Balancing Coastal Engineering and Potential Impacts of Discarded Military Munitions on Beach Replenishment Projects

23rd Annual National Conference on Beach Preservation Technology

February 4, 2010
Agenda

- LBI beach replenishment project background
- Responses to munitions at Surf City
- Lessons learned
- Engineering controls to mitigate risks
- Cost considerations
Site Location / Background

- Water Resources Development Act of 2000, Public Law 106-541
- Coastal Storm Damage Reduction Program (CSDRP), to construct a multi-phased beach fill project consisting of an estimated 11,000,000 cubic yards (cy)
- Non-Federal sponsor NJDEP
Borrow Area Feasibility Study

- Due diligence investigations: magnetic, acoustic, bathymetric remote sensing, and hydrographic surveys
- HTRW, FUDS/OEW, historical/cultural resources, underground cables
- 'Young' sediment grab sampler (benthic), commercial clam dredge (surf clams), Vibratory cores (sediment)
- Multi-agency review of NEPA EIS
- Compliance with Sec. 401 CWA, Sec 307(c) CZMA, Sec 404(b) F&WCA, etc; Federal Consistency Determination by NJDEP
Beach Replenishment
1st Phase of LBI:
- 1.6 miles: Surf City to Ship Bottom, NJ
- Dec-06 through Mar-07

Approx. 886,000 cy

Berm: 8 - 12 ft thick, 125 ft wide at Elev. +8 ft NAVD88

Dune: 30-ft wide crest at Elev. +22 ft NAVD88

Overall berm/dune profile approx. 400 - 500 ft wide
Beach / Dune System

3rd Street

4th Street

5th Street

Surf Zone

Beach / Dune Fence

Beach / Dune Fence

Dune Top

Dune Slope

Beach Berm
Digital Geophysical Mapping (DGM)

4-Coil EM61-MK2 Towed-Array

RTK GPS Base Station
Mag and Dig (M&D) Dunes
Typical MEC Types Found

Base Detonating Fuze
Model 1906

MKI Fuze

MKII PD Fuze w/ Booster

37-mm Projectile

MKIII Booster
Phase I MEC TCRA Results

- Approx. 1,200 MEC items recovered
- Discarded Military Munitions (DMM)
- All items turned over to U.S. Army EOD for disposal
Land Use Controls – Signage and Brochure

CENAB OE-SS on-site and on-call 24/7

MEC recognition and safety training for municipal employees – Police, fire, township, and lifeguards

Early morning and evening visual scans of the beach

Visual scan of surf zone at low tide

Phase 2 Monitoring
EE/CA Alternatives

A. No further action

B. Close beach

C. Continue Land Use Controls (LUCs)

D. Repeat surface / subsurface clearance

E. Sieve berm / surf zone to depth of sand placement

F. Sieve entire beach – berm, surf, and dune to depth of sand placement

G. Alternative E with a subsequent storm event that erodes the dune
Consider the Risks
Phase 3 Goals

- Remove MEC from remaining new beach fill – dunes, berm, and, intertidal / surf zone

- Re-open beaches prior to 22 May 2009 season

- Ensure safe and secure site at all times

- Control sand losses

- Minimize beach closures to public

- Establish / maintain excellent coordination / communications among project stakeholders
Stakeholder Engagement

- U.S. Army Corps of Engineers
  - Philadelphia District
  - Baltimore District
- Boroughs of Surf City and Ship Bottom, NJ
- Local Public
- State of New Jersey (NJDEP)
- Environmental Protection Agency (Region II)
- Weston Solutions, Inc. Team
  - Sevenson Environmental Services
  - Seismic Surveys, Inc
  - Rettew Associates
Stakeholder Engagement
Project Quality Pledge

Surf City and Ship Bottom, NJ
Munitions Non-Time Critical Removal Action
Project Quality Pledge

We commit to ensuring the complete opening of the public beaches at Surf City and Ship Bottom, New Jersey prior to May 22, 2009!

These are our Quality Goals:

- Safety - Everyone's number one priority!
- Execution - Complete the project with minimal impact to the surrounding communities.
- Schedule - Complete MEC removal and beach restoration on schedule.
- Communication - Ensure issues and challenges are addressed quickly and public information goes out in a timely manner.
- Approach - Locate and remove all MEC possible from remaining beachfill, reducing residual hazard, while minimizing sand losses.
- Budget - Sustain accurate and timely cost reporting to facilitate effective decision making. Cost is important!
- Delivery - Restore project area which allows the citizens of Surf City and Ship Bottom to confidently and safely access all of their beaches.

Quality end-product

Safety
Community
Schedule
Communications
Technique
Cost
Primary Work Elements

- Planning and mobilization
- Surveys
- Screening to remove MEC from dune and berm
- MEC surf zone removal
- MEC offsite disposal
- Dune reconstruction and restoration
Wintry Conditions
Wintry Conditions
Typical Section

Based on May-08 Survey

ZONE A – 150,000 CY
ZONE B – 300,000 CY
ZONE C – 50,000 CY

Volumes between December 2006 and May 2008:
Above High Tide Volume = 352,100 CY
Intertidal Volume = 35,700 CY
Below Low Tide Volume = 175,200 CY
Total Fill Volume = 563,000 CY

TYPICAL PROFILE
HORIZONTAL SCALE: 1”=60’-0”
VERTICAL SCALE: 1”=30’-0”
Clearing Excavations
Surf Zone Clearance
EOD Coordination
Total DMM Recovered

Phase 1 (TCRA) - 1,078
Phase 2 (monitoring) - 113
Phase 3 (Removal) - 1,914
Phase 4 (post monitor) - 2

Total to date = 3,107
Communications & Recognition
Progress This Week:

- Beach Status (33 blocks total) ........................................... 6 Blocks Open / 27 Blocks Closed (see attached site map)
- DMM Items Found (weekly / cumulative to date) .................. 540 / 1331
  (see attached summary table)

Mechanical Screening Operations (CY volume screened):
- Operation 1 Volume (weekly / cumulative) .................. 10,911 cy / 50,512 cy
- Operation 2 Volume (weekly / cumulative) .................. 14,167 cy / 65,478 cy
- Operation 3 Volume (weekly / cumulative) .................. 16,598 cy / 86,515 cy
- Operation 4 Volume (weekly / cumulative) .................. 16,041 cy / 71,067 cy
- Operation 5 Volume (weekly/cumulative) .................. 5,355 cy / 8197 cy

Surf Zone Operations:
- Blocks Completed (36 blocks total) ................................. 19/36

Dune Reconstruction Status:
- Areas Final Graded (by street) N. 24th Street – N. 21st Street, N. 15th Street, N. 8th – N. 6th Street, N 2nd Street – N. 1st Street
- Vehicular Cross-overs Completed to Date (of 3 total) .. N/A
- Pedestrian Cross-overs Completed to Date (of 25 total) .. 4/25
- Handicap Cross-overs Completed to Date (of 1 total) .. N/A
- Sand Fencing Completed (of 8,100 linear feet) ............ 1952 feet / 8100 feet
- Dune Grass Replanted (by street) ................................ N. 6th Street, N. 7th Street, N. 8th Street, N. 20th Street, N. 21st Street

Noteworthy Events This Week:
- Project Team contracted for aerial photos of project on 3/17/09
- Dune Grass reinstallation started.

Anticipated Accomplishments Next Week:
- Ongoing dune, berm, and surfzone operations.

Project Milestones:
- ✔ Accomplished ☐ Missed
- ✔ Completed Partnering Meeting and Pre-Con Meeting .......... (1/14/2009)
- ✔ Complete site mobilization and initiate MEC removal from dunes and berm .......... (2/12/2009)
- ✔ Initiate MEC removal from surf zone .......... (2/28/2009)
- ✔ Initiate reconstruction of beach access points and dune fencing .......... (3/6/2009)
- • Complete MEC removal and open Surf City beach for public access from N. 18th Street vehicular cross over and areas north .......... (4/10/2009)
- • Complete MEC removal and open Surf City beach for public access from N. 12th Street vehicular cross over and areas north .......... (4/10/2009)
- • Complete MEC removal and open Surf City beach for public access from N. 5th Street vehicular cross-over and areas north .......... (4/17/2009)
- • Complete MEC removal and open Surf City and Ship Bottom beaches for public access from N. 5th Street and areas south .......... (4/24/2009)
- • Complete MEC removal from surf zone .......... (4/24/2009)
- • Complete dune restoration and reconstruction of beach access points .......... (5/15/2009)
- • Complete site demobilization .......... (5/22/2009)
Surf City and Ship Bottom, NJ - Munitions Removal
Weekly Project Update – 03/14/09 thru 03/20/09

Site Status Map

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<table>
<thead>
<tr>
<th>Items to Date</th>
<th>Quantity</th>
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<tr>
<td>Beach</td>
<td>Surf</td>
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<tr>
<td>MKIII Booster</td>
<td>956</td>
</tr>
<tr>
<td>MKII Booster</td>
<td>236</td>
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<td>MKII Fuze</td>
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<td>MKI Fuze</td>
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<td>M1906 Base Fuze</td>
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<tr>
<td>V/B Rifle Grenade</td>
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<tr>
<td>37mm Projectile</td>
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<table>
<thead>
<tr>
<th>MD Items</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>2.25&quot; SCAR Rocket</td>
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</table>

Total Items By Area: 1330
Total Items to Date: 1331

Safety – Everyone’s No. 1 Priority!
- 42,088 Hours worked without a lost time incident.
- Employee Safety Participation Program in force.
1. Private Crossover Sand Fence installed and inspected at toe of dune.

2. Excavation and screening activities on 16 March 2009 captured in aerial photograph.

3. WESTON UXO Team sweeping base of excavation in dune system with MK26 instrumentation on 19 March 2009.
Dune / Berm Reconstruction

- Sand fencing
- Split rail fencing
- Pedestrian crossovers at each street
- 3 vehicular dune crossovers
- 1 handicap dune crossover
- Private dune crossovers
Project Metrics

- 400,000 cy of sand sifted in 65 days
- Over 3,000 DMM items safely removed
- Over 60,000 hours worked with no lost time
- Approx. 100 workers onsite each day
- Beaches open 3 weeks early
Lessons Learned – Underwater MEC
MEC Potential

- Underwater MEC sites may exist in ponds, lakes, marshes, streams, rivers, estuaries, harbors, canals, seas, and oceans.

- Some MEC sites have existed for decades and are well-known, while the presence of others is discovered during dredging operations when MEC unexpectedly appears in the dredging system or spoils.

- MEC (including CWM) have been recovered from dredging spoils, commercial fishing catches, at-sea clam harvesting, and beach replenishment operations.
ALL OCEAN BORROW SITES ARE SUSPECT!

- Dredging projects along the Atlantic and Pacific Seaboard should take steps to prevent the introduction of MEC into the dredge system and subsequent spoils.

- Ocean dumping of military munitions (DMM) was a lawful disposal method for MEC and CWM until 1973.

- Many offshore dump sites can be found on maritime charts. *Not all sites are known.*
Ocean
Harbors
MEC Potential

- MEC items can show up in many places during a dredging project (i.e. drag heads, cutter heads, pump casings, pipes, turtle screens, placement sites...).

- MEC detonations have damaged dredge plants, and have been rumored as the cause for the sinking of at least one fishing vessel.
Clamshell (Bucket) Dredge (Mechanical)
Backhoe Dredge (Mechanical)
Cutter Head Dredge (Hydraulic)
“ILLINOIS” Cutter Head (Hydraulic)
Hopper Dredge (Hydraulic)
Planning

- Archive searches
- MEC detection and discrimination
- General considerations
  - Hazards analysis
  - Removal vs. avoidance
  - Production rates
  - **Costs**
# 1 Solution – Screen sediment intake and outfall and conduct periodic inspection of screens and spoils

- Utilize experienced MEC specialists in the planning and operational phases
- Essential that the correct verbiage is placed in the dredging specifications before contract award
Discharge to Beach
Surf City – Remediation Costs

- Team Recommended Remedy – Sift Berm
  - Estimated Cost - $12.8M

- Public Recommendation – Sift Berm & Dune
  - Estimated Cost - $19.88M

- Final Decision – Sift Berm and Dune
  - Completed April 09 ($13.2M)
**IT IS CHEAPER TO SCREEN AND PREVENT RATHER THAN CONDUCT A POST-REPLENISHMENT MEC REMOVAL ACTION**
Success Story: Bethany Beach, DE

- 3.2 million cu yds of sand over 2.75 miles
- 1.25 inch screen on drag heads
- 1.25 inch screening basket at outflow
- 37mm projectile is smallest MEC item expected in borrow area
Beach Screening Basket
40mm & 37mm Projectiles in Basket
Ongoing MEC Prevention

Harvey Cedars, Long Beach Island, NJ

- Screen material to 3/4 inch
- Screen dredge intake at the ocean bottom (borrow area) and the outfall point
- Intake screen may be larger than outfall screen to minimize impact on dredging plant
- MEC support being provided aboard dredge
Other Success Stories

**Sandbridge, VA**, Beach Replenishment via Hopper Dredge:
Borrow area in known USN firing range (large projectiles 5”).
Screen on drag head - No MEC (completed 07’).

**Ocean City, MD**, Beach Replenishment via Hopper Dredge:
Borrow area within range fan of (former) Ft Miles coastal shore batteries.
Screen on drag head - No MEC (completed 06’).

**Bethany Beach, DE**, Beach Replenishment Via Hopper Dredge:
Borrow area within range fan of (former) Ft Miles coastal shore batteries. Drag head screen, outflow screen. 12 MEC captured in beach outflow basket (completed 08’).

**New York Harbor, NY**, Ongoing harbor deepening project: 1.5” screen on intake (recently changed to 1.25”).

**Cape May, NJ**, Beach Replenishment Via Hopper Dredge:
Borrow area within range fan of coastal shore batteries. Drag head screen, outflow screen. No MEC (completed 09’).

**Dewey Beach, DE**, Beach Replenishment Via Hopper Dredge:
Borrow area within range fan of (former) Ft Miles coastal shore batteries. Drag head Screen, outflow screen - No MEC (completed 09’).
Positive Steps

- NJDEP requiring MEC screens on intake and outfall for all dredging projects in NJ
- DDESB planning to insert language in 6055.09 STD requiring MEC screens during dredging
- USACE EM 385-1-1 inserting language in the safety manual requiring dredging districts to consult with MMDC to determine whether MEC screens are required on specific projects
- USACE guidance manual published in August 2008
Positive Steps

- NAD drafting requirement for all NAD districts to consider MEC screens during dredging.

- NAP requires all dredging PDT’s to consult with MMDC on applicability of MEC screens during specific dredging projects; NAP requires an OESS on-site during dredging that may encounter MEC.
So What’s the Problem?

Culture

Attitudes

Funding
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