Recycling and Reuse:

Comparing OR & WA

22 October 2024

ENVIRONMENTAL MANAGEMENT SYSTEMS, INC.

National Onsite Wastewater Recycling Association

MEGA Conference October 2024

Onsite Wastewater Recycling Professionals

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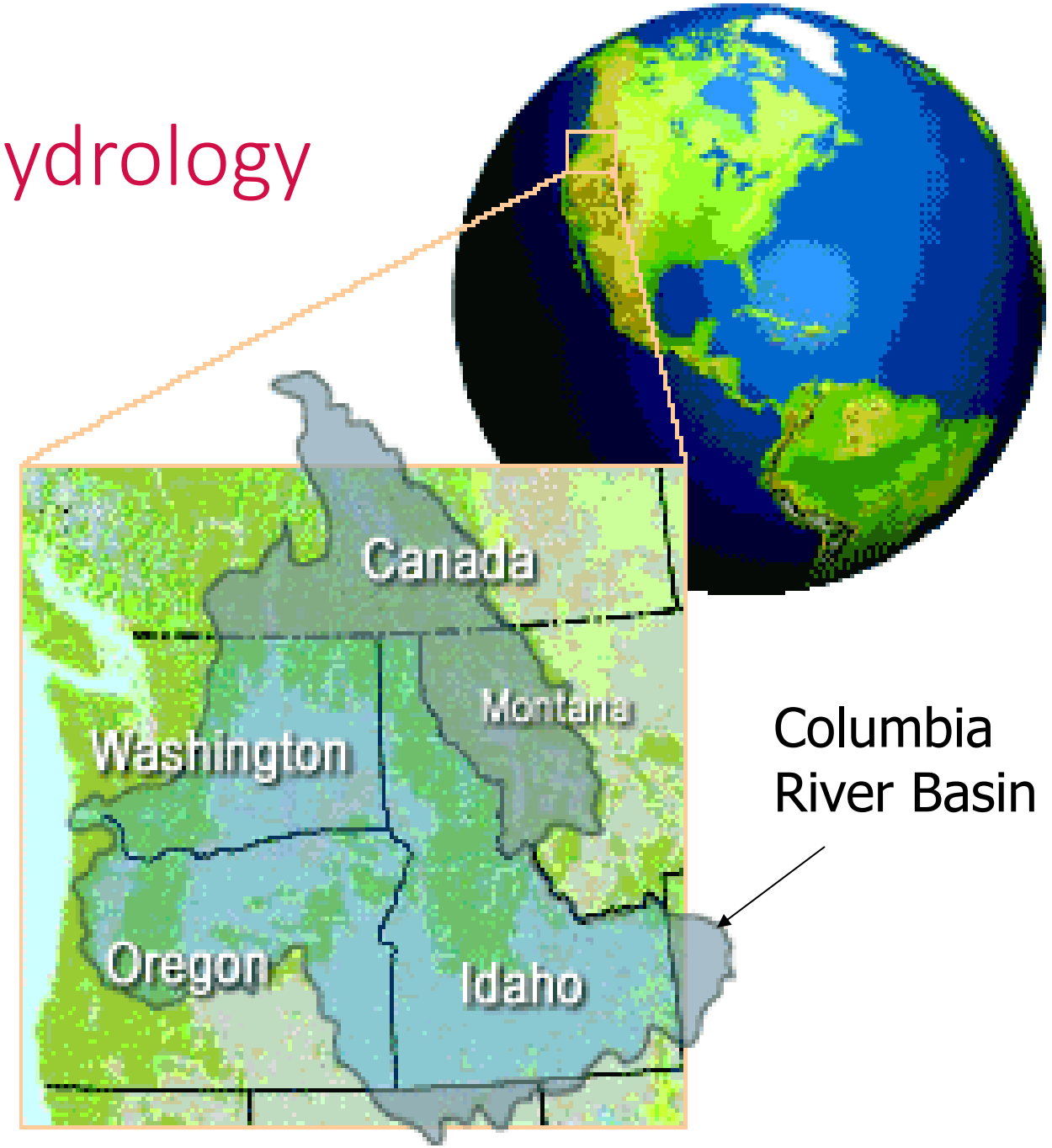
OR REHS / WA Professional Onsite Wastewater Treatment System Designer

This Presentation Represents the Opinion of the Author and Does Not Reflect the Opinion of NOWRA, its Members or Sponsors of the 2024 Mega-Conference.

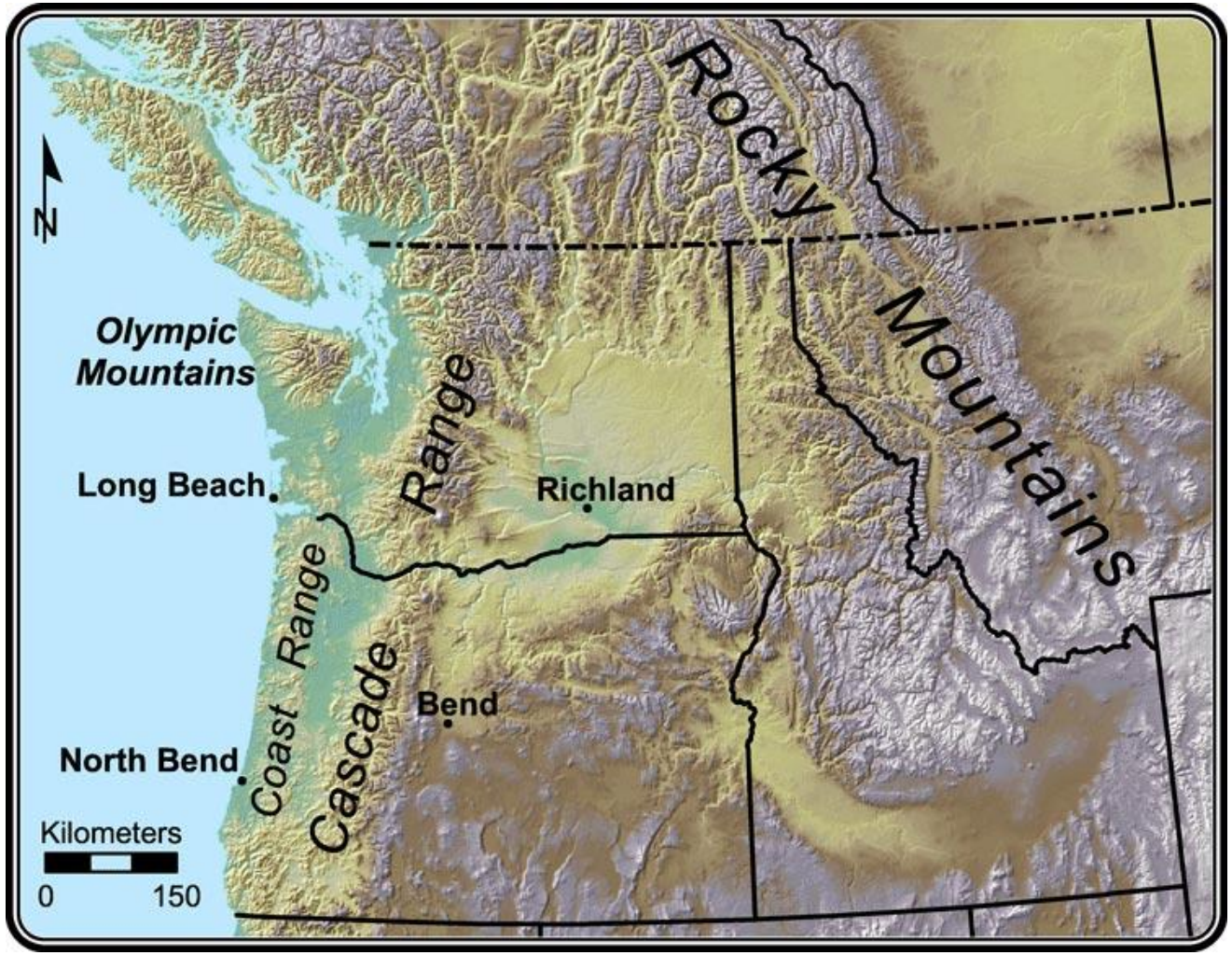
Objectives:

- Describe Onsite Water Recycling & Reuse
- Compare and Contrast Oregon and Washington
- Officially Recognize that Modern Onsite Wastewater Systems are fully capable of Providing Beneficial Reuse.
- Discuss Obstacles to Implementation of on Onsite Reuse
- Outline Pathway to Implement Recycling and Reuse Onsite

NW Hydrology



NW Geography / Geology



NW Climate

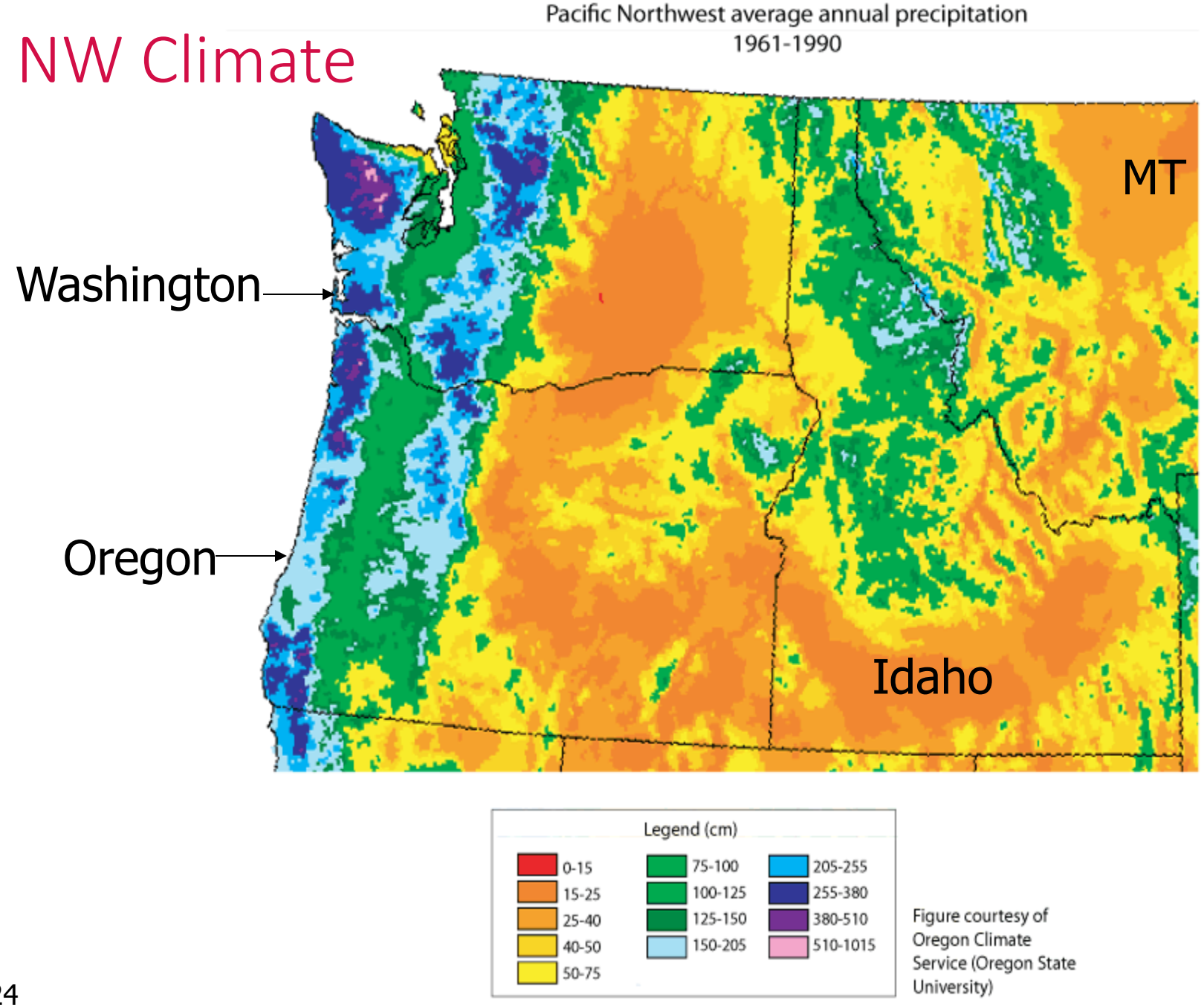


Figure courtesy of Oregon Climate Service (Oregon State University)

Climate

	OR	WA
HIGH TEMP	119	118
LOW TEMP	-54	-48
Highest Avg	55	56
Lowest Avg	38	37
Consecutive Days > 90 degrees	74	48
Consecutive Days < 32 degrees	209	201
Max Annual Precipitation	204	185
Min Annual Precipitation	3	3
Max 24 hr Precipitation	12	14
Highest Avg Annual Precip	131	137
Lowest Avg Annual Precip	7	7
Consec. Days Measurable Precip	79	55
Consec. Days No Precip	141	140
Max Winter Snowfall	836	1140
Max 1-day Snowfall	37	52
Highest Average Annual Snowfall	530	680

Rounded to nearest integer

EPA (U.S. Environmental Protection Agency)	**Definition:** Wastewater reuse, also known as water recycling, involves the process of treating wastewater to make it suitable for a specific beneficial purpose. **Key Concepts:** The EPA emphasizes the potential for wastewater reuse to conserve water, reduce wastewater discharge, and protect sensitive ecosystems. Treatment levels vary based on the intended reuse application, from basic treatment for irrigation to advanced processes for potable water supplies. **EPA does not require or restrict any type of reuse.**

Beneficial Purpose: IRRIGATION	Class A	Class B	Class C	Class D	Non-DIsinfected
Non-Food Crops not Intended for Human Consumption	Yes	Yes	Yes	Yes	Yes
Trees	Yes	Yes	Yes	Yes	NO
Sod	Yes	Yes	Yes	Yes	NO
Pasture for Animals	Yes	Yes	Yes	Yes	NO
Processed Food Crops	Yes	Yes	Yes	NO	NO
Orchards or Vineyards	Yes	Yes	Yes	NO	NO
Golf Courses	Yes	Yes	Yes	NO	NO
Agricultural or Horticultural Use	Yes	NO	NO	NO	NO
Parks, Playgrounds, School Yards, Residential Landscapes,	Yes	NO	NO	NO	NO

Key Points:

- **EPA: Focuses on the broad potential for wastewater reuse across various sectors, emphasizing conservation and ecosystem protection.**

- **Oregon DEQ: Prioritizes strict quality standards and the sustainable management of resources, with diverse applications from irrigation to industrial use.**

- **Washington DOH: Emphasizes public health protection and the role of wastewater reuse in addressing water scarcity, with particular attention to non-potable applications.**

- **Shared goal of safely and effectively reusing treated wastewater while accounting for specific regional priorities and regulatory frameworks.**

Permitting Organization

OREGON

- All Wastewater Permits are "**DEQ** Permits"
- Local Jurisdictions Can Contract as a **DEQ Agent** to Implement Prescriptive Codes for Onsite Soil-Based Systems.
- Variances, Non-Approved and Larger than 2,500 gpd are DEQ Actions.
- WPCF permits & NPDES permits

WASHINGTON

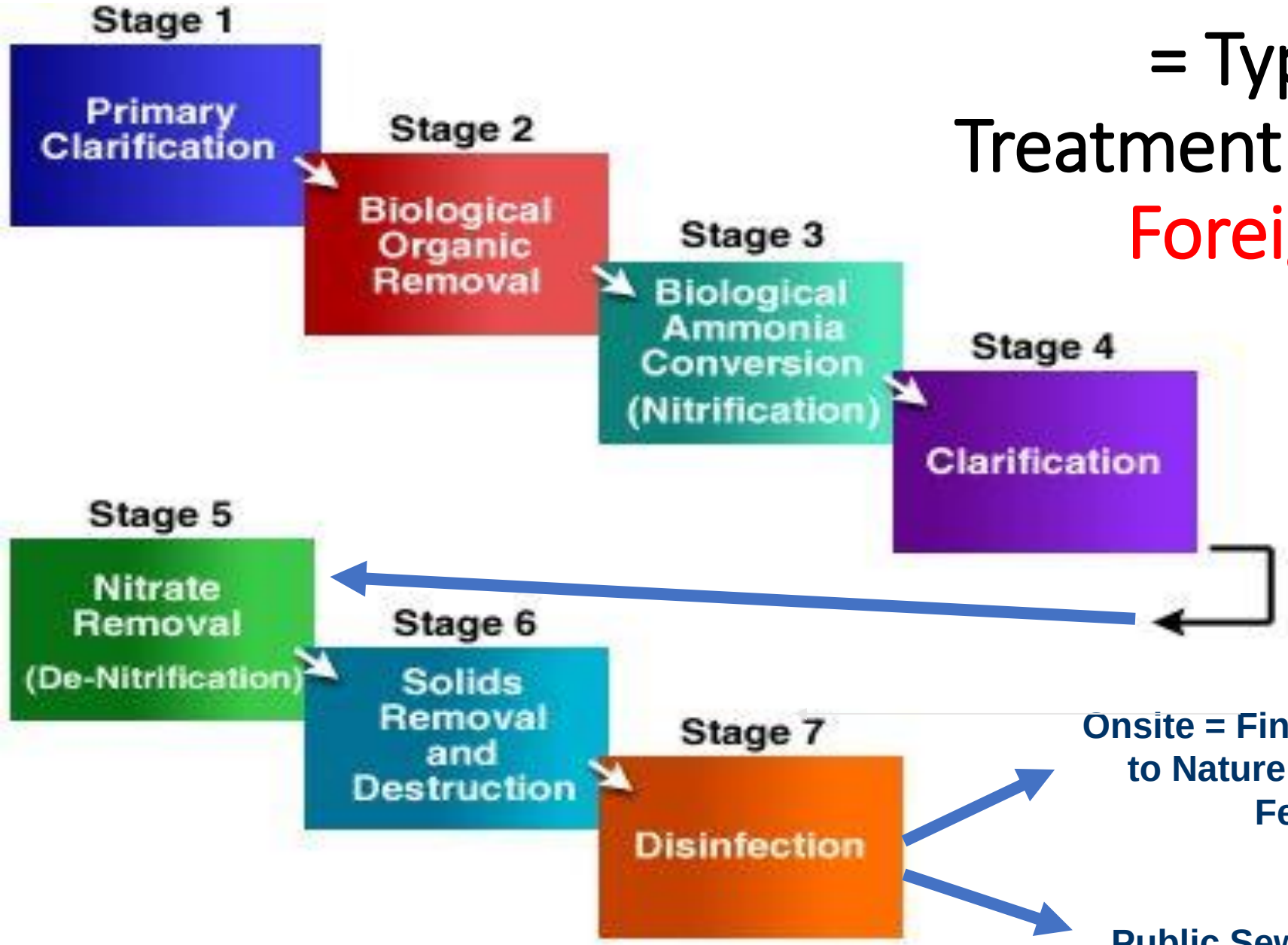
- **Local Jurisdictions** Can Enact Local Rules Consistent with State Statutes and Codes for Systems <3,500 gpd.
- Waiver System through **WADOH**
- LOSS >= 3,500 to 100,000 gpd Systems require WA DOH Permits
- >= 100,000 gpd require **WA DOE** Permits.

Oregon DEQ (Department of Environmental Quality)	**Definition:** Wastewater reuse in Oregon is the practice of treating and reusing municipal, industrial, and agricultural wastewater for beneficial uses, such as irrigation, industrial cooling, and environmental enhancement. **Key Concepts:** Oregon's DEQ focuses on ensuring that reused water meets strict quality standards to protect public health and the environment. Regulations are tailored to different reuse applications, with a strong emphasis on sustainability and resource management.

Washington DOH (Department of Health)	**Definition:** The reuse of treated wastewater in Washington involves the application of treated effluent for various non-potable uses, including irrigation, industrial uses, and environmental restoration, with a focus on protecting public health and water resources. **Key Concepts:** The Washington DOH highlights the importance of rigorous treatment and monitoring processes to ensure that reused water is safe for its intended applications. The agency also promotes water reuse as a strategy for addressing water scarcity and enhancing environmental resilience.

WA Work in Progress

- ‘Reclaimed Water’ (RW) permits are mostly issued by the Department of Ecology to municipal systems. Reclaimed water - Washington State Department of Ecology.
- However, the rule (chapter 173-219 WAC) does provide for generating reclaimed water with a Large Onsite Sewage System (LOSS) - with WADOH permits.
- According to WADOH staff: “I believe we have only one permit for an Onsite Recycling & Reuse System.”
- WADOH working on a rule for on-site nonpotable water systems for a regulatory pathway for more advanced water treatment systems to be used in buildings at a variety of scales-but not single-family residences.
- This rule is the result of an amendment to the reclaimed water act that added RCW 90.46.290



= Typical Steps in Treatment : NONE are Foreign to OWTS!

Onsite = Final Soil Treatment & Return to Nature = REUSE Is an Inherent Feature of OWTS !

v.

Public Sewer = Discharge to Water. Limited Opportunities to REUSE.

Biological Treatment:

- Activated Sludge Process:
  - microorganisms break down wastewater in an aerated tank.

- Sequencing Batch Reactor (SBR):
  - process treats wastewater in batches in a single tank.

- Trickling Filter:
  - spread over a media bed that contains a biofilm of microorganisms that degrade organic matter.

Chemical Treatment:

- Coagulation and Flocculation: coagulants to destabilize and aggregate suspended solids, allowing them to settle and be removed more easily.

- Chemical Precipitation: chemicals to wastewater to induce the formation of insoluble particles (precipitates) that can be separated from the water.

- Disinfection: The use of chemicals (e.g., chlorine, ozone, ultraviolet light) to destroy or inactivate pathogens in the wastewater.

Advanced Treatment:

- Membrane Filtration: fine pores separate suspended solids, bacteria, and other contaminants from wastewater.

- Advanced Oxidation Processes (AOPs): Employing chemical reactions (such as ozonation or UV/hydrogen peroxide) to break down persistent organic compounds and eliminate microorganisms.

- Adsorption: activated carbon or other materials to adsorb and remove organic compounds and contaminants from wastewater.

1. Wastewater Reuse Specific Technologies:

    1. Reverse Osmosis (RO): A high-pressure membrane filtration

    2. UV Disinfection: ultraviolet (UV) light to disinfect and inactivate pathogens, making it safe for specific reuse purposes.

    3. Advanced Electrochemical Processes: use electrical current to treat wastewater and remove contaminants.

Compare Oxidation and Aeration for Wastewater Treatment

Both oxidation and aeration are essential components of wastewater treatment, but they serve related but somewhat different roles.

Aeration is primarily used to support biological processes by supplying oxygen, making it critical for the treatment of organic matter.

Oxidation, on the other hand, is a chemical process that targets specific pollutants, making it ideal for treating more complex or toxic substances that cannot be easily biodegraded. The choice between oxidation and aeration depends on the specific needs of the wastewater treatment process and the nature of the pollutants present.

WAC 173-219-330 Reclaimed water performance standards.

All Class A and B Reclaimed Water … must meet the technology-based performance standards listed in Table 1 & Table 2 for the Class of Reclaimed Water generated at the facility.

Table 1: Minimum Biological Oxidation Performance Standards

Biological Oxidation		
Parameter[1]	**Minimum Biological Oxidation Performance Standard**	
Dissolved Oxygen	Must be measurably present	
BOD_5	**Monthly Average**	**Weekly Average**
	30 mg/L	45 mg/L
$CBOD_5$	25mg/L	40 mg/L
TSS	30 mg/L	45 mg/L
pH	**Minimum**	**Maximum**
	6 s.u.	9 s.u.
pH (Groundwater recharge)	6.5 s.u.	8.5 s.u.

[1] The parameter must be measured at the end of the unit process or alternative monitoring location as set in a reclaimed water permit.

Figure 1
Introduction of reclaimed water to Bell Creek (Photo credit: Gray & Osborne, Inc.)

Figure 2
Sequim Water Reclamation Facility expansion (Photo credit: Gray & Osborne, Inc.)

WA
PUBLIC SEWER
Reuse Plan

City of Sequim's Expanded Water Reclamation Facility and Upland Reuse System

Standards are Lower Than Onsite Systems BEFORE Final Soil Treatment Component.

We Can Do This !

Table 1 Reclaimed Water Quality Requirements

Parameter	Effluent Limit	
	Monthly Average	Weekly Average
BOD_5 (mg/L)	30	45
TSS (mg/L)	30	45
D.O. (mg/L)	Must be present	
Filtration	**Monthly Average**	**Sample Maximum**
Turbidity (NTU)	2	5
Disinfection	**7-Day Median**	**Sample Maximum**
Total Coliform (MPN/ 100 mL)	<2.2	23
Nitrogen Removal	**Monthly Average**	**Daily Maximum**
Ammonia (mg/L)	3.3	5.7
Total Nitrogen (mg/L)	10	N/A

Restaurant – OR

- Failing System w No Room for More Drainfield.
- 5,500 gpd: Existing Septic & Grease Tanks,
- One Point of Entry 2,335 Ft Serial Drainfield
- Retro-Fitted Aerobic Treatment and Recirculating Textile Filter.
- Effluent: <1 ppm Prior to Drainfield.

- Split Drainfield for Equal Distribution Pumping to Cells.

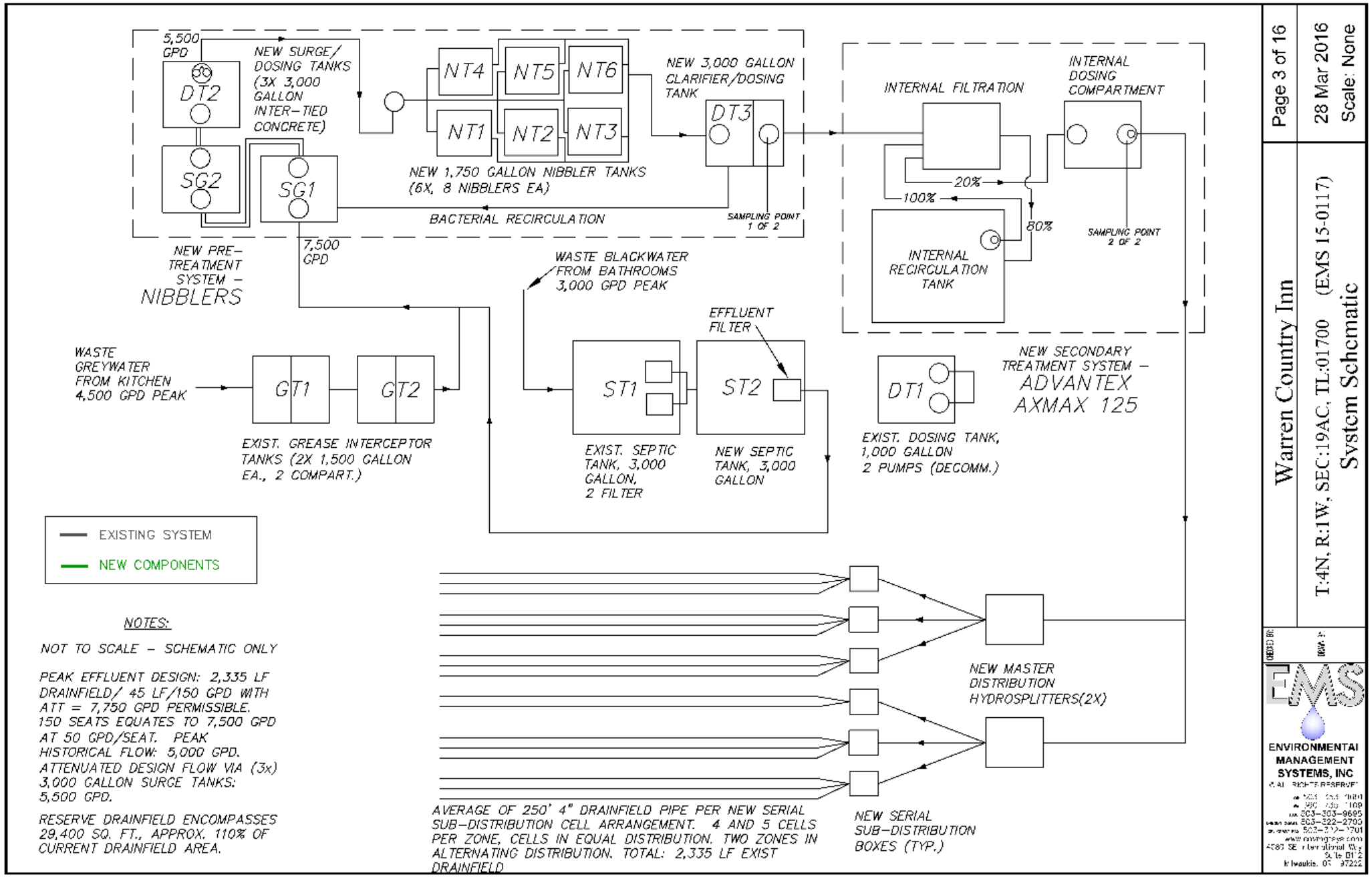
Typical Designs Achieve 5 to 10 ppm for BOD5 & TSS

Performance Parameters:	Starting Wastewater	Allowed Maximum:	Tested Average Effluent:
Biochemical Oxygen Demand (BOD5)	500 mg/L	20 mg/L	0.36 mg/L
Total Suspended Solids:	300 mg/L	20 mg/L	0.0 mg/L
Total Kjeldahl Nitrogen	50 mg/L	25 mg/L	0.77 mg/L

EMS Performs On-Going Operational Monitoring, Maintenance & Reporting

Restaurant Bar Repair 5,500 gpd

On-Site Community Has the Knowledge & Technology to Meet ReUse Standards



Both Oregon and Washington Have Laws that Support Reuse. Rules are Similar – Focused on Public Facilities, but Neglect to Include OWTS.

- Reuse rules and policies in OR & WA. Mostly, these rules are oriented on municipal facilities and allow beneficial uses onsite with appropriate provisions for protecting the public and environment.
- Most municipal systems are centralized, so lack opportunities for reuse. It is possible to pump effluent back to the sources, but rarely cost-effective to do so.
- Why Centralize When Modern Onsite Can Do It Now?

In Oregon, water reuse provisions can be applied to onsite wastewater treatment systems primarily through the reuse of treated graywater:

Types of Graywater: Oregon recognizes three types of graywater, each with different levels of treatment and approved end-use applications:

Type 1: No treatment required, used for subsurface irrigation.

Type 2 and 3: Require treatment systems certified to NSF/ANSI Standard 350, used for surface drip, subsurface and sprinkler landscape irrigation, ponds (not intended for human contact), vehicle and sidewalk washing, toilet and urinal flushing, and fire suppression systems[1].

2. Regulatory Framework: The Oregon Administrative Rules (OAR) 340-053 outline the requirements for graywater reuse and disposal systems. These systems must meet all applicable provisions of the Clean Water Act (CWA) and state water quality standards[1].

3. Permits and Plans: Oregon requires a National Pollutant Discharge Elimination Systems (NPDES) permit or a Water Pollution Control Facilities (WPCF) permit, along with a "Recycled Water Use Plan"[2].

4. Applications: Approved applications for treated graywater include:

1. **Irrigation**: Surface drip, subsurface, and sprinkler landscape irrigation.
2. **Non-potable Uses**: Vehicle and sidewalk washing, toilet and urinal flushing, and fire suppression systems[1].

Implementing these provisions involves ensuring that the treatment systems are properly designed, installed, and maintained to meet the required standards. This helps in promoting sustainable water management practices while protecting public health and the environment.

Oregon – System Favors Municipal Systems, But Onsite Can Qualify.

1.Municipal Systems: These systems typically require more comprehensive permits, such as the National Pollutant Discharge Elimination System **(NPDES)** permits, due to their larger scale and the potential for greater environmental impact.
2.Onsite Systems: While the focus is often on municipal systems, onsite wastewater treatment systems can also obtain permits for graywater reuse. These permits are generally less complex but still require adherence to specific standards and regulations to ensure safe and effective reuse. These systems must meet the standards set forth in OAR 340-053 and may require a Water Pollution Control Facilities **(WPCF)** permit
3.Regulatory Requirements: Both municipal and onsite systems must comply with the Oregon Administrative Rules (OAR) and the Clean Water Act (CWA). The level of treatment required and the specific reuse applications permitted can vary based on the type of system and the intended use of the treated water.
4.Graywater Reuse: Onsite systems can be designed to treat and reuse graywater for non-potable applications such as irrigation, toilet flushing, and vehicle washing.

While the permitting process is more detailed for municipal systems, there are still pathways for onsite wastewater treatment systems to obtain permits for water reuse, particularly for graywater applications.

WA

TABLE 1. Treatment Standards 1 and 2

(From WSDOH. List of Approved Systems and Products. November 2001)

Standard	Treated effluent from Alternative On-site Sewage Systems Must meet (or exceed) these performance standards:		
	BOD_5 (5-day Biochemical Oxygen Demand) Maximum 30-day average (mg BOD / liter Effluent)	TSS (Total Suspended Solids) Maximum 30-day average (mg TSS / liter Effluent)	Fecal Coliform Maximum 30-day geometric mean, (Colonies/100 ml Effluent)
Treatment Standard 1:	< 10 mg *	< 10 mg	< 200
Treatment Standard 2:	< 10 mg *	< 10 mg	< 800

* A 30 day average of less than 8.3 mg /L of carbonaceous biochemical oxygen demand (5-day $CBOD_5$) will be accepted in lieu of the BOD_5 value when data are submitted in the course of NSF Standard No. 40 testing and reporting protocols.

Oregon Administrative Rules - Chapter 340
Division 71 - Onsite Wastewater Treatment Systems

- OAR Division 71
  - Rules based on Oregon Revised Statutes
  - Current Tables 9A-9F with fees
- **340-071-0135 Approval of New or Innovative Technologies, Materials, or Designs for Onsite Systems**
- Division 73 – Construction Standards
- Chapter 340, Division 55 RECYCLED WATER USE
- Onsite Systems Inherently Reuse Water
- All the technology exists to treat & reuse onsite.

Oregon TREATMENT & DISINFECTION IN ONSITE WASTEWATER TREATMENT DISPOSAL SYSTEMS

Biological Treatment Typically Achieves Better than Treatment Standards for Non-Reuse / Disposal Systems of the following:

Oregon TS2		Typical Results
BOD5	<20mg/L	<10mg/L
TSS	<20mg/L	<10mg/L
TN	<30mg/L	<10mg/L

Disinfection to 99% effectiveness via

- Ultra Violet Rays
- Ozone

Onsite Systems Rarely: use ANY Chlorine or Iodine

Proprietary System Approvals

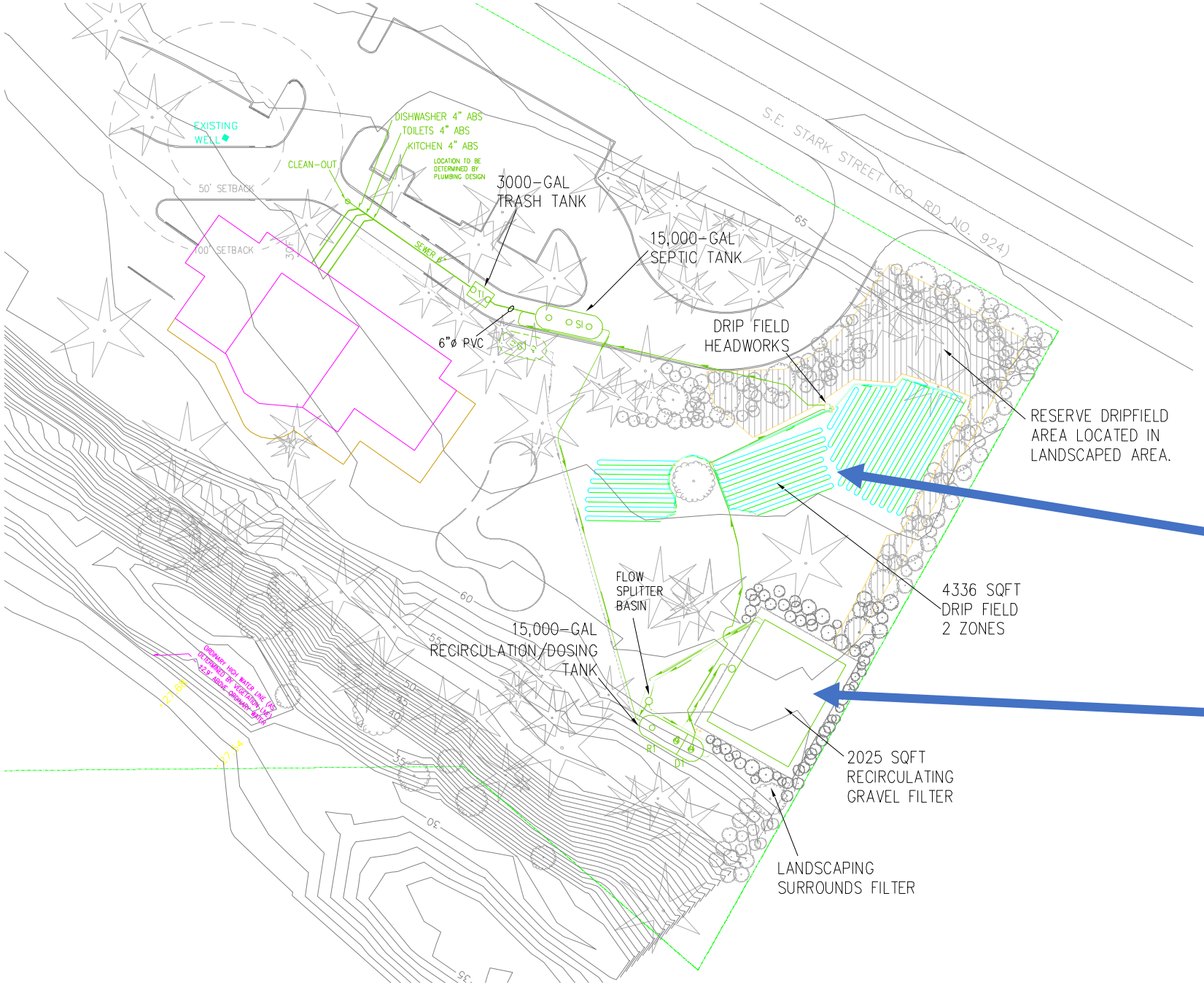
- NSF/ANSI 40 (or equivalent) for Residential on-site systems is recognized as the standard for the residential strength wastewater treatment devices.

- NSF/ANSI 245 for nitrogen. Includes Standard 40 and provides 50% total nitrogen reduction.

- **NSF/ANSI 350 Onsite Residential and Commercial Water Reuse Treatment**
  - None of these address effluent as it moves through the soil.

Restaurant when completed, viewed from RGF.

Dripfield among trees on right.



2005 Oregon Restaurant & Bar with Large Events 5,000 gpd

Subsurface Dripfield

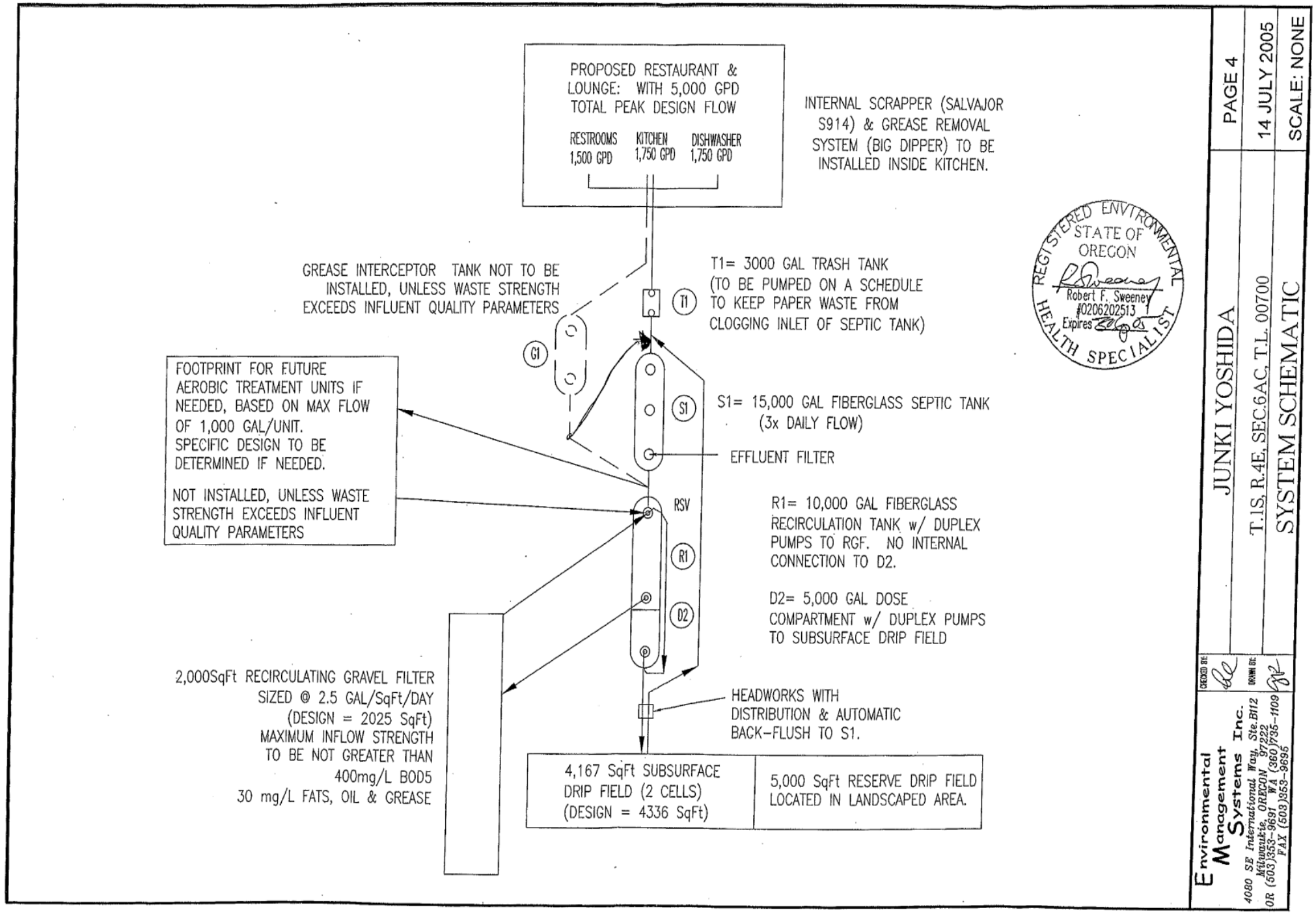
Recirculating Gravel Filter

2005 Oregon Restaurant Schematic

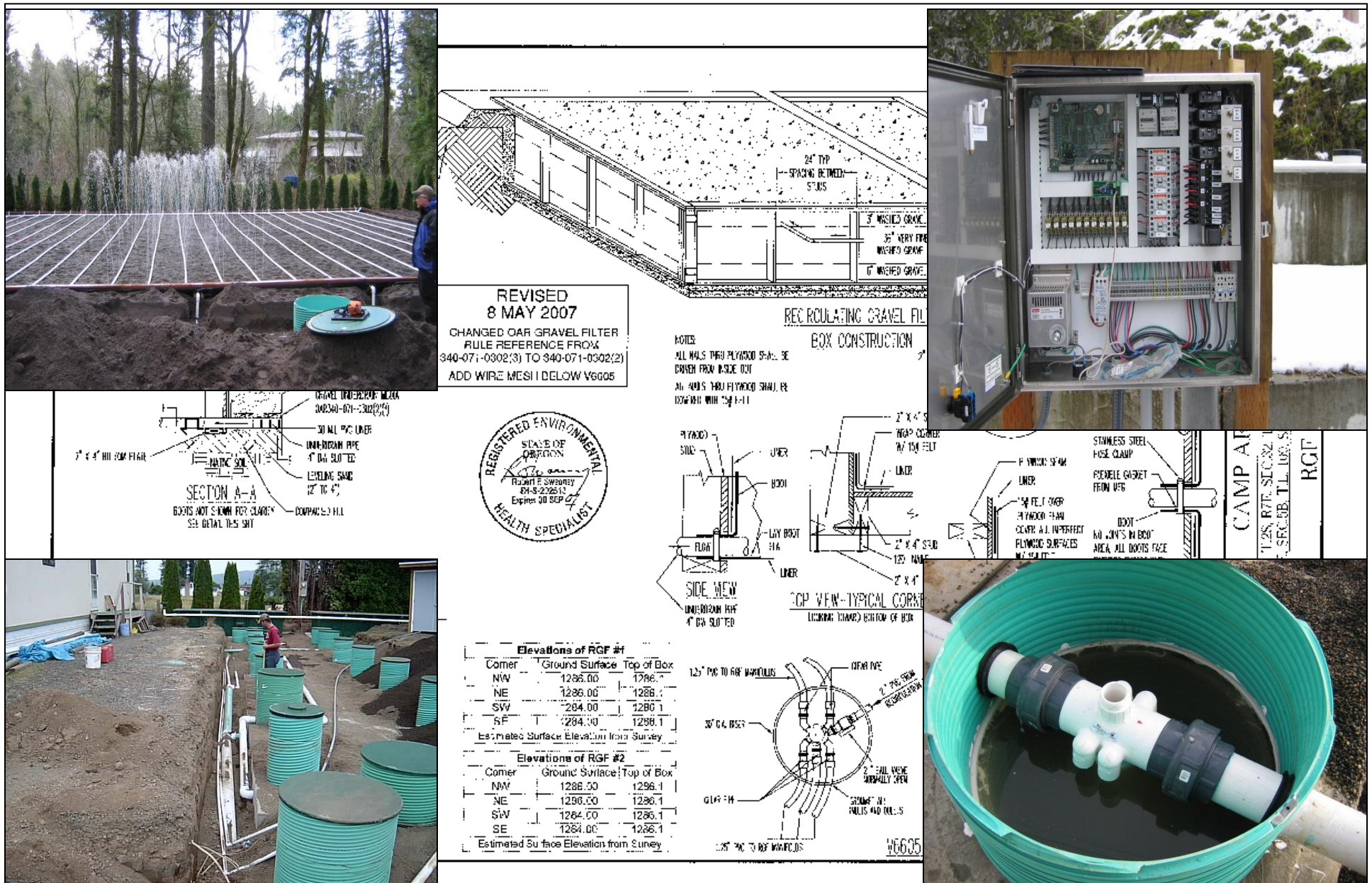
Dec 2023 Sampling Results:
BOD5 In = 771 mg/L
BOD5 Out= ND

TSS In = 52 mg/L
TSS Out = ND

TKN Out = 0.79 mg/L
NH4 Out = 0.023 mg/L
NO3-N Out = 3.4 mg/L

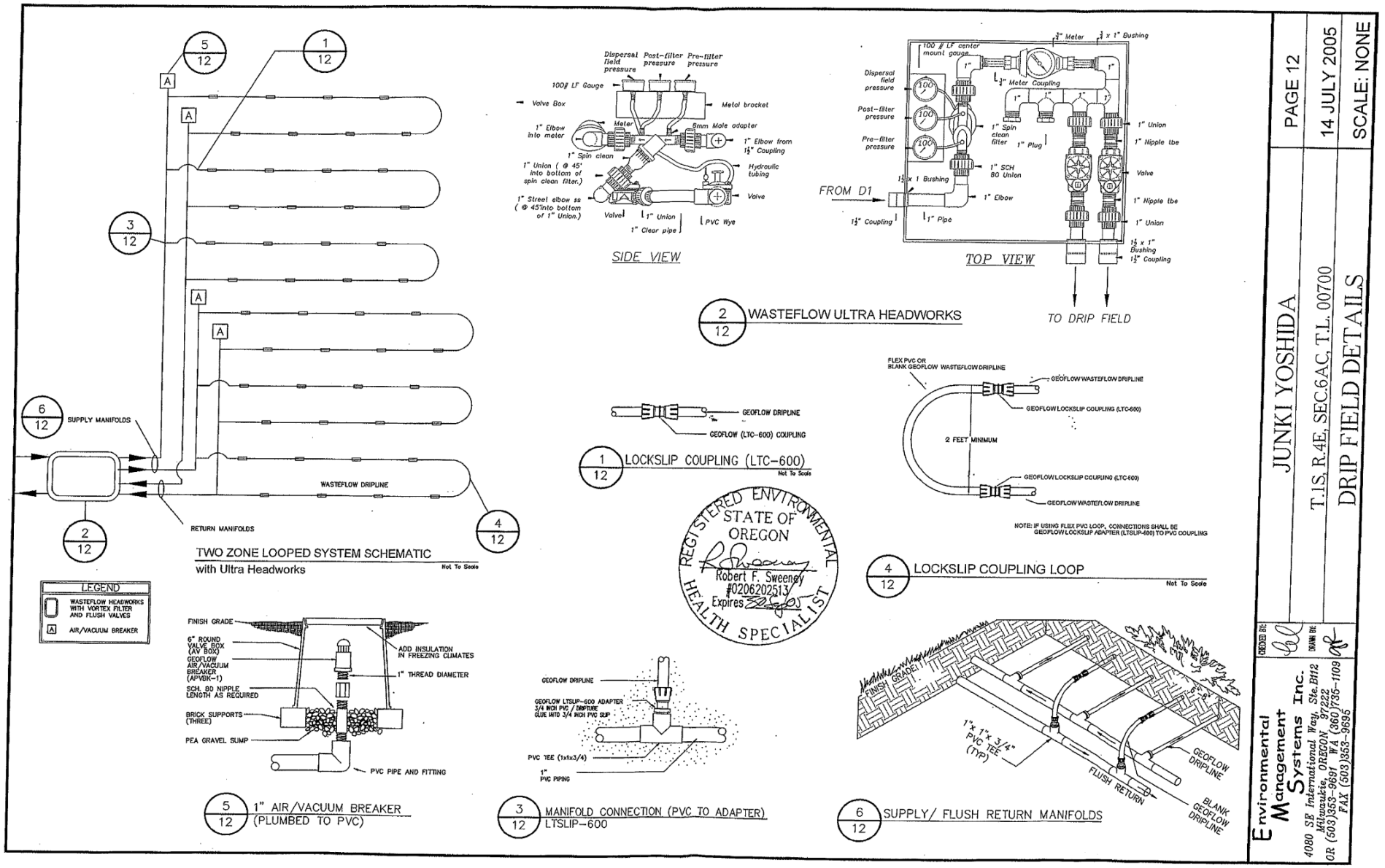


Non-Proprietary Wastewater Treatment Systems

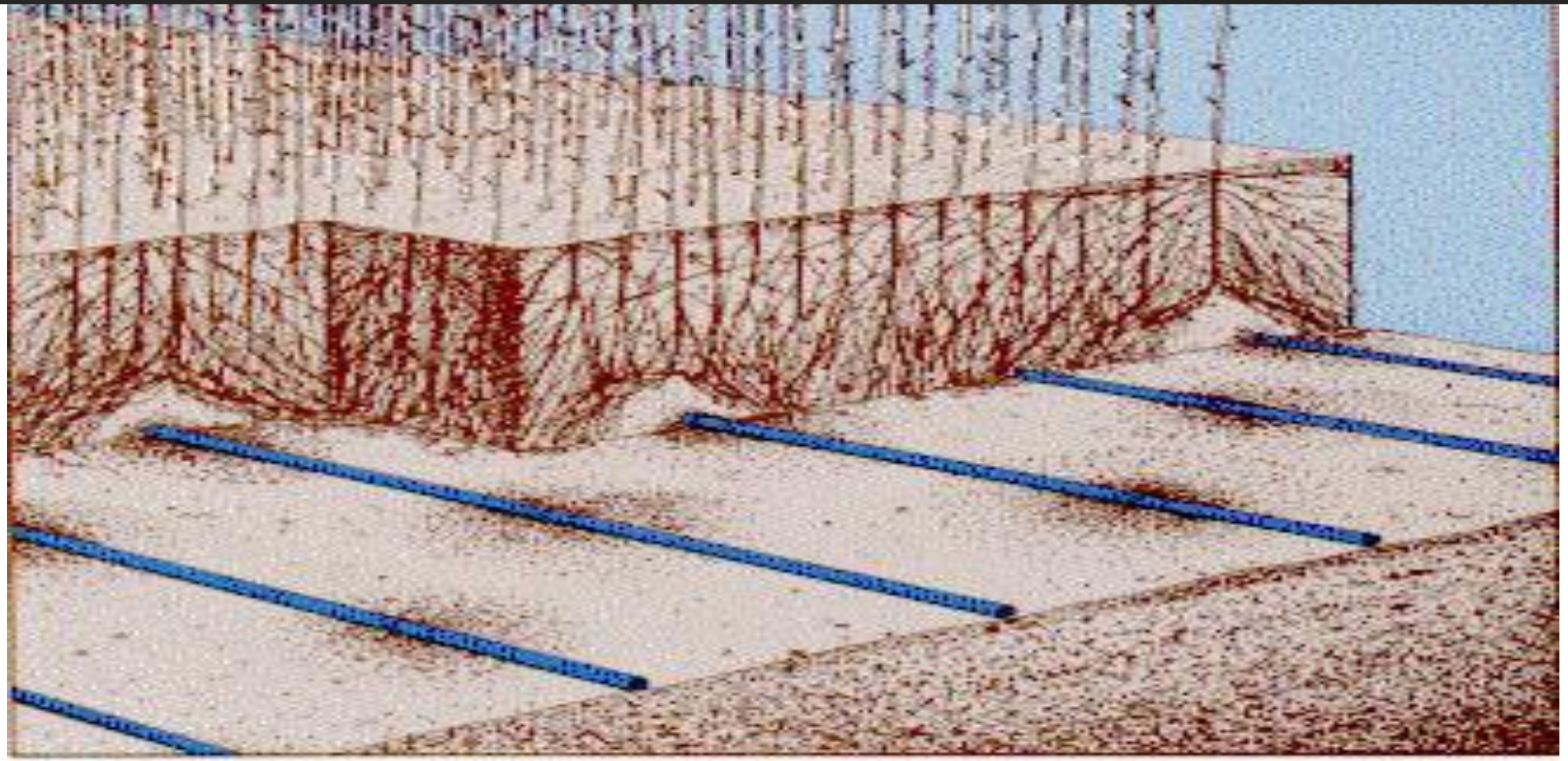


Dripfield after hydroseeding.

EMS Dripfield



Dripfield Emitter Pattern



Battelle-Northwest's biobarrier technology excludes plant roots from drip emitters for upto 20 years.

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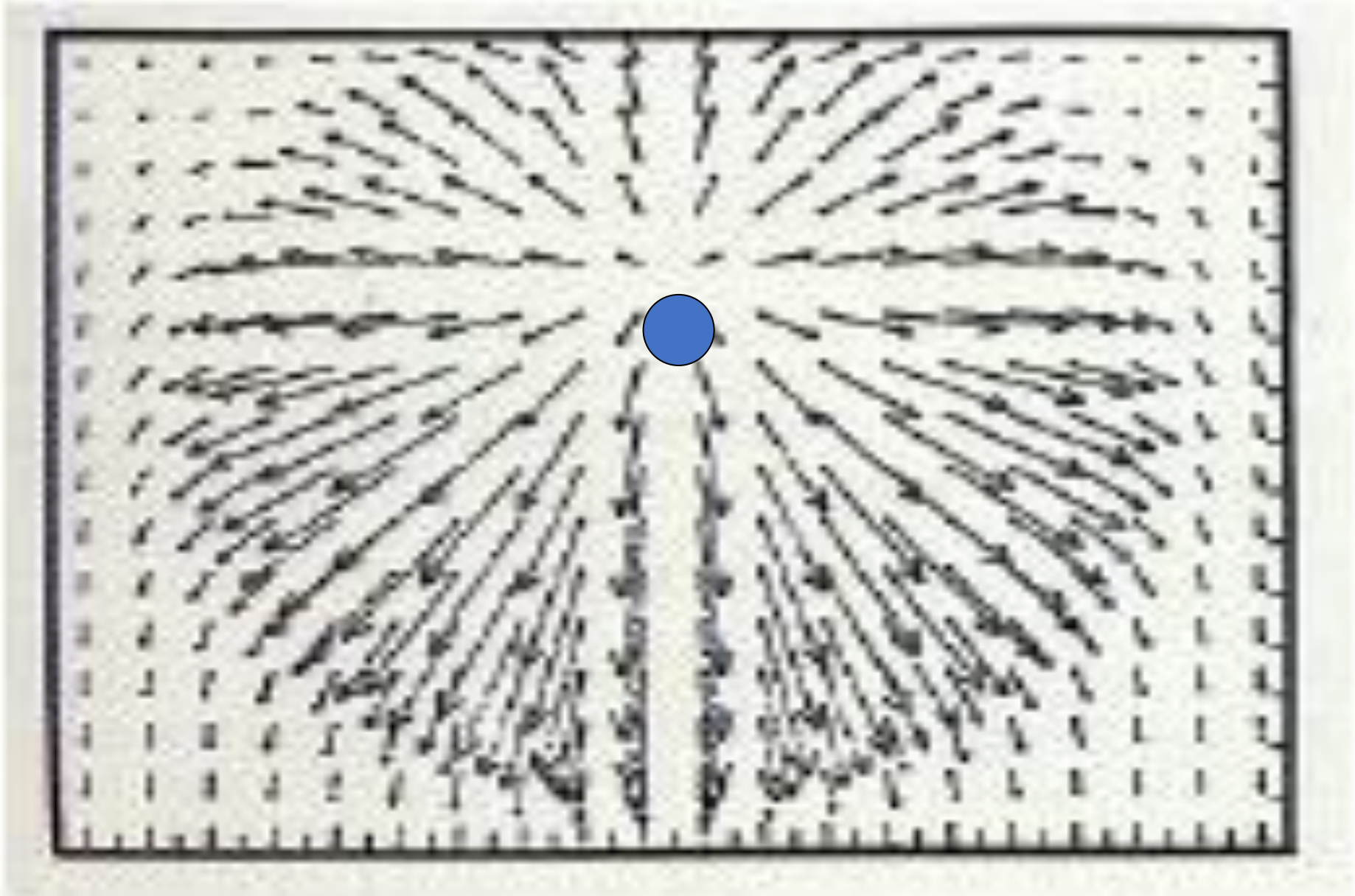
Soil Wetting Pattern at Emitters



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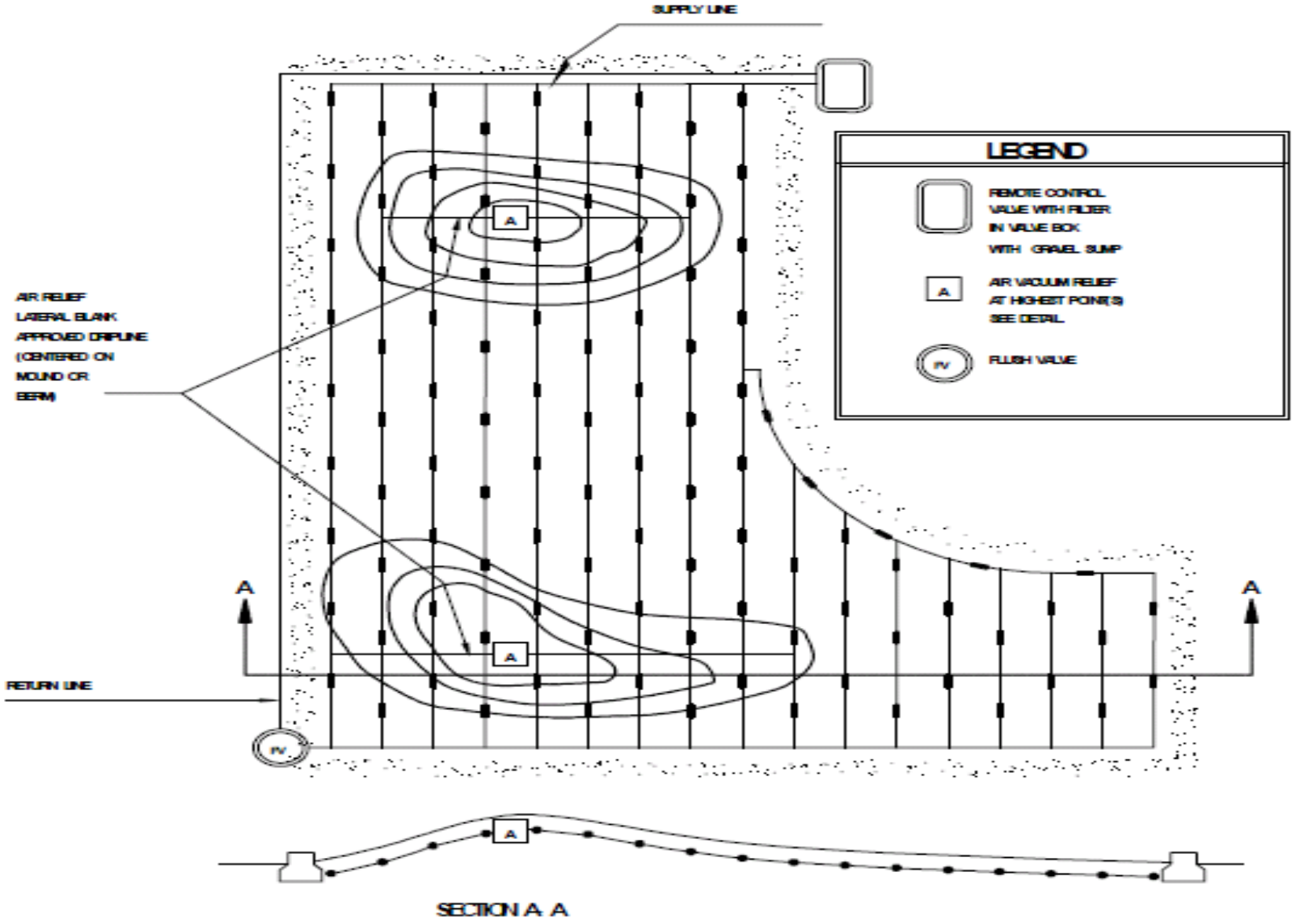
Wetting Pattern of a Subsurface Drip Lateral
Photo Courtesy of Kansas State University

Topographic considerations



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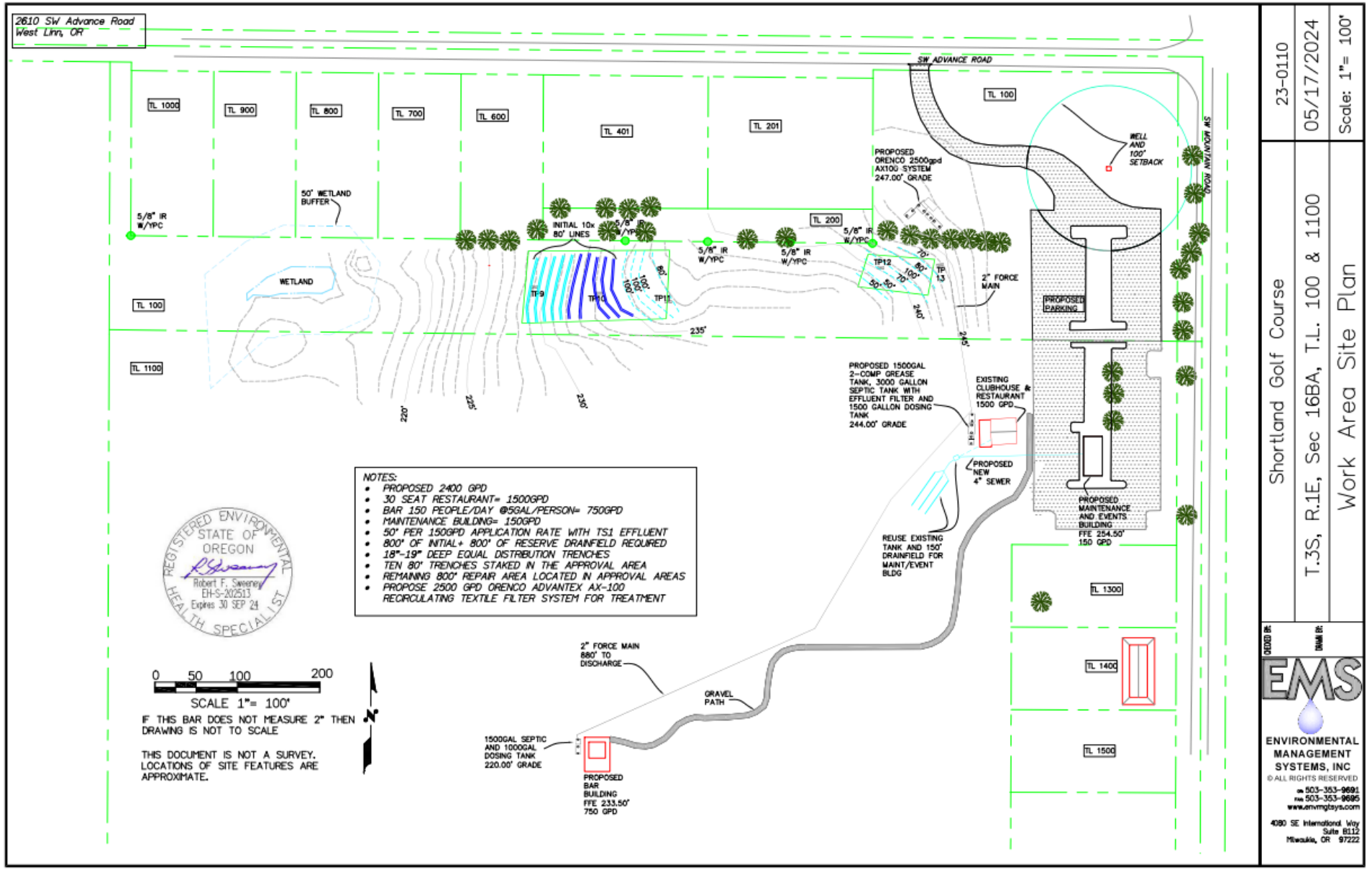
Drip Line

Golf Course Layout



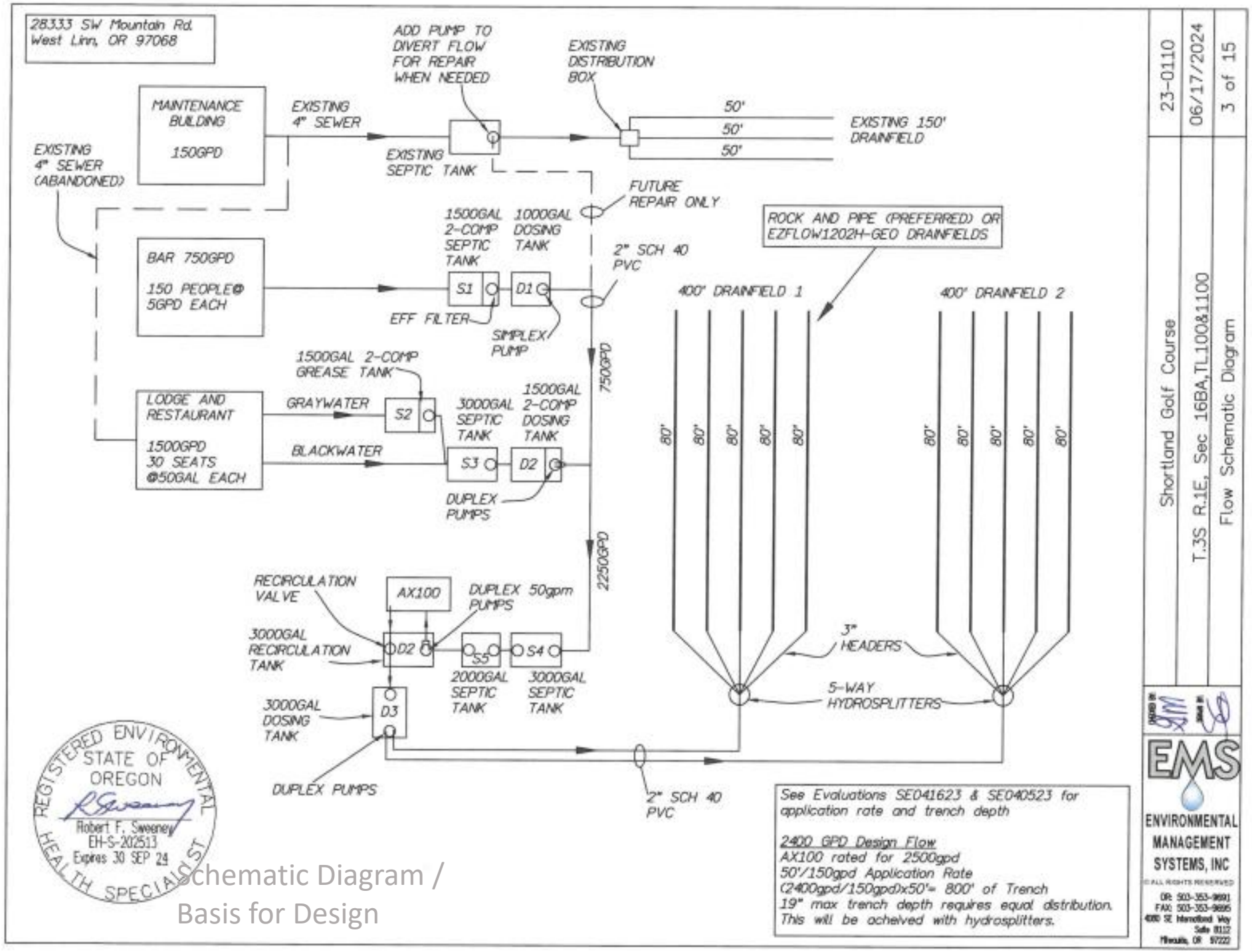
Q: With All the Vegetation, Why would we need to Force the Drainfield into a Small Boxed Area?

A: Because it isn't "Re-Use"

System Designed: Tanks, Recirculating Textile Filter with UV Disinfection to Pressure Assisted Gravity Drainfield for Disposal.

Existing System Left as Std DF.

Obtaining a Reuse Permit Might be Allowed, but would add unacceptable uncertainty, delays and costs.



Schematic Diagram / Basis for Design

WA

Long-Narrow
Mound

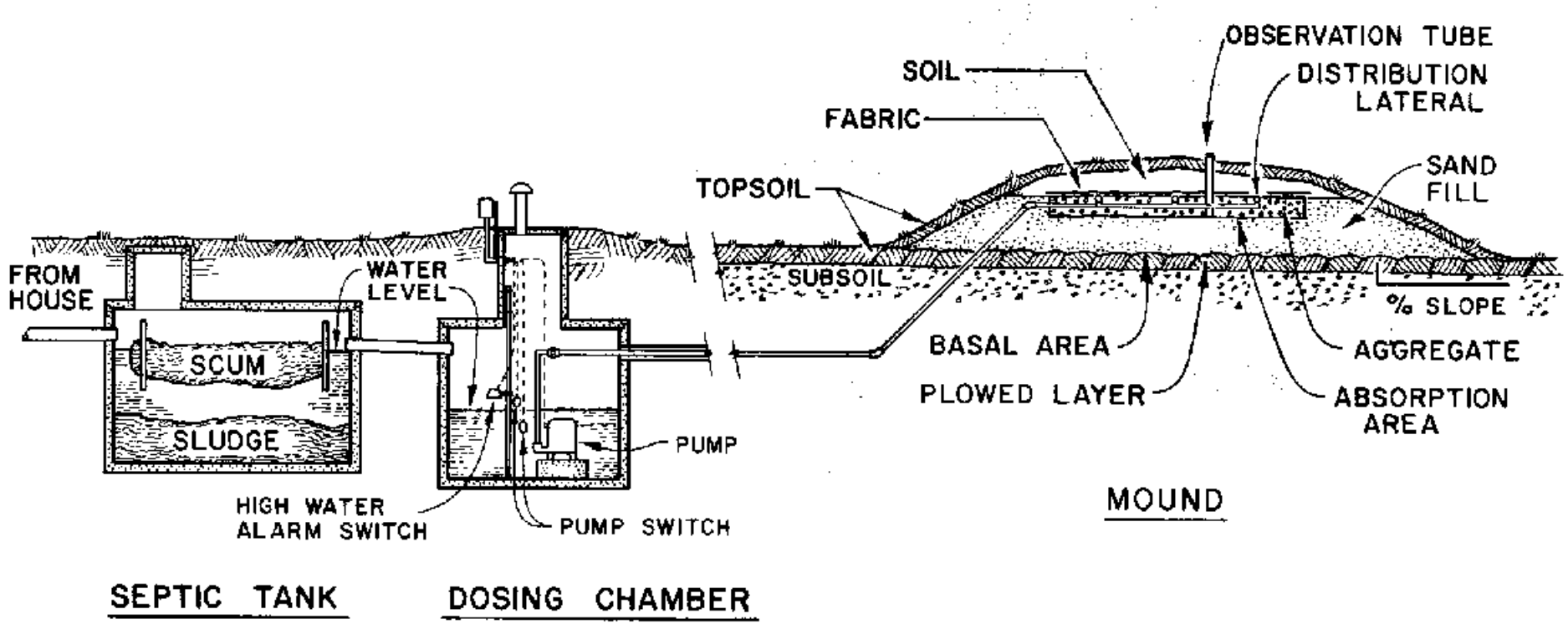
(= Bottomless Sand Filter w/o a Box) to
Distribute Effluent to Prepared Surface on Shallow Depth to Water Table Sites.

OR

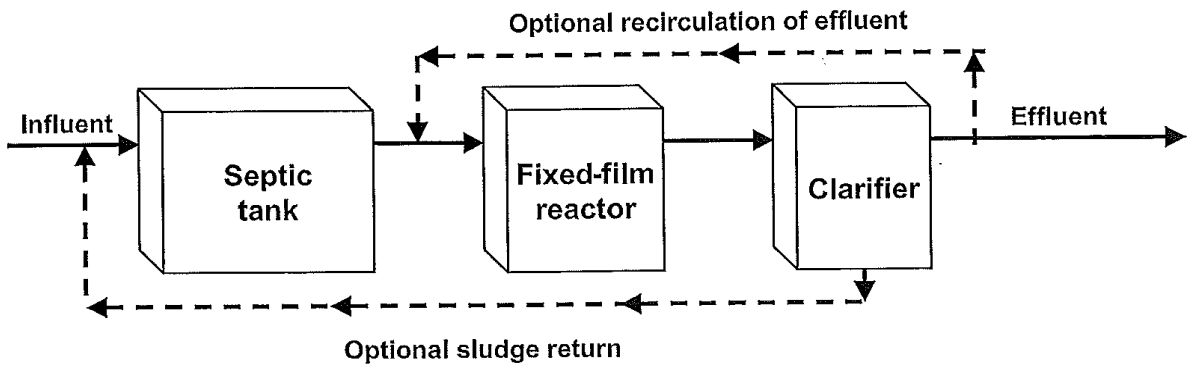
Mounds Not Approved for Routine Use, because they are not on the List of Approved Products

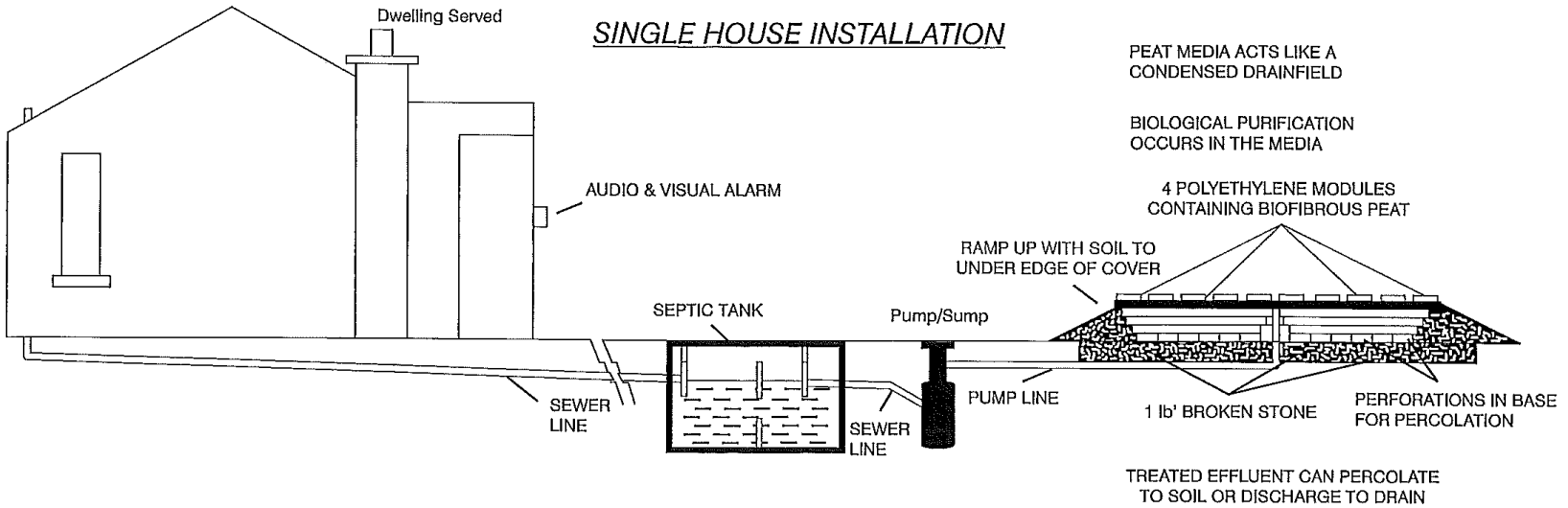
WA

Sand Mound System



Peat filters





Cluster systems

Cluster Systems Combine Several Facilities into One Design.

May Have Separate Septic Tank Effluent Pump Tanks flowing to one or several community systems.

State-Wide Land Use Restrictions in Oregon Make this Difficult. Must have single ownership.

History of Concentrating Flow has Given this Option a Bad Reputation in Both OR & WA.

UpFlow Sand Filters Installed

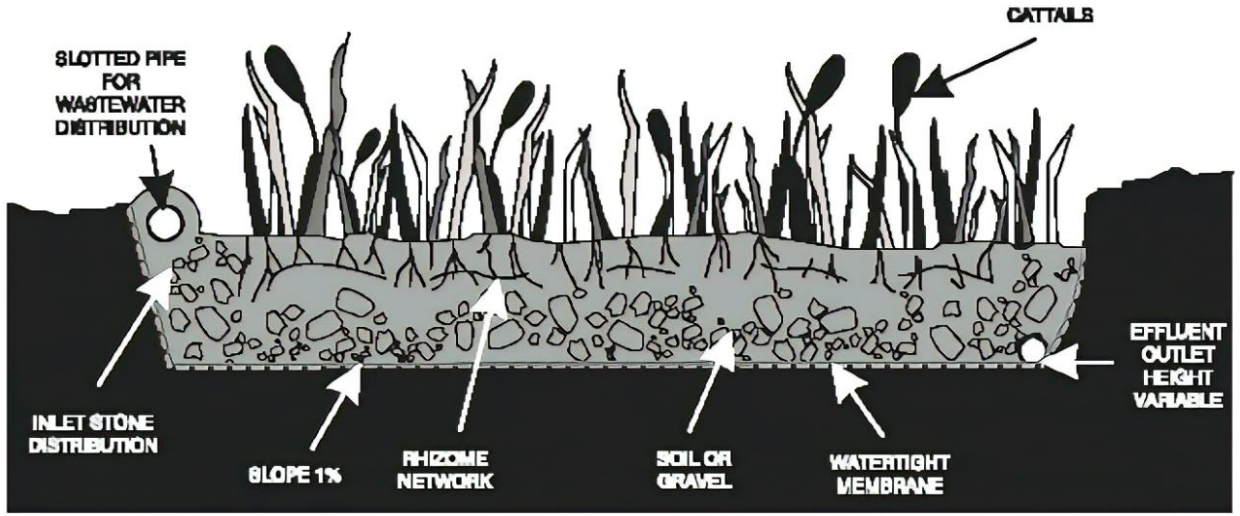
WA. UpFLow Sand Filters were specifically designed to help with Puget Sound Pollution.

High Treatment without Additional Disinfection.

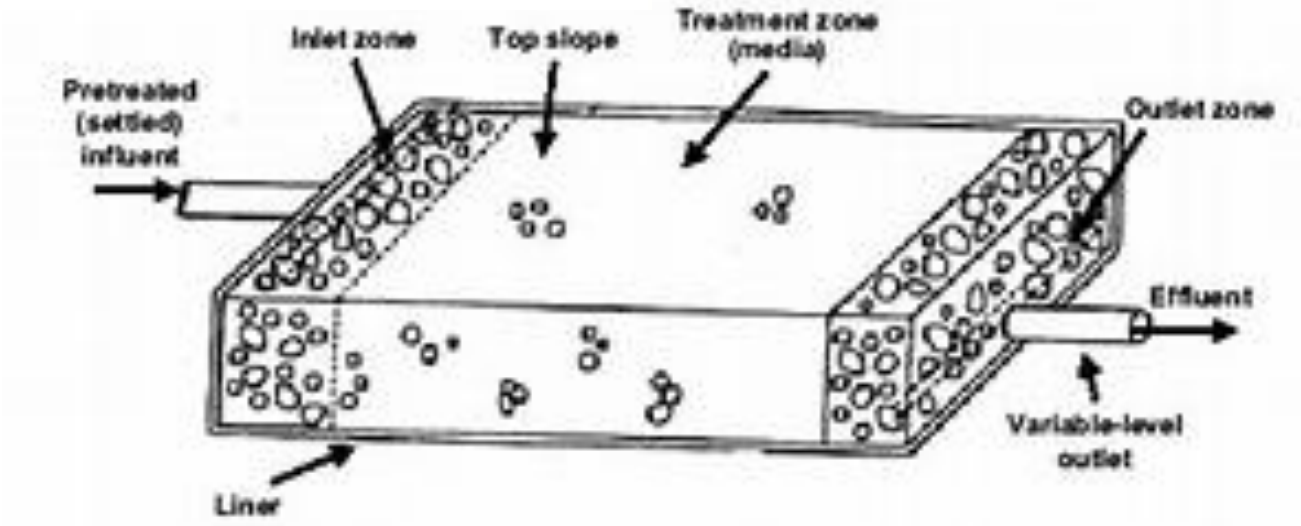
These rely on slowly pumping into a full anaerobic chamber in a tank or liner, with layers of textile fabric to colonize bacteria.

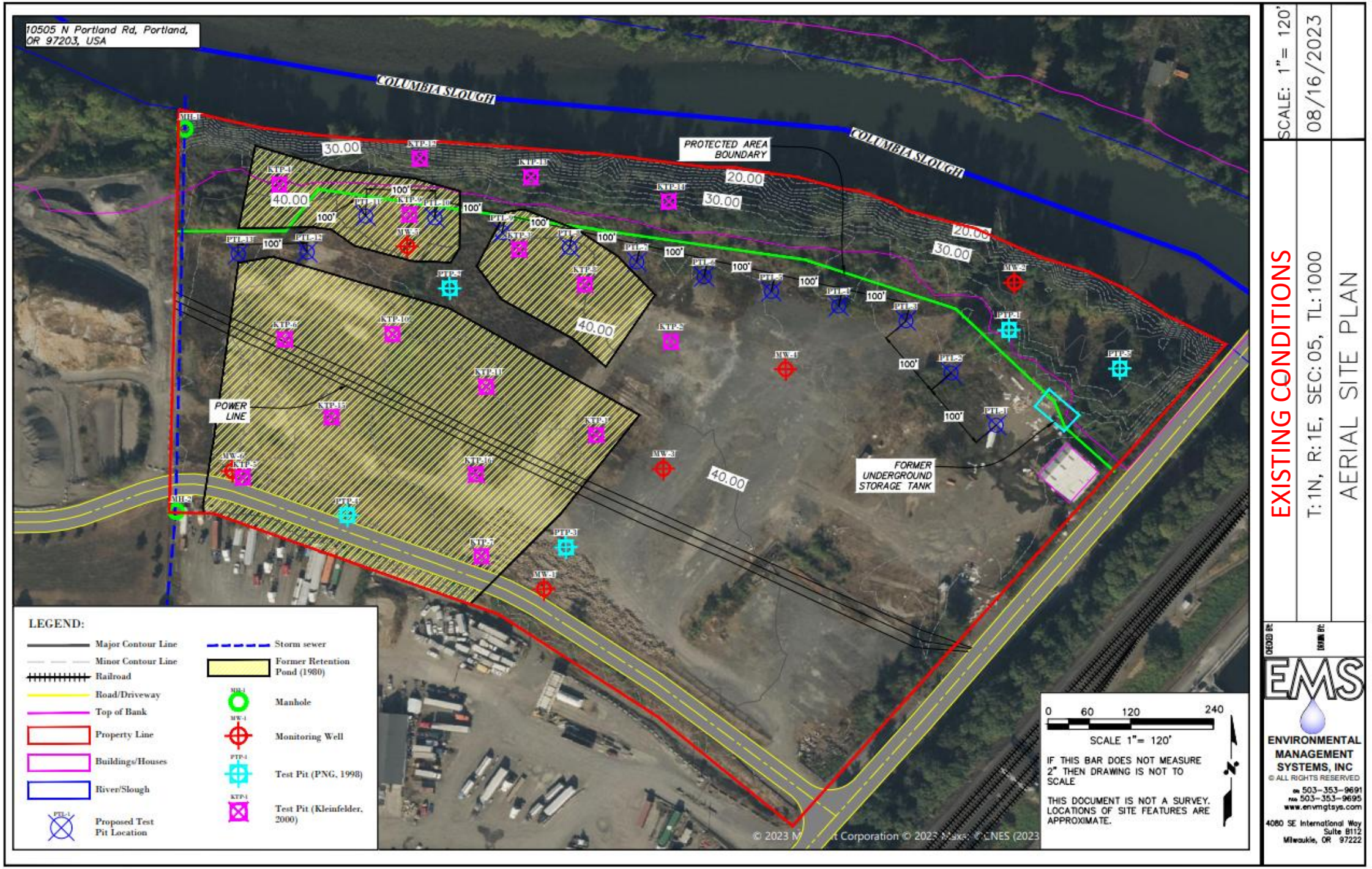
Effluent then wicks up encountering air and then continues over the top of the level filter surface into the aerobic sand & return to the environment.

Vegetated Submerged Beds



AKA:
Subsurface Constructed Wetland





SCALE: 1"= 120'

08/16/2023

EXISTING CONDITIONS

T: 1N, R: 1E, SEC: 05, TL: 1000

AERIAL SITE PLAN

DESIGN BY:

DRAWN BY:

EMS

ENVIRONMENTAL MANAGEMENT SYSTEMS, INC

ph 503-353-9691
fax 503-353-9695
www.envmgtsys.com

4080 SE International Way
Suite B112
Milwaukie, OR 97222

PROPOSED OCCUPANCY / FLOW:

- Occupants: 250 Homeless Persons x 35 g/d/c = 8,750 gpd
- Staff: 30 x 15 g/d = 450 gpd
- Washing Machines : 12 x 500 g/d each = 6,000 gpd
- TOTAL PEAK FLOW: 15,200 gpd
- AVERAGE FLOW: (1/2 Peak Flow) 7,600 gpd

OPTIONS:

- Traditional Sewer: Not Available

- Phase 1. Holding Tanks
  - Hauling Off-Site at >= $0.50 x 7,600 gallons / day = $3,800/day.
    - $3,800 x 365.35 days / year = $1,387,950 / year just for pumping & hauling.
  - Monitor Actual Quantity & Quality for Future Options

Test Pits 5 Oct 23

Lab Results were Not Available as of 13Oct23

12 Soil Pits were evaluated: All were found to have: disturbed structure, visible debris &/or petroleum odors.

Site Constraints

Exceedance Contaminants

Volatile Organic Compounds(VOCs)

- **Benzene**
- **Vinyl chloride**
- **Dichloroethane**
- **Dichloroethene**
- **Trichloroethene**
- **Dichloropropane**
- **Tetrachloroethene**
- **Chlorobenzene**

Heavy Metals: Cadmium, Copper, Zinc

Planning Restrictions

Environmental Conservation Zone Mapped w/ Green Line 75 to 200+ feet from River Bank = Only area that is relatively un-disturbed.

Department of Environmental Quality Standards for Onsite Wastewater Treatment System Siting: Oregon Administrative Rule 340-071-0150 Site Evaluation Procedures

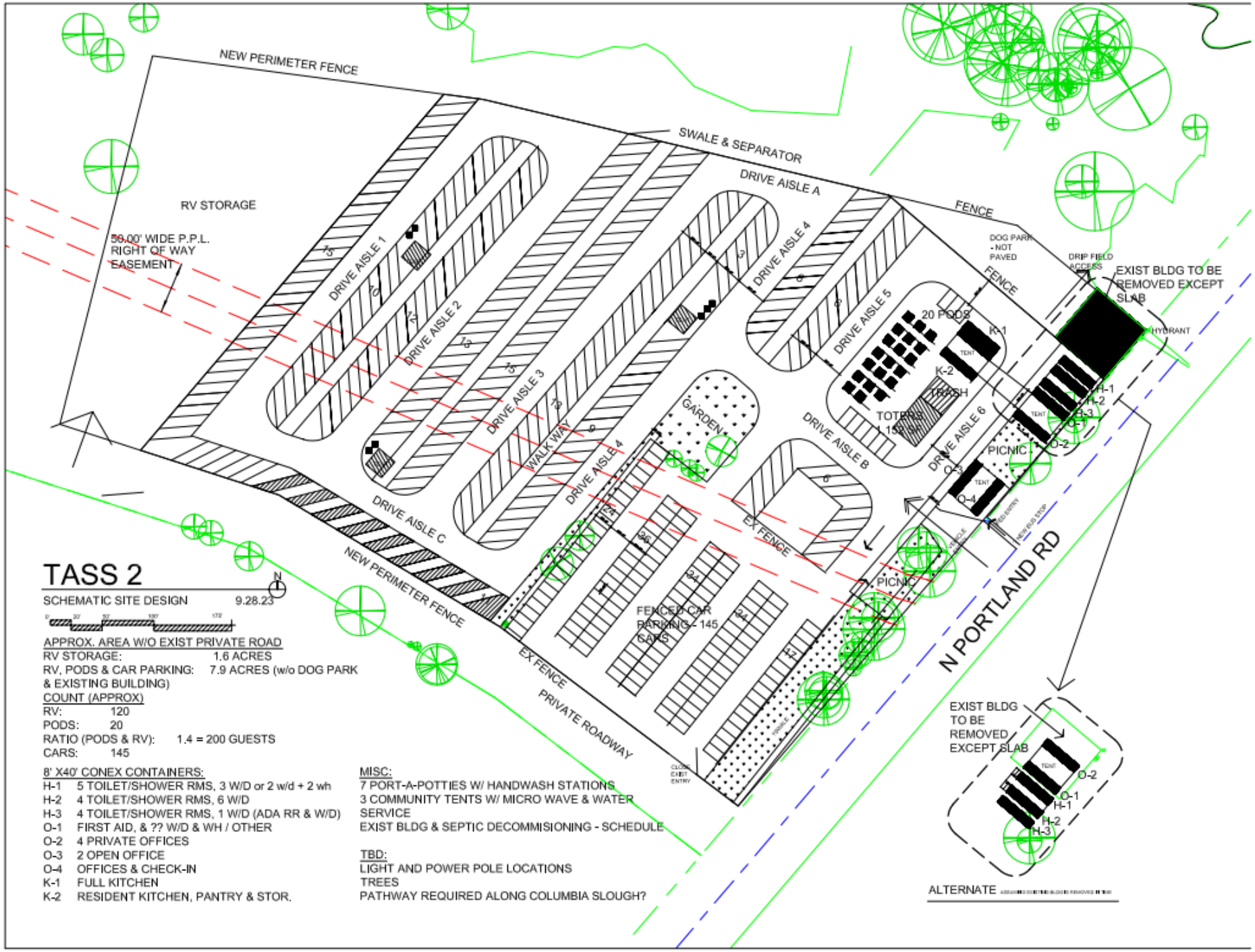
50 Ft setback from top of river bank with treatment standard 2:
Biochemical Oxygen Demand (BOD5) <= 20 mg/L
Total Suspended Solids (TSS) <= 20 mg/L
Total Nitrogen (TN) <= 30 mg/L
Fecal Coliform Units (FC) <= 400 Fecal Coliform / 100 mL

Red Flags for Evaluator Approval:

Disturbed Soil, Compaction, Cuts & Unknown Fills,
Soil Pits Revealed Contaminated Fill & Compressed Soil,
Best Area for Initial & Replacement Disposal Fields is Zoned as Environmental Conservation & Deemed Unavailable by Planning.
Underground Storage Tank. (Has been removed per City BES)
Sewer Available within 5 years (Not Planned or Funded)

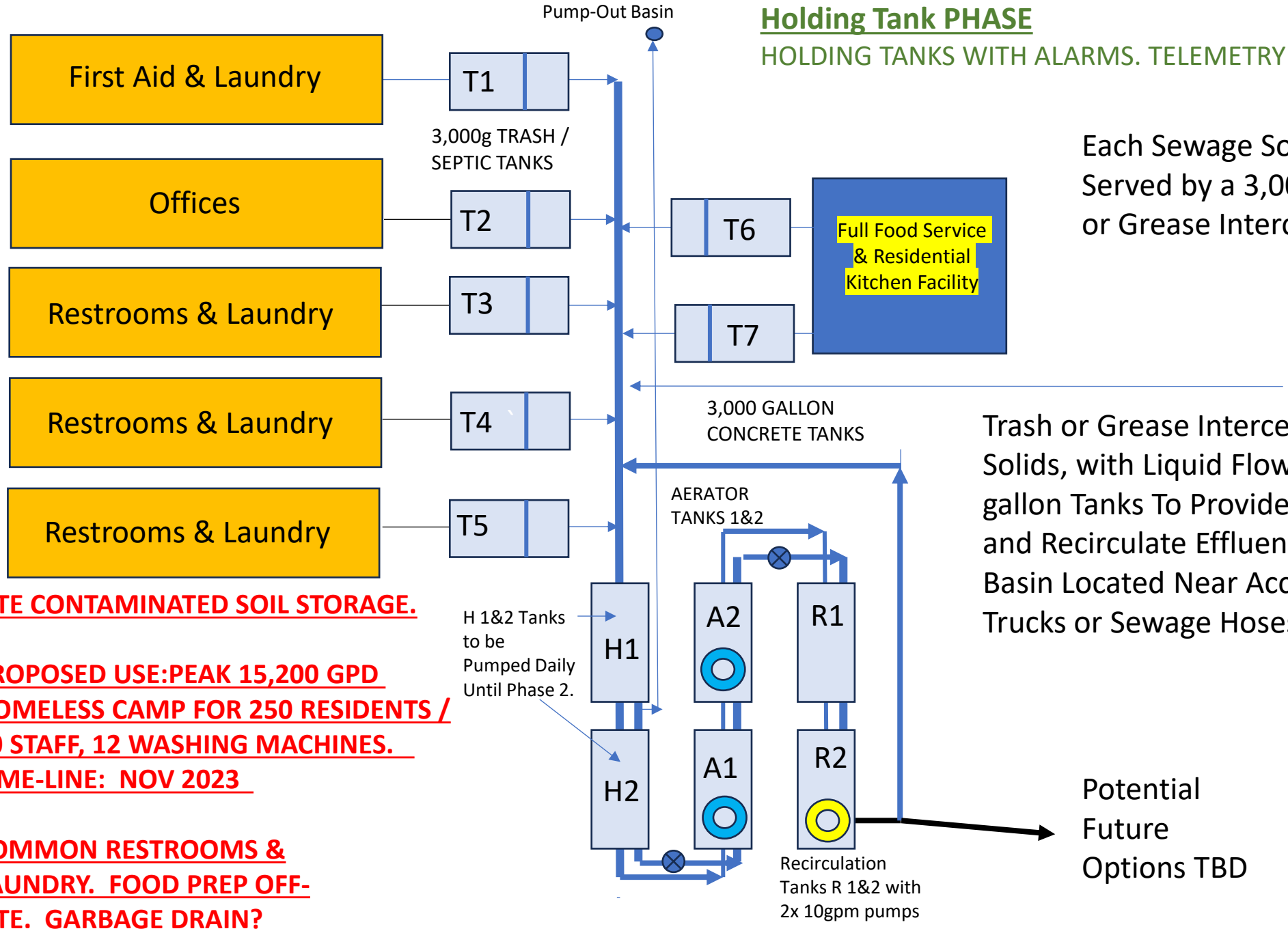
We Love Challenging Sites !

Site Development Plan from Architect



Holding Tank PHASE

HOLDING TANKS WITH ALARMS. TELEMETRY & RECIRCULATION



Each Sewage Source to be Served by a 3,000 gallon Trash or Grease Interceptor Tank

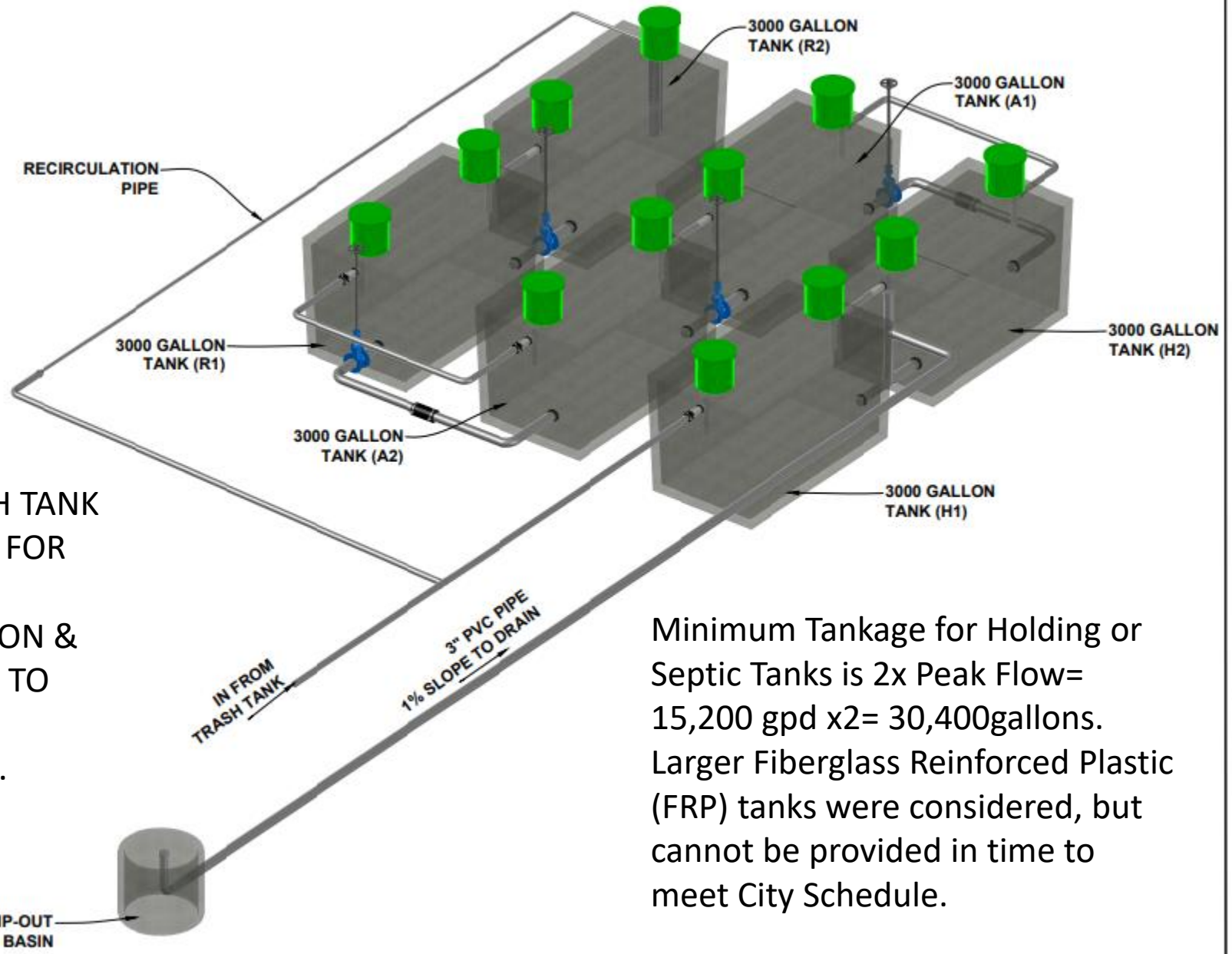
Trash or Grease Interceptor Tanks Screen Solids, with Liquid Flowing to 6x 3,000 gallon Tanks To Provide Primary Treatment and Recirculate Effluent to a Pump-Out Basin Located Near Access to avoid Pumper Trucks or Sewage Hoses in the Camp Itself.

Potential Future Options TBD

SITE CONTAMINATED SOIL STORAGE.

PROPOSED USE:PEAK 15,200 GPD HOMELESS CAMP FOR 250 RESIDENTS / 30 STAFF, 12 WASHING MACHINES.
TIME-LINE: NOV 2023

COMMON RESTROOMS & LAUNDRY. FOOD PREP OFF-SITE. GARBAGE DRAIN?



POST - TRASH TANK PROCESSING FOR AERATION, RECIRCULATION & EASY ACCESS TO PUMP-OUT OPERATIONS.

Minimum Tankage for Holding or Septic Tanks is 2x Peak Flow= 15,200 gpd x2= 30,400gallons. Larger Fiberglass Reinforced Plastic (FRP) tanks were considered, but cannot be provided in time to meet City Schedule.

08/16/2023

INTERTIED TANK ISOMETRIC VIEW

T:1N, R:1E, SEC:05, TL:1000

-

CHECKED BY:

DRAWN BY:

EMS

ENVIRONMENTAL MANAGEMENT SYSTEMS, INC

4080 SE International Way
Suite B112
Milwaukie, OR 97222

- **Phase 2. Convert to Septic Tank Effluent Pump (STEP)**
  - Pump to Sewer. Not Available
    - Requires Pumping Under the Railroad / No Easement.
  - Pump to Onsite Treatment System
    - Treatment and Disinfection Prior to:
      - Traditional Drainfield / Seepage System: Not Suitable
      - Saturated Flow By-passes Soil Treatment Capacity

- **Phase 3 ?? Treatment and Bio Remediation Via Subsurface Dripfield,**
  - Augmented in Modified Soils, incorporating Symbiotic Effects of:
    - Phyto-Remediation with Native Trees and Shrubs, &
    - Myco-Remediation via Mushroom Compost (various species)
    - Bio-Remediation via Soil Microbial & Effluent Bacterial & Action
  - Requires Application & Design in Accordance with Oregon *Administrative Rule (OAR 340-052-0050) for Sewage Systems Utilizing New or Unproven Technology.*
  - *This May be considered after Holding Tanks Are in Place.*

Oregon Administrative Rules in Support of Innovation in Wastewater Treatment & Reuse.

340-055-0007

Policy

It is the policy of the Environmental Quality Commission to encourage the use of recycled water for domestic, agricultural, industrial, recreational, and other beneficial purposes in a manner which protects public health and the environment of the state. The use of recycled water for beneficial purposes will improve water quality by reducing discharge of treated effluent to surface waters, reduce the demand on drinking water sources for uses not requiring potable water, and may conserve stream flows by reducing withdrawal for out-of-stream use.

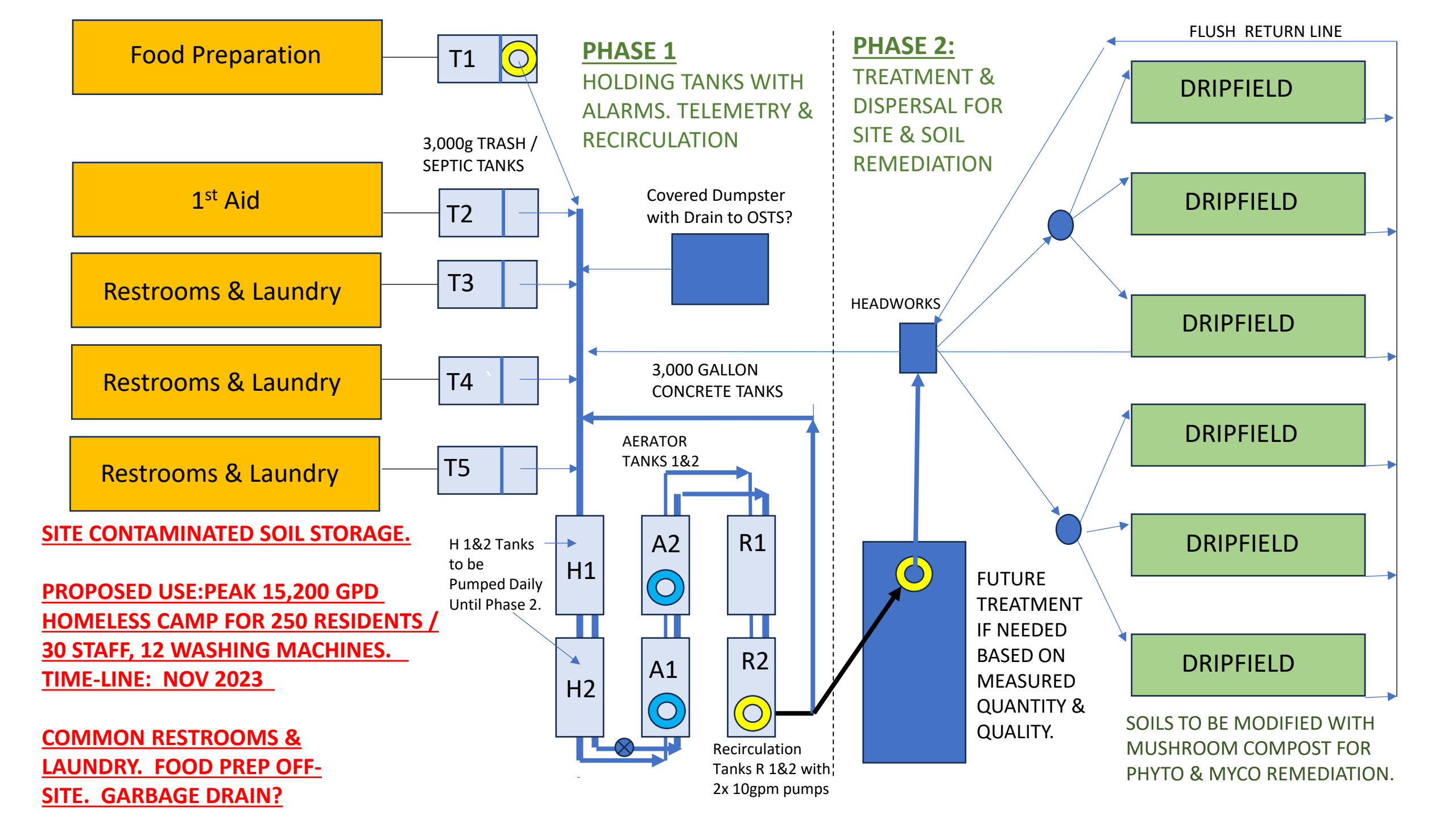
REVIEW OF PLANS AND SPECIFICATIONS

340-052-0050

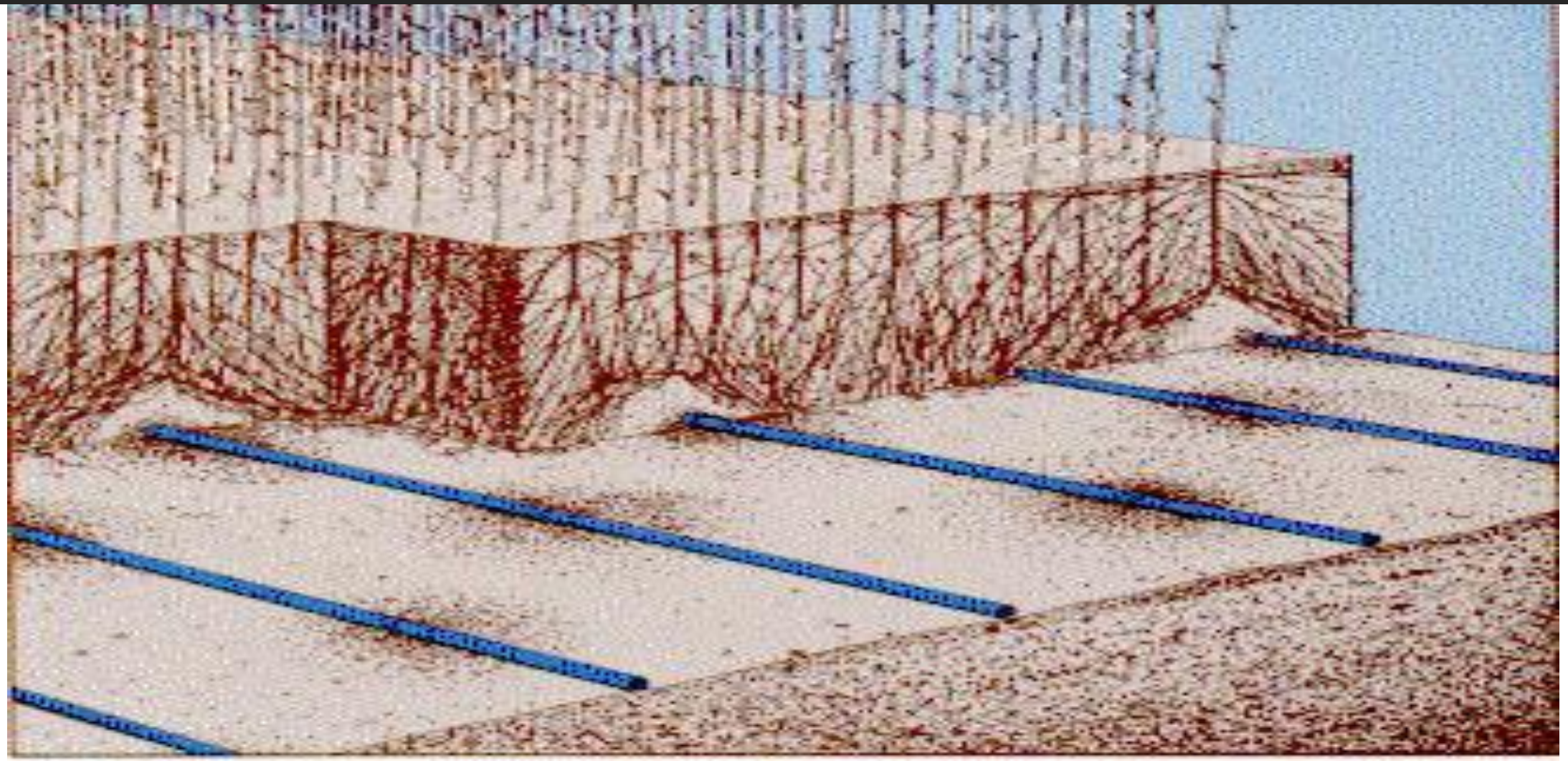
Treatment Works and Sewerage Systems Utilizing New or Unproven Technology

The Department encourages the development of new technology and will approve plans of such provided adequate documentation is submitted. The burden of proof for demonstrating new processes, treatment systems, and technologies lies with the design engineer. Documented case histories where any such new application has been successfully and similarly demonstrated or operated on a full scale basis shall be submitted. Demonstrations shall be at other than bench scale and shall be at field conditions such that the prototype information can be validly scaled up to a working facility. Experimental data need not be acquired solely from actual permanent operating facilities. For all such proposals, contingency plans shall be presented which will assure that in event of failure, public health and water quality would be protected.

Statutory/Other Authority: ORS 468

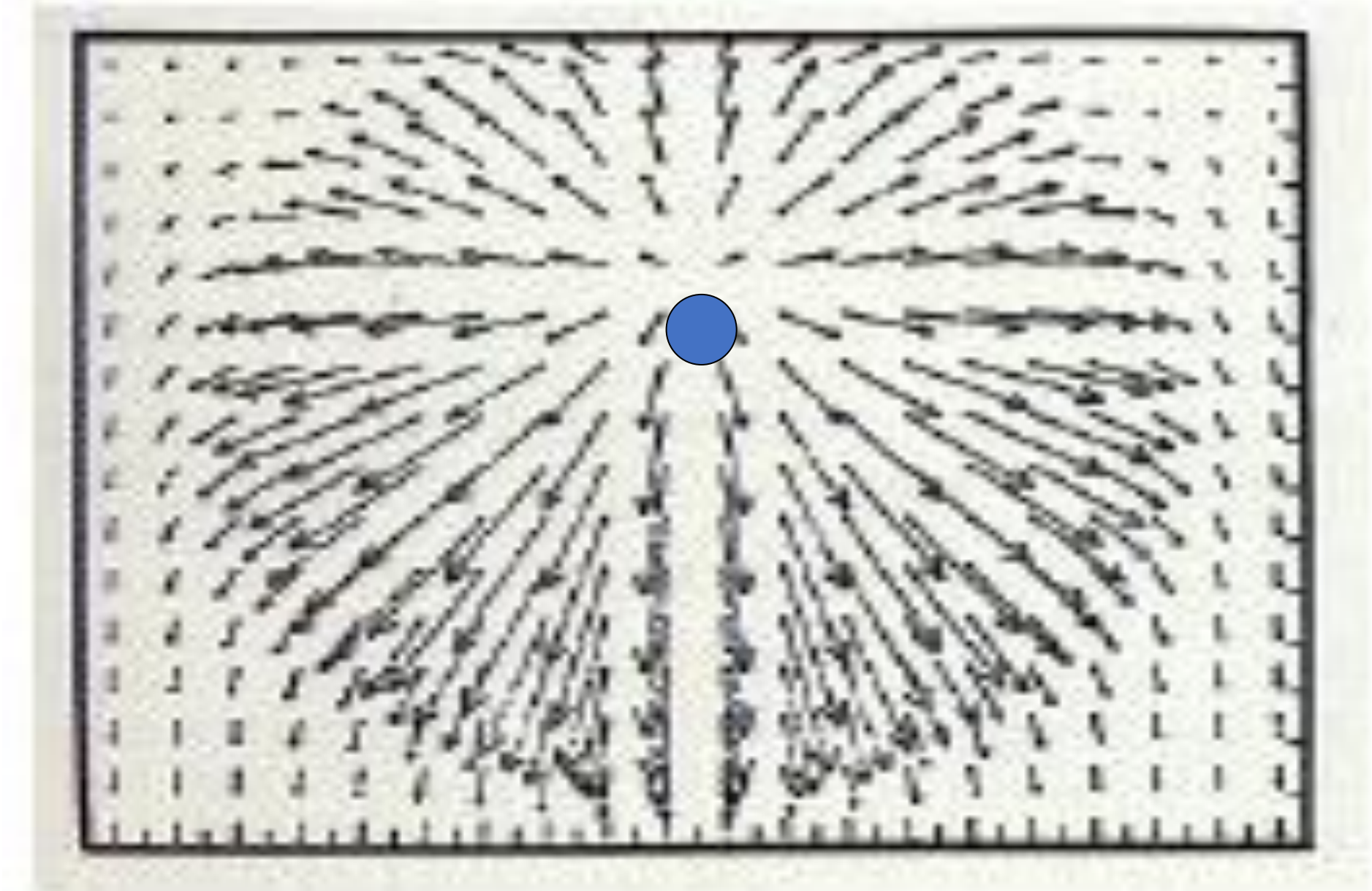

Food Preparation
T1
PHASE 1
HOLDING TANKS WITH ALARMS. TELEMETRY & RECIRCULATION
PHASE 2:
TREATMENT & DISPERSAL FOR SITE & SOIL REMEDIATION
FLUSH RETURN LINE
3,000g TRASH / SEPTIC TANKS
1st Aid
T2
Covered Dumpster with Drain to OSTS?
Restrooms & Laundry
T3
HEADWORKS
DRIPFIELD
DRIPFIELD
DRIPFIELD
Restrooms & Laundry
T4
3,000 GALLON CONCRETE TANKS
AERATOR TANKS 1&2
Restrooms & Laundry
T5
H 1&2 Tanks to be Pumped Daily Until Phase 2.
H1
H2
A2
A1
R1
R2
DRIPFIELD
DRIPFIELD
DRIPFIELD
FUTURE TREATMENT IF NEEDED BASED ON MEASURED QUANTITY & QUALITY.
Recirculation Tanks R 1&2 with 2x 10gpm pumps
SOILS TO BE MODIFIED WITH MUSHROOM COMPOST FOR PHYTO & MYCO REMEDIATION.
SITE CONTAMINATED SOIL STORAGE.
PROPOSED USE:PEAK 15,200 GPD HOMELESS CAMP FOR 250 RESIDENTS / 30 STAFF, 12 WASHING MACHINES.
TIME-LINE: NOV 2023
COMMON RESTROOMS & LAUNDRY. FOOD PREP OFF-SITE. GARBAGE DRAIN?

Dripfield Emitter Pattern



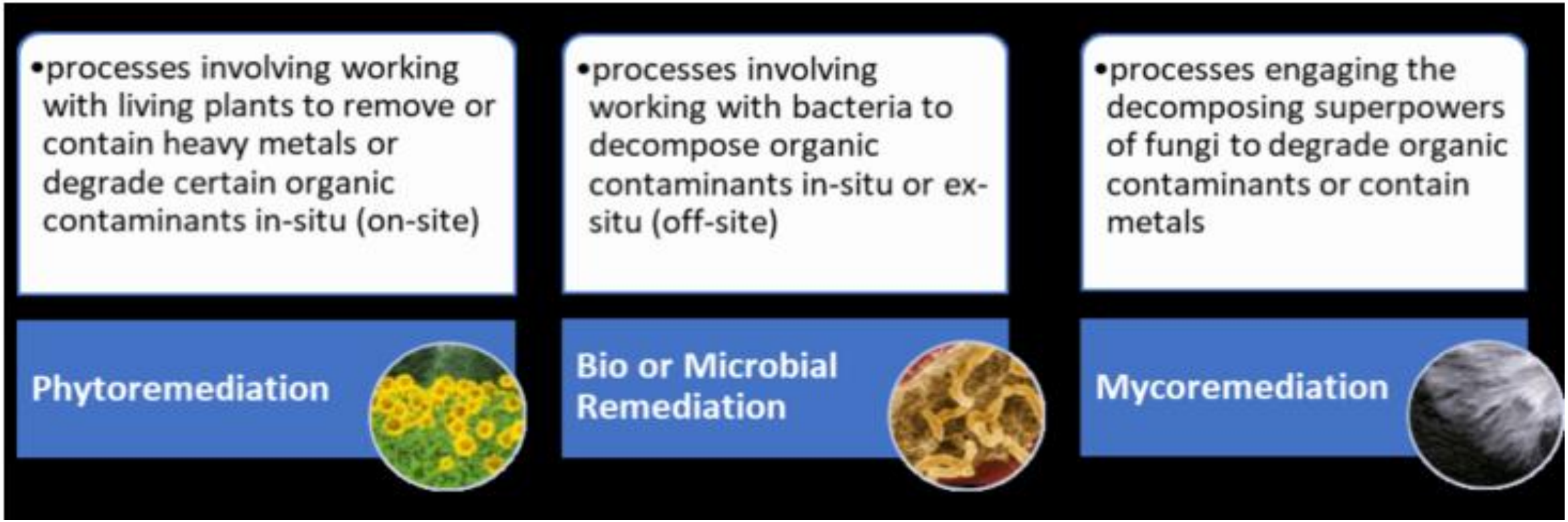
Battelle-Northwest's biobarrier technology excludes plant roots from drip emitters for upto 20 years.

Soil Wetting Pattern at Emitters



What are Bio-, Phyto- and Myco-Remediation?

Working with plants to clean up contaminated soil or water is called ‘phytoremediation’ and working with fungi to clean soil or water is called ‘mycoremediation.’ There are decomposer fungi who break down organic materials for food and can also break down some contaminants, and mycorrhizal fungi (aka “plant friend” fungi) which connect to plants through the roots and help plants grow, who can enhance or inhibit hazardous metal uptake into plants. Phyto and myco – remediation are part of a larger approach known as biological remediation or bioremediation for short.



Testing Locally-Adapted and Sustainable Solutions for Brownfields Cleanup

Taylor Yard, one of the study pilot locations, a former railyard on the LA river.

Researchers at the University of California, Riverside have teamed up with the City of Los Angeles and several community land trusts to test a soil clean up method involving native plants and fungi in a 1-year research field study launching this winter. UCR researchers in the Environmental Sciences and Toxicology department found that some plants and fungi growing naturally on contaminated sites around Los Angeles take up metals such as lead and cadmium from the soil

University of California, Riverside Study

The field study will test these biological remediation combinations:

- Native plants (pictured below)
- Native soil fungi
- Commercial Mycorrhizal Fungal Inoculum
- Decomposer Fungal Inoculum
  - with and without irrigation

(Telegraphweed

California Buckwheat

Supporting Information
REGARDING
Bio-Phyto-Myco-Remediation of Contaminated Soils

Microbial Bioremediation and Biodegradation of Petroleum Products

(Adedeji, J.A, etal & Chetty, Maggie, 2022

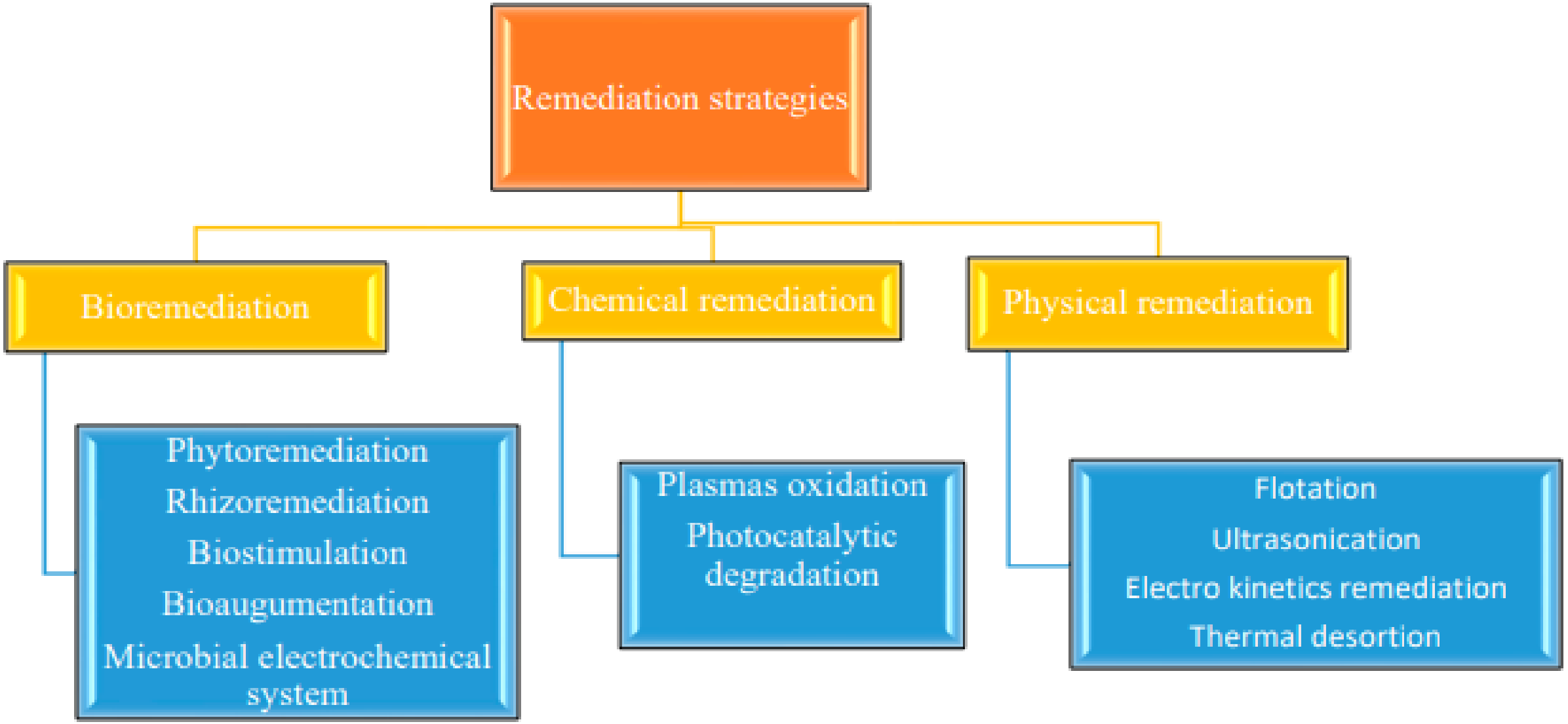


Figure 5. Diagram of soil remediation techniques for oil-contaminated areas.

Factors that Influence Petroleum Hydrocarbon Degradation.

Anything OWTS cannot provide ?

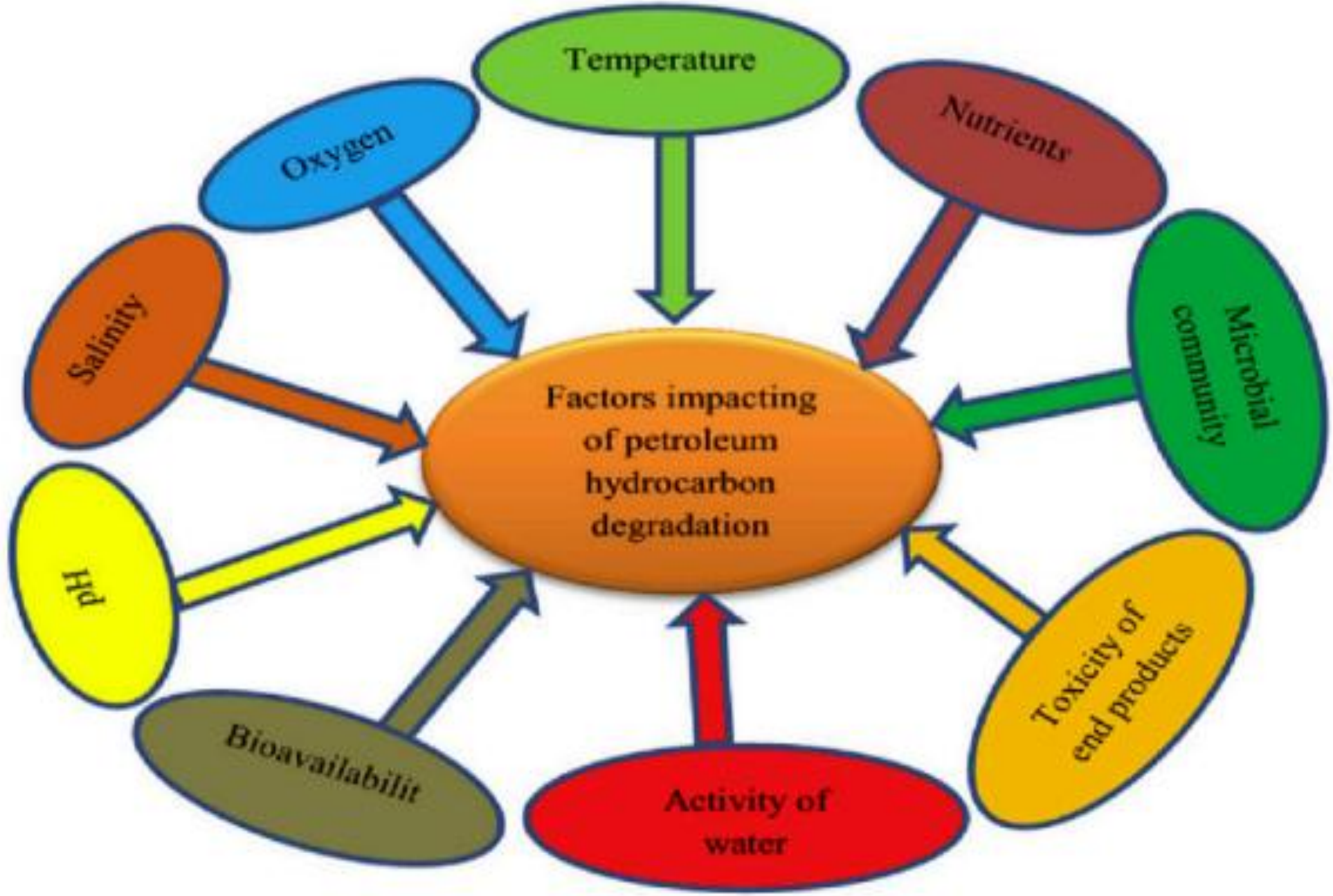
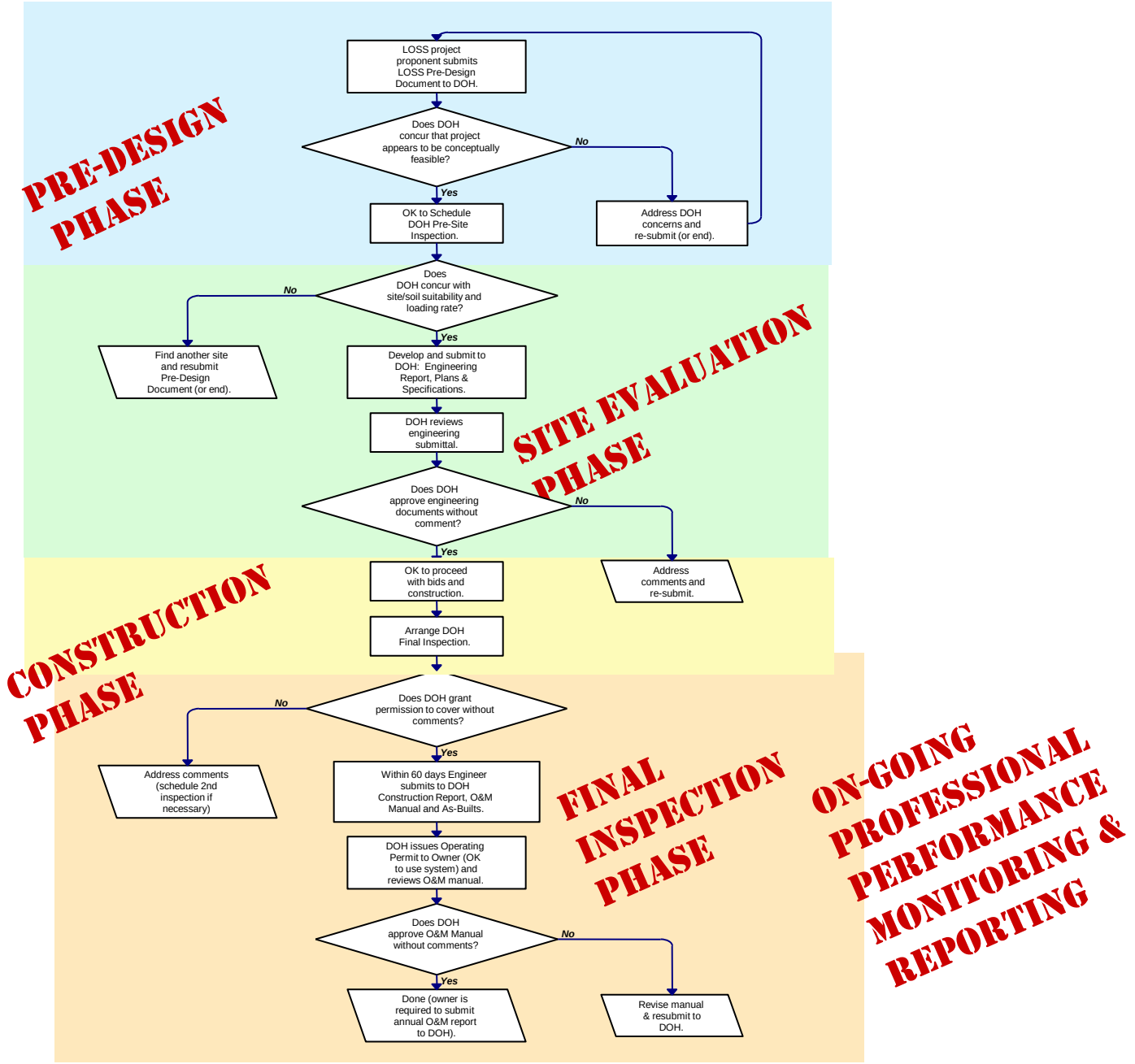


Figure 6. Schematic representation of factors that influence microbial remediation.

LOSS Project Application Process Flowchart

WADOH Has an Effective Process to Ensure Quality Siting, Design, Installation, Inspection and Performance Monitoring !



U.S. Water Recovery System on the International Space Station (NASA)

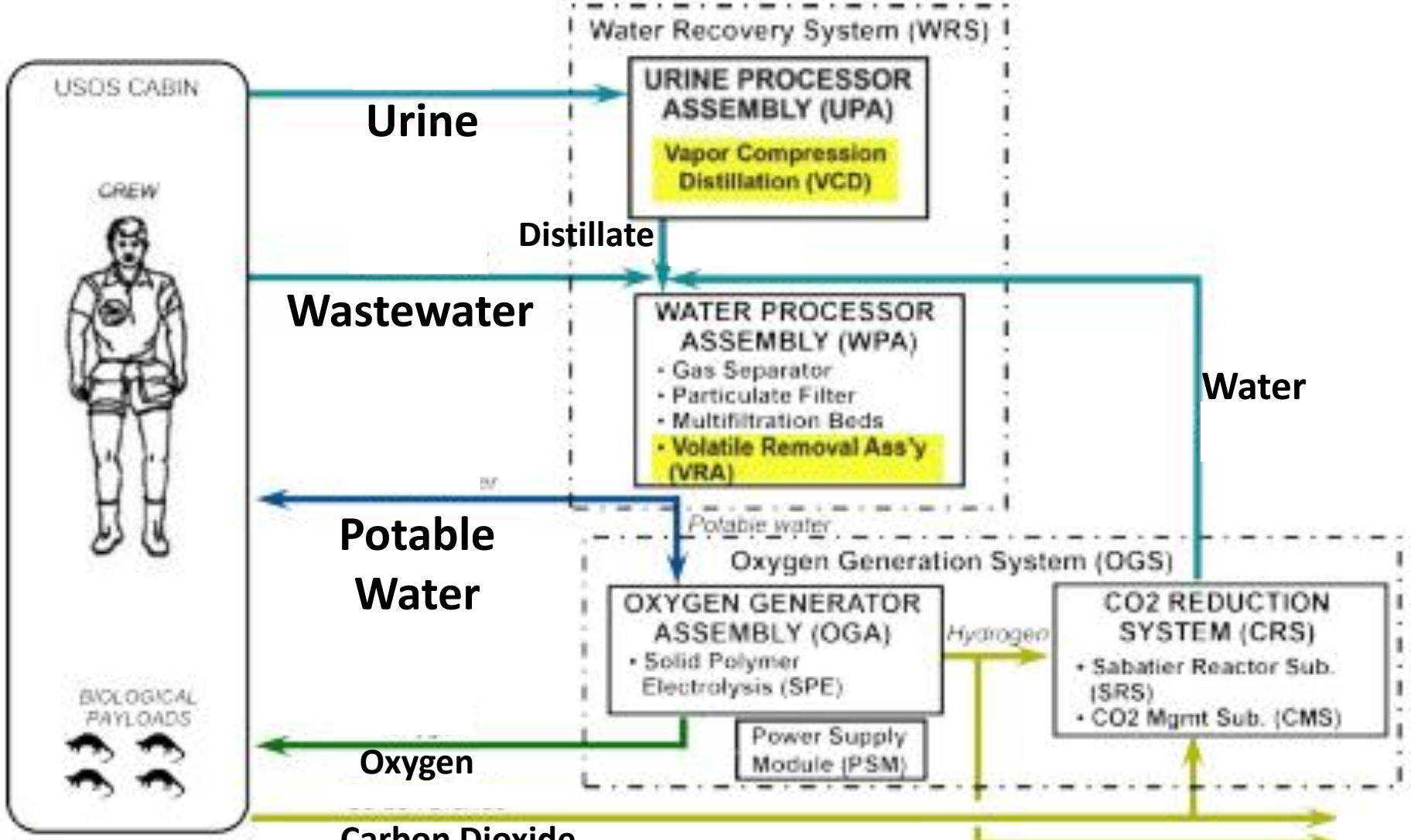


Figure 1
WRS and Oxygen Generator Assembly (OGS) process flow diagram

YES- OWTS ARE Rocket Science !

Soap Box (yours & mine)

- Why do we do what we do?
  - Science? Trial & Error? Inertia?
  - Why Such Arbitrary Horizontal Setbacks?
  - Why 10ft between trenches in OR? 8ft in WA?
  - Why not Soil as a Volume v sidewall or bottom surface?
  - Prescriptive v. Performance standards?
  - Why not REUSE for DeCentralized Systems?
- Strive for Continual Improvement
  - Personal / Professional / Organizational
- Keep Prescriptive Codes for Routine Sites,
- AND Performance Codes to Encourage Innovation

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