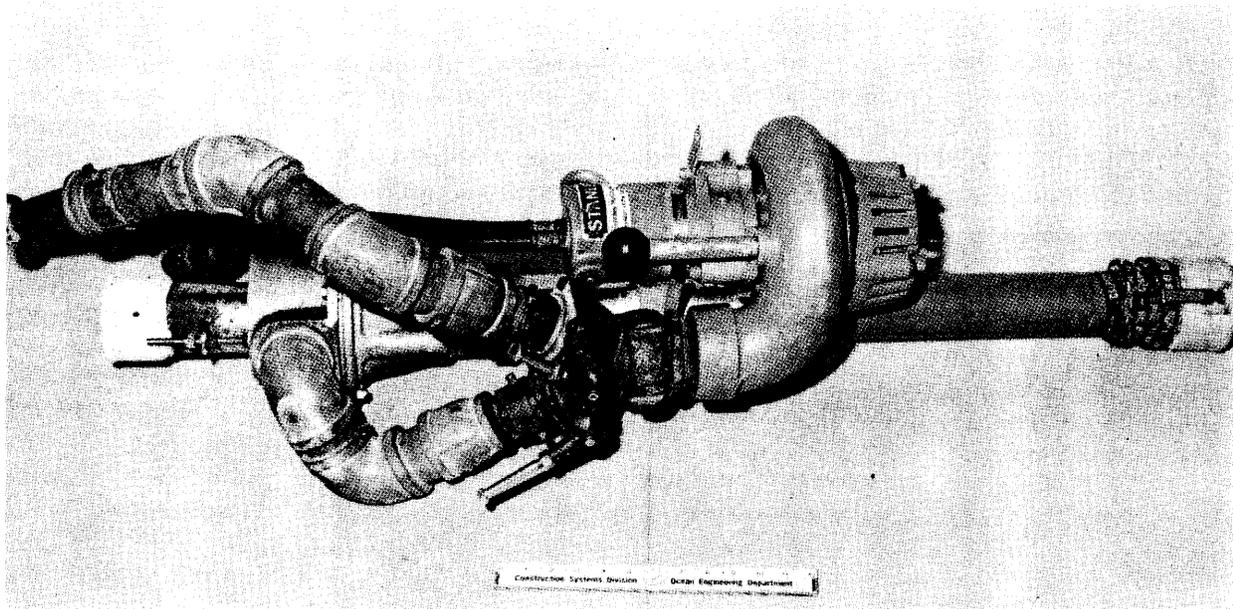




REMR TECHNICAL NOTE CS-ES-3.6  
 UNDERWATER CLEANING OF CONCRETE AND  
 STEEL: DIVER-OPERATED JET-DREDGE



PURPOSE: To provide information on use of the jet-dredge for underwater excavation to remove sediment and other bed material from concrete stilling basins, discharge laterals, and outlet channels.

APPLICATION: The diver-operated jet-dredge is a tool that can be used to remove accumulated bed material, such as mud, sand, silt, clay, and cobbles. Excavation of this material from concrete and steel structure surfaces is required before many types of underwater surveys, maintenance, or repairs can be carried out.

ADVANTAGES: Two common underwater excavation techniques are jetting and dredging. Sediment removal with a jetting technique is inefficient. The jet stream easily fluidizes the sediment, but with no means for further transport the sediment eventually settles back into the same area. On the other hand, dredging with water-injected eductors does not provide a mechanism for fluidizing unconsolidated silts and clays. A diver is often required to breakup and fluidize the sediment material in front of the dredge suction tube. The diver-operated jet-dredge combines the benefits of a fluidizing jet and dredging jet eductor. In comparison to the performance of the individual jet and dredge components, the combination tool increases excavation rates, reduces reaction forces, and minimizes sediment resuspension in jetting operations. Average excavation rates of 15 cu ft/min can be obtained, depending upon the sediment characteristics and the operating environment.

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LIMITATIONS: Because the jet-dredge tool weighs over 100 lb (in the dry), it is difficult to handle on the surface. The jet-dredge must be flushed periodically to prevent debris and sediment from blocking the jet-eductor venturi. A debris ejector system has been built into the tool which allows the venturi of the jet eductor to be cleared while being operated underwater.

PERSONNEL REQUIREMENTS: A trained and qualified scuba diver is required to operate the jet-dredge underwater. Another person is required to operate the controls and monitor the performance of the hydraulic power supply. A diving supervisor may also be required to monitor the diving operation.

EQUIPMENT DESCRIPTION: The jet-dredge tool was developed by the Naval Civil Engineering Laboratory (NCEL). The jet-dredge tool is composed of the following commercially available components: a Gold Divers jet eductor, a Stanley Tools hydraulic-powered sump pump (Model No. SM22), and Spray Systems Company jet nozzles. The pump operates at 9 gpm and 1,500 psi. A multiple-jet nozzle assembly improves performance and minimizes the reduction in underwater visibility. A buoyancy package, consisting of closed-cell urethane foam (Upjohn Company, CPR 739 series), is molded around the tool. The buoyancy package is removable to allow access to the tool components. The in-water weight of the entire tool, with the buoyancy package, is approximately 8 lb. The overall length of the tool is dependent upon the length of the suction tube. With the longer length (2-3/4-ft) suction tube, the overall length is approximately 6-3/4 ft. Tests conducted with the jet-dredge tool indicated that divers prefer the longer length because it allows the tool to be comfortably operated from a standing position.

ENVIRONMENTAL CONSIDERATIONS: Cleaning operations with the equipment discussed in this Technical Note may increase the level of suspended and soluble materials in the water column adjacent to and downstream from the operation. Whether these increases will result in unacceptable water quality or other undesirable environmental consequences should be evaluated on a project-specific basis. Variables that influence the nature and magnitude of any impacts include, but may not be limited to: the hydrodynamic setting, the physical and chemical characteristics of the sediment or residue generated during the cleaning or dredging process, and the regulatory environment. Personnel familiar with evaluating water quality impacts of construction operations should be consulted during the early stages of project planning to ensure that appropriate water quality criteria and other environmental regulations will be met.

REFERENCE:

Diver-operated sediment excavation tool. H. Thompson. Naval Civil Engineering Laboratory, Port Hueneme, CA, Sep 1983. TN-1677.