

Sanitation Engineering in the North

Past Solutions and Considerations

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Sanitation Engineering in the North

Presentation Overview

Water Source

- Groundwater
- Surface Water
- Groundwater Under the Direct Influence of Surface Water (GUDISW)

- Water Treatment

- Organics
- Inorganics
- Microorganisms

- Water Distribution

- Piped Systems
- Haul Systems

Sanitation Engineering in the North

Presentation Overview

Wastewater Collection

- Gravity Systems
- Vacuum Systems
- Low Pressure Systems
- Haul Systems

- Wastewater Treatment

- Lagoons
- Septic Tanks
- Advanced Treatment

- Wastewater Disposal

- Liquids
- Solids

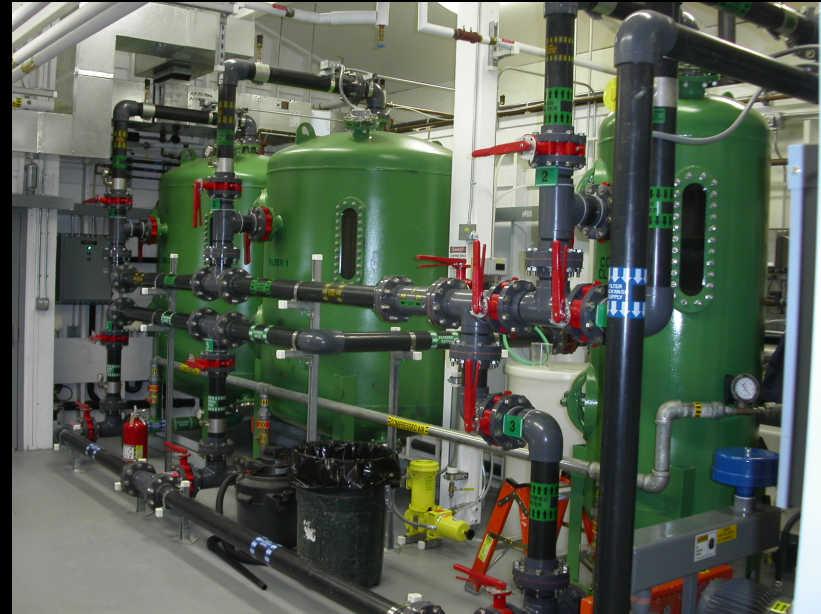
Water Source

- **Groundwater**
 - Wells
- **GUDISW**
 - Wells
 - Infiltration Galleries
- **Surface Water**
 - Impoundments
 - Diversion Structures



Water Treatment

- **Groundwater**
 - Inorganics & Complexed Organics
- **GUDISW**
 - Inorganics & Complexed Organics
 - Microorganisms
- **Surface Water**
 - Inorganics
 - Organics & Complexed Organics
 - Microorganisms
- **Regulatory Requirements**



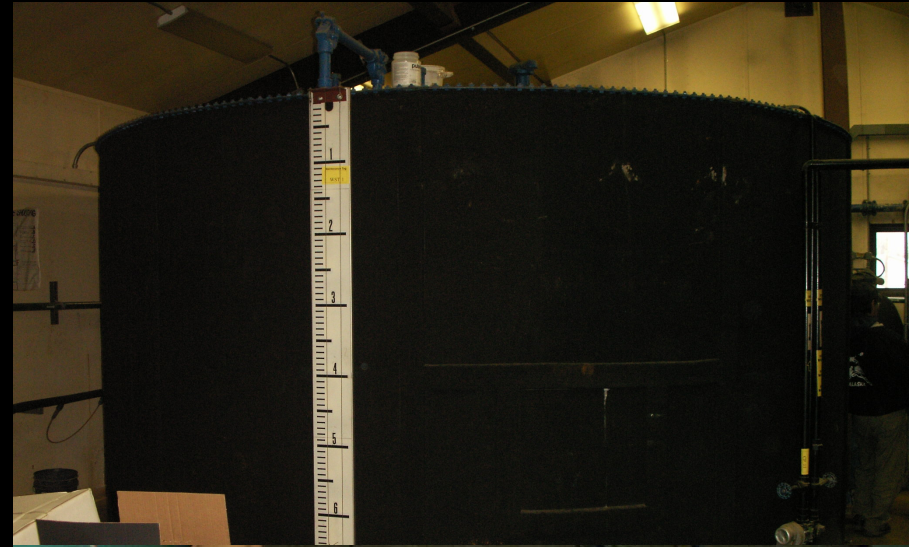
Water Treatment

- Streaming Current Detectors
- Online Monitoring
- Drives



Water Storage

- Exterior Insulated Tanks
- Interior Tanks in Buildings



Water Distribution

- **Piped Distribution**
 - Buried
 - Above Ground
 - Utilidor



Water Distribution

- **Haul**
 - **Community**
 - **Individual**



Water Distribution

- High Efficiency Heating Systems
- Boiler Controls
- Drives (motor controls)
- Integrating Online Monitoring



Wastewater Collection

- **Piped Collection**

- Gravity
- Vacuum
- Low Pressure



Wastewater Collection

- **Haul**
 - Individual
 - Community



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Wastewater Treatment

- **Natural Systems**
 - **Facultative Lagoons**
 - **Septic Tanks**
- **Advanced Treatment**
 - **Aerated Ponds**
 - **Suspended or Attached Growth**
- **Regulatory Requirements**



Wastewater Disposal

- **Liquids**

- **Percolation**
- **Surface Discharge**

- **Solids**

- **Landfill**



Opportunities

- **Piped Systems**

- **Well Refined**
- **Expensive to Construct**
- **Lower Operational Cost**
- **Benefit from Economy of Scale**

- **Haul Systems**

- **Not Well Refined**
- **Inexpensive to Construct**
- **Higher Operational Cost**



QUESTIONS?

