Purchasing the future: a Custom-Built Water Injection Dredge (WID) for the North Carolina State Ports Authority

Wilmington & Morehead City, North Carolina

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Mr. Wagner is a associate dredging engineer with nearly 20 years of experience planning, designing, permitting, and implementing various dredging engineering projects, including developing long-range dredged material management plans; designing upland dredged material containment facilities; creating dredging templates, performing economic evaluations, and assessing various alternate dredging technologies.
North Carolina State Ports Authority (NCSPA)

Water Injection Dredging
Port of Wilmington & Port of Morehead City
Port of Wilmington
Sediment Management through Dredging (Mechanical & Hydraulic)

Water Injection Dredging
Mechanical Dredge Classifications
Clamshell Dredge Operation
Hydraulic Pipeline
Hydrodynamic (Agitation and Plough) Dredging

Water Injection Dredging
Hydraulic and Mechanical Dredging are *conventional dredging techniques* that use hydraulic or mechanical means to raise the excavated material to the water surface.

- The transport of the severed sediments from the dredge area to disposal or placement area is conveyed by buckets, hoppers, transport barges, pressurized pipelines, etc.

In comparison, all **Hydrodynamic Dredging** techniques have the common characteristic that the horizontal transport of the dredged material takes place completely within the water.

- No mechanical transport in hoppers, barges, or buckets
- No pressurized movement through pipelines

All **Hydrodynamic Dredging** sediments *flow through water* for the dredge area to the disposal or placement area.
Agitation and Plough Dredging

- **Agitation and Plough Dredging** disperses the sediments from the bottom into the whole water column.

- **Two phases** are needed for **Agitation and Plough Dredging**:
  1. Equipment that suspends sediments into the water column.
  2. Flow that transports the sediment away from the site.

- Various equipment can be used for this process, including:
  - Prop-Wash
  - Hopper Dredge Agitation
  - Vertical mixers or Air Bubbles
  - Drag beams or Rakes (Plough Dredging)

- **Agitation and Plough Dredging** produce a *turbid water column* and thus, at least temporarily, higher water quality impacts.
Agitation and Plough Dredging induced Turbidity
Hydrodynamic (Water Injection) Dredging

Water Injection Dredging
Water Injection Dredging Technique

- **Water Injection Dredging** pumps water into channel bottom sediments at relatively high-volume and low pressure.

- **Water Injection Dredging** dilutes and fluidizes the sediments, creating a near-bottom layer (density current) with higher density than the surrounding water.

- **Water Injection Dredging** allows sediments to flow horizontally out of a waterbody taking advantage of natural processes and forces, while the fluidized sediment layer remains close to the water bed.

- The objective is to remove the material from a selected area by taking advantage of the near-bottom layer (density current) and
  - **Tides**
  - **Currents**
  - **Other Hydrodynamic Forces**
NCSPA WID Design-Build and Demonstration

Water Injection Dredging
Procurement Fact Sheet

<table>
<thead>
<tr>
<th>Task</th>
<th>Date</th>
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<tbody>
<tr>
<td>NCSPA Water Injection Dredge Procurement Fact Sheet</td>
<td>December 06, 2018</td>
</tr>
<tr>
<td>Issued to Potential Interested Parties</td>
<td>December 21, 2018</td>
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<tr>
<td>Responses from Potential Parties Due</td>
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• Contacted over 70 organizations (dredge manufactures and other possible sources of relevant information)
  – Dredging related electronic newsletters - e.g., *DredgeWire, Dredging Today*
  – Trade publications- e.g., *Marine News, Maritime Reporter and Engineering News*
  – Trade show membership and attendance- e.g., *Western Dredging Association*
  – Annual dredging related directories- e.g., *International Dredging Review, World Dredging Mining & Construction*
  – Hydraulic agitation dredge operators working in the Southeastern or Gulf region of the United States- e.g., *Biblia, Inc. (Savannah Marine)*
“Section 1 of the Act of May 24, 1906 (34 Stat. 204; 46 U.S.C. App. 292), provides that, “a foreign-built dredge shall not, under penalty of forfeiture, engage in dredging in the United States unless documented as a vessel of the United States.”
Solicit feedback from dredge manufacturers and other regarding several crucial project factors. These key factors includes:

- Preliminary schedule
- Duration of time needed to fabricate and transport the dredge to the NCSPA
- Other factors included those similar to those required of any NCSPA purchase of large, expensive equipment, such as cranes.
  - Maintenance
  - Warranties
  - Proof of concept demonstrations
  - Training requirement
  - Operation manuals
  - Etc.
Request for Pre-Qualifications

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<tr>
<th>Task</th>
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<tbody>
<tr>
<td>NCSPA Water Injection Dredge Prequalification Form</td>
<td></td>
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<tr>
<td>Issued to Potential Interested Parties</td>
<td>December 21, 2018</td>
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<tr>
<td>Responses from Potential Parties Due</td>
<td>January 25, 2019</td>
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<tr>
<td>Notification of Qualification Letter sent to Selected Teams</td>
<td>March 02, 2019</td>
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Project sequence includes the following work items:

- Commissioning of a fully equipped Water Injection Dredge (WID)
- Delivery of WID to the NCSPA Port of Wilmington dockside
  - Execution of a Port operator’s training program
  - Demonstration of a full week at the Port of Wilmington
- Delivery of WID to the NCSPA Port of Morehead City.
  - Demonstration of a full week at the Port of Morehead City
- Receipt of report summarizing the Contractor’s executed proof of concept, including pre- and post-dredge hydrographic survey data
- Modification of the WID plan, as necessary, and handover to NCSPA
## Request for Information & Geotechnical Data Collection

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<tr>
<td>NCSPA Water Injection Dredge RFI for Geotechnical Data Collection</td>
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<td>Issued to Potential Interested Parties</td>
<td>March 08, 2019</td>
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<td>Responses from Potential Parties Due</td>
<td>March 22, 2019</td>
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<tr>
<td><strong>Updated Proposed Schedule sent to Selected Teams</strong></td>
<td>June 28, 2019</td>
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<td>Task</td>
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<tr>
<td>Geotechnical Data Collection (CPT &amp; Sediment Grab Samples)</td>
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<td>Mobilization to Port of Wilmington</td>
<td>July 08, 2019</td>
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<tr>
<td>Mobilization to Port of Morehead City</td>
<td>July 18, 2019</td>
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<td>Final Reports for both Ports</td>
<td>August 15, 2019</td>
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## Request for Proposals & Selection and Delivery

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<tr>
<td><strong>Design-Build Request for Proposals (RFP)</strong></td>
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<td>Issue Design-Build Request for Proposals (RFP) to all teams</td>
<td>August 16, 2019</td>
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<tr>
<td>Technical Proposals and Sealed Price Proposals Due</td>
<td>September 26, 2019</td>
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<tr>
<td>Technical Presentations by Teams (alphabetical order)</td>
<td>October 01–02, 2019</td>
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<tr>
<td><strong>Selection and Delivery</strong></td>
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<tr>
<td>Recommend Selection - NCSPA Board of Directors Meeting</td>
<td>October 24, 2019</td>
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<tr>
<td>Final Selection - NCSPA Board of Directors Meeting</td>
<td>December 19, 2019</td>
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<tr>
<td>Contract Execution</td>
<td>January 17, 2019</td>
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<tr>
<td>Substantial Completion (dredge delivery, training materials, etc.)</td>
<td>December 11, 2020</td>
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