Mesa Lot Feasibility Study

Onsite Wastewater Treatment System Alternatives

Pt. Reyes Station, Community Meeting #2

January 18, 2023

Agenda

- Introductions
- Summary of Case Studies
- Definitions and Regulatory Requirements
- Wastewater Treatment & Disposal Alternatives
- Next Steps
- Q&A

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Introductions

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Introductions

Craig Richardson
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Supervisor - District 4

Max Korten
Parks Director

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Principal Engineer

Carina Chen, PE, LEED AP
Project Manager

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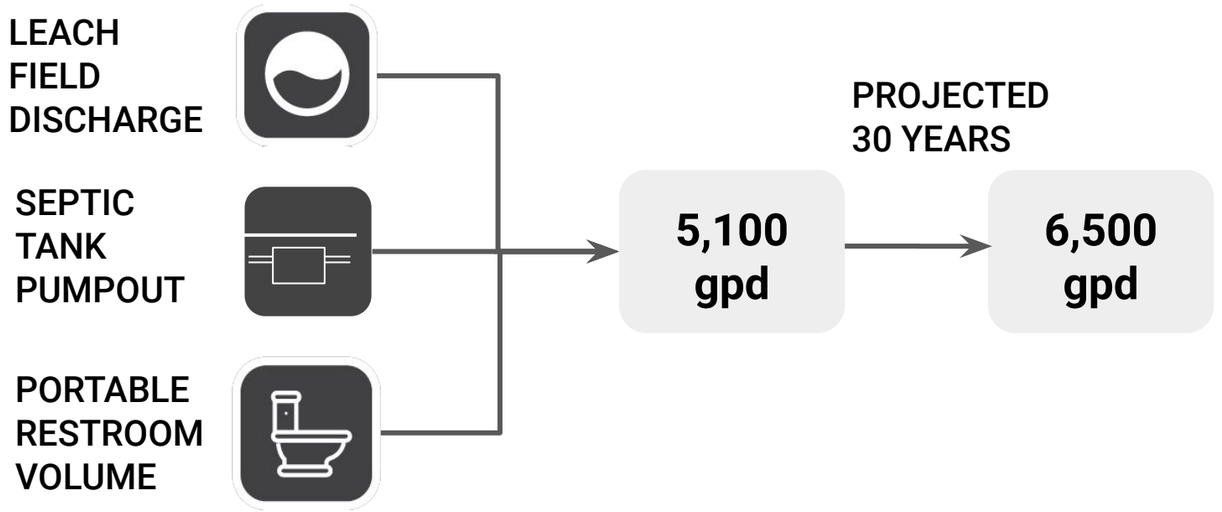
Project Engineer

Josiah Cain
Director of Innovation

Work Done To Date: Feasibility Study

- **Needs Assessment:** Sherwood used leach field, septic tank pumpout, and portable restroom records to get an estimate of actual wastewater flow to the existing restroom. Projected this by 30 years to estimate flow for a treatment system serving the existing Toby's Playground and a new facility on the Mesa Lot.

- **Case Studies:** Sherwood gathered 12 examples of similarly-sized, alternative green wastewater treatment systems and disposal options.



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Case Studies

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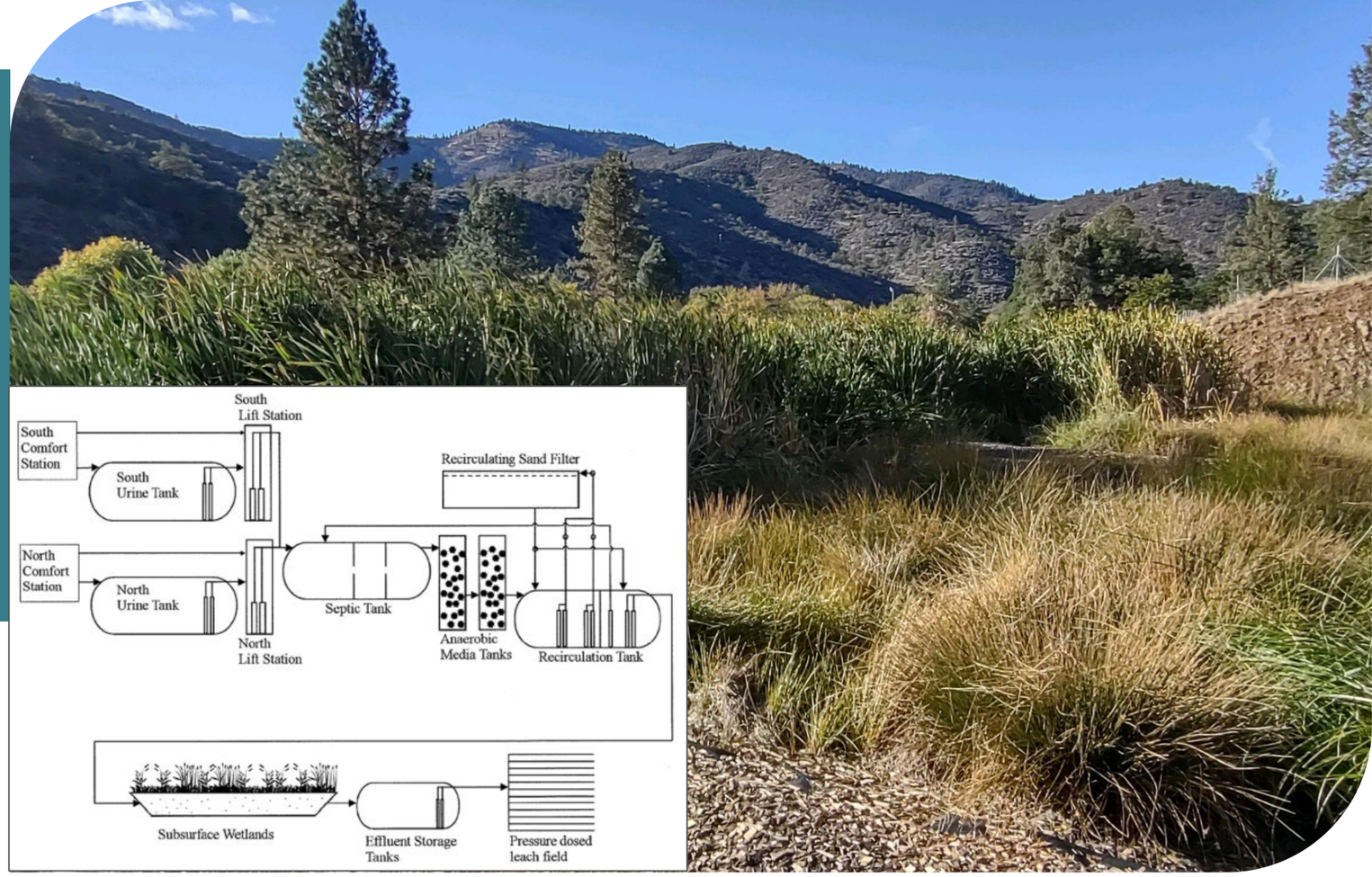
Caltrans RE Collier SRRA

Location

Treatment Type: ABR, anaerobic media tanks, recirculating sand filter, subsurface wetland
Disposal Type: Subsurface disposal field



SYSTEM SIZE

Average Flow: 4,800 gpd
Peak Flow: 14,300 gpd

HIGHLIGHTS

- High strength wastewater, treatment complies with strict nitrogen limits
- Urine diversion tanks on urinals
- Low maintenance, with reliable remote monitoring, Caltrans not staffed for wastewater treatment operations

COST

The EPA estimates the capital cost of a subsurface treatment wetland at about $178,000 per acre for the technology only.

Rest areas typically have very high strength wastewater and nitrogen removal is key. The wastewater treatment system consists of ABRs, two anaerobic media tanks, recirculation tank, sand filter, two horizontal subsurface wetlands, an effluent storage tank and a subsurface pressure-dosed disposal field. There is a 100% redundant disposal field to meet the requirements of the General Order the system is regulated by. The system produces a backwash water volume of 1,500-5,000 gallons per month which is discharged into retention basins. Challenges include users flushing rags, diapers, and sometimes clothes. Influent grinder pumps are the biggest operational issue.

Information provided by Sherwood Design Engineers staff.

Xiaogan Service Area

Hubei Province, China

Treatment Type: Aspiral™ Smart Package WWTP (MABR)
Disposal Type: On-site reuse

SYSTEM SIZE

Design Flow: 50,000 gal/day)
Influent TSS and BOD of 300 and 200 mg/L. Effluent <10 mg/L.

HIGHLIGHTS

- Design was near a popular service station, system had to be aesthetically pleasing with minimal noise or odors.
- Treats high nitrogen wastewater to China's strict Class 1A standard.
- Low energy consumption.

COST

- Economical CapEx and OpEx.
- Timeline: two months for installation and commissioning.

The service area, which includes restaurants, gas stations, mechanics, accommodations, shopping and parking, was upgraded to address growing traffic demand. This upgrade including its wastewater treatment capabilities to comply with new regulations. The system needed to be compact to fit within the footprint of the previous plant, and have minimal noise and odor. Rest areas typically have a high nitrogen concentration, which was removed to < 15 mg/L meet China's Class 1A standard. The system includes pretreatment with fine screen and selection tank, two Aspiral L4 units, a secondary clarifier, a media filter, and disinfection unit.

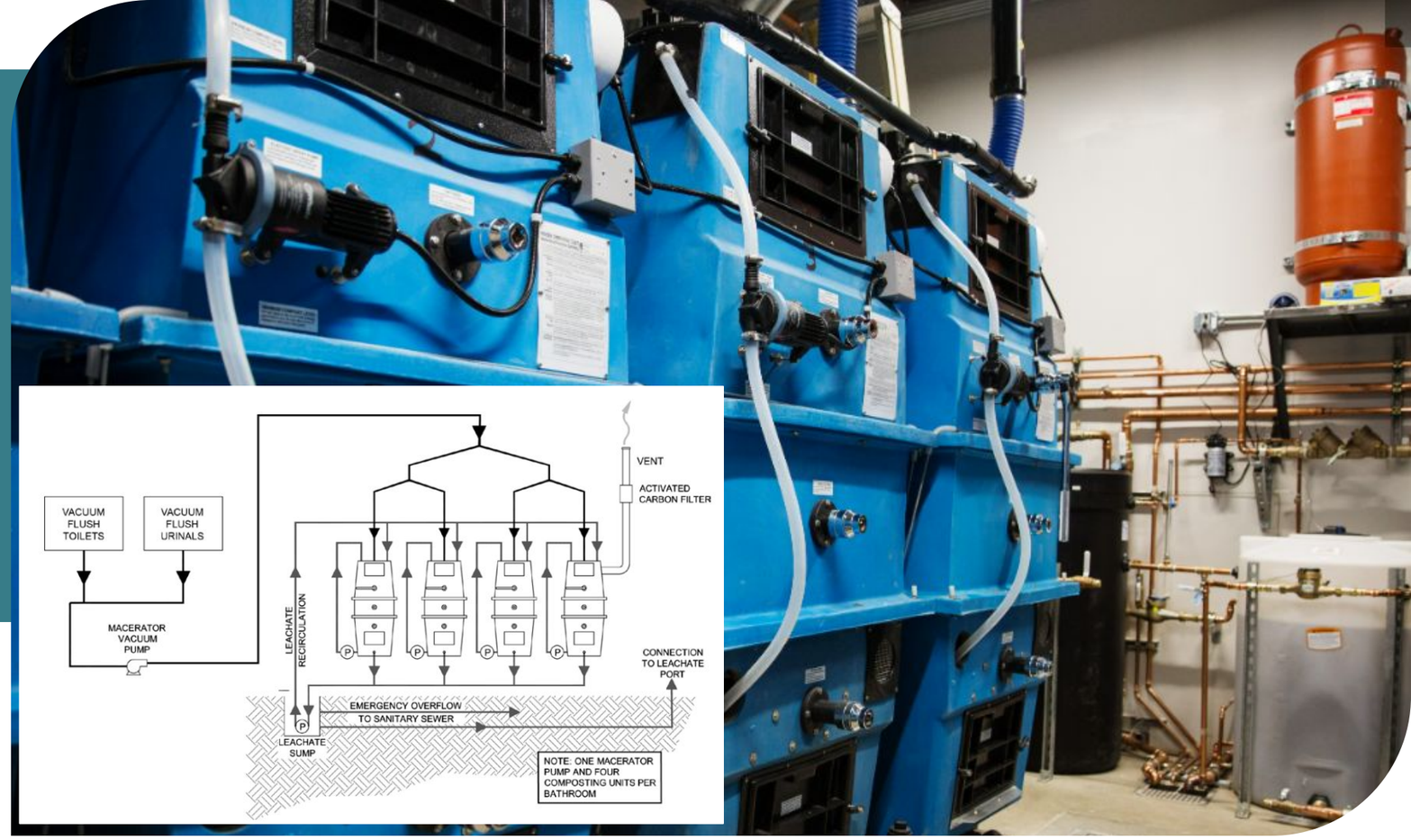
Case study provided by Fluence:
https://www.fluencecorp.com/wp-content/uploads/2019/07/HUBEI-CS_May19.pdf

Architectural Nexus SAC

Sacramento, California

Treatment Type: Composting Toilets

Disposal Type: On-site treatment and reuse for toilets and irrigation



SYSTEM SIZE

8 Composters serve two restrooms: one women's and one men's.
Serves an 8,200 square foot office building.
40 full-time staff and 10 visitors per day.

HIGHLIGHTS

- All wastewater is treated on site. No discharge to City sewer. Compost meets Class A Standards and is sent to a educational farm in Placer County for use in a garden.
- Installed in 2016, it is California's first Living Building Certified building and is Net Zero Water.

COST

- Estimated cost is $100,000 for the full system which includes the composters, toilet fixtures, vacuum pump, control panel, and installation.

The building reduces water use by means of waterless urinals, composting toilets, and low flow fixtures, and harvests and stores rainwater on site. The composting toilet system (Phoenix) uses wall-mounted vacuum flush toilets (JETS) with a macerator pump which helps distributes material. The in-ground leachate tank is produced by Oldcastle. Operations staff adds wood chips and mixes bins weekly. System is oversized so they have only removed one batch of finished compost in the last three years.
The gray water system provides recycled water for toilet flushing and irrigation. Tenant education efforts encourage participation in energy savings and the buildings operations. The team also installed a system to convert rainwater to potable water but cannot operate it until California changes its water permitting laws.

Case study of the office building at:
http://www.archnexus.com/arch-nexus-sac/building/

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Regulatory

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Regulatory Agencies and Requirements

County of Marin: Local Area Management Plan (LAMP) and Marin County Code (MCC) provide setback requirements for treatment system and require 100% redundancy for disposal alternatives.

Regional Water Quality Control Board (RWQCB): Implements the Onsite Wastewater Treatment System (OWTS) policy that establishes state-wide regulation and management measures for OWTS. They may delegate permitting and oversight to the County.

North Marin Water District (NMWD): Service provider of potable water to site. To protect a groundwater well in the area, they set a 1,600’ buffer, which bisects the Mesa Lot. Treatment requirements will depend on this buffer.

	Treatment and Disposal Outside of 1,600’ NMWD Buffer *Minimum Treatment*	**Treatment and Disposal within 1,600’ NMWD Buffer** *Maximum Treatment*
Regulations	At minimum, will comply with LAMP and MCC setback and construction requirements. May need to comply with RWQCB General Order.	California Code of Regulations, Title 22 for Recycled Water
Treatment	Secondary (biological) treatment. Monthly monitoring requirements.	Secondary (biological) treatment with tertiary filtration and disinfection. Daily monitoring requirements.
Disposal	Leach field: 200% capacity	Leach field: 100% capacity Subsurface drip: 100% capacity

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Wastewater Treatment & Disposal Alternatives

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Mesa Lot Alternatives

Moving Bed Biofilm Reactor (MBBR)

Advantages
- High level of treatment.
- Lower energy use compared to MBR.
- Smallest footprint.
- Equipment can be buried.

Disadvantages
- High capital cost.
- Technical operations.

Membrane Bioreactor (MBR)

Advantages
- High level of treatment.
- Compact footprint.
- Modular.

Disadvantages
- Highest capital cost.
- High energy cost.
- Membrane cleaning and replacement.
- Technical operations.

Anaerobic Baffled Reactor (ABR) w/ Membrane Aerated Biofilm Reactor (MABR)

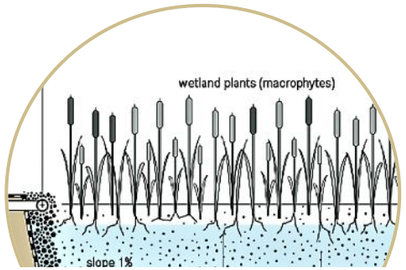
Advantages
- Compact footprint, package in shipping container.
- Process stability with fluctuating loads.

Disadvantages
- New, emerging technology.
- Medium energy use.

Trickling Filters and Vertical Treatment Wetland

Advantages
- Low maintenance.
- Low capital and operating cost.
- Low energy use.
- Creates habitat, visual benefit.

Disadvantages
- Treatment wetland not likely to be allowed within NMWD buffer.
- Performance of wetland is less consistent than conventional treatment.



Engineered design: Anaerobic Media Tanks w/ Horizontal Treatment Wetland

Advantages
- Level of treatment tailored specifically to higher strength rest area wastewater.
- Habitat creation.
- Vertical wetland will fit within buffer.

Disadvantages
- Custom design.
- Performance of wetland is less consistent than conventional treatment.

Composting Toilets

Advantages
- Minimal water use.
- Beneficial reuse of composted material.

Disadvantages
- High degree of operator interference.
- Still requires liquid leachate treatment and disposal.
- Requires vacuum flush system.
- Permitting pathway uncertainty.

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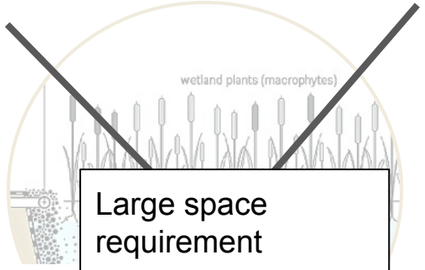

Large space requirement

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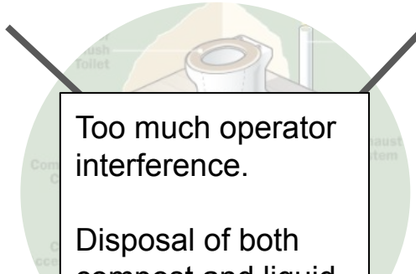

Too much operator interference.

Disposal of both compost and liquid stream required.

Toilets

Advantages
- Minimal water use.
- Beneficial reuse of composted material.

Disadvantages
- High degree of operator interference.
- Still requires liquid leachate treatment and disposal.
- Requires vacuum flush system.
- Permitting pathway uncertainty.

Alternatives

The area requirements of the shortlisted alternatives are shown in the figure.

All alternatives will require disposal (shown in the green and yellow areas). Hardscape development of the site cannot occur in these areas.

All treatment and disposal options will not fit outside of the NMWD buffer.

Any disposal area limits the type of development.

If treatment and disposal is within the buffer, treatment alternatives will be required to meet Title 22, adding tertiary filtration and disinfection to the treatment process.

Potential Uses for Disposal Areas

Allowed

- Public access
- Planted walkable surface
- Landscaping

Not Allowed

- Building/structure
- Hardscape

Selected Alternatives Matrix

May change based on NMWD Requirements

	Capital Expense (CapEx)	Operational Costs (OpEx)	Reliability + Performance	Odor and Noise	Land Area Requirements	Permitting Requirements
Moving Bed Biofilm Reactor (MBBR)	$1.2M High capital cost.	Medium/high O&M cost. Lower when compared to MBR system.	Proven technology. High reliability and treatment.	Medium odor and noise potential.	500 sq. ft. Smallest space requirement. Mobile-sized unit can be buried.	Depends on NMWD buffer zone. Tertiary filtration and disinfection would need to be added to meet Title 22 requirements per NMWD.
Membrane Bioreactor (MBR)	$1.6M Highest capital cost.	High O&M cost. Largest operating expense is energy use.	Proven technology. High reliability and treatment.	Medium odor and noise potential.	700 sq. ft. Small space requirement. Tanks can be buried.	Depends on NMWD buffer zone. Already includes tertiary filtration. Disinfection would need to be added to meet Title 22 requirements per NMWD.
ABR w/ Membrane Aerated Biofilm Reactor (MABR)	$1.5M High capital cost.	Medium/high O&M cost. Lower when compared to MBR system.	Emerging technology.	Medium odor and noise potential.	800 sq. ft. Medium space requirement. MABR in shipping container above ground.	Depends on NMWD buffer zone. Tertiary filtration and disinfection would need to be added to meet Title 22 requirements per NMWD.
Trickling Filters and Treatment Wetland	$350,000 Lowest capital cost.	Low O&M cost.	High level of reliability with the tradeoff of a lower level of treatment.	Low odor and noise potential.	1,500 sq. ft. for trickling filter tank and pumps 1,000 sq. ft for vertical flow wetland Largest area requirement with wetland.	Depends on NMWD buffer zone. Tertiary filtration and disinfection would need to be added to meet Title 22 requirements per NMWD. Treatment wetlands will likely not be allowed within the NMWD well buffer.

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Next Steps

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Q&A Session

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Thank you

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