comply with the permit terms and conditions in writing within 30 days of becoming aware that the non-compliance has occurred. The written notification must include all of the following:

1. A description of the non-compliance, including dates.

2. Beginning and ending dates of the non-compliance, and if the non-compliance has not been corrected, the anticipated date of correction.

3. Steps taken or planned to reduce, eliminate, or prevent reoccurrence of the non-compliance.

B. Take appropriate action to stop or correct the condition of non-compliance.

G21. UPSETS

Permittees shall meet the conditions of 40 CFR 122.41(n) regarding "Upsets." The conditions are as follows:

A. Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

B. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of paragraph (C) of this condition are met. Any determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, will not constitute final administrative action subject to judicial review.

C. Conditions necessary for demonstration of upset. A Permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and that the Permittee can identify the cause(s) of the upset;

2. The permitted facility was at the time being properly operated; and

3. The Permittee submitted notice of the upset as required in 40 CFR 122.41(l)(6)(ii)(B) (24-hour notice of noncompliance).

4. The Permittee complied with any remedial measures required under 40 CFR 122.41(d) (Duty to Mitigate).

D. Burden of proof. In any enforcement proceeding, the Permittee seeking to establish the occurrence of an upset has the burden of proof.

DEFINITIONS AND ACRONYMS

"40 CFR" means Title 40 of the Code of Federal Regulations, which is the codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the federal government.

"ADT" means Average Daily Traffic.

"AKART" means All Known, Available, and Reasonable methods of prevention, control, and Treatment. See also the State Water Pollution Control Act, sections 90.48.010 RCW and 90.48.520 RCW.

"All known, available, and reasonable methods of prevention, control, and treatment" refers to the state Water Pollution Control Act, RCW 90.48.010 and 90.48.520.

"Applicable TMDL" means a TMDL which has been approved by EPA on or before the issuance date of this permit, or prior to the date that Ecology issues coverage under this permit, whichever is later..

"Average Daily Traffic" means the expected number of vehicles using a roadway. Projected average daily traffic volumes are considered in designing a roadway or roadway improvement. ADT volumes shall be estimated using "Trip Generation" published by the *Institute of Transportation Engineers* or from a traffic study prepared by a professional engineer or transportation specialist with expertise in traffic volume estimation. ADT volumes shall be estimated for the design year or expected life of the project (the intent is for treatment facilities to be added in the soonest period of disruptive construction). For project sites with seasonal or varied use, evaluate the highest period of expected traffic impacts.

"Beneficial Uses" means uses of waters of the state, which include but are not limited to: use for domestic, stock watering, industrial, commercial, agricultural, irrigation, mining, fish and wildlife maintenance and enhancement, recreation, generation of electric power and preservation of environmental and aesthetic values, and all other uses compatible with the enjoyment of the public waters of the state.

"Best Management Practices" are the schedules of activities, prohibitions of practices, maintenance procedures, and structural and/or managerial practices approved by Ecology that, when used singly or in combination, prevent or reduce the release of pollutants and other adverse impacts to waters of Washington State.

"BMP" means Best Management Practice.

"Bypass" means the diversion of stormwater from any portion of a stormwater treatment facility.

"Census urban area" means Urbanized Area.

"Certified Erosion and Sediment Control Lead" means an individual who is knowledgeable in the principles and practices of erosion and sediment control. The CESCL shall have the skills to assess: the site conditions and construction activities that could impact the quality of stormwater; and the effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges. The CESCL shall have current certification through an

approved erosion and sediment control training program that meets the minimum training standards established by Ecology (see BMP C160 in the *Stormwater Management Manual for Eastern Washington* (2004)).

"CESCL" means Certified Erosion and Sediment Control Lead.

"Circuit" means a portion of a MS4 discharging to a single point or serving a discrete area determined by, traffic volumes, land use, topography, or the configuration of the MS4.

"Common plan of development or sale" means a site where multiple separate and distinct construction activities may be taking place at different times on different schedules and/or by different contractors, but still under a single plan. Examples include: 1) phased projects and projects with multiple filings or lots, even if the separate phases or filings/lots will be constructed under separate contract or by separate owners (*e.g.* a development where lots are sold to separate builders); 2) a development plan that may be phased over multiple years, but is still under a consistent plan for long-term development; and 3) projects in a contiguous area that may be unrelated but still under the same contract, such as construction of a building extension and a new parking lot at the same facility. If the project is part of a common plan of development or sale, the disturbed area of the entire plan shall be used in determining permit requirements.

"Component" or "Program Component" means an element of the Stormwater Management Program listed in S5 Stormwater *Management Program for Cities, Towns, and Counties* or S6 *Stormwater Management Program for Secondary Permittees,* S7 *compliance with Total Maximum Daily Load Requirements,* or S8 *Monitoring* of this permit.

"Co-Permittee" means any owner or operator of a regulated small MS4 that is in a cooperative agreement with at least one other applicant for coverage under this permit. A Co-Permittee owns or operates a regulated small MS4 located within or in proximity to another regulated MS4. A Co-Permittee is only responsible for complying with the conditions of this permit relating to discharges from the MS4 the Co-Permittee owns or operates. See also 40 CFR 122.26(b)(1)

"CWA" means the federal Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended in Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483, and Pub. L. 97-117, 33 U.S.C. 1251 *et. seq.*

"Director" means the Director of the Washington State Department of Ecology, or an authorized representative.

"Entity" means a governmental body or a public or private organization.

"EPA" means the U.S. Environmental Protection Agency

"Existing conditions" are the impervious surfaces, drainage systems, land cover, native vegetation and soils that exist at a site prior to any changes associated with achieving the proposed development conditions. Approved permits and engineering plans may be required. If sites have impervious areas and drainage systems that were built without approved permits, then the existing condition is defined as those that existed prior to the issue date of this

Permit. Existing conditions may be verified by using aerial photography or other records. Existing conditions are used for hydrologic analysis at the site unless a City or County imposes other requirements.

"General Permit" means a permit which covers multiple dischargers of a point source category within a designated geographical area, in lieu of individual permits being issued to each discharger.

"Ground water" means water in a saturated zone or stratum beneath the surface of the land or below a surface water body. Refer to chapter 173-200 WAC.

"Hazardous substance" means any liquid, solid, gas, or sludge, including any material, substance, product, commodity, or waste, regardless of quantity, that exhibits any of the physical, chemical, or biological properties described in WAC 173-303-090 or WAC 173-303-100.

"Heavy equipment maintenance or storage yard" means an uncovered area where any heavy equipment, such as mowing equipment, excavators, dump trucks, backhoes, or bulldozers are washed or maintained, or where at least five pieces of heavy equipment are stored on a long term basis.

"High ADT Roadways and Parking Areas" are any road with ADT greater than 30,000 vehicles per day; and parking areas with more than 100 trip ends per 1,000 SF of gross building area or greater than 300 total trip ends are considered to be high-use traffic areas. Examples include commercial buildings with a frequent turnover of customers and other visitors.

"High-Use Sites" generate high concentrations of oil due to high traffic turnover or the frequent transfer of oil and/or other petroleum products. High-use sites are land uses where sufficient quantities of free oil are likely to be present such that they can be effectively removed with special treatment. A high-use site is any one of the following:

- A road intersection with expected ADT of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvements; or
- A commercial or industrial site with an expected trip end count equal to or greater than 100 vehicles per 1,000 square feet of gross building area (best professional judgment should be used in comparing this criterion with the following criterion); or
- A customer or visitor parking lot with an expected trip end count equal to or greater than 300 vehicles (best professional judgment should be used in comparing this criterion with the preceding criterion); or
- Commercial on-street parking areas on streets with an expected total ADT count equal to or greater than 7,500; or
- Fueling stations and facilities; or
- A commercial or industrial site subject to petroleum storage and transfer in excess of 1,500 gallons per year (not including locations where heating fuel is routinely delivered to end users and the annual amount of heating oil used at the site is the sole basis for the

site meeting this definition; heating fuel handling and storage facilities are subject to this definition); or

- A commercial or industrial site subject to use, storage, or maintenance of a fleet of 25 or more diesel vehicles that are over 10 tons gross weight (trucks, buses, trains, heavy equipment, etc.); or
- Maintenance and repair facilities for vehicles, aircraft, construction equipment, railroad equipment or industrial machinery and equipment; or
- Outdoor areas where hydraulic equipment is stored; or
- Log storage and sorting yards and other sites subject to frequent use of forklifts and/or other hydraulic equipment; or
- Railroad yards.

"Hydrologic modification of a wetland" means, for the purpose of stormwater management, that the wetland will receive a greater total volume of surface runoff following the proposed development than it receives in the current condition.

"Hyperchlorinated" means water that contains more than 10 mg/Liter chlorine.

"Illicit connection" means any infrastructure connection to the MS4 that is not intended, permitted or used for collecting and conveying stormwater or non-stormwater discharges allowed as specified in this permit (S5.B.3 and S6.D.3). Examples include sanitary sewer connections, floor drains, channels, pipelines, conduits, inlets, or outlets that are connected directly to the MS4.

"Illicit discharge" means any discharge to a MS4 that is not composed entirely of storm water or of non-stormwater discharges allowed as specified in this permit (S5.B.3 and S6.D.3).

LID means Low Impact Development.

"Low ADT Roadways and Parking Areas" are urban roads with ADT fewer than 7,500 vehicles per day; rural roads and freeways with ADT less than 15,000 vehicles per day; and parking areas with less than 40 trip ends per 1,000 SF of gross building area or fewer than 100 total trip ends per day are considered to be low-use traffic areas. Examples include most residential parking, and employee-only parking areas for small office parks or other commercial buildings. Urban roads are located within designated Urban Growth Management Areas; rural roads are located outside designated Urban Growth Management Areas. Freeways, defined as fully controlled and partially controlled limited access highways, may be located either inside or outside of Urban Growth Management Areas.

"Low Density Residential Land Use" means, for the purpose of permit section S8 *Monitoring and Assessment*, one dwelling unit per 1 to 5 acres.

"Low Impact Development" means a stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design.

"Material Storage Facilities" means an uncovered area where bulk materials (liquid, solid, granular, etc.) are stored in piles, barrels, tanks, bins, crates, or other means.

"Maximum Extent Practicable" refers to paragraph 402(p)(3)(B)(iii) of the federal Clean Water Act, which reads as follows: "Permits for discharges from municipal storm sewers shall require controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques, and system, design, and engineering methods, and other such provisions as the Administrator or the State determines appropriate for the control of such pollutants."

"MEP" means Maximum Extent Practicable.

"Moderate ADT Roadways and Parking Areas" are urban roads with ADT between 7,500 and 30,000 vehicles per day; rural roads and freeways with ADT between 15,000 and 30,000 vehicles per day; and parking areas with between 40 and 100 trip ends per 1,000 SF of gross building area or between 100 and 300 total trip ends per day are considered to be moderate-use traffic areas. Examples include visitor parking for small to medium commercial buildings with a limited number of daily customers. Urban roads are located within designated Urban Growth Management Areas; rural roads are located outside designated Urban Growth Management Areas. Freeways, defined as fully controlled and partially controlled limited access highways, may be located either inside or outside of Urban Growth Management Areas.

"Moderate-Use Sites" include moderate ADT roadways and parking areas (see definition above); primary access points for high-density residential apartments; most intersections controlled by traffic signals; and transit center bus stops. These sites are expected to generate sufficient concentrations of metals that additional runoff treatment is needed to protect water quality in non-exempt surface waters.

"MS4" means Municipal Separate Storm Sewer System.

"Municipal Separate Storm Sewer" means a conveyance, or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade 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) having jurisdiction over disposal of wastes, storm water, or other wastes, 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 CWA that discharges to waters of Washington State;

(ii) designed or used for collecting or conveying stormwater;

(iii) which is not a combined sewer; and

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

(v) which is defined as "large" or "medium" or "small" or otherwise designated by Ecology pursuant to 40 CFR 122.26.

"National Pollutant Discharge Elimination System" means the national program for issuing, modifying, revoking, and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of the Federal Clean Water Act, for the discharge of pollutants to surface waters of the state from point sources. These permits are referred to as NPDES permits and, in Washington State, are administered by the Washington State Department of Ecology.

"New development" is the conversion of previously undeveloped or pervious surfaces to impervious surfaces and managed landscape areas not specifically exempt in the "Exemptions" or "Partial Exemptions" sections of Appendix 1. Projects that add new lanes on an existing roadway or otherwise expand the pavement edge are included in the definition of new development because they create new impervious surfaces; these projects are subject to the thresholds and requirements for new development as set forth in Appendix 1.

"New Permittee" means a City, Town or County that is subject to the *Eastern Washington Phase II Municipal Stormwater General Permit* and was not subject to the permit prior to August 1, 2014.

"New Secondary Permittee" means a Secondary Permittee that is covered under a municipal stormwater general permit and was not covered by the permit prior to August 1, 2014.

"NOI" means Notice of Intent.

"Non-Pollutant Generating Impervious Surfaces" are considered to be insignificant sources of pollutants in stormwater runoff. Roofs that are subject only to atmospheric deposition or normal heating, ventilation, and air conditioning vents are considered NPGIS, unless the roofing material is uncoated metal. The following may also be considered NPGIS: paved bicycle pathways and pedestrian sidewalks that are separated from and not subject to drainage from roads for motor vehicles, fenced fire lanes, infrequently used maintenance access roads, and "in-slope" areas of roads. Sidewalks that are regularly treated with sand, salt or other de-icing/anti-icing agents are not considered NPGIS.

"Notice of Intent" means an application or request for coverage under a General NPDES Permit pursuant to WAC 173-226-200.

"NPDES" means National Pollutant Discharge Elimination System.

"NPGIS" means Non-Pollutant Generating Impervious Surfaces.

"Outfall" means point source as defined by 40 CFR 122.2 at the point where a discharge leaves the MS4 and discharges to waters of the State. Outfall does not include pipes, tunnels, or other conveyances which connect segments of the same stream or other surface waters and are used to convey primarily surface waters (i.e. culverts).

"Permittee" unless otherwise noted, includes Co-Permittee, Secondary Permittee, and New Secondary Permittee.

"PGIS" means Pollutant Generating Impervious Surfaces.

"Physically interconnected" means that one MS4 is connected to another storm sewer system in such a way that it allows for direct discharges to the second system. For example, the roads with drainage systems and municipal streets of one entity are physically connected directly to a storm sewer system belonging to another entity.

"Pollutant Generating Impervious Surfaces" are surfaces that are considered to be significant sources of pollutants in stormwater runoff. Such surfaces include those that are subject to vehicular use, industrial activities, or storage of erodible or leachable materials that receive direct rainfall or run-on or blow-in of rainfall. Metal roofs are considered to be PGIS unless coated with an inert, non-leachable material. Roofs that are subject to venting of indoor pollutants from manufacturing, commercial or other operations or processes are also considered PGIS. A surface, whether paved or not, will be considered PGIS 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.

"Proposed development conditions" are the impervious surfaces, drainage systems, land cover, native vegetation and soils that are proposed to exist at the site at the completion of the project (complete build-out). Also called "post-developed conditions."

"QAPP" means Quality Assurance Project Plan.

"Qualified Personnel" means someone who has had professional training in the aspects of stormwater management for which they are responsible and are under the functional control of the Permittee. Qualified Personnel may be staff members, contractors, and/or volunteers.

"Quality Assurance Project Plan" means a document that describes the objectives of an environmental study and the procedures to be followed to achieve those objectives.

"RCW" means the Revised Code of Washington State.

"Redevelopment" is the replacement or improvement of impervious surfaces on a developed site. The project proponent shall identify what Core Elements in Appendix 1 apply to all of the new and replaced impervious surfaces created by the project. All new impervious surfaces added during a redevelopment project are subject to the Core Elements in Appendix 1. The requirements for redevelopment projects set forth in the Core Elements in Appendix 1 apply to the impervious surfaces altered or replaced by a redevelopment project. Impervious surface replacements defined as exempt activities in the "Exemptions" section of Appendix 1 and at other projects identified in the "Partial Exemptions" section of Appendix 1 have reduced requirements.

"Regulatory Threshold" refers to the one-acre size, including the exception noted below, of new development and redevelopment projects that shall be regulated under this permit. The threshold includes construction site activities and new development and redevelopment projects that result in a land disturbance of equal to or greater than one acre and construction activities and projects less than one acre that are part of a larger common plan of development or sale. This threshold is a minimum requirement that may be exceeded by a local jurisdiction.

"Replaced impervious surfaces" means, for structures, the removal and replacement of any exterior impervious surfaces or foundation; or, for other impervious surfaces, the removal down to bare soil, or base course, and replacement. Exemptions and partial exemptions are defined in Appendix 1 of this permit.

"Runoff" is water that travels across the land surface, or laterally through the ground near the land surface, and discharges to water bodies either directly or through a collection and conveyance system. See also "Stormwater."

"Rural roads" are roads located outside designated Urban Growth Management Areas.

"Secondary Permittee" is an operator of a MS4 that is not a city, town or county. Secondary Permittees include special purpose districts and other public entities that meet the criteria in S1.B.

"Shared water bodies" means water bodies, including downstream segments, lakes and estuaries that receive discharges from more than one Permittee.

"Short Duration Storm" means the 3-hour duration design storm distribution, described in Chapter 4.2.1 of the *Stormwater Management Manual for Eastern Washington* (2004), which represents the short durations, high intensities, and smaller volumes that characterize summer thunderstorms in eastern Washington.

"Significant contributor" means a discharge that contributes a loading of pollutants considered to be sufficient to cause or exacerbate the deterioration of receiving water quality or instream habitat conditions.

Small Municipal Separate Storm Sewer System" or "Small MS4" is a conveyance or system of conveyances including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, and/or storm drains which is not defined as a "large" or "medium" MS4 pursuant to 40 CFR 122.26(b)(4) & (7) or designated under 40 CFR 122.26 (a)(1)(v).

"Stormwater" means runoff during and following precipitation and snowmelt events, including surface runoff, drainage or interflow.

"Stormwater Associated with Industrial and Construction Activity" means the discharge from any conveyance used for collecting and conveying stormwater directly related to manufacturing, processing or raw materials storage areas at an industrial plant, or associated with clearing, grading and/or excavation, and required to have an NPDES permit in accordance with 40 CFR 122.26.

"Stormwater Management Manual for Eastern Washington" means the technical manual (Publication No. 04-10-076) published by the Department of Ecology in September 2004.

"Stormwater Management Program" means a set of actions and activities designed to reduce the discharge of pollutants from the MS4 to the MEP and to protect water quality, and comprising the components listed in S5 or S6 of this permit and any additional actions necessary to meet the requirements of applicable TMDLs pursuant to S7 *Compliance with TMDL Requirements* and S8 *Monitoring and Assessment*.

"SWMMEW" means the *Stormwater Management Manual for Eastern Washington* (2004).

"SWMP" means Stormwater Management Program.

"SWMP Plan" means Stormwater Management Program Plan.

"TMDL" means Total Maximum Daily Load.

"TMDL waste load allocation" means the allowable load of a single pollutant from a single contributing point source.

"Total Maximum Daily Load" means a water cleanup plan. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation shall include a margin of safety to ensure that the water body can be used for the purposes the state has designated. The calculation shall also account for seasonable variation in water quality. Water quality standards are set by states, territories, and tribes. They identify the uses for each water body, for example, drinking water supply, contact recreation (swimming), and aquatic life support (fishing), and the scientific criteria to support that use. The Clean Water Act, section 303, establishes the water quality standards and TMDL programs.

"Trip Ends" means the expected number of vehicles using a parking area. Projected trip end counts for a parking area are associated with the proposed land use. Trip end counts shall be estimated using "Trip Generation" published by the Institute of Transportation Engineers or from a traffic study prepared by a professional engineer or transportation specialist with expertise in traffic volume estimation. Trip end counts shall be made for the design year or expected life of the project (the intent is for treatment facilities to be added in the soonest period of disruptive construction). For project sites with seasonal or varied use, evaluate the highest period of expected traffic impacts.

"UA" means Urbanized Area.

"Urban Growth Area" means the designated area within which urban growth shall be encouraged and outside of which growth can occur only if it is not urban in nature, as defined at chapter 36.70A.110 RCW (Growth Management Act).

"Urbanized Area" is a federally-designated land area comprising one or more places and the adjacent densely settled surrounding area that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile. Urbanized Areas are designated by the U.S. Census Bureau based on the most recent decennial census.

"Urban roads" are roads located within designated Urban Growth Areas. Partially controlled limited access highways located inside of Urban Growth Management Areas are considered urban roads. Freeways, as defined above, are not considered urban roads for the purpose of applying the Core Elements in Appendix 1.

"Waters of the state" includes those waters as defined as "waters of the United States" in 40 CFR 122.2 within the geographic boundaries of Washington State and "waters of the state" as defined in Chapter 90.48 RCW which includes: lakes, rivers, ponds, streams, inland waters, underground waters, salt waters and all other surface waters and water courses within the jurisdiction of the State of Washington.

"Waters of the United States" is as defined in 40 CFR 122.2.

"Water quality standards" means Surface Water Quality Standards, Chapter 173-201A WAC; Ground Water Quality Standards, Chapter 173-200 WAC; and Sediment Management Standards, Chapter 173-204 WAC.

Appendix B.

2015 Stormwater Management Program Plan (SWMP Plan)

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City of Richland
Stormwater Management Plan

City of Richland
Public Works Department
840 Northgate Drive
Richland, WA 99352

2015

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City of Richland
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Background

Introduction

The 2007 issued *National Pollutant Discharge Elimination System and State Waste Discharge General Permit for Discharges from Small Separate Storm Sewers in Eastern Washington*, hereinafter referred to as the Phase II Permit, outlines stormwater activities and implementation milestones Permittees must follow to comply with the federal Clean Water Act. All Phase II communities are expected to develop a Stormwater Management Program (SWMP) that includes the required activities, implement those activities with the required timeframes of the life of the permit (2007-2012) and submit annual reports to Ecology by March 31st of each year to document progress toward complete program implementation. The Phase II Permit was issued by the Washington State Department of Ecology (Ecology) on January 17, 2007 and became effective February 16, 2007. The Permit covers a five year period that expires on February 15, 2012. The 2011 Washington State Legislative session extended the Permit period to July 31, 2013 and then in 2012, the Legislature extended the Permit period again to July 31, 2014. The requirements remain the same within the two year extension. In 2012, the Department of Ecology issued the 2014-2019 Eastern Washington Phase II Municipal Stormwater Permit. This permit becomes effective August 1, 2014.

The City's new permit began in August 2014 but for consistency in reporting the reporting requirements of this Plan cover a calendar year from January 1 to December 31st.

The Phase II Permit automatically applies to cities and counties with populations of less than 100,000 located within or partially located within a federally designated urbanized area and that operate a municipal separate storm sewer system (MS4) which discharges to a "water of the state" (river, stream, wetland, etc.). Urbanized areas are defined as population centers with 50,000 people and densities of at least 1,000 people per square mile and are based on the 2000 census.

Ecology can also designate cities with a population of 10,000 or more that are located outside of urbanized area as additional Permittees. Designation criteria can include considerations such as discharge to sensitive waters, high populations density, high growth or growth potential, contiguity to an urbanized area, significant contribution of pollutants to waters of the US or state or ineffective water quality protection by other programs. The City of Richland (Richland) has been designated by Ecology as a Phase II Permittee based on the current population of 51,000 and its location within the Tri-Cities urbanized area.

The City is located in Benton County and was incorporated in 1955. Richland is bisected by the Yakima River and the Columbia River separates it from the City of Pasco. The City is also located adjacent to the National Hanford Nuclear Reservation. The City is rich in technology, agriculture and education.

The City has entered into an interlocal agreement with the Port of Benton, located within its city limits for the purpose of providing intergovernmental cooperation of their secondary Permit and grant funding. The Port of Benton is a secondary Phase II Permittee and requires the Port of meet the same elements and timelines as the City.

Stormwater Management Program Components

The Phase II Permit is comprised of six elements and the implementation and enforcement of the six elements is collectively referred to as a Permittees SWMP. The six elements are:

1. Public Education and Outreach
2. Public Participation and Involvement
3. Illicit Discharge Detection and Elimination
4. Construction Site Stormwater Runoff Control
5. Post-Construction Stormwater Management for New Development and Redevelopment
6. Pollution Prevention and Good Housekeeping for Municipal Operations

In addition to these six minimum elements, Ecology required three additional elements:

1. Compliance with stormwater provisions of approved Total Maximum Daily Loads (TMDLs)
2. Monitoring and assessment which would include developing 12-15 permit effectiveness questions for study.

The SWMP is designed to reduce the discharge of pollutants from municipalizes to the maximum extent practicable to satisfy the state requirement to apply "All Known Available and Reasonable Methods of Prevention, Control and Treatment" (AKART) prior to discharge and to protect water quality. The Phase II Permit and subsequent Permits, requires that specified activities from Permit elements be completed each year in order to achieve full compliance by the end of the each Permit term.

Stormwater Program Planning

As the City addresses the requirements and deadlines of the NPDES Phase II Permit, it is important tools be available to help the City know what elements of the permit are due each year and to track the status of what is being successfully implemented. The City continues to track the cost of development and implementation of each element of their Phase II Permit. A matrix of required annual Permit activities has been developed and included in this Plan.

Public Education and Outreach – S5.B.1

Regulatory Requirements

The City must develop and implement a formal Public Education and Outreach Program (Education) aimed at distributing educational material to the community about the impacts of stormwater discharges to water bodies and the steps that can be taken to reduce the pollutants in stormwater. The City's outreach and educational efforts should include a multimedia approach and must be targeted and presented to specific audiences within the community, including the general public, businesses, design professional, contractors, developers and City staff.

Existing Activities

Phase II Permit 2014-2019
Permit Year One - The City and adjacent Phase II Cities sponsored a regional stormwater workshop directed to contractors, design professionals, builders, developers, local agency personnel and the public; The City distributed a stormwater flyer with a monthly billing; The City and adjacent Cities contracted with the Franklin Conservation District to distribute stormwater material within the schools during the course of their water conservation seminars; The City and adjacent Phase II Cities distributed educational materials at the local regional Home/Garden show; The City distributed stormwater educational materials to the community at the Benton-Franklin County Fair; The City participated in Salmon Week handing out educational stormwater materials to school age children.

Program Planning

Permit Year 2015 – The City will distribute a stormwater educational flyer insert with their monthly utility billing; The City and adjacent Cities will continue their contract with the Franklin Conservation District to distribute stormwater educational material within the schools during the course of their water conservation seminars; The City and adjacent Phase II Cities will distribute educational materials at the local regional Home/Garden show and the Benton Franklin County Fair; The City will participate in Salmon Week with a booth providing stormwater educational materials to school age children.

Public Involvement and Participation – S5.B.2

Regulatory Requirements

The City must adopt a program or policy directive to create opportunities for the public to participate in the decision making process involving the development, implementation and update of the City's SWMP. The Public Involvement and Participation Program implemented by the City must comply with applicable state and local public notice requirements and shall provide opportunities for the public to participate in the decision making process.

Existing Activities

Phase II Permit 2014-209
Permit Year One- Updated SWMP was posted on the City's website; The City and adjacent Phase II Cities distributed educational materials and took questions and comments at the local regional Home/Garden show and Benton Franklin County Fair.

Program Planning

Permit Year 2015 – The City has created a webpage allowing the public to make comments on applicable BMPs on current and proposed stormwater retrofit projects. The location and development of the webpage was sent out by postcard to target groups located adjacent to the proposed projects; the City will develop a webpage showing existing and future projects and their process during construction. The public will have the opportunity to make comments and suggestions on this webpage.

Illicit Discharge Detection and Elimination – S5.B.3

Regulatory Requirements

The City must develop, implement and enforce a program to detect and eliminate illicit discharges into its MS4.

Existing Activities

Phase II Permit 2014-2019
Permit Year One - The City and adjacent Phase II Cities sponsored a regional stormwater workshop directed to contractors, design professionals, builders, developers instructing them of the current IDDE ordinances; The City developed a spreadsheet and electronic documentation of illicit discharges reported or discovered during the year; Staff assessed five (5) outfalls to the Columbia River: Sprout Street, Saint Street, Ferry Road and Richardson Road at the Port of Benton; Hot line is active and receiving calls.

Program Planning

Permit Year 2015 – The City will assess current software available for use as recording and documenting IDDE calls; the City has hired a consultant to assess the City's stormwater program and make recommendations for improvement. The City's IDDE program is part of the assessment and the City will review the recommendations and make changes as funding becomes available; the City will develop brochures for target audiences and distribute them; Staff will provide training to each of the City's divisions on how to detect and report IDDE 's.

Construction Site Stormwater Runoff Control – S5.B4

Regulatory Requirements

The City must develop, implement and enforce a program to reduce pollutants in stormwater runoff to its MS4 from construction activities, including private and public projects.

Status of Existing Activities

Phase II Permit 2014-2019
Permit Year One - Construction ordinances requiring soil and erosion control plans and enforcement actions are in effect and being enforced by city staff; Staff continues to review soil and erosion plans as part of plan reviews; Staff inspects all stormwater BMPs installed during construction; The City and adjacent Phase II Cities sponsored a regional stormwater workshop directed to contractors, design professionals, builders, developers and reviewed the construction ordinances in place at each city.

Program Planning

Permit Year 2015 – The City has hired a consultant to assess the City's stormwater program and make recommendations for improvement. The City's construction program is part of the assessment and the

City will review the recommendations and make changes as funding becomes available; The City will continue to provide training to their construction inspection staff as training is developed and becomes available.

Post-Construction Stormwater Management for New Development and Redevelopment – S5.B5

Regulatory Requirements

The City must develop, implement and enforce a program to post-construction stormwater runoff to its MS4 from both private and public new development and redevelopment projects. This element of the SWMP requires that the City:

Status of Existing Activities

Phase II Permit 2014-2019
Permit Year One – Post-construction ordinances requiring site inspection and enforcement actions are in effect and being enforced by city staff; Soil and erosion plans are reviewed as part of plan reviews; Projects are inspected on a daily basis.

Program Planning

Permit Year 2015 – The City has hired a consultant to assess the City's stormwater program and make recommendations for improvement. The City's post construction program is part of the assessment and the City will review the recommendations and make changes as funding becomes available;

Pollution Prevention and Good Housekeeping for Municipal Operations – S5.B6

Regulatory Requirements

The City must develop and implement an Operation and Maintenance Program (O&M Plan) aimed at preventing or reducing pollutant runoff from municipal facilities and/or activities. The O&M Plan shall include appropriate pollution prevention/good housekeeping practices for various municipal operations (storm system maintenance, municipal building maintenance, equipment maintenance, etc.) and shall include a schedule of inspections and record keeping requirements. The City must also develop and implement a formal training program for all staff whose job functions may impact stormwater quality.

Status of Existing Activities

Phase II Permit 2014-2019
Permit Year One – City staff inspected and cleaned approximately 539 stormwater catch basins and manholes; Inspected 44,757 LF of stormwater pipe which included jetting and TV inspection.

Program Planning

Permit Year 2015 – The City has hired a consultant to assess the City's stormwater program and make recommendations for improvement. The City's maintenance and operations program is part of the assessment and the City will review the recommendations and make changes as funding becomes available; Staff will review the City's stormwater maintenance and operations plan and make changes as needed; Staff will continue with training of City staff.

Compliance with Total Maximum Daily Load Allocations

Regulatory Requirements

Ecology conducted a review of all TMDLs approved by EPA at the time of the final permit issuance (January 17, 2007) to determine whether stormwater, including municipal stormwater sources were identified in any of the TMDLs. Ecology did not identify any TMDLs with established load or waste load allocation for municipal stormwater discharges covered under the Permit. Since Ecology has not identified any TMDLs with more specific requirements than those found in the NPDES Phase II Permit, compliance with the Permit constitutes compliance with applicable TMDLs.

Phase II Permit 2012-2014
Permit Year One through Two – Not applicable

Monitoring Assessment – S8

Regulatory Requirements –S8.A

All Permittees including Secondary Permittees shall provide, in each annual report, a description of any stormwater monitoring or stormwater-related studies conducted by the Permittee during the reporting period. If other stormwater monitoring or stormwater-related studies were conducted on behalf of the Permittee during the reporting period, or if stormwater-related investigations conducted by other entities were reported to the Permittee during the reporting period, a brief description of the type of information gathered or received shall be included in the annual report.

Status of Existing Activities

Phase II Permit 2014-2019
Permit Year One – The City hired a consultant to review a technical memorandum developed in 2011 by HDR and revised in 2014 by URS, reviewing all City stormwater outfalls and recommending those outfalls for retrofit or removal. The review has recommended specific outfalls and drainage basins for retrofit projects for submission during Ecology's grant program.

Program Planning

Permit Year 2015 – The City will further develop the recommended projects into final design for submission to Ecology's grant program in August.

Regulatory Requirements –S8.B

Stormwater Management Program Effectiveness Studies. Each city and county Permittee listed in S1.D.2.a.i and S1.D.2.a.ii shall collaborate with other Permittees to select, propose, develop, and conduct Ecology-approved studies to assess, on a regional or sub-regional basis, effectiveness of permit-required stormwater management program activities and best management practices.

Status of Existing Activities

Phase II Permit 2014-2019
Permit Year One – The City is a member of the Eastern Washington Stormwater Group. In 2014 a member of the group, Spokane Valley, took lead in applying for and obtaining a GROSS grant to begin Phase I of developing 12-15 effectiveness questions for submission to Ecology for approval.

Program Planning

Permit Year 2015 – As a member of the Eastern Washington Stormwater Group, the City will participate in Phase II of further development of the required study effectiveness questions defining which eastern Washington agency will take lead on which study. At this time it appears the City of Ellensburg will take lead in Phase II.

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Appendix C.

Interlocal Agreement

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INTERLOCAL AGREEMENT

This AGREEMENT, made and entered into this 4th day of April 2007, between the City of Richland, a Washington Municipal Corporation (hereafter called the "City"), and the Port of Benton, a Washington Municipal Corporation (hereinafter called the "Port"), collectively hereinafter referred to as the "PARTIES".

WHEREAS, the City created a stormwater utility in March 1998 to fund operations, maintenance, capital improvements and administration of its stormwater conveyance and treatment facilities. Operations and maintenance activities include street sweeping, inlet structure and pipeline cleaning, erosion control, etc.; and

WHEREAS, the City established stormwater rates for residential properties in 1998 and commercial properties in 2001; and

WHEREAS, the Port, as owner of commercial properties within the City limits, has been a customer of the City's stormwater utility since 2001; and

WHEREAS, the Port owns and maintains public streets and stormwater conveyance facilities within the City limits; and

WHEREAS, the United States Environmental Protection Agency (EPA) issued Phase II Stormwater regulations under the authority of the Clean Water Act and published in the Federal Register in December 1999; and

WHEREAS, the EPA's regulations name the City of Richland's municipal separate storm sewer system as subject to the Phase II regulations; and

WHEREAS, the Washington State Department of Ecology administers the Phase II regulations in Washington State and has prepared an Eastern Washington Phase II General Stormwater National Pollution Discharge Elimination System (NPDES) Permit that will enforce the Federal Phase II requirements and state water quality regulations on the City's municipal separate storm sewer system; and

WHEREAS, the Washington State Department of Ecology's Phase II NPDES General Permit requires compliance by the Port as a secondary Permittee; and

WHEREAS, the Port desires to contract for stormwater services required to comply with the EPA and Ecology regulations; and

WHEREAS, the City has used funding supplied by its stormwater utility to prepare for compliance with the EPA and Ecology regulations; and

WHEREAS, the City can cost-effectively oversee regulatory compliance for the Port-owned stormwater facilities; and

WHEREAS, RCW 39.34 authorizes interlocal agreements between Washington municipalities

NOW THEREFORE, in consideration for the mutual covenants, conditions, and terms contained herein, the said PARTIES hereby enter into this agreement as follows:

1. The City will provide, under funding from its stormwater utility, street sweeping services on Port-owned public streets to the same standards and frequency as to City-owned public streets. The Port grants the City a right of entry to Port-owned public streets to allow completion of this service.
2. The City will provide, under funding from its stormwater utility, stormwater conveyance system cleaning and maintenance to the same standards and frequency as to City-owned conveyance system facilities. The Port grants the City a right of entry to its stormwater conveyance facilities to allow completion of this service.
3. The City will repair damage to Port–owned streets and stormwater conveyance facilities caused by its implementation of No.'s 1 and 2 above.
4. The Port will provide the City with current data on its leased properties and assist the City in developing billing practices for collecting stormwater utility revenues from Port-owned facilities.
5. The City will correct stormwater utility billings for Port-owned facilities by March 1, 2007 in accordance with parcel data provided by the Port and reviewed by the City.
6. The City will exempt Port-owned public streets and airport facilities utilized primarily by aircraft from the City's stormwater rates.
7. The Port will fund City stormwater activities through payment of the City's stormwater utility rates as adopted by City Council. In establishing stormwater utility rates the City shall treat Port facilities the same as other properties of similar land use within the City. The Port will make payment no later than March 30, 2007 so that all City stormwater utility accounts for Port-owned properties shall be current and without delinquent charges. The City will waive any pending late payment charges on stormwater accounts for Port-owned facilities.
8. Within 180 days of the date of this agreement the Port will provide the City with its most current stormwater facility mapping data for inclusion into the City's stormwater facilities geographical information system (GIS) maps. After the City inputs the Port facilities into its GIS maps the Port will review the maps for accuracy and direct the City to any required corrections.
9. Within 180 days of execution of this agreement the City shall inspect Port-owned stormwater conveyance facilities. The City shall notify the Port of all detected defects. The Port shall be responsible for correction of all identified defects. Once Port repairs are accepted by the City, the City will perform ongoing maintenance and repairs of Port-owned conveyance facilities.

   Since the scope and cost of the defects are unknown at the date of this agreement the City and Port agree that they will evaluate the list of defects after they are identified by the City. The City and Port may elect to negotiate a schedule for completion of repairs or to terminate this agreement if:
   a. The Port determines that the investment required to repair its system defects is too high to justify the benefits provided by the City's stormwater services.
   b. The City determines that the cost of ongoing maintenance of Port facilities is too high to justify extending stormwater services to the Port.
10. The Port shall indemnify and hold the City harmless from and against all claims, damages, losses and expenses including attorney fees and court costs, for injury to persons or damage to property which results from or is caused by the negligent or willful act or omission of the Port, its agents or employees.

The City shall indemnify and hold the Port, its employees and agents harmless from and against all claims, damages, losses and expenses including attorney fees and court costs, for injury to persons or damage to property which results from or is caused by the negligent or willful act or omission of the City, its subcontractors, agents or employees.

In the event it is determined that the injury to persons or damage to property is caused in part by the negligent act or omission of both the Port and City, then each party shall be liable only to the extent of its percentage of fault. Each party shall contribute to the payment of damages, attorney fees and costs in the same percentage as its percentage of fault in causing the injuries or damages.

11. The City will, through funding from its stormwater utility, apply its NPDES Phase II General Stormwater Permit compliance programs to Port-owned stormwater conveyance system facilities. The City agrees to create and administer programs to achieve compliance with Section S6 of the NPDES Phase II permit for Port-owned facilities. The City will prepare program documents and reports as required by the NPDES Phase II permit for Port owned facilities. The Port will cooperate by supplying the City information about its operations and facilities necessary for preparation of compliance documents.
12. The Port will supply the City with all data necessary to achieve compliance with the Washington State Department of Ecology Underground Injection Control Rule for Port-owned stormwater drywells and stormwater injection facilities.
13. The City will include Port-owned stormwater conveyance facilities in any updates to its City-wide Stormwater Management Plan. The City's first Stormwater Management Plan was completed in 2005. There is no scheduled update as of the date of this agreement. The City shall submit any updates to its Stormwater Management Plan for Port review and approval. Port approval of a City Stormwater Management Plan shall not be unreasonably withheld.
14. The City will fund and complete capital improvements to Port-owned stormwater conveyance facilities required by EPA and Ecology regulations or included in a Council adopted Stormwater Management Plan. The City shall submit proposed capital improvements to Port-owned facilities to the Port for review and approval. Port approval of a capital improvement to Port-owned facilities shall not be unreasonably withheld.
15. The Port shall grant the City, without cost to the City, easements and rights-of-way required to implement stormwater construction and maintenance activities.
16. The Port may terminate this agreement by giving the City ninety (90) days written notice of termination. Upon termination, the City shall be relieved of the obligation to provide the services specified in this agreement and the Port shall be responsible for compliance with all stormwater regulations affecting the Port property and facilities.

This agreement shall not be deemed or construed to be an agreement by the Port as to the validity or enforceability of the Stormwater ordinances adopted by the City or as a waiver of any rights of the Port or its tenants or lessees to contest or challenge the City's Stormwater ordinances.

IN WITNESS WHEREOF, the PARTIES hereto have executed this AGREEMENT as of the day and year above written.

CITY OF RICHLAND

By: _____
John C. Darrington,
City Manager

PORT OF BENTON

By: _____
Scott D. Keller,
Executive Director

ATTEST:

_____
Cynthia Johnson, City Clerk

APPROVED AS TO FORM:

_____
Thomas O. Lampson, City Attorney

Appendix D.

Redline Mark-ups of Suggested Revisions to the Design Guidelines

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City of Richland
Public Works
Civil and Utility Engineering

Recommended Updates to Selected Sections of the Public Infrastructure Construction Plan Requirements and Design Guidelines (Rev January 7, 2015)

SECTION 2 – CONSTRUCTION PLANS

G. STORM DRAINAGE, PROFILE VIEW

1. Location, size, length, material type and slope of all storm drainage mains.
2. Location, size, number designation, rim elevation and grate elevation of all manholes, inlets and catch basins.
3. ~~All storm manholes with grated lids shall have an 18-inch sump in the bottom of them.~~

SECTION 3 - DESIGN GUIDELINES

C. STORM DRAINAGE COLLECTION SYSTEMS

1. All submittals shall contain an erosion and sedimentation control plan (ESC) indicating how existing downstream storm systems and properties will be protected from storm runoff.
2. The applicant's project may require coverage under the Washington State General NPDES Permit for Construction projects. The Developer shall be responsible for compliance with the State stormwater permit conditions. The City has adopted revised standards affecting the construction of new stormwater facilities in order to comply with conditions of its NPDES General Stormwater Permit program. This project, and each phase thereof, shall comply with the requirements of the City's stormwater program in place at the time each phase is engineered.
3. All public storm ~~drainage~~conveyance, flow control, and treatment systems shall be designed ~~following~~in accordance with: (1) the ~~core elements defined in the~~ latest edition of the Stormwater Management Manual for Eastern Washington (SWMMEW); (2) Appendix 1 of the Eastern Washington Phase II Municipal Stormwater Permit; (3) the Richland Municipal Code; (4) or as modified by these design guidelines~~. The Hydrologic Analysis and Design shall be completed based on the following criteria: Washington, Region 2, Benton County; SCS Type 1A – 24 Hour storm for storm volume with a 25-year return period. The applicant's design shall provide runoff protection to downstream property owners~~.
4. The following storm events and routing methods shall be used for hydrologic analysis and design:
    - ~~The flow rate of the public storm drainage system shall be designed using the 2-Year, 3-Hour short duration Eastern Washington storm for p~~Pipe and inlet sizing of public storm drainage systems in roadways shall be designed using SCS or Santa Barbra method with a ~~50-year storm used at sag locations and a~~ 25-year

storm, except for sag locations, which shall be designed using a 50-year storm: ~~used for all other locations; i~~

- Public storm drainage systems outside of roads shall be designed using the 2-year, short duration Eastern Washington storm at a minimum, using SCS or Santa Barbra method; no modifying or adding time of concentration; no surcharging of pipes or structures allowed unless allowed by exemption approved by the Director.

- Inlets, pipes, and other flow~~-~~based infrastructure (e.g., biofiltration swales, oil/water separators) shall use the short duration Eastern Washington storm.

- ~~; v~~Volume~~-~~based infrastructure (e.g. ponds) shall use the 24-hour SCS Type IA storm. N~~; n~~o modifying or adding time of concentration and ~~;~~ no surcharging of pipes or structures allowed unless by exemption approved by the Director.

5. Hydrologic analysis shall include delineation of drainage area tributary to the proposed facilities and that tributary drainage area shall be used in the hydrologic modeling to size facilities.

4.6. ~~Public storm drainage systems outside of roads shall be designed using the 2-year, short duration Eastern Washington storm at a minimum, using SCS or Santa Barbra method; no modifying or adding time of concentration; no surcharging of pipes or structures allowed.~~ Calculations shall be stamped by a registered professional engineer and shall include a profile of the system showing the modeled hydraulic grade line for the system. ~~The calculations should include runoff generated by the complete contributing basin to the inlet including areas outside of the project site if they contribute runoffa 50-foot wide strip behind each right of way line to represent drainage from private property into the City system. Of that area, 50% shall be considered pervious and 50% impervious. Calculations shall include a profile for the design showing the hydraulic grade line for the system. Passing the storm downhill to an existing system will require a downstream storm system capable of accepting the water without being overwhelmed.~~

7. ~~For privately-owned & maintained commercial sites the on-site storm drainage system shall be designed following the core elements defined in the latest edition of the Stormwater Management Manual for Eastern Washington. The Hydrologic Analysis and Design shall be completed based on the following criteria: Washington, Region 2, Benton County; SCS Type 1A – 24 Hour storm for storm volume with a 25-year return period. Hydraulic Analysis Ccalculations shall be stamped by a registered professional Civil Engineer.~~ Prior to discharging any storm drainage waters from paved surfaces into drainage ditches, groundwater or a public system, an oil/water separator must be installed.

~~5.~~8. The applicant's design shall provide runoff protection to downstream property owners.

~~6.~~9. All construction projects that don't meet the exemption requirements outlined in Richland Municipal Code, Section 16.06 shall comply with the requirements of the Washington State Department of Ecology issued Eastern Washington NPDES Phase II Municipal Stormwater Permit. All construction activities subject to this title shall be required to comply with the standards and requirements set forth in the ~~Stormwater Management Manual for Eastern Washington (~~SWMMEW~~)~~ and prepare a Stormwater Site Plan. In addition a Stormwater Pollution Prevention Plan (SWPPP) or submission of a completed erosivity waiver certification is required at the time of plan submittal.

10. For commercial sites the proposed storm drainage and grading of all areas within the proposed development shall be shown on the plans (most grading and drainage plans must be prepared by a licensed civil engineer). If the site contains at least 1,000 sq.ft. of new impervious surfaces, and/or contains 30% or more impervious surfaces, storm drainage calculations from a licensed civil engineer are required. Stormwater shall be kept on-site (on the developing property that generated it). Stormwater shall not be flowed onto adjacent properties, or to the public Right-of-Way, without first obtaining written permission.

11. All new development and redevelopment projects that disturb one acre or more, or disturb less than one acre but are part of a larger common plan of development disturbing more than one acre, shall retain runoff generated on-site for a 10-year, 24-hour SCS Type IA storm and infiltrate retained runoff. Where infiltration is not infeasible, a regional stormwater facility may be used after City approval.

12. To meet site runoff retention and flow control requirements, contractors and developers are encouraged to incorporate the L~~l~~ow ~~i~~Impact D~~d~~evelopment (LID) B~~b~~est M~~m~~anagement P~~p~~ractices (BMPs) discussed in the latest version of the Eastern Washington Low Impact Development Guidance Manual.

13. Any project not meeting the flow control exemptions for Core Element #6 (Flow Control) of the ~~Stormwater Management Manual for Eastern Washington~~SWMMEW shall perform a Hydrologic Analysis of the pre-development and the proposed-development condition using a 25-year, 24-hour SCS Type IA storm.

    - The pre-development condition shall be the condition of the drainage area before development and shall assume natural vegetative cover that would be found in the drainage area.

    - When discharging to non-exempt streams (as defined in the ~~Stormwater Management Manual for Eastern Washington~~SWMMEW): The peak rate of runoff of the proposed-development condition for the 25-year storm is limited to the peak runoff of the pre-development condition for the 25-year storm.

    - When discharging to wetlands and lakes: If the wetland or lake does not have an outlet to a stream or has a direct outlet to the Columbia or Yakima Rivers, the peak rate of runoff of the proposed-development condition for the 25-year storm is limited to the peak runoff of the pre-development condition for the 25-year storm.

14. Gutter, inlet, and conveyance pipe capacity for roads shall be designed ~~for~~using the 10-year, short duration Eastern Washington storm. ~~, and a~~At sag points, ~~using~~ the 50-year, short duration Eastern Washington storm shall be used. Travel ways for all freeway, principal, and minor arterial classified roads shall have at least 10 ft that are free of water. All collector and local classified roads shall not have a depth of flow that exceeds 0.12 ft at the edge of shoulder. The allowable design spread for the design storm is the following:

    - Freeway, principal, and minor arterial classified roads
        - < 45 mph = shoulder + 2 ft
        - ≥ 45 mph = shoulder
        - Sag points = shoulder + 2 ft
    - Collector and local streets

- o < 45 mph = shoulder + 1/2 driving lane
- o ≥ 45 mph = shoulder
- o Sag points = 1/2 driving lane

15. Flow rate based water quality treatment BMPs shall be designed to treat the 6-month, short duration Eastern Washington storm. Volume based water quality treatment BMPs shall be designed to treat the 6-month, 24-hour SCS Type IA storm. The treatment BMP shall be able to convey the 25-year, short duration Eastern Washington storm without damaging the BMP or dislodging pollutants. Otherwise, a bypass shall be provided to convey damaging flows away from the BMP from storms with a return frequency more frequent than 25-years.

16. The following storm precipitation depths ~~should~~shall be used for hydrologic analyses for the City of Richland:

- When using the 24-hour, SCS Type IA storm
  - o 6-month 0.53 inches
  - o 2-year 0.80 inches
  - o 10-year 1.30 inches
  - o 25-year 1.60 inches
  - o 50-year 1.80 inches
  - o 100-year 2.00 inches
- When using the short duration, Eastern Washington storm
  - o 6-month 0.26 inches
  - o 2-year 0.42 inches
  - o 10-year 0.69 inches
  - o 25-year 0.92 inches
  - o 50-year 1.14 inches
  - o 100-year 1.35 inches

- ~~—~~

~~7.~~17. If any existing storm drainage or ground water seepage empties onto the proposed site, said storm drainage shall be considered an existing condition, and it shall be the responsibility of the property developer to design a system to contain or treat and release the off-site storm drainage.

~~8.~~18. If there are any natural drainage ways across the proposed pre-plat, the engineered construction plans shall address it in accordance with Richland Municipal code 24.16.170 (“Easementswatercourses”).

~~9.~~19. The City may require that the public storm drainage system be extended to the adjacent, undeveloped property, 10-feet past the end of pavement.

~~10.~~20. All public storm drainage pipes or culverts shall be 12-inches diameter or larger.

~~11.~~21. Pipes shall have a minimum slope of 0.5% and a minimum velocity of 3-feet per second in a full flow condition. Pipes shall be sized so that they do not surcharge under design storm conditions unless allowed by exemption approved by the Director.

~~12.~~22. Reference the most current City of Richland Materials List for acceptable materials.

~~13. Storm mains shall be constructed out of SDR35 PVC.~~

~~14.~~23. Manholes are required at all angle points and all changes in slope. Curved or deflected storm drainage lines are not allowed. The length of pipe between manholes shall not exceed a distance of 400-feet for 12" mains, and shall not exceed 600-feet for mains larger than 12".

~~15.~~24. All storm manholes with solid lids shall have a channeled base and all catch basin manholes shall have a "sump" in the bottom of them in accordance with the approved standard details.

~~16.~~25. The need for storm drain manholes to be 48-inches instead of a 24-inch barrel is a judgment call based on the following criteria:

- Are there 2 or more catch basins upstream of the fixture in question?
- Is the depth to invert 3-feet or deeper?
- Is the number of laterals penetrating the barrel more than 2?
- If the angle of the laterals where they enter the fixture are close together, then the structural integrity of the catch basin could be compromised, therefore a 48" manhole may be needed.

~~17.~~26. Catch basins and inlets shall be spaced at appropriate locations to catch all of the storm water within the contributing area. The spacing shall be based on inlet capacity and curb line grade and shall not exceed 500-feet between inlet structures. At all low points & sag curves two times the required inlet capacity shall be provided. Curb-line spread of the storm water shall not pond into the travelled way. Curb inlet structures will be considered for use on curb line profiles exceeding 10% to improve inlet capacity.

~~18.~~27. Storm water flow shall be kept in the gutter, and shall not be allowed to flow across intersections (i.e.; "valley gutters"). Catch basins shall be installed at appropriate locations so as to prevent this. Catch basin "bubbler" type installations are not allowed.

~~19.~~28. Catch basins and inlets shall be located at the ends of curb returns or at property lines between lots. Catch basins and inlets shall not be located within driveways, driveway transitions or pedestrian ramps.

~~20.~~29. In locations where deviations are allowed from the standard crowned street, additional structures will be required so that surface stormwater flow does not transition from one side of the street to the other.

~~21.~~30. A "spill control" separator is required prior to discharging any storm drainage waters from paved surfaces into drainage ditches, ground water or a public drainage collection system. These structures are not required if the stormwater is sheet-flowed into a grassy swale or pond.

~~22.~~31. If the City storm pond slopes are greater than 25%, then a fence will be required around the perimeter of the pond with a minimum 12-foot wide gate for maintenance vehicles. A maintenance road to the bottom of the pond from the City Right of Way will also be needed. The city's maintenance of the pond in the future will consist of trimming weeds to keep them below 6-inches and maintaining the pond for functionality. If the

developer wishes for the pond to be landscaped and visually appealing, then the developer or homeowners association ~~should~~ shall be considered for maintenance responsibilities. This will require an irrigation meter and sprinkler system (and a power source), and responsibility for mowing grass (see section below pertaining to basins).

~~23.~~32. For commercial projects; the designing engineer shall provide both the total square footage of the entire commercial property under review, and the total square footage of all impervious surfaces, including but not limited to; the proposed building, any concrete or asphalt paving, sidewalk, and roof surface, etc. (after addition is complete). Please provide this information in a table form on the cover sheet, or on the site plan sheet. This information is required of all new commercial development (or of any structure undergoing modification or addition).

D. STORMWATER RETENTION AND DETENTION BASINS / FLOW CONTROL DESIGN

1. Stormwater off of City Right-of-Ways is typically collected into a central collection basin (storm pond). Drywells are only allowed in limited applications, and are not normally allowed except in extreme circumstances where a central collection basin will not function.

2. All Best Management Practices used for stormwater treatment or flow control shall meet the requirements of the latest edition of the ~~Stormwater Management Manual for Eastern Washington~~SWMMEW except for where criteria are amended by these guidelines.

3. A Spill Control Separator is required prior to discharging stormwater into landscaped ponds (infiltration, evaporation, detention, etc.) This structure is in addition to any best management practice required for runoff treatment or flow control per the ~~Stormwater Management Manual for Eastern Washington~~SWMMEW. This structure shall not be used as a surface inlet.

4. Surface water from a pollution-generating source shall not be collected directly into a subsurface infiltration BMP, but shall first be collected in an inlet, swale or some other means for separating the suspended solids.

5. Basins designed as infiltration facilities shall require a percolation test of the native soils that will comprise the base of the basin to confirm the effectiveness of the design. The test shall be supervised by a professional engineer or geologist using a minimum safety factor of 2.

6. Basins designed with the potential for water depth greater than 24-inches shall be either fenced or have side slopes no steeper than 4h:1v. Basins designed with maximum water depth less than 24-inches shall have side slopes no steeper than 4h:1v.

7. The designer should consider the long-term appearance of the basin, particularly if it will occupy a prominent location in the development. City maintenance practices involve only semi-annual vegetation trimming and silt and debris removal. Basins designed as detention and evaporative basins need to include plantings that will tolerate or thrive on standing water in the basin. Planting designs for areas not routinely exposed to water shall include plants that will thrive without irrigation.

8. The developer shall be responsible for the plantings for a period of 12 months from the date of final acceptance. The developer shall replace all plantings that have failed to survive this period. The developer shall also perform trimmings required to control weeds in excess of 18-inches in height for the 12 months following the date of final acceptance.

9. Developers proposing landscape improvements that require frequent maintenance, such as turf grass, shrubs, and/or trees shall provide for ongoing maintenance of the improvements through a local association binding on its members. The maintenance responsibility shall be noted on the final plat.

10. Basins shall include a maintenance vehicular access road to the basin bottom sloped at no greater than a 12% slope. The road shall be a minimum of 12-feet wide and shall be surfaced with 2” of crushed top course rock, minimum.

11. Fenced basins shall include a gate with a minimum opening of 12-feet at the vehicular entrance point.

12. The developer of a basin shall be responsible for the maintenance of the basin for a period of 12 months from the date of final acceptance. At 11 months after the final acceptance date the developer shall clean the storm system and basin of all accumulated oil, sediment, and debris. After this maintenance is completed and inspected the City will begin routine maintenance of the system and basin.

13. The parcel occupied by a stormwater basin shall be identified as a separate parcel or tract on the final plat and shall be dedicated to the City stormwater utility.

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Appendix E.

2014 Stormwater LID Retrofit Project Pre-Design Report

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CITY OF RICHLAND

Stormwater LID Retrofit Project Pre-Design Report

City of Richland
Public Works Department
840 Northgate Drive
P.O. Box 190, MS-26
Richland, WA 99352

April 16, 2014

ACKNOWLEDGEMENTS

City of Richland

Stormwater LID Retrofit Project—Pre-Design Report

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Prepared by:

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Project Manager

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Senior Environmental Scientist

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Water Resources Engineer

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City of Richland

Stormwater LID Retrofit Project—Pre-Design Report

Sections

Attachments

As a part of the 2013-2015 Biennial Municipal Stormwater Capacity Grant Program, the Washington State Department of Ecology (Ecology) has provided the City of Richland (City), a NPDES Phase II community, with funds to conduct project specific planning and design (pre-construction) activities for retrofit projects which address stormwater pollution runoff from existing development. As a condition for pre-construction activity funding, at least one of the projects must implement low impact development techniques in accordance with Ecology approved design manuals, primarily the Stormwater Management Manual for Eastern Washington (SWMMEW) and the Eastern Washington Low Impact Development Guidance Manual (E. WA LID Manual).

City staff selected two locations as the best candidate sites for incorporating stormwater retention best management practices (BMPs): 1) Swift Blvd.; and 2) Columbia Park Trail. These sites were evaluated for retrofits based on their proximity to an impaired waterbody (Columbia River), traffic volumes, size of drainage area, public visibility, and use.

In the fall of 2013, Ecology reviewed conceptual retrofit ideas for the sites and verified them as eligible to use planning and design grant funds. The retrofit project locations are shown in the vicinity map below and described in detail in Section 2.

An overview of Richland's climate is provided in the table below.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	40.7	48.6	57.9	66.4	75.3	82.2	90.5	89.3	80.6	66.7	50.7	41.5	65.9
Average Min. Temperature (F)	26.4	30.2	35.1	40.8	48.1	54.7	59.7	58.7	50.8	41.2	33.7	28.2	42.3
Average Total Precipitation (in.)	0.99	0.70	0.61	0.49	0.59	0.54	0.20	0.23	0.28	0.54	0.93	1.05	7.15
Average Total Snowfall (in.)	2.6	1.5	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.2	7.1
Avg. Snow Depth (in.)	1	0	0	0	0	0	0	0	0	0	0	0	0

Source: Western Region Climate Center (2014)

Both sites are located in climatic Region 2 (Central Basin) of eastern Washington and receive approximately 7.15 inches of mean annual precipitation, a portion of which falls as snow.

2.1 Swift Blvd.

A portion of Swift Blvd. consists of a four-lane roadway with streetside parking and a 40-foot vegetated median. The median presents an excellent opportunity to allow localized street runoff to be retained, treated, and infiltrated rather than entering into the existing storm drain system, which conveys untreated runoff to a U.S. Army Corps of Engineers drainage system where it is subsequently pumped to the Columbia River.

2.1.1 Basin Description

Basin Delineation

An overall basin map for the Swift Blvd. stormwater drainage system is provided as Attachment 2-1. Fifteen subbasins have been identified for potential bioretention retrofits along the median of Swift Blvd. Drainage subbasin maps are provided as Attachments 4-1 through 4-4. The maps show the drainage basin boundaries and flow directions for existing and proposed conditions. Existing and proposed peak runoff rates and volume calculations are provided in Attachment 3.

Swift Blvd. Median Looking West

Basin Information

The existing land use consists primarily of residential homes with limited public and commercial areas. There are no expected future land use changes for the sites or overall basin.

Native soils are generally Hydrologic Class A, expected to have high to very high infiltration rates. The water table is expected to be well below the ground surface.

The overall Swift Blvd. basin is approximately 116.18 acres in size and consists of roughly 105.18 acres of impervious surfaces and 11.00 acres of pervious surfaces. The smaller subbasins range in size from 2,000 sq-ft to almost 1 acre and consists almost entirely of impervious surfaces.

Stormwater quality issues include those typically associated with moderate average daily traffic (ADT) urban minor arterial roadways, including sediments, hydrocarbons, vehicle fluids, metals, elevated temperature, and other pollutants.

Based on review of Ecology's 2012 303(d) list of impaired receiving waters, the Columbia River is currently listed as impaired for temperature near the ultimate discharge point for the project area. There are currently no ongoing efforts to develop a total maximum daily load (TMDL) for this water quality impairment. Retention and infiltration is a suitable way to reduce temperature increases due to stormwater runoff from impervious surfaces during spring through fall thunderstorms.

2.1.2 Site Description

Existing Stormwater Controls

The overall Swift Blvd. basin, including the subbasins, drain to an existing stormwater conveyance system that ultimately discharges to the Columbia River (see Attachment 2-1). There are no existing stormwater quality or flow control BMPs in the basin (the Columbia River is exempt from flow control requirements).

Total Area, Impervious Area, Pervious Area

In total, the fifteen drainage subbasins are approximately 3.66 acres in size. Attachment 3-2 provides a breakdown of Total Area, Connected ISA, Disconnected ISA, and Pervious Area by subbasin. Refer to Attachment 4-1 through 4-4 for subbasin delineations.

Vegetation and Wetlands

Existing vegetation in the median includes: maintained turf grass, mature trees, and other shrubbery. No wetlands are present within the immediate project area.

Soils

According to the Benton County Soil Survey, surficial soils at the project site primarily consist of Burbank loamy fine sand, an excessively drained soil with an estimated saturated hydraulic conductivity in the 5.95 to 19.98 inches/hour range (see Attachment 1). Based on the experience of City staff on a recent stormwater infiltration design project, it is anticipated that each bioretention swale will require soil amendments to reduce the infiltration rate of the facility to meet the water quality design requirements as stated in the Stormwater Management Manual for Eastern Washington. Note that a detailed geotechnical investigation will be performed during the design stage.

Access

Access to the site is readily available through the existing City road infrastructure.

2.2 Columbia Park Trail

Columbia Park Trail is a 4-lane roadway located in southern Richland along the Columbia River. The City's 2013 Streetscape Master Plan proposes sidewalk and greenspace improvements along both sides of Columbia Park Trail, including parking lot improvements for Wye Park. The proposed greenspace presents an excellent opportunity to allow localized street and parking lot runoff to be retained, treated, and infiltrated within bioretention swales rather than entering into the existing storm drain system, which discharges directly to the Columbia River. As an alternative to grading the parking lot to drain to a bioretention swale, porous asphalt will be considered as the design process progresses. Due to project scope and funding limitations, this submittal focuses only on retrofitting LID BMPs on the north side of the roadway (with the exception of a bioretention facility on the south side of the roadway at the intersection of Columbia Center Blvd., near the City storm outfall SR08).

2.2.1 Basin Description

Basin Delineation

Existing and proposed subbasin maps are provided as a part of Attachments 4-9 through 4-12. The maps show the drainage basin boundaries and flow directions for existing and proposed conditions. Existing and proposed peak runoff rates and volume calculations are provided in Attachment 3.

Columbia Park Trail Shoulder Looking East

Basin Information

The existing land use consists of commercial and industrial businesses, as well as open space. There are no expected future land use changes for the project area.

Native soils are generally Hydrologic Class A, expected to have high to very high infiltration rates. The water table is expected to be below the ground surface at an elevation similar to the Columbia River.

In total, the twelve drainage subbasins evaluated for this project (SR08 and SR20a through SR20k) are approximately 5.34 acres in size and consist primarily of sloped to fairly flat impervious surfaces.

Stormwater quality issues include those typically associated with moderate ADT urban minor arterial roadways, including sediments, hydrocarbons, vehicle fluids, metals, and elevated temperature, and other pollutants.

Based on review of Ecology's 2012 303(d) list of impaired receiving waters, the Columbia River is currently listed as impaired for temperature near the ultimate discharge point for the project area. There are currently no ongoing efforts to develop a total maximum daily load (TMDL) for this water quality impairment. Retention and infiltration is a suitable way to reduce temperature increases due to stormwater runoff from impervious surfaces during spring through fall thunderstorms.

2.2.2 Site Description

Existing Stormwater Controls

The intersection of Columbia Park Trail and Columbia Center Blvd. is drained by an existing stormwater conveyance system that discharges directly to the Columbia River (SR08). There are no existing stormwater quality or flow control BMPs in the subbasin (the Columbia River is exempt from flow control requirements). The remaining subbasins (SR20a through SR20k) discharge to a drainage swale behind a U.S. Army Corps of Engineers levee. The swale likely provides some water quality and flow control benefit for the Columbia River.

Total Area, Impervious Area, Pervious Area

In total, the twelve drainage subbasins are approximately 5.34 acres in size. Attachment 3-2 provides a breakdown of Total Area, Connected ISA, Disconnected ISA, and Pervious Area by subbasin. Refer to Attachment 4-9 and 4-12 for subbasin delineations.

Vegetation and Wetlands

Existing vegetation at the project site includes naturally vegetated roadway shoulders and maintained park landscaping. No wetlands are present within the immediate project area.

Soils

According to the Benton County Soil Survey, surficial soils at the project site consist of Burbank loamy fine sand, an excessively drained soil with an estimated saturated hydraulic conductivity in the 5.95 to 19.98 inches/hour range and Finley stony fine sandy loam, a well drained soil with an estimated saturated hydraulic conductivity in the 1.98 to 5.95 inches/hour range (see Attachment 1). Based on the experience of City staff on a recent stormwater infiltration design project, it is anticipated that each bioretention swale will require soil amendments to reduce the infiltration rate of the facility to meet the water quality design requirements as stated in the Stormwater Management Manual for Eastern Washington. Note that a detailed geotechnical investigation will be performed during the design stage.

Access

Access to the site is readily available through the existing City road infrastructure.

3.1 Alternatives Considered

City staff initially evaluated a number of sites for retrofit desirability based on proximity to a receiving water, public visibility and use, and planned City projects. This initial process resulted in the identification of three candidate sites including: 1) Swift Blvd.; 2) the Uptown Mall Parking Lot; and 3) Columbia Park Trail.

The Uptown Mall Parking Lot is owned by the City and presents an opportunity to improve stormwater quality and flow control through the use of LID BMPs (primarily bioretention). The conceptual design for the Uptown Mall parking lot (see Attachments 4-5 through 4-8) includes retrofitting bioretention facilities into the existing parking lot at strategic locations. Two conceptual alternatives were developed:

Alternative 1. Construct large bioretention facilities over the top of existing catch basins and modify the catch basins to serve as overflow structures into the existing storm system; or

Alternative 2. Construct small bioretention facilities at the ends of each row of parking and leave the existing storm system unmodified for overflow.

Hydrology and sizing calculations were performed for both alternatives at a select area within the parking lot. The City intends to begin talks with the mall tenants to determine which, if any, of these concepts will be preferred before utilizing template sizing calculations and completing design for the remainder of the parking lot. It is unlikely that the City will be able to complete a 90% design by the current July 31 grant deadline. As such, the City has decided to focus current grant funded design efforts on the Swift Blvd. and Columbia Park Trail retrofit sites.

Following the selection of the two preferred retrofit sites, a meeting and field review was conducted with City staff to refine the selection and location of LID BMPs at each site. The following issues were considered during the BMP selection and layout process:

- Climate/seasonal precipitation patterns.
- Expected traffic use levels.
- Available right-of-way and setback requirements.
- Ability to work with existing drainage patterns and infrastructure to degree possible.
- Review/avoidance of likely utility/existing infrastructure issues.
- Likely soil and groundwater properties/conditions.
- Avoidance of steep or unstable slopes, or other geologic hazard areas.
- Ability to help address receiving water concerns.
- Minimizing/avoiding work within exterior roads and sidewalks.
- Typical O&M requirements/level of effort/special equipment.

- Critical areas issues.
- Tree related issues such as the effects of roots and leaves on BMPs.
- Ability to safely drain overflow water to an appropriate location.
- Ability to prevent significant problems in the event that systems fail or periodically operate below the intended design level.
- City tree/shrub retention/replacement goals/requirements.
- Corridor beautification goals/standards.
- Aesthetic compatibility of BMPs with existing site structures and features.
- Consideration of future improvement projects.

Many of these considerations are also feasibility criteria recommended by the Eastern Washington LID and Stormwater Management Manuals.

3.2 Description of Final Alternatives

3.2.1 Design Storms

Water quality facilities (bioretention swales) will be designed to retain, treat, and infiltrate up to the 25-year, 24-hour SCS Type 1A storm event for the contributing areas. Each facility will be designed to completely drain down within at most 72-hours in order to meet the following objectives:

- Restore hydraulic capacity to receive runoff from a new storm;
- Maintain infiltration rates; and
- Aerate vegetation and soil to keep the vegetation healthy, prevent anoxic conditions in the treatment soils, and enhance the biodegradation of pollutants and organics.

All storm drain pipes and other conveyance facilities will be designed to convey the peak discharge from the 10-year, 3-hour short duration storm event.

3.2.2 Preliminary Infiltration Characteristics

As discussed in Section 2, based on published Soil Survey information, the saturated hydraulic conductivity of the native soil at each site is estimated at 5.95 to 19.98 inches/hour, which can also serve as an initial conservative estimate of the long-term infiltration rate for minimal ponding depth situations (gravity flow conditions). For purposes of this Pre-Design Report, it was assumed that soil amendments will be required to reduce the infiltration rate of each facility to 2.4 inches/hour in order to meet the water quality design requirements as stated in the Stormwater Management Manual for Eastern Washington.

Geotechnical testing will be conducted to verify soil properties.

3.2.3 Swift Blvd.

The Swift Blvd. retrofit project includes retrofitting bioretention facilities into existing landscaped median islands and adjacent shoulder landscaped areas. Preliminary hydrology and sizing calculations reveal that most bioretention facilities may be able to retain, treat, and infiltrate stormwater runoff up to the 25-year storm event from localized roadway subbasins. The concept of utilizing the median space to daylight the storm main and treat at least the water quality storm for the entire Swift Blvd. basin was deemed infeasible due to the size of the overall basin and large amount of stormwater runoff generated during the 6-month, 24-hour storm event.

Key aspects of the project include:

- Installing curb inlets along the median to allow localized street runoff to enter into proposed bioretention swales.
- In two locations, installing a bubble-up system to direct runoff from nearby catch basins into proposed median bioretention swales.
- In one location, installing a flow splitter to direct up to the 25-year, 24-hour peak flow to a proposed bioretention swale located in a relatively flat grassed portion of the George Prout Aquatic Complex (City owned) and constructing an emergency overflow for the bioretention swale.

Refer to the pre-design plan drawings included as Attachments 4-1 through 4-4 for additional information. These same attachments also include proposed subbasin maps as well as approximate utility locations. Peak runoff rates and volume calculations are provided in Attachments 3.

Water Quality Benefits

The proposed stormwater LID retrofits will reduce the volume of runoff from each outfall site as compared to the existing condition by retaining and infiltrating the 25-year, 24-hour SCS Type 1A storm event from the contributing areas. Water quality is also improved from the existing condition since the proposed BMPs will effectively retain and treat greater than 90% of the annual runoff volume from the retrofit areas including nearly all of the "first flush" storm events.

Preliminary Cost Estimate

The pre-design level construction cost estimate for the Swift Blvd. retrofit project is $386,688.17, including a 50% pre-design contingency. See Attachment 5 for a complete breakdown of the pre-design level construction cost estimate.

3.2.4 Columbia Park Trail

The Columbia Park Trail retrofit project includes retrofitting bioretention facilities into existing roadway shoulder areas and either porous asphalt or bioretention into an existing public parking lot during a future roadway corridor improvement project. The goal of the retrofit projects is to improve stormwater quality for the runoff discharging to outfalls SR08 and SR20. The conceptual locations for bioretention facilities were taken from the City's Streetscape Master Plan (June 2013). Due to project scope and funding limitations, this submittal focuses only on retrofitting bioretention on the north side of the roadway (with the exception of a bioretention facility for SR08 on the south side of the roadway at the intersection of Columbia Center Blvd.). Preliminary hydrology and sizing calculations reveal that most bioretention facilities may be able to retain, treat, and infiltrate stormwater runoff up to the 25-year storm event from localized roadway subbasins.

Key aspects of the project include:

- Constructing new sidewalk along Columbia Park Trail with curb inlets to allow localized street runoff to enter into proposed bioretention swales along the backside of the sidewalk. The City is aware that sidewalk improvements are likely not grant eligible, and will have to fund them separately.
- Improving the existing park parking by:
  - Alternative 1: utilizing conventional asphalt to direct stormwater runoff towards a bioretention swale; or
  - Alternative 2: utilizing porous asphalt.

  As the design progresses the City will decide which site improvement will be best.

Refer to the pre-design plan drawings included as Attachments 4-9 through 4-12 for additional information. These same attachments also include proposed subbasin maps as well as approximate utility locations. Peak runoff rates and volume calculations are provided in Attachment 3.

Water Quality Benefits

The proposed stormwater LID retrofits will reduce the volume of runoff from each outfall site as compared to the existing condition by retaining and infiltrating the 25-year, 24-hour SCS Type 1A storm event from the contributing areas. Water quality is also improved from the existing condition since the proposed BMPs will effectively retain and treat greater than 90% of the annual runoff volume from the retrofit areas including nearly all of the "first flush" storm events.

Preliminary Cost Estimate

The pre-design level construction cost estimate for Alternative 1 of the Columbia Park Trail retrofit project is $473,224.25, including a 50% pre-design contingency. The pre-design level construction cost estimate for Alternative 2 of the Columbia Park Trail retrofit project is $610,942.61, including a 50% pre-design contingency. See Attachment 5 for a complete breakdown of the pre-design level construction cost estimates.

4.1 Design and Operational Considerations to be Addressed Between the Pre-Design Report and 60% Design

The design submitted with this Pre-Design Report is at a preliminary level. Design and operational considerations to be addressed in the next phase of the design process are discussed below.

4.1.1 Existing Utilities

There are multiple water lines running through the median areas of Swift Blvd. It was assumed that the water lines are sufficiently deep and will not interfere with the bioretention facilities. During the design phase, the City will want to call for locates, perform potholing, and/or utilize as-built information to gain a better understanding of the exact location and depth to the existing water lines as well as any other utilities.

4.1.2 Swift Blvd. Median Bioretention Areas East of Long Avenue

The landscaped median east of Long Ave. on Swift Blvd. has approximately 20 feet of fall across its length. This will require a stair-stepped bioretention design that may be difficult to construct and potentially unattractive. We do not recommend pursuing bioretention placement within this median; however, if the City decides to move forward with design, Attachment 1 provides preliminary sizing calculations and Attachment 2-5 shows a possible layout. Based on recent communications (Asotin County), Ecology considers drywells to be equivalent to an approved LID approach; while not a visible and educational BMP for the public, they may be a good retrofit option for this steep sloped area.

4.1.3 Bioretention Footprints

The bioretention footprints shown in Attachment 2 are rectangular in shape for purposes of quickly calculating and displaying the estimated size of the facilities required to retain, treat, and infiltrate stormwater runoff up to the 25-year storm event. The actual design should be aesthetically pleasing with respect to shape, landscaping, cover, and vegetation selection. We also recommend, where feasible, that bioretention facilities adjacent to roadway curbing (i.e., no sidewalk) be setback from the roadway curbing at least 3 feet for vehicle safety and roadway integrity reasons. The use of shallow infiltration next to existing pavements should consider and address any structural stability concerns (this is generally not a significant concern unless fine textured subgrade soils are present).

4.1.4 Curb Inlets to Bioretention Facilities

Example photo of a preferred curb inlet with sump into a bioretention facility (likely oversized).

The curb inlets into bioretention facilities should have the ability to capture sediment and debris prior to spilling runoff into the facility for treatment and infiltration. The example shown on the right is the preferred approach; it allows roadway runoff to enter into a sump where large sediment and debris will settle out, while the backside of the sump structure serves as a weir allowing runoff to spill into the bioretention facility. The sump structure should have an access lid for easy maintenance of the sump (i.e., removal of sediment and debris) that is large enough for use of the City's vactor truck hose. The weir elevation should be set 1 – 2 inches below the roadway gutter elevation to ensure adequate head. The grading design of the bioretention facilities should allow runoff to enter the facility, but when the facility is full of water that water surface elevation should be equal to that of the calculated water depth traveling in the roadway gutter at the inlet; this will not allow any additional water to enter the facility thereby eliminating the need for an overflow structure. Roadway runoff not able to enter a full bioretention facility should continue down the gutter to the nearest existing catch basin/inlet and into the City's existing storm system. Each bioretention facility should also be designed with some amount of freeboard to ensure that the facility does not overtop as the water surface elevation in the facility approaches that of the calculated maximum water depth traveling in the roadway gutter.

This preferred inlet also provides for a continuous curb, which will ultimately be safer for vehicles and not allow a vehicle tire to travel into the inlet as could potentially be the case for other inlet types, an example of which is shown in the photo on the right.

Also note that not all inlets are shown for the Columbia Park Trail retrofit sites. It is expected that some subbasins will need to be further broken up and inlets added as necessary to accommodate topographic changes along the roadway alignment.

Example photo of a curb cut inlet into a bioretention facility (not the preferred approach.)

4.1.5 Swift Blvd. Bioretention Facilities Served by Bubble Ups

There are two opportunities along Swift Blvd. where stormwater runoff can be intercepted and allowed to bubble up into two separate median bioretention facilities (refer to Attachments 2-3 and 2-4). In both cases, the concept is to install a manhole along the storm lateral with a new storm pipe leading east to a bubble up structure placed at the bottom of a bioretention facility. Within the manhole there will be an overflow weir/structure to allow stormwater to overflow into the existing storm system once the bioretention swale is full. Preliminary elevations and calculations suggest that there will be enough head between the upstream catch basin and the downstream bubble up to allow at least the 10-year, 3-hour short duration peak flow to pass through the system and enter the bioretention swale.

4.1.6 Recommended Landscaping, Vegetation, and Irrigation

The character of the bioretention facilities may vary depending on the setting and goals of the City. Preliminary landscaping, vegetation, and irrigation recommendations for the Swift Blvd. and Columbia Park Trail retrofit locations are provided below:

- **Swift Blvd** — The bioretention facilities within the medians of Swift Blvd. should use more of a xeriscaped approach where the existing turf is replaced with low maintenance river rock, landscaping cobbles/boulders, and several low to moderate water use plants that perform well with minimal supplemental irrigation. See Attachment 4 for examples of this approach. Several plant species suitable for this condition are included in the table below.

Scientific/Common Name	Planting Zone[1]	Height/ Spread	Typical Spacing[2]	Sun/Shade Preference	Irrigation Need
Spiraea species Spirea	1	2-4'/2-4'	8'	Full Sun to Part Shade	Mod
Physocarpus species Ninebark	1	6-8'/6-8'	16'	Full Sun to Part Shade	Mod
Helictotrichon sempervirens Blue Oat Grass	1	2-4'/2-3'	6'	Full Sun	Mod
Lonicera tatarica Honeysuckle	2	8-10'/8-10'	20'	Full Sun	Low
Berberis species Barberry	2	4-6'/4-6'	12'	Full Sun to Part Shade	Low
Perovskia atriplicifolia Russian Sage	2	3-5'/3-4'	8'	Full Sun	Low
Festuca ovina glauca Blue Fescue	2	10-12'/10-12'	24"	Full Sun to Part Shade	Low

[1] *Planting Zone 1 includes bottom portion of bioretention facility subject to periodic inundation or saturation. Zone 2 includes side slopes with dry soils that are infrequently inundated or saturated.*

[2] *Typical spacing per plant defined as twice the mature plant spread. City may wish to increase/decrease spacing depending on desired planting density.*

- **Columbia Park Trail —** The bioretention facilities should incorporate roadside trees, turf grass, and other landscaping per the City's Streetscape Master Plan. Placing trees or other vegetation in or around the bioretention facilities should have minimal to no impact on the facilities ability to retain, treat, and infiltrate stormwater runoff; however, supplemental irrigation will be required. Since irrigation will be used it may be desirable to include more green vegetation including turf grass and flowering tree species. See Attachment 4 for examples of this approach. Several plant species suitable for this condition are included in the table below.

Scientific/Common Name	Planting Zone[1]	Height/ Spread	Typical Spacing[2]	Sun/Shade Preference	Irrigation Need
Pyrus calleyana 'Aristocrat' Aristocrat Callery Pear	1/2	20-30'/15-20'	40'	Full Sun	Mod
Quercus *robur 'Crimschmidt'* Crimson Spire Columnar Oak	1/2	35-45'/12-15'	40'	Full Sun	Mod
Ginkgo biloba 'Princeton' Princeton Sentry Maidenhair	1/2	50-65'/15-20'	40'	Full Sun	Mod
Cornus florida Dogwood (pink/white)	1/2	25'/25'	40'	Full Sun to Part Shade	Mod
Festuca species Tall Fescue Blend	1/2	N/A	N/A	Full Sun to Part Shade	Mod to High

[1] *Planting Zone 1 includes bottom portion of bioretention facility subject to periodic inundation or saturation. Zone 2 includes side slopes with dry soils that are infrequently inundated or saturated.*

[2] *Typical spacing per plant as provided in the City of Richland Streetscape Master Plan (2013).*

Additional design and operational considerations to be addressed in the next phase of the design process include:

- Call for utility locates (approximate utility locations are shown in Attachment 4).
- Collect detailed topographic and utilities survey data.
- Identify, avoid, or otherwise address any utility conflicts.
- Verify high groundwater levels and depth to bedrock.
- Test the soil conditions and infiltration characteristics and refine the BMP designs accordingly.
- Address potential irrigation requirements for bioretention swales (currently all proposed bioretention areas for Swift Blvd. have existing irrigation infrastructure).
- Prepare planting and irrigation plans for bioretention swales based on recommended plant species as described above.
- Specify mulching requirements to control weeds and any soil amendments necessary to meet required maximum infiltration rates and to help establish vegetation.

- Design flow entrances to provide for sediment control and erosion prevention as described above.
- Determine if conventional asphalt with a bioretention swale or porous asphalt is best suited for the parking lot at Wye Park.
- Verify construction accessibility and traffic control issues.
- Address O&M equipment accessibility and routes.
- Other considerations and limitations per the Eastern Washington LID Manual and the Stormwater Management Manual for Eastern Washington.

4.2 Additional Implementation Considerations

Based on City input, it is expected that permitting requirements include:

- Swift Blvd. – SEPA and City Construction Stormwater.
- Columbia Park Trail – SEPA, Shorelines, Critical Areas, City Construction Stormwater, and City Floodplain Development.
- State mandated cultural resources requirements.

Anticipated City Council involvement includes:

- Approval to submit grant application for construction funding.
- Approval for any contracts associated with project work.
- Approval to place LID projects on the City CIP list.

Section 5—Proposed Schedule

The City anticipates completing 60% design by mid-June, and 90% design by the end of July (to be submitted to Ecology for review and acceptance). The 90% design package will include:

- 90% design
- 90% bid schedule
- 90% bid specifications and special provisions
- Engineers estimate of probable project costs
- O&M Guide

Following completion of the 90% design, the City will complete and submit an application to the competitive grant program scheduled for September 2014 in hopes of securing grant funding for construction activities.

ATTACHMENT 1 — PRELIMINARY GEOTECHNICAL INFORMATION

Soil Map—Benton County Area, Washington
(Swift Blvd)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 6, 2010—Oct 17, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Benton County Area, Washington (WA605)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
BbA	Burbank loamy fine sand, 0 to 2 percent slopes	24.7	59.8%
PaA	Pasco fine sandy loam, 0 to 2 percent slopes	3.9	9.5%
QuA	Quincy loamy sand, 0 to 2 percent slopes	7.7	18.8%
QuD	Quincy loamy sand, 2 to 15 percent slopes	4.9	11.9%
Totals for Area of Interest		**41.2**	**100.0%**

Benton County Area, Washington

BbA—Burbank loamy fine sand, 0 to 2 percent slopes

Map Unit Setting

Elevation: 300 to 1,300 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 160 to 220 days

Map Unit Composition

Burbank and similar soils: 90 percent

Description of Burbank

Setting

Landform: Terraces
Parent material: Mixed alluvium and/or eolian deposits over gravelly and stony alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 2.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4s
Land capability (nonirrigated): 6e
Hydrologic Soil Group: A

Typical profile

0 to 5 inches: Loamy fine sand
5 to 16 inches: Loamy sand
16 to 30 inches: Very gravelly loamy sand
30 to 60 inches: Extremely gravelly sand

Data Source Information

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Benton County Area, Washington

PaA—Pasco fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

Elevation: 250 to 700 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 136 to 190 days

Map Unit Composition

Pasco and similar soils: 90 percent

Description of Pasco

Setting

Landform: Flood plains
Parent material: Alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Very slightly saline to slightly saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water capacity: High (about 9.9 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 3w
Land capability (nonirrigated): 6e
Hydrologic Soil Group: C

Typical profile

0 to 6 inches: Fine sandy loam
6 to 60 inches: Silt loam

Data Source Information

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Benton County Area, Washington

QuA—Quincy loamy sand, 0 to 2 percent slopes

Map Unit Setting

Elevation: 200 to 4,500 feet
Mean annual precipitation: 6 to 12 inches
Mean annual air temperature: 46 to 54 degrees F
Frost-free period: 100 to 200 days

Map Unit Composition

Quincy and similar soils: 90 percent

Description of Quincy

Setting

Landform: Terraces
Parent material: Eolian sands

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 3 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 6.1 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 3e
Hydrologic Soil Group: A

Typical profile

0 to 9 inches: Loamy sand
9 to 60 inches: Loamy fine sand

Data Source Information

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Benton County Area, Washington

QuD—Quincy loamy sand, 2 to 15 percent slopes

Map Unit Setting

Elevation: 200 to 4,500 feet
Mean annual precipitation: 6 to 12 inches
Mean annual air temperature: 46 to 54 degrees F
Frost-free period: 100 to 200 days

Map Unit Composition

Quincy and similar soils: 100 percent

Description of Quincy

Setting

Landform: Terraces
Parent material: Eolian sands

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 3 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 6.1 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 4e
Land capability (nonirrigated): 3e
Hydrologic Soil Group: A

Typical profile

0 to 9 inches: Loamy sand
9 to 60 inches: Loamy fine sand

Data Source Information

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Soil Map—Benton County Area, Washington
(Uptown Mall)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 6, 2010—Oct 17, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Benton County Area, Washington (WA605)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
BbA	Burbank loamy fine sand, 0 to 2 percent slopes	0.1	0.1%
BlA	Burbank loamy fine sand, gravelly substratum, 0 to 2 percent slopes	5.1	10.1%
BlD	Burbank loamy fine sand, gravelly substratum, 2 to 15 percent slopes	0.1	0.3%
FeA	Finley fine sandy loam, 0 to 2 percent slopes	14.7	29.4%
PaA	Pasco fine sandy loam, 0 to 2 percent slopes	30.1	60.2%
Totals for Area of Interest		**50.0**	**100.0%**

Benton County Area, Washington

BbA—Burbank loamy fine sand, 0 to 2 percent slopes

Map Unit Setting

Elevation: 300 to 1,300 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 160 to 220 days

Map Unit Composition

Burbank and similar soils: 90 percent

Description of Burbank

Setting

Landform: Terraces
Parent material: Mixed alluvium and/or eolian deposits over gravelly and stony alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 2.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4s
Land capability (nonirrigated): 6e
Hydrologic Soil Group: A

Typical profile

0 to 5 inches: Loamy fine sand
5 to 16 inches: Loamy sand
16 to 30 inches: Very gravelly loamy sand
30 to 60 inches: Extremely gravelly sand

Data Source Information

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Benton County Area, Washington

BlA—Burbank loamy fine sand, gravelly substratum, 0 to 2 percent slopes

Map Unit Setting

Elevation: 300 to 1,300 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 160 to 220 days

Map Unit Composition

Burbank and similar soils: 90 percent

Description of Burbank

Setting

Landform: Terraces
Parent material: Mixed alluvium and/or eolian deposits over gravelly and stony alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 2.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4s
Land capability (nonirrigated): 6e
Hydrologic Soil Group: A

Typical profile

0 to 5 inches: Loamy fine sand
5 to 16 inches: Loamy sand
16 to 30 inches: Very gravelly loamy sand
30 to 60 inches: Extremely gravelly sand

Data Source Information

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Benton County Area, Washington

BID—Burbank loamy fine sand, gravelly substratum, 2 to 15 percent slopes

Map Unit Setting

Elevation: 300 to 1,300 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 160 to 220 days

Map Unit Composition

Burbank and similar soils: 100 percent

Description of Burbank

Setting

Landform: Terraces
Parent material: Mixed alluvium and/or eolian deposits over gravelly and stony alluvium

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 2.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4e
Land capability (nonirrigated): 6s
Hydrologic Soil Group: A

Typical profile

0 to 5 inches: Loamy fine sand
5 to 16 inches: Loamy sand
16 to 30 inches: Very gravelly loamy sand
30 to 60 inches: Extremely gravelly sand

Data Source Information

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Benton County Area, Washington

FeA—Finley fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

Elevation: 300 to 1,800 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 135 to 180 days

Map Unit Composition

Finley and similar soils: 90 percent

Description of Finley

Setting

Landform: Flood plains, terraces
Parent material: Alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.3 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 6e
Hydrologic Soil Group: A

Typical profile

0 to 3 inches: Fine sandy loam
3 to 13 inches: Fine sandy loam
13 to 28 inches: Very gravelly loam
28 to 60 inches: Extremely gravelly sand

Data Source Information

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Benton County Area, Washington

PaA—Pasco fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

Elevation: 250 to 700 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 136 to 190 days

Map Unit Composition

Pasco and similar soils: 90 percent

Description of Pasco

Setting

Landform: Flood plains
Parent material: Alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Very slightly saline to slightly saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water capacity: High (about 9.9 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 3w
Land capability (nonirrigated): 6e
Hydrologic Soil Group: C

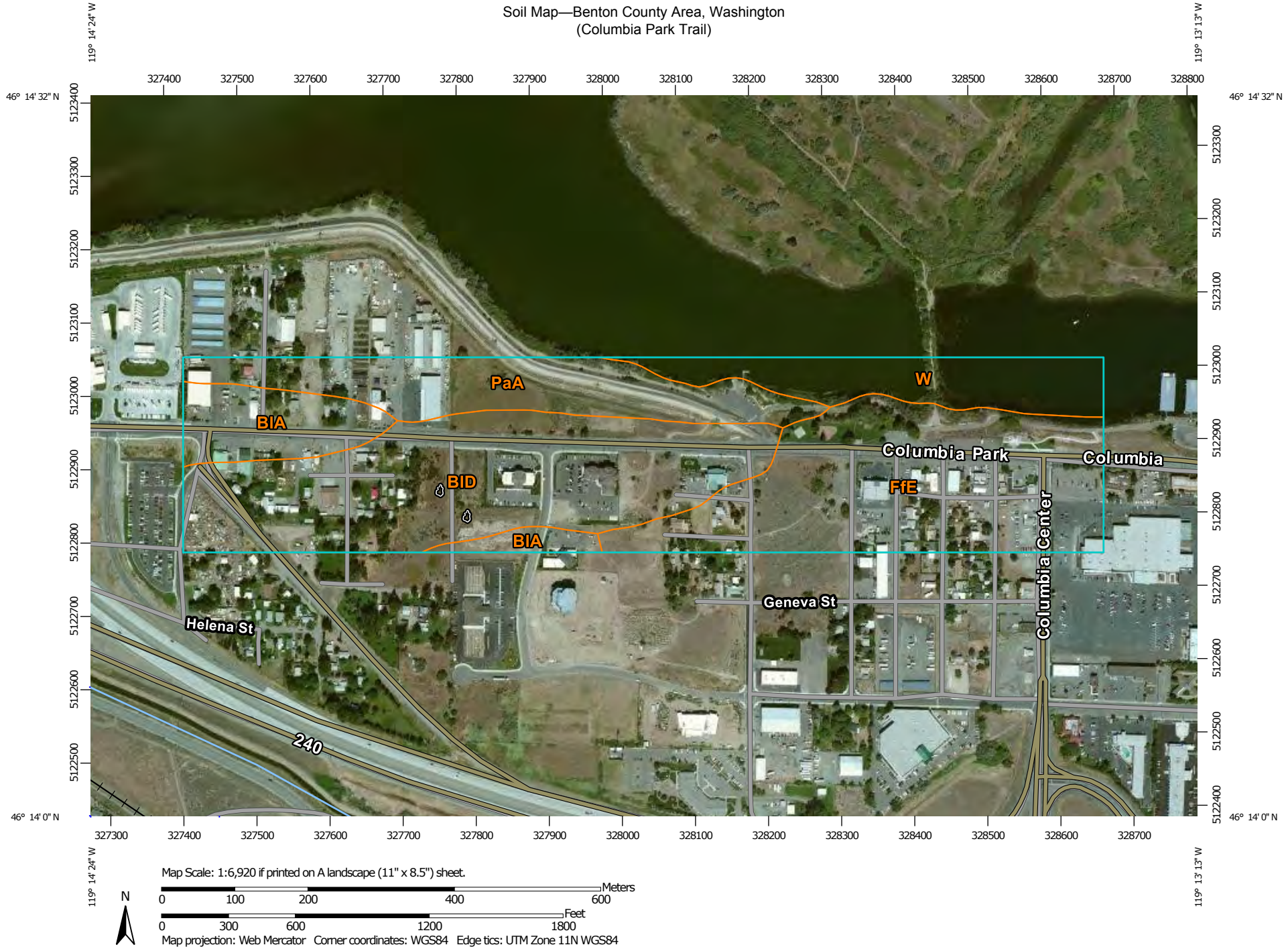
Typical profile

0 to 6 inches: Fine sandy loam
6 to 60 inches: Silt loam

Data Source Information

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Soil Map—Benton County Area, Washington
(Columbia Park Trail)



Map Scale: 1:6,920 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 6, 2010—Oct 17, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Benton County Area, Washington (WA605)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
BlA	Burbank loamy fine sand, gravelly substratum, 0 to 2 percent slopes	7.6	9.1%
BlD	Burbank loamy fine sand, gravelly substratum, 2 to 15 percent slopes	28.0	33.7%
FfE	Finley stony fine sandy loam, 0 to 30 percent slopes	25.5	30.7%
PaA	Pasco fine sandy loam, 0 to 2 percent slopes	13.0	15.7%
W	Water	9.0	10.8%
Totals for Area of Interest		**83.1**	**100.0%**

Benton County Area, Washington

BlA—Burbank loamy fine sand, gravelly substratum, 0 to 2 percent slopes

Map Unit Setting

Elevation: 300 to 1,300 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 160 to 220 days

Map Unit Composition

Burbank and similar soils: 90 percent

Description of Burbank

Setting

Landform: Terraces
Parent material: Mixed alluvium and/or eolian deposits over gravelly and stony alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 2.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4s
Land capability (nonirrigated): 6e
Hydrologic Soil Group: A

Typical profile

0 to 5 inches: Loamy fine sand
5 to 16 inches: Loamy sand
16 to 30 inches: Very gravelly loamy sand
30 to 60 inches: Extremely gravelly sand

Data Source Information

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Benton County Area, Washington

BID—Burbank loamy fine sand, gravelly substratum, 2 to 15 percent slopes

Map Unit Setting

Elevation: 300 to 1,300 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 160 to 220 days

Map Unit Composition

Burbank and similar soils: 100 percent

Description of Burbank

Setting

Landform: Terraces
Parent material: Mixed alluvium and/or eolian deposits over gravelly and stony alluvium

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very low (about 2.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4e
Land capability (nonirrigated): 6s
Hydrologic Soil Group: A

Typical profile

0 to 5 inches: Loamy fine sand
5 to 16 inches: Loamy sand
16 to 30 inches: Very gravelly loamy sand
30 to 60 inches: Extremely gravelly sand

Data Source Information

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Benton County Area, Washington

FfE—Finley stony fine sandy loam, 0 to 30 percent slopes

Map Unit Setting

Elevation: 300 to 1,500 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 135 to 180 days

Map Unit Composition

Finley and similar soils: 90 percent

Description of Finley

Setting

Landform: Terraces, flood plains
Parent material: Alluvium

Properties and qualities

Slope: 0 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 6e
Land capability (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: SANDY 6-10 PZ (R007XY501WA)

Typical profile

0 to 3 inches: Stony fine sandy loam
3 to 13 inches: Fine sandy loam
13 to 28 inches: Very gravelly loam
28 to 60 inches: Extremely cobbly loamy sand

Data Source Information

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Benton County Area, Washington

PaA—Pasco fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

Elevation: 250 to 700 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 136 to 190 days

Map Unit Composition

Pasco and similar soils: 90 percent

Description of Pasco

Setting

Landform: Flood plains
Parent material: Alluvium

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Very slightly saline to slightly saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water capacity: High (about 9.9 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 3w
Land capability (nonirrigated): 6e
Hydrologic Soil Group: C

Typical profile

0 to 6 inches: Fine sandy loam
6 to 60 inches: Silt loam

Data Source Information

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

Benton County Area, Washington

W—Water

Map Unit Composition
Water: 100 percent

Description of Water

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 8

Data Source Information

Soil Survey Area: Benton County Area, Washington
Survey Area Data: Version 9, Dec 9, 2013

ATTACHMENT 2 — EXISTING SUBBASIN MAPS

City of Richland Stormwater LID Retrofit Projects

Swift Blvd

Existing Condition
Subbasin Map

Raleigh St
Potter Ave
Putnam St
Peikins Ave
Black Ct
McPherson Ave
Marshall Ave
Long Ave
Willard Ave
Pullen St
Partridge St
Wright Ave
Winslow Ave
Provo St
Sanford Ave
Thayer Dr
Swift Basin
Swift Blvd
Cedar Ave
Birch Ave
McClellan St
Longfitt St
Stanton Ave
Snow Ave
Smith Ave
Kuhn St
Lee Blvd

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- 1999 Contours
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Subbasin Description	
Swift Basin	105.18 Acres Impervious Area
	11.00 Acres Pervious Area
	Flows to Existing Storm System

Attachment 2-1

N

0 150 300 600 Feet

Date Created: March 28, 2014

ATTACHMENT 3 — DESIGN CALCULATIONS

Hydrologic Calculations - Time of Concentration

Stormwater Management Manual for Eastern Washington

Calculated By: E. Pruneda	Date: 3/28/2014	Project: Richland
Checked By: J. Knutson	Date: 3/31/2014	Project No: 33764414
Attachment 3-1		Sheet No: 1 of 1

	Sheet Flow					Shallow Concentrated Flow				Open Channel Flow				Time of Concentration
	$T_t = 0.42 * (n_s * L)^{0.8} / ((P_{2yr2hr})^{0.5} * (s_0)^{0.4})$					$T_t = L / (60 * (k * (s_0)^{0.5}))$				$T_t = L / (60 * (k_c * (s_0)^{0.5}))$				$T_c = T_{t1} + T_{t2} + \ldots Tt_m$
Subbasin ID	n_s	L (ft)	P_{2yr2hr} (in)	s_0 (ft/ft)	T_t (min)	L (ft)	k	s_0 (ft/ft)	T_t (min)	L (ft)	k_c	s_0 (ft/ft)	T_t (min)	T_c (min)
Swift Basin	0.011	20	0.4	0.0200	0.95	913	27	0.0044	8.52	3521	42	0.0125	12.50	21.96
Swift1a	0.011	100	0.4	0.0100	4.52	183	27	0.0218	0.76					5.29
Swift1b	0.011	94	0.4	0.0211	3.19	280	27	0.0215	1.18					5.00
Swift1c	0.011	20	0.4	0.0246	0.87	172	27	0.0146	0.88					5.00
Swift2a	0.011	100	0.4	0.0150	3.85	180	27	0.0110	1.06					5.00
Swift2b	0.011	81	0.4	0.0123	3.52	238	27	0.0094	1.52					5.03
Swift2c	0.011	20	0.4	0.0200	0.95	588	27	0.0120	3.31					5.00
Swift2c Disconnected	0.15	61	0.4	0.0247	17.15	25	27	0.0119	0.14					17.29
Swift3a	0.011	24	0.4	0.0200	1.09	308	27	0.0065	2.36					5.00
Swift3b	0.011	52	0.4	0.0200	2.03	124	27	0.0162	0.60					5.00
Swift4a	0.011	100	0.4	0.0025	7.87	188	27	0.0050	1.64					9.51
Swift4b	0.011	100	0.4	0.0025	7.87	179	27	0.0040	1.75					9.62
Swift4c	0.011	100	0.4	0.0200	3.43	386	27	0.0039	3.82					7.25
Swift4c Disconnected	0.15	100	0.4	0.0250	25.35	349	27	0.0039	3.45					28.80
Swift5a	0.011	50	0.4	0.0200	1.97	433	27	0.0554	1.14					5.00
Swift5b	0.011	82	0.4	0.0212	2.86	157	27	0.0463	0.45					5.00
Swift5c	0.011	18	0.4	0.0550	0.58	74	27	0.0671	0.18					5.00
Swift5d	0.011	20	0.4	0.0497	0.66	90	27	0.0669	0.21					5.00
Uptown-Alt1	0.011	32	0.4	0.0200	1.38	231	27	0.0073	1.67					5.00
Uptown1-Alt2	0.011	66	0.4	0.0170	2.62									5.00
Uptown2-Alt2	0.011	78	0.4	0.0200	2.81									5.00
Uptown3-Alt2	0.011	66	0.4	0.0170	2.62									5.00
Uptown4-Alt2	0.011	55	0.4	0.0200	2.12									5.00
Uptown5-Alt2	0.011	74	0.4	0.0170	2.87									5.00
Uptown6-Alt2	0.011	47	0.4	0.0100	2.47									5.00
SR08	0.011	100	0.4	0.0019	8.87	561	27	0.0053	4.76					13.63

Notes:

(1) Connected ISA = Impervious streets, driveways, parking lots, etc. directly connected to the drainage system (via curb & gutter, catchbasins, downspouts connected to curbs, etc.). Runoff from these areas directly enters the drainage system.
Pervious and Disconnected ISA = Pervious areas + Impervious rooftops, etc. where runoff must flow through pervious areas prior to entering the drainage system.

(2) Connected ISA and Pervious and Disconnected ISA areas were modeled separately, each with their own Time of Concentration value.

(3) All subbasins are considered "Connected ISA" unless otherwise shown.

(4) Time of Concentration values less than 5 minutes were rounded up to 5 minutes.

(5) Time of Concentration values for Columbia Park Trail (SR20a through SR20k) were assumed to be 5 minutes.

Hydrologic Calculations - Santa Barbara Urban Hydrograph

Stormwater Management Manual for Eastern Washington

Calculated By:	E. Pruneda	Date:	3/28/2014	Project:	Richland
Checked By:	J. Knutson	Date:	3/31/2014	Project No:	33764414
Attachment 3-2				Sheet No:	1 of 1

							24-Hour Type 1A Storm Event 6-Month (0.53 in)		24-Hour Type 1A Storm Event 2-Year (0.80 in)		24-Hour Type 1A Storm Event 10-Year (1.30 in)		24-Hour Type 1A Storm Event 25-Year (1.60 in)		3-Hour Short Duration Storm Event 10-Year (0.69 in)	
Subbasin ID	Area (ac)	Pervious Area (ac)	% Imp. (dec)	Imp. CN	Perv. CN	T_c (min)	Peak Flow (cfs)	Volume (cf)	Peak Flow (cfs)	Volume (cf)	Peak Flow (cfs)	Volume (cf)	Peak Flow (cfs)	Volume (cf)	Peak Flow (cfs)	Volume (cf)
Swift Basin	116.18	11.00	0.91	98	49	21.96	7.06	131,089	12.68	228,440	23.20	413,694	29.47	526,382	65.06	188,569
Swift1a	0.07	0.00	1.00	98	49	5.29	0.01	92	0.01	160	0.02	290	0.03	369	0.09	132
Swift1b	0.41	0.00	1.00	98	49	5.00	0.04	513	0.06	894	0.12	1,619	0.15	2,060	0.50	738
Swift1c	0.08	0.00	1.00	98	49	5.00	0.01	106	0.01	184	0.02	333	0.03	424	0.10	152
Swift2a	0.08	0.00	1.00	98	49	5.00	0.01	94	0.01	163	0.02	295	0.03	376	0.09	135
Swift2b	0.19	0.00	1.00	98	49	5.03	0.02	243	0.03	424	0.05	767	0.07	976	0.24	350
Swift2c	0.35	0.00	1.00	98	49	5.00	0.03	438	0.05	764	0.10	1,383	0.13	1,760	0.43	631
Swift2c Disconnected	0.10	0.10	0.00	98	63.7	17.29	#N/A	#N/A	0.00	0	0.00	2	0.00	13	0.00	0
Swift2c Total							#N/A	#N/A	0.05	764	0.10	1,385	0.13	1,773	0.43	631
Swift3a	0.08	0.00	1.00	98	49	5.00	0.01	105	0.01	182	0.02	330	0.03	420	0.10	151
Swift3b	0.15	0.00	1.00	98	49	5.00	0.01	187	0.02	326	0.04	590	0.05	751	0.18	269
Swift4a	0.09	0.00	1.00	98	49	9.51	0.01	115	0.01	200	0.02	362	0.03	460	0.09	165
Swift4b	0.09	0.00	1.00	98	49	9.62	0.01	108	0.01	189	0.02	342	0.03	436	0.08	156
Swift4c	0.39	0.00	1.00	98	49	7.25	0.03	476	0.06	842	0.10	1,502	0.13	1,912	0.42	685
Swift4c Disconnected	0.97	0.97	0.00	98	63.7	28.80	#N/A	#N/A	0.00	0	0.00	15	0.00	121	0.00	0
Swift4c Total							#N/A	#N/A	0.06	842	0.10	1,518	0.13	2,032	0.42	685
Swift5a	0.24	0.00	1.00	98	49	5.00	0.02	300	0.04	523	0.07	948	0.09	1,206	0.29	432
Swift5b	0.25	0.00	1.00	98	49	5.00	0.02	307	0.04	535	0.07	968	0.09	1,232	0.30	441
Swift5c	0.05	0.00	1.00	98	49	5.00	0.00	59	0.01	104	0.01	188	0.02	239	0.06	86
Swift5d	0.07	0.00	1.00	98	49	5.00	0.01	82	0.01	143	0.02	260	0.02	330	0.08	118
Uptown-Alt1	1.54	0.11	0.93	98	79	5.00	0.12	1,793	0.22	3,135	0.40	5,726	0.51	7,319	1.75	2,583
Uptown1-Alt2	0.07	0.00	1.00	98	79	5.00	0.01	91	0.01	158	0.02	286	0.03	364	0.09	130
Uptown2-Alt2	0.13	0.02	0.88	98	79	5.00	0.01	137	0.02	240	0.03	441	0.04	566	0.13	197
Uptown3-Alt2	0.07	0.00	1.00	98	79	5.00	0.01	91	0.01	158	0.02	287	0.03	365	0.09	131
Uptown4-Alt2	0.08	0.01	0.88	98	79	5.00	0.01	91	0.01	160	0.02	294	0.03	378	0.09	132
Uptown5-Alt2	0.11	0.00	1.00	98	79	5.00	0.01	137	0.02	239	0.03	433	0.04	551	0.13	197
Uptown6-Alt2	0.14	0.04	0.71	98	79	5.00	0.01	122	0.02	216	0.03	411	0.04	536	0.12	177
SR08	1.32	0.00	1.00	98	49	13.63	0.10	1,643	0.18	2,863	0.33	5,185	0.42	6,598	1.07	2,364
SR20a	0.18	0.00	1.00	98	49	5.00	0.02	219	0.03	381	0.05	690	0.06	878	0.21	315
SR20b	0.68	0.00	1.00	98	49	5.00	0.06	849	0.10	1,480	0.19	2,680	0.24	3,410	0.83	1,222
SR20c	0.53	0.00	1.00	98	49	5.00	0.05	666	0.08	1,161	0.15	2,102	0.19	2,674	0.65	958
SR20d	0.40	0.00	1.00	98	49	5.00	0.03	499	0.06	869	0.11	1,574	0.14	2,002	0.49	717
SR20e	0.89	0.00	1.00	98	49	5.00	0.08	1,109	0.14	1,932	0.25	3,499	0.32	4,452	1.08	1,595
SR20f	0.25	0.00	1.00	98	49	5.00	0.02	317	0.04	552	0.07	999	0.09	1,271	0.31	455
SR20g	0.37	0.00	1.00	98	49	5.00	0.03	464	0.06	808	0.10	1,464	0.13	1,863	0.45	667
SR20h	0.19	0.00	1.00	98	49	5.00	0.02	231	0.03	403	0.05	730	0.07	929	0.23	333
SR20i	0.21	0.00	1.00	98	49	5.00	0.02	261	0.03	454	0.06	822	0.07	1,046	0.25	375
SR20j	0.13	0.00	1.00	98	49	5.00	0.01	156	0.02	273	0.04	494	0.04	628	0.15	225
SR20k	0.20	0.00	1.00	98	49	5.00	0.02	248	0.03	431	0.06	781	0.07	994	0.24	356

Notes:

(1) Connected ISA = Impervious streets, driveways, parking lots, etc. directly connected to the drainage system (via curb & gutter, catchbasins, downspouts connected to curbs, etc.). Runoff from these areas directly enters the drainage system.
Pervious and Disconnected ISA = Pervious areas + Impervious rooftops, etc. where runoff must flow through pervious areas prior to entering the drainage system.

(2) Connected ISA and Pervious and Disconnected ISA areas were modeled separately, each with their own Time of Concentration value.

(3) All subbasins are considered "Connected ISA" unless otherwise shown.

(4) It is assumed that Pervious and Disconnected ISA areas do not contribute runoff during the 6-Month, 24-Hour Type 1A Storm Event.

(5) 10-Year, 3-Hour Short Duration peak flows are provided for high-flow bypass conveyance sizing.

Bioretention Swale Calculations

Calculated By:	E. Pruneda	Date:	3/28/2014	Project:	Richland
Checked By:	J. Knutson	Date:	3/31/2014	Project No:	33764414
Attachment 3-3				Sheet No:	1 of 1

	Available Storage Volume					Predicted Infiltration Rate (cfs)	24-Hour Type 1A Storm Event 6-Month (0.53 in)		24-Hour Type 1A Storm Event 2-Year (0.80 in)		24-Hour Type 1A Storm Event 10-Year (1.30 in)		24-Hour Type 1A Storm Event 25-Year (1.60 in)	
Bioretention ID (Subbasin ID)	Top Area (sq-ft)	Bottom Area (sq-ft)	Side Slope (H:V)	Depth (ft)	Volume (cf)		Volume (cf)	Max Volume in Swale During Event (cf)	Volume (cf)	Max Volume in Swale During Event (cf)	Volume (cf)	Max Volume in Swale During Event (cf)	Volume (cf)	Max Volume in Swale During Event (cf)
Swift1a	1513	528	2:1	0.5	510	0.029	92	0	160	0	290	0	369	0
Swift1b	1660	731	2:1	0.5	598	0.041	513	0	894	32	1619	158	2060	268
Swift1c	825	290	2:1	0.5	279	0.016	106	0	184	0	333	10	424	22
Swift2a	501	319	2:1	0.5	205	0.018	94	0	163	0	295	3	376	12
Swift2b	501	319	2:1	0.5	205	0.018	243	0	424	19	767	83	976	140
Swift2c	1565	1142	2:1	0.5	677	0.063	438	0	764	0	1385	49	1773	103
Swift3a	728	486	2:1	0.5	303	0.027	105	0	182	0	330	0	420	3
Swift3b	1251	965	2:1	0.5	554	0.054	187	0	326	0	590	0	751	0
Swift4a	1073	727	2:1	0.5	450	0.040	115	0	200	0	362	0	460	0
Swift4b	997	649	2:1	0.5	412	0.036	108	0	189	0	342	0	436	0
Swift4c	1788	1438	2:1	0.5	806	0.080	476	0	842	0	1518	28	2032	79
Swift5a	1553	1081	2:1	0.5	658	0.060	300	0	523	0	948	7	1206	34
Swift5b	543	316	2:1	0.5	215	0.018	307	4	535	36	968	140	1232	239
Swift5c	399	102	2:1	0.5	125	0.006	59	0	104	2	188	15	239	25
Swift5d	156	50	2:1	0.5	52	0.003	82	5	143	19	260	72	330	123
Uptown-Alt1	2352	1730	3:1	0.5	1021	0.096	1793	31	3135	234	5726	888	7319	1546
Uptown1-Alt2	550	264	3:1	0.5	203	0.015	91	0	158	0	286	7	364	17
Uptown2-Alt2	550	264	3:1	0.5	203	0.015	137	0	240	2	441	28	566	50
Uptown3-Alt2	550	264	3:1	0.5	203	0.015	91	0	158	0	287	8	365	17
Uptown4-Alt2	550	264	3:1	0.5	203	0.015	91	0	160	0	294	8	378	18
Uptown5-Alt2	550	264	3:1	0.5	203	0.015	137	0	239	2	433	28	551	49
Uptown6-Alt2	550	264	3:1	0.5	203	0.015	122	0	216	0	411	21	536	40
SR08	1167	381	2:1	0.5	387	0.021	1643	360	2863	1303	5185	3500	6598	4877
SR20a	559	392	2:1	0.5	238	0.022	219	0	381	6	690	50	878	86
SR20b	3112	1847	2:1	0.5	1240	0.103	849	0	1480	1	2680	142	3410	261
SR20c	5351	4267	2:1	0.5	2404	0.237	666	0	1161	0	2102	0	2674	0
SR20d	2148	708	2:1	0.5	714	0.039	499	0	869	32	1574	154	2002	262
SR20e	5644	1869	2:1	0.5	1878	0.104	1109	0	1932	40	3499	275	4452	470
SR20f	1296	424	2:1	0.5	430	0.024	317	0	552	23	999	105	1271	178
SR20g	2322	766	2:1	0.5	772	0.043	464	0	808	18	1464	118	1863	202
SR20h	1038	337	2:1	0.5	344	0.019	231	0	403	14	730	69	929	118
SR20i	1209	394	2:1	0.5	401	0.022	261	0	454	14	822	74	1046	127
SR20j	837	271	2:1	0.5	277	0.015	156	0	273	5	494	38	628	64
SR20k	1091	356	2:1	0.5	362	0.020	248	0	431	15	781	75	994	128

Notes:

(1) Uptown-Alt1: Top Area represents bioretention swale at the overflow elevation. Recommend a minimum of 6" freeboard between overflow elevation and curb cuts (true Top Area as shown in figure = 2690 sq ft assuming a 3:1 side slope).

(2) An assumed max infiltration rate of 2.4 in/hr was applied to each bioretention swale. If geotechnical investigations determine the infiltration rate to be lower for any of the facilities, hydrology calculations should be rerun to verify adequate storage volume.

(3) Red text denotes insufficient storage volume.

(4) Bioretention swales (subbasins) SR20b through SR20h will need to be designed with longitudnal slope in mind. Actual storage volumes will be less than those shown above.

Bubble Up Calculations Energy Equation and Darcy Weisbach	Calculated By: E. Pruneda	Date: 3/26/2014	Project: Richland
	Checked By: J. Knutson	Date: 3/31/2014	Project No: 33764414
	Attachment 3-4		Sheet No: 1 of 2

Location: Swift2c

Catchbasin Rim Elevation =	395.00 ft	
Catchbasin Water Elevation =	394.50 ft	*Assumed to be 0.5 ft below rim of catchbasin*
Existing Ground Elevation at BMP =	393.75 ft	
Bubble Up Rim Elevation =	392.75 ft	*Assumed to be 1.0 ft below ground elevation to allow room for 0.5 ft depth of runoff storage and 0.5 ft depth of freeboard*
Max Water Surface Elev in BMP =	393.25 ft	
10-Year, 3-Hour Peak Flow, Q =	0.43 cfs	
Pipe Material =	Conc	*Equivalent Roughness, ε (ft) = 40.0 x 10^{-4}*
Pipe Diameter, d =	0.67 ft	*8" Pipe*
Pipe Length, L =	100 ft	
Head Loss, h_{loss} =	1.25 ft	*Application of the Energy Equation assuming two reservoirs Catchbasin Water Elevation - Max Water Surface Elevation in BMP*

Friction Loss, $h_f = \frac{fL}{d}\frac{Q^2}{\left[\left(\frac{\pi}{4}\right)d^2\right]^2 2g} = \frac{fLQ^2}{39.68d^5}$ *in FPS units*

Minor Losses, $h_m = K\frac{Q^2}{\left[\left(\frac{\pi}{4}\right)d^2\right]^2 2g} = \frac{KQ^2}{39.68d^4}$ *in FPS units*

where K =

Entrance Loss	0.5
Exit Loss	1.0
90° Bend	0.9
Total	2.4

$h_{loss} = h_f + h_m$

$$1.25 = \frac{fLQ^2}{39.68d^5} + \frac{KQ^2}{39.68d^4}$$

Assuming trial f = 0.03, solve for Q *and recalculate f:*

Q =	1.21 cfs		
A =	0.3491 sf		
V =	3.45 ft/s		
Re =	$\frac{Vd}{\nu}$	= $\frac{Vd}{1.217x10-5}$	= 1.89E+05
ε/d =	0.006		
f =	0.0323	*from the Moody Diagram*	

f = 0.0323, solve for Q *and recalculate f:*

Q =	1.18 cfs		
A =	0.3491 sf		
V =	3.37 ft/s		
Re =	$\frac{Vd}{\nu}$	= $\frac{Vd}{1.217x10-5}$	= 1.85E+05
ε/d =	0.006		
f =	0.0323	*from the Moody Diagram*	

Since f stabilizes, Q = 1.18 cfs
Bubble up will function for flows up to 1.18 cfs.

Bubble Up Calculations Energy Equation and Darcy Weisbach	Calculated By: E. Pruneda	Date: 3/26/2014	Project: Richland
	Checked By: J. Knutson	Date: 3/31/2014	Project No: 33764414
	Attachment 3-4		Sheet No: 2 of 2

Location: Swift4c

Catchbasin Rim Elevation =	392.75 ft	
Catchbasin Water Elevation =	392.25 ft	*Assumed to be 0.5 ft below rim of catchbasin*
Existing Ground Elevation at BMP =	391.75 ft	
Bubble Up Rim Elevation =	390.75 ft	*Assumed to be 1.0 ft below ground elevation to allow room for 0.5 ft depth of runoff storage and 0.5 ft depth of freeboard*
Max Water Surface Elev in BMP =	391.25 ft	
10-Year, 3-Hour Peak Flow, Q =	0.42 cfs	
Pipe Material =	Conc	*Equivalent Roughness, ε (ft) = 40.0 x 10^{-4}*
Pipe Diameter, d =	0.67 ft	*8" Pipe*
Pipe Length, L =	120 ft	
Head Loss, h_{loss} =	1.00 ft	*Application of the Energy Equation assuming two reservoirs Catchbasin Water Elevation - Max Water Surface Elevation in BMP*

Friction Loss, h_f = $\frac{fL}{d}\frac{Q^2}{\left[\left(\frac{\pi}{4}\right)d^2\right]^2 2g} = \frac{fLQ^2}{39.68d^5}$ *in FPS units*

Minor Losses, h_m = $K\frac{Q^2}{\left[\left(\frac{\pi}{4}\right)d^2\right]^2 2g} = \frac{KQ^2}{39.68d^4}$ *in FPS units*

where K =

Entrance Loss	0.5
Exit Loss	1.0
90° Bend	0.9
Total	2.4

$h_{loss} = h_f + h_m$

$1.00 = \frac{fLQ^2}{39.68d^5} + \frac{KQ^2}{39.68d^4}$

Assuming trial f = 0.03, solve for Q *and recalculate* f*:*

Q =	1.01 cfs		
A =	0.3491 sf		
V =	2.90 ft/s		
Re =	$\frac{Vd}{\nu}$ =	$\frac{Vd}{1.217x10-5}$ =	1.59E+05
ε/d =	0.006		
f =	0.0325	*from the Moody Diagram*	

f = 0.0325, solve for Q *and recalculate* f*:*

Q =	0.99 cfs		
A =	0.3491 sf		
V =	2.82 ft/s		
Re =	$\frac{Vd}{\nu}$ =	$\frac{Vd}{1.217x10-5}$ =	1.55E+05
ε/d =	0.006		
f =	0.0325	*from the Moody Diagram*	

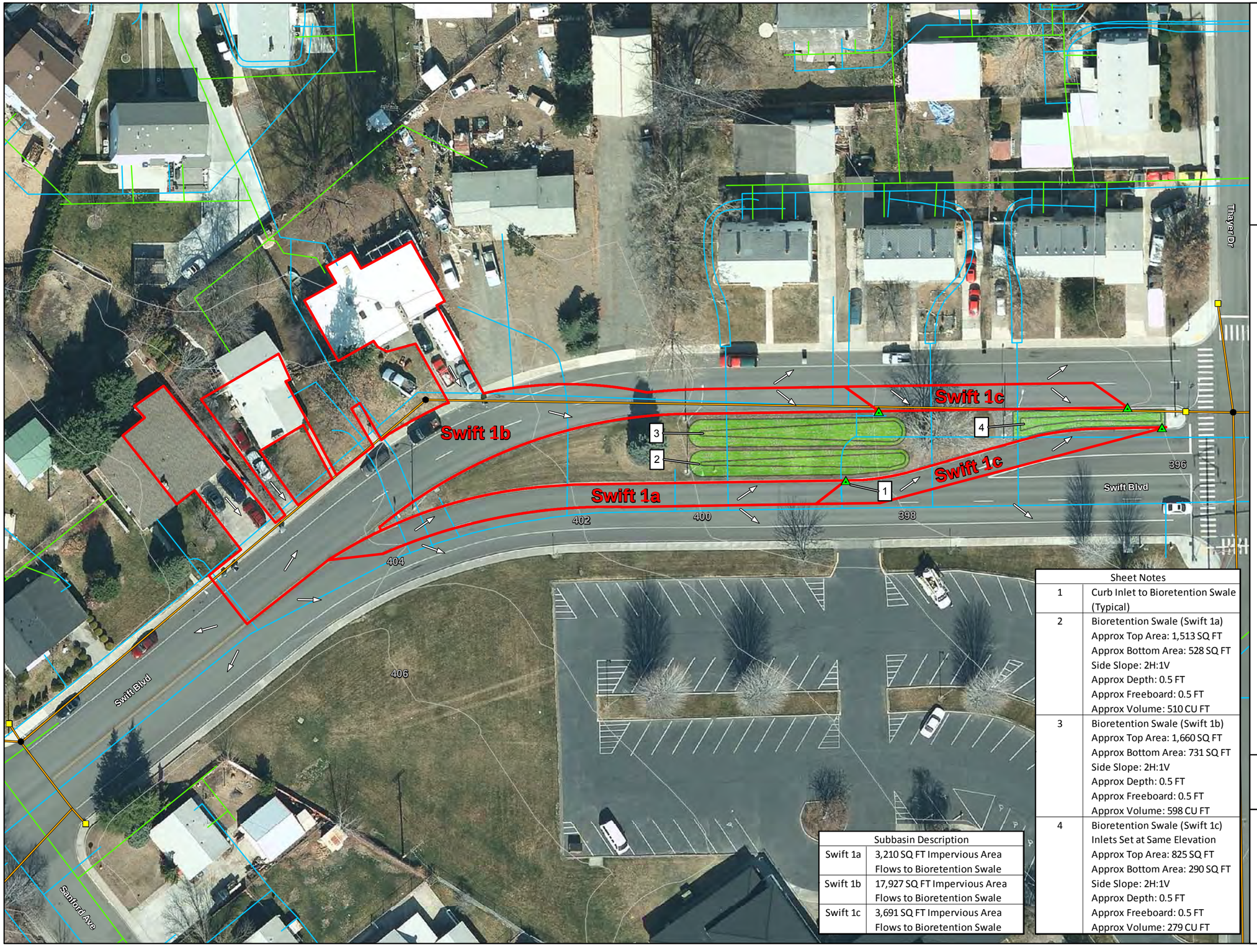
Since f stabilizes, Q = 0.99 cfs
Bubble up will function for flows up to 0.99 cfs.

ATTACHMENT 4 — PLANS AND DETAILS

City of Richland Stormwater LID Retrofit Projects

Swift Blvd

Proposed Condition
Subbasin Map



Subbasin Description	
Swift 1a	3,210 SQ FT Impervious Area Flows to Bioretention Swale
Swift 1b	17,927 SQ FT Impervious Area Flows to Bioretention Swale
Swift 1c	3,691 SQ FT Impervious Area Flows to Bioretention Swale

Sheet Notes	
1	Curb Inlet to Bioretention Swale (Typical)
2	Bioretention Swale (Swift 1a) Approx Top Area: 1,513 SQ FT Approx Bottom Area: 528 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 510 CU FT
3	Bioretention Swale (Swift 1b) Approx Top Area: 1,660 SQ FT Approx Bottom Area: 731 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 598 CU FT
4	Bioretention Swale (Swift 1c) Inlets Set at Same Elevation Approx Top Area: 825 SQ FT Approx Bottom Area: 290 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 279 CU FT

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-1

N

0 25 50 100 Feet

Date Created: April 10, 2014

City of Richland Stormwater LID Retrofit Projects

Swift Blvd

Proposed Condition Subbasin Map

Sheet Notes	
1	Curb Inlet to Bioretention Swale (Typical)
2	Bioretention Swale (Swift 2a) Approx Top Area: 501 SQ FT Approx Bottom Area: 319 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 205 CU FT
3	Bioretention Swale (Swift 2b) Approx Top Area: 501 SQ FT Approx Bottom Area: 319 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 205 CU FT
4	Bioretention Swale (Swift 2c) Approx Top Area: 1,565 SQ FT Approx Bottom Area: 1,142 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 677 CU FT
5	Construct Manhole with 60 LF of 8" Conc Storm Pipe Connected to Bubble Up. Manhole to Have Internal Weir to Allow Stormwater to Overflow to Existing Storm Pipe.
6	Construct Bubble Up at Bioretention Swale Bottom.
7	Bioretention Swale (Swift 3a) Approx Top Area: 728 SQ FT Approx Bottom Area: 486 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 303 CU FT
8	Bioretention Swale (Swift 3b) Approx Top Area: 1,251 SQ FT Approx Bottom Area: 965 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 554 CU FT

Subbasin Description	
Swift 2a	3,268 SQ FT Impervious Area Flows to Bioretention Swale
Swift 2b	8,494 SQ FT Impervious Area Flows to Bioretention Swale
Swift 2c	Connected: 15,321 SQ FT Impervious Area Disconnected: 4,596 SQ FT Impervious Area 10,725 SQ FT Pervious Area Flows to Bioretention Swale
Swift 3a	3659 SQ FT Impervious Area Flows to Bioretention Swale
Swift 3b	6536 SQ FT Impervious Area Flows to Bioretention Swale
Swift 4c	Connected: 16,887 SQ FT Impervious Area Disconnected: 5,066 SQ FT Impervious Area 11,821 SQ FT Pervious Area Flows to Bioretention Swale

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-2

N

0 20 40 80 Feet

Date Created: March 28, 2014

City of Richland Stormwater LID Retrofit Projects

Swift Blvd

Proposed Condition Subbasin Map

Swift 4b
Swift 4a
Swift 4c
Swift 4c Disconnected
Swift 3b
Swift Blvd
Mc.Pherson Ave
390
392
394
1
2
3
4
5
6

Subbasin Description	
Swift 4a	4007 SQ FT Impervious Area Flows to Bioretention Swale
Swift 4b	3791 SQ FT Impervious Area Flows to Bioretention Swale
Swift 4c	Connected: 16,887 SQ FT Impervious Area Disconnected: 5,066 SQ FT Impervious Area 11,821 SQ FT Pervious Area Flows to Bioretention Swale

Sheet Notes	
1	Curb Inlet to Bioretention Swale (Typical)
2	Bioretention Swale (Swift 4a) Approx Top Area: 1,073 SQ FT Approx Bottom Area: 727 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 450 CU FT
3	Bioretention Swale (Swift 4b) Approx Top Area: 997 SQ FT Approx Bottom Area: 649 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 412 CU FT
4	Bioretention Swale (Swift 4c) Approx Top Area: 1,788 SQ FT Approx Bottom Area: 1,438 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 806 CU FT
5	Construct Manhole with 60 LF of 8" Conc Storm Pipe Connected to Bubble Up. Manhole to Have Internal Weir to Allow Stormwater to Overflow to Existing Storm Pipe.
6	Construct Bubble Up at Bioretention Swale Bottom.

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-3

N

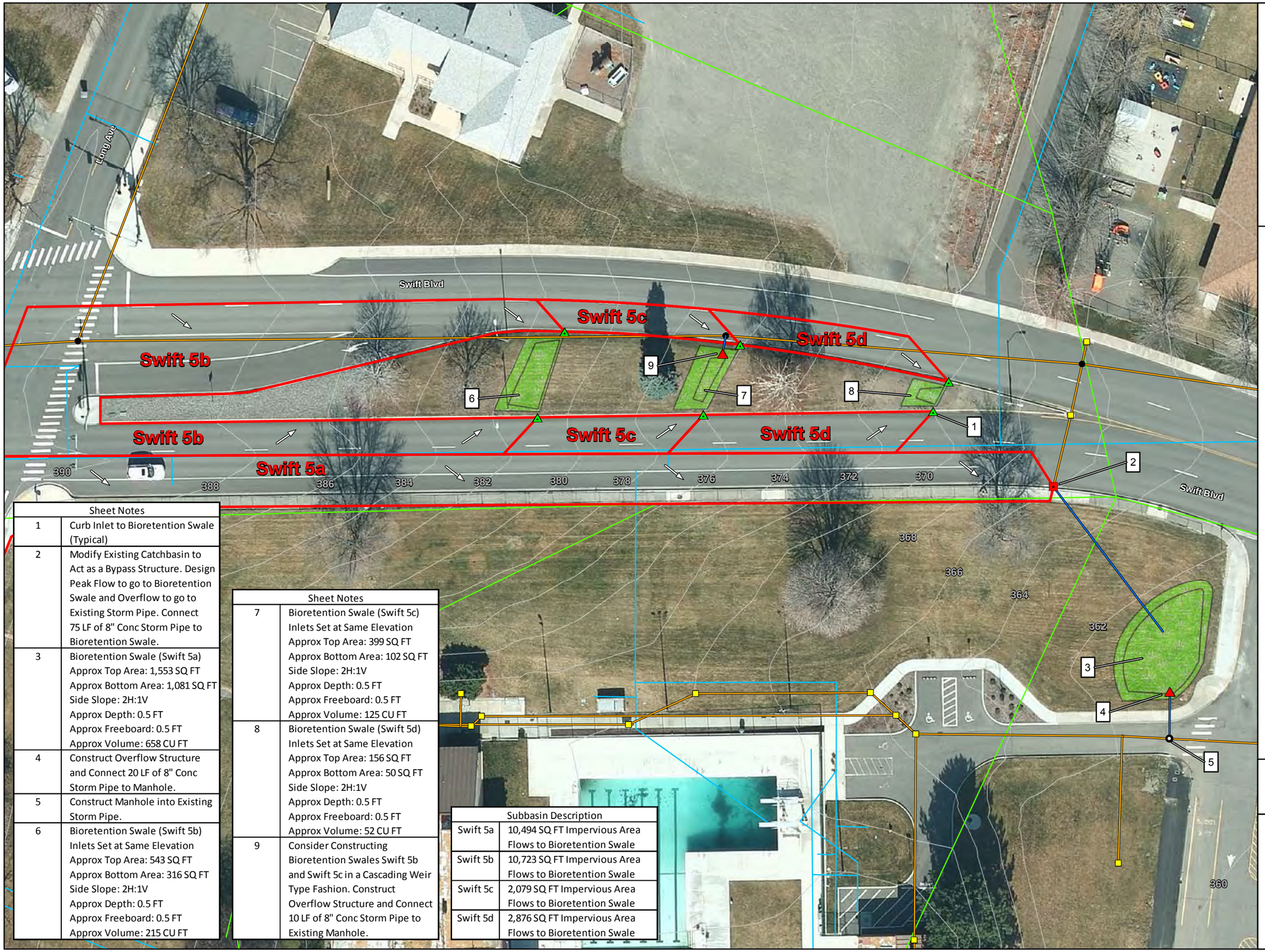
0 20 40 80 Feet

Date Created: March 28, 2014

City of Richland Stormwater LID Retrofit Projects

Swift Blvd

Proposed Condition
Subbasin Map



Sheet Notes	
1	Curb Inlet to Bioretention Swale (Typical)
2	Modify Existing Catchbasin to Act as a Bypass Structure. Design Peak Flow to go to Bioretention Swale and Overflow to go to Existing Storm Pipe. Connect 75 LF of 8" Conc Storm Pipe to Bioretention Swale.
3	Bioretention Swale (Swift 5a) Approx Top Area: 1,553 SQ FT Approx Bottom Area: 1,081 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 658 CU FT
4	Construct Overflow Structure and Connect 20 LF of 8" Conc Storm Pipe to Manhole.
5	Construct Manhole into Existing Storm Pipe.
6	Bioretention Swale (Swift 5b) Inlets Set at Same Elevation Approx Top Area: 543 SQ FT Approx Bottom Area: 316 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 215 CU FT

Sheet Notes	
7	Bioretention Swale (Swift 5c) Inlets Set at Same Elevation Approx Top Area: 399 SQ FT Approx Bottom Area: 102 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 125 CU FT
8	Bioretention Swale (Swift 5d) Inlets Set at Same Elevation Approx Top Area: 156 SQ FT Approx Bottom Area: 50 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 52 CU FT
9	Consider Constructing Bioretention Swales Swift 5b and Swift 5c in a Cascading Weir Type Fashion. Construct Overflow Structure and Connect 10 LF of 8" Conc Storm Pipe to Existing Manhole.

Subbasin Description	
Swift 5a	10,494 SQ FT Impervious Area Flows to Bioretention Swale
Swift 5b	10,723 SQ FT Impervious Area Flows to Bioretention Swale
Swift 5c	2,079 SQ FT Impervious Area Flows to Bioretention Swale
Swift 5d	2,876 SQ FT Impervious Area Flows to Bioretention Swale

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-4

N

0 20 40 80 Feet

Date Created: March 28, 2014

City of Richland Stormwater LID Retrofit Projects

Uptown Mall

Proposed Condition
Alternative 1

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- 1999 Contours
- Bioretention Swale

2012 Aerial Imagery

Attachment 4-5

N

0 75 150 300 Feet

Date Created: March 28, 2014

City of Richland Stormwater LID Retrofit Projects

Uptown Mall

Proposed Condition
Alternative 2

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- 1999 Contours
- Bioretention Swale

2012 Aerial Imagery

Attachment 4-6

N

0 75 150 300 Feet

Date Created: March 28, 2014

City of Richland Stormwater LID Retrofit Projects

Uptown Mall

Proposed Condition
Subbasin Map Alt 1

Sheet Notes	
1	Curb Cut to Bioretention Swale (Typical)
2	Construct Curb and Gutter Per City Standard Gutter to Match Existing Asphalt
3	Bioretention Swale (Uptown-Alt1) Centered on Existing Inlet Approx Top Area: 2,690 SQ FT Approx Area at Overflow Structure: 2,352 SQ FT Approx Bottom Area: 1,730 SQ FT Side Slope: 3H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 1,021 CU FT
4	Overflow Structure Utilize as Much of Existing Inlet Structure as Possible

Subbasin Description	
Uptown-Alt1	67,259 SQ FT Impervious Area Flows to Bioretention Swale

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-7

N

0 25 50 100 Feet

Date Created: March 28, 2014

City of Richland Stormwater LID Retrofit Projects

Uptown Mall

Proposed Condition
Subbasin Map Alt 2

Uptown1-Alt2
Uptown2-Alt2
Uptown3-Alt2
Uptown4-Alt2
Uptown5-Alt2
Uptown6-Alt2

354
356
358
360
George Washington Way

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Sheet Notes	
1	Bioretention Inlet (Typical) Curb Cut Along Curb and Gutter
2	Construct Curb and Gutter Per City Standard (Typical) Gutter Slope to Match Existing Asphalt
3	Construct Standing Curb Per City Standard (Typical)
4	Bioretention Outlet (Typical) Curb Cut Along Standing Curb
5	Bioretention Swale (Typical) Approx Top Area: 550 SQ FT Approx Bottom Area: 264 SQ FT Side Slope: 3H:1V Approx Depth: 0.5 FT Approx Volume: 203 CU FT
6	Existing Inlet to Remain

Subbasin Description	
Uptown1-Alt2	3,169 SQ FT Impervious Area Flows to Bioretention Swale
Uptown2-Alt2	4,780 SQ FT Impervious Area 677 SQ FT Pervious Area Flows to Bioretention Swale
Uptown3-Alt2	3,178 SQ FT Impervious Area Flows to Bioretention Swale
Uptown4-Alt2	3,191 SQ FT Impervious Area 427 SQ FT Pervious Area Flows to Bioretention Swale
Uptown5-Alt2	4,796 SQ FT Impervious Area Flows to Bioretention Swale
Uptown6-Alt2	4,266 SQ FT Impervious Area 1,783 SQ FT Pervious Area Flows to Bioretention Swale

N

0 25 50 100 Feet

Date Created: March 28, 2014

Attachment 4-8

City of Richland Stormwater LID Retrofit Projects

Columbia Park Trail

Proposed Condition Subbasin Map

General Notes	
1	Longitudinal Slope of Bioretention Swales SR20b through SR20h will Require Bioretention Swales to be Divided into Smaller Swales and Inlets Added in Order to Hold Required Runoff Volumes.

Sheet Notes	
1	Proposed Sidewalk per City of Richland Streetscape Master Plan.
2	Proposed Greenspace per City of Richland Streetscape Master Plan.
3	Curb Inlet to Bioretention Swale (Typical)
4	Bioretention Swale (SR08) Approx Top Area: 1,167 SQ FT Approx Bottom Area: 381 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 387 CU FT
5	Bioretention Swale (SR20a) Approx Top Area: 559 SQ FT Approx Bottom Area: 392 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 238 CU FT
6	Available Greenspace for Bioretention Swale if Needed Due to Parking Lot Grading.

Sheet Notes	
7	Alt1: Conventional Asphalt Pavement Parking Lot. Grade to Slope Towards Bioretention Swale. Alt2: Porous Asphalt Pavement Parking Lot.
8	Bioretention Swale (SR20b) Approx Top Area: 3,112 SQ FT Approx Bottom Area: 1,847 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 1,240 CU FT
9	Bioretention Swale (SR20c) Approx Top Area: 5,351 SQ FT Approx Bottom Area: 4,267 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 2,404 CU FT

Subbasin Description	
SR08	57,423 SQ FT Impervious Area Flows to Bioretention Swale
SR20a	7,642 SQ FT Impervious Area Flows to Bioretention Swale
SR20b	29,681 SQ FT Impervious Area Flows to Bioretention Swale
SR20c	23,278 SQ FT Impervious Area Flows to Bioretention Swale
SR20d	17,429 SQ FT Impervious Area Flows to Bioretention Swale

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-9

N

0 37.5 75 150 Feet

Date Created: April 10, 2014

City of Richland Stormwater LID Retrofit Projects

Columbia Park Trail

Proposed Condition Subbasin Map

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-10

N

0 37.5 75 150 Feet

Date Created: March 28, 2014

Sheet Notes	
1	Proposed Sidewalk per City of Richland Streetscape Master Plan.
2	Proposed Greenspace per City of Richland Streetscape Master Plan.
3	Curb Inlet to Bioretention Swale (Typical)
4	Bioretention Swale (SR20d) Approx Top Area: 2,148 SQ FT Approx Bottom Area: 708 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 714 CU FT
5	Bioretention Swale (SR20e) Approx Top Area: 5,644 SQ FT Approx Bottom Area: 1,869 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 1,878 CU FT

General Notes	
1	Longitudinal Slope of Bioretention Swales SR20b through SR20h will Require Bioretention Swales to be Divided into Smaller Swales and Inlets Added in Order to Hold Required Runoff Volumes.

Subbasin Description	
SR20d	17,429 SQ FT Impervious Area Flows to Bioretention Swale
SR20e	38,749 SQ FT Impervious Area Flows to Bioretention Swale

City of Richland Stormwater LID Retrofit Projects

Columbia Park Trail

Proposed Condition Subbasin Map

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-11

N

0 37.5 75 150 Feet

Date Created: March 28, 2014

Subbasin Description	
SR20e	38,749 SQ FT Impervious Area Flows to Bioretention Swale
SR20f	11,066 SQ FT Impervious Area Flows to Bioretention Swale
SR20g	16,214 SQ FT Impervious Area Flows to Bioretention Swale

General Notes	
1	Longitudinal Slope of Bioretention Swales SR20b through SR20h will Require Bioretention Swales to be Divided into Smaller Swales and Inlets Added in Order to Hold Required Runoff Volumes.

Sheet Notes	
1	Proposed Sidewalk per City of Richland Streetscape Master Plan.
2	Proposed Greenspace per City of Richland Streetscape Master Plan.
3	Curb Inlet to Bioretention Swale (Typical)
4	Bioretention Swale (SR20e) Approx Top Area: 5,644 SQ FT Approx Bottom Area: 1,869 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 1,878 CU FT

Sheet Notes	
5	Bioretention Swale (SR20f) Approx Top Area: 1,296 SQ FT Approx Bottom Area: 424 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 430 CU FT
6	Bioretention Swale (SR20g) Approx Top Area: 2,322 SQ FT Approx Bottom Area: 766 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 772 CU FT

City of Richland Stormwater LID Retrofit Projects

Columbia Park Trail

Proposed Condition Subbasin Map

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-12

N

0 37.5 75 150 Feet

Date Created: March 28, 2014

Sheet Notes	
1	Proposed Sidewalk per City of Richland Streetscape Master Plan.
2	Proposed Greenspace per City of Richland Streetscape Master Plan.
3	Curb Inlet to Bioretention Swale (Typical)
4	Bioretention Swale (SR20g) Approx Top Area: 2,322 SQ FT Approx Bottom Area: 766 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 772 CU FT
5	Bioretention Swale (SR20h) Approx Top Area: 1,038 SQ FT Approx Bottom Area: 337 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 344 CU FT

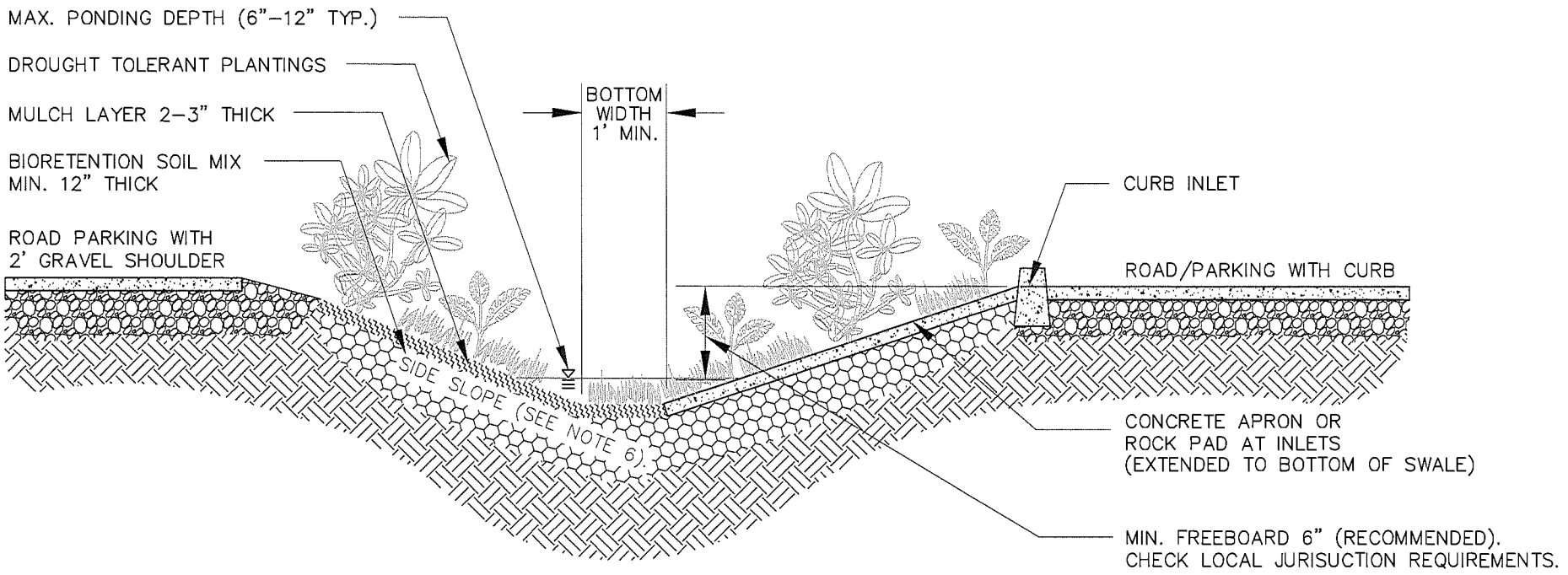
Sheet Notes	
6	Bioretention Swale (SR20i) Approx Top Area: 1,209 SQ FT Approx Bottom Area: 394 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 401 CU FT
7	Bioretention Swale (SR20j) Approx Top Area: 837 SQ FT Approx Bottom Area: 271 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 277 CU FT
8	Bioretention Swale (SR20k) Approx Top Area: 1,091 SQ FT Approx Bottom Area: 356 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 362 CU FT

General Notes	
1	Longitudinal Slope of Bioretention Swales SR20b through SR20h will Require Bioretention Swales to be Divided into Smaller Swales and Inlets Added in Order to Hold Required Runoff Volumes.

Subbasin Description	
SR20g	16,214 SQ FT Impervious Area Flows to Bioretention Swale
SR20h	8,089 SQ FT Impervious Area Flows to Bioretention Swale
SR20i	9,106 SQ FT Impervious Area Flows to Bioretention Swale
SR20j	5,466 SQ FT Impervious Area Flows to Bioretention Swale
SR20k	8,651 SQ FT Impervious Area Flows to Bioretention Swale

NOTES:

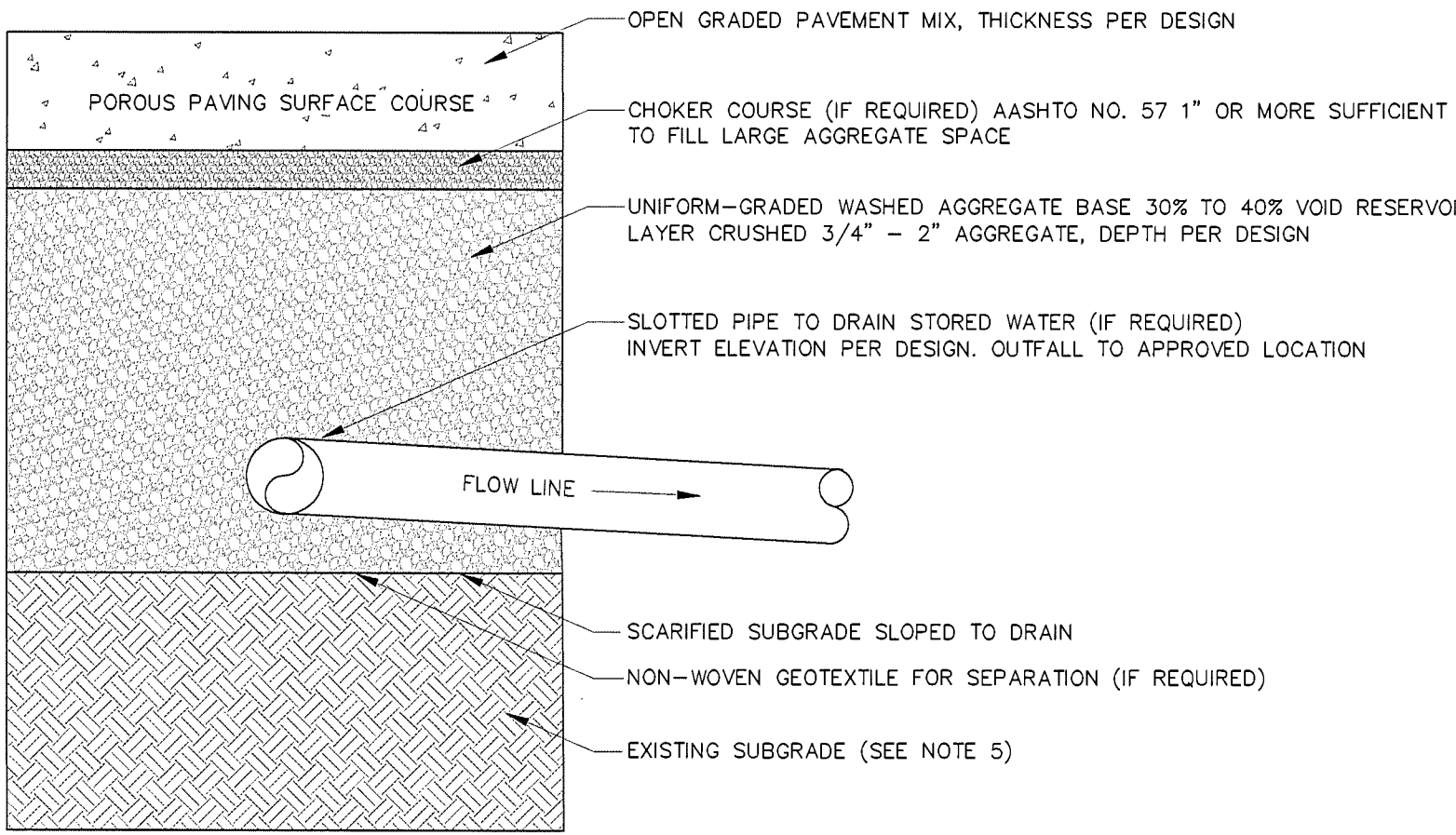
1. SIZE AND DEPTH PER SWMMEW BMP T5.30 (BIO–INFILTRATION SWALES) OR LOCAL EQUIVALENT.
2. PROVIDE OVERFLOW STRUCTURE PER LOCAL JURISDICTION REQUIREMENTS.
3. THE VOLUME CONTAINED BY THE SWALE MUST BE SUFFICIENT TO TREAT THE WATER QUALITY VOLUME PRIOR TO OVERFLOWING.
4. DESIGN FACILITY TO DRAIN COMPLETELY WITHIN 72 HOURS.
5. TREES OR DEEP ROOTED VEGETATION ARE NOT RECOMMENDED OVER UTILITIES.
6. SIDE SLOPE 2.5H:1V MAX. (RECOMMENDED). SEE LOCAL JURISDICTION REQUIREMENTS.



NTS

EASTERN WASHINGTON LID
GUIDANCE MANUAL

BIORETENTION W/O UNDER–DRAIN
DRAWING #101



NOTES:

1. NOT INTENDED FOR PUBLIC RIGHT OF WAY WITHOUT PRIOR APPROVAL. ENGINEERING DESIGN REQUIRED FOR STORMWATER AND STRUCTURE FUNCTIONS.
2. PAVEMENT SURFACE WITH SIGNIFICANT PERMEABILITY (>8" PER HR).
3. PROVIDE SLOTTED PIPE MANIFOLD IN RESERVOIR LAYER FOR CONVEYANCE, IF REQUIRED SUBGRADE INFILTRATION RATES LESS THAN 2"/HOUR.
4. NOT RECOMMENDED FOR TRAFFIC SURFACES WITH SLOPE >5%.
5. DO NOT COMPACT EXISTING SUBGRADE.
6. SUBGRADE SLOPED TO SLOTTED PIPE (IF REQUIRED) FOR DRAINAGE.
7. CONSULT WITH QUALIFIED GEOTECHNICAL ENGINEER IF HIGH GROUNDWATER IS SUSPECTED.
8. SIGNAGE IDENTIFYING POROUS PAVEMENT REQUIRED.

NTS

EASTERN WASHINGTON LID GUIDANCE MANUAL

PERMEABLE PAVEMENT
DRAWING #401

ATTACHMENT 5 — PRE-DESIGN LEVEL CONSTRUCTION COST ESTIMATES

Swift Blvd. LID Retrofit Project				Pre-Design Estimate	
ITEM NO.	**DESCRIPTION OF ITEM**	**UNIT**	**ESTIMATED QUANTITY**	**UNIT PRICE**	**EXTENDED AMOUNT**
1	Mobilization	LS	1	$ 15,000.00	$ 15,000.00
2	Traffic Control	LS	1	$ 25,000.00	$ 25,000.00
3	Clearing and Grubbing	LS	1	$ 10,000.00	$ 10,000.00
4	Removal of Structures and Obstructions	LS	1	$ 3,000.00	$ 3,000.00
5	Sawcutting	LF	154.0	$ 5.00	$ 770.00
6	Structure Excavation Class B Incl. Haul	CY	92.5	$ 10.00	$ 924.59
7	Amended Treatment Soil Mix	CY	836.2	$ 20.00	$ 16,724.44
8	HMA Patch	LS	1	$ 500.00	$ 500.00
9	8-inch Diameter Storm Drain Pipe, in Place	LF	215.0	$ 20.00	$ 4,300.00
10	Pipe Zone Backfill	CY	50.4	$ 40.00	$ 2,017.28
11	Gravel Backfill for Pipe Zone Bedding	CY	42.0	$ 50.00	$ 2,101.34
12	Catch Basin Type 1 as Bubble-Up	EA	2	$ 1,500.00	$ 3,000.00
13	Curb Inlet	EA	16	$ 1,500.00	$ 24,000.00
14	Bypass Structure Manhole 48 In. Diam.	EA	3	$ 2,500.00	$ 7,500.00
15	Manhole 48 In. Diam. w/ Overflow Grate	EA	1	$ 8,500.00	$ 8,500.00
16	Connect to Drainage Structure	EA	6	$ 500.00	$ 3,000.00
17	Quarry Spalls	CY	3.6	$ 35.50	$ 126.22
18	Bioretention Swales	LS	1	$ 75,000.00	$ 75,000.00
19	Animal Guard, 8-Inch Diameter	EA	1	$ 400.00	$ 400.00
20	ESC Lead	DAY	7	$ 150.00	$ 1,050.00
21	Erosion Control	FA	EST	$ 5,000.00	$ 5,000.00
22	Minor Change	FA	EST	$ 10,000.00	$ 10,000.00
	Construction Subtotal				**$ 217,913.88**
	Construction Management (10%)				$ 21,791.39
	WA State Sales Tax (8.3%)				$ 18,086.85
	Subtotal				**$ 257,792.12**
	Pre-Design Contingency (50%)				$ 128,896.06
	Total				**$ 386,688.17**

Notes:

- Curb Inlet includes sump structure, access lid, and concrete gutter restoration.
- Bioretention Swale includes excavation, grading, soil mix, mulch, planting, and irrigation.

Columbia Park Trail LID Retrofit Project - Alt 1				Pre-Design Estimate	
ITEM NO.	**DESCRIPTION OF ITEM**	**UNIT**	**ESTIMATED QUANTITY**	**UNIT PRICE**	**EXTENDED AMOUNT**
1	Mobilization	LS	1	$ 35,000.00	$ 35,000.00
2	Traffic Control	LS	1	$ 40,000.00	$ 40,000.00
3	Clearing and Grubbing	LS	1	$ 10,000.00	$ 10,000.00
4	Amended Treatment Soil Mix	CY	1,431.8	$ 20.00	$ 28,636.67
5	Crushed Surfacing Top Course	TON	636.7	$ 22.00	$ 14,006.67
6	HMA Cl. 1/2-Inch PG 64-28	TON	439.3	$ 90.00	$ 39,537.00
7	Curb Inlet	EA	12	$ 1,500.00	$ 18,000.00
8	Bioretention Swales	LS	1	$ 60,000.00	$ 60,000.00
9	ESC Lead	DAY	10	$ 150.00	$ 1,500.00
10	Erosion Control	FA	EST	$ 10,000.00	$ 10,000.00
11	Minor Change	FA	EST	$ 10,000.00	$ 10,000.00
	Construction Subtotal				**$ 266,680.33**
	Construction Management (10%)				$ 26,668.03
	WA State Sales Tax (8.3%)				$ 22,134.47
	Subtotal				**$ 315,482.83**
	Pre-Design Contingency (50%)				$ 157,741.42
	Total				**$ 473,224.25**

Notes:

- Curb Inlet includes sump structure, access lid, and concrete gutter restoration.
- Bioretention Swale includes excavation, grading, soil mix, mulch, planting, and irrigation.

Columbia Park Trail LID Retrofit Project - Alt 2				Pre-Design Estimate	
ITEM NO.	**DESCRIPTION OF ITEM**	**UNIT**	**ESTIMATED QUANTITY**	**UNIT PRICE**	**EXTENDED AMOUNT**
1	Mobilization	LS	1	$ 35,000.00	$ 35,000.00
2	Traffic Control	LS	1	$ 40,000.00	$ 40,000.00
3	Clearing and Grubbing	LS	1	$ 10,000.00	$ 10,000.00
4	Unclassified Excavation Incl. Haul	CY	848.9	$ 10.00	$ 8,488.89
5	Amended Treatment Soil Mix	CY	1,431.8	$ 20.00	$ 28,636.67
6	Aggregate Base for Porous HMA	CY	848.9	$ 50.00	$ 42,444.44
7	Porous HMA	SF	22,920	$ 3.50	$ 80,220.00
8	Curb Inlet	EA	12	$ 1,500.00	$ 18,000.00
9	Bioretention Swales	LS	1	$ 60,000.00	$ 60,000.00
10	ESC Lead	DAY	10	$ 150.00	$ 1,500.00
11	Erosion Control	FA	EST	$ 10,000.00	$ 10,000.00
12	Minor Change	FA	EST	$ 10,000.00	$ 10,000.00
	Construction Subtotal				**$ 344,290.00**
	Construction Management (10%)				$ 34,429.00
	WA State Sales Tax (8.3%)				$ 28,576.07
	Subtotal				**$ 407,295.07**
	Pre-Design Contingency (50%)				$ 203,647.54
	Total				**$ 610,942.61**

Notes:

- Curb Inlet includes sump structure, access lid, and concrete gutter restoration.
- Bioretention Swale includes excavation, grading, soil mix, mulch, planting, and irrigation.

ATTACHMENT 6 — EXAMPLE LID BMP PHOTOS

Parking Lot Bioretention Swale Examples

Example xeriscaped parking lot bioretention swales.

Note: URS recommends having a clear space between parking stalls and bioretention curbing to avoid tripping hazards.

Example non-xeriscaped parking lot bioretention swale.

Non-xeriscaped Roadside Bioretention Examples

Example bioretention swale with roadside and parking lot runoff inputs.

Example bioretention swale with roadside and parking lot runoff inputs. Note the berm separating the roadside swale from the parking lot swale.

Non-xeriscaped Roadside Bioretention Examples

Example of cascading bioretention swales.

Example bioretention swale. Lower zone comprised of turf grass and upper zone comprised of select grasses, shrubs, and trees.

Xeriscaped Roadside Bioretention Examples

Example bioretention swale with a xeriscaped approach. Lower zone comprised of river rock and upper zone comprised of select grasses, shrubs, and trees.

Example bioretention swale with a xeriscaped approach. Lower zone comprised of river rock and upper zone comprised of select grasses, shrubs, and trees.

Xeriscaped Roadside Bioretention Examples

Example bioretention swale with a xeriscaped approach. Lower zone comprised of pea gravel and upper zone comprised of select grasses, shrubs, and trees.

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Appendix F.

CIP Project Sheets

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Appendix F.1

Flood Risk (FR) CIP Project Sheets and Cost Details

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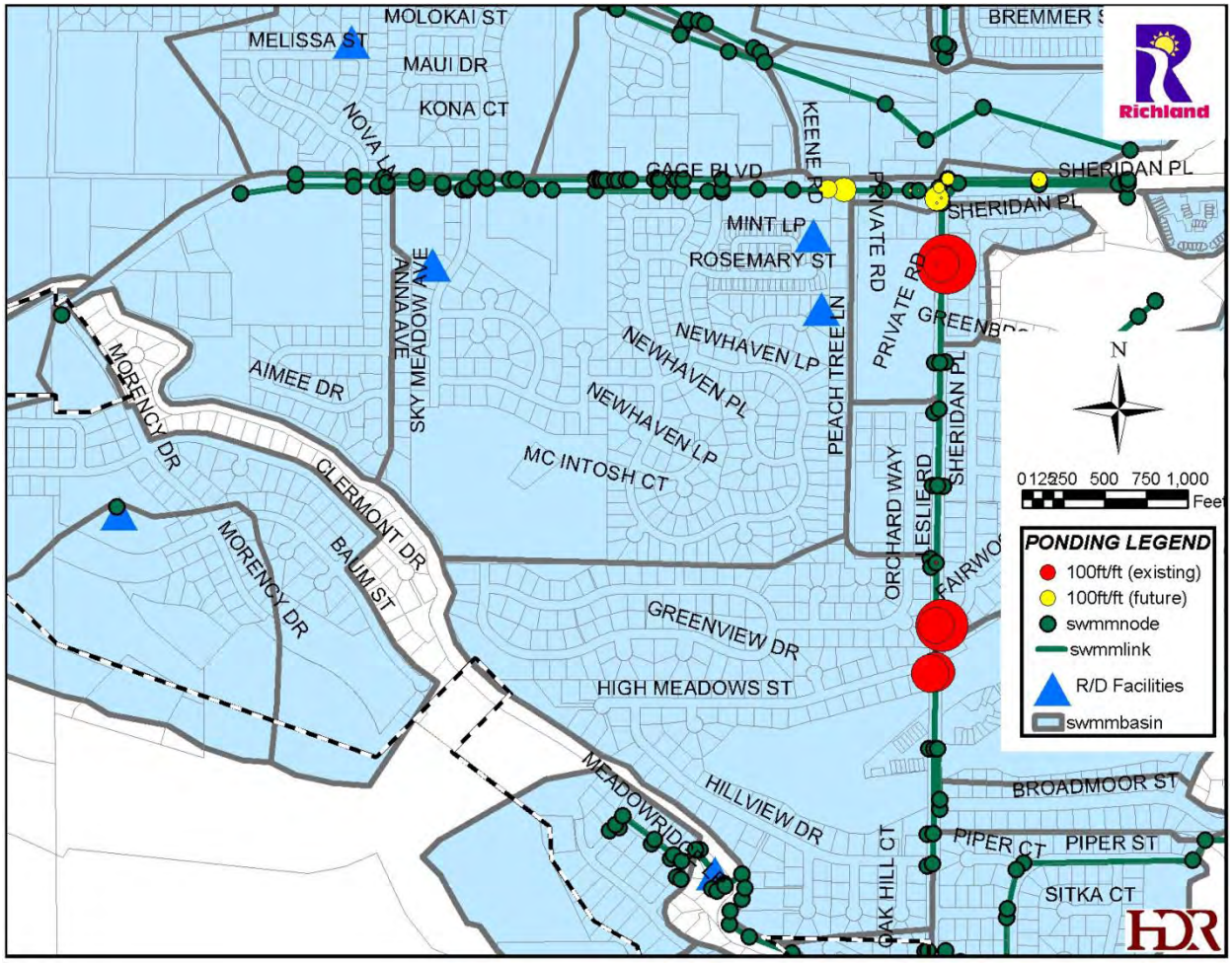
FR-01 Leslie/Gage Basin Improvements

Exerts below taken from the City of Richland 2005 Stormwater Management Plan

The Leslie Road and Gage Intersection area has been determined to be an existing deficiency. Flooding has been documented by records and knowledge of the City engineering and operations staff. During large storm events, catch basins on Leslie Road (south of Gage Blvd.) and Gage Boulevard, at their intersection, over-top causing ponding of water on the roadway. There is a known problem with the existing lines being clogged with concrete and sediment from development in the area. The existing outfall for this basin to Amon Creek is deeply incised and in need of replacement. The flooding problem has been predicted in the South Richland model while routing of the 25 year storm event. The model predicts that flooding will be slightly magnified in the future because there is still some limited room within its tributary basin for continued build-out.



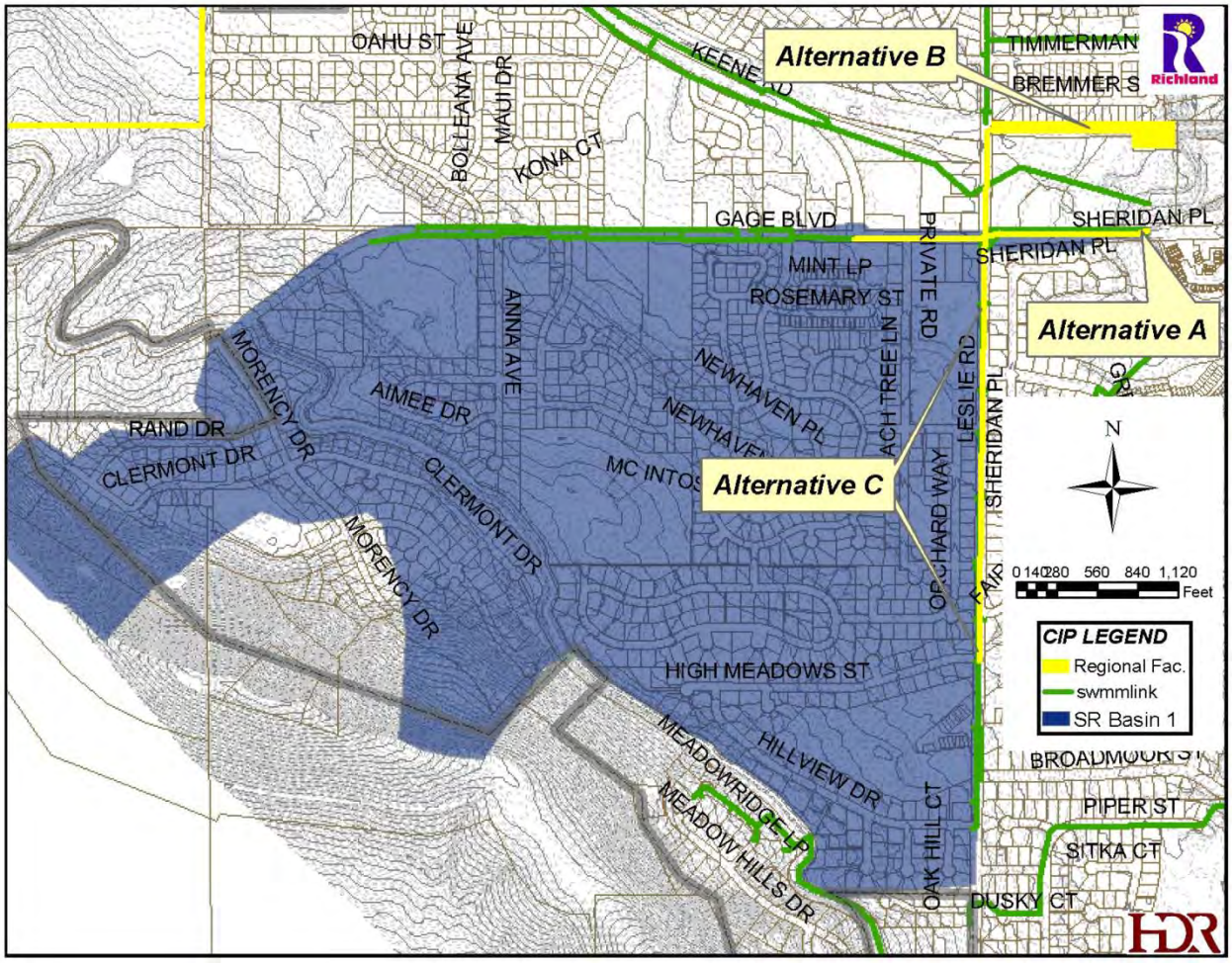
Modeled 25-Yr Storm Ponding

The existing conveyance system combines the flows from both Gage Blvd. and Leslie Road and discharges them into Amon Creek at the Gage Blvd. crossing.

The capacity problems in Leslie Rd. and Gage Blvd. could be solved by upsizing the existing conveyance lines. Gage Blvd, between Leslie Rd. and Steptoe St., is scheduled to be improved in the near future when transportation funding becomes available. While improving Gage Blvd, it makes economic sense to combine the storm flows of Leslie and Gage at the intersection into a properly sized line that addresses the identified conveyance problems at the same time.

The proposed solutions are broken down into three alternatives A,B, and C. Alternatives A and B address the conveyance deficiencies in Gage Blvd. and both propose upsizing the conveyance lines to handle a combined flow from Leslie Rd and Gage Blvd. Alternative C is not evaluated against A&B because it addresses capacity deficiencies in Leslie Rd, south of Gage Blvd. Alternative C is proposed as a separate future project and would not be constructed prior to Alternative A or B due to the increased peak flow of storm water that it will allow once constructed at the intersection of Gage Blvd and Leslie Rd.

NOTE: ALTERNATIVE A HAS BEEN COMPLETED



Alternative Capital Improvements and Benefited Basin

Alternative C would upsize and replace the existing lines in Leslie Rd that are both deficient in capacity and partially filled with construction sediment. More specifically, the project could include: Replacing storm line on Leslie Rd from High Meadows St. to Greenbrook Blvd (1870 LF - 24" SD Pipe); Replacing storm line on Leslie Rd from Greenbrook Blvd to Gage Blvd (1150 LF – 36" SD Pipe); The runoff from this basin, as it currently is configured, discharges to Amon Creek un-detained through an existing outfall structure off Gage Boulevard. As stated above, Alternatives A or B would need to constructed prior to or along with Alternative C.

HDR ONE COMPANY | *Many Solutions*℠

ENGINEER'S OPINION OF PROBABLE COST

PROJECT DESCRIPTION: LESLIE/GAGE BASIN IMPROVEMENTS (ALT. C) DATE: 2/25/2005

LESLIE RD STORM IMPROVEMENTS (HIGH MEADOWS TO GAGE BLVD)

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION		UNIT PRICE		TOTAL COST
1	1	L.S.	MOBILIZATION	$	23,676	$	23,675.75
2	1	L.S.	TEMPORARY POLLUTION CONTROL	$	8,000	$	8,000.00
3	1	L.S.	TRAFFIC CONTROL	$	20,000	$	20,000.00
4	1	L.S.	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	$	10,000	$	10,000.00
5	270	C.Y.	ROADWAY EXCAVATION INCL. HAUL	$	10	$	2,700.00
6	250	C.Y.	EMBANKMENT COMPACTION	$	4	$	1,000.00
7	1655	TON	CRUSHED SURFACING BASE COURSE	$	11	$	18,205.00
8	620	TON	CRUSHED SURFACING TOP COURSE	$	12	$	7,440.00
9	690	TON	HMA CL B PG-64-28	$	40	$	27,600.00
10	1	EA.	CONCRETE STORM INLET STRUCTURE	$	4,000	$	4,000.00
11	9	EA.	54" STD STORM MANHOLE	$	3,500	$	31,500.00
12	200	S.Y.	SOIL RESIDUAL HERBICIDE	$	2	$	400.00
13	6140	L.F.	SAWCUT EXISTING AC PAVEMENT	$	2	$	12,280.00
14	1870	L.F.	24" STORM	$	55	$	102,850.00
15	1150	L.F.	36" STORM	$	65	$	74,750.00
16	500	SY	FINE GRADING	$	15	$	7,500.00
17	1	L.S.	RELOCATE EXISTING UTILITIES	$	10,000	$	10,000.00
18	0	ACRES	LAND ACQUISTION	$	55,000	$	-

NOTE: 1. Not a revenue producing project, no sales tax.

SUBTOTAL		$	361,901
CONTINGENCY	30%	$	108,570
WSST (8.3%)		$	-
ENG/ ADMIN	20%	$	94,094
TOTAL		$	564,565

Table above in 2005 dollars. Project cost escalated to 2015 dollars based on the Engineering News Record (ENR) Construction Cost Index (CCI). The cost in 2015 dollars is $795,472.

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Appendix F.2

Renewal and Replacement (RR) CIP Project Sheets and Cost Details

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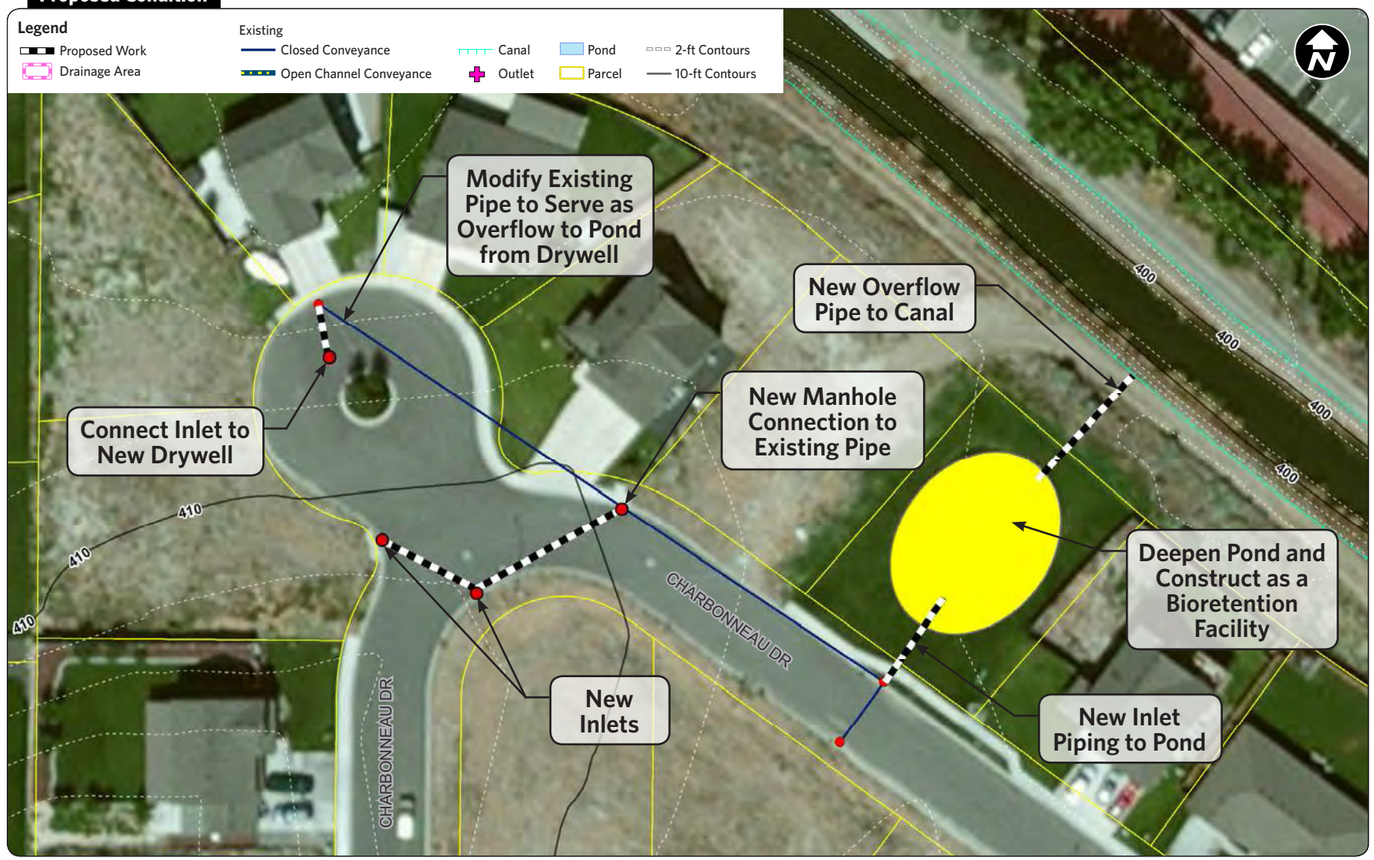
CITY OF RICHLAND

STORMWATER MANAGEMENT PLAN

PROJECT STUDY AREA: **RR-01**

CHARBONNEAU DRIVE PIPE IMPROVEMENTS

Proposed Condition



Project Summary

Project Type: Conveyance Improvements to Stormwater Detention Pond

Receiving Water: CID Main Canal
(eventual canal discharge to Columbia River)

Planning-Level Construction Cost Range

Low end: $123,318
Middle: $164,424
High end: $205,530

Description

A cul-de-sac on Charbonneau Drive near the intersection of Charbonneau Drive and Satus Street is at a low point in the development. During storm events, the existing inlets along Charbonneau do not adequately intercept stormwater runoff, allowing flows to bypass to downgradient properties located at the north side of the cul-de-sac. The pond stormwater discharges to is also overgrown, lacks proper overflow, and uses a bubbler system prone to clogging.

The project would install two inlets, one on each side of Charbonneau Drive, at the base of the hill coming off of Satus Street and upgradient of the cul-de-sac. A new 12-inch-diameter pipe would convey runoff from these inlets to the existing 12-inch pipe and make the connection through a new manhole.. A new dry well will be located in the cul-de-sac to infiltrate water collected from the inlet in the cul-de-sac. The existing pipe connected to the inlet will be modified to serve as an overflow to the pond if the drywell capacity is exceeded.

The pond will be further excavated to a bottom elevation of 395 feet to remove the existing bubbler type discharge to the pond and provide more pond capacity. The inlet pipe to the pond will be modified accordingly to fit the new elevation. The excavated pond will then be constructed as a bioretention facility per the Eastern Washington LID Manual with an overflow pipe to the CID Main Canal. The project will also include the creation of an effective vegetation control strategy to maintain the bioretention pond.

Opportunities

- Reduce stormwater flows to low-lying residential properties
- Improve detention pond outlet structure for high flow conveyance
- Restore pond's original design capacity
- Enhance community detention pond with aesthetic landscaping
- Improve removal of stormwater pollutants through use of redesigned bioretention pond.

Constraints

- Local access to adjacent homes needs to be maintained during construction
- Design requires assessment by qualified professional to determine infiltration feasibility of drywell

Hydrologic and Hydraulic Data

Subbasin: N/A

System type: Pipe

Local Drainage Area (ac): 4.7 ac

Model Results:

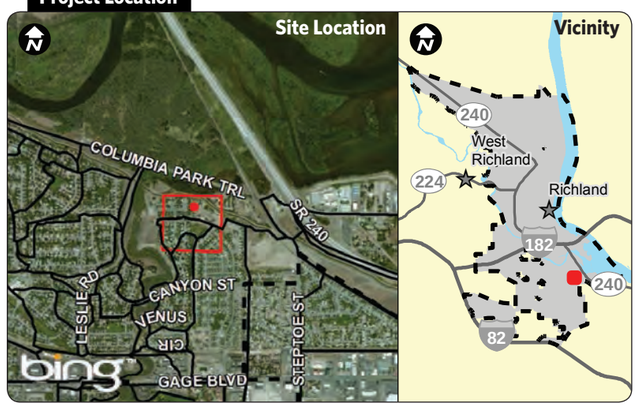
2-year, 3-hr storm event

- **Peak flow rate:** 5.20 cfs
- **Surcharge depth (Headwater):** 0.49 ft
- **Flooding Depth:** N/A

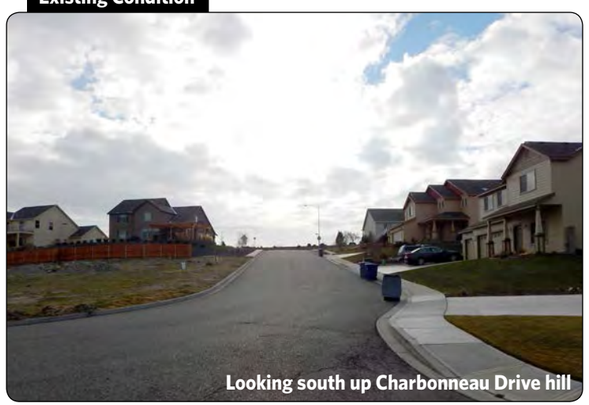
25-year, 24-hr storm event

- **Peak flow rate:** 8.90 cfs
- **Surcharge depth (Headwater):** 0.64 ft
- **Flooding Depth:** N/A

Project Location

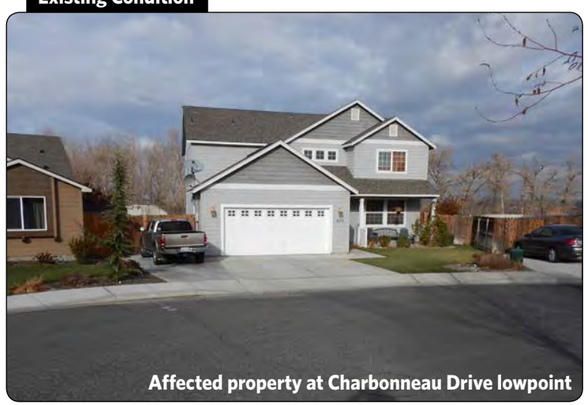


Existing Condition



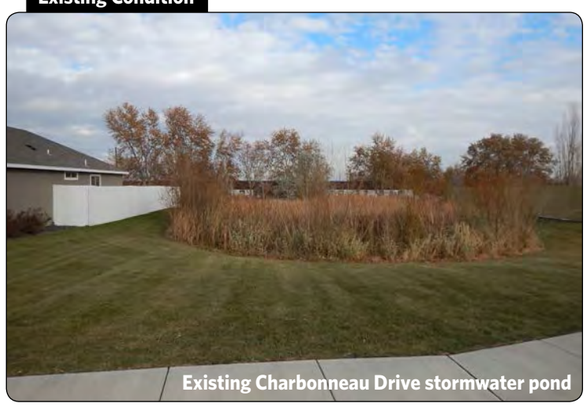
Looking south up Charbonneau Drive hill

Existing Condition



Affected property at Charbonneau Drive lowpoint

Existing Condition



Existing Charbonneau Drive stormwater pond

Preliminary Cost Estimate

RR-01 Charbonneau Drive Pipe Improvements				Preliminary Estimate	
Item No.	**Description of Item**	**Unit**	**Estimated Quantity**	**Unit Price**	**Extended Amount**
1	Traffic Control	LS	1	$5,000	$5,000.00
2	Removing Bituminous Pavement	SY	70	$50.0	$3,500.00
3	Excavation (excluding pond)	CY	370	$35	$12,950.00
4	12-inch Storm Pipe	LF	260	$40	$10,400.00
5	Connection to Existing Pipe	EA	3	$800	$2,400.00
6	Type 1 Catch Basin	EA	2	$1,500	$3,000.00
7	Shallow Manhole	EA	1	$3,500	$3,500.00
8	Bioretention Pond	LS	1	$30,000	$30,000.00
9	Drywell	EA	1	$5,000	$5,000.00
10	Fill	CY	200	$35	$7,000.00
11	Crushed Surfacing Base Course	TON	18.9	$180	$3,402.00
12	Crushed Surfacing Top Course	TON	9.5	$60	$570.00
13	Hot Mixed Asphalt (HMA)	TON	9.8	$200	$1,960.00
14	Storm Pipe Testing	LF	150	$10	$1,500.00
				Construction Subtotal	**$90,182.00**
				Sales Tax (8.6% of construction subtotal)	$7,755.65
				Mob/Demobilization (5% of con. Subtotal)	$4,509.10
				Subtotal A	**$102,446.75**
				Contractor's Fee (10% of subtotal A)	$10,244.68
				Subtotal B	**$112,691.43**
				Contractor's Bonds and Insurance (1.5% of subtotal B)	$1,690.37
				Subtotal C	**$114,381.80**
				Contingency (25% of subtotal C)	$28,595.45
				Subtotal D	**$142,977.25**
				Engineering, Legal, Administration (15% subtotal D)	$21,446.59
				Total	**$164,423.84**

CITY OF RICHLAND

STORMWATER MANAGEMENT PLAN

PROJECT STUDY AREA: **RR-02**

COLUMBIA PARK TRAIL CULVERT

Proposed Condition

Project Summary

Project Type: Culvert Retrofit

Receiving Water: Yakima River

Planning-Level Construction Cost Range

Low end: $22,289

Middle: $29,719

High end: $37,149

Description

This project would provide inlet protection for the existing 36-inch-diameter CMP roadway culvert located under Columbia Park Trail, approximately 3,000 feet west of the intersection of Columbia Park Trail and State Route 240. Specifically, the inlet protection will provide a functional, but environmental solution to the damage currently being caused by the local beaver population. Project will need to meet Washington Department of Fish and Wildlife Fish Passage standards. The project would also include civil site work to construct a ramp to provide easy equipment access to the inlet.

Opportunities

- Provide beaver deterrent to improve function of culvert inlet
- Reduce potential for roadway flooding
- Restore flow regime through the system, improving ecosystem function

Constraints

- Maintenance access needs to be provided on both sides of the culvert

Hydrologic and Hydraulic Data

Subbasin: N/A

System type: Culvert

Local Drainage Area (ac): 3,149

Model Results:

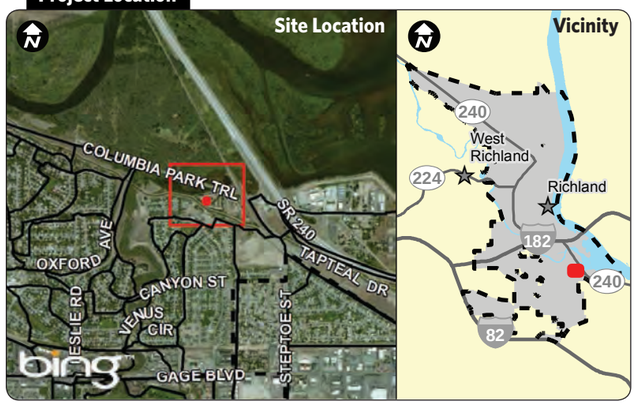
2-year, 3-hr storm event

- **Peak flow rate:** 229.80 cfs
- **Surcharge depth (Headwater):** 2.48 ft
- **Flooding Depth:** N/A

25-year, 24-hr storm event

- **Peak flow rate:** 337.40 cfs
- **Surcharge depth (Headwater):** 2.76 ft
- **Flooding Depth:** N/A

Project Location



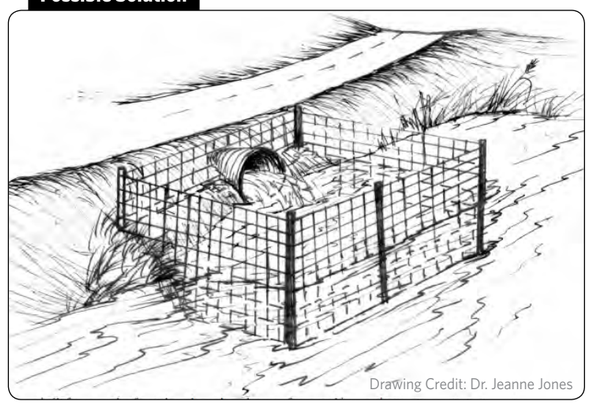
Existing Condition

View from south side of Columbia Park Trail, looking toward the inlet side of the culvert

Possible Solution

Photo Credit: FSI Culvert, Inc.

Possible Solution



Drawing Credit: Dr. Jeanne Jones

Preliminary Cost Estimate					
RR-02 Columbia Park Trail Culvert				Preliminary Estimate	
Item No.	Description of Item	Unit	Estimated Quantity	Unit Price	Extended Amount
1	Traffic Control	LS	1	$500	$500.00
2	Beaver inlet protection device	LS	1	$1,800	$1,800.00
3	Access Road	LS	1	$14,000	$14,000.00
				Construction Subtotal	**$16,300.00**
				Sales Tax (8.6% of construction subtotal)	$1,401.80
				Mob/Demobilization (5% of con. Subtotal)	$815.00
				Subtotal A	**$18,516.80**
				Contractor's Fee (10% of subtotal A)	$1,851.68
				Subtotal B	**$20,368.48**
				Contractor's Bonds and Insurance (1.5% of subtotal B)	$305.53
				Subtotal C	**$20,674.01**
				Contingency (25% of subtotal C)	$5,168.50
				Subtotal D	**$25,842.51**
				Engineering, Legal, Administration (15% subtotal D)	$3,876.38
				Total	**$29,718.89**

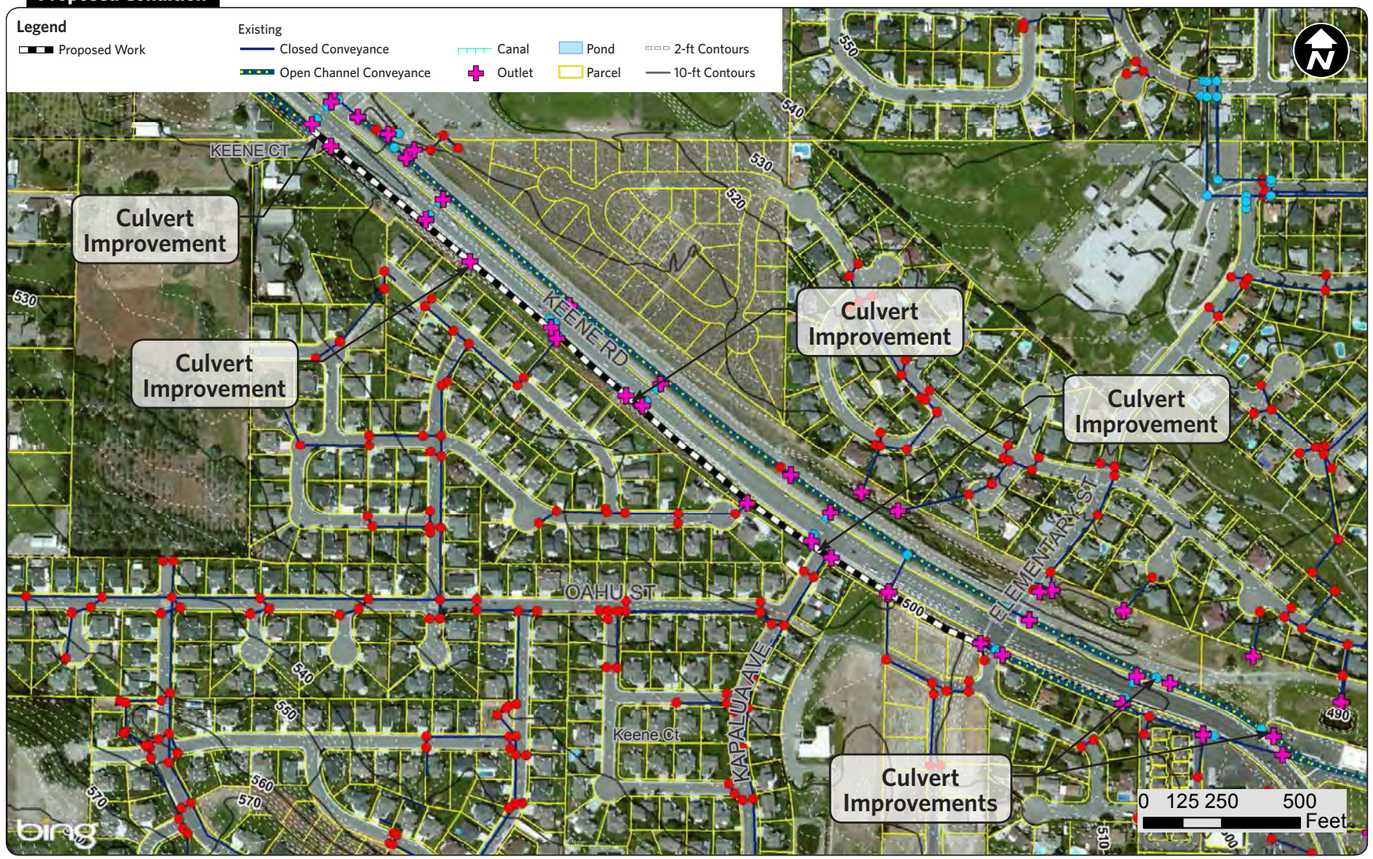
CITY OF RICHLAND

STORMWATER MANAGEMENT PLAN

PROJECT STUDY AREA: **RR-03**

KEENE ROAD CONVEYANCE

Proposed Condition



Project Summary

Project Type: Conveyance Improvements

Receiving Water: Amon Wasteway

Planning-Level Construction Cost Range

Low end: $114,774
Middle: $153,032
High end: $191,290

Description

City Operation and Maintenance staff have observed relatively frequent flooding of the open stormwater conveyance channel running adjacent to the west side of Keene Road, with overflows flooding and blocking the western lanes of Keen Road between Kapalua Avenue and Keene Court. Modeling of the area indicates that undersized culverts and overgrown vegetation contribute significantly to the flooding issue. Between Keene Court and Kapalua Avenue, the channel flows through four 30-inch-diameter culverts before crossing under Keene Road via two parallel 48-inch-diameter culverts. East of Elementary Street, the main channel (now on the east side of Keene Road) then flows through two 15-inch diameter culverts before heading east toward Amon Wasteway. The project would replace the four 30-inch diameter culverts with 36-inch-diameter culverts and the two 15-inch diameter culverts with 24-inch diameter culverts. The project may include the development of a vegetation management plan specific to the Keene Road corridor that would find a balance in meeting the hydraulic needs of the channel while supporting local interest groups' preferences in maintaining riparian habitat.

Opportunities

- Reduce flooding of Keene Road
- Maintain and control vegetation in open channel, increasing conveyance capacity

Constraints

- Traffic along Keene Road must be maintained during construction by keeping at least one southbound travel lane open when working adjacent to the west side of the road.
- Culvert between Kapalua Avenue and Keene Court passes beneath pedestrian path connecting neighborhood to the southwest with Keene Road. Provisions for pedestrian detours will be needed.
- Kapalua Avenue provides the most direct access between the neighborhood to the southwest and travel to/from the northwest on Keene Road. Local access or detours will need to be maintained during construction.

Hydrologic and Hydraulic Data

Subbasin: N/A

System type: Culvert

Local Drainage Area (ac): N/A

Model Results (30-inch culvert under Kapalua Avenue):

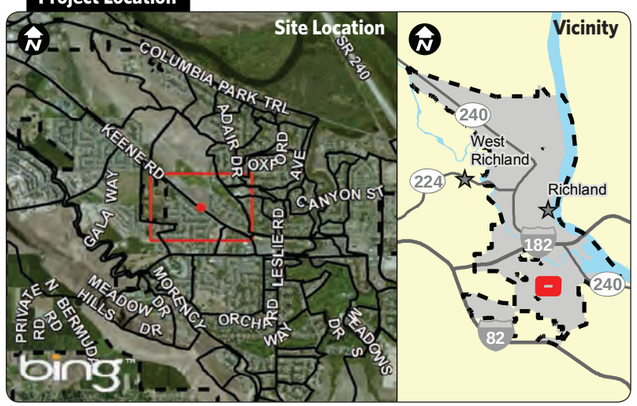
2-year, 3-hr storm event

- **Peak flow rate:** 20.40 cfs
- **Surcharge depth (Headwater):** 1.66 ft
- **Flooding Depth:** N/A

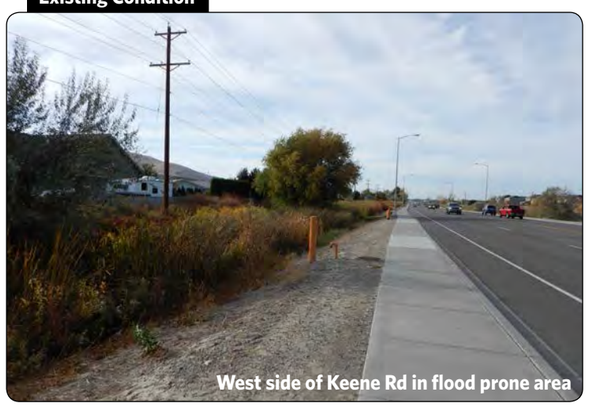
25-year, 24-hr storm event

- **Peak flow rate:** 36.00 cfs
- **Surcharge depth (Headwater):** 3.02 ft
- **Flooding Depth:** N/A

Project Location



Existing Condition



Existing Condition

Existing Condition

Preliminary Cost Estimate

RR-03 Keene Road Conveyance				Preliminary Estimate	
Item No.	**Description of Item**	**Unit**	**Estimated Quantity**	**Unit Price**	**Extended Amount**
1	Traffic Control	LS	1	$7,500	$7,500.00
2	36-inch Culvert	LF	240	$115.0	$27,600.00
3	24-inch Culvert	LF	95	$80.0	$7,600.00
4	Sidewalk Removal	SY	12	$51.0	$612.00
5	Removing Bituminous Pavement	SY	100	$50.0	$5,000.00
6	Excavation	CY	315	$35	$11,025.00
7	Fill	CY	315	$35	$11,025.00
8	Crushed Surfacing Base Course	TON	31.5	$180	$5,670.00
9	Crushed Surfacing Top Course	TON	15.8	$60	$948.00
10	Hot Mixed Asphalt (HMA)	TON	16.3	$200	$3,260.00
11	Sidewalk	SY	12	$125	$1,500.00
				Construction Subtotal	**$81,740.00**
				Sales Tax (8.6% of construction subtotal)	$7,029.64
				Mob/Demobilization (5% of con. Subtotal)	$4,087.00
				Subtotal A	**$92,856.64**
				Contractor's Fee (10% of subtotal A)	$9,285.66
				Subtotal B	**$102,142.30**
				Contractor's Bonds and Insurance (1.5% of subtotal B)	$1,532.13
				Subtotal C	**$103,674.44**
				Contingency (25% of subtotal C)	$25,918.61
				Subtotal D	**$129,593.05**
				Engineering, Legal, Administration (15% subtotal D)	$19,438.96
				Vegetation Management Plan	$4,000.00
				Total	**$153,032.01**

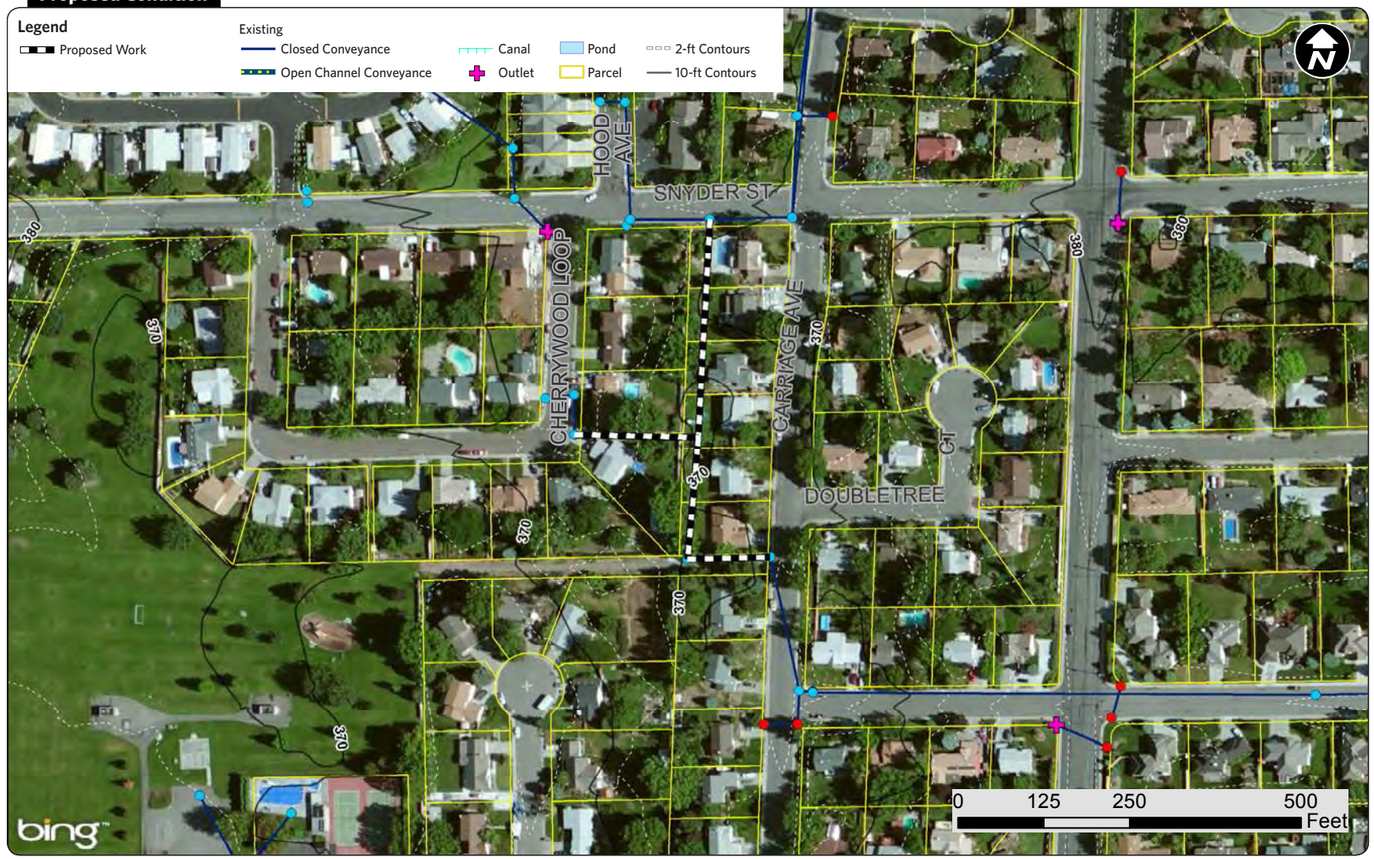
CITY OF RICHLAND

STORMWATER MANAGEMENT PLAN

PROJECT STUDY AREA: **RR-04**

PIPE REHABILITATION SOUTH OF SNYDER ST

Proposed Condition



Project Summary

Project Type: Pipe Rehabilitation

Receiving Water: Columbia River

Planning-Level Construction Cost Range

Low end: $28,983

Middle: $38,644

High end: $48,305

Description

Root intrusion in the stormwater conveyance pipes south of Snyder Street between Carriage Avenue and Cherrywood Loop is contributing to clogging and backup of flows into adjacent local streets. The system in this area consists of 12- and 15-inch-diameter conveyance pipes that receive runoff from Cherrywood Loop, Snyder Street, Hood Avenue, and Carriage Avenue. This project includes CCTV inspection to determine the location and extent of root intrusion, root removal and cleaning of pipe, and replacement of pipes critically damaged from root intrusion.

Opportunities

- Restore design capacity of stormwater system
- Remove roots from storm pipes

Constraints

- Direct access to pipes is limited and may require the removal and replacement of fences, as well as restoration of residential landscaping during construction.
- Local access to residences will need to be maintained during construction.

Hydrologic and Hydraulic Data

Subbasin: N/A

System type: Pipe

Local Drainage Area (ac): N/A

Model Results:

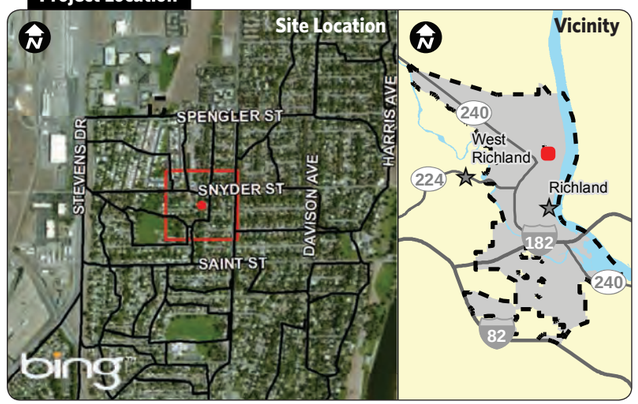
2-year, 3-hr storm event

- **Peak flow rate:** 2.90 cfs
- **Surcharge depth (Headwater):** 2.80 ft
- **Flooding Depth:** N/A

25-year, 24-hr storm event

- **Peak flow rate:** 4.70 cfs
- **Surcharge depth (Headwater):** 7.41 ft
- **Flooding Depth:** N/A

Project Location



Existing Condition

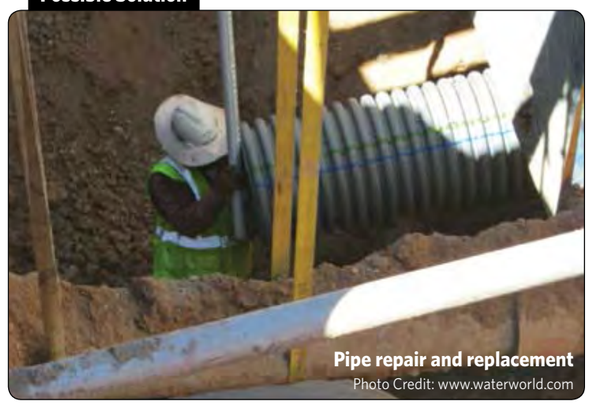
Inlet at Shaw St and Carriage Ave

Existing Condition

Example of extensive root damage

Photo Credit: www.preciseplumbing.com.au

Possible Solution



Pipe repair and replacement

Photo Credit: www.waterworld.com

Preliminary Cost Estimate

RR-04 Pipe Rehabilitation South of Snyder St				Preliminary Estimate	
Item No.	**Description of Item**	**Unit**	**Estimated Quantity**	**Unit Price**	**Extended Amount**
1	Traffic Control	LS	1	$1,000	$1,000.00
2	12-inch Pipe CCTV Inspection	LF	185	$5.0	$925.00
3	15-inch Pipe CCTV Inspection	LF	620	$5.5	$3,410.00
4	Root Removal	LF	80	$75.0	$6,000.00
5	15-inch Pipe Replacement	LF	40	$54.0	$2,160.00
6	Excavation	CY	30	$35	$1,050.00
7	Fill	CY	30	$35	$1,050.00
8	Storm Pipe Testing	LF	40	$10	$400.00
9	Wood fence removal and replacement	LF	80	$40	$3,200.00
10	Landscape Repair	LS	1	$2,000	$2,000.00
				Construction Subtotal	**$21,195.00**
				Sales Tax (8.6% of construction subtotal)	$1,822.77
				Mob/Demobilization (5% of con. Subtotal)	$1,059.75
				Subtotal A	**$24,077.52**
				Contractor's Fee (10% of subtotal A)	$2,407.75
				Subtotal B	**$26,485.27**
				Contractor's Bonds and Insurance (1.5% of subtotal B)	$397.28
				Subtotal C	**$26,882.55**
				Contingency (25% of subtotal C)	$6,720.64
				Subtotal D	**$33,603.19**
				Engineering, Legal, Administration (15% subtotal D)	$5,040.48
				Total	**$38,643.67**

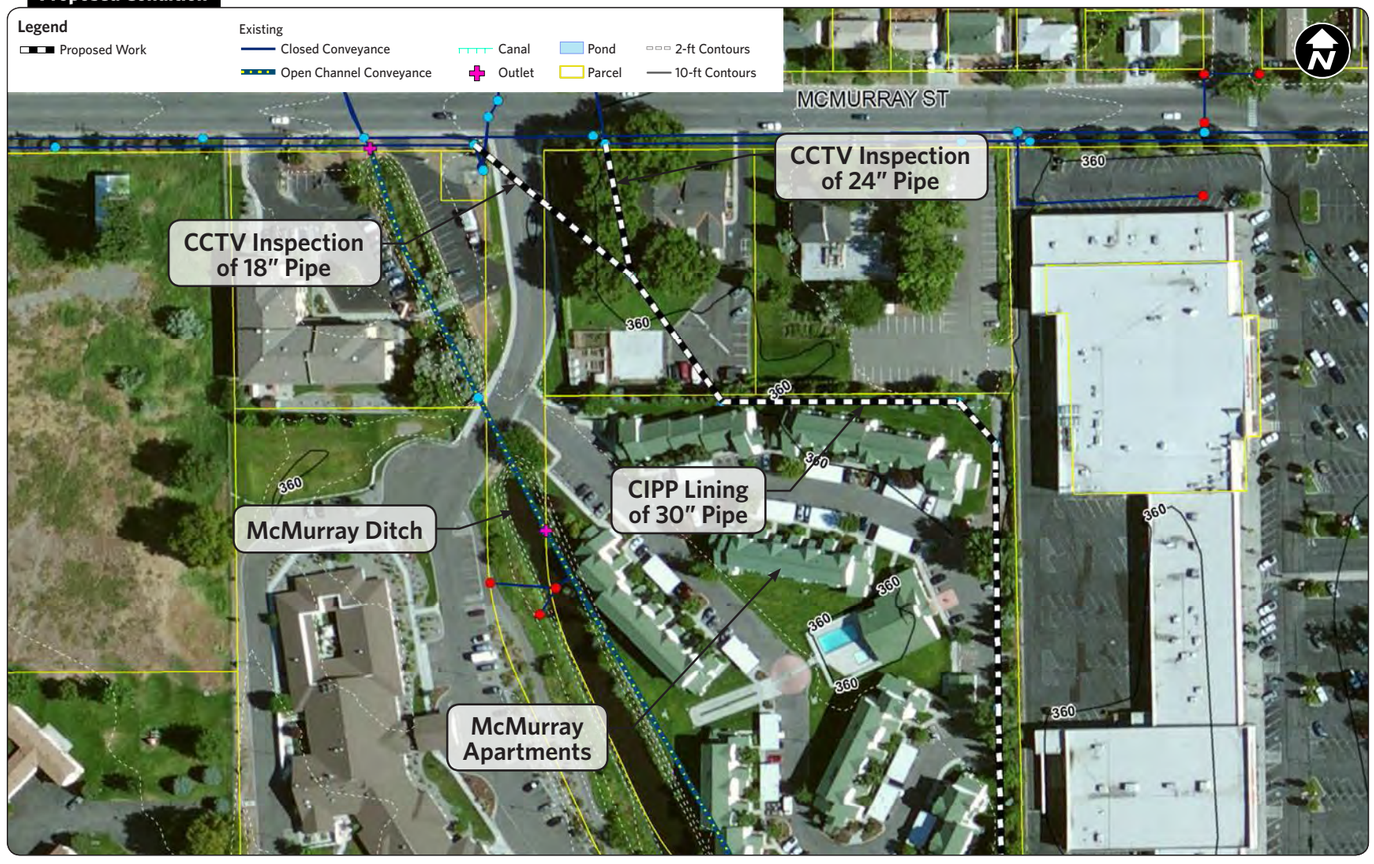
CITY OF RICHLAND

STORMWATER MANAGEMENT PLAN

PROJECT STUDY AREA: **RR-05**

STORMWATER PIPE DECOMMISSION

Proposed Condition



Project Summary

Project Type: Pipe Rehabilitation

Receiving Water: Columbia River

Planning-Level Construction Cost Range

Low end: $280,419
Middle: $373,893
High end: $467,366

Description

The 30-inch-diameter stormwater conveyance pipe located west of the intersection of George Washington Way and McMurray Street (between Safeway and the McMurray Park Apartments) receives runoff from Pike Avenue, Lassen Avenue, and Berkshire Street to the north. This pipe segment previously received significant groundwater contribution, pumped from the McMurray Lift Station; however, due to the issues of the 30-inch-diameter pipe, the McMurray Lift Station now pumps into an 8-inch-diameter pipe that discharges to the McMurray Ditch which is heavily vegetated. The pipe runs along the perimeter of the McMurray Park Apartments property which is lined with mature trees planted parallel to the pipe. Significant tree root intrusion has reduced the capacity of the system and contributed to localized flooding. The pipe is HDPE and is described as being "soil tight" not "water tight" by maintenance staff.

This project would rehabilitate the 30-inch pipe running along the McMurray Park Apartments using cured in place pipe (CIPP). CCTV inspections of the 24- and 18-inch-diameter pipes upstream of the 30-inch pipe will be made to verify their satisfactory condition with repairs completed as need. The McMurray Lift Station discharge can then be redirected from the McMurray Ditch and back to the 30-inch pipe.

Opportunities

- Reduce localized flooding
- Reduce opportunity for future tree root intrusion by having a water tight pipe
- Restore capacity of McMurray Ditch

Constraints

- McMurray Park Apartments, and Richland Rehabilitation Center and Eagle Assisted Living are only accessed by Pike Avenue. Local access will need to be maintained during construction.

Hydrologic and Hydraulic Data

Subbasin: N/A

System type: Pipe

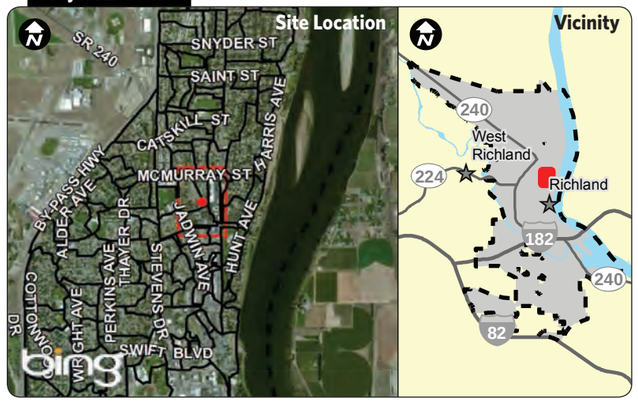
Local Drainage Area (ac): N/A

Model Results:

2-year, 3-hr storm event
- **Peak flow rate:** 2.10 cfs
- **Surcharge depth (Headwater):** 0.62 ft
- **Flooding Depth:** N/A

25-year, 24-hr storm event
- **Peak flow rate:** 4.40 cfs
- **Surcharge depth (Headwater):** 2.20 ft
- **Flooding Depth:** N/A

Project Location



Existing Condition

Existing Condition

Existing Condition

Preliminary Cost Estimate

RR-05 McMurray Apartments Pipe Rehabilitation				Preliminary Estimate	
Item No.	**Description of Item**	**Unit**	**Estimated Quantity**	**Unit Price**	**Extended Amount**
1	Traffic Control	LS	1	$1,500	$1,500.00
2	24-inch Pipe CCTV Inspection	LF	140	$6.5	$910.00
3	18-inch Pipe CCTV Inspection	LF	210	$6.0	$1,260.00
4	30-inch Pipe CCTV Inspection	LF	880	$7.5	$6,600.00
5	30-inch CIPP Rehabilitation	LF	880	$200.0	$176,000.00
6	Storm Pipe Testing	LF	880	$10	$8,800.00
7	Reconfiguration of Pump Station Piping	LS	1	$5,000.0	$5,000.00
8	Landscape Repair	LS	1	$5,000.0	$5,000.00
				Construction Subtotal	**$205,070.00**
				Sales Tax (8.6% of construction subtotal)	$17,636.02
				Mob/Demobilization (5% of con. Subtotal)	$10,253.50
				Subtotal A	**$232,959.52**
				Contractor's Fee (10% of subtotal A)	$23,295.95
				Subtotal B	**$256,255.47**
				Contractor's Bonds and Insurance (1.5% of subtotal B)	$3,843.83
				Subtotal C	**$260,099.30**
				Contingency (25% of subtotal C)	$65,024.83
				Subtotal D	**$325,124.13**
				Engineering, Legal, Administration (15% subtotal D)	$48,768.62
				Total	**$373,892.75**

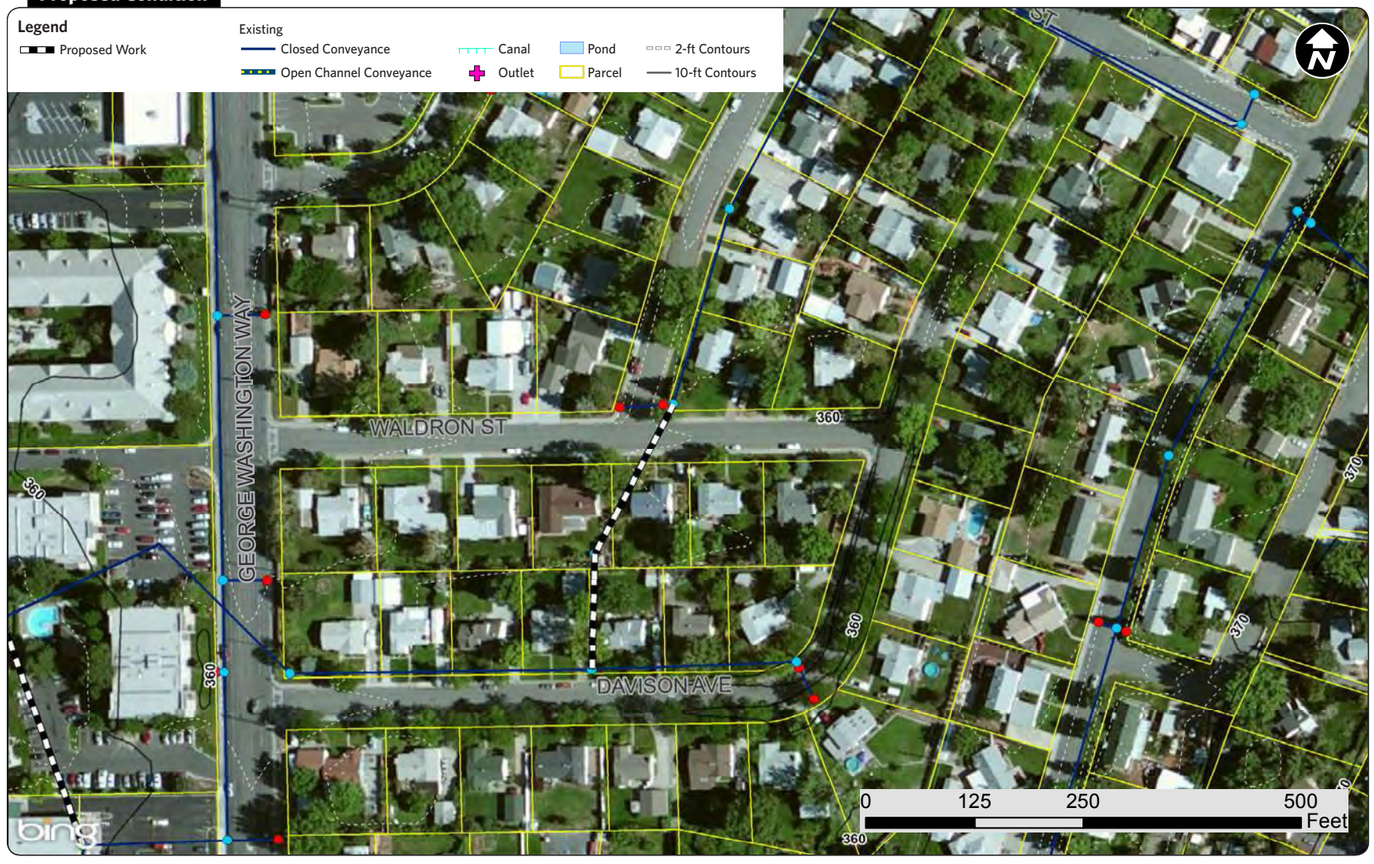
CITY OF RICHLAND

STORMWATER MANAGEMENT PLAN

PROJECT STUDY AREA: **RR-06**

LESLIE ROAD PIPE REHABILITATION

Proposed Condition



Project Summary

Project Type: Pipe Rehabilitation

Receiving Water: Columbia River

Planning-Level Construction Cost Range

Low end: $17,346

Middle: $23,128

High end: $28,910

Description

The 12-inch-diameter stormwater conveyance pipe that runs on the east side of George Washington Way, between the intersection of Waldron Street and Horn Avenue, and Davison Avenue to the south, conveys runoff collected by the surrounding neighborhood to the north. The pipe's capacity has been reduced due to root damage resulting in localized flooding on Waldron Street. The project includes CCTV inspection of the pipe to determine the location and extent of root damage, root removal, replacement of pipe sections as necessary, and landscape restoration.

Opportunities

- Restore design conveyance capacity.
- Replace damaged section of pipe.

Constraints

- Direct access to pipes is extremely limited and may require the removal and replacement of fences, and restoration of residential landscaping during construction.
- Local access to residences will need to be maintained during construction.

Hydrologic and Hydraulic Data

Subbasin: N/A

System type: Pipe

Local Drainage Area (ac): N/A

Model Results:

2-year, 3-hr storm event

- **Peak flow rate:** 1.20 cfs
- **Surcharge depth (Headwater):** 0.58 ft
- **Flooding Depth:** N/A

25-year, 24-hr storm event

- **Peak flow rate:** 2.70 cfs
- **Surcharge depth (Headwater):** 1.18 ft
- **Flooding Depth:** N/A

Project Location

Existing Condition

Viewing north along pipe alignment from Davison Ave – limited access to pipe

Existing Condition

Viewing south along pipe alignment from Waldron St – limited access to pipe

Existing Condition

Example of root damage

Photo Credit: www.preciseplumbing.com.au

Preliminary Cost Estimate

RR-06 Waldron Street Pipe Rehabilitation				Preliminary Estimate	
Item No.	**Description of Item**	**Unit**	**Estimated Quantity**	**Unit Price**	**Extended Amount**
1	Traffic Control	LS	1	$500	$500.00
2	12" Pipe CCTV Inspection	LF	330	$5.0	$1,650.00
3	Root Removal	LF	35	$75.0	$2,625.00
4	12-inch Pipe Replacement	LF	20	$40.0	$800.00
5	Excavation	CY	13	$35	$455.00
6	Fill	CY	13	$35	$455.00
7	Storm Pipe Testing	LF	20	$10	$200.00
8	Wood fence removal and replacement	LF	100	$40	$4,000.00
9	Landscape Repair	LS	1	$2,000	$2,000.00
				Construction Subtotal	**$12,685.00**
				Sales Tax (8.6% of construction subtotal)	$1,090.91
				Mob/Demobilization (5% of con. Subtotal)	$634.25
				Subtotal A	**$14,410.16**
				Contractor's Fee (10% of subtotal A)	$1,441.02
				Subtotal B	**$15,851.18**
				Contractor's Bonds and Insurance (1.5% of subtotal B)	$237.77
				Subtotal C	**$16,088.94**
				Contingency (25% of subtotal C)	$4,022.24
				Subtotal D	**$20,111.18**
				Engineering, Legal, Administration (15% subtotal D)	$3,016.68
				Total	**$23,127.86**

Appendix F.3

Water Quality (WQ) CIP Project Sheets and Cost Details

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Stormwater Retrofit Cut Sheets

WQ-01

Copied from Updated Stormwater Treatment Retrofit Memorandum (2014), by URS

PROJECT INFORMATION

Project Name: NR01 – Infiltration Pond

Project Location: Upstream of the NR01 storm drain outfall near Richardson Rd. in the northern portion of Richland.

EXISTING CONDITIONS

The outfall discharges directly into the Columbia River through a 48-inch diameter storm drain pipe and has a contributing basin of approximately 78 acres based on recent basin delineation work, of which 36.5 acres can be considered directly connected impervious surfaces. The zoning in the basin is primarily Business/Research Park while the discharge itself is located in an area zoned as natural open space. The zoning type and the large area of parking lots found in the basin suggests that the potential pollutant loading is higher compared to other outfalls in the City. Currently, no stormwater quality treatment BMPs are utilized in the basin.

HYDROLOGY

It is assumed that only directly connected impervious surfaces will contribute runoff during the 6-month, 24-hour Type 1A storm event. Pervious and disconnected impervious surface areas should be considered if the City intends to treat stormwater runoff for larger storm events.

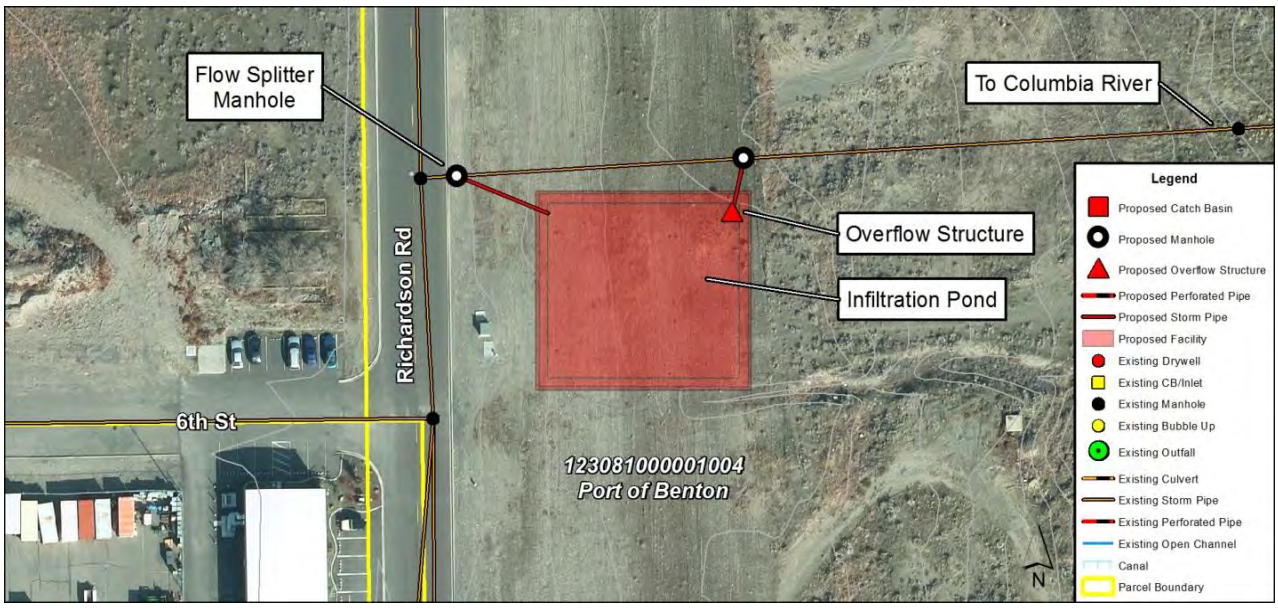
Peak Flow and Volume for the 6-Month, 24-Hour Type 1A Storm Event (0.53 in).

Basin Area (acres)	Peak Flow (cfs)	Volume (cf)
36.5	2.38	45,566

PROPOSED SOLUTION

Divert the 6-month, 24-hour (stormwater quality) design storm to an infiltration pond east of Richardson Rd. Components include: a flow splitter manhole, an infiltration pond with approximately 14,000 cubic feet of runoff storage and 6-inches of freeboard, and an overflow structure directed back to the existing storm drain pipe. Infiltration pond sizing assumes an infiltration rate of 2.4 inches per hour. Preliminary cost estimate assumes no land acquisition costs.

LOCATION MAP



PRELIMINARY COST ESTIMATE

NR01 - Infiltration Pond				Preliminary Estimate	
ITEM NO.	DESCRIPTION OF ITEM	UNIT	ESTIMATED QUANTITY	UNIT PRICE	EXTENDED AMOUNT
1	Mobilization	LS	1	$ 10,000.00	$ 10,000.00
2	Temporary Erosion and Sediment Control	LS	1	$ 5,000.00	$ 5,000.00
3	Unclassified Excavation Incl. Haul	CY	1,185	$ 10.00	$ 11,851.85
4	Amended Treatment Soil Mix	CY	630	$ 20.00	$ 12,592.59
5	12-inch Diameter Storm Drain Pipe	LF	80	$ 30.00	$ 2,400.00
6	Manhole 54-inch Diameter / Flow Splitter	EA	1	$ 10,500.00	$ 10,500.00
7	Manhole 54-inch Diameter	EA	1	$ 10,000.00	$ 10,000.00
8	Manhole 48-inch Diameter w/ Overflow Grate	EA	1	$ 8,500.00	$ 8,500.00
9	Animal Guard, 12-inch Diameter	EA	1	$ 400.00	$ 400.00
10	Hydroseed	Acre	0.35	$ 2,500.00	$ 875.00
	Construction Subtotal				**$ 72,119.44**
	Engineering / Administration (20%)				$ 14,423.89
	WSST (8.3%)				$ 5,985.91
	Subtotal				**$ 92,529.25**
	Contingency (25%)				$ 23,132.31
	Total				**$ 115,661.56**

Notes:
(1) Assumes no land acquisition costs.

Table above in 2014 dollars. Project cost escalated to 2015 dollars based on the Engineering News Record (ENR) Construction Cost Index (CCI). The cost in 2015 dollars is $118,206.

Stormwater Retrofit Cut Sheets

WQ-02

Copied from Updated Stormwater Treatment Retrofit Memorandum (2014), by URS

PROJECT INFORMATION

Project Name: NR02 – Infiltration Trench

Project Location: Upstream of the NR02 storm drain outfall at the eastern end of Sprout Rd. and near the southeastern corner of the Washington State University (WSU) Tri-Cities Campus.

EXISTING CONDITIONS

The outfall discharges directly into the Columbia River through an 18-inch diameter storm drain pipe and has a contributing basin of approximately 4.8 acres based on recent basin delineation work, of which 3.1 acres can be considered directly connected impervious surfaces. The zoning in the basin is primarily single family residential; however, a small area of the eastern WSU entrance contributes runoff into the basin. The amount of traffic in and out of the WSU entrance coupled with the on-street parking by students suggests that the potential pollutant loading is higher compared to other outfalls in the City. Currently, no stormwater quality treatment BMPs are utilized in the basin.

HYDROLOGY

It is assumed that only directly connected impervious surfaces will contribute runoff during the 6-month, 24-hour Type 1A storm event. Pervious and disconnected impervious surface areas should be considered if the City intends to treat stormwater runoff for larger storm events.

Peak Flow and Volume for the 6-Month, 24-Hour Type 1A Storm Event (0.53 in).

Basin Area (acres)	Peak Flow (cfs)	Volume (cf)
3.1	0.22	3,820

PROPOSED SOLUTION

Divert the 6-month, 24-hour (stormwater quality) design storm to an underground infiltration trench at the eastern end of Sprout Rd. right-of-way. Components include: two additional catch basins on Sprout Rd. directed to a flow splitter manhole with perforated pipe leading to an infiltration trench with approximately 972 cubic feet of runoff storage within the void space of the rock infiltration gallery. Infiltration trench sizing assumes an infiltration rate of 2.4 inches per hour. Preliminary cost estimate assumes no land acquisition costs.

LOCATION MAP

PRELIMINARY COST ESTIMATE

NR02 - Infiltration Trench				Preliminary Estimate	
ITEM NO.	DESCRIPTION OF ITEM	UNIT	ESTIMATED QUANTITY	UNIT PRICE	EXTENDED AMOUNT
1	Mobilization	LS	1	$ 10,000.00	$ 10,000.00
2	Temporary Erosion and Sediment Control	LS	1	$ 5,000.00	$ 5,000.00
3	Traffic / Pedestrian Control	LS	1	$ 5,000.00	$ 5,000.00
4	Unclassified Excavation Incl. Haul	CY	109	$ 10.00	$ 1,087.04
5	Amended Treatment Soil Mix	CY	45	$ 20.00	$ 900.00
6	Infiltration Trench Rock (No. 2 Stone)	CY	37	$ 50.00	$ 1,851.85
7	12-inch Diameter Storm Drain Pipe	LF	60	$ 30.00	$ 1,800.00
8	12-inch Perforated Storm Drain Pipe	LF	60	$ 10.00	$ 600.00
9	Manhole 48-inch Diameter / Flow Splitter	EA	1	$ 8,500.00	$ 8,500.00
10	Catch Basin 24-inch Diameter Type 2	EA	2	$ 2,000.00	$ 4,000.00
11	Geotextile	SY	2,100	$ 2.50	$ 5,250.00
12	Pavement / Sidewalk Restoration	SY	110	$ 50.00	$ 5,500.00
	Construction Subtotal				**$ 49,488.89**
	Engineering / Administration (20%)				$ 9,897.78
	WSST (8.3%)				$ 4,107.58
	Subtotal				**$ 63,494.24**
	Contingency (25%)				$ 15,873.56
	Total				**$ 79,367.81**

Table above in 2014 dollars. Project cost escalated to 2015 dollars based on the Engineering News Record (ENR) Construction Cost Index (CCI). The cost in 2015 dollars is $81,114

Stormwater Retrofit Cut Sheets

WQ-03

Copied from Updated Stormwater Treatment Retrofit Memorandum (2014), by URS

PROJECT INFORMATION

Project Name: SR10 – Wetpond

Project Location: This outfall is located in southern Richland on Leslie Rd. near the intersection of Columbia Park Trail. The proposed wetpond would utilize a portion of the properties at the southwest corner of the intersection.

EXISTING CONDITIONS

The outfall discharges directly into Amon Wasteway through a 24-inch diameter storm drain pipe and has a contributing basin of approximately 108.5 acres based on recent basin delineation work, of which 28.5 acres can be considered directly connected impervious surfaces. The zoning in the basin is primarily single family residential; however, Leslie Rd. sees a higher traffic volume and contributes some stormwater to the outfall. Most of the contributing subbasins from the residential areas pass through spill control separators (e.g., catch basin with down-turned elbow) before discharging into the main storm line that parallels Leslie Rd. No stormwater quality treatment BMPs are utilized along Leslie Rd. It is probable that pollutants from the residential area consist of nutrients and sediments. Considering these characteristics, it is assumed that the potential pollutant loading of the outfall is higher compared to other outfalls in the City.

HYDROLOGY

It is assumed that only directly connected impervious surfaces will contribute runoff during the 6-month, 24-hour Type 1A storm event. Pervious and disconnected impervious surface areas should be considered if the City intends to treat stormwater runoff for larger storm events.

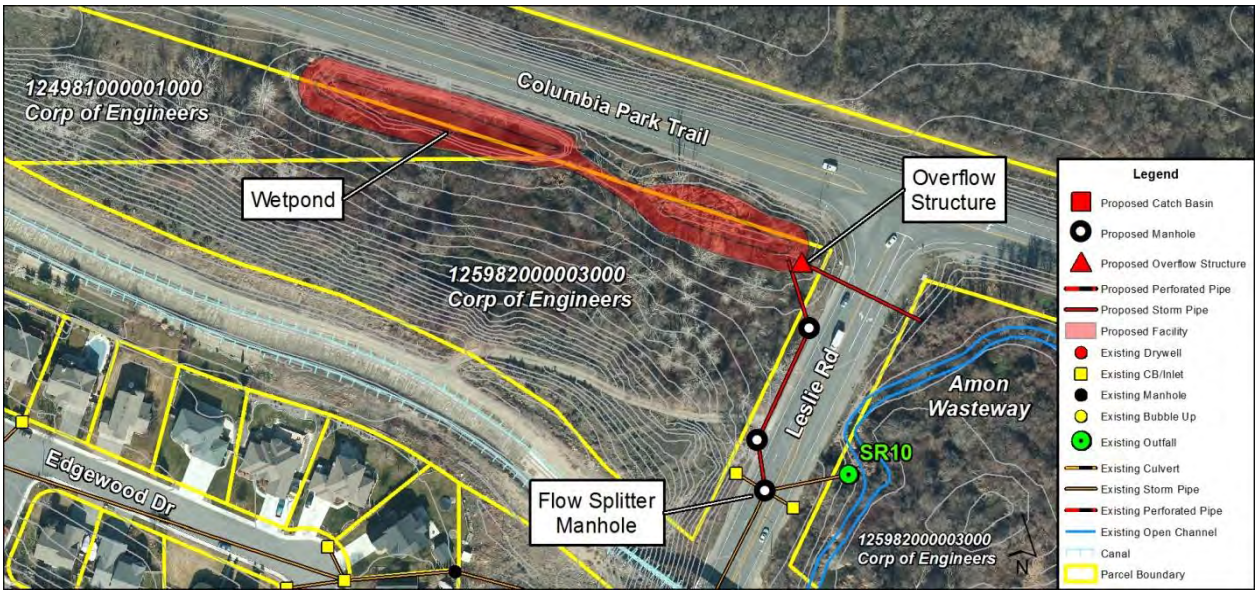
Peak Flow and Volume for the 6-Month, 24-Hour Type 1A Storm Event (0.53 in).

Basin Area (acres)	Peak Flow (cfs)	Volume (cf)
28.5	2.23	35,568

PROPOSED SOLUTION

Divert the 6-month, 24-hour (stormwater quality) design storm to a wetpond located on the properties at the southwest corner of the intersection of Leslie Rd. and Columbia Park Trail. Components include: a flow splitter manhole with storm pipe leading to a wetpond with approximately 40,514 cubic feet of runoff storage, and an overflow structure with storm pipe leading back east across Leslie Rd. to Amon Wasteway. Wetpond sizing assumes no infiltration. Preliminary cost estimate assumes no land acquisition costs and limited wetpond excavation as the existing terrain appears to provide adequate storage potential.

LOCATION MAP



PRELIMINARY COST ESTIMATE

SR10 - Wetpond				Preliminary Estimate	
ITEM NO.	DESCRIPTION OF ITEM	UNIT	ESTIMATED QUANTITY	UNIT PRICE	EXTENDED AMOUNT
1	Mobilization	LS	1	$ 10,000.00	$ 10,000.00
2	Temporary Erosion and Sediment Control	LS	1	$ 5,000.00	$ 5,000.00
3	Traffic / Pedestrian Control	LS	1	$ 10,000.00	$ 10,000.00
4	Unclassified Excavation Incl. Haul	CY	287	$ 10.00	$ 2,866.67
5	Clearing and Grubbing	LS	1	$ 5,000.00	$ 5,000.00
6	12-inch Diameter Storm Drain Pipe	LF	430	$ 30.00	$ 12,900.00
7	Manhole 48-inch Diameter w/ Solid Cover	EA	2	$ 8,000.00	$ 16,000.00
8	Manhole 48-inch Diameter / Flow Splitter	EA	1	$ 8,500.00	$ 8,500.00
9	Manhole 48-inch Diameter w/ Overflow Grate	EA	1	$ 8,500.00	$ 8,500.00
10	Pavement / Sidewalk Restoration	SY	37	$ 50.00	$ 1,833.33
11	Animal Guard, 12-inch Diameter	EA	2	$ 400.00	$ 800.00
12	Landscaping	LS	1	$ 5,000.00	$ 5,000.00
	Construction Subtotal				**$ 86,400.00**
	Engineering / Administration (20%)				$ 17,280.00
	WSST (8.3%)				$ 7,171.20
	Subtotal				**$ 110,851.20**
	Contingency (25%)				$ 27,712.80
	Total				**$ 138,564.00**

Notes:
(1) Assumes no land acquisition costs.
(2) Assumes limited wetpond excavation as the existing terrain appears to provide adequate storage potential.

Table above in 2014 dollars. Project cost escalated to 2015 dollars based on the Engineering News Record (ENR) Construction Cost Index (CCI). The cost in 2015 dollars is $141,612.

WQ-04 Swift Blvd Water Quality Retrofit

Exerts below taken from the Stormwater LID Retrofit Project Pre-Design Report (2014) by URS

The Swift Blvd. retrofit project includes retrofitting bioretention facilities into existing landscaped median islands and adjacent shoulder landscaped areas. Preliminary hydrology and sizing calculations reveal that most bioretention facilities may be able to retain, treat, and infiltrate stormwater runoff up to the 25-year storm event from localized roadway subbasins. The concept of utilizing the median space to daylight the storm main and treat at least the water quality storm for the entire Swift Blvd. basin was deemed infeasible due to the size of the overall basin and large amount of stormwater runoff generated during the 6-month, 24-hour storm event.

Key aspects of the project include:

- Installing curb inlets along the median to allow localized street runoff to enter into proposed bioretention swales.
- In two locations, installing a bubble-up system to direct runoff from nearby catch basins into proposed median bioretention swales.
- In one location, installing a flow splitter to direct up to the 25-year, 24-hour peak flow to a proposed bioretention swale located in a relatively flat grassed portion of the George Prout Aquatic Complex (City owned) and constructing an emergency overflow for the bioretention swale.

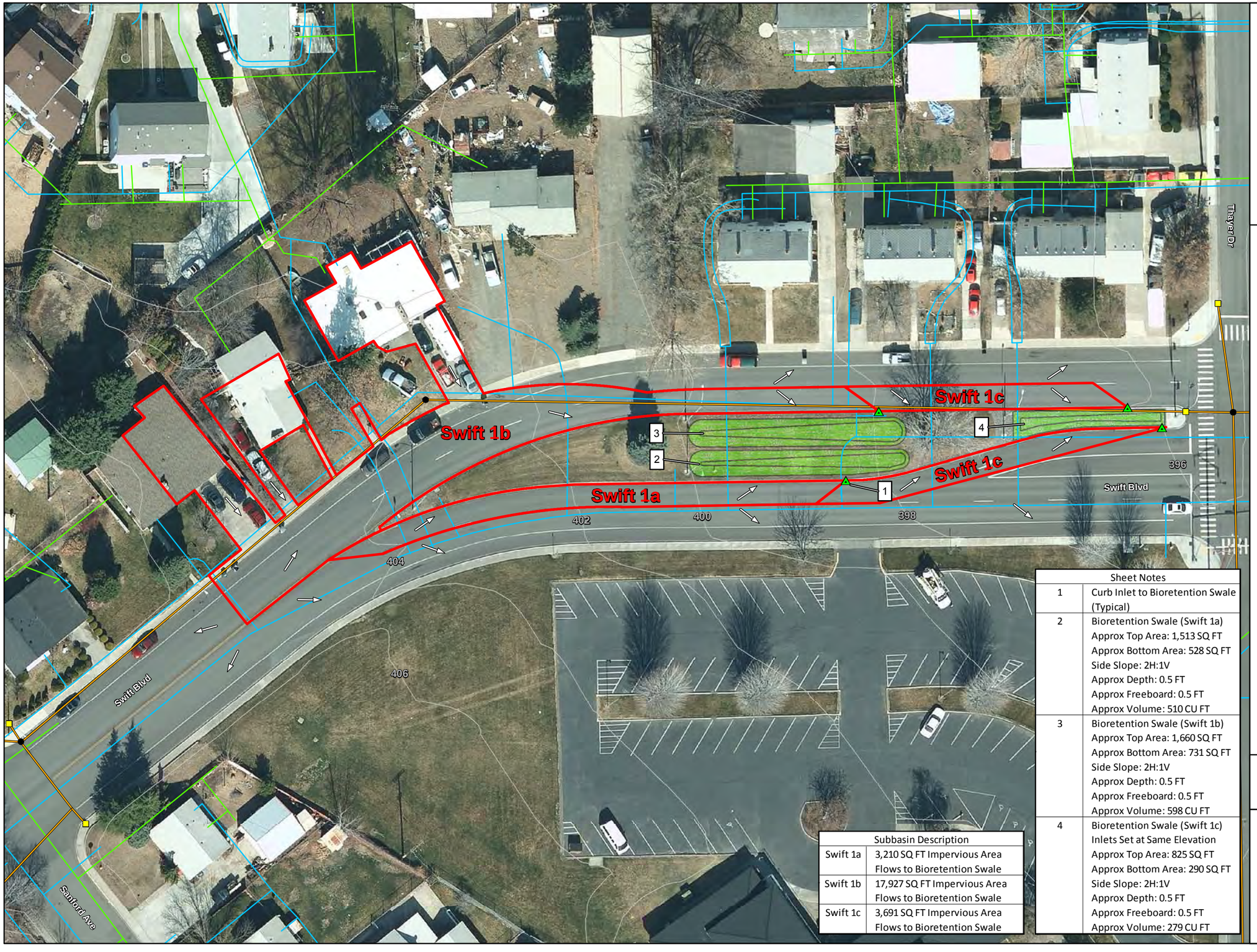
Water Quality Benefits

The proposed stormwater LID retrofits will reduce the volume of runoff from each outfall site as compared to the existing condition by retaining and infiltrating the 25-year, 24-hour SCS Type 1A storm event from the contributing areas. Water quality is also improved from the existing condition since the proposed BMPs will effectively retain and treat greater than 90% of the annual runoff volume from the retrofit areas including nearly all of the “first flush” storm events.

City of Richland Stormwater LID Retrofit Projects

Swift Blvd

Proposed Condition
Subbasin Map



Subbasin Description	
Swift 1a	3,210 SQ FT Impervious Area Flows to Bioretention Swale
Swift 1b	17,927 SQ FT Impervious Area Flows to Bioretention Swale
Swift 1c	3,691 SQ FT Impervious Area Flows to Bioretention Swale

Sheet Notes	
1	Curb Inlet to Bioretention Swale (Typical)
2	Bioretention Swale (Swift 1a) Approx Top Area: 1,513 SQ FT Approx Bottom Area: 528 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 510 CU FT
3	Bioretention Swale (Swift 1b) Approx Top Area: 1,660 SQ FT Approx Bottom Area: 731 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 598 CU FT
4	Bioretention Swale (Swift 1c) Inlets Set at Same Elevation Approx Top Area: 825 SQ FT Approx Bottom Area: 290 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 279 CU FT

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-1

N

0 25 50 100 Feet

Date Created: April 10, 2014

City of Richland Stormwater LID Retrofit Projects

Swift Blvd

Proposed Condition Subbasin Map

Sheet Notes	
1	Curb Inlet to Bioretention Swale (Typical)
2	Bioretention Swale (Swift 2a) Approx Top Area: 501 SQ FT Approx Bottom Area: 319 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 205 CU FT
3	Bioretention Swale (Swift 2b) Approx Top Area: 501 SQ FT Approx Bottom Area: 319 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 205 CU FT
4	Bioretention Swale (Swift 2c) Approx Top Area: 1,565 SQ FT Approx Bottom Area: 1,142 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 677 CU FT
5	Construct Manhole with 60 LF of 8" Conc Storm Pipe Connected to Bubble Up. Manhole to Have Internal Weir to Allow Stormwater to Overflow to Existing Storm Pipe.
6	Construct Bubble Up at Bioretention Swale Bottom.
7	Bioretention Swale (Swift 3a) Approx Top Area: 728 SQ FT Approx Bottom Area: 486 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 303 CU FT
8	Bioretention Swale (Swift 3b) Approx Top Area: 1,251 SQ FT Approx Bottom Area: 965 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 554 CU FT

Subbasin Description	
Swift 2a	3,268 SQ FT Impervious Area Flows to Bioretention Swale
Swift 2b	8,494 SQ FT Impervious Area Flows to Bioretention Swale
Swift 2c	Connected: 15,321 SQ FT Impervious Area Disconnected: 4,596 SQ FT Impervious Area 10,725 SQ FT Pervious Area Flows to Bioretention Swale
Swift 3a	3659 SQ FT Impervious Area Flows to Bioretention Swale
Swift 3b	6536 SQ FT Impervious Area Flows to Bioretention Swale
Swift 4c	Connected: 16,887 SQ FT Impervious Area Disconnected: 5,066 SQ FT Impervious Area 11,821 SQ FT Pervious Area Flows to Bioretention Swale

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-2

N

0 20 40 80 Feet

Date Created: March 28, 2014

City of Richland Stormwater LID Retrofit Projects

Swift Blvd

Proposed Condition Subbasin Map

Swift 4b
Swift 4a
Swift 4c
Swift 4c Disconnected
Swift 3b
Swift Blvd
Mc.Pherson Ave
390
392
394
1
2
3
4
5
6

Subbasin Description	
Swift 4a	4007 SQ FT Impervious Area Flows to Bioretention Swale
Swift 4b	3791 SQ FT Impervious Area Flows to Bioretention Swale
Swift 4c	Connected: 16,887 SQ FT Impervious Area Disconnected: 5,066 SQ FT Impervious Area 11,821 SQ FT Pervious Area Flows to Bioretention Swale

Sheet Notes	
1	Curb Inlet to Bioretention Swale (Typical)
2	Bioretention Swale (Swift 4a) Approx Top Area: 1,073 SQ FT Approx Bottom Area: 727 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 450 CU FT
3	Bioretention Swale (Swift 4b) Approx Top Area: 997 SQ FT Approx Bottom Area: 649 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 412 CU FT
4	Bioretention Swale (Swift 4c) Approx Top Area: 1,788 SQ FT Approx Bottom Area: 1,438 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 806 CU FT
5	Construct Manhole with 60 LF of 8" Conc Storm Pipe Connected to Bubble Up. Manhole to Have Internal Weir to Allow Stormwater to Overflow to Existing Storm Pipe.
6	Construct Bubble Up at Bioretention Swale Bottom.

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-3

N

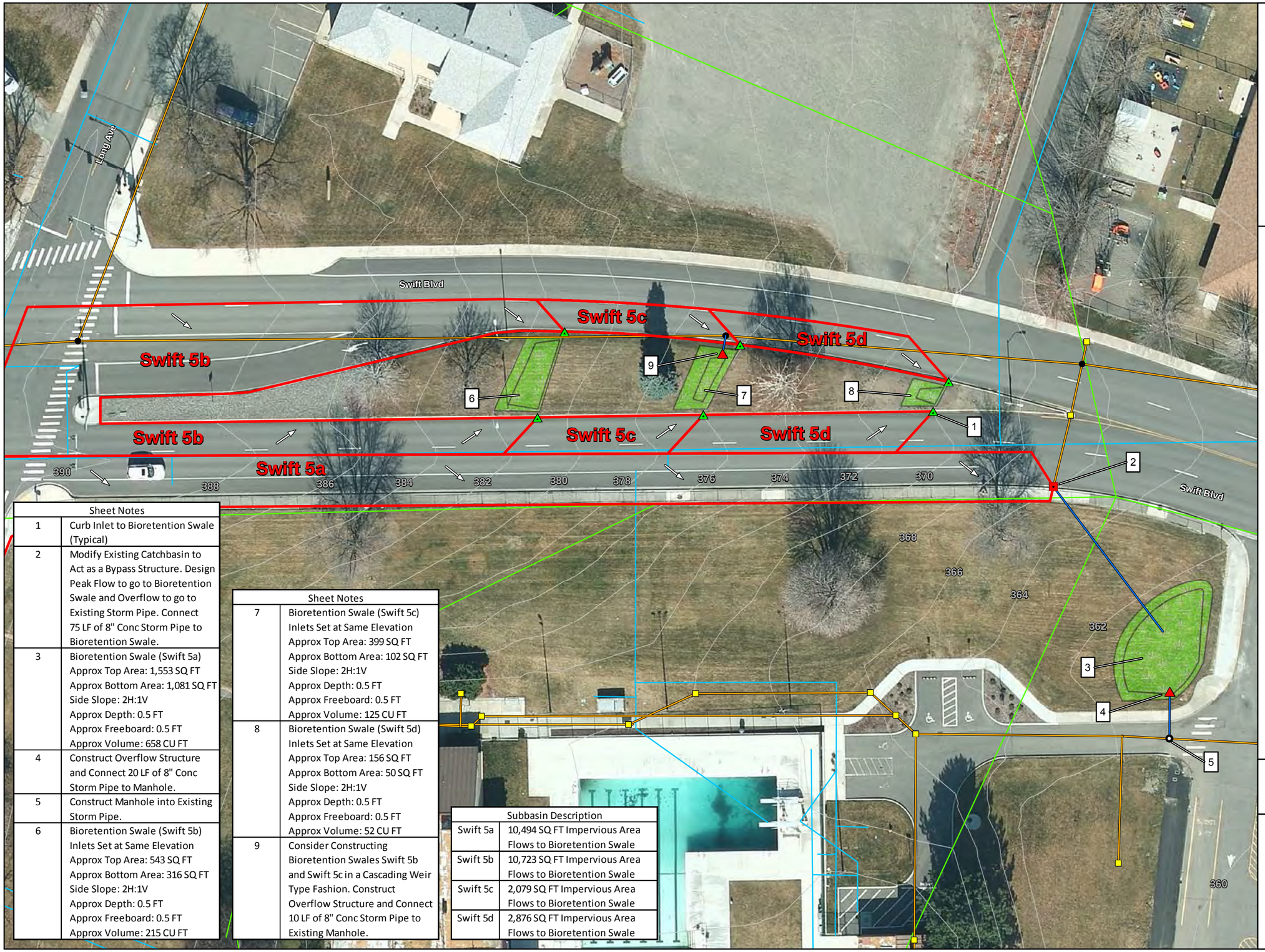
0 20 40 80 Feet

Date Created: March 28, 2014

City of Richland Stormwater LID Retrofit Projects

Swift Blvd

Proposed Condition
Subbasin Map



Sheet Notes	
1	Curb Inlet to Bioretention Swale (Typical)
2	Modify Existing Catchbasin to Act as a Bypass Structure. Design Peak Flow to go to Bioretention Swale and Overflow to go to Existing Storm Pipe. Connect 75 LF of 8" Conc Storm Pipe to Bioretention Swale.
3	Bioretention Swale (Swift 5a) Approx Top Area: 1,553 SQ FT Approx Bottom Area: 1,081 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 658 CU FT
4	Construct Overflow Structure and Connect 20 LF of 8" Conc Storm Pipe to Manhole.
5	Construct Manhole into Existing Storm Pipe.
6	Bioretention Swale (Swift 5b) Inlets Set at Same Elevation Approx Top Area: 543 SQ FT Approx Bottom Area: 316 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 215 CU FT

Sheet Notes	
7	Bioretention Swale (Swift 5c) Inlets Set at Same Elevation Approx Top Area: 399 SQ FT Approx Bottom Area: 102 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 125 CU FT
8	Bioretention Swale (Swift 5d) Inlets Set at Same Elevation Approx Top Area: 156 SQ FT Approx Bottom Area: 50 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 52 CU FT
9	Consider Constructing Bioretention Swales Swift 5b and Swift 5c in a Cascading Weir Type Fashion. Construct Overflow Structure and Connect 10 LF of 8" Conc Storm Pipe to Existing Manhole.

Subbasin Description	
Swift 5a	10,494 SQ FT Impervious Area Flows to Bioretention Swale
Swift 5b	10,723 SQ FT Impervious Area Flows to Bioretention Swale
Swift 5c	2,079 SQ FT Impervious Area Flows to Bioretention Swale
Swift 5d	2,876 SQ FT Impervious Area Flows to Bioretention Swale

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-4

N

0 20 40 80 Feet

Date Created: March 28, 2014

Swift Blvd. LID Retrofit Project				Pre-Design Estimate	
ITEM NO.	DESCRIPTION OF ITEM	UNIT	ESTIMATED QUANTITY	UNIT PRICE	EXTENDED AMOUNT
1	Mobilization	LS	1	$ 15,000.00	$ 15,000.00
2	Traffic Control	LS	1	$ 25,000.00	$ 25,000.00
3	Clearing and Grubbing	LS	1	$ 10,000.00	$ 10,000.00
4	Removal of Structures and Obstructions	LS	1	$ 3,000.00	$ 3,000.00
5	Sawcutting	LF	154.0	$ 5.00	$ 770.00
6	Structure Excavation Class B Incl. Haul	CY	92.5	$ 10.00	$ 924.59
7	Amended Treatment Soil Mix	CY	836.2	$ 20.00	$ 16,724.44
8	HMA Patch	LS	1	$ 500.00	$ 500.00
9	8-inch Diameter Storm Drain Pipe, in Place	LF	215.0	$ 20.00	$ 4,300.00
10	Pipe Zone Backfill	CY	50.4	$ 40.00	$ 2,017.28
11	Gravel Backfill for Pipe Zone Bedding	CY	42.0	$ 50.00	$ 2,101.34
12	Catch Basin Type 1 as Bubble-Up	EA	2	$ 1,500.00	$ 3,000.00
13	Curb Inlet	EA	16	$ 1,500.00	$ 24,000.00
14	Bypass Structure Manhole 48 In. Diam.	EA	3	$ 2,500.00	$ 7,500.00
15	Manhole 48 In. Diam. w/ Overflow Grate	EA	1	$ 8,500.00	$ 8,500.00
16	Connect to Drainage Structure	EA	6	$ 500.00	$ 3,000.00
17	Quarry Spalls	CY	3.6	$ 35.50	$ 126.22
18	Bioretention Swales	LS	1	$ 75,000.00	$ 75,000.00
19	Animal Guard, 8-Inch Diameter	EA	1	$ 400.00	$ 400.00
20	ESC Lead	DAY	7	$ 150.00	$ 1,050.00
21	Erosion Control	FA	EST	$ 5,000.00	$ 5,000.00
22	Minor Change	FA	EST	$ 10,000.00	$ 10,000.00
	Construction Subtotal				**$ 217,913.88**
	Construction Management (10%)				$ 21,791.39
	WA State Sales Tax (8.3%)				$ 18,086.85
	Subtotal				**$ 257,792.12**
	Pre-Design Contingency (50%)				$ 128,896.06
	Total				**$ 386,688.17**

Notes:
- Curb Inlet includes sump structure, access lid, and concrete gutter restoration.
- Bioretention Swale includes excavation, grading, soil mix, mulch, planting, and irrigation.

Table above in 2014 dollars. Project cost escalated to 2015 dollars based on the Engineering News Record (ENR) Construction Cost Index (CCI). The cost in 2015 dollars is $395,195.

WQ-05 Uptown Mall Bioretention Retrofit

Exerts below taken from the Stormwater LID Retrofit Project Pre-Design Report (2014) by URS

The Uptown Mall Parking Lot is owned by the City and presents an opportunity to improve stormwater quality and flow control through the use of LID BMPs (primarily bioretention). The conceptual design for the Uptown Mall parking lot includes retrofitting bioretention facilities into the existing parking lot at strategic locations. Two conceptual alternatives were developed:

- Alternative 1. Construct large bioretention facilities over the top of existing catch basins and modify the catch basins to serve as overflow structures into the existing storm system; or
- Alternative 2. Construct small bioretention facilities at the ends of each row of parking and leave the existing storm system unmodified for overflow.

An estimated project cost for the Uptown Mall Bioretention Retrofit Project was not developed for the URS report. Based on the information provided in the report, a preliminary planning level estimate for project costs was determined based on Alternative 1. This developed cost in 2015 dollars is $625,000.

City of Richland Stormwater LID Retrofit Projects

Uptown Mall

Proposed Condition
Alternative 1

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- 1999 Contours
- Bioretention Swale

2012 Aerial Imagery

Attachment 4-5

N

0 75 150 300 Feet

Date Created: March 28, 2014

City of Richland Stormwater LID Retrofit Projects

Uptown Mall

Proposed Condition
Alternative 2

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- 1999 Contours
- Bioretention Swale

2012 Aerial Imagery

Attachment 4-6

N

0 75 150 300 Feet

Date Created: March 28, 2014

City of Richland Stormwater LID Retrofit Projects

Uptown Mall

Proposed Condition
Subbasin Map Alt 1

Sheet Notes	
1	Curb Cut to Bioretention Swale (Typical)
2	Construct Curb and Gutter Per City Standard Gutter to Match Existing Asphalt
3	Bioretention Swale (Uptown-Alt1) Centered on Existing Inlet Approx Top Area: 2,690 SQ FT Approx Area at Overflow Structure: 2,352 SQ FT Approx Bottom Area: 1,730 SQ FT Side Slope: 3H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 1,021 CU FT
4	Overflow Structure Utilize as Much of Existing Inlet Structure as Possible

Subbasin Description	
Uptown-Alt1	67,259 SQ FT Impervious Area Flows to Bioretention Swale

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-7

N

0 25 50 100 Feet

Date Created: March 28, 2014

City of Richland Stormwater LID Retrofit Projects

Uptown Mall

Proposed Condition
Subbasin Map Alt 2

Uptown1-Alt2
Uptown2-Alt2
Uptown3-Alt2
Uptown4-Alt2
Uptown5-Alt2
Uptown6-Alt2

354
356
358
360
George Washington Way

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Sheet Notes	
1	Bioretention Inlet (Typical) Curb Cut Along Curb and Gutter
2	Construct Curb and Gutter Per City Standard (Typical) Gutter Slope to Match Existing Asphalt
3	Construct Standing Curb Per City Standard (Typical)
4	Bioretention Outlet (Typical) Curb Cut Along Standing Curb
5	Bioretention Swale (Typical) Approx Top Area: 550 SQ FT Approx Bottom Area: 264 SQ FT Side Slope: 3H:1V Approx Depth: 0.5 FT Approx Volume: 203 CU FT
6	Existing Inlet to Remain

Subbasin Description	
Uptown1-Alt2	3,169 SQ FT Impervious Area Flows to Bioretention Swale
Uptown2-Alt2	4,780 SQ FT Impervious Area 677 SQ FT Pervious Area Flows to Bioretention Swale
Uptown3-Alt2	3,178 SQ FT Impervious Area Flows to Bioretention Swale
Uptown4-Alt2	3,191 SQ FT Impervious Area 427 SQ FT Pervious Area Flows to Bioretention Swale
Uptown5-Alt2	4,796 SQ FT Impervious Area Flows to Bioretention Swale
Uptown6-Alt2	4,266 SQ FT Impervious Area 1,783 SQ FT Pervious Area Flows to Bioretention Swale

N

0 25 50 100 Feet

Date Created: March 28, 2014

Attachment 4-8

WQ-06 Columbia Park Trail Water Quality Retrofit

Exerts below taken from the Stormwater LID Retrofit Project Pre-Design Report (2014) by URS

The Columbia Park Trail retrofit project includes retrofitting bioretention facilities into existing roadway shoulder areas and either porous asphalt or bioretention into an existing public parking lot during a future roadway corridor improvement project. The goal of the retrofit projects is to improve stormwater quality for the runoff discharging to outfalls SR08 and SR20. The conceptual locations for bioretention facilities were taken from the City's Streetscape Master Plan (June 2013). Due to project scope and funding limitations, this submittal focuses only on retrofitting bioretention on the north side of the roadway (with the exception of a bioretention facility for SR08 on the south side of the roadway at the intersection of Columbia Center Blvd.). Preliminary hydrology and sizing calculations reveal that most bioretention facilities may be able to retain, treat, and infiltrate stormwater runoff up to the 25-year storm event from localized roadway subbasins.

Key aspects of the project include:

- Constructing new sidewalk along Columbia Park Trail with curb inlets to allow localized street runoff to enter into proposed bioretention swales along the backside of the sidewalk. The City is aware that sidewalk improvements are likely not grant eligible, and will have to fund them separately.
- Improving the existing park parking by:
    - Alternative 1: utilizing conventional asphalt to direct stormwater runoff towards a bioretention swale; or
    - Alternative 2: utilizing porous asphalt.

Water Quality Benefits

The proposed stormwater LID retrofits will reduce the volume of runoff from each outfall site as compared to the existing condition by retaining and infiltrating the 25-year, 24-hour SCS Type 1A storm event from the contributing areas. Water quality is also improved from the existing condition since the proposed BMPs will effectively retain and treat greater than 90% of the annual runoff volume from the retrofit areas including nearly all of the "first flush" storm events.

City of Richland Stormwater LID Retrofit Projects

Columbia Park Trail

Proposed Condition Subbasin Map

General Notes	
1	Longitudinal Slope of Bioretention Swales SR20b through SR20h will Require Bioretention Swales to be Divided into Smaller Swales and Inlets Added in Order to Hold Required Runoff Volumes.

Sheet Notes	
1	Proposed Sidewalk per City of Richland Streetscape Master Plan.
2	Proposed Greenspace per City of Richland Streetscape Master Plan.
3	Curb Inlet to Bioretention Swale (Typical)
4	Bioretention Swale (SR08) Approx Top Area: 1,167 SQ FT Approx Bottom Area: 381 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 387 CU FT
5	Bioretention Swale (SR20a) Approx Top Area: 559 SQ FT Approx Bottom Area: 392 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 238 CU FT
6	Available Greenspace for Bioretention Swale if Needed Due to Parking Lot Grading.

Sheet Notes	
7	Alt1: Conventional Asphalt Pavement Parking Lot. Grade to Slope Towards Bioretention Swale. Alt2: Porous Asphalt Pavement Parking Lot.
8	Bioretention Swale (SR20b) Approx Top Area: 3,112 SQ FT Approx Bottom Area: 1,847 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 1,240 CU FT
9	Bioretention Swale (SR20c) Approx Top Area: 5,351 SQ FT Approx Bottom Area: 4,267 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 2,404 CU FT

Subbasin Description	
SR08	57,423 SQ FT Impervious Area Flows to Bioretention Swale
SR20a	7,642 SQ FT Impervious Area Flows to Bioretention Swale
SR20b	29,681 SQ FT Impervious Area Flows to Bioretention Swale
SR20c	23,278 SQ FT Impervious Area Flows to Bioretention Swale
SR20d	17,429 SQ FT Impervious Area Flows to Bioretention Swale

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-9

N

0 37.5 75 150 Feet

Date Created: April 10, 2014

City of Richland Stormwater LID Retrofit Projects

Columbia Park Trail

Proposed Condition Subbasin Map

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-10

N

0 37.5 75 150 Feet

Date Created: March 28, 2014

Sheet Notes	
1	Proposed Sidewalk per City of Richland Streetscape Master Plan.
2	Proposed Greenspace per City of Richland Streetscape Master Plan.
3	Curb Inlet to Bioretention Swale (Typical)
4	Bioretention Swale (SR20d) Approx Top Area: 2,148 SQ FT Approx Bottom Area: 708 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 714 CU FT
5	Bioretention Swale (SR20e) Approx Top Area: 5,644 SQ FT Approx Bottom Area: 1,869 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 1,878 CU FT

General Notes	
1	Longitudinal Slope of Bioretention Swales SR20b through SR20h will Require Bioretention Swales to be Divided into Smaller Swales and Inlets Added in Order to Hold Required Runoff Volumes.

Subbasin Description	
SR20d	17,429 SQ FT Impervious Area Flows to Bioretention Swale
SR20e	38,749 SQ FT Impervious Area Flows to Bioretention Swale

City of Richland Stormwater LID Retrofit Projects

Columbia Park Trail

Proposed Condition Subbasin Map

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-11

N

0 37.5 75 150 Feet

Date Created: March 28, 2014

Subbasin Description	
SR20e	38,749 SQ FT Impervious Area Flows to Bioretention Swale
SR20f	11,066 SQ FT Impervious Area Flows to Bioretention Swale
SR20g	16,214 SQ FT Impervious Area Flows to Bioretention Swale

General Notes	
1	Longitudinal Slope of Bioretention Swales SR20b through SR20h will Require Bioretention Swales to be Divided into Smaller Swales and Inlets Added in Order to Hold Required Runoff Volumes.

Sheet Notes	
1	Proposed Sidewalk per City of Richland Streetscape Master Plan.
2	Proposed Greenspace per City of Richland Streetscape Master Plan.
3	Curb Inlet to Bioretention Swale (Typical)
4	Bioretention Swale (SR20e) Approx Top Area: 5,644 SQ FT Approx Bottom Area: 1,869 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 1,878 CU FT

Sheet Notes	
5	Bioretention Swale (SR20f) Approx Top Area: 1,296 SQ FT Approx Bottom Area: 424 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 430 CU FT
6	Bioretention Swale (SR20g) Approx Top Area: 2,322 SQ FT Approx Bottom Area: 766 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 772 CU FT

City of Richland Stormwater LID Retrofit Projects

Columbia Park Trail

Proposed Condition Subbasin Map

Legend

- Existing Inlet/Catch Basin
- Existing Manhole
- Existing Bubble Up
- Existing Outlet
- Existing UIC Facility
- Existing Culvert
- Existing Storm Pipe
- Existing Open Channel
- Existing Perforated Pipe
- Existing Sewer System
- Existing Water System
- 1999 Contours
- Curb Inlet
- Bubble Up
- Bypass Structure
- Manhole
- Overflow Structure
- Curb and Gutter
- Standing Curb
- Storm Pipe
- Bioretention Swale
- Asphalt Parking Lot
- Sidewalk
- Subbasin
- Approx Flow Direction

2012 Aerial Imagery

Attachment 4-12

N

0 37.5 75 150 Feet

Date Created: March 28, 2014

Sheet Notes	
1	Proposed Sidewalk per City of Richland Streetscape Master Plan.
2	Proposed Greenspace per City of Richland Streetscape Master Plan.
3	Curb Inlet to Bioretention Swale (Typical)
4	Bioretention Swale (SR20g) Approx Top Area: 2,322 SQ FT Approx Bottom Area: 766 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 772 CU FT
5	Bioretention Swale (SR20h) Approx Top Area: 1,038 SQ FT Approx Bottom Area: 337 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 344 CU FT

Sheet Notes	
6	Bioretention Swale (SR20i) Approx Top Area: 1,209 SQ FT Approx Bottom Area: 394 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 401 CU FT
7	Bioretention Swale (SR20j) Approx Top Area: 837 SQ FT Approx Bottom Area: 271 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 277 CU FT
8	Bioretention Swale (SR20k) Approx Top Area: 1,091 SQ FT Approx Bottom Area: 356 SQ FT Side Slope: 2H:1V Approx Depth: 0.5 FT Approx Freeboard: 0.5 FT Approx Volume: 362 CU FT

General Notes	
1	Longitudinal Slope of Bioretention Swales SR20b through SR20h will Require Bioretention Swales to be Divided into Smaller Swales and Inlets Added in Order to Hold Required Runoff Volumes.

Subbasin Description	
SR20g	16,214 SQ FT Impervious Area Flows to Bioretention Swale
SR20h	8,089 SQ FT Impervious Area Flows to Bioretention Swale
SR20i	9,106 SQ FT Impervious Area Flows to Bioretention Swale
SR20j	5,466 SQ FT Impervious Area Flows to Bioretention Swale
SR20k	8,651 SQ FT Impervious Area Flows to Bioretention Swale

Columbia Park Trail LID Retrofit Project - Alt 1				Pre-Design Estimate	
ITEM NO.	DESCRIPTION OF ITEM	UNIT	ESTIMATED QUANTITY	UNIT PRICE	EXTENDED AMOUNT
1	Mobilization	LS	1	$ 35,000.00	$ 35,000.00
2	Traffic Control	LS	1	$ 40,000.00	$ 40,000.00
3	Clearing and Grubbing	LS	1	$ 10,000.00	$ 10,000.00
4	Amended Treatment Soil Mix	CY	1,431.8	$ 20.00	$ 28,636.67
5	Crushed Surfacing Top Course	TON	636.7	$ 22.00	$ 14,006.67
6	HMA Cl. 1/2-Inch PG 64-28	TON	439.3	$ 90.00	$ 39,537.00
7	Curb Inlet	EA	12	$ 1,500.00	$ 18,000.00
8	Bioretention Swales	LS	1	$ 60,000.00	$ 60,000.00
9	ESC Lead	DAY	10	$ 150.00	$ 1,500.00
10	Erosion Control	FA	EST	$ 10,000.00	$ 10,000.00
11	Minor Change	FA	EST	$ 10,000.00	$ 10,000.00
	Construction Subtotal				**$ 266,680.33**
	Construction Management (10%)				$ 26,668.03
	WA State Sales Tax (8.3%)				$ 22,134.47
	Subtotal				**$ 315,482.83**
	Pre-Design Contingency (50%)				$ 157,741.42
	Total				**$ 473,224.25**

Notes:
- Curb Inlet includes sump structure, access lid, and concrete gutter restoration.
- Bioretention Swale includes excavation, grading, soil mix, mulch, planting, and irrigation.

Table above in 2014 dollars. Project cost escalated to 2015 dollars based on the Engineering News Record (ENR) Construction Cost Index (CCI). The cost in 2015 dollars is $483,635.

Columbia Park Trail LID Retrofit Project - Alt 2				Pre-Design Estimate	
ITEM NO.	DESCRIPTION OF ITEM	UNIT	ESTIMATED QUANTITY	UNIT PRICE	EXTENDED AMOUNT
1	Mobilization	LS	1	$ 35,000.00	$ 35,000.00
2	Traffic Control	LS	1	$ 40,000.00	$ 40,000.00
3	Clearing and Grubbing	LS	1	$ 10,000.00	$ 10,000.00
4	Unclassified Excavation Incl. Haul	CY	848.9	$ 10.00	$ 8,488.89
5	Amended Treatment Soil Mix	CY	1,431.8	$ 20.00	$ 28,636.67
6	Aggregate Base for Porous HMA	CY	848.9	$ 50.00	$ 42,444.44
7	Porous HMA	SF	22,920	$ 3.50	$ 80,220.00
8	Curb Inlet	EA	12	$ 1,500.00	$ 18,000.00
9	Bioretention Swales	LS	1	$ 60,000.00	$ 60,000.00
10	ESC Lead	DAY	10	$ 150.00	$ 1,500.00
11	Erosion Control	FA	EST	$ 10,000.00	$ 10,000.00
12	Minor Change	FA	EST	$ 10,000.00	$ 10,000.00
	Construction Subtotal				**$ 344,290.00**
	Construction Management (10%)				$ 34,429.00
	WA State Sales Tax (8.3%)				$ 28,576.07
	Subtotal				**$ 407,295.07**
	Pre-Design Contingency (50%)				$ 203,647.54
	Total				**$ 610,942.61**

Notes:

- Curb Inlet includes sump structure, access lid, and concrete gutter restoration.
- Bioretention Swale includes excavation, grading, soil mix, mulch, planting, and irrigation.

Table above in 2014 dollars. Project cost escalated to 2015 dollars based on the Engineering News Record (ENR) Construction Cost Index (CCI). The cost in 2015 dollars is $624,383.

Appendix F.4

Developer Driven (DD) CIP Project Sheets and Cost Details

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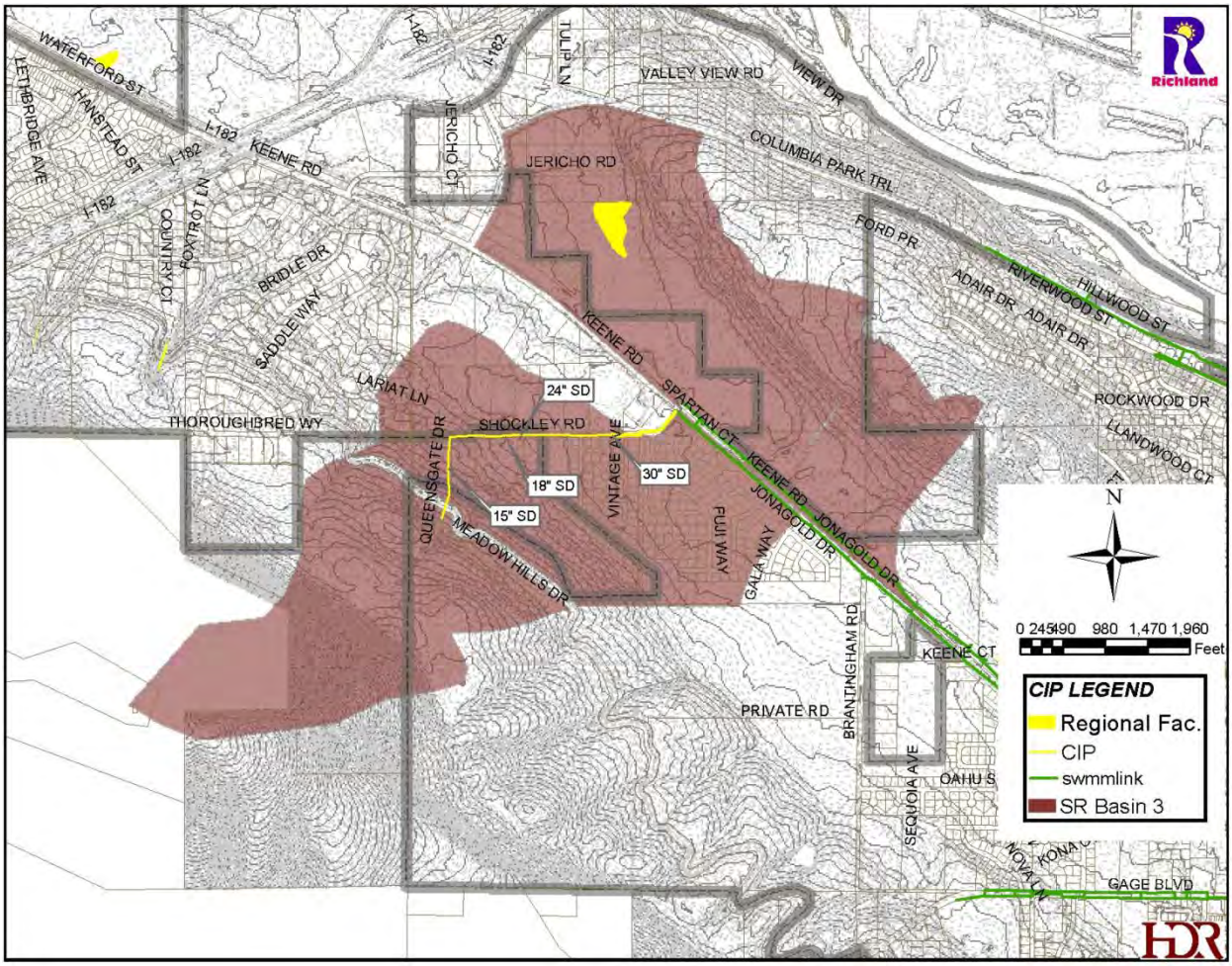
DD-01 Shockley Storm Mainline Conveyance

Exerts below taken from the City of Richland 2005 Stormwater Management Plan

In order to convey the stormwater for this fully developed basin, the City is concerned with the sizing of the storm mainline for runoff. Using the build-out assumptions for sizing the regional facility, a conceptual storm mainline was routed down from the hillside sub-basins south of the KID irrigation canal. It is expected that the City will intercept all stormwater to treat and detain it in a regional facility without discharge to the canal.



Shockley Storm Mainline Conveyance and Benefited Basin

Only part of the cost for constructing the conveyance system is included in the budget schedule for the CIP. It is anticipated that the majority of the mainline would be constructed through the development of the region. Both Shockley Rd and Queensgate Dr have been improved or partially improved as a result of recent development in the basin. Therefore, the cost estimate of the proposed storm drainage conveyance accounts for the repair and reconstruction of the road. Because the basin south of the KID canal has already been approved for development and infrastructure is already being constructed, sizing for the Shockley Rd conveyance anticipates that developed flows from the area south of the canal are equal to pre-developed conditions.

HDR ONE COMPANY | *Many Solutions*

ENGINEER'S OPINION OF PROBABLE COST

PROJECT DESCRIPTION: SHOCKLEY STORM MAINLINE CONVEYANCE — DATE: 2/25/2005

SHOCKLEY STORM CONVEYANCE IMPROVEMENTS

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION		UNIT PRICE		TOTAL COST
1	1	L.S.	MOBILIZATION	$	16,140	$	16,140.00
2	1	L.S.	TEMPORARY POLLUTION CONTROL	$	5,000	$	5,000.00
3	1	L.S.	TRAFFIC CONTROL	$	10,000	$	10,000.00
4	12	EA.	48" STD STORM MANHOLE	$	2,500	$	30,000.00
5	5	EA.	54" STD STORM MANHOLE	$	3,500	$	17,500.00
6	335	C.Y.	ROADWAY EXCAVATION INCL. HAUL	$	10	$	3,350.00
7	335	C.Y.	EMBANKMENT COMPACTION	$	4	$	1,340.00
8	2046	TON	CRUSHED SURFACING BASE COURSE	$	11	$	22,506.00
9	767	TON	CRUSHED SURFACING TOP COURSE	$	12	$	9,204.00
10	850	TON	HMA CL B PG-64-28	$	40	$	34,000.00
11	4500	S.Y.	SOIL RESIDUAL HERBICIDE	$	2	$	9,000.00
12	7600	L.F.	SAWCUT EXISTING AC PAVEMENT	$	2	$	15,200.00
13	1750	L.F.	15" STORM DRAIN PIPE	$	40		70,000.00
14	700	L.F.	18" STORM DRAIN PIPE	$	45	$	31,500.00
15	400	L.F.	24" STORM DRAIN PIPE	$	55	$	22,000.00
16	880	L.F.	30" STORM DRAIN PIPE	$	65	$	57,200.00

NOTE: 1. Not a revenue producing project, no sales tax.

SUBTOTAL		$	353,940
CONTINGENCY	30%	$	106,182
WSST (8.3%)		$	-
ENG/ ADMIN	20%	$	92,024
TOTAL		$	552,146

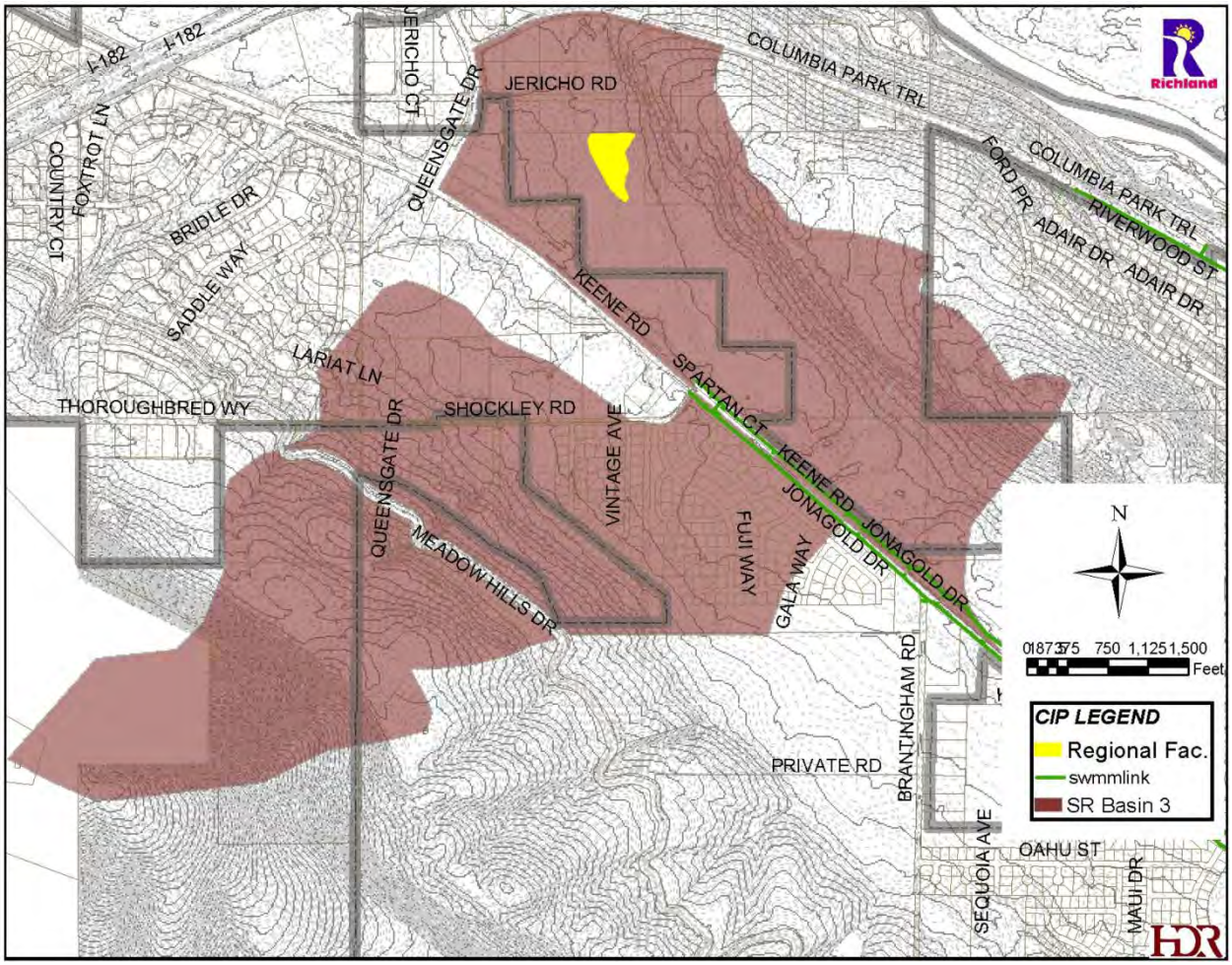
Table above in 2005 dollars. Project cost escalated to 2015 dollars based on the Engineering News Record (ENR) Construction Cost Index (CCI). The cost in 2015 dollars is $777,768.

DD-02 Jericho Road Regional Facility

Exerts below taken from the City of Richland 2005 Stormwater Management Plan

Basin 3 consists of a largely undeveloped and under-developed residential area south of Keene Road on the hill side. This basin is approximately 737 acres. It is expected that the developed areas would be approximately 25% impervious due to zoning and steep slopes. The proposed facility is approximately 3.8 acres in plan area, 6 feet deep, and designed as an infiltration (2in/hr) and detention facility. The facility is intended to use the natural terrain as the facility with simply berming the downstream end. As an alternative, the City could simply construct a facility alongside Keene Rd., however, the facility would only collect 60% of the basin for control and treatment.

The proposed facility would be located upstream of a natural drainage channel that conveys stormwater through the vineyards located north of Columbia Park trail and along the Yakima River. This existing channel is deeply incised and will need to be repaired. The proposed facility would detain and infiltrate the 25-year runoff volume. The facility would have a slow release to the downstream channel and an emergency overflow to the downstream channel. The cost estimate for the facility included a flow control manhole and repair of the existing channel.



Jericho Rd. Regional Improvements and Benefited Basin

HDR ONE COMPANY | *Many Solutions*℠

ENGINEER'S OPINION OF PROBABLE COST

PROJECT DESCRIPTION: JERICHO RD REGIONAL FACILITY — DATE: 2/25/2005

3.8 ACRE REGIONAL R/D FACILITY

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION		UNIT PRICE		TOTAL COST
1	1	L.S.	MOBILIZATION	$	22,813	$	22,812.50
2	1	L.S.	TEMPORARY POLLUTION CONTROL	$	3,500	$	3,500.00
3	1	L.S.	TRAFFIC CONTROL	$	5,000	$	5,000.00
4	1	L.S.	CLEARING AND GRUBBING	$	3,000	$	3,000.00
5	8,000	C.Y.	BERM EXCAVATION INCL. HAUL	$	4	$	32,000.00
6	4000	C.Y.	EMBANKMENT COMPACTION	$	5	$	20,000.00
7	2000	L.F.	DRAINAGE DITCH	$	40	$	80,000.00
8	50	CY	QUARRY SPALLS	$	50	$	2,500.00
9	1	EA.	TRASH RACK	$	500	$	500.00
10	2500	L.F.	RECONSTRUCT/ REPAIR EX CHANNEL	$	35	$	87,500.00
11	1	EA.	54" STD STORM FLOW CONTROL MANHOLE	$	4,500	$	4,500.00
12	150	L.F.	18" STORM DRAIN PIPE	$	35	$	5,250.00
13	7	ACRES	HYDROSEED	$	3,000	$	21,000.00
14	5000	SY	FINE GRADING	$	15	$	75,000.00
15	4	ACRES	LAND ACQUISTION	$	30,000	$	120,000.00

NOTE: 1. Not a revenue producing project, no sales tax.

SUBTOTAL		$	482,563
CONTINGENCY	30%	$	144,769
WSST (8.3%)		$	-
ENG/ ADMIN	20%	$	125,466
TOTAL		$	752,798

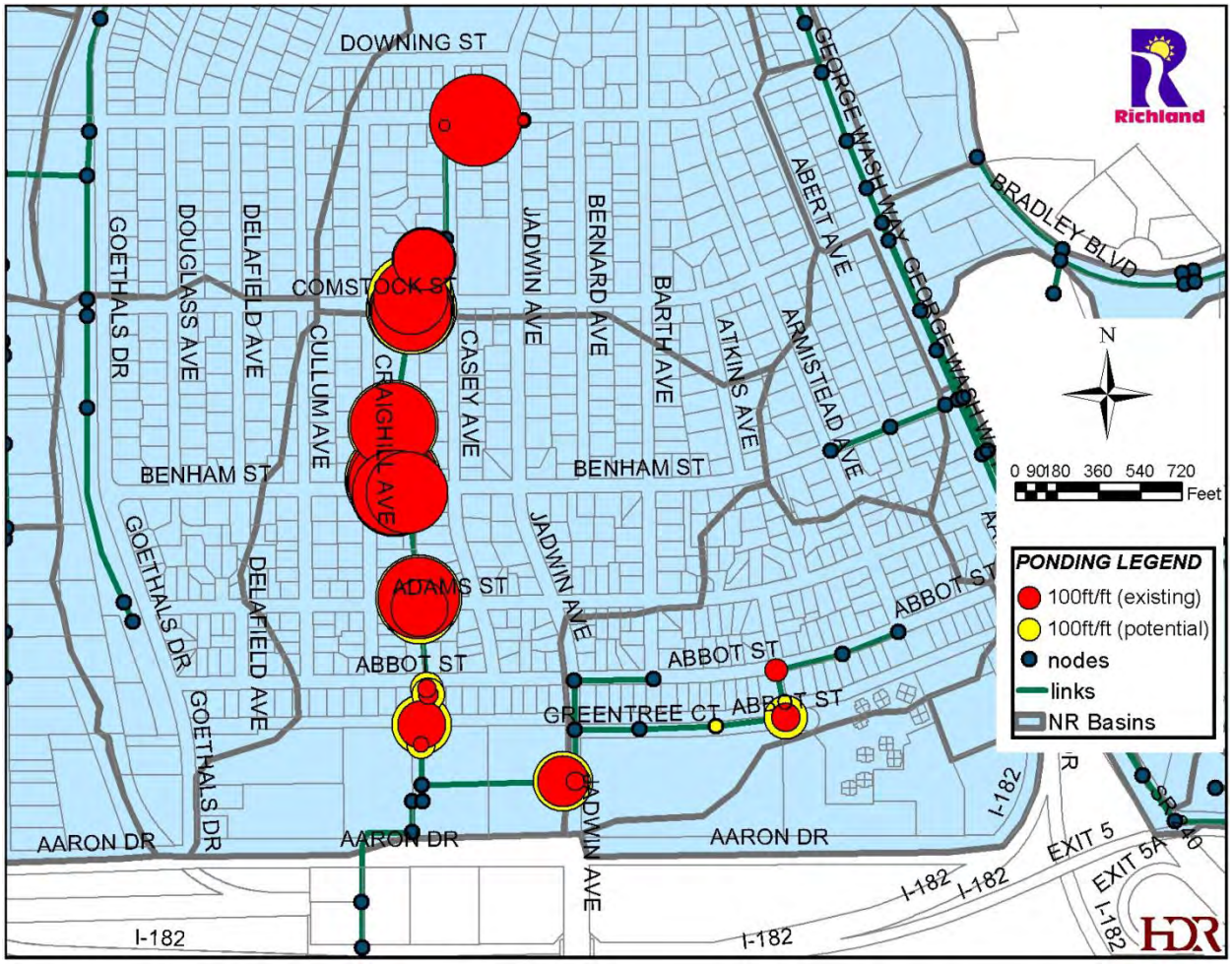
Table above in 2005 dollars. Project cost escalated to 2015 dollars based on the Engineering News Record (ENR) Construction Cost Index (CCI). The cost in 2015 dollars is $1,060,977.

DD-03 Craighill Area Improvements

Exerts below taken from the City of Richland 2005 Stormwater Management Plan

The Craighill area encompasses approximately 207 acres of tributary area that discharges water under Aaron Dr to the south and into WSDOT right-of-way. The storm drainage system can be characterized as an overcapacity system, pieced together with varying pipe sizes and materials. This problem has been compounded when an open ditch section through a City Park along Craighill Ave was covered and converted into a tightlined system with an under sized pipe.

The City has plans in coming years to rehabilitate the City streets in the area and upgrade them to standard City street sections with curb and gutter. This will decrease surface ponding and run-off abstraction that occurs now and increase the potential for flooding. The figure below depicts the storm model's prediction of potential flooding from a 25 year storm with the streets upgrade to curb and gutter street sections.

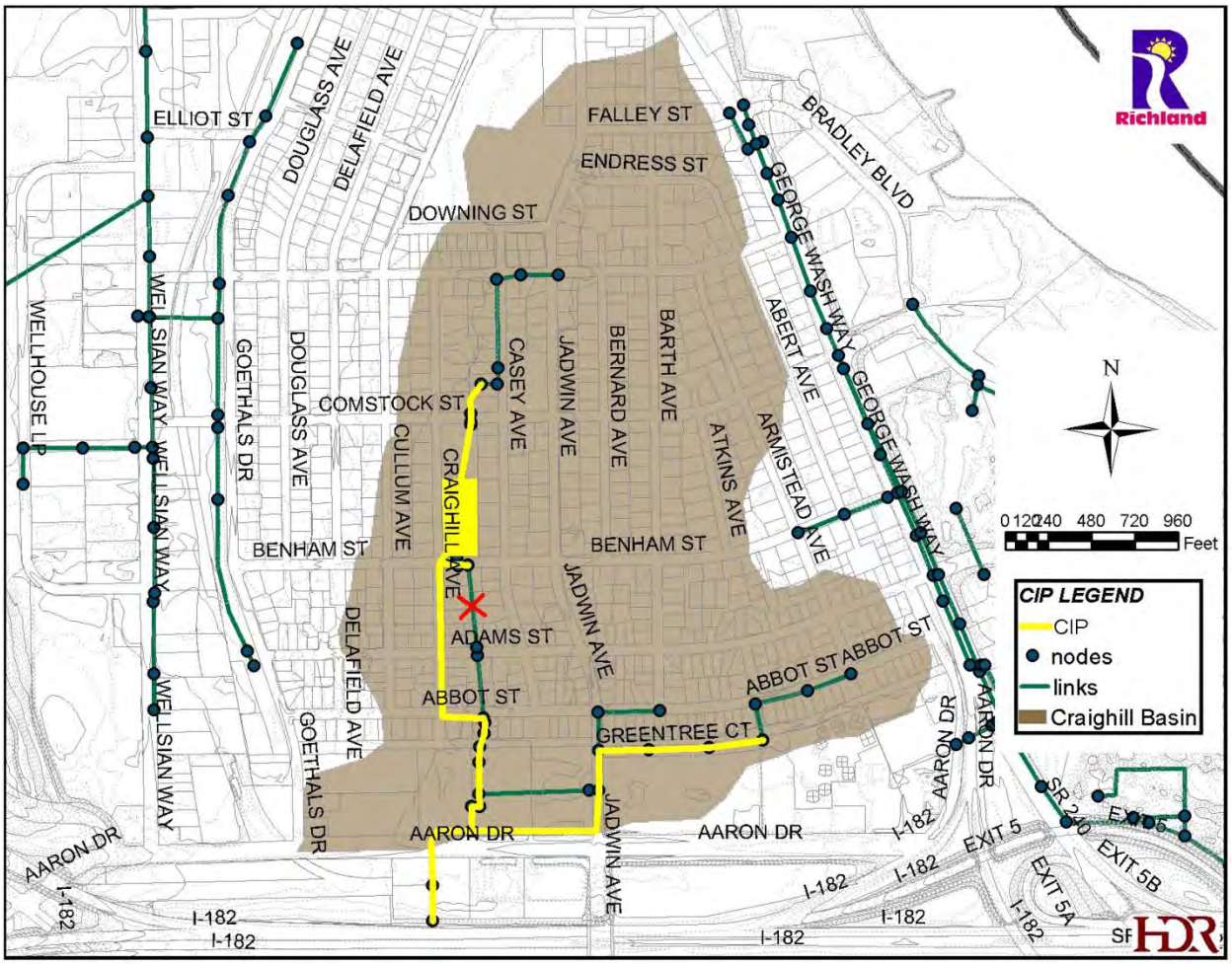


Modeled 25-Yr Storm Ponding

A solution to the Craighill Area involves a combination of upsizing the infrastructure and constructing a retention/detention facility in the Craighill Ave Park. The retention/detention facility in the Park will serve the upper 80 acres of the Craighill Area, and potentially decrease the flow of the 25 year storm event by 80% for the upper part of the basin. The intent would be to construct the facility in the park as a 1.25 acre, shallow facility with a linear infiltration ditch below it. For small storm events, the infiltration ditch would infiltrate the majority of the storm. For larger events, the run-off would be allowed to surcharge into the depression created in the park to remove the peak flow from the storm.

Run-off from the facility would be metered out of a flow-control manhole located at the southern end of the park. A small stretch of conveyance line would need to be upsized north of the park to 24" storm line to avoid ponding in the Falley St and Endress St areas. An alternative facility was considered during analysis to be placed in the City owned alley, south of Abbot St. This facility was determined to be unfeasible do to inverts, site constraints, and ground elevations through the alley.

Downstream of the proposed facility, the model is predicting the infrastructure to be over capacity, even with the upper basin flow routed into the park facility. Therefore, rather than reconstructing storm pipe in the backyards of the residences between Benham St and Abbot St, the proposed improvement would construct a new 21" storm line south on Craighill Ave to Abbot St, then east on Abbot St to connect to the existing storm line. From this new connection downstream, the project would reconstruct the storm line as a 24" storm line until it discharges on the south side of Aaron Dr. The model predicts the discharge flow on Aaron Dr. to 15.3 cfs during the 25-yr, 24 hour storm event. This report does not address the outfall into DOT right-of way and their specific requirements.



Craighill Ave. Regional Facility Improvements and Benefited Area

HDR ONE COMPANY | *Many Solutions*℠

ENGINEER'S OPINION OF PROBABLE COST

PROJECT DESCRIPTION: CRAIGHILL AVE. IMPROVEMENTS — DATE: 2/25/2005

CRAIGHILL AVE STORM IMPROVEMENTS

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION		UNIT PRICE		TOTAL COST
1	1	L.S.	MOBILIZATION	$	34,212	$	34,211.50
2	1	L.S.	TEMPORARY POLLUTION CONTROL	$	2,000	$	2,000.00
3	1	L.S.	TRAFFIC CONTROL	$	15,000	$	15,000.00
4	1	L.S.	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	$	15,000	$	15,000.00
5	520	C.Y.	ROADWAY EXCAVATION INCL. HAUL	$	10	$	5,200.00
6	520	C.Y.	COMPACTION	$	4	$	2,080.00
7	2600	TON	CRUSHED SURFACING BASE COURSE	$	11	$	28,600.00
8	980	TON	CRUSHED SURFACING TOP COURSE	$	12	$	11,760.00
9	1090	TON	HMA CL B PG-64-28	$	40	$	43,600.00
10	1	EA.	54" STD STORM FLOW CONTROL MANHOLE	$	4,500	$	4,500.00
11	5	EA.	48" STD STORM MANHOLE	$	2,500	$	12,500.00
12	13	EA.	54" STD STORM MANHOLE	$	3,500	$	45,500.00
13	1000	S.Y.	SOIL RESIDUAL HERBICIDE	$	2	$	2,000.00
14	9900	L.F.	SAWCUT EXISTING AC PAVEMENT	$	4	$	34,650.00
15	2050	L.F.	18" STORM	$	45	$	92,250.00
16	1152	L.F.	20" STORM	$	50	$	57,600.00
17	2218	L.F.	24" STORM	$	55	$	121,990.00
18	700	L.F.	24" PERF., INFILTRATION TRENCH	$	110	$	77,000.00
20	1	L.S.	RELOCATE EXISTING UTILITIES	$	45,000	$	45,000.00
21	1	L.S.	SURGE POND	$	60,000	$	70,000.00
22	0	ACRES	LAND ACQUISTION	$	55,000	$	-

NOTE: 1. Not a revenue producing project, no sales tax.

SUBTOTAL		$	720,442
CONTINGENCY	30%	$	216,132
WSST (8.3%)		$	-
ENG/ ADMIN	20%	$	187,315
TOTAL		$	1,123,889

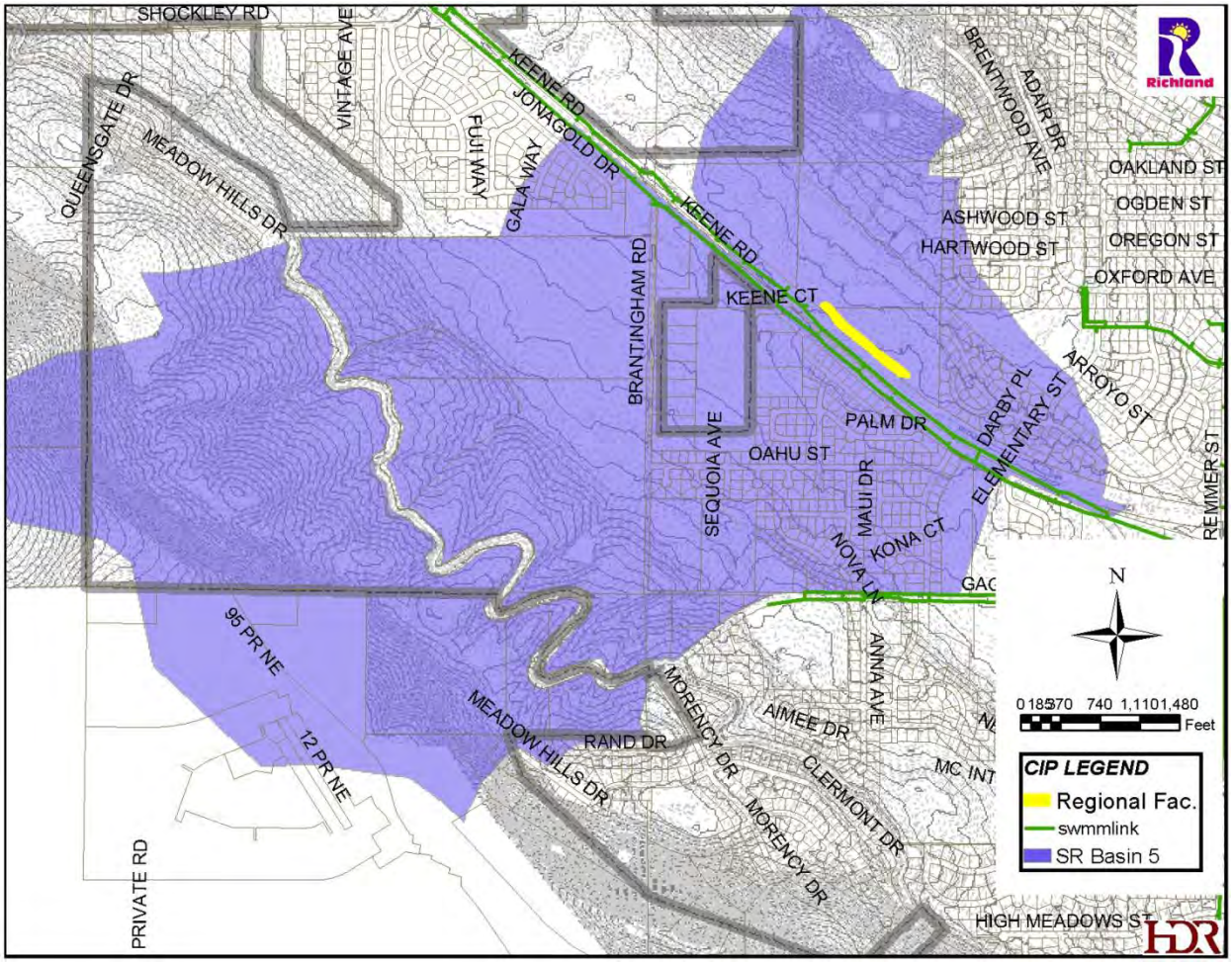
Table above in 2005 dollars. Project cost escalated to 2015 dollars based on the Engineering News Record (ENR) Construction Cost Index (CCI). The cost in 2015 dollars is $1,583,716.

DD-04 Keene Road Regional Facility

Exerts below taken from the City of Richland 2005 Stormwater Management Plan

South Richland Basin 5 consists of a largely undeveloped and partially developed residential area south of Keene Road on the hill side. This basin is approximately 733 acres. For sizing the regional facility it was anticipated that the developed areas would be residential, ranging from ¼ acre lots to 1/3 acre lots with an impervious area of 35% or 30% respectively. The proposed facility is approximately 2.6 acres in plan area and it would be approximately 6 feet deep. The facility would be an expansion of the existing roadside ditch to create a wide spot in the ditch. The facility is an infiltration and detention facility. The infiltration capacity of the facility is limited due to the high groundwater in the vicinity; the facility is expected to have an infiltration rate of 1.4 inches/ hour.

The ditch discharges to the two 24” CMP culverts at the crossing of Leslie Road. The undetained runoff from Basin 5 for the 25-year, 24-hour storm is estimated at 81 cfs. Basin 5 is the primary contributor of runoff to the road side ditches, but there are other tributary areas not captured by the regional facility. Thus, in an effort to limit the peak runoff from this basin, the regional facility was proposed.



Keene Rd. Regional Facility Improvements and Benefited Area

The detention capacity of the existing drainage ditches was taken into consideration for this analysis with a typical cross-section used for the entire length of the ditch. The typical cross section for the

ditch is considered to be trapezoidal, 6ft wide bottom, 4 to 1 side-slopes, and 4.5 ft in depth. A more in depth analysis with survey information at regular intervals should be done in conjunction with design for this facility. A more accurate modeling of the existing ditches may increase, decrease, or remove the need to attenuate the peak runoff rate. If further analysis shows that the detention capacity of this regional facility is unnecessary, this facility could be focused solely on water quality treatment.

HDR ONE COMPANY | *Many Solutions*

ENGINEER'S OPINION OF PROBABLE COST

PROJECT DESCRIPTION: KEENE RD REGIONAL FACILITY — DATE: 2/25/2005

EXPAND EXISTING DITCH , 2.6 ACRE FACILITY IN R-O-W)

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION		UNIT PRICE		TOTAL COST
1	1	L.S.	MOBILIZATION	$	16,623	$	16,622.50
2	1	L.S.	TEMPORARY POLLUTION CONTROL	$	5,000	$	5,000.00
3	1	L.S.	TRAFFIC CONTROL	$	10,000	$	10,000.00
4	1	L.S.	CLEARING AND GRUBBING	$	6,000	$	6,000.00
5	22,500	C.Y.	POND EXCAVATION INCL. HAUL	$	4	$	90,000.00
6	4000	C.Y.	EMBANKMENT COMPACTION	$	5	$	20,000.00
7	1	L.F.	GAGE ROAD CROSSING	$	15,000	$	15,000.00
8	60	CY	QUARRY SPALLS	$	50	$	3,000.00
9	2	EA.	TRASH RACK	$	700	$	1,400.00
10	90	L.F.	18" STORM DRAIN PIPE	$	45	$	4,050.00
11	2200	L.F.	RECONSTRUCT/ REPAIR EX CHANNEL	$	30	$	66,000.00
12	1	EA.	54" STD STORM FLOW CONTROL MANHOLE	$	4,500	$	4,500.00
13	5	ACRES	HYDROSEED	$	3,000	$	15,000.00
14	4000	SY	FINE GRADING	$	15	$	60,000.00
15	0.75	ACRES	LAND ACQUISTION	$	50,000	$	37,500.00

NOTE: 1. Not a revenue producing project, no sales tax.

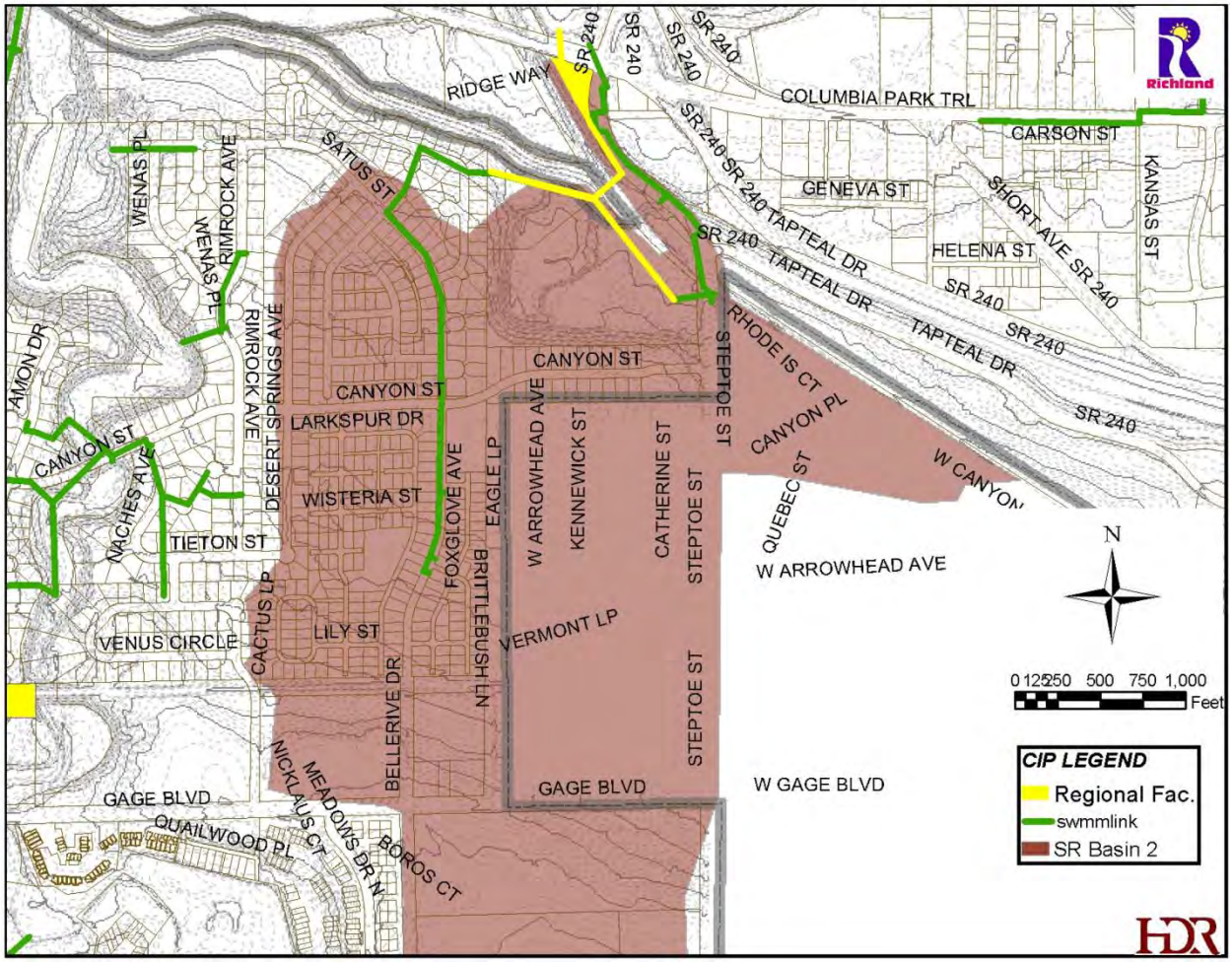
SUBTOTAL		$	354,073
CONTINGENCY	30%	$	106,222
WSST (8.3%)		$	-
ENG/ ADMIN	20%	$	92,059
TOTAL		$	552,353

Table above in 2005 dollars. Project cost escalated to 2015 dollars based on the Engineering News Record (ENR) Construction Cost Index (CCI). The cost in 2015 dollars is $777,768.

DD-05 Steptoe Regional Facility

Exerts below taken from the City of Richland 2005 Stormwater Management Plan

This basin comprises an area of Richland east of Amon Creek and west of Steptoe St. Much of this 285 acre basin is developed with residential lots, but several large areas along Gage and Steptoe are yet undeveloped. For the purposes of sizing the regional facility, the basin is expected to be fully developed. The proposed facility will combine flows from the Steptoe St and the residential development around Foxglove Ave., at the existing Gravel Pit area. The stormwater will convey to the north under the CID Canal and railroad to a regional detention facility within the WSDOT right-of-way at the corner of Steptoe St and Columbia Park Trail. This five-way intersection is in the process of being modified into a large traffic circle. The facility would provide detention for the described area by relocating and enlarging the City's existing facility at the north end of Steptoe St that currently detains a smaller sub-basin. This new facility will accept runoff from a 24" storm line bored in a 36" casing under the canal and railroad and the existing storm system on Steptoe St. The detention/retention pond would be approximately 6 feet deep and have a surface area of almost 1 acre at the max water surface. This facility would detain flows for the 25 year storm event and provide a 24" overflow/outflow line across Columbia Park Trail in order to discharge flows in excess of the design storm. The discharge is expected to be 33 cfs for the 100-yr, 24 hour storm event.



Steptoe Regional Facility and Benefited Area

HDR ONE COMPANY | *Many Solutions*℠

ENGINEER'S OPINION OF PROBABLE COST

PROJECT DESCRIPTION: STEPTOE REGIONAL FACILITY — DATE: 2/25/2005

BORING, STEPTOE CONVEYANCE, POND, AND OUTFALL

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION		UNIT PRICE		TOTAL COST
1	1	L.S.	MOBILIZATION	$	19,597	$	19,596.95
2	1	L.S.	TEMPORARY POLLUTION CONTROL	$	5,000	$	5,000.00
3	1	L.S.	TRAFFIC CONTROL	$	15,000	$	15,000.00
4	1	L.S.	CLEARING AND GRUBBING	$	3,000	$	3,000.00
5	1	L.S.	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	$	2,000	$	2,000.00
6	7850	C.Y.	POND EXCAVATION INCL. HAUL	$	5	$	39,250.00
7	405	C.Y.	ROADWAY EXCAVATION INCL. HAUL	$	5	$	2,025.00
8	405	C.Y.	EMBANKMENT COMPACTION	$	4	$	1,620.00
9	205	TON	CRUSHED SURFACING BASE COURSE	$	11	$	2,255.00
10	77	TON	CRUSHED SURFACING TOP COURSE	$	12	$	924.00
11	85	TON	HMA CL B PG-64-28	$	40	$	3,400.00
12	10	CY	QUARRY SPALLS	$	50	$	500.00
13	250	L.F.	BORING (36" STEEL CASING)	$	450	$	112,500.00
14	1	EA.	54" STD STORM FLOW CONTROL MANHOLE	$	4,500	$	4,500.00
15	5	EA.	54" STD STORM MANHOLE	$	3,500	$	17,500.00
16	190	L.F.	24" STORM (OVERFLOW/OUTFALL)	$	55	$	10,450.00
17	612	L.F.	24" STORM DRAIN PIPE	$	55	$	33,660.00
18	625	L.F.	18" STORM	$	45	$	28,125.00
19	763	L.F.	21" STORM	$	50	$	38,150
20	1	L.S.	OUTFALL	$	3,000	$	3,000.00
21	2	ACRES	HYDROSEED	$	3,000	$	6,000.00
22	4840	SY	FINE GRADING	$	12	$	58,080.00
23	1	L.S.	RELOCATE EXISTING UTILITIES	$	10,000	$	10,000.00
24	0	ACRES	LAND ACQUISTION	$	30,000	$	-

NOTE: 1. Does not include conveyance pipe to get run-off to boring location.
2. Assumes

SUBTOTAL		$	416,536
CONTINGENCY	30%	$	124,961
WSST (8.3%)		$	-
ENG/ ADMIN	20%	$	108,299
TOTAL		$	649,796

Table above in 2005 dollars. Project cost escalated to 2015 dollars based on the Engineering News Record (ENR) Construction Cost Index (CCI). The cost in 2015 dollars is $915,850.

Appendix G.

Financial Technical Appendix

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City of Richland
Stormwater Cost of Service Study
Revenue Requirement Summary

	Budget		Projected																			
	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Revenues																						
Total Rate Revenues	$1,752,000	$1,773,000	$1,790,730	$1,808,637	$1,826,724	$1,844,991	$1,863,441	$1,882,075	$1,900,896	$1,919,905	$1,939,104	$1,958,495	$1,978,080	$1,997,861	$2,017,839	$2,038,018	$2,058,398	$2,078,982	$2,099,772	$2,120,769	$2,141,977	$2,163,397
Total Miscellaneous Revenues	68,599	58,755	101,479	95,371	104,245	66,413	54,138	58,652	65,204	69,165	71,072	79,715	72,399	81,312	69,650	83,185	63,795	74,700	68,131	78,736	66,271	68,373
Total Revenues	**$1,820,599**	**$1,831,755**	**$1,892,209**	**$1,904,008**	**$1,930,969**	**$1,911,404**	**$1,917,578**	**$1,940,728**	**$1,966,100**	**$1,989,070**	**$2,010,176**	**$2,038,210**	**$2,050,479**	**$2,079,173**	**$2,087,489**	**$2,121,203**	**$2,122,193**	**$2,153,681**	**$2,167,903**	**$2,199,505**	**$2,208,249**	**$2,231,770**
Expenses																						
Total Salaries	$141,010	$138,682	$142,842	$147,128	$151,542	$156,088	$160,770	$165,594	$170,561	$175,678	$180,949	$186,377	$191,968	$197,727	$203,659	$209,769	$216,062	$222,544	$229,220	$236,097	$243,180	$250,475
Total Benefits	79,950	77,926	82,480	87,330	91,661	96,216	100,535	105,050	109,771	114,707	119,867	125,263	130,904	136,802	142,970	149,419	156,162	163,214	170,587	178,298	186,362	194,795
Total Supplies	17,853	16,823	17,328	17,848	18,383	18,934	19,502	20,088	20,690	21,311	21,950	22,609	23,287	23,986	24,705	25,446	26,210	26,996	27,806	28,640	29,499	30,384
Total Other Services & Charges	85,228	89,236	91,731	94,298	96,940	99,659	102,457	105,337	108,302	111,353	114,494	117,727	121,056	124,483	128,010	131,642	135,382	139,232	143,197	147,280	151,484	155,813
Total Interfund Services	870,753	869,982	923,163	950,725	979,112	1,008,350	1,038,463	1,069,478	1,101,422	1,134,324	1,168,211	1,203,113	1,239,061	1,276,086	1,314,220	1,353,497	1,393,950	1,435,616	1,478,529	1,522,729	1,568,253	1,615,142
Total O&M Expenses	**$1,194,794**	**$1,192,649**	**$1,257,543**	**$1,297,328**	**$1,337,637**	**$1,379,247**	**$1,421,728**	**$1,465,547**	**$1,510,747**	**$1,557,373**	**$1,605,471**	**$1,655,089**	**$1,706,276**	**$1,759,084**	**$1,813,565**	**$1,869,773**	**$1,927,766**	**$1,987,601**	**$2,049,340**	**$2,113,044**	**$2,178,778**	**$2,246,610**
Total Taxes	**$171,450**	**$190,149**	**$181,548**	**$183,363**	**$185,197**	**$187,049**	**$188,919**	**$190,808**	**$192,716**	**$194,643**	**$196,590**	**$198,556**	**$200,541**	**$202,547**	**$204,572**	**$206,618**	**$208,684**	**$210,771**	**$212,879**	**$215,008**	**$217,158**	**$219,329**
Rate Funded Capital	**$125,000**	**$125,000**	**$130,000**	**$135,000**	**$140,000**	**$145,000**	**$150,000**	**$155,000**	**$160,000**	**$165,000**	**$170,000**	**$175,000**	**$180,000**	**$185,000**	**$190,000**	**$195,000**	**$200,000**	**$205,000**	**$210,000**	**$215,000**	**$220,000**	**$225,000**
Net Debt Service	**$170,650**	**$172,454**	**$265,693**	**$267,018**	**$267,618**	**$263,018**	**$167,268**	**$120,148**	**$78,029**	**$76,604**	**$63,988**	**$62,538**	**$66,088**	**$64,413**	**$62,713**	**$66,013**	**$69,088**	**$66,781**	**$64,475**	**$67,169**	**$64,606**	**$67,044**
Total Change in Working Capital	**$158,705**	**$151,503**	**$57,426**	**($28,700)**	**($8,056)**	**($26,044)**	**$98,688**	**$156,294**	**$211,226**	**$182,319**	**$161,210**	**$134,283**	**$84,963**	**$119,377**	**$134,908**	**$172,387**	**$178,999**	**$223,212**	**$174,273**	**$135,711**	**$77,478**	**$26,883**
Total Revenue Requirement	**$1,820,599**	**$1,831,755**	**$1,892,209**	**$1,854,008**	**$1,922,395**	**$1,948,269**	**$2,026,603**	**$2,087,797**	**$2,152,719**	**$2,175,940**	**$2,197,259**	**$2,225,466**	**$2,237,869**	**$2,330,420**	**$2,405,758**	**$2,509,791**	**$2,584,537**	**$2,693,365**	**$2,710,966**	**$2,745,932**	**$2,758,020**	**$2,784,866**
Bal./(Def.) of Funds Before Added Tax	$0	$0	$0	$0	($66,426)	($136,865)	($211,524)	($252,132)	($294,308)	($297,251)	($300,224)	($303,226)	($306,258)	($373,087)	($443,155)	($516,596)	($593,553)	($674,173)	($680,915)	($687,724)	($694,601)	($701,547)
Plus Add'l Taxes of 1.5% + 10%	$0	$0	$0	$0	($6,643)	($13,686)	($21,152)	($25,213)	($29,431)	($29,725)	($30,022)	($30,323)	($30,626)	($37,309)	($44,315)	($51,660)	($59,355)	($67,417)	($68,091)	($68,772)	($69,460)	($70,155)
Net Bal./(Def.) of Funds	$0	$0	$0	$0	($73,069)	($150,551)	($232,677)	($277,345)	($323,739)	($326,976)	($330,246)	($333,548)	($336,884)	($410,396)	($487,470)	($568,256)	($652,908)	($741,590)	($749,006)	($756,496)	($764,061)	($771,702)
Rate Adj. as a % of Rate Revenue	0.0%	0.0%	0.0%	0.0%	4.0%	8.2%	12.5%	14.7%	17.0%	17.0%	17.0%	17.0%	17.0%	20.5%	24.2%	27.9%	31.7%	35.7%	35.7%	35.7%	35.7%	35.7%
Proposed Rate Adjustment	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**4.0%**	**4.0%**	**4.0%**	**2.0%**	**2.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**3.0%**	**3.0%**	**3.0%**	**3.0%**	**3.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Add'l Revenue with Rate Adj.	$0	$0	$0	$0	$73,069	$150,551	$232,677	$277,345	$323,739	$326,976	$330,246	$333,548	$336,884	$410,396	$487,470	$568,256	$652,908	$741,590	$749,006	$756,496	$764,061	$771,702
Bal./(Def.) of Funds	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Additional Rate Adjustment Required	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Total Ending Fund Balance	**$1,359,034**	**$1,693,355**	**$1,541,461**	**$1,409,260**	**$452,454**	**$135,910**	**$234,098**	**$375,268**	**$504,577**	**$603,645**	**$764,854**	**$652,138**	**$737,101**	**$500,977**	**$635,885**	**$248,272**	**$426,771**	**$359,483**	**$533,756**	**$308,967**	**$385,945**	**$412,828**

City of Richland
Stormwater - Exhibit 1
Escalation Factors

		Budget		Projected																	
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	Revenues:																						
A	Customer Growth	Calculated	Calculated	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
B	Miscellaneous Revenues	Budget	Budget	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
	Expenses:																						
1	Labor	Budget	Budget	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
2	Benefits - Medical	20.0%	20.0%	8.0%	8.0%	6.0%	6.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
3	Benefits - Other	Budget	Budget	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
4	Materials & Supplies	Budget	Budget	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
5	Equipment	Budget	Budget	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
6	Miscellaneous	Budget	Budget	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
7	Utilities	Budget	Budget	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
8	Insurance	Budget	Budget	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
	Interest:	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
	New Debt Service:																						
	Low Interest Loans																						
	Term in Years	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
	Rate	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%
	Revenue Bond																						
	Term in Years	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	Rate	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%	5.5%

	Budget		Projected																				
Account Name	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**Notes:**
Rate Revenues																							
Residential	$797,000	$803,000	$811,030	$819,140	$827,332	$835,605	$843,961	$852,401	$860,925	$869,534	$878,229	$887,012	$895,882	$904,840	$913,889	$923,028	$932,258	$941,581	$950,996	$960,506	$970,111	$979,813	As Customer Growth
Commercial	900,000	915,000	924,150	933,392	942,725	952,153	961,674	971,291	981,004	990,814	1,000,722	1,010,729	1,020,837	1,031,045	1,041,355	1,051,769	1,062,287	1,072,909	1,083,639	1,094,475	1,105,420	1,116,474	As Customer Growth
Municipal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Customer Growth
Surface	55,000	55,000	55,550	56,106	56,667	57,233	57,806	58,384	58,967	59,557	60,153	60,754	61,362	61,975	62,595	63,221	63,853	64,492	65,137	65,788	66,446	67,110	As Customer Growth
Total Rate Revenues	$1,752,000	$1,773,000	$1,790,730	$1,808,637	$1,826,724	$1,844,991	$1,863,441	$1,882,075	$1,900,896	$1,919,905	$1,939,104	$1,958,495	$1,978,080	$1,997,861	$2,017,839	$2,038,018	$2,058,398	$2,078,982	$2,099,772	$2,120,769	$2,141,977	$2,163,397	
Miscellaneous Revenues																							
Interest	$15,085	$12,540	$54,802	$48,227	$56,630	$18,322	$5,565	$9,594	$15,655	$19,121	$20,527	$28,665	$20,839	$29,236	$17,053	$30,062	$10,141	$20,509	$13,399	$23,456	$10,439	$11,982	Calc'd on Oper. Balance
Interfund Loans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Miscellaneous Revenues
RES EQ TRF From Emp Benefit	6,714	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Miscellaneous Revenues
Sale of Plans & Specs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Miscellaneous Revenues
Sale of Salvage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Miscellaneous Revenues
Other Misc Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Miscellaneous Revenues
Late Fees	46,000	46,000	46,460	46,925	47,394	47,868	48,346	48,830	49,318	49,811	50,310	50,813	51,321	51,834	52,352	52,876	53,405	53,939	54,478	55,023	55,573	56,129	As Miscellaneous Revenues
Bad Debt Recovery	800	215	217	219	222	224	226	228	231	233	235	237	240	242	245	247	250	252	255	257	260	262	As Miscellaneous Revenues
Total Miscellaneous Revenues	$68,599	$58,755	$101,479	$95,371	$104,245	$66,413	$54,138	$58,652	$65,204	$69,165	$71,072	$79,715	$72,399	$81,312	$69,650	$83,185	$63,795	$74,700	$68,131	$78,736	$66,271	$68,373	
Total Revenues	**$1,820,599**	**$1,831,755**	**$1,892,209**	**$1,904,008**	**$1,930,969**	**$1,911,404**	**$1,917,578**	**$1,940,728**	**$1,966,100**	**$1,989,070**	**$2,010,176**	**$2,038,210**	**$2,050,479**	**$2,079,173**	**$2,087,489**	**$2,121,203**	**$2,122,193**	**$2,153,681**	**$2,167,903**	**$2,199,505**	**$2,208,249**	**$2,231,770**	
Expenses																							
Salaries																							
Salaries & Wages - Regular	$131,868	$129,109	$132,982	$136,972	$141,081	$145,313	$149,673	$154,163	$158,788	$163,551	$168,458	$173,512	$178,717	$184,079	$189,601	$195,289	$201,148	$207,182	$213,398	$219,799	$226,393	$233,185	As Labor
Salaries - Part Time	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Labor
Holiday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Labor
Salaries & Wages - Overtime	5,916	5,916	6,093	6,276	6,465	6,659	6,858	7,064	7,276	7,494	7,719	7,951	8,189	8,435	8,688	8,948	9,217	9,493	9,778	10,072	10,374	10,685	As Labor
Vacation/PTO Cashout	2,926	3,357	3,458	3,561	3,668	3,778	3,892	4,008	4,129	4,253	4,380	4,512	4,647	4,786	4,930	5,078	5,230	5,387	5,549	5,715	5,887	6,063	As Labor
Call Out Costs - Meals	300	300	309	318	328	338	348	358	369	380	391	403	415	428	441	454	467	481	496	511	526	542	As Labor
Total Salaries	**$141,010**	**$138,682**	**$142,842**	**$147,128**	**$151,542**	**$156,088**	**$160,770**	**$165,594**	**$170,561**	**$175,678**	**$180,949**	**$186,377**	**$191,968**	**$197,727**	**$203,659**	**$209,769**	**$216,062**	**$222,544**	**$229,220**	**$236,097**	**$243,180**	**$250,475**	
Benefits																							
Social Security - FICA	$10,764	$10,586	$11,009	$11,450	$11,908	$12,384	$12,879	$13,395	$13,930	$14,488	$15,067	$15,670	$16,297	$16,949	$17,626	$18,332	$19,065	$19,827	$20,620	$21,445	$22,303	$23,195	As Benefits - Other
Pension Contributions - PERS	12,959	16,507	17,167	17,854	18,568	19,311	20,083	20,887	21,722	22,591	23,495	24,434	25,412	26,428	27,485	28,585	29,728	30,917	32,154	33,440	34,778	36,169	As Benefits - Other
Industrial Ins & Med Aid	4,124	4,369	4,544	4,726	4,915	5,111	5,316	5,528	5,749	5,979	6,218	6,467	6,726	6,995	7,275	7,566	7,868	8,183	8,510	8,851	9,205	9,573	As Benefits - Other
Unemployment	615	605	629	654	681	708	736	766	796	828	861	896	931	969	1,007	1,048	1,090	1,133	1,178	1,226	1,275	1,326	As Benefits - Other
Life & Disability Insurance	1,279	1,257	1,307	1,360	1,414	1,471	1,529	1,591	1,654	1,720	1,789	1,861	1,935	2,012	2,093	2,177	2,264	2,354	2,449	2,546	2,648	2,754	As Benefits - Other
Dental Insurance	3,147	3,383	3,654	3,946	4,183	4,434	4,655	4,888	5,133	5,389	5,659	5,942	6,239	6,551	6,878	7,222	7,583	7,962	8,360	8,778	9,217	9,678	As Benefits - Medical
Health Insurance	35,553	31,982	34,541	37,304	39,542	41,915	44,010	46,211	48,521	50,947	53,495	56,170	58,978	61,927	65,023	68,274	71,688	75,273	79,036	82,988	87,137	91,494	As Benefits - Medical
Vision Insurance	517	547	591	638	676	717	753	790	830	871	915	961	1,009	1,059	1,112	1,168	1,226	1,287	1,352	1,419	1,490	1,565	As Benefits - Medical
Deferred Compensation	4,881	5,500	5,720	5,949	6,187	6,434	6,692	6,959	7,238	7,527	7,828	8,141	8,467	8,806	9,158	9,524	9,905	10,301	10,713	11,142	11,588	12,051	As Benefits - Other
Post Employee Health Benefits	6,111	3,190	3,318	3,450	3,588	3,732	3,881	4,036	4,198	4,366	4,540	4,722	4,911	5,107	5,312	5,524	5,745	5,975	6,214	6,462	6,721	6,990	As Benefits - Other
Vacation PTO Buyout	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Benefits - Other
Call Out Costs - Meals	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Benefits - Other
Accrued Wages & Benefits	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Benefits - Other
Total Benefits	**$79,950**	**$77,926**	**$82,480**	**$87,330**	**$91,661**	**$96,216**	**$100,535**	**$105,050**	**$109,771**	**$114,707**	**$119,867**	**$125,263**	**$130,904**	**$136,802**	**$142,970**	**$149,419**	**$156,162**	**$163,214**	**$170,587**	**$178,298**	**$186,362**	**$194,795**	

Account Name	Budget 2014	Budget 2015	Projected 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Notes:
Supplies																							
Operating Supplies & Materials	$1,823	$1,823	$1,878	$1,934	$1,992	$2,052	$2,113	$2,177	$2,242	$2,309	$2,379	$2,450	$2,523	$2,599	$2,677	$2,757	$2,840	$2,925	$3,013	$3,104	$3,197	$3,293	As Materials & Supplies
Repair/Maintenance Supplies	14,000	14,000	14,420	14,853	15,298	15,757	16,230	16,717	17,218	17,735	18,267	18,815	19,379	19,961	20,559	21,176	21,812	22,466	23,140	23,834	24,549	25,286	As Materials & Supplies
Small Tools & Equip <$2,500	2,030	1,000	1,030	1,061	1,093	1,126	1,159	1,194	1,230	1,267	1,305	1,344	1,384	1,426	1,469	1,513	1,558	1,605	1,653	1,702	1,754	1,806	As Materials & Supplies
Total Supplies	**$17,853**	**$16,823**	**$17,328**	**$17,848**	**$18,383**	**$18,934**	**$19,502**	**$20,088**	**$20,690**	**$21,311**	**$21,950**	**$22,609**	**$23,287**	**$23,986**	**$24,705**	**$25,446**	**$26,210**	**$26,996**	**$27,806**	**$28,640**	**$29,499**	**$30,384**	
Other Services & Charges																							
Expert Services	$10,000	$10,000	$10,250	$10,506	$10,769	$11,038	$11,314	$11,597	$11,887	$12,184	$12,489	$12,801	$13,121	$13,449	$13,785	$14,130	$14,483	$14,845	$15,216	$15,597	$15,987	$16,386	As Miscellaneous
Shared Values Program	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Miscellaneous
Telephone & Comm Svcs	180	180	185	189	194	199	204	209	214	219	225	230	236	242	248	254	261	267	274	281	288	295	As Miscellaneous
Postage	0	2,400	2,460	2,522	2,585	2,649	2,715	2,783	2,853	2,924	2,997	3,072	3,149	3,228	3,308	3,391	3,476	3,563	3,652	3,743	3,837	3,933	As Miscellaneous
Travel Expenses	400	400	410	420	431	442	453	464	475	487	500	512	525	538	551	565	579	594	609	624	639	655	As Miscellaneous
Rentals - Equipment	6,000	6,000	6,180	6,365	6,556	6,753	6,956	7,164	7,379	7,601	7,829	8,063	8,305	8,555	8,811	9,076	9,348	9,628	9,917	10,215	10,521	10,837	As Equipment
Insurance	1,328	1,460	1,511	1,564	1,619	1,675	1,734	1,795	1,858	1,923	1,990	2,059	2,132	2,206	2,283	2,363	2,446	2,532	2,620	2,712	2,807	2,905	As Insurance
Utilities	9,565	14,610	15,194	15,802	16,434	17,092	17,775	18,486	19,226	19,995	20,795	21,626	22,491	23,391	24,327	25,300	26,312	27,364	28,459	29,597	30,781	32,012	As Utilities
Licenses & Permits	26,990	33,171	34,000	34,850	35,722	36,615	37,530	38,468	39,430	40,416	41,426	42,462	43,523	44,611	45,727	46,870	48,041	49,243	50,474	51,735	53,029	54,355	As Miscellaneous
Outside Services Provided	29,700	20,000	20,500	21,013	21,538	22,076	22,628	23,194	23,774	24,368	24,977	25,602	26,242	26,898	27,570	28,259	28,966	29,690	30,432	31,193	31,973	32,772	As Miscellaneous
Tuition/Conference Fees	515	515	528	541	555	568	583	597	612	627	643	659	676	693	710	728	746	765	784	803	823	844	As Miscellaneous
Collection Services	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Miscellaneous
First Aid & Safety Costs	500	500	513	525	538	552	566	580	594	609	624	640	656	672	689	706	724	742	761	780	799	819	As Miscellaneous
Other Permits & Fees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Miscellaneous
Total Other Services & Charges	**$85,228**	**$89,236**	**$91,731**	**$94,298**	**$96,940**	**$99,659**	**$102,457**	**$105,337**	**$108,302**	**$111,353**	**$114,494**	**$117,727**	**$121,056**	**$124,483**	**$128,010**	**$131,642**	**$135,382**	**$139,232**	**$143,197**	**$147,280**	**$151,484**	**$155,813**	
Interfund Services																							
Admin Fees	$30,921	$26,643	$27,442	$28,266	$29,114	$29,987	$30,887	$31,813	$32,768	$33,751	$34,763	$35,806	$36,880	$37,987	$39,126	$40,300	$41,509	$42,754	$44,037	$45,358	$46,719	$48,120	As Labor
Customer Accounts Expense	152,367	172,427	177,600	182,928	188,416	194,068	199,890	205,887	212,063	218,425	224,978	231,727	238,679	245,840	253,215	260,811	268,636	276,695	284,996	293,545	302,352	311,422	As Labor
Warehouse Service	3,005	2,644	2,723	2,805	2,889	2,976	3,065	3,157	3,252	3,349	3,450	3,553	3,660	3,770	3,883	3,999	4,119	4,243	4,370	4,501	4,636	4,775	As Labor
Information System Services	65,274	67,882	69,918	72,016	74,176	76,402	78,694	81,055	83,486	85,991	88,571	91,228	93,965	96,784	99,687	102,678	105,758	108,931	112,199	115,565	119,031	122,602	As Labor
Intfnd Svsc - System Division	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Labor
Intfnd Svsc - Street Sweeping	115,000	131,250	135,188	139,243	143,420	147,723	152,155	156,719	161,421	166,264	171,251	176,389	181,681	187,131	192,745	198,527	204,483	210,618	216,936	223,444	230,148	237,052	As Labor
Vehicle & Equip Replacement	50,843	52,386	81,171	83,606	86,114	88,698	91,359	94,099	96,922	99,830	102,825	105,910	109,087	112,360	115,730	119,202	122,778	126,462	130,256	134,163	138,188	142,334	As Equipment
Interfund Maintenance	100	100	103	106	109	113	116	119	123	127	130	134	138	143	147	151	156	160	165	170	175	181	As Labor
Fleet M&O	136,033	102,142	105,206	108,362	111,613	114,962	118,411	121,963	125,622	129,390	133,272	137,270	141,388	145,630	149,999	154,499	159,134	163,908	168,825	173,890	179,107	184,480	As Equipment
PW Admin & Eng Svcs	309,332	307,918	317,156	326,670	336,470	346,564	356,961	367,670	378,700	390,061	401,763	413,816	426,231	439,017	452,188	465,754	479,726	494,118	508,942	524,210	539,936	556,134	As Labor
PIO/EEC	7,878	6,590	6,656	6,722	6,790	6,858	6,926	6,995	7,065	7,136	7,207	7,279	7,352	7,426	7,500	7,575	7,651	7,727	7,805	7,883	7,961	8,041	As Customer Growth
Total Interfund Services	**$870,753**	**$869,982**	**$923,163**	**$950,725**	**$979,112**	**$1,008,350**	**$1,038,463**	**$1,069,478**	**$1,101,422**	**$1,134,324**	**$1,168,211**	**$1,203,113**	**$1,239,061**	**$1,276,086**	**$1,314,220**	**$1,353,497**	**$1,393,950**	**$1,435,616**	**$1,478,529**	**$1,522,729**	**$1,568,253**	**$1,615,142**	
Future FTE's & Programatics																							
NPDES Program Assumption	$0	$0	$0	$50,000	$75,000	$100,000	$102,500	$105,063	$107,689	$110,381	$113,141	$115,969	$118,869	$121,840	$124,886	$128,008	$131,209	$134,489	$137,851	$141,297	$144,830	$148,451	As Miscellaneous
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	As Miscellaneous
Total Future FTE's & Programatics	**$0**	**$0**	**$0**	**$50,000**	**$75,000**	**$100,000**	**$102,500**	**$105,063**	**$107,689**	**$110,381**	**$113,141**	**$115,969**	**$118,869**	**$121,840**	**$124,886**	**$128,008**	**$131,209**	**$134,489**	**$137,851**	**$141,297**	**$144,830**	**$148,451**	

Account Name	Budget 2014	Budget 2015	Projected 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Notes:
Total O&M Expenses	**$1,194,794**	**$1,192,649**	**$1,257,543**	**$1,347,328**	**$1,412,637**	**$1,479,247**	**$1,524,228**	**$1,570,609**	**$1,618,436**	**$1,667,755**	**$1,718,612**	**$1,771,059**	**$1,825,145**	**$1,880,924**	**$1,938,451**	**$1,997,781**	**$2,058,975**	**$2,122,090**	**$2,187,191**	**$2,254,341**	**$2,323,608**	**$2,395,060**	
Taxes																							
State Taxes	$32,000	$32,000	$26,861	$27,130	$27,401	$27,675	$27,952	$28,231	$28,513	$28,799	$29,087	$29,377	$29,671	$29,968	$30,268	$30,570	$30,876	$31,185	$31,497	$31,812	$32,130	$32,451	@ 1.5% of Rate Rev
Property Taxes & Irrigation	2,450	2,450	2,475	2,499	2,524	2,549	2,575	2,601	2,627	2,653	2,680	2,706	2,733	2,761	2,788	2,816	2,844	2,873	2,902	2,931	2,960	2,989	As Customer Growth
City Utility Tax	137,000	155,699	152,212	153,734	155,272	156,824	158,392	159,976	161,576	163,192	164,824	166,472	168,137	169,818	171,516	173,232	174,964	176,713	178,481	180,265	182,068	183,889	@ 8.5% of Rate Rev
Total Taxes	**$171,450**	**$190,149**	**$181,548**	**$183,363**	**$185,197**	**$187,049**	**$188,919**	**$190,808**	**$192,716**	**$194,643**	**$196,590**	**$198,556**	**$200,541**	**$202,547**	**$204,572**	**$206,618**	**$208,684**	**$210,771**	**$212,879**	**$215,008**	**$217,158**	**$219,329**	
Rate Funded Capital	**$125,000**	**$125,000**	**$130,000**	**$135,000**	**$140,000**	**$145,000**	**$150,000**	**$155,000**	**$160,000**	**$165,000**	**$170,000**	**$175,000**	**$180,000**	**$185,000**	**$190,000**	**$195,000**	**$200,000**	**$205,000**	**$210,000**	**$215,000**	**$220,000**	**$225,000**	2013 Depr. Exp. = $136,000; Rate Funded Capital Increased $5k/Yr.
Debt Service																							
Revenue Bond Principal	$95,000	$100,000	$105,000	$110,000	$115,000	$115,000	$25,000	$25,000	$30,000	$30,000	$30,000	$30,000	$35,000	$35,000	$35,000	$40,000	$45,000	$45,000	$45,000	$50,000	$50,000	$55,000	Debt schedule
Loan & Note Principal	7,306	7,624	7,624	7,624	7,624	7,624	7,624	7,624	7,624	7,624	0	0	0	0	0	0	0	0	0	0	0	0	Debt schedule
Revenue Bond Interest	64,351	61,263	57,763	54,088	49,688	45,088	39,338	38,088	36,838	35,413	33,988	32,538	31,088	29,413	27,713	26,013	24,088	21,781	19,475	17,169	14,606	12,044	Debt schedule
Loan/Note/Contract Interest	3,993	3,567	3,567	3,567	3,567	3,567	3,567	3,567	3,567	3,567	0	0	0	0	0	0	0	0	0	0	0	0	Debt schedule
New Low Interest Loan (P&I)	0	0	91,739	91,739	91,739	91,739	91,739	45,869	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Calculated
New Revenue Bond (P&I)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Calculated
Total Debt Service	$170,650	$172,454	$265,693	$267,018	$267,618	$263,018	$167,268	$120,148	$78,029	$76,604	$63,988	$62,538	$66,088	$64,413	$62,713	$66,013	$69,088	$66,781	$64,475	$67,169	$64,606	$67,044	
Less: Connection Charges	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Net Debt Service	**$170,650**	**$172,454**	**$265,693**	**$267,018**	**$267,618**	**$263,018**	**$167,268**	**$120,148**	**$78,029**	**$76,604**	**$63,988**	**$62,538**	**$66,088**	**$64,413**	**$62,713**	**$66,013**	**$69,088**	**$66,781**	**$64,475**	**$67,169**	**$64,606**	**$67,044**	
Change in Working Capital																							
Operating Reserve	$158,705	$151,503	$57,426	($28,700)	($8,056)	($26,044)	$98,688	$156,294	$211,226	$182,319	$161,210	$134,283	$84,963	$119,377	$134,908	$172,387	$178,999	$223,212	$174,273	$135,711	$77,478	$26,883	Input
Capital Reserve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Input
Connection Charge Reserve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Input
Total Change in Working Capital	$158,705	$151,503	$57,426	($28,700)	($8,056)	($26,044)	$98,688	$156,294	$211,226	$182,319	$161,210	$134,283	$84,963	$119,377	$134,908	$172,387	$178,999	$223,212	$174,273	$135,711	$77,478	$26,883	
Total Revenue Requirement	**$1,820,599**	**$1,831,755**	**$1,892,209**	**$1,904,008**	**$1,997,395**	**$2,048,269**	**$2,129,103**	**$2,192,859**	**$2,260,408**	**$2,286,321**	**$2,310,400**	**$2,341,436**	**$2,356,737**	**$2,452,261**	**$2,530,644**	**$2,637,799**	**$2,715,746**	**$2,827,854**	**$2,848,818**	**$2,887,229**	**$2,902,850**	**$2,933,317**	
Bal./(Def.) of Funds Before Added Tax	$0	$0	$0	$0	($66,426)	($136,865)	($211,524)	($252,132)	($294,308)	($297,251)	($300,224)	($303,226)	($306,258)	($373,087)	($443,155)	($516,596)	($593,553)	($674,173)	($680,915)	($687,724)	($694,601)	($701,547)	
Plus Add'l Taxes of 1.5% + 10%	0	0	0	0	(6,643)	(13,686)	(21,152)	(25,213)	(29,431)	(29,725)	(30,022)	(30,323)	(30,626)	(37,309)	(44,315)	(51,660)	(59,355)	(67,417)	(68,091)	(68,772)	(69,460)	(70,155)	
Net Bal./(Def.) of Funds	$0	$0	$0	$0	($73,069)	($150,551)	($232,677)	($277,345)	($323,739)	($326,976)	($330,246)	($333,548)	($336,884)	($410,396)	($487,470)	($568,256)	($652,908)	($741,590)	($749,006)	($756,496)	($764,061)	($771,702)	
Rate Adj. as a % of Rate Revenue	0.0%	0.0%	0.0%	0.0%	4.0%	8.2%	12.5%	14.7%	17.0%	17.0%	17.0%	17.0%	17.0%	20.5%	24.2%	27.9%	31.7%	35.7%	35.7%	35.7%	35.7%	35.7%	
Proposed Rate Adjustment	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**4.0%**	**4.0%**	**4.0%**	**2.0%**	**2.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**3.0%**	**3.0%**	**3.0%**	**3.0%**	**3.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	
Add'l Revenue with Rate Adj.	$0	$0	$0	$0	$73,069	$150,551	$232,677	$277,345	$323,739	$326,976	$330,246	$333,548	$336,884	$410,396	$487,470	$568,256	$652,908	$741,590	$749,006	$756,496	$764,061	$771,702	
Bal./(Def.) of Funds	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Additional Rate Adjustment Required	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

** Additional rate revenue in 2016 from the proposed rate adjustment is assumed at 50% due to an anticipacted partial year implementation**

Account Name	Budget 2014	Budget 2015	Projected 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Notes:
Average Monthly Residential Rate	**$3.85**																						
Rate After Required Adjustment	$3.85	$3.85	$3.85	$3.85	$4.00	$4.16	$4.33	$4.42	$4.51	$4.51	$4.51	$4.51	$4.51	$4.64	$4.78	$4.92	$5.07	$5.22	$5.22	$5.22	$5.22	$5.22	
Rate After Proposed Adjustment	$3.85	$3.85	$3.85	$3.85	$4.00	$4.16	$4.33	$4.42	$4.51	$4.51	$4.51	$4.51	$4.51	$4.64	$4.78	$4.92	$5.07	$5.22	$5.22	$5.22	$5.22	$5.22	
Debt Service Coverage Ratio																							
Before Rate Adjustment	2.66	2.60	1.71	1.40	1.24	0.93	1.22	1.49	1.99	1.65	1.48	1.10	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*Minimum = 1.25*
After Proposed Rate Adjustment	2.66	2.60	1.71	1.40	1.52	1.50	2.61	3.80	6.13	5.92	6.65	6.43	5.47	6.30	6.89	7.35	7.34	8.42	8.02	7.25	6.68	5.80	
Debt Service Coverage Ratio - Revenue Bonds Only																							
Before Rate Adjustment	2.85	2.78	2.78	2.28	2.02	1.53	3.18	2.84	2.32	1.94	1.48	1.10	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
After Proposed Rate Adjustment	2.85	2.78	2.78	2.28	2.47	2.47	6.79	7.24	7.16	6.94	6.65	6.43	5.47	6.30	6.89	7.35	7.34	8.42	8.02	7.25	6.68	5.80	
Fund Balances																							
Operating Reserve																							
Beginning Reserve Fund Balance	**$1,200,329**	**$1,541,852**	**$1,693,355**	**$1,541,461**	**$1,409,260**	**$452,454**	**$135,910**	**$234,098**	**$375,268**	**$504,577**	**$603,645**	**$764,854**	**$652,138**	**$737,101**	**$500,977**	**$635,885**	**$248,272**	**$426,771**	**$359,483**	**$533,756**	**$308,967**	**$385,945**	
Plus: To Reserve Fund	158,705	151,503	57,426	0	0	0	98,688	156,294	211,226	182,319	161,210	134,283	84,963	119,377	134,908	172,387	178,999	223,212	174,273	135,711	77,478	26,883	
Less: Uses of Funds	0	0	(209,320)	(132,200)	(956,806)	(316,544)	(500)	(15,124)	(81,917)	(83,251)	0	(247,000)	0	(355,500)	0	(560,000)	(500)	(290,500)	0	(360,500)	(500)	0	
Ending Fund Balance	**$1,359,034**	**$1,693,355**	**$1,541,461**	**$1,409,260**	**$452,454**	**$135,910**	**$234,098**	**$375,268**	**$504,577**	**$603,645**	**$764,854**	**$652,138**	**$737,101**	**$500,977**	**$635,885**	**$248,272**	**$426,771**	**$359,483**	**$533,756**	**$308,967**	**$385,945**	**$412,828**	
Target 45 Days O&M	*$147,303*	*$147,039*	*$155,040*	*$166,109*	*$174,161*	*$182,373*	*$187,919*	*$193,637*	*$199,533*	*$205,614*	*$211,884*	*$218,350*	*$225,018*	*$231,895*	*$238,987*	*$246,302*	*$253,846*	*$261,628*	*$269,654*	*$277,933*	*$286,472*	*$295,281*	
Capital Reserve																							
Beginning Reserve Fund Balance	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	
Plus: To Reserve Fund	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Less: Uses of Funds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ending Fund Balance	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	
Connection Charges																							
Beginning Reserve Fund Balance	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	
Plus: To Reserve Fund	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Less: Uses of Funds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ending Fund Balance	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	
Total Ending Fund Balance	**$1,359,034**	**$1,693,355**	**$1,541,461**	**$1,409,260**	**$452,454**	**$135,910**	**$234,098**	**$375,268**	**$504,577**	**$603,645**	**$764,854**	**$652,138**	**$737,101**	**$500,977**	**$635,885**	**$248,272**	**$426,771**	**$359,483**	**$533,756**	**$308,967**	**$385,945**	**$412,828**	

City of Richland
Stormwater - Exhibit 3
Capital Improvement Program

Inflation 2.7%

	Project ID	Budget 2014	Budget 2015	Projected 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Notes:
Capital Improvements - General																								
Annual Rehab & Replacement		$125,000	$125,000	$216,374	$0	$0	$0	$111,000	$57,124	$58,667	$60,251	$131,250	$135,000	$139,250	$143,000	$147,000	$151,000	$155,000	$159,000	$162,250	$166,000	$170,000	$173,250	
Water Quality Improvement		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Stormwater Retention Pond		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Utility - CFP Projects		0	0	1,833,309	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Capital Improvements - General		$125,000	$125,000	$2,049,683	$0	$0	$0	$111,000	$57,124	$58,667	$60,251	$131,250	$135,000	$139,250	$143,000	$147,000	$151,000	$155,000	$159,000	$162,250	$166,000	$170,000	$173,250	
Flood Risk																								
Leslie/Gage Basin Improvements	*FR - 01*	$0	$0	$0	$0	$839,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Total Flood Risk		$0	$0	$0	$0	$839,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Renewal & Replacement [1]																								
Charbonneau Dr. Pipe Improvements	*RR - 02*	$0	$0	$0	$169,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Columbia Park Trail Culvert	*RR - 03*	0	0	0	31,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Keene Rd Conveyance	*RR - 04*	0	0	0	0	161,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pipe Rehabilitation South of Snyder St.	*RR - 05*	0	0	0	0	41,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
McMurray Apartments Pipe Rehabilitation	*RR - 06*	0	0	0	0	0	405,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Waldron St Pipe Rehabilitation	*RR - 07*	0	0	0	0	24,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Renewal & Replacement		$0	$0	$0	$200,000	$226,000	$405,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Water Quality Retrofit																								
NR01 - Richardson	*WQ - 01*	$0	$0	$118,206	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
NR02 - Sprout	*WQ - 02*	0	0	81,114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SR10 - Leslie	*WQ - 03*	0	0	0	0	0	0	158,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Swift Blvd Water Quality Retrofit	*WQ - 04*	0	0	0	0	0	0	0	452,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Uptown Mall Bioretention Retrofit	*WQ - 05*	0	0	0	0	0	0	0	0	733,000	0	0	0	0	0	0	0	0	0	0	0	0	0	
Columbia Park Trail Water Quality Retrofit	*WQ - 06*	0	0	0	0	0	0	0	0	0	752,000	0	0	0	0	0	0	0	0	0	0	0	0	
Future Water Quality Projects [2]		0	0	0	154,000	95,000	122,000	0	0	0	0	155,000	159,000	163,000	168,000	172,000	177,000	182,000	186,000	191,000	197,000	202,000	207,000	
Total Water Quality Retrofit		$0	$0	$199,320	$154,000	$95,000	$122,000	$158,000	$452,000	$733,000	$752,000	$155,000	$159,000	$163,000	$168,000	$172,000	$177,000	$182,000	$186,000	$191,000	$197,000	$202,000	$207,000	
Developer Related																								
Shockley Storm Mainline Conveyance	*DD - 01*	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$989,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Jericho Rd Regional Facility	*DD - 02*	0	0	0	0	0	0	0	0	0	0	0	0	0	1,422,000	0	0	0	0	0	0	0	0	
Craighill Area Improvements	*DD - 03*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,239,000	0	0	0	0	0	0	
Keene Rd Regional Facility	*DD - 04*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,160,000	0	0	0	0	
Steptoe Regional Facility	*DD - 05*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,441,000	0	0	
Total Developer Related		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$989,000	$0	$1,422,000	$0	$2,239,000	$0	$1,160,000	$0	$1,441,000	$0	$0	
Future Unidentified Capital Projects		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Transfer to Operating Reserves		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Total Capital Improvement Plan		**$125,000**	**$125,000**	**$2,249,003**	**$354,000**	**$1,160,000**	**$527,000**	**$269,000**	**$509,124**	**$791,667**	**$812,251**	**$286,250**	**$1,283,000**	**$302,250**	**$1,733,000**	**$319,000**	**$2,567,000**	**$337,000**	**$1,505,000**	**$353,250**	**$1,804,000**	**$372,000**	**$380,250**	
Other Funding Sources																								
Connection Charges		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	
Operating Reserves		0	0	209,320	103,500	948,750	290,500	500	15,124	81,917	83,251	0	247,000	0	355,500	0	560,000	500	290,500	0	360,500	500	0	
Capital Reserves		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Department of Ecology Grant		0	0	1,509,683	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Assumed Grant Funded		0	0	0	115,500	71,250	91,500	118,500	339,000	549,750	564,000	116,250	119,250	122,250	126,000	129,000	132,750	136,500	139,500	143,250	147,750	151,500	155,250	
Assumed Developer Funded		0	0	0	0	0	0	0	0	0	0	0	741,750	0	1,066,500	0	1,679,250	0	870,000	0	1,080,750	0	0	
New Low Interest Loan		0	0	400,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
New Public Works Trust Fund Loans		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
New Revenue Bonds		0	0	0	0	0	0	0	0	(0)	(0)	0	0	0	0	0	0	0	0	0	0	0	0	
Total Other Funding Sources		$0	$0	$2,119,003	$219,000	$1,020,000	$382,000	$119,000	$354,124	$631,667	$647,251	$116,250	$1,108,000	$122,250	$1,548,000	$129,000	$2,372,000	$137,000	$1,300,000	$143,250	$1,589,000	$152,000	$155,250	
Rate Funded Capital		**$125,000**	**$125,000**	**$130,000**	**$135,000**	**$140,000**	**$145,000**	**$150,000**	**$155,000**	**$160,000**	**$165,000**	**$170,000**	**$175,000**	**$180,000**	**$185,000**	**$190,000**	**$195,000**	**$200,000**	**$205,000**	**$210,000**	**$215,000**	**$220,000**	**$225,000**	

Notes:

[1] Leslie Road Pipe Rehabilitation project (RR-01) identified in Section 7 not included. RR-01 would no longer be needed if FR-01 is completed.

[2] Includes the SR17 - Meadow Sp in 2017, NR03 - Ferry Rd in 2018, & NR04 - Park St in 2019. Projects identified by City for inclusion in financial plan; projects are not discussed in Section 7.

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