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Plan-view photos, benthic grabs, and sediment-profile images: Using complementary techniques to assess response to seafloor disturbance

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ABSTRACT

A monitoring survey was conducted in July 2005 at the Rhode Island Sound Disposal Site (RISDS) as part of the Disposal Area Monitoring System (DAMOS) program. The survey included the collection of sediment-profile and plan-view images, and benthic biology grabs. Each of these techniques provides a different, yet complementary perspective on benthic community conditions. These complementary techniques aided in the assessment of the benthic recovery process within RISDS following the placement of dredged material from the Providence River and Harbor Maintenance Dredging Project (PRHMDP). Based on observed patterns of physical, chemical, and biological responses of seafloor environments to dredged material disposal activity it was expected that the benthic community within RISDS would be in an intermediate phase of recolonization (Stage II). Results of the 2005 RISDS survey indicated that in the six months since disposal activities at RISDS had concluded, the biological community at RISDS was recovering relatively rapidly and Stages II and III infauna were present throughout the region.

1. Introduction

Open water disposal of dredged material is an environmental concern in New England as well as throughout the world (Fredette and French, 2004; Van Dolah et al., 1984). The effects of dredged material disposal on benthic communities are well documented (Bolam and Rees, 2003). Impacts to the benthie community include direct burial by dredged material (Newell et al., 1998), reduction in community diversity (Jones, 1986; Harvey et al., 1998), and a shift in the dominance patterns within the benthic community (Harvey et al., 1998; Roberts et al., 1998). Biological impacts from dredged material disposal are influenced by a number of factors including the composition of the dredged material, the receiving habitat, and the community composition of the disposal site (Smith and Rule, 2001; Bolam et al., 2006). The timing of disturbance can also influence the identity of colonizers and course of recovery, particularly in New England where there is a strong seasonal influence (Zajac and Whitlatch, 1982; Wilber et al., 2007).

In New England, over thirty five years of research indicates that, when carefully managed, ocean disposal of dredged material will have minimal environmental impact (Fredette and French, 2004). The US Army Corps of Engineers (USACE) New England District Disposal Area Monitoring System (DAMOS) program is a comprehensive monitoring and management program designed and conducted to address environmental concerns associated with the use of open water disposal sites throughout the New England region. DAMOS monitoring surveys are designed to test hypotheses related to expected physical and ecological response patterns following placement of dredged material on the seafloor at established disposal sites.

A monitoring survey was conducted at the Rhode Island Sound Disposal Site (RISDS) in July 2005 as part of the DAMOS program. RISDS, located approximately 16.7 km south of Point Judith, Rhode Island, is an open water disposal site for dredged material from Rhode Island, southeastern Massachusetts, and surrounding harbors (40 CFR Part 228) (Fig. 1). The objective of the 2005 RISDS survey was to assess the benthic conditions within RISDS following placement of approximately 4 million m^3 sediment from the Providence River and Harbor Maintenance Dredging Project (PRHMDP) between April 2003 and January 2005.

A variety of techniques have been used by the DAMOS program to evaluate benthic community conditions following dredged material disposal. The 2005 monitoring survey included the collection of sediment-profile and plan-view images, and benthic biology grabs. Based on previously observed patterns of physical, chemical,

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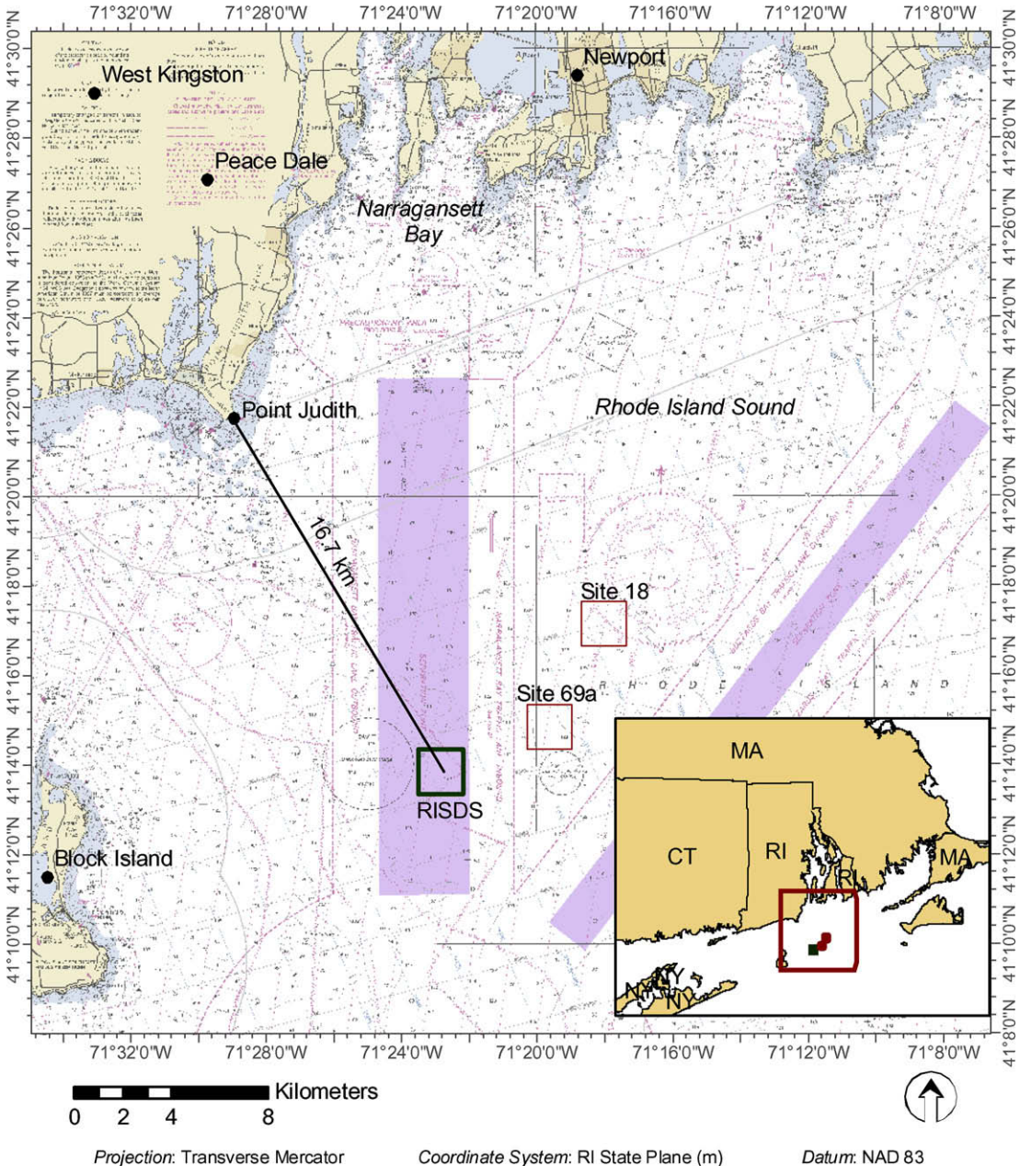

Fig. 1. RISDS a open water disposal site alternatives in Rhode Island Sound.

and biological responses of seafloor environments to dredged material disposal activity at other sites, our prediction was that the benthic community within RISDS would be in an intermediate phase of recolonization (Stage II) (Rhoads and Germano, 1982, 1986; Rhoads and Boyer, 1982). Specifically, the community was expected to consist of small, tubicolous polychaetes and Ampeliscid amphipods or equivalent fauna. However, depending on the elapsed time between a given cluster of disposal events and the location of monitoring stations, a gradation of recolonization might be expected.

The main purpose of this paper is to describe the use of three complementary techniques in assessing the condition of the benthic community at RISDS following dredged material disposal. Although each of these techniques targets different aspects of the benthic ecosystem, the use of all three techniques allows for a comprehensive assessment of the benthic conditions in Rhode Island Sound and provides insight into understanding the recovery of RISDS following placement of sediment from the PRHMDP. Further, this paper highlights the tiered approach of the DAMOS program and the importance of clearly identifying study objectives and selecting appropriate sampling techniques.

2. Methods

The July 2005 survey at RISDS was performed by a team of investigators from ENSR, CR Environmental, and Germano and Associates. The survey was conducted 30 June-3 July 2005 aboard the *F/V Shanna Rose* to assess the benthic condition within RISDS following placement of sediment from the PRHMDP. Field activities included the collection of sediment-profile images, plan-view images, and benthic biology grabs.

The field team collected SPI and plan-view images at 30 stations within RISDS (Fig. 2) and at 15 reference stations (Fig. 3). Five