Performance Update for Three Stormwater Treatment Approaches for Three Linked Industrial Sites

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Engineers & Scientists
Discussion Topics

- Sites & Operational Descriptions
- Stormwater Characteristics
- Treatment Evaluation and Selection
- Construction Costs
- Performance Summary
- Lessons Learned
Three Linked Industrial Sites

- General Peninsula Project
- Olympic Container Terminal (OCT)
- North Intermodal Yard (NIM)
- South Intermodal Yard (SIM)
- Heavy Industrial Maritime Property
- Containerized Cargo
- Difficult Meeting ISGP Benchmarks
Olympic Container Terminal (OCT)

- 56 acres
- Ship to Rail or Truck and Back
- 5 Drainage Basins
- Outfalls Under Pier
North Intermodal Yard (NIM)

- 12 acres
- Containers moved between terminals
- Efficient means of ship to inland or inland to ship transport
- 24 hour operations
- Small strip of unpaved land available
South Intermodal Yard (SIM)

- 22 acres
- Operating rail facility
- 2 drainage basins
- Long rectangular configuration
- Perforated storm drain piping underneath track ballast
Stormwater Characteristics

- Zinc – Main pollutant of concern
- Occasional turbidity exceedances throughout
- Copper at SIM
- Larger particulate at SIM (perforated storm drains along tracks)

<table>
<thead>
<tr>
<th>Turbidity</th>
<th>pH</th>
<th>Zinc</th>
<th>Copper</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCT Average</td>
<td>23.0</td>
<td>7.0</td>
<td>150.0</td>
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<tr>
<td>OCT Maximum</td>
<td>74.0</td>
<td>7.9</td>
<td>275.0</td>
</tr>
<tr>
<td>NIM Average</td>
<td>16.0</td>
<td>7.0</td>
<td>115.0</td>
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<tr>
<td>NIM Maximum</td>
<td>22.0</td>
<td>7.8</td>
<td>189.0</td>
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<tr>
<td>SIM Average</td>
<td>21.0</td>
<td>7.0</td>
<td>124.0</td>
</tr>
<tr>
<td>SIM Maximum</td>
<td>44.3</td>
<td>7.8</td>
<td>281.0</td>
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</tbody>
</table>

Benchmarks

<table>
<thead>
<tr>
<th>Turbidity</th>
<th>pH</th>
<th>Zinc</th>
<th>Copper</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>5 to 9</td>
<td>117</td>
<td>14</td>
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</tbody>
</table>

Note:
Bold red text indicates exceedance of the parameter benchmark.
Treatment Alternatives Selected

- 2 up-flow type
- 1 lateral flow
OCT - Upward Flow Media Filtration

- Subsurface vault
- Fluidized media filtration technology
- Bags of media Inside filter modules
Lateral Flow Media Filtration

- At-grade system
- Front end settling
- Pre-filtration cartridges
- Media filtration
- Perforated collection piping
Upward Flow Cartridge Filtration

- Subsurface manhole
- Up-flow configuration
- Membrane filters
- Passive backwash
OCT Final Design/Cost

- 5 subsurface vaults
- From 8’ x 12’ to 16’ x 17’
- 15 feet deep
- Accommodates 125 Kip wheel loads

Project Costs:
Final Construction Cost: $1,033,614
Cost per acre treated: $18,457
NIM Final Design/Cost

- 2 At-grade systems
- Each 10’ x 20’
- 1 flow splitter and collection MH
- Located clear of container traffic, on strip of unpaved area

Project Costs

Final Construction Cost: $301,104
Cost per acre treated: $25,092
SIM Final Design/Cost

- 2 Subsurface 6” ID Filter Systems.
- Upstream Flow Splitter MH and Downstream Collection MH for each
- Accommodates 125 Kip Wheel Loads

Project Costs:
- Final Construction Cost: $418,603
- Cost per acre treated: $11,674
OCT Modifications

- Chopping check valves
- Sealing the modules
- Installing sampling Tee
- Varying media
- Losing the bags
- Resorting to milk crates, VPS, & chicken feed
You Have No Idea How Long it Took to Make This Chart

OCT NIM SIM Zn Data

- Treatment Installed
- Chicken Food Installed

Legend:
- Oct
- Nim
- Sim
- Zn Benchmark

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Conclusions/Questions?

► There is NO SILVER BULLET
► Know your pollutant characteristics
► Always, wait... Never, trust the vendor
► Don’t be afraid to get in the hole
► Never give up, sometimes what you need is in your shed