

May 9, 2013

# Navigating Increasingly Stringent Stormwater Requirements and Streamlining the Permitting Process for Drinking Water Facilities:

## Tacoma Water's Green River Filtration Facility

**Doug Lane, PE**  
**Scott Radford, RLA**

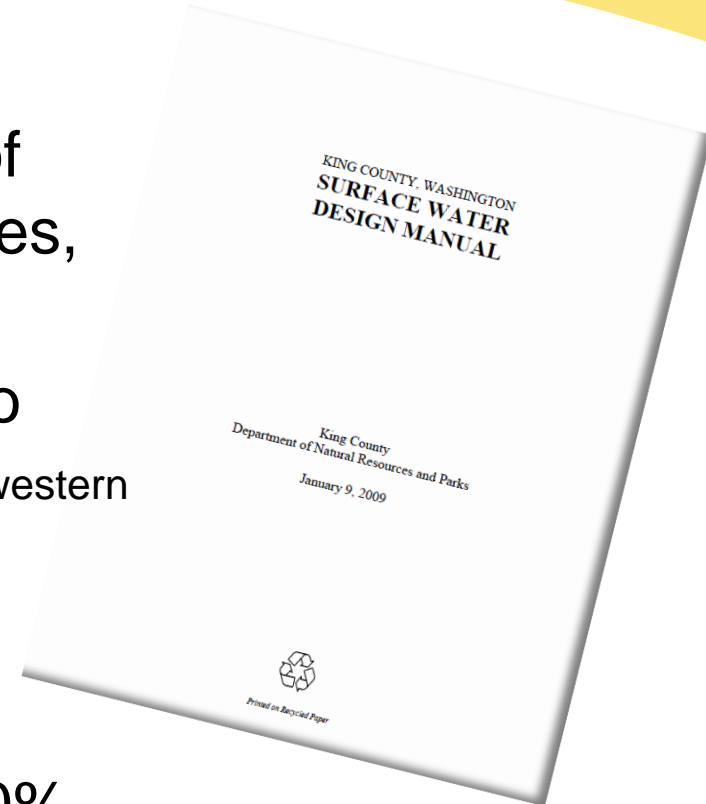


**MWH®**

***BUILDING A BETTER WORLD***

# Stormwater Regulations are Stricter

- More Stringent Standards:
  - All Projects that result in 2,000 sf of new or replaced impervious surfaces, OR 7,000 sf of pervious surfaces.
  - FLOW CONTROL: Runoff needs to match historical site (i.e. 100% Forest in western Washington)
  - WATER QUALITY:
    - Basic: Removal of 80% TSS
    - Enhanced Basic: Removal of 80% TSS AND 50% Reduction in zinc.



**i.e. Virtually All Projects Require a Drainage Review.**

# Stormwater Regulations are Stricter

- Know and Understand the Core Requirements
  - Discharge at Natural Location
  - Off site Analysis
  - Flow Control to limit discharge
  - Analyze Conveyance System
  - Erosion Control
  - Maintenance & Operations
  - Financial Guarantees
  - Meet Water Quality Standard
- Special Requirements
  - Avoid Flood Hazard
  - Contaminant Source Control
  - Oil Control

SECTION 1.1 DRAINAGE REVIEW

TABLE 1.1.2.A REQUIREMENTS APPLIED UNDER EACH DRAINAGE REVIEW TYPE

REQUIREMENTS	Targeted Drainage Review			Full Drainage Review	Large Project Drainage Review
	Category 1	Category 2	Category 3		
SMALL PROJECT DRAINAGE REQUIREMENTS					
CORE REQUIREMENT #1 Discharge at Natural Location	✓				
CORE REQUIREMENT #2 Offsite Analysis					
CORE REQUIREMENT #3 Flow Control	* <sup>(2)</sup>	✓			
CORE REQUIREMENT #4 Conveyance System	* <sup>(2)</sup>	✓ <sup>(3)</sup>			
CORE REQUIREMENT #5 Erosion & Sediment Control	* <sup>(2)</sup>			✓ <sup>(3)</sup>	
CORE REQUIREMENT #6 Maintenance & Operations		✓		✓ <sup>(3)</sup>	✓ <sup>(3)</sup>
CORE REQUIREMENT #7 Financial Guarantees & Liability	* <sup>(2)</sup>	✓	✓	✓	✓ <sup>(3)</sup>
CORE REQUIREMENT #8 Water Quality	* <sup>(2)</sup>	✓	✓	✓	✓
SPECIAL REQUIREMENT #1 Other Adopted Requirements	* <sup>(2)</sup>	✓ <sup>(3)</sup>	✓ <sup>(3)</sup>	✓	✓
SPECIAL REQUIREMENT #2 Flood Hazard Area Delineation	* <sup>(2)</sup>	✓ <sup>(3)</sup>	✓ <sup>(3)</sup>	✓ <sup>(3)</sup>	✓ <sup>(3)</sup>
SPECIAL REQUIREMENT #3 Flood Protection Facilities	✓ <sup>(3)</sup>			✓ <sup>(3)</sup>	✓ <sup>(3)</sup>
SPECIAL REQUIREMENT #4 Source Control	✓ <sup>(3)</sup>			✓ <sup>(3)</sup>	✓ <sup>(3)</sup>
SPECIAL REQUIREMENT #5 Oil Control	✓ <sup>(3)</sup>	✓ <sup>(3)</sup>	✓ <sup>(3)</sup>	✓ <sup>(3)</sup>	✓ <sup>(3)</sup>

(1) Category 3 projects installing oil controls that construct or modify a 12-inch pipe/ditch are also Category 2 projects.  
 (2) May be applied by DDES based on project or site-specific conditions.  
 (3) These requirements have exemptions or thresholds that may preclude or limit their application to a specific project.

1-12  
 2009 Surface Water Design Manual


# Stormwater Regulations Exemptions & Adjustments

- Know and Understand Possible Exemptions & Credits
  - Project Size Thresholds (Drainage Basins)
  - Project Valuation Thresholds (Value of Improvements)
  - Flow Control BMP Selection Sizing Credits
  - Water Quality Exemptions
    - Surface Area Exemption
    - Impervious Surface Exemption
    - Cost Valuation Exemption
    - Soil Treatment Exemption
- Apply for Adjustments

Web Date: 09/22/2008

**SURFACE WATER DESIGN MANUAL  
 REQUIREMENTS / STANDARDS  
 ADJUSTMENT\* REQUEST**

For alternate formats, call 206-296-6600.

 <b>King County</b> <b>Department of Development and Environmental Services</b> 900 Oakesdale Avenue Southwest Renton, WA 98057-5212 206-296-6600 TTY 206-296-7217	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project Name: <b>Green River Filtration Facility</b></td> <td style="width: 50%;">DDES Project File No:</td> </tr> <tr> <td>Project Address: 36932 SE GREEN RIVER HEADWORKS BLVD, RAVENSDALE, WA 98051</td> <td>DDES Engineer/Planner Name: Design Engineer: <span style="float: right;">Phone:</span> <b>Douglas Lane, P.E.</b> <span style="float: right;"><b>(425)896-6916</b></span></td> </tr> <tr> <td>Applicant/Agent**: <b>Randall Krueger, P.E.,</b> <span style="float: right;">Phone:</span> <span style="float: right;"><b>(253) 502-8202</b></span></td> <td>Signature of Design Engineer: <span style="float: right;">Date:</span></td> </tr> <tr> <td>Signature of Applicant/Agent: <span style="float: right;">Date:</span></td> <td>Engineering Firm Name: <b>MWH AMERICAS, INC.</b></td> </tr> <tr> <td>Address: <span style="float: right;">City, State, ZIP:</span> <b>3628 South 35th Street, Tacoma, WA 98409</b></td> <td>Address: <span style="float: right;">City, State, ZIP:</span> <b>2353 130TH AVE NE, SUITE 200, BELLEVUE, WA 98005</b></td> </tr> </table>	Project Name: <b>Green River Filtration Facility</b>	DDES Project File No:	Project Address: 36932 SE GREEN RIVER HEADWORKS BLVD, RAVENSDALE, WA 98051	DDES Engineer/Planner Name: Design Engineer: <span style="float: right;">Phone:</span> <b>Douglas Lane, P.E.</b> <span style="float: right;"><b>(425)896-6916</b></span>	Applicant/Agent**: <b>Randall Krueger, P.E.,</b> <span style="float: right;">Phone:</span> <span style="float: right;"><b>(253) 502-8202</b></span>	Signature of Design Engineer: <span style="float: right;">Date:</span>	Signature of Applicant/Agent: <span style="float: right;">Date:</span>	Engineering Firm Name: <b>MWH AMERICAS, INC.</b>	Address: <span style="float: right;">City, State, ZIP:</span> <b>3628 South 35th Street, Tacoma, WA 98409</b>	Address: <span style="float: right;">City, State, ZIP:</span> <b>2353 130TH AVE NE, SUITE 200, BELLEVUE, WA 98005</b>
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# Benefits of Stringent Regulations & BMP's

- Lower Thresholds = More Projects in Compliance
- Improved Overall Regional Water Quality
- Low-Impact Development & Green Stormwater Infrastructure BMP's when Implemented well can:
  - Mitigate flooding
  - Reduce pollution
  - Enhance water quality and habitat
  - Reduce erosion and sedimentation
  - Can reduce drainage system O&M and capital costs.



**COST SAVINGS  
USING LID VS.  
CONVENTIONAL**

**\$100,000 SAVINGS  
PER CITY BLOCK**

Source: Seattle Public Utilities:  
Natural Drainage System

# One Size Does Not Fit All

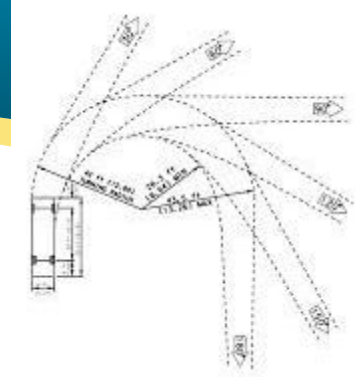
ONE SIZE DOES NOT FIT ALL.  
KEEP TRYING...



- Regulations are generalized:
  - Geared toward residential and commercial development
  - Assume developer has profit motive (money to spend)
  - Assume plenty of land available
- Common strategies include:
  - Minimize Building Footprint (increase building density, height, etc)
  - Minimize Impervious Surfaces (narrow parking, narrow roads, etc)
  - Centralized facilities for entire development or complex
- Many (most?) of the tools & strategies available to meet regulations don't work on a water facility site - but the runoff requirements still apply!
- Regulators/Reviewers not familiar with Odd Ball Projects

# Unique Challenges for Water Facilities

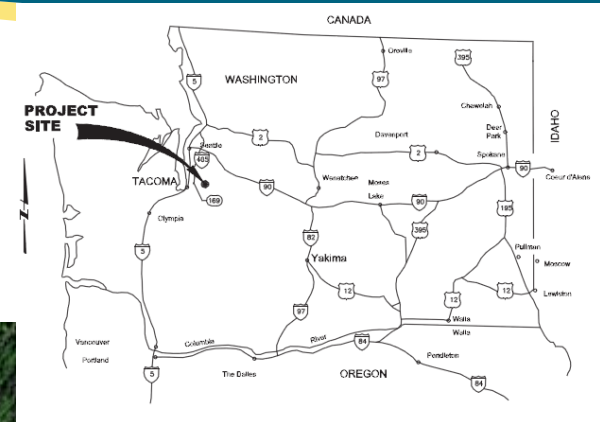
- Impervious footprint is usually fixed!
  - Constrained by volume/capacity needed at facility
  - Governed by hydraulic grade
  - If utility vehicles or delivery trucks don't need large turning radius, the fire department will!
- Constrained sites
  - Less room for stormwater detention facilities
- Constrained budgets
- Over-burdened O&M Staff



# Green River Filtration Facility

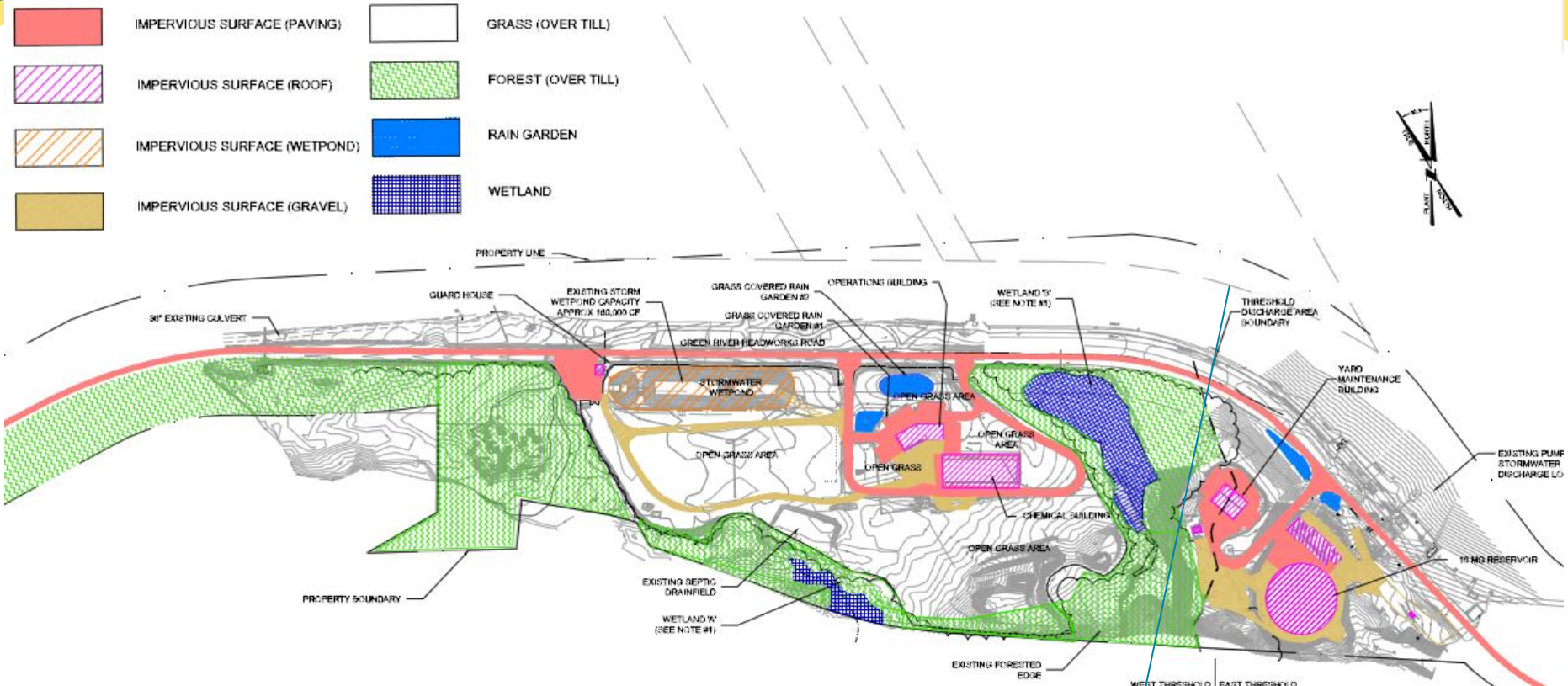
Location: On Green River, Near Ravensdale, WA

- 35 miles east of Tacoma, WA
- Forested Site
- Within 720 Acre Watershed
- 90 inches annual rainfall
- 40 inches annual snowfall














# Green River Filtration Facility (Existing Site)



- West Site: 51 Acres

- East Site: 10 Acres

# Green River Filtration Facility (Proposed)

















-  IMPERVIOUS SURFACE (PAVING)
-  IMPERVIOUS SURFACE (ROOF)
-  IMPERVIOUS SURFACE (WETPOND)
-  IMPERVIOUS SURFACE (GRAVEL)
-  RAINWATER HARVEST
-  GRASS (OVER TILL)
-  FOREST (OVER TILL)
-  RAIN GARDEN
-  WETLAND

	EXISTING SITE		PROPOSED SITE	
	WEST AREA	EAST AREA	WEST AREA	EAST AREA
PAVEMENT (INCL HEADWORKS RD)	4.316 AC	1.514 AC	5.442 AC	1.766 AC
IMPERVIOUS SURFACE (GRAVEL)	1.293 AC	1.124 AC	1.939 AC	0.937 AC
IMPERVIOUS SURFACE (ROOF)	0.804 AC	1.290 AC	2.942 AC	1.434 AC
IMPERVIOUS SURFACE (WETPOND)	1.381 AC	N/A	1.381 AC	N/A
RAIN GARDEN	0.272 AC	0.156 AC	0.234 AC	0.156 AC
RAINWATER HARVESTING	N/A	N/A	4.173 AC	N/A
FOREST	25.733 AC	2.142 AC	18.851 AC	2.142 AC
WETLAND	2.112 AC	N/A	2.112 AC	N/A
GRASS	14.862 AC	3.965 AC	13.241 AC	3.514 AC
TOTAL	50.736 AC	10.037 AC	50.736 AC	10.037 AC



• West Site: 51 Acres

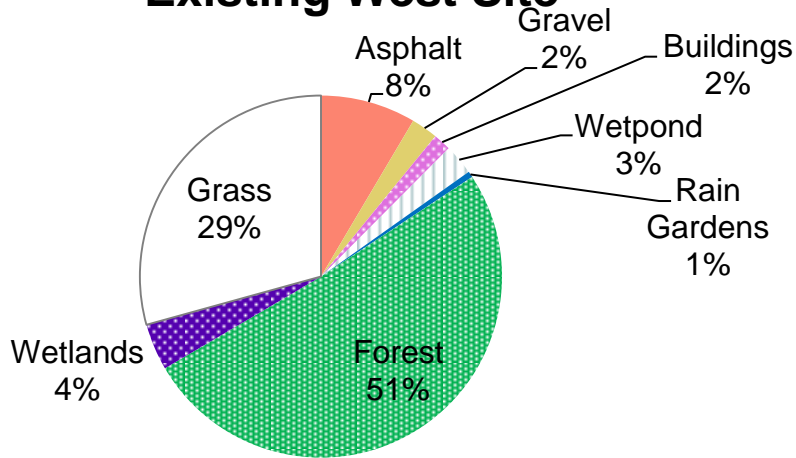
• East Site: 10 Acres

- SITE KEY**
-  RAW WATER SPILL CHAMBER
  -  CHEMICAL BUILDING
  -  OZONE BUILDING
  -  RAW WATER METERING
  -  FLOCCULATION/SEDIMENTATION BASIN
  -  FILTERS
  -  P1 AND P5 CLEARWELLS
  -  FINISHED WATER PUMP STATION
  -  WASHWATER EQUALIZATION/CLARIFIER FACILITIES
  -  RECYCLE WATER FACILITIES
  -  SOLIDS THICKENERS/BLENDING FACILITIES
  -  MECHANICAL DEWATERING BUILDING
  -  FILTER OUTLET WEIR STRUCTURE/BACKWASH FACILITIES
  -  NORTHFORK WELLFIELD STORAGE FACILITIES
  -  OPERATIONS BUILDING/POLE BUILDING
  -  ELECTRICAL BUILDING/GENERATOR FACILITIES

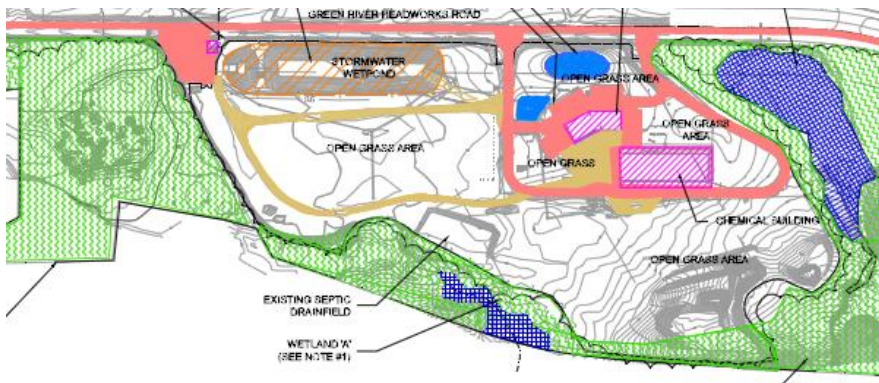
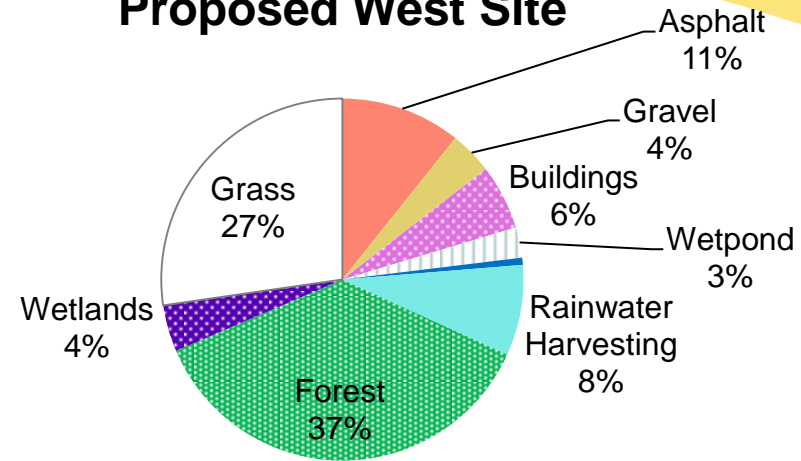
- NOTES:**
- WETLAND BOUNDARIES BASED ON PRELIMINARY WETLAND DELINEATION (2011). WETLAND A- 16, 500 SQ FT
  - TEMPORARY IMPACTS TO WETLAND B FOR PIPELINE INSTALLATION TO OCCUR IN THE SUMMER MONTHS.

# GRFF – WEST SITE LAND USE

## Existing West Site

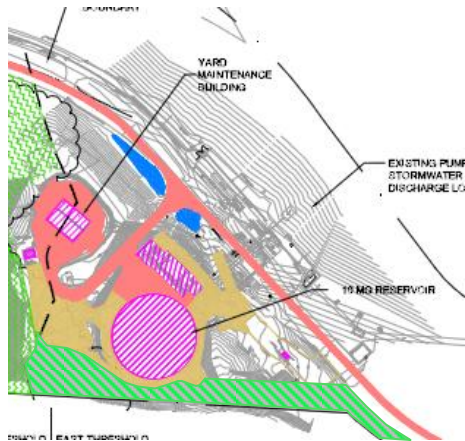
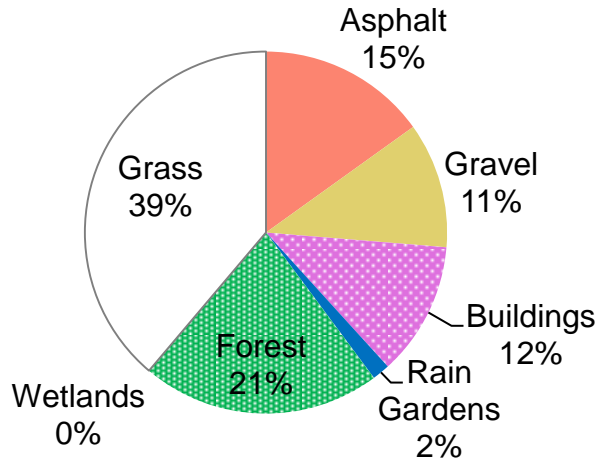


## Proposed West Site

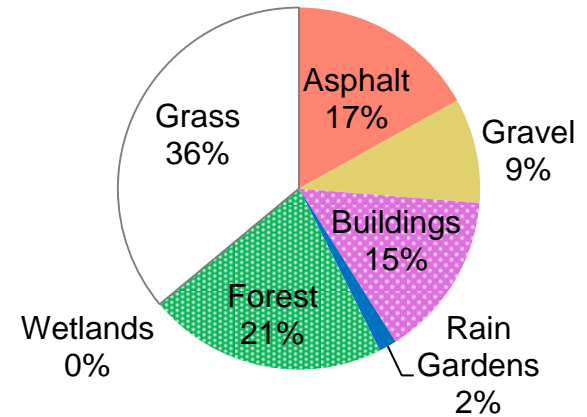


# GRFF – EAST SITE LAND USE

## Existing East Site



## Proposed East Site



# Strategies Used for GRFF

- Direct Discharge Exemption Variance
- Dispersion
- Limit Drainage System
- Rain Garden
- Rainwater Harvesting



**MEMORANDUM**

**To:** Bruce Whittaker, King County DDES  
**From:** Douglas Lane, MWH  
**Subject:** Tacoma Water – Green River Filtration Facility Stormwater Adjustment Request  
**Date:** February 23, 2012  
**Cc:** Charlie Bromley

This Adjustment Request memorandum is submitted concurrently with the Draft Technical Information Report for the Green River Filtration Facility (GRFF) project. The GRFF is located in King County, WA and requires a Drainage Review by the King County Department of Development and Environmental Services (DDES).

**Requested Adjustments**  
The following drainage Adjustments are sought for the proposed GRFF project:

**Continued use of Direct Discharge Exemption**  
The Adjustment Request to continue use of the Direct Discharge Exemption is “complex” because it pertains to the requirements of Chapter 1 (1.2.3.1).


**Rainwater Harvesting**  
The Adjustment Request for rainwater harvesting is a “standard” Adjustment Request, because it pertains to the requirements of KCSWDM Appendix C.

**Change in Discharge Location**  
The Adjustment Request to change the discharge location is “complex” because it pertains to the requirements of Chapter 1 (1.2.1).

# Strategies Used for GRFF Direct Discharge Exemption

- Prior to 2009, direct discharges to Green River (any location) could obtain the flow control exemption.
- 2003 project at the site used the exemption
- Code revised in 2009: *“No More Exemption For You!”*
  - Exemption could only be used downstream of river mile 6
- Worked with the County to get a variance
  - Peak discharges were... compared to minimum Green River flow
  - Demonstrated no impacts to...

Web Date: 09/22/2008



**King County**  
Department of Development  
and Environmental Services  
900 Oakesdale Avenue Southwest  
Renton, WA 98057-5212  
206-296-6600 TTY 206-296-7217

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# Strategies Used for GRFF Dispersion Techniques

- Rock Pads
- Splash Blocks
- Gravel-Filled Trenches
  - Limit use of curbs on roadways
  - Part of standard detail anyway
- Sheet Flow
  - Allows limited area of impervious surface to be modeled as 50% grass/50% Impervious



# Strategies Used for GRFF

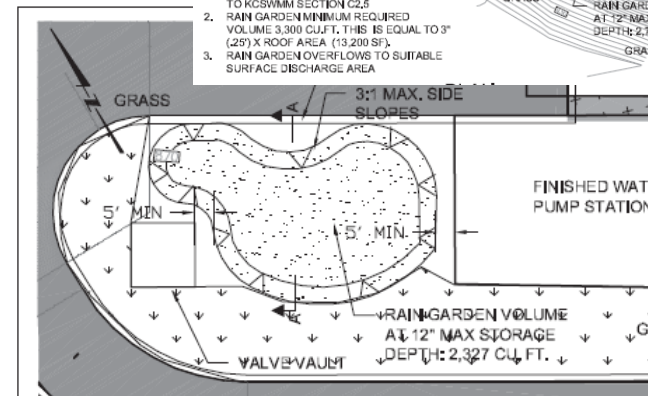
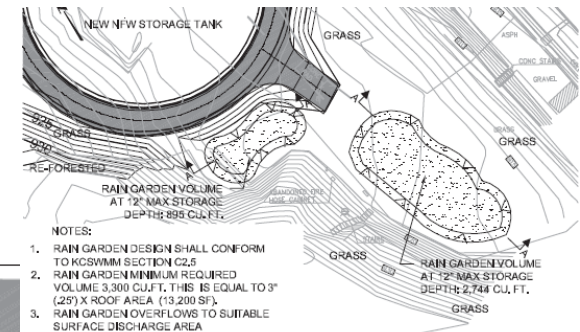
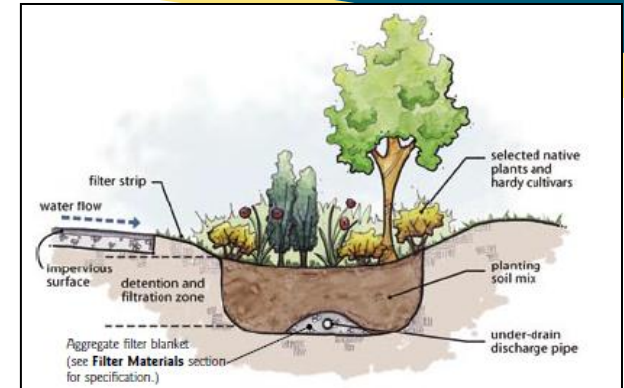
## Limit the Drainage System

- King County:
  - “Impervious = All impervious surfaces, including heavily compacted gravel and dirt roads...”
  - Gravel & dirt now count as paved (100% impervious)!
- The Solution:
  - “Gravel/Dirt Roads and Parking Lots, Roads without Collection System”: Effective Impervious Fraction = 0.50
  - All road surfaces (even paved!) only count as 50% impervious if they don't drain to collection system
- Where feasible (remote sites) limiting the extent of the collection system limits the modeled runoff.



# Strategies Used for GRFF: Rain Gardens

- Can be various sizes/shapes to fit odd shapes
- Requires appropriate soil blend
- Subgrade permeability needs to be understood and if necessary, piped drains should be installed
- Tributary impervious areas modeled as 50% Grass and 50% Impervious.
- Flow Control and Water Quality



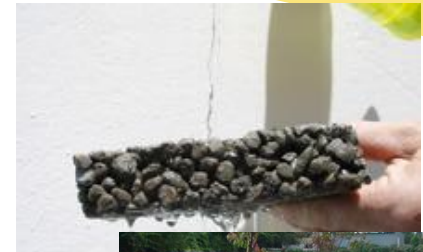
# Strategies Used for GRFF: Rainwater Harvesting

- This BMP intended to collect water from roof run off and use for domestic and irrigation purposes. But can be used on a larger scale for utility raw water.
- Only works for raw water or treatment facilities
- 2 unique ways this can be used:
  - Treatment basins (filters, sed basins, dewatering basins)
  - If site runoff drains into a raw water reservoir
- 100% credit for attributable areas (zero runoff)
- May require bird netting or wires
- Susceptible to freezing



# Other Strategies Available

- These strategies were not used at GRFF site, but might work for yours:
  - Impervious Surface Percentage Exemption
  - Permeable Pavements (Concrete, Asphalt, Unit Pavers)
  - Vegetated Roof – ‘Green Roof’
  - Use as an Educational Community Asset
  - Preservation of Natural Areas
  - Improve Soil Quality
  - Minimize Impervious Areas via use of Permeable Pavements
  - Dispersion



# Other Strategies Available: Impervious Surface Percentage Exemption

- Possibility for utilities that own their watershed control area
- Call the entire watershed parcel the “site”
- If new + existing impervious area < 4% of site, then the project may be fully exempt from flow control requirements
- Slam dunk if attainable



# Other Strategies Available: Permeable Pavements

- Porous Concrete
- Porous Asphalt
- Grass Pave
- Porous Unit Paving
  - Successfully utilized temperate and cold climates.
  - Very good at TSS removal.
  - Porosity in excess of 1400 in/hr.
  - Studies show Freeze Thaw not an issue
  - Requires Periodic Cleaning
  - Can reduce the need for other detention facilities.
  - Permeable paving systems ARE 'Detention Facilities'
  - No-brainer for some urban sites.
  - Moss growth a problem in some areas



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Gravelpave<sup>2</sup>. How  
at or below ab

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maintain  
last 25 years |

# Other Strategies Available: Vegetated Roof

- Vegetated Roof
  - Stormwater regulators may allow credit for “vegetated roof” (green roof) on buried facilities
  - Often considered as 50% impervious for runoff computations
- Vegetated Roofs on At-Grade Buildings
  - Expensive and high maintenance compared to other potential options.
  - Operators not typically enthused



# Other Strategies: Community Asset, Infiltration, Native Growth Retention

- Treat LID as a Community Asset
  - Can help to sell the project to skeptical public
  - Signs, displays, etc
- Infiltration (if feasible)
- Native Growth Retention Credit
- More...



# Summary

To successfully Navigate Stringent Stormwater Requirements and Streamlining the Permitting Process for Drinking Water Facilities:

- Understand the Requirements
- Understand your Site
- Understand the BMP's
- Understand the Potential Exemptions
- Communicate to Regulators





# Questions?



**Doug Lane, PE**  
**Scott Radford, RLA**

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