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DRAFT
Characterization Analysis Report
Weather Deck Runoff

Section 3.0 -- Buoy Maintenance

2003

3.0 BUOY MAINTENANCE

The survey team conducted an assessment of the buoy handling systems aboard a WLM 175 Class vessel on June 9, 1999. USCG WLM/WLB Class buoy tenders retrieve, maintain, and reset navigational buoys, primarily inside 12 nm. Navigational buoy servicing consists of (1) buoy retrieval and re-deployment, and (2) inspection, cleaning, and maintenance. Major repairs, including full buoy repainting, are conducted at shoreside facilities (Wenzel, 2000e).

3.1 CLEANING COMPOUNDS

Simple Green™ is the only cleaning compound used during the buoy maintenance. The cleaner is applied to the solar power panel using a spray bottle and immediately removed with a clean rag. All other cleaning is conducted with a high-pressure washer (seawater) and mechanical scrapers. The survey team concluded cleaning agents used in the buoy handling/cleaning process do not contribute to deck runoff (Wenzel *et al*., 2001a).

3.2 PAINTING AND PRESERVATION

The manufacturer's instructions for navigational buoys require paints used for submerged service to comply with MIL-P-24647. All exterior steel surfaces above the waterline must meet the requirements listed in the Commandant Instruction (COMDTINST) M10360.3B, Chapter 16. These specifications establish that paints shall comply with volatile organic compounds (VOC) requirements (no more than 340 g/L) and be free of lead and chromium (a mass fraction of less than 0.06% for either metal) (U.S. Coast Guard, 1998, 1999, 2000b). During buoy manufacturing, two coats of epoxy primer, each with 5 mils dry film thickness, are applied to the buoy's external surfaces. One topcoat of paint is used for above waterline surfaces. Polyurethane paints are used for a topcoat on ionomer foam and steel ocean buoys (3 mils dry film thickness), and epoxy acrylic paints are used on unlighted steel river buoys (1.5 mils to 2.0 mils dry film thickness). Two coats, each 5 mils thick, of ablative antifouling paint (MIL-P-24647) are applied to all below-the-waterline exterior surfaces.

Because most of the paint is located below the waterline, it is assumed that most paint chips consist of primer and antifouling ablative paints. These ablative antifouling paints contain a mass fraction of approximately 47 % copper as copper (I) oxide (cuprous oxide) and a mass fraction of approximately 15 % zinc as zinc oxide.

Buoys, which are used for navigational and weather observation purposes, are maintained both inside and outside 12 nm, with the majority of buoys inside 12 nm. Buoys, along with their sinkers and anchor chains, are raised from their position in the water and hauled on deck using cranes and cross-deck winches. Once on the vessel's deck, the buoys, sinker, and chain are cleaned, inspected, repaired, preserved, and subsequently returned to their position. Buoys are cleaned using a scraper and seawater with a high-pressure washer. The non-paint chip component of the debris consists of rust, biological material (e.g., epiphytic algae and invertebrates), marine bird and mammal excrements, and sediments (e.g., mud and sand) attached to the buoys, concrete sinkers, and steel chains. The precise composition of this material cannot be ascertained because it is temporally and spatially variable. Some of the debris cleaned from the buoy is made of neutrally buoyant material (e.g., filamentous algae, and soft body invertebrates) with a density

close to 1 g/ml that can remain suspended in the water column when it is washed off the deck. Other debris is heavier (e.g., encrusting algae, barnacles, and sediments) and will sink through the water column.

Rust, biological material, sediment, and paint chips resulting from buoy cleaning and washing are pushed overboard using shovels and a 3,000 psi pressure washer using seawater supplied by the vessel's 160 psi firemain system. Constituents found in this discharged material are likely to include biological materials, rust, and weathered paint chips (including metals and biocides contained in the buoy paints). Although the survey team was unable to estimate the exact composition, they observed that sediment and biological materials comprises more than 99 % of this mixture (Wenzel *et al*., 2001a). When a buoy-tending vessel conducts maintenance and preservation on a buoy that is going to be reset in the same place that it was hauled in from, the vessel stays as close as it safely can to the haul-in/deploy location. If the buoy is going to be transported to a buoy overhaul facility, an overhauled or new buoy will be deployed in its place. Using a hose, the crew washes the loose biofouling material off of the buoy to be transported, as it is hauled aboard. The buoy is then chained down so the new buoy can be deployed resulting in only one loose buoy at a time. Once the deployment is complete, the crew will turn their attention to cleaning the remaining biofouling materials from the newly hauled buoy. If another buoy in the vicinity is to be hauled and deployed, the crew may postpone cleaning the previously hauled buoy as they prepare for the next haul-in. Buoy tending vessel operators depend on this flexibility to be able to efficiently tend to the buoys in their area of responsibility. If the next buoy to be hauled is only 500 yards up the river or bay, it may be more efficient to haul and deploy the next buoy while the weather and vessel traffic are favorable to operations. This may delay the final biofouling material cleaning of the previously hauled buoys. However, as long as the biofouling material is discharged in the same “ecological area” (as defined in the deck runoff environmental effects analysis report (EEAR)), the potential to transport non-indigenous species (NIS) is eliminated (Volpe, 2002a).

All major repainting is performed off vessel; occasionally minor touch-up painting is performed underway during the buoy maintenance process. During the day of the assessment, none of the six buoys retrieved required touch-up painting. Based on interviews with crewmembers, the survey team concluded that touch-up paint does not contribute constituents to deck runoff (Wenzel *et al*., 2001a).

As noted above, based on the survey team’s visual observations, more than 99 % of the mixture was sediment and marine growth; less than 1 % of the mixture appeared to be rust and paint chips. The fleet-wide discharge of biological materials, sediment, rust, and paint chips from buoy maintenance is calculated as follows (Wenzel *et al*., 2001a).

a. The survey team visually estimated the volume of biological materials, sediment, rust, and paint chips removed from an average sized buoy to be approximately 4 gal per service episode. The USCG fleet of WLM/WLB buoy tenders is responsible for a total of 9,000 buoys. USCG regulations require each buoy be inspected and serviced, if needed, at least every two years. USCG estimates that approximately 10 % of the buoys will be moved off station or damaged by storms each year. These buoys require inspection and servicing prior to resetting. Therefore, the USCG typically services approximately 5,400 buoys each year.

b. Estimating that 5,400 buoys are inspected each year and approximately 4 gal of biological materials, sediment, rust, and paint chips are released per buoy; approximately 21,600 gal of biological materials, sediment, rust, and paint chips are potentially released as deck runoff annually.

c. Based upon an assumption that less than 1 % of the marine sediment mixture is paint chips, the annual paint chip release can be estimated at less than 216 gal.

d. The current fleet of WLM and WLB (33 hulls) services approximately 5,400 buoys annually (Navy, 2002). A WLM 175 services approximately six navigational buoys during each maintenance day (Wenzel, 2000a). After each buoy is serviced, the working deck is washed for approximately 5 min with a 3 gal/min pressure washer, resulting in approximately 90 gal/day of water being discharged. At the end of each day, the buoy deck is washed for approximately 20 min with a 3 gal/min pressure washer and a 100 gal/min standard nozzle hose supplied by the firemain. The volume generated during the end-of-day 20 min wash is more than 2,000 gal. In summary, the daily liquid discharge volume from buoy and working deck washdowns onboard a WLM 175 is approximately 2,150 gal. Assuming that each buoy tender services approximately 164 buoys annually, and six buoys are serviced in a day, each buoy tender spends approximately 28 days per year maintaining buoys. This results in an annual discharge volume of more than 60,000 gal per vessel.

Information presented in the following table is based on the survey team's observations; information obtained from MSDSs based on those observations; and military specifications listed in the COMDTINST M10360.3B, Color and Coatings Manual.

Table 3-3— Potential Discharge Materials for Buoy Operations

Potential Discharge Material	Potential Discharge Volume (gal/fleet·yr)	Bulk Constituents	CAS #	Composition (%)	Constituent Mass Loading (gal/fleet·yr)	Any BCCs Present?
Paint chips/debris	1.0E+02 (estimated)	Copper as cuprous oxide	7440508	47	5.1E+01	Reduction
		Zinc as zinc oxide	7440666	15	1.6E+01	Reduction

Table 3-4— Narrative Parameters for Buoy Operations

Narrative Parameter	Survey Team Observations
Alkalinity	Unknown-not evaluated
BOD/DO	Unknown-not evaluated
Color	No change noted.
Floating Material	None observed; however, the potential does exist.
Hardness	Sediment is indigenous to the waters it is retrieved from/returned to.
Nutrients	Unknown-not evaluated
Odor	Unknown-not evaluated
Oil and Grease	None observed, paint chips would not cause a sheen.
Pathogens	Unknown-not evaluated
PH	Unknown-not evaluated
Settleable Materials	None observed; however, the potential does exist.
Specific Conductance	Unknown-not evaluated
Suspended Solids	None observed, but unlikely to exceed 25 mg/l daily average.
Taste	Unknown-not evaluated
Temperature	Does not change temperature.
Total Dissolved Gases	Unknown-not evaluated
Turbidity/Colloidal Matter	Unknown-not evaluated

The need for the information in this table was not recognized at the time of the assessment. The information is based on survey team recollection and consensus.

3.3 PERFORMANCE OBJECTIVES AND ACTIVITIES

The performance objective for buoy maintenance is for the vessel's responsible party to prevent the discharge of rust, paint chips, paint drips, cleaning compounds, and other materials associated with buoy maintenance that may negatively impact water quality. An additional objective of buoy maintenance is to prevent transporting non-indigenous or invasive species with fouling material and sediment released during buoy maintenance operations. Activities that could be performed to meet this performance objective include, but are not limited to: using high-pressure washes; conducting only minor buoy repairs underway; and discharging biofouling material and sediment from where the buoy was pulled.

Using a focused, high-pressure washer with a 3,000 psi water stream to remove marine biofouling during buoy cleaning evolutions reduces the amount of loose paint chips and loose rust removed compared with using a scraper. Using the pressure washer minimizes the need for scraping; thereby reducing the contribution of paint chips and rust to deck runoff.

Performing only minor paint removal, various repairs (e.g., structural welding), and touch-up preservation reduces the amount of paint chips, rust, and paint drips on the deck where they could potentially contribute to deck runoff. Buoys that require major painting or repair are transferred to shore where major maintenance is performed.

During routine buoy cleaning, biofouling organisms and sediment are washed from the buoys. This material is deposited on the deck. This activity involves discharging this material in the same "ecological area" (as defined in the deck runoff environmental effects analysis report

(EEAR)) as to where the buoy is stationed. Discharging to the location of origin could reduce the risk of transporting non-indigenous species to sensitive areas. All Armed Forces vessels conducting buoy maintenance perform this activity.