DREDGING, DEWATERING, AND DISPOSAL OF MARINE SEDIMENTS FROM RESIDENTIAL CANALS IN ST. JOHN’S COUNTY, FL USING GEOTEXTILE TUBES

Chris Timpson
TenCate Geosynthetics
Background

Source: www.dewatering-press.com
Background

Wastewater stream pumped into geotextile tube. Dewatering capacity determined by tube circumference & length.
Background

Wastewater residuals are captured, liquid escapes. Filling & dewatering process is repeated.
Background

Wastewater residuals continue to consolidate over time. After consolidation, residuals can be disposed.
Project Location

St. Augustine, FL
Project Scope:

- Residential community platted in 1969.
- 8.9 kilometers of canals.
- Last dredged more than a decade ago.
- Community has impaired water access.
Project Challenge:

- Last dredged in 1990’s, impaired water access.
- Environmental impact to salt marsh.
- Limited laydown area.
- No 3-phase power.
Proposed Solution

- Conduct feasibility study to demonstrate viability of dewatering with geotextile tubes.
- Utilize FL DEP approved polymers to meet discharge criteria of filtrate water into salt marsh.
- Temporary close Butler Park and repurpose to create a containment and dewatering cell.
Typical Geotextile Tube Dewatering Process

Typical Geotextile Tube Dewatering Process
Polymer Bench Testing

Polymer Bench Testing
Proposed Dewatering Cell
Proposed Tube Layout
# Geotube® Estimator

**English Units Input - Known Volume**

**Version 15.0**

Christopher Timpson 01/12/15

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>Treasure Beach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>St. Augustine, FL</td>
</tr>
<tr>
<td>Contact:</td>
<td>Gator Dredging</td>
</tr>
<tr>
<td>Date:</td>
<td>4/2/2014</td>
</tr>
<tr>
<td>Type of Material:</td>
<td>Marine Sediments</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input</th>
<th>Units</th>
<th>Output</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>100,000</td>
<td>Total Volume Pumped</td>
<td>30,901,987</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.60</td>
<td>Wet Volume per day</td>
<td>450,000</td>
</tr>
<tr>
<td>% Solids in Place</td>
<td>15.0%</td>
<td>Wet Volume per day</td>
<td>2,227.7</td>
</tr>
<tr>
<td>% Solids During Pumping</td>
<td>10.0%</td>
<td>Total Bone Dry Tons</td>
<td>13,389.1</td>
</tr>
<tr>
<td>Target dewatered % Solids</td>
<td>30%</td>
<td>Estimated Pumping Days</td>
<td>68.7</td>
</tr>
<tr>
<td>% Coarse grain &amp; sand*</td>
<td>1.0%</td>
<td>Estimated Dewatered Volume</td>
<td>47,549.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Estimated Dewatered Weight</td>
<td>44,630.5</td>
</tr>
</tbody>
</table>

* % Coarse grain & sand is removed from the calculation for volume reduction due to dewatering and added back in at the end in required Geotube® volume.

**Production:**

<table>
<thead>
<tr>
<th>Production</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pumping Rate (GPM)</td>
<td>1,000</td>
</tr>
<tr>
<td>Hours per Day</td>
<td>10.0</td>
</tr>
<tr>
<td>% Efficiency</td>
<td>75%</td>
</tr>
</tbody>
</table>

**Material type:**

- Silts and/or Organics

| Percent of Maximum Filled Capacity | 80% |

**Estimated Geotube® Quantity:**

<table>
<thead>
<tr>
<th>Circumference x Pumping Height</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>90' X 8.5'</td>
<td>5.151</td>
</tr>
</tbody>
</table>

**For MDS Applications:**

<table>
<thead>
<tr>
<th>Legal Hauling Capacity</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**Estimated MDS Geotube® Units:**

<table>
<thead>
<tr>
<th>MDS Dimension</th>
<th>Each</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.5' X 22'</td>
<td>#DIV/0!</td>
</tr>
</tbody>
</table>

**Disclaimer:** No warranty or guarantee expressed or implied is made regarding the performance of any product since the manner of handling and use is beyond our control. This document should not be construed as engineering advice, and the final design should be the responsibility of the project engineer and/or the project manager.
Geotube® Simulator
Cross Section

4/2/14
Project: Treasure Beach

<table>
<thead>
<tr>
<th>Units:</th>
<th>English</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Level:</td>
<td>Fully Emerged</td>
<td></td>
</tr>
<tr>
<td>Geotube® Height (H) =</td>
<td>8.5 ft</td>
<td></td>
</tr>
<tr>
<td>Geotube® Circumference (C) =</td>
<td>90 ft</td>
<td></td>
</tr>
<tr>
<td>Relative Density of Fill Material =</td>
<td>1.4 sq ft</td>
<td></td>
</tr>
<tr>
<td>Geotube® Fabric Type:</td>
<td>GT500</td>
<td></td>
</tr>
<tr>
<td>Geotube® Fabric Type:</td>
<td>Rigid Mechanical</td>
<td></td>
</tr>
<tr>
<td>Circumferential Tensile Force (T) =</td>
<td>132.53 lb/in.</td>
<td></td>
</tr>
<tr>
<td>Geotube® Base Contact Width (B) =</td>
<td>36.58 ft</td>
<td></td>
</tr>
<tr>
<td>Geotube® Filled Width (W) =</td>
<td>41.00 ft</td>
<td></td>
</tr>
<tr>
<td>Geotube® Cross Section Area (A) =</td>
<td>311.56 sq ft</td>
<td></td>
</tr>
<tr>
<td>Geotube® Volume Per Unit of Length (V) =</td>
<td>11.54 cu yd/ft</td>
<td></td>
</tr>
<tr>
<td>FS of Circumferential Failure =</td>
<td>3.4 FS</td>
<td></td>
</tr>
<tr>
<td>Axial Direction FS (AFS) =</td>
<td>3.4 FS</td>
<td></td>
</tr>
<tr>
<td>FS of Fill Port Failure =</td>
<td>3.4 FS</td>
<td></td>
</tr>
</tbody>
</table>
Sequence of Dredging
GT500/GP8/TS/90/ML

100'

45'

GP8 8" PVC Fill Ports

Handling loops every 14.3' along both sides of the tube.

Customer Approval:

X ____________

Approved By:

By signing this fabrication plan, the client acknowledges their acceptance of its accuracy. All other references to fabrication instructions shall be superseded and considered no longer valid.

<table>
<thead>
<tr>
<th>Construction Instructions</th>
<th>Fabric Type: GT500</th>
<th>Special Instructions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circumference:</td>
<td>90'</td>
<td></td>
</tr>
<tr>
<td>Length:</td>
<td>100'</td>
<td></td>
</tr>
<tr>
<td>Port Type:</td>
<td>GP8</td>
<td></td>
</tr>
<tr>
<td>Total Panel Qty:</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>End Type:</td>
<td>Tapered</td>
<td></td>
</tr>
<tr>
<td>Pump Height:</td>
<td>8.5'</td>
<td></td>
</tr>
<tr>
<td>Core Type:</td>
<td>Steel</td>
<td></td>
</tr>
<tr>
<td>Roll-up Width:</td>
<td>12'</td>
<td></td>
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Standards & Tolerances:

The following shall be considered the standard formal and tolerances of Geotube® containers and Secur-A-Ports:

- Threading side shall be at a minimum of 600' from the port and loops.
- Seawall to be made with a minimum of 600' of Geotube® containers.
- Inner wall to be made with a minimum of 600' of Geotube® containers.
- Outer wall to be made with a minimum of 600' of Geotube® containers.

- Side pockets to be made with a minimum of 600' of Geotube® containers.
- Cap pockets to be made with a minimum of 600' of Geotube® containers.
- Inner wall to be made with a minimum of 600' of Geotube® containers.
- Outer wall to be made with a minimum of 600' of Geotube® containers.

- Geotextile performance and Geotextile containers shall be fabricated to the same specifications.
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Summary

- Project completed in 8 months.
- Over 76,500 m³ removed from 8.9 kilometers of canals.
- Approximately 1,524 meters of geotextile tubes.
- After completion, Butler Park was restored and reopened for recreational use.
- Dredging improvements provided efficient canal and channel access for residents.
Questions / Comments:

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Technical Services Mgr  
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c.Timpson@tencate.com