Port Gamble LOSS

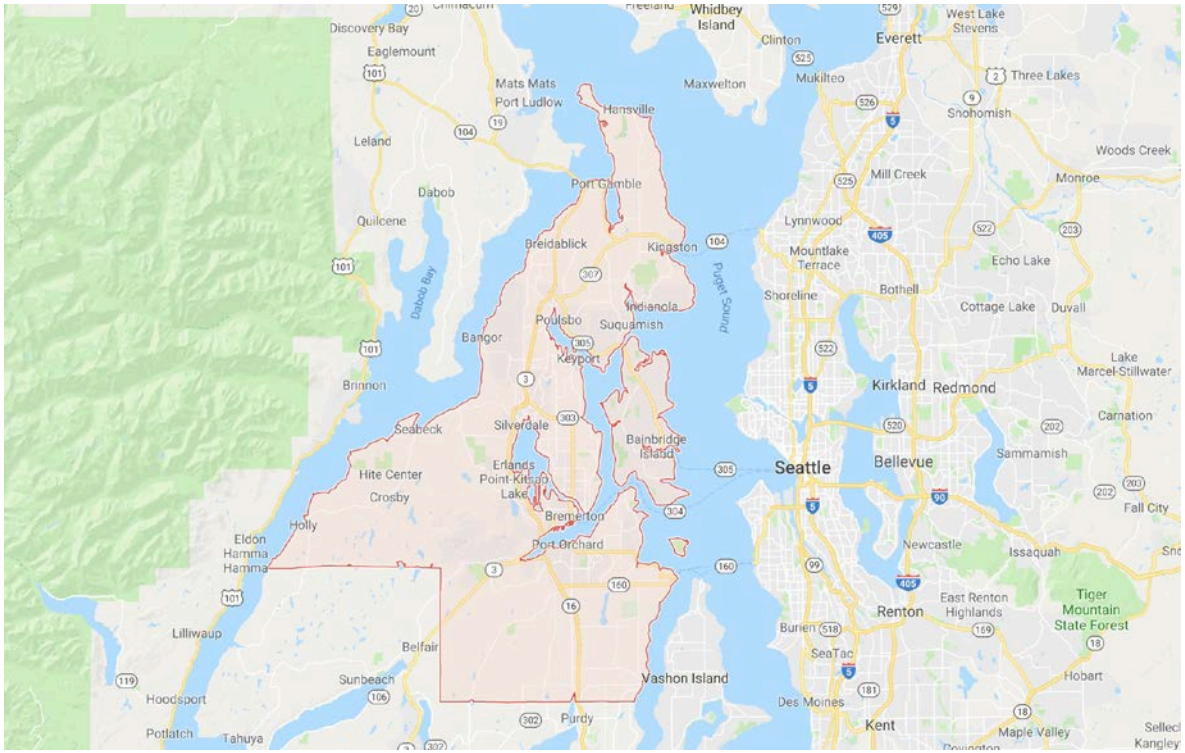
KPUD's Water Reclamation Project

by
R. Dale Richwine, PE, WEF Fellow

Port Gamble, Washington

richwine
environmental

KPUD Location



Old Pope and Talbot Mill Site

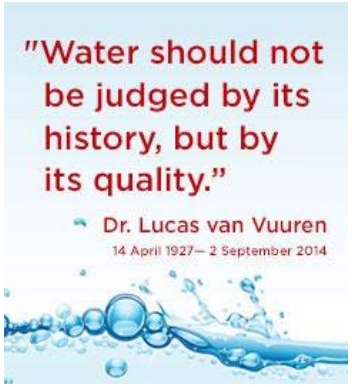
richwine environmental

Port Gamble Development Plan

KPUD's Interest in Wastewater Treatment

KPUD's Interest in Wastewater Treatment

- Public partner needed to administer $2 million allocation from legislature. Asked KPUD.
- Countywide groundwater management role
- Interested in recharge vs. offshoring
- Emerging issue
  - Currently 58,000 septic systems in Kitsap County
  - Discharges 11.6-mgd to groundwater
- Water reuse lowers peak demand



richwine environmental

KPUD's Interest in Wastewater Treatment
OPG Need

- Existing plant is 47-years old
- Removal of outfall to Hood Canal
  - Opens 90-acres for Geoduck harvest
- $2.0M Appropriation from Legislature
- WAC 246-272B-04100 requires:
  - **A public entity or a wastewater company regulated by the Washington utilities and transportation commission**; or
  - A private management entity with a public entity or a wastewater company regulated by the Washington utilities and transportation commission contracted as a third party guarantor.

richwine environmental

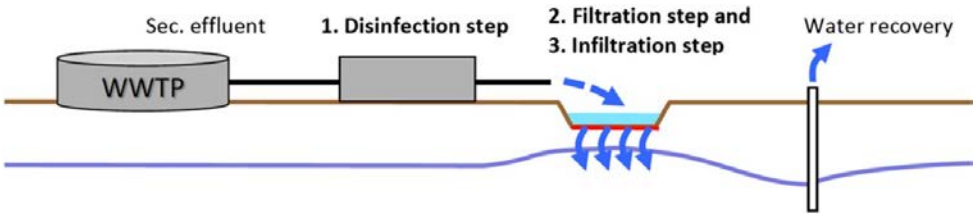
KPUD's Interest in Wastewater Treatment
Port Gamble Existing Treatment Plant is 47-years Old

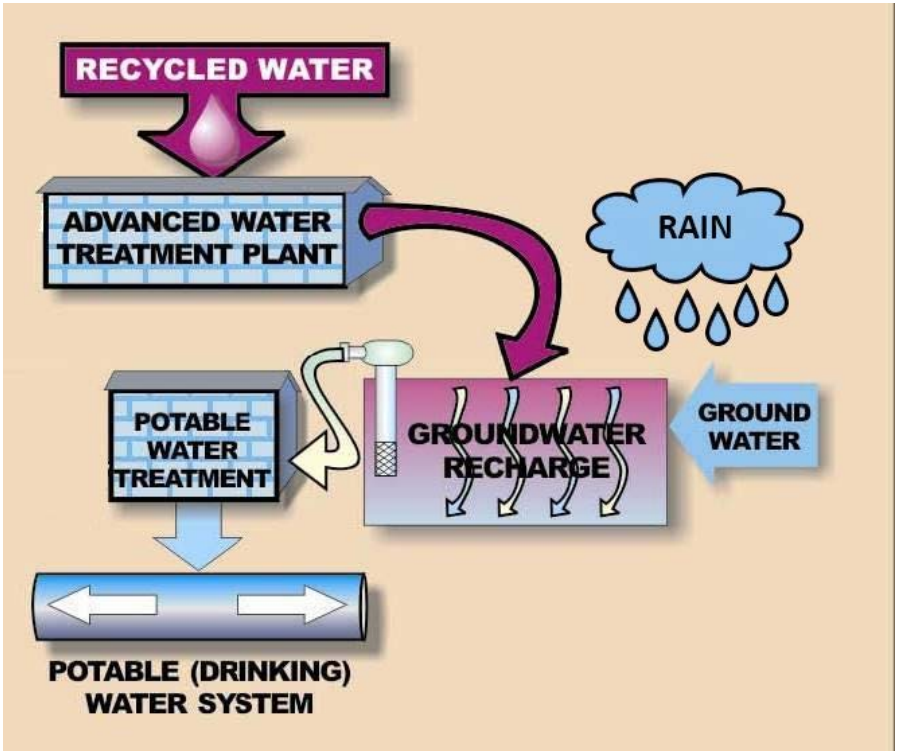
richwine environmental

KPUD's Interest in Wastewater Treatment
Put Clean Water in the Ground

Kitsap Peninsula is water limited

- One of three counties with no snowpack
- Over 3 billion gallons of treated wastewater discharged to marine water annually
- Project population growth of 100,000 by 2030

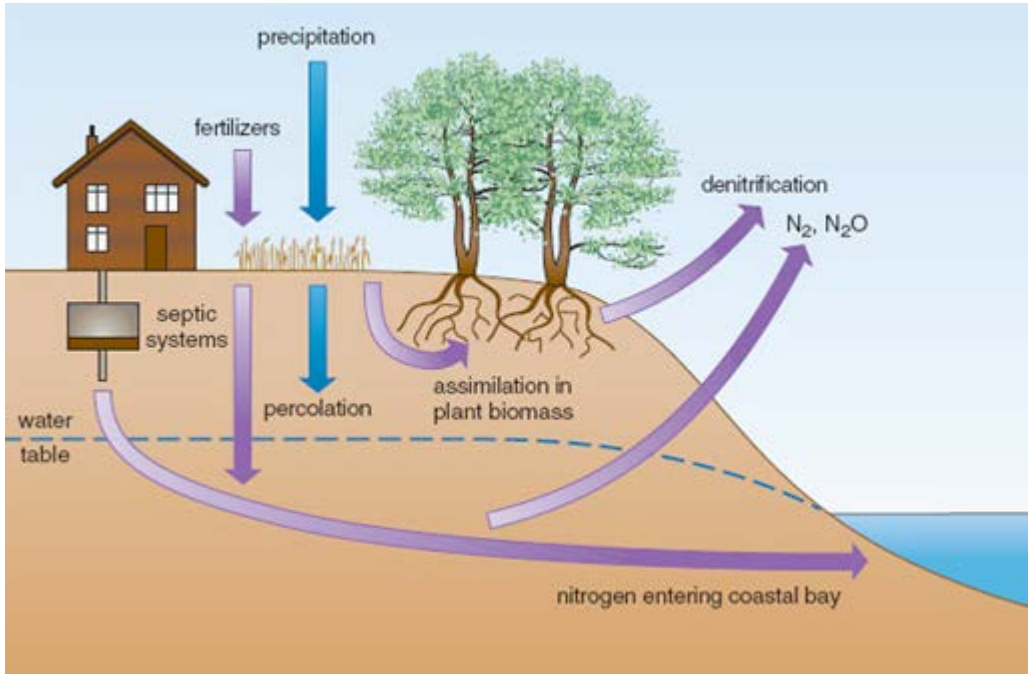




richwine environmental

KPUD's Interest in Wastewater Treatment
Assist Failing Septic Systems

- Failing systems affect groundwater quality
- Increasing nitrogen levels in Hood Canal
- Increasing nitrogen levels in Puget Sound
- Contaminants of emerging concern



richwine environmental

KPUD's Interest in Wastewater Treatment
Water Reuse Lowers Peak Demand

- Limited groundwater resource
- Continued growth in service are
- Reuse is sustainable

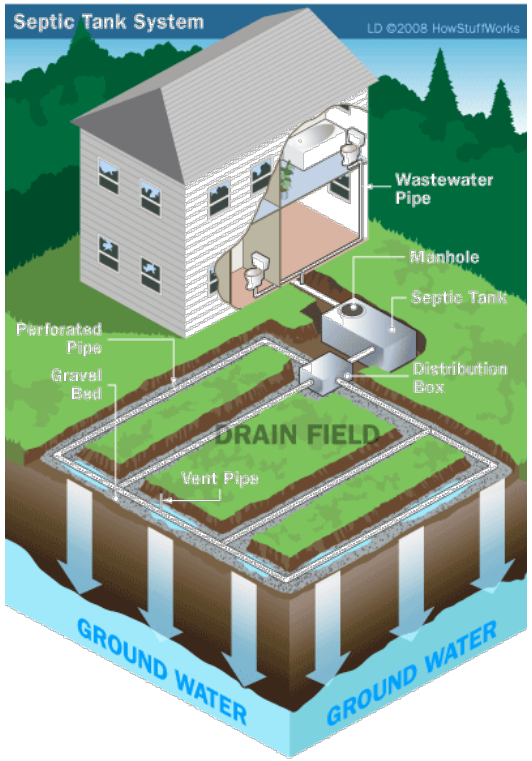
richwine environmental

Septic Tank vs. MBR Treatment

Conventional Septic Tank System

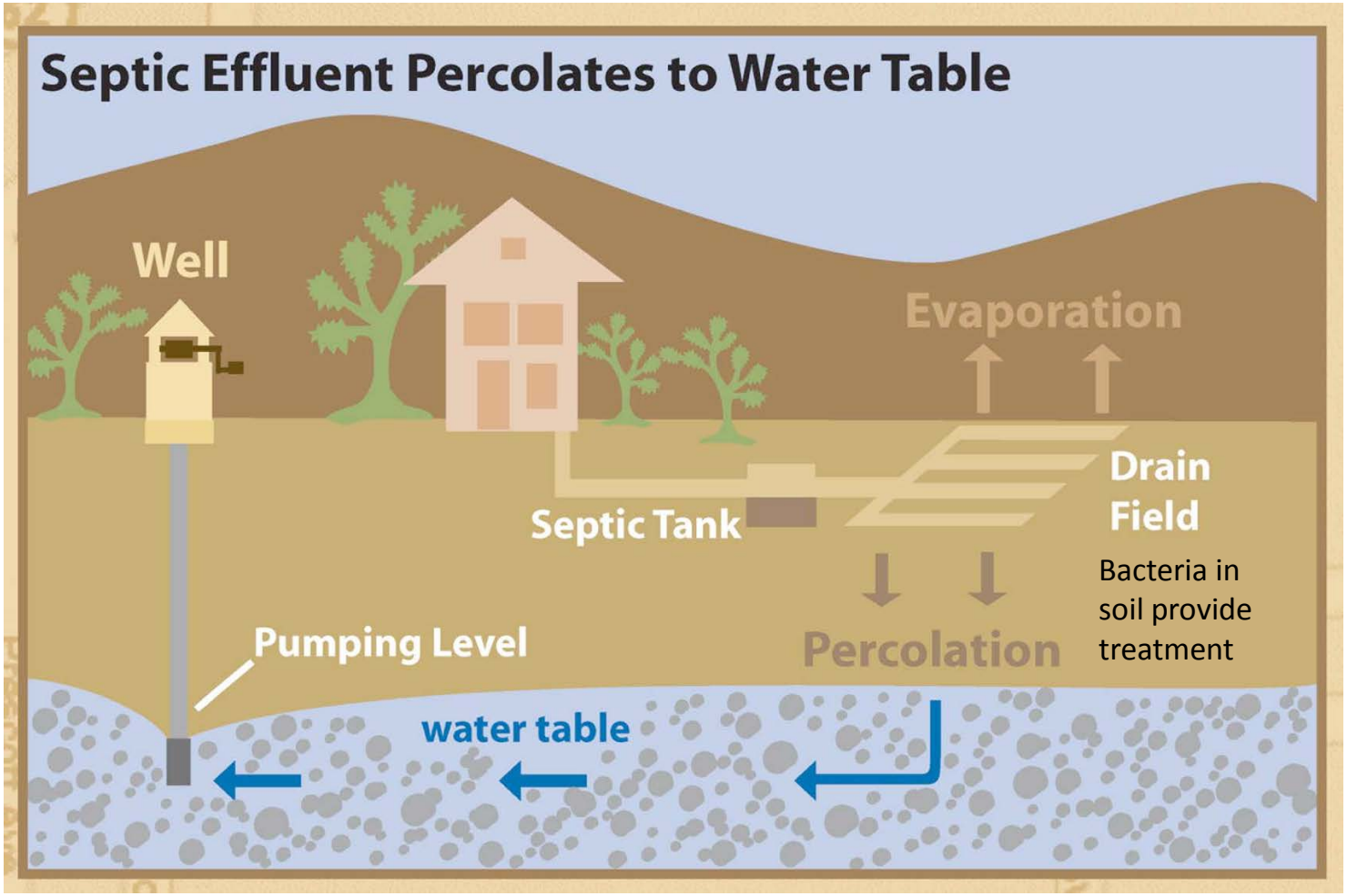
- Septic Tank
  - 3000-gallons
- Drainfield
  - Dependent on soil conditions
- Effluent Quality
  - BOD* = 158 mg/L
  - TSS* = 54 mg/L
  - TN* = 55.3 mg/L

*Values per DOH Basic Principles of Onsite Sewage



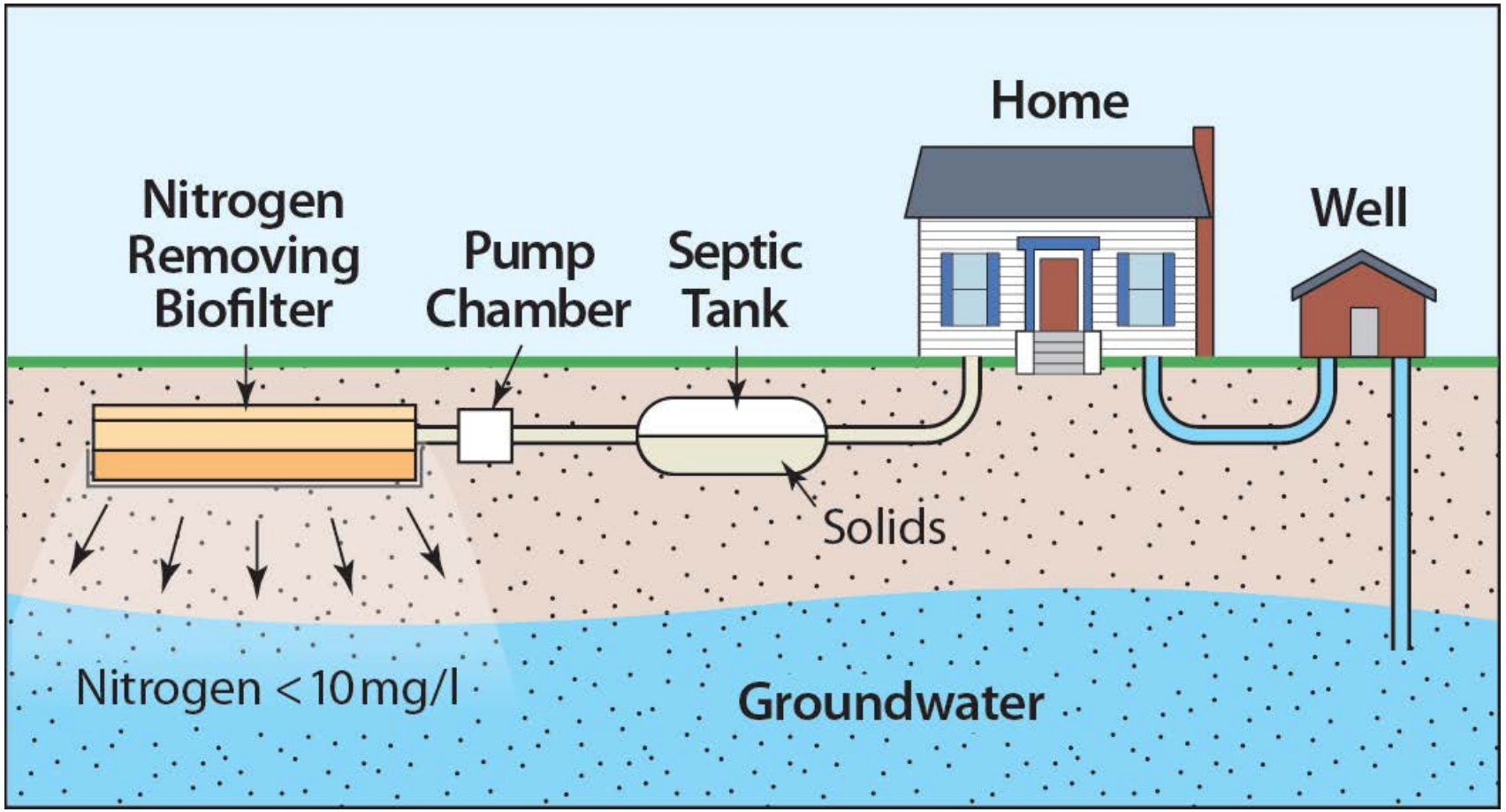
richwine environmental

Conventional Septic Tank System
Treatment Occurs in Soils



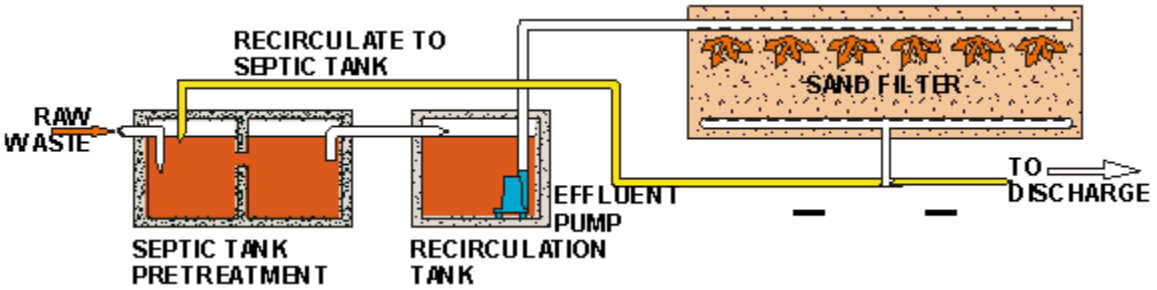
richwine environmental

Conventional Septic Tank System
Septic Tank Followed by Nitrogen Removal



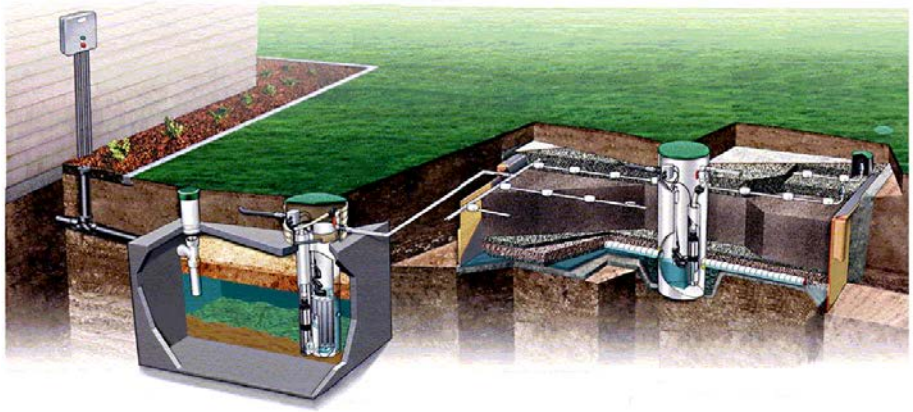
richwine environmental

Conventional Septic Tank System
Septic Tank Effluent Nitrogen Removal Systems



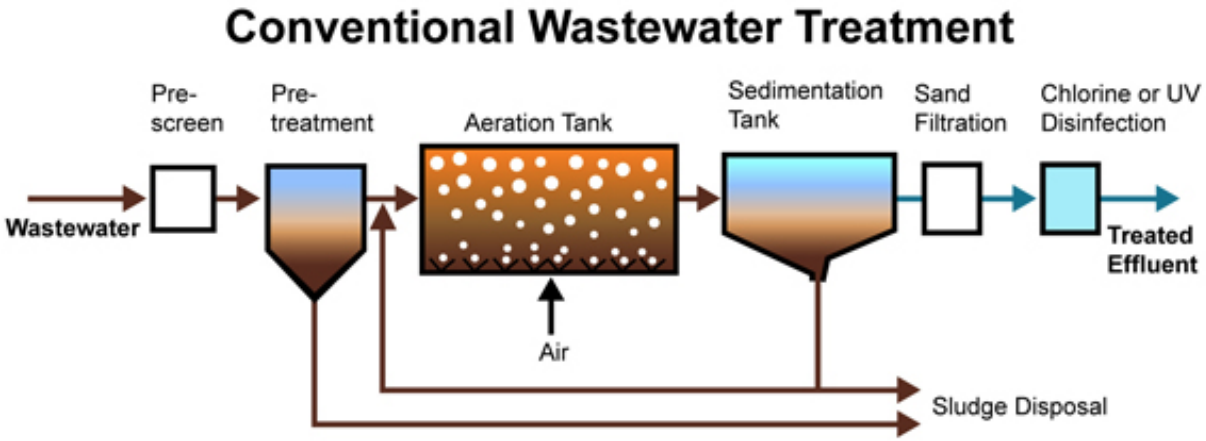
TN = 14 – 20 mg/L
Weather
Dependent

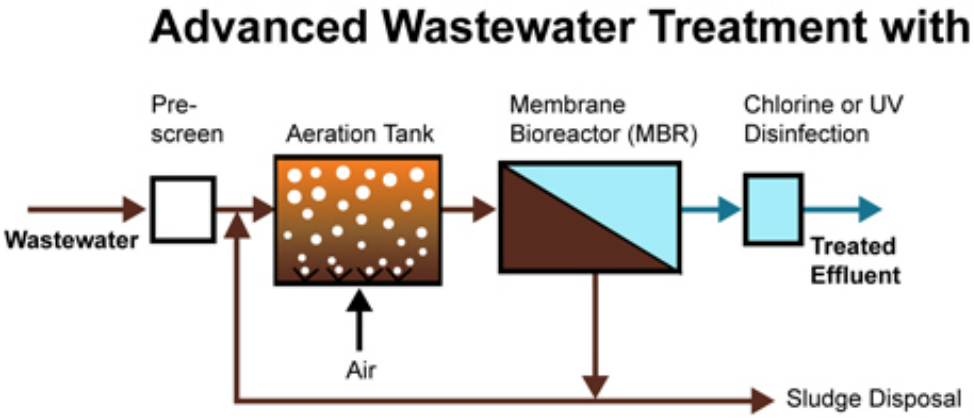
Package System



richwine
environmental

MBR Treatment
Conventional Treatment vs. MBR Treatment

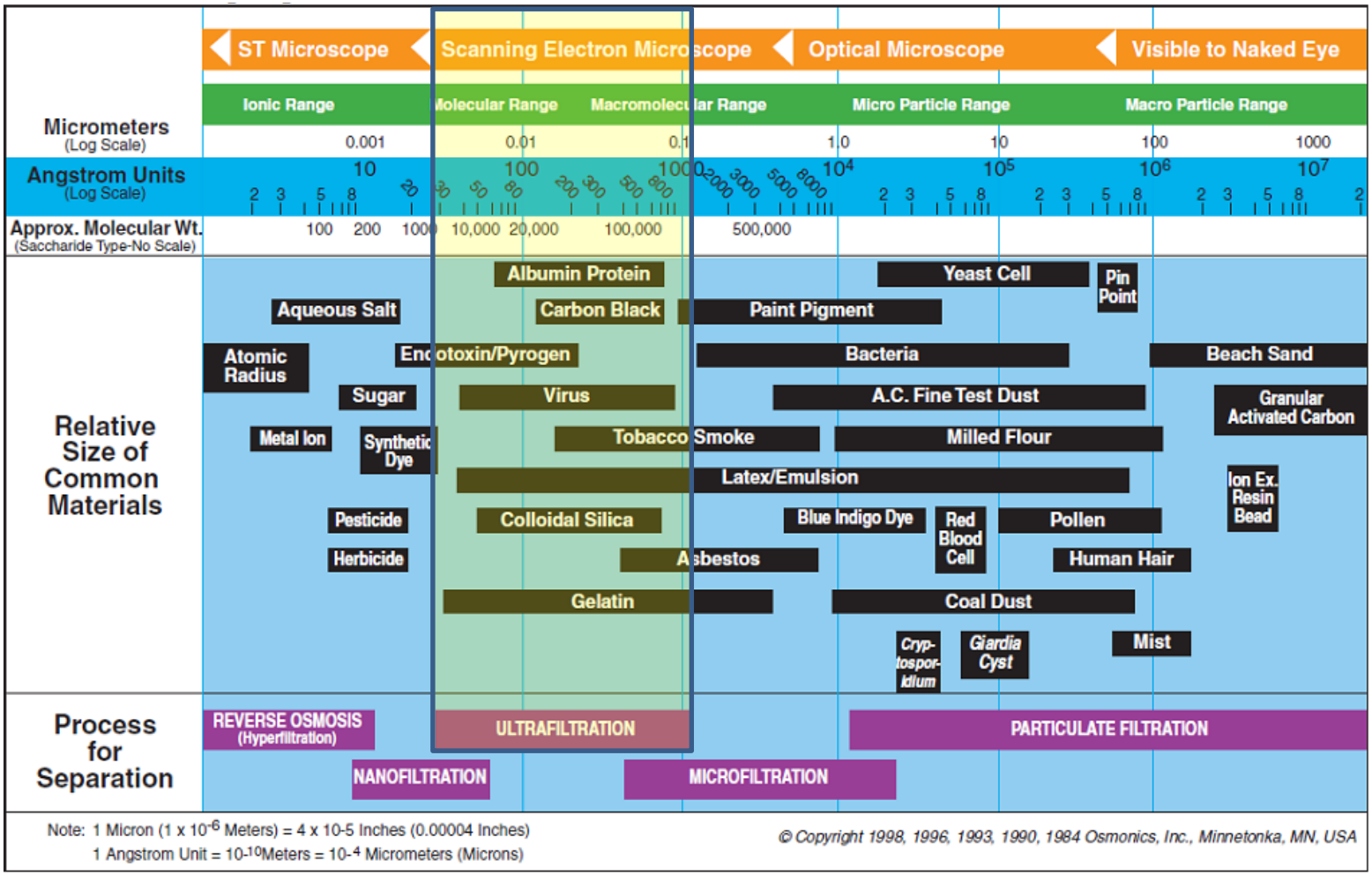




Ionics Freshwater Ltd. 2010

richwine environmental

MBR Treatment
Classes of Membrane Filtration

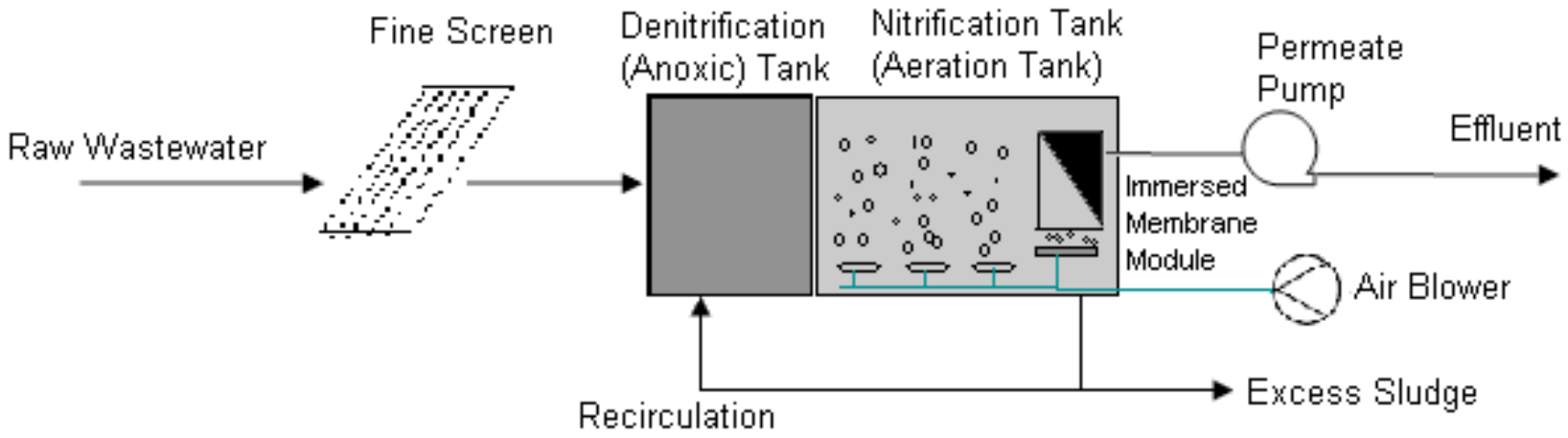


Note: 1 Micron (1 x 10^{-6} Meters) = 4 x 10-5 Inches (0.00004 Inches)
1 Angstrom Unit = 10^{-10}Meters = 10^{-4} Micrometers (Microns)

© Copyright 1998, 1996, 1993, 1990, 1984 Osmonics, Inc., Minnetonka, MN, USA

richwine environmental

MBR Treatment
Port Gamble MBR Treatment Process



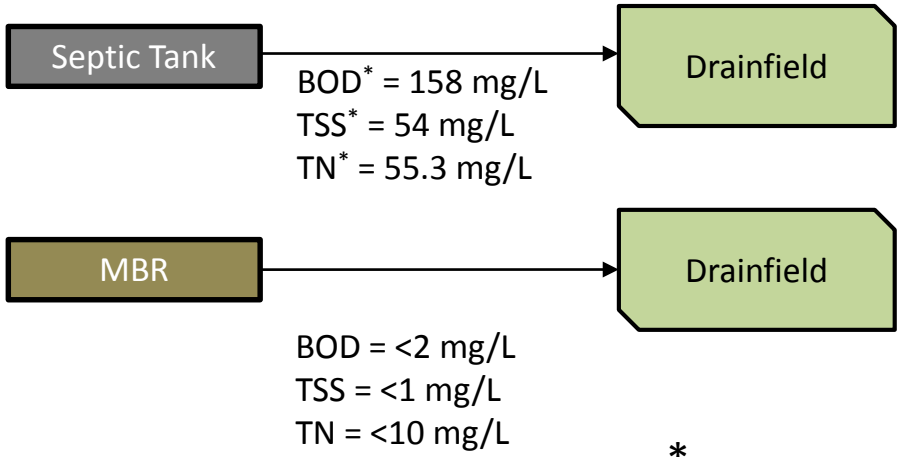
MBR Treatment
Ovivo MicroBLOX Plant

microBLOX®

richwine environmental

Septic Tank vs. MBR Treatment

Treatment Prior to Drainfield



*Values per DOH Basic Principles of Onsite Sewage

Drainfield Design

- Acceptable Loading Rates
  - Septic Tank – 0.6 gpd/ft^2
  - MBR – 5.0 gpd/ft^2

richwine environmental

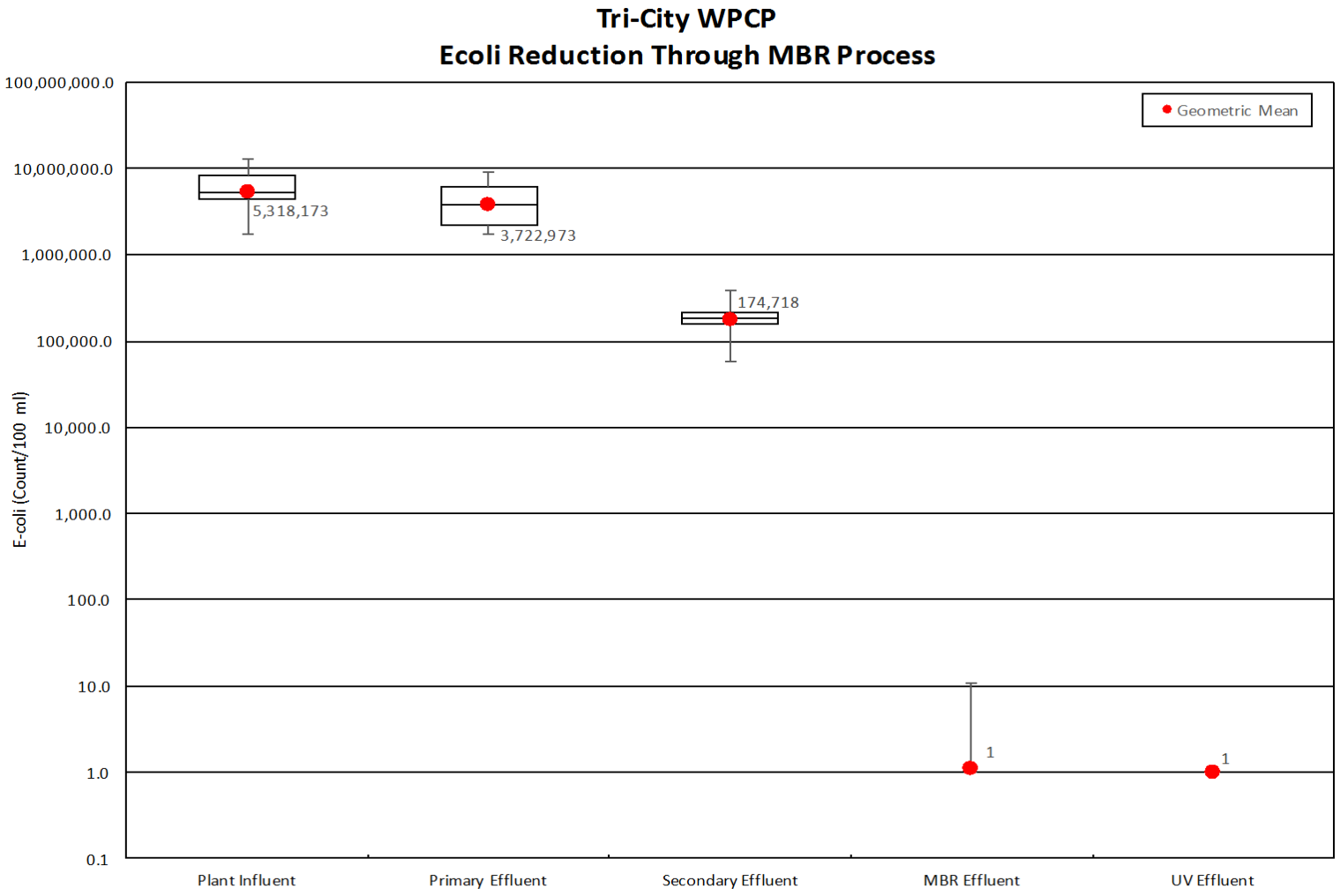
Port Gamble LOSS Permit Limits

Level HQE Treatment Permit Limits

Parameter	Septic Tank Effluent	Initial DRAFT LOSS Permit	Final DRAFT LOSS Permit	MBR Effluent
$cBOD_5$	158 mg/L	25 mg/L	5 mg/L	<2 mg/L
TSS	54 mg/L	30 mg/L	5 mg/L	<1 mg/L
Turbidity	-	-	-	<2 NTU
Total Nitrogen	55.3 mg/L	10 mg/L	10 mg/L	8 mg/L
Fecal Coliform	421,000 cfu/100 ml	50,000 cfu/100 ml	-	-
Total Coliform Median Maximum	 - -	 - -	 2.2 cfu/100 ml 23 cfu/100 ml	 <2.2 cfu/100 ml

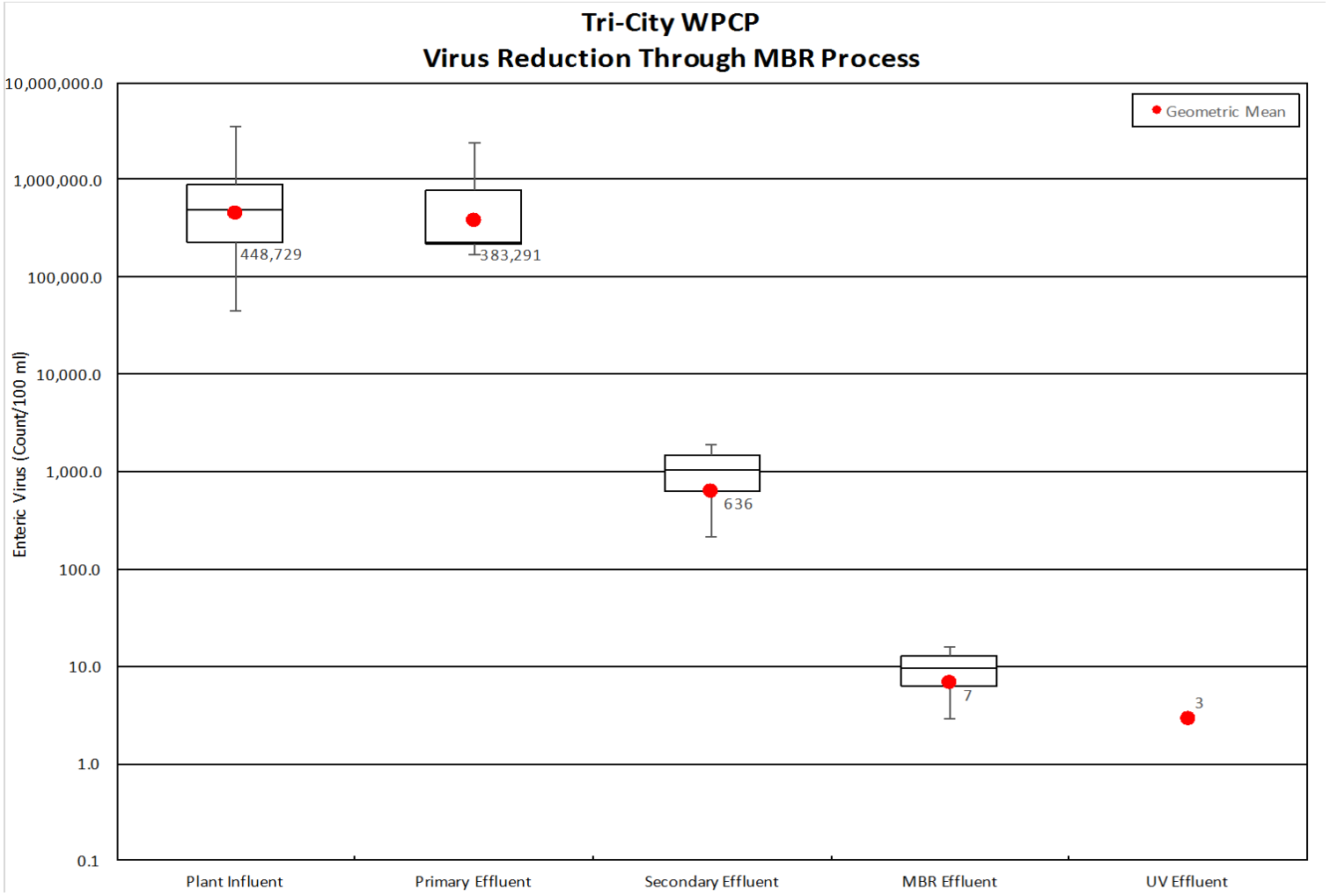
richwine environmental

E. coli Reduction Through MBR Process



richwine environmental

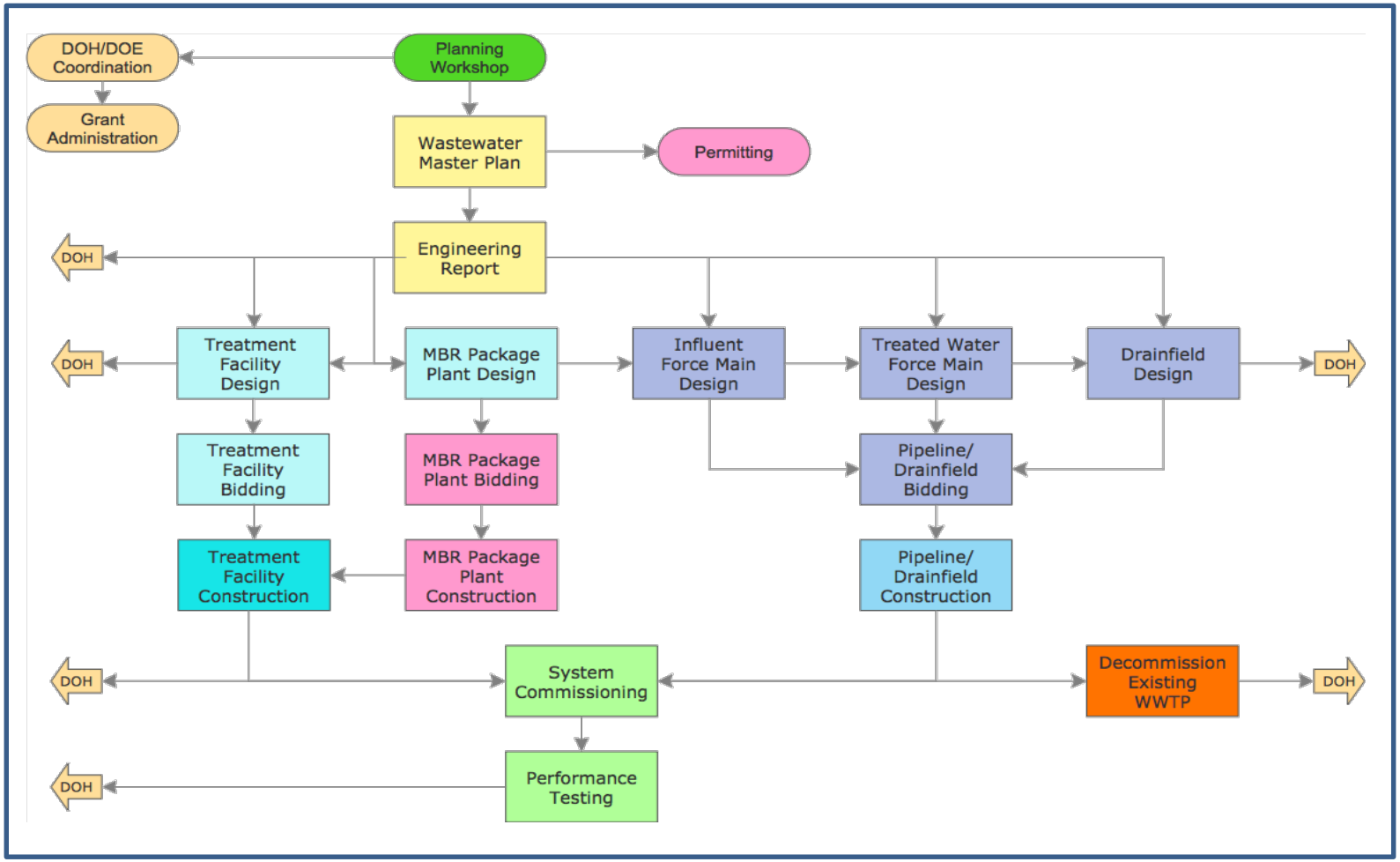
Virus Reduction Through MBR Process



richwine environmental

History of Project

History of Project
Project Plan



richwine environmental

Project Design Packages

Contract Package #1
MBR Package Plant

Contract Package #2
Influent Force Main

Contract Package #3
Hwy 104 Crossing

Contract Package #4
Treatment Facility

Contract Package #5
Treated Effluent Force Main

Contract Package #6
Drainfield

Contract Package #7
Standby Generators

Contract Package #8
Household Sumps

Other Items – (OPG)
Landscaping
Existing Plant Decommissioning
Outfall Removal

richwine environmental

History of Project
Project Permitting

Appropriation

SEPA
SDAP
Building Permits
Stormwater

SR104 Crossing Permit

Historical Preservation
Cultural Resources

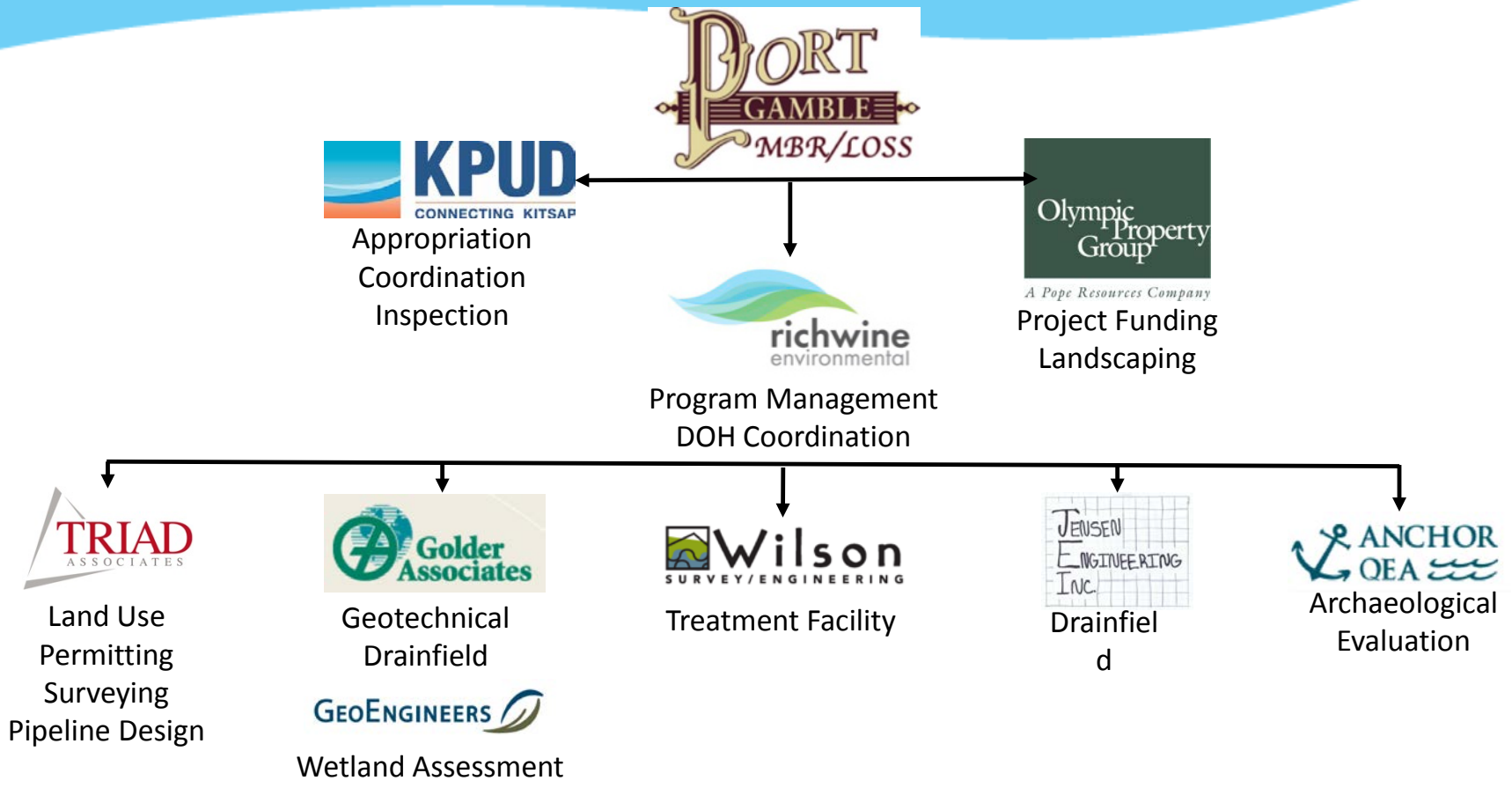
LOSS Permit
Engineering Approval
Design Approval
Construction Approval

Appropriation Oversight
Stormwater Permit

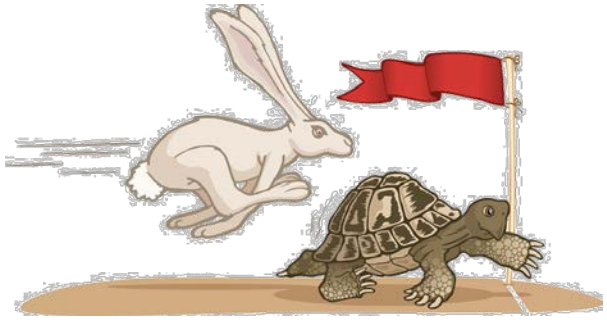
New Electrical Service

History of Project

Project Design



History of Project
Sequence of Events



- OPG Predesign Report (Sept. 12, 2012)
  - Selected septic tank and drainfield
  - Proposed Septic Tank Volume – 300,000 gallons
  - Tank Site – 39.47 acres
  - Drainfield – 63.23 acres
  - Total Acreage – 102.70 acres
- Site Risk Survey and Hydrogeologic Report (March 24, 2014)
  - Recommended treatment of total nitrogen to 8-mg/L
- KPUD Performs Project Review (Feb. 19, 2014)
- KPUD Evaluation of Treatment Technologies (April 23, 2014)
  - Technology selection dependent on system size and water quality

richwine environmental

History of Project
Sequence of Events (cont.)

- OPG-KPUD Coordination Meeting (Nov. 14, 2014)
- Project Planning Workshop (Nov. 21, 2014)
- MBR Procurement Workshops (Dec. 18-19, 2014)
- Wetland and Stream Baseline Data Report (Jan. 27, 2015)
- MBR Package Plant Bid Opening (Jan. 30, 2015)
- Value Engineering Workshop (March 27, 2015)
- KPUD wastewater authority in November 2015 election, 70% in favor
- Project Budget Approved (May 2016)
- Engineering Report and Design Approved by DOH (June 17, 2016)
- Wastewater Treatment Begins (April 12, 2017)
- Project Complete (June 30, 2017)

History of Project
Project Permitting

- Kitsap County
  - SDAP – Site Development Activity Permit
  - SEPA – State Environmental Policy Act
  - Building Permits
- WSDOT
  - Right of Way Permit
- Ecology
  - NPDES Permit – Stormwater Treatment
  - DAHP – Dept. of Archaeology and Historic Preservation
- PSE – Puget Sound Energy
  - Electric Service Application

- Dept. of Health
  - Predesign Report
  - Site Risk Survey and Hydrogeologic Report
  - Wetland and Stream Baseline Data Report
  - Critical Areas Assessment
  - Engineering Report
  - Management Plan
  - Monitoring and Sampling Plan
  - Geotechnical Report
  - Drainage Report
  - O&M Manual
  - Plans and Specification
  - LOSS Operating Permit
  - Public Domain and Proprietary Technology Approval
  - Sewage Tank Approval

History of Project
Project Construction

OVIVO MBR
ONE SYSTEM, MANY SOLUTIONS

CP#1 – MBR Treatment Plant

Seton CONSTRUCTION INC.

CP#2 Influent Force Main
CP#3 Hwy 104 Crossing
CP#5 Treated Water Pipeline
CP#6 Drainfield

MSI
McCLURE & SONS, INC.
INDUSTRIAL CONTRACTORS

CP#4 Treatment Facility
CP#8 Household

Cummins Power Generation

CP#7 Standby Generators

Olympic Property Group
A Pope Resources Company

Landscaping
Existing Plant Decommissioning
Outfall Removal

richwine environmental

Project Funding

Appropriation Funded

Contract Package #1
MBR Package Plant

Contract Package #2
Influent Force Main

Contract Package #3
Hwy 104 Crossing

Contract Package #7
Standby Generators

Engineering

KPUD Oversight

OPG Funded

Contract Package #4
Treatment Facility

Contract Package #8
Household Sumps

Contract Package #5
Treated Effluent Force Main

Contract Package #6
Drainfield

Other Items – (OPG)
Landscaping
Existing Plant Decommissioning
Outfall Removal*

*Outfall Removal Not Part of Project

richwine environmental

Project Cost To-Date Summary

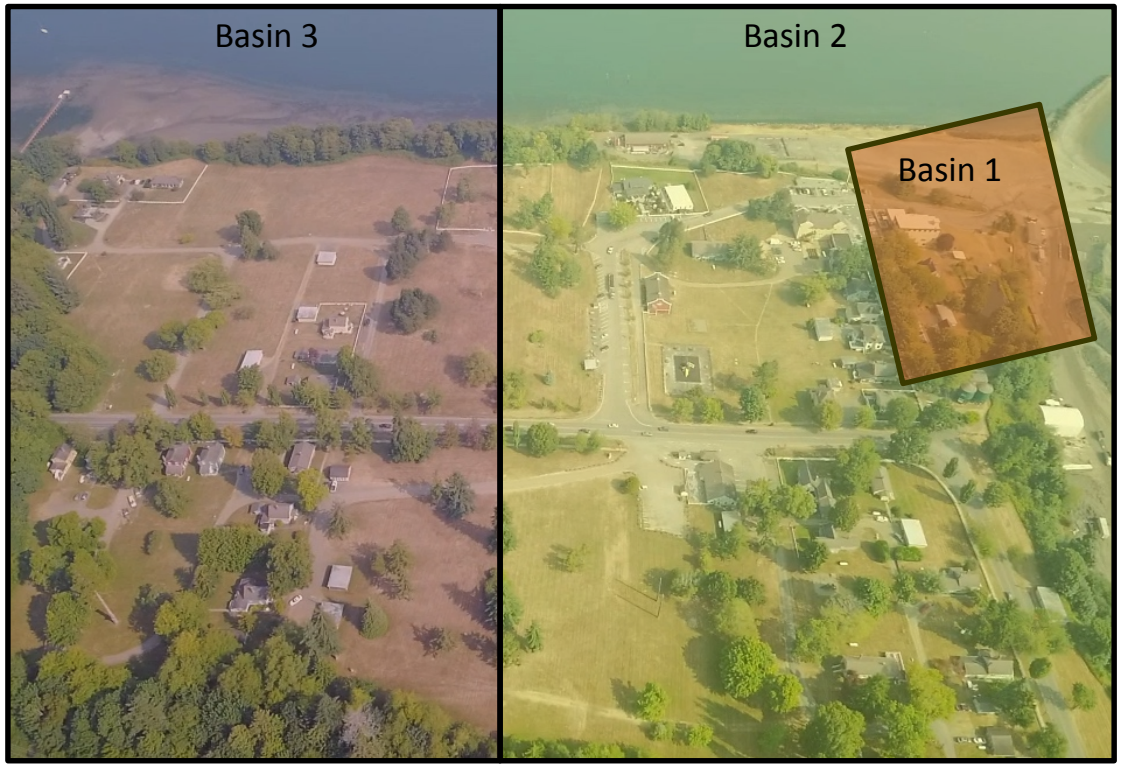
Project Element	Current Cost	% of Project	Status
Contract Administration	$157,904	3.0%	Ongoing
Planning and Permitting	$61,357	1.1%	Complete
Engineering	$457,370	8.6%	Complete
Archeological Issues	$87,421	1.6%	Complete
CP#1 – MBR Package Plant	$901,668	16.9%	Ongoing
CP#2 & CP #3 – Influent Force Main	$234,343	4.4%	Complete
CP#4 – Treatment Facility	$2,877,036	53.8%	Ongoing
CP#5 – Treated Effluent Pipeline	$52,000	1.0%	Complete
CP#6 - Drainfield	$294,750	5.5%	Complete
CP#7 – Standby Generators	$85,862	1.6%	Complete
Other Costs	$96,000	1.8%	Complete
Commissioning and Closeout	$157,904	3.0%	Ongoing
Project Total	$5,344,504	100.0%	-

Port Gamble LOSS

- Collection System
  - 2 Grinder Pump Stations
  - Original Gravity System
  - 2 Lift Stations
  - Collection Pump Station
- Influent Force Main
- MBR Treatment Facility
- Treated Effluent Force Main
- Drainfield

richwine environmental

Collection System Basins



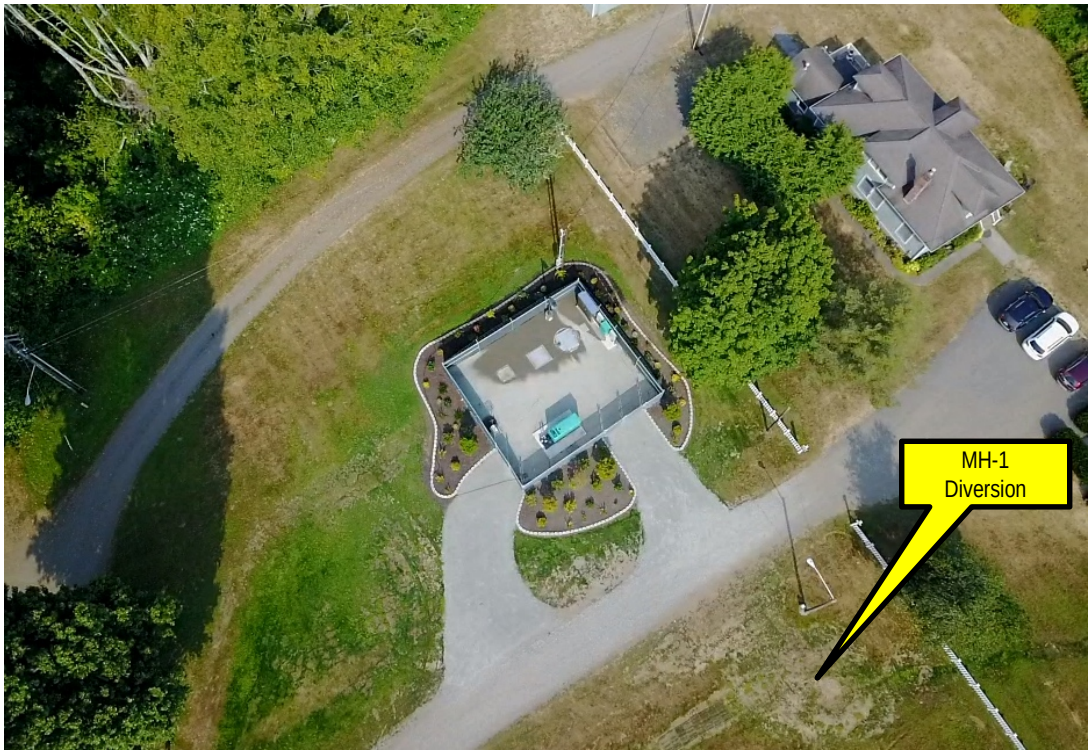
Collection System

richwine
environmental

Lift Station No. 2

Lift Station No. 1

Collection Pump Station



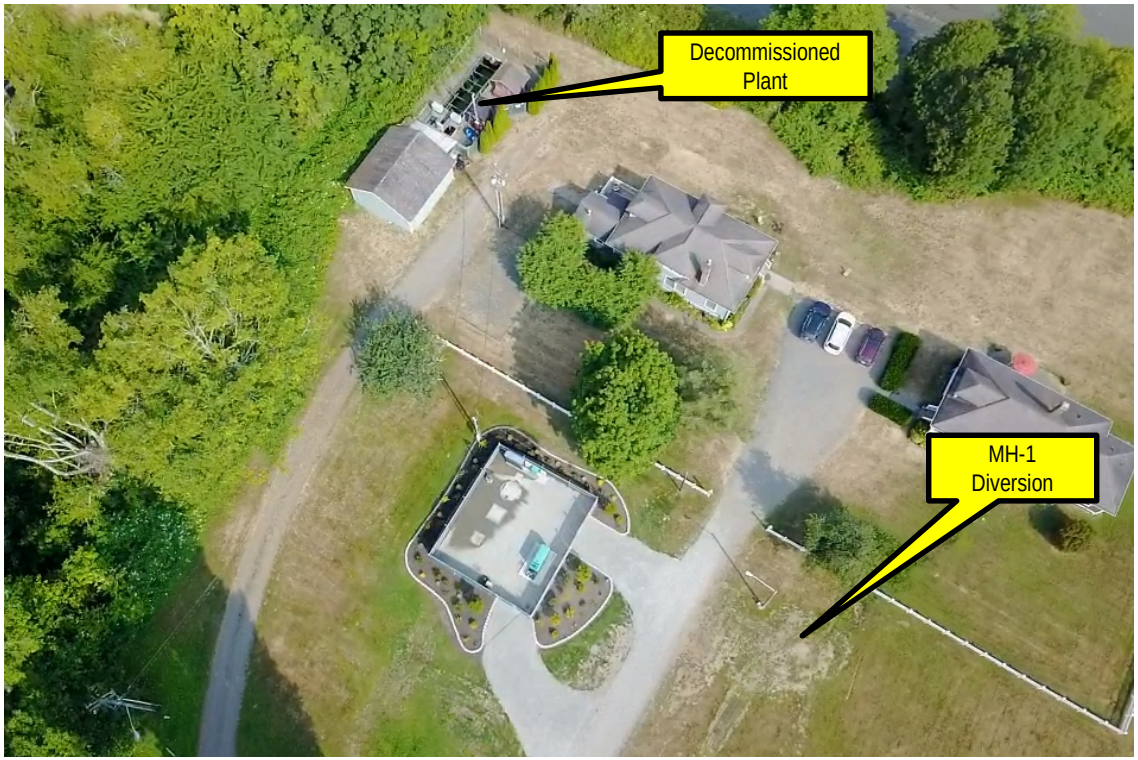
MBR Treatment Plant

richwine environmental

Drainfield

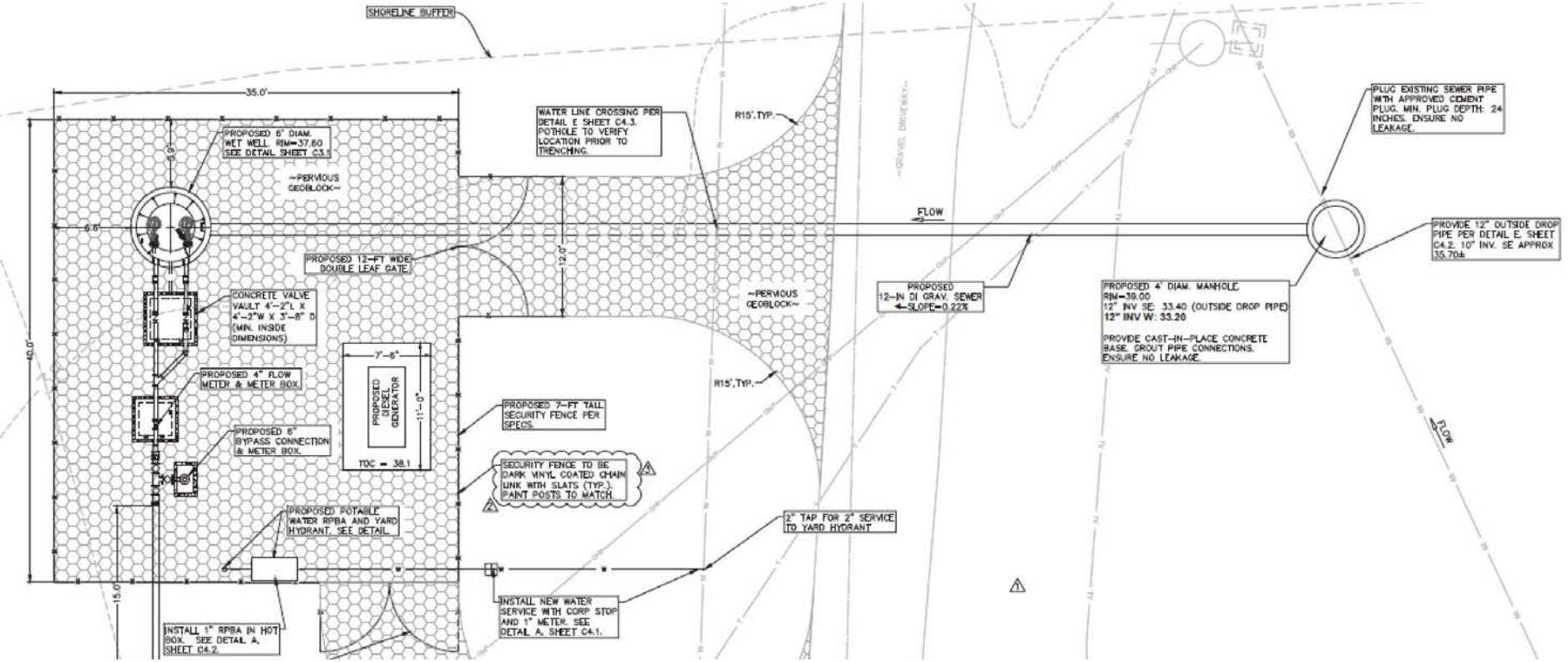
Plant Decommissioning

Existing Plant



richwine environmental

Diversion to Collection Pump Station



richwine environmental

Outfall Removal

richwine environmental

Data Reporting

- Excel Spreadsheet
- Salinity Test

O&M Manual

Questions?