Key Design Elements for Successful On-site Systems to Community Liquid Only Sewers

Cory Lyon
Director of Product Management

2025-07-23

Presented at the 2025 NOWRA Mega-Conference, October 19-22, 2025

Objectives

1) **Highlight design elements of successful systems in three examples**

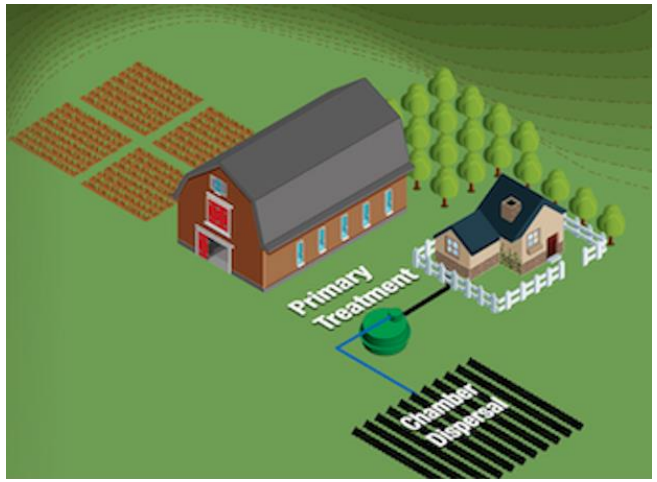
2) **Highlight commonalities or shared DNA**

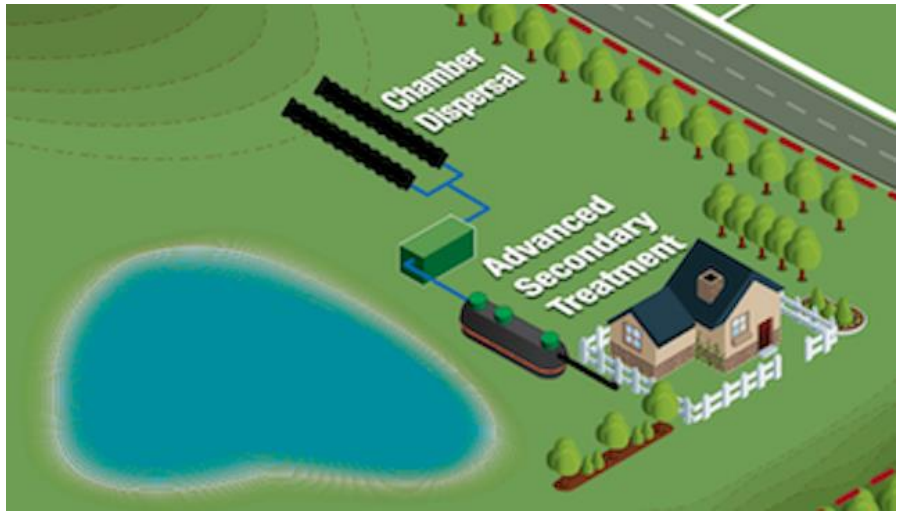
3) **The balance of these factors based on system users**
    1) **Owner needs**
    2) **Regulatory and performance needs**
    3) **Site constraints**

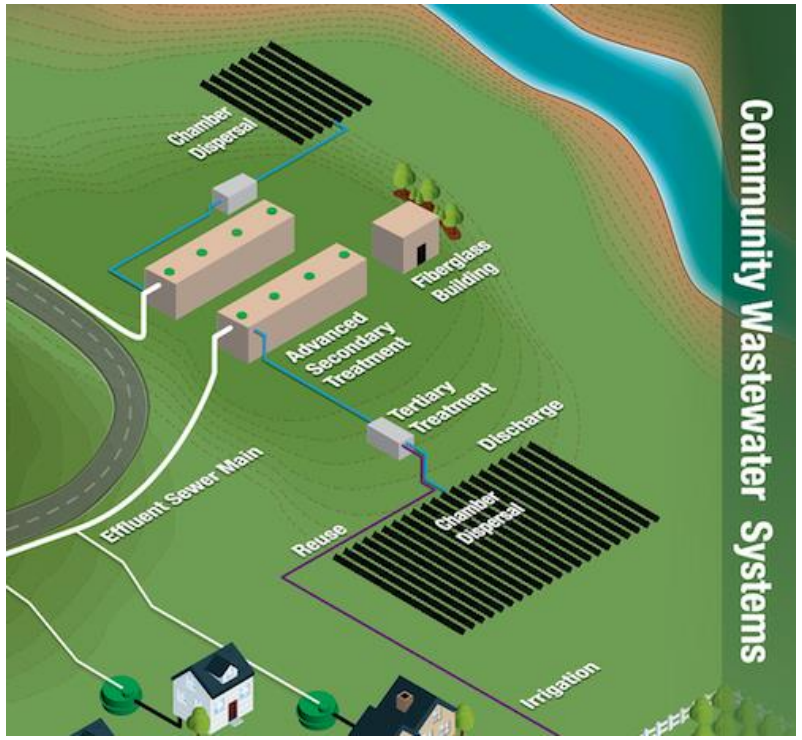
Disclaimer – Any opinions presented are those of the presenter’s and not those of NOWRA or it’s affiliates.

Example Systems

- **Conventional gravity or pump and drainfield**
- **Advanced secondary treatment system**
- **Community collection and treatment**







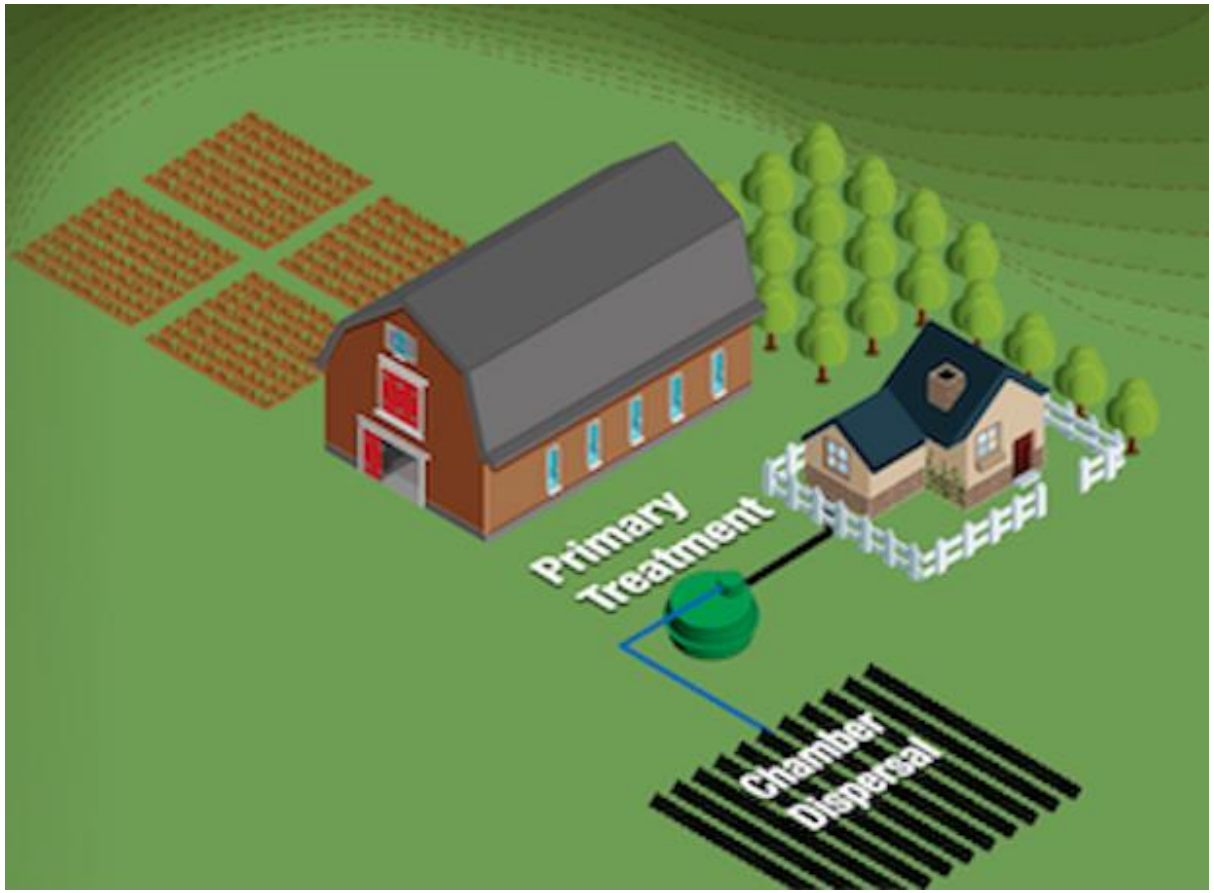
Classic On-Lot System

System Goals

- **Conveyance and storage**
- **Safe disposal to watershed**

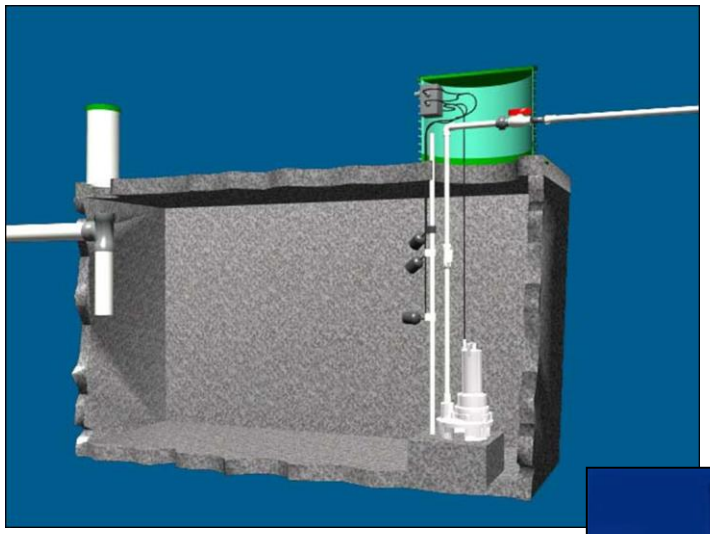
Constraints:

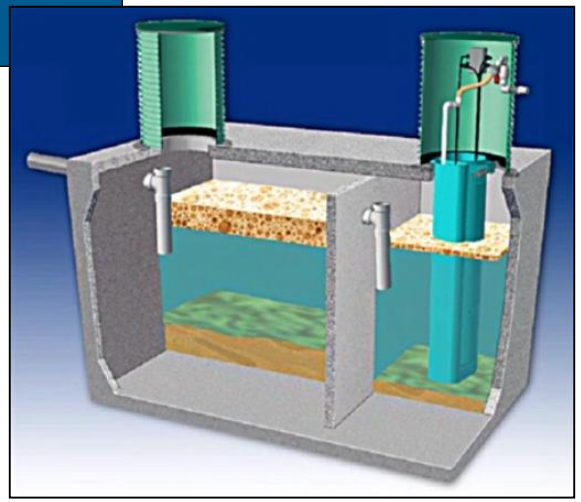
- **Space constraints unlikely**
- **Limiting layers or horizons may be in play**

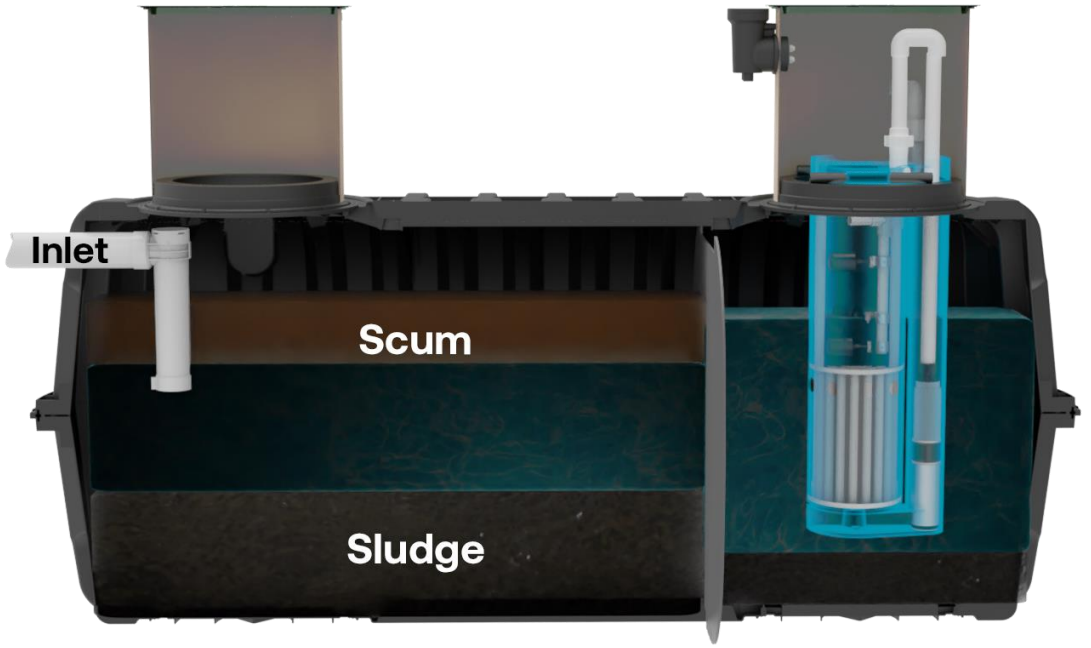


Classic On-Lot System

A conventional on-lot system can take several forms.





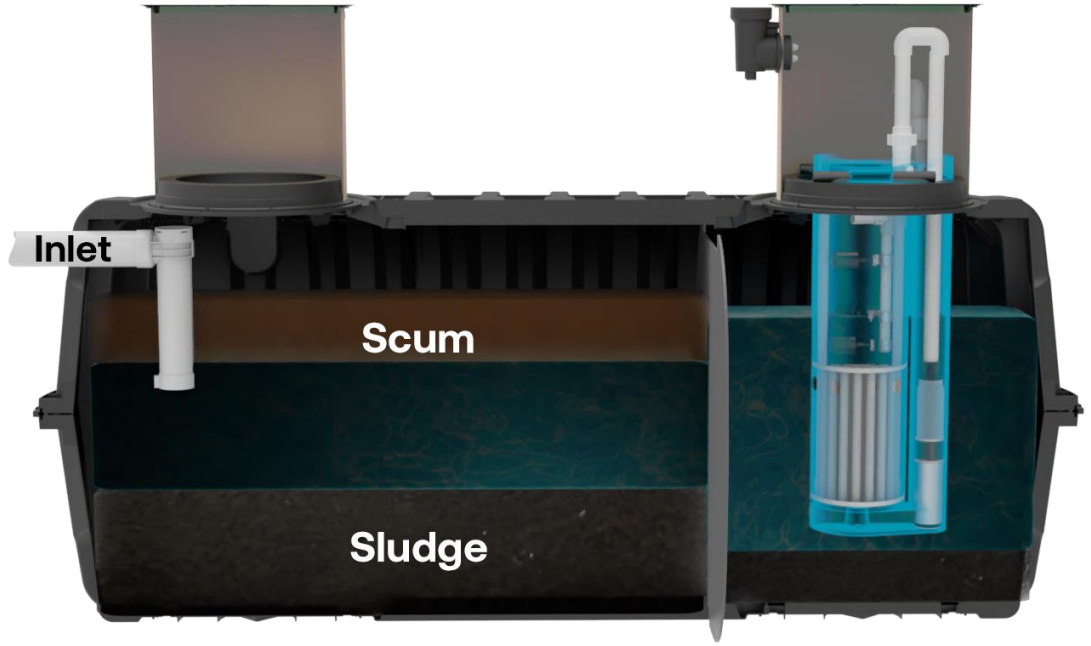


Classic On-Lot System

Design Attributes

- **Primary storage – hydraulic retention time**
  - **Reg driven typ. Often 1.5 to 2days of design**
- **Settling and conveyance**
  - **Solids storage for long term digestion**
  - **Watertight**
  - **Effluent filtration**

Example two compartment tank with filtered pump system.

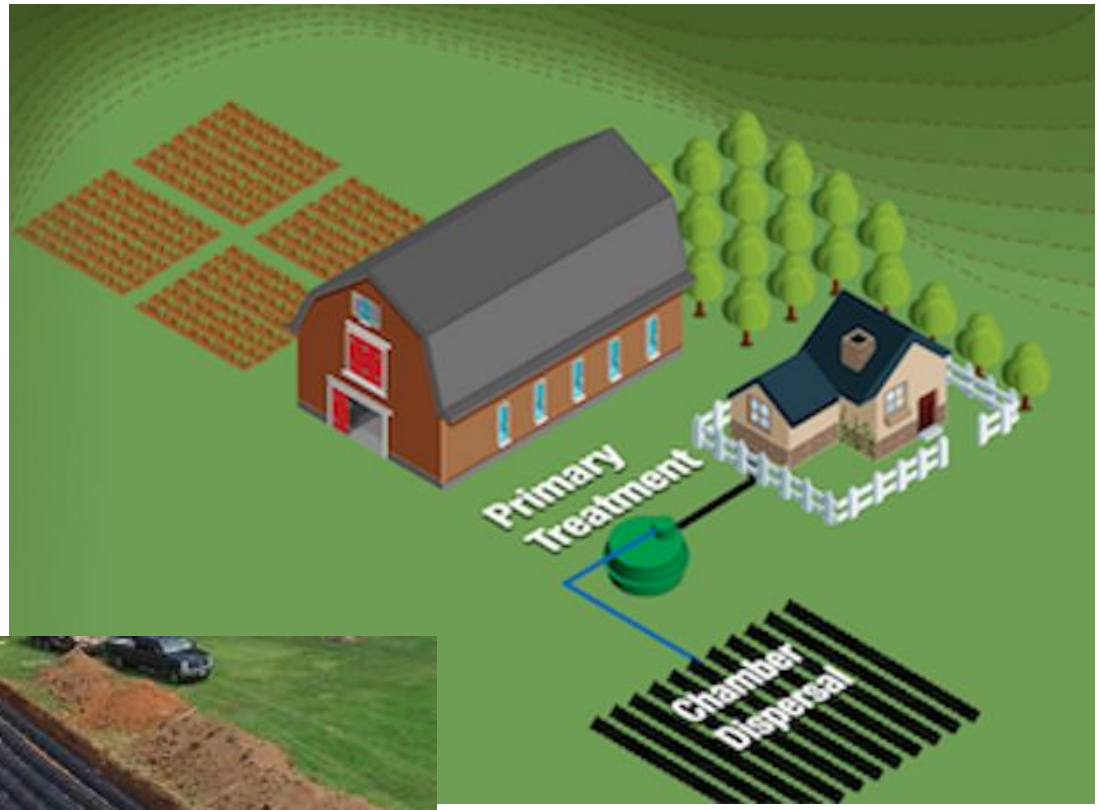


Classic On-Lot System

Design Attributes

- **Soil type and conditions**
  - **Loading rate by soil and dispersal method**
  - **Depth to limiting layers**
  - **Set back distances**
  - **Effluent distribution**

Example of chamber dispersal field



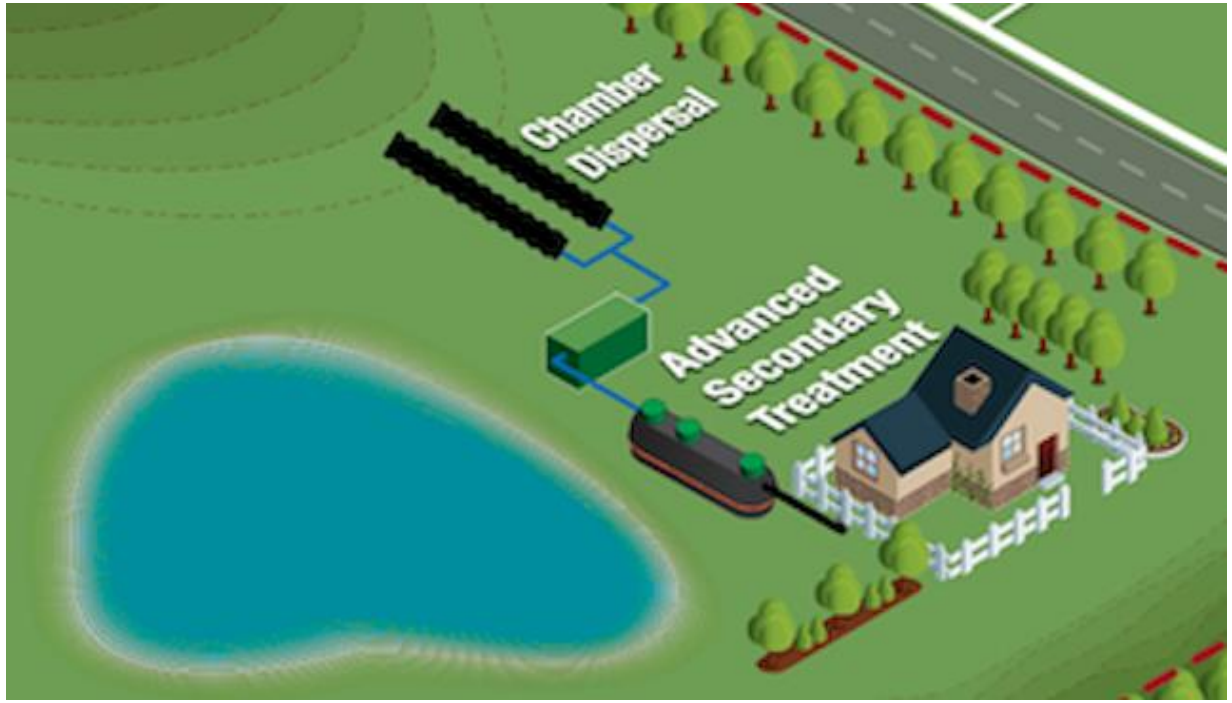
Advanced Secondary Treatment System

System Goals

- **Conveyance and storage**
- **Safe disposal to watershed**
- **High quality effluent (ex. < 10mg/L TSS, BOD, TN**
- **Low costs of ownership**

Constraints:

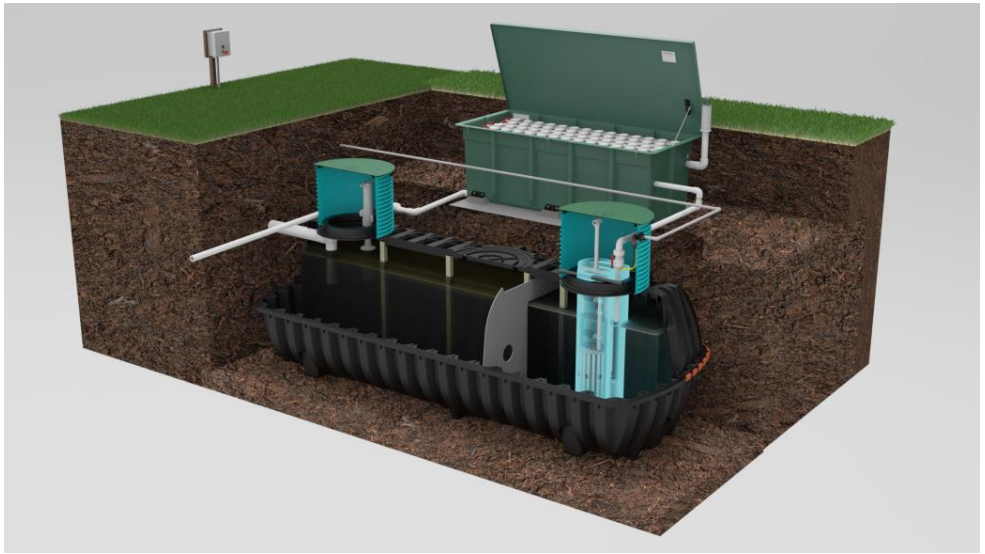
- **Property boundary**
- **Limiting layers or horizons in play**
- **Nearby water body**



Advanced Secondary Treatment System

Design Attributes

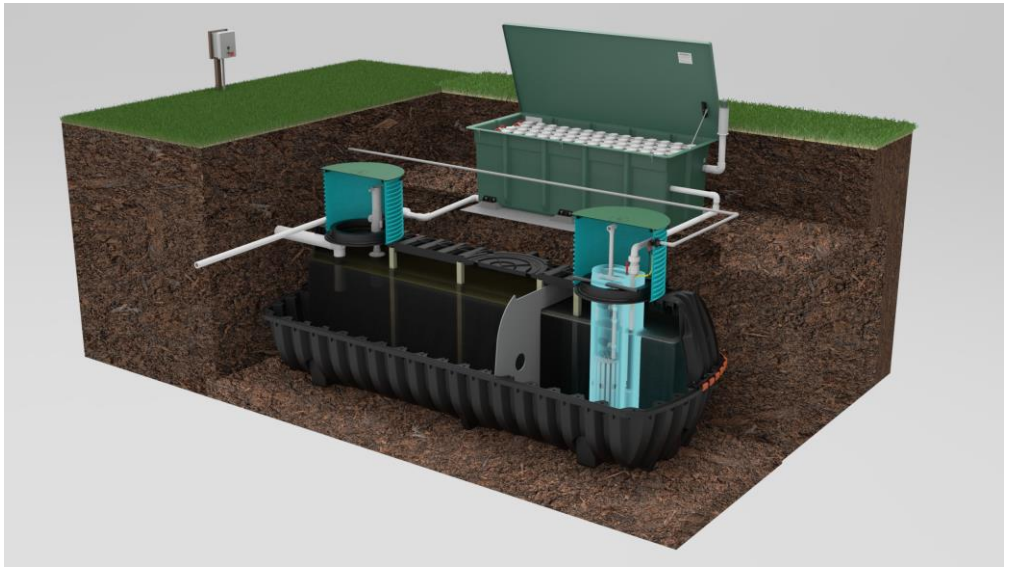
- **Primary storage – hydraulic retention time**
  - **Reg driven typ. often 1.5 to 2days of design**
- **Settling and conveyance**
  - **Solids storage for long term digestion**
  - **Watertight**
  - **Effluent filtration**
- **Secondary treatment – sized for organic and hydraulic loads**
  - **Typ. aerobic process to achieve reductions in BOD, TSS, TN, and FC. Ex. <20mg/L TSS/BOD, <10mg/L TSS, BOD, 19mg/L TN + FC 5log reduction**
  - **Sized for organic removal**
- **Small footprint (system often used to lieu of soil)**
- **Process control elements!**



Example – recirculating media filter

Advanced Secondary Treatment System

Design Attributes Cont.



- **Disposal**
  - **Advanced secondary effluent quality may allow for:**
    - **Higher loading rates**
    - **Closer proximity to sensitive water bodies**
    - **In some cases, direct discharge depending on permit and jurisdiction.**

- **O&M typically required**

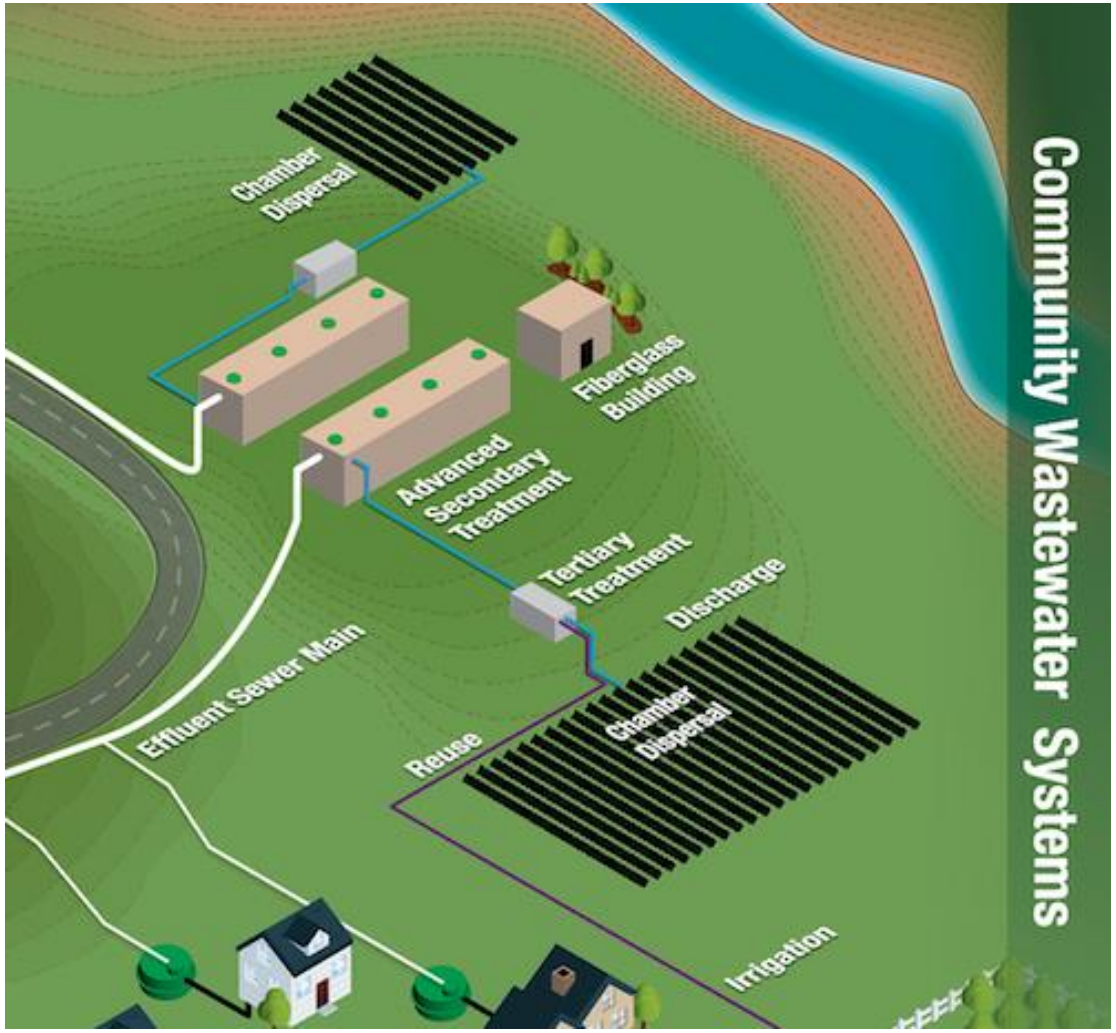
Community Collection System

System Goals

- **Conveyance and storage**
- **Safe disposal to watershed**
- **High quality effluent (ex. < 10mg/L TSS, BOD, TN**
- **Economic sustainability**

Constraints:

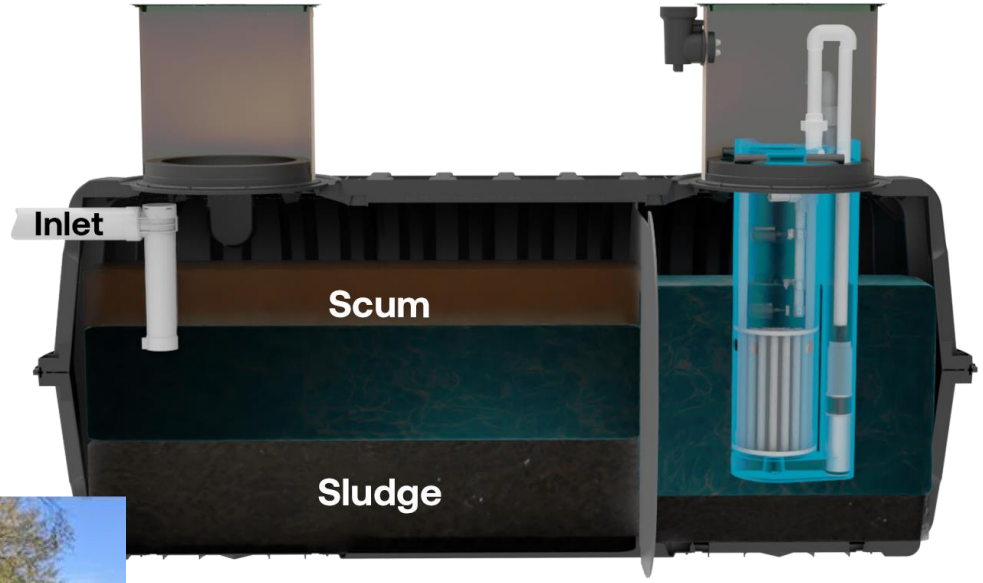
- **Property boundary**
- **Limiting layers or horizons in play**
- **Nearby water body**
- **Varied topography**



Community Collection System

Design Attributes

- **Primary storage – hydraulic retention time**
  - **Reg driven typ. often 1.5 to 2days of design**
- **Settling and conveyance**
  - **Solids storage for long term digestion**
  - **Watertight**
  - **Effluent filtration**

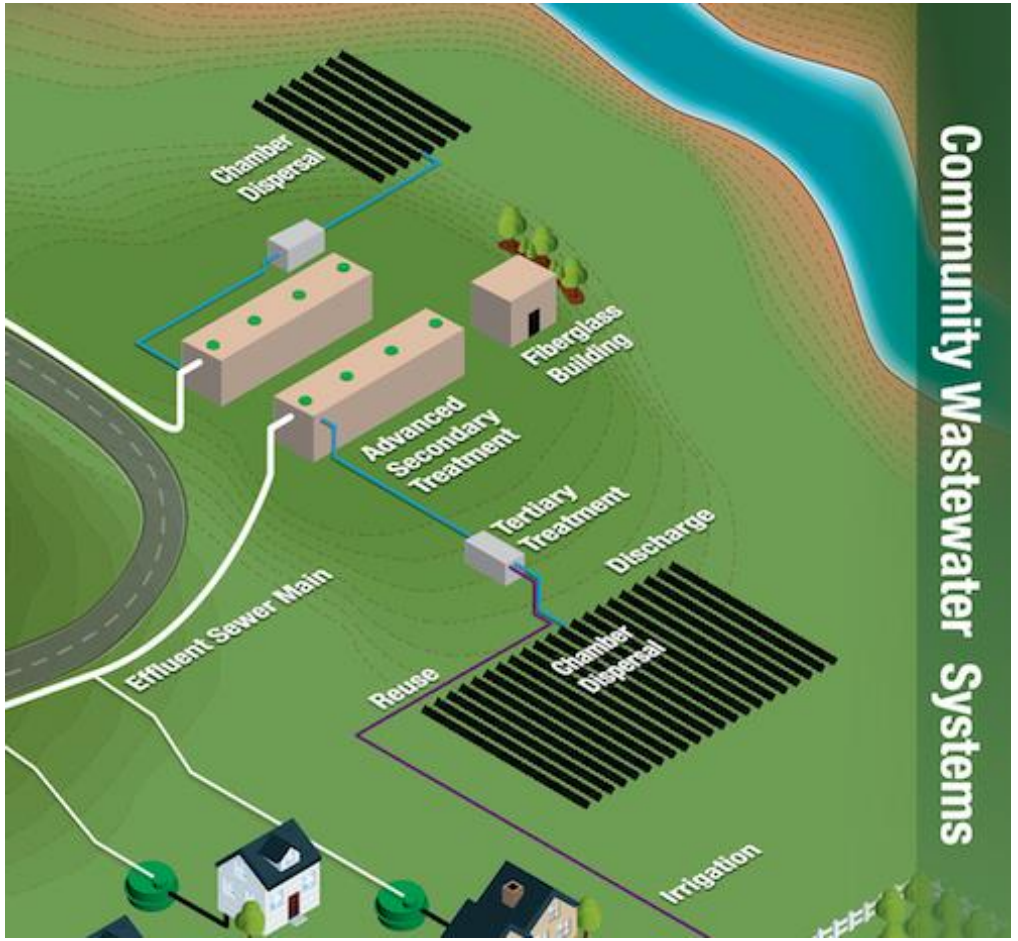


Example two compartment tank with filtered pump system that pumps to a community collection sys.

Advanced Secondary Treatment System for Community

Design Attributes

- **Primary storage & Settling**
  - Handled by on-lot filtered pump systems
- **Conveyance**
  - 2 to 4in force main (filtered effluent)
  - Watertight
  - Few topography constraints
- **Secondary treatment – Sized for organic and hydraulic loads**
  - Typ. Aerobic process to achieve reductions in BOD, TSS, TN, and FC. (Ex. <20mg/L TSS/BOD, <10mg/L TSS, BOD, 19mg/L TN + FC 5log reduction)
  - Sized for organic removal
- **Process control elements still present**
- **Flexible design that can be deployed as needed!**

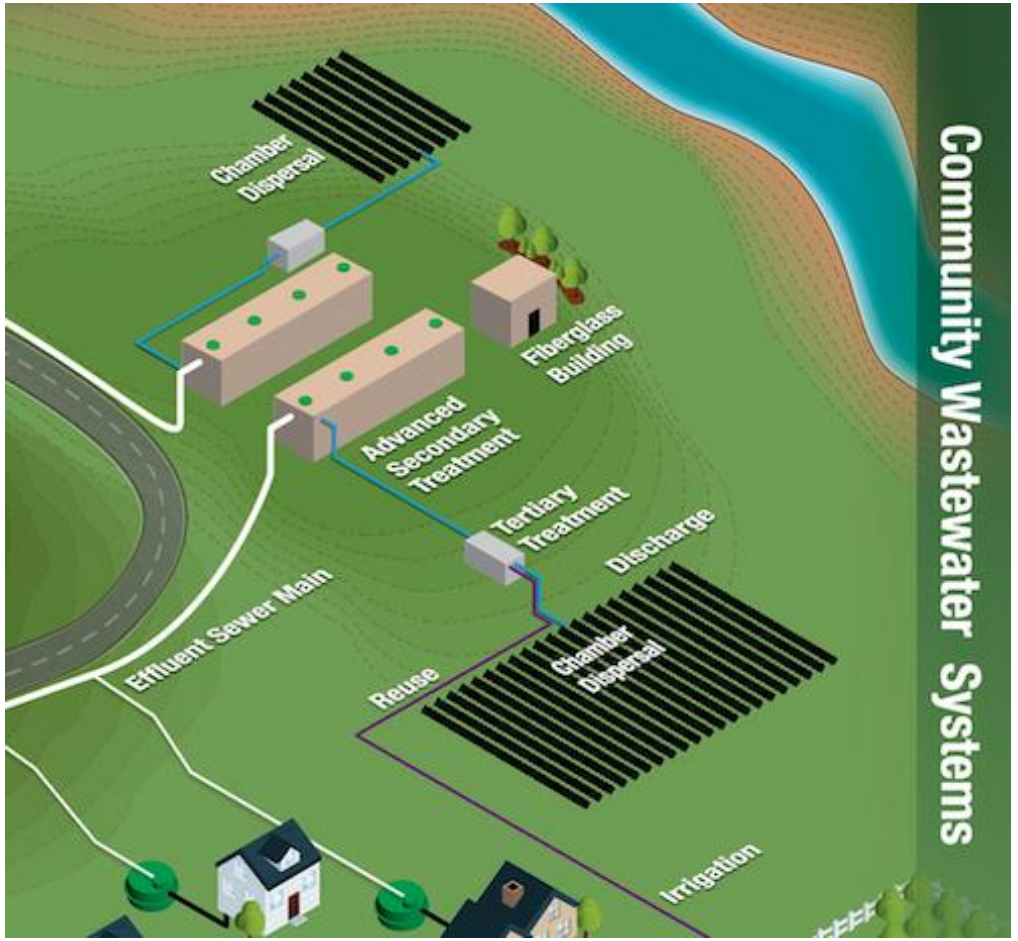


Advanced Secondary Treatment System for Community

Design Attributes

- Process control elements still present
- Flexible design that can be deployed as needed

- Decentralize elements can enhance the economic sustainability of the community system



Objectives

- **Highlight commonalities or shared DNA**
  - **Primary treatment sizing, solids storage, watertightness, filtered effluent**
  - **Effluent conveyance and the options it allows**
  - **Decentralized technologies allow for flexible and modular designs**
  - **The system performance and costs were aligned with the needs of the site and owners**
  - **The system performance was aligned with the regulatory needs and site constraints**

It’s all about good building blocks that build on each other.

Q & A